MEDICAL SCHOOL ADMISSIONS ACROSS SOCIOECONOMIC GROUPS:

AN ANALYSIS ACROSS RACE NEUTRAL AND RACE SENSITIVE ADMISSIONS CYCLES

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Dissertation Prepared for the Degree of

DOCTOR OF EDUCATION

UNIVERSITY OF NORTH TEXAS

May 2010

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Kennedy, Mike. Medical school admissions across socioeconomic groups: An analysis across race neutral and race sensitive admissions cycles. Doctor of Education (Higher Education), May 2010, 87 pp., 23 tables, references, 68 titles.

While the relationship between academic variables and admission into medical school has been well documented, the relationship between socioeconomic background and admission has not been extensively examined. In 2001, the Texas Legislature passed HB 1641, which allowed for the use of socioeconomic variables in the admission of graduate and professional school students. Additionally, the *Grutter v. Bollinger* decision in 2003 removed a prohibition on the use of race or ethnicity in the admission of students in the state of Texas. The study examined the role medical school admissions selectivity as it relates to the socioeconomic background during a race neutral admissions cycle in 2005 and a race sensitive admissions cycle in 2006. The results of data analysis found that in a race neutral admissions cycle socioeconomic background was a significant factor in the admission of applicants to medical school. However, it was not a significant factor for applicants from underrepresented minority groups. The analysis also found that socioeconomic background was a significant factor in the admission of applicants to medical school in a race sensitive admissions cycle as well. Finally, the study found that variances in selectivity led to differences in the socioeconomic makeup of entering students across different medical schools. From the data analyzed in this study, it can be argued admission to medical school is in agreement with the sociological literature in that parental socioeconomic status is positively related to academic opportunities for their offspring.

ACKNOWLEDGMENTS

I can remember on the first day of kindergarten my arms wrapped around my father's leg and not letting go. He stayed with me that day in the corner of the classroom and quietly pointed out all the things I can learn in school. He held me close, provided comfort, and made my first day of school a bearable experience. Encouraging me since my first day of school, I am very fortunate my parents always supported my education.

I would like to thank my advisor, Dr. Ron Newsom, who moved me forward, kept me on track, and provided timely feedback throughout the dissertation process. I also want to express my thanks to both Dr. Tina Machu and Dr. Marc Cutright, who agreed to serve on my committee. They also provided terrific feedback and made this dissertation a better work product than when I started. I would also like to thank my "motivator-in-chief", Dr. Mike Haynes, whose friendship made my dissertation a more enjoyable experience.

I would like to convey my gratitude to Walter "Budge" Mabry and Carl Wang at the Texas Medical and Dental Schools Application Service. They provided the critical data I needed to complete this study. Along these lines, I would like to thank all of my colleagues and co-workers who provided encouragement and ideas in the completion of this dissertation.

Finally, I would like to express my appreciation to my wife Mary Ann and my son Matthew. When I was in the library doing research or sequestered away writing, they handled my absences with loving support. While it is with some sorrow that my doctoral education is coming to a close, I am quite happy now to spend more time with my wonderful family.

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CHAPTER I

INTRODUCTION

With the recent increase in the number of applications, admission into medical school continues to be one of the most competitive processes in American higher education. Each year tens of thousands of aspiring physicians spend countless hours of academic and non-academic preparation to impress upon the various admissions committees their desire to pursue a career in medicine. For the 2009 entering class for Doctor of Medicine (MD) schools, the Association of American Medical Colleges reports that there were 42,269 applicants for 18,390 seats (Association of American Medical Colleges, 2009). That same year, the nation's osteopathic medical schools received 12,617 applications for 4,639 seats (American Association of Colleges of Osteopathic Medicine, 2009). For state-supported Texas medical schools, the competition is even more challenging as there were 4,005 applicants for 1,355 seats in 2008 (Texas Medical and Dental Schools Application Service (TMDSAS), 2009). In addition to its competitive nature, the admissions process is also complex since it uses a wide variety of variables to develop a sense of not only the applicant's ability to be academically successful in medical school, but the service to society that the applicant will eventually provide as a future member of the medical profession.

Nowacek and Sachs (1990) note that while the use of grade point averages and test scores have been used as traditional admissions benchmarks, demographic variables in admissions have been used "inconsistently" and rarely is it the focus of published research (p. 140). Among these variables are the applicant's socioeconomic background and its relationship with the admissions process and ultimately the medical profession. They found that in most

studies on admissions and socioeconomic background, it served as a secondary variable rather the primary variable within the study.

There is also some literature that suggests that using socioeconomic variables may be of value in medical school admissions that will enhance the cultural diversity of students. Edwards, Maldonado and Engelagu (2000) wrote that when greater weight is given to non-cognitive variables in a race neutral admissions process, subsequent increases in minority enrollment may occur. While a number of institutions have been barred from using race or ethnicity as a factor in admissions, Steinecke, Beaudreau, Bletzinger, and Terrell (2007) note medical schools have engaged in a number of race neutral alternatives like admissions with socioeconomic indices, adversity indices, or outreach programs. They also point out that while the *Grutter v. Bollinger* (2003) decision allows for the use of race in the admissions process, institutions of higher education are obligated to examine the effectiveness of race neutral alternatives prior to the implementation of race or ethnicity as a new admissions criterion.

Advocates for the inclusion of social class in the admissions decision-making process also contend that socioeconomic background contains its own benefit without being considered just as an alternative means to racial diversity. It has been argued that the nation's health care system would benefit from a physician workforce inclusive of socioeconomic diversity as it will lead to more effective medical care for patients from lower social class groups (Magnus & Mick, 2000) as well a broader distribution of the physician workforce to rural and underserved urban areas (Freeman, Ferrer, & Greiner, 2007). Educationally, it is also believed that the inclusion of more medical students from lower socioeconomic backgrounds will enhance the overall quality of the educational experience and cultural training of medical

students (Garcia, 2004). Waldman (1977) wrote that both minorities and applicants from lower income households are at a "competitive disadvantage" in terms of their academic credentials for medical school admission (p. 961).

Two separate events over the past eight years have provided a unique opportunity to examine this demographic variable and the admissions process. The first was passage of House Bill (HB) 1641 during the 78th session of the Texas Legislature codified the use of socioeconomic variables, including governing the use of admission test scores in graduate and professional school admissions. These variables were subsequently asked on all future medical school applications beginning with the 2002 admissions cycle.

The task for the overall administration of the state-supported medical school application process in Texas falls under the TMDSAS. Founded in 1968 by the University of Texas Board of Regents, the TMDSAS became the nation's first common application used in medical school admissions. For its first thirty years, the TMDSAS was the central receiving point for the applications to the four medical schools that are members of the University of Texas System. In 1999, the medical schools at Texas Tech University Health Science Center and the Texas A&M Health Science Center joined as member schools. In 2000, the University of North Texas Health Science Center-Texas College of Osteopathic Medicine joined as its seventh member. In 2008, the Texas Tech Health Sciences Center Paul L. Foster School of Medicine at El Paso joined as its eighth member medical school. This organization is unique in that it is the only medical school application service in the nation that serves multiple schools in the same state with the common laws regarding admissions. As an advantage to applicants, TMDSAS provides a central common application that allows prospective medical students to apply to a single institution

using a common application thereby reducing paperwork for applications. As a service to the medical schools, TMDSAS provides a central location for processing thousands of applications, guidance in the development of admissions policies and procedures, and reduces the overall administrative costs of processing applications (Walter "Budge" Mabry, personal communication, November 3, 2009).

As part of the compliance with HB 1641, a model was developed using responses to certain application questions to place applicants into one of four socioeconomic groups: A, B, C and D based on seven criteria. Applicants therefore can be reviewed not only as part of the broader applicant pool, but also in comparison to a peer group as well. This process had initially used thirteen variables but was later revised to use seven variables starting with the 2004 application cycle.

The second event was the previously mentioned U.S. Supreme Court's ruling in *Grutter v. Bollinger* in 2003, which allowed for the use or race or ethnicity in admissions as part of an institution's efforts to create a diverse student body. While race or ethnicity cannot be used as the sole criterion for consideration of an applicant, the decision reversed nearly a decade-long prohibition in the use of race in admissions from the *Hopwood v. University of Texas* decision in the Fifth Circuit Court of Appeals in 1995. All state-supported medical schools in Texas implemented policies that allowed the use of race and ethnicity as part of their admissions criteria beginning with 2006 admissions cycle.

With these events as a backdrop along with data collected by the TMDSAS, research can be done on the admission of applicants among the seven state-supported medical schools: The University of Texas Medical Branch in Galveston, University of Texas at Houston Medical School,

University of Texas School of Medicine at San Antonio, University of Texas Southwestern Medical Center at Dallas, Texas A&M University System Health Science Center College of Medicine, Texas Tech University Health Sciences Center School of Medicine and the University of North Texas Health Science Center-Texas College of Osteopathic Medicine. To date, there has been no published research completed in Texas to determine whether or not there is any relationship between medical school admissions and socioeconomic backgrounds despite the enactment of HB 1641. With admissions data based on from varying socioeconomic backgrounds available. It is also possible to examine the relationship between ethnicity and socioeconomic groups in the medical school admissions process in Texas.

Whether an admissions process that uses socioeconomic background as an admissions criterion can produce a different outcome is not yet known. This study examined the problem of whether or not socioeconomic parity in the admission of applicants to medical school is possible through the use of socioeconomic background as an admissions criterion. The study also examined whether or not the use of socioeconomic background as well as race or ethnicity as part of the criteria changes the parity in the admission of applicants across different socioeconomic, race or ethnic backgrounds. It is the examination of this medical school admissions data that will serve as the focus of this study.

The Problem

To what extent does socioeconomic background relate to admission and matriculation into medical school in the state of Texas?

Purpose of the Study

The purpose of this study was to examine the relationship between admission of applicants for Texas state-supported medical schools and their socioeconomic, racial or ethnic backgrounds. This study also examined whether the inclusion of race or ethnicity as an admissions factor changes the acceptance rate among applicants from different socioeconomic backgrounds. Finally, the study the examined whether or not admissions selectivity leads to differences in the socioeconomic background of matriculants at Texas state-supported medical schools.

Research Questions

1. What is the relationship between socioeconomic background and admission to medical school?
2. What is the relationship between socioeconomic background and admission to medical school for different racial or ethnic groups?
3. When race or ethnicity is used as an additional admissions factor, what is the relationship between socioeconomic background and admission to medical school?
4. When race or ethnicity is used as an additional admissions factor, what is the relationship between socioeconomic background and admission to medical school for different racial or ethnic groups?
5. Is there a difference in the socioeconomic makeup of entering students based on medical school selectivity?

Significance of the Study

Admissions to medical school is a highly complex process that takes into account a number of variables that may ultimately differ among different medical schools. Research that clarifies this process will contribute to the overall body of literature on this subject.

While a limited number of studies have explored the topic of admissions and socioeconomic status as well as race or ethnicity, this study will be unique as it will process data on actual admissions decisions rather than final enrollment of medical students. While the recent study conducted by Jolly (2008) found an increase in the medical student enrollment from those who come from upper-income households, it did not take into account whether this was a product of the applicant pool or whether the admissions criteria or decision process actually contributed to this trend.

Underlying the significance of this study is whether or not socioeconomic status plays some role in the admissions decision process. As previously stated, medical educators have not spent any considerable time on this subject for at least the past decade. In general, researchers have found that socioeconomic status as a prominent factor in the areas of college access, enrollment and persistence (Mc Donough & Fann, 2007). In what can be considered alarming, educational inequality across socioeconomic backgrounds may persist throughout the 21st century if previous trends are predictors of future patterns of educational outcomes (Gamoran, 2001).

Furthermore, social status attainment models indicate that parental educational attainment, occupation and income are related to each subsequent stage of one's eventual development of their future careers (Beeghley, 2000). More related to medical education, a

study conduct by Yancik (1977) found among graduates at 28 medical schools that 44.3% of them overall and 53.9% of them who entered surgery made the decision to enter a career in medicine prior to their college enrollment, so there appears to be some process of career development for future physicians prior to entering higher education. Pascarella and Terenzini (1991) noted that those who attend college eventually show long-term benefits for their offspring. More recently, a study by the National Center for Educational Statistics (2001) found that those who come from college-educated households are more likely to obtain graduate or professional school training as opposed to college attendees from first-generation college attendee households.

As stated earlier, the changes implemented in enactment of HB 1641 from the 78th Session of the Texas State Legislature and the *Grutter v. Bollinger* decision in 2003 codified or rationalized that indeed, these variables should be addressed in the admission of future students in graduate and professional school education. In writing for the majority in *Grutter*, Justice O'Connor mentions that diversity includes characteristics like "personal adversity and family hardship" (p. 26). Because the parameters of the admissions decision-making process come from the same source (legislative mandate from HB 1641 and policy enactments based the Grutter decision), this study provides a framework to measure a consistent examination of admissions data across multiple medical schools. Additionally, this study can be beneficial to public policy makers who develop policies governing higher education admissions as well as government agencies and educational associations who work closely on topics in this area.

Definitions

Applicant—For the purposes of this study, applicant is defined as a person who submits a completed medical school application to the Texas Medical and Dental Schools Application Service and that applicant is sent to those medical schools as indicated on the application.

Acceptance offered—For the purposes of this study, acceptance offered is defined as an offer of acceptance made by one of the seven state-supported medical schools in Texas and reported to the Texas Medical and Dental Schools Application Service.

Medical school selectivity—For the purposes of this study, medical school selectivity is defined as the mean score on the Medical College Admission Test (MCAT) for entering students for Entry Year 2006.

Race or ethnicity—For the purposes of this study, racial or ethnic group are defined as Native America, White (non-Hispanic), Hispanic (Mexican American, Puerto Rican, other Hispanic), African American, Asian, other unknown and international.

Socioeconomic background—For the purposes of this study, socioeconomic background is a variable assigned to each medical school applicant based on points received from seven criteria: father's educational attainment, mother's educational attainment, area where the applicant lived, size of household, property value of the home where the applicant was raised, whether the applicant contributed to the family income and whether the applicant was a first-generation college student.

Assumptions

There are two assumptions in the design of this study. First, the data that was used to determine the applicant's socioeconomic background was self-reported; as such, it must be assumed that the responses to the application questions were correct and ultimately were placed in the appropriate group. Secondly, the study also assumes that each of the seven medical schools utilized the criteria in compliance with their legislative and/or governing board approval; all medical schools in the TMDSAS were subject to the requirements outlined in the Texas Educational Code on use of criteria for admission and all schools implemented a race or ethnicity criteria beginning with 2006 admissions.

Limitations

There are many variables that ultimately lead to an admissions decision for applicants including academic variables such as, personal interviews, motivation for medicine and prior health-related experiences. Because of this, it cannot be conclusive that socioeconomic background alone actually leads to a particular admissions decision. Secondly, this study used ex-post facto data, which has not been tested for validity or reliability. Finally, the data used in this study was solely from the medical schools in Texas. Since there are both demographic and geographic limitations in this study, limitations exist in how the results of this study can be generalized in other venues. Along these lines, all the medical schools used in this study are state-supported; it is unknown whether the data from these schools would differ should any of them be privately controlled.

CHAPTER II

REVIEW OF THE LITERATURE

As stated by Nowacek and Sachs (1990), socioeconomic status did not appear as the primary focus of any studies regarding medical school admissions in their review of the literature. Sometimes socioeconomic status has been combined with race or ethnicity as one population. For example, in studies regarding the effectiveness of certain outreach programs by Bediako, M. R., McDermott, B. A., Bleich, M. E. and Colliver, J. A. (1996), Kornitzer, Ronan and Rifkin (2005), and Grumbach and Chen (2006) combined economically disadvantaged students with minority students which no one could discern whether the outcomes could have been different for each group.

A recent online search for materials related to medical students and socioeconomic status through 1,750 journals revealed only one article. However, the literature search for this study ultimately returned over 30 book chapters, articles, and dissertations related to this topic. While most of the material found was related to medical education and ultimately found in MedLine®, a number of other publications from psychology, sociology and even one from a business journal were incorporated in this review. After the materials were gathered and initially read, they were placed into six categories: the role of diversity in medical education, the study in historical context, admissions and enrollment, student performance, residency and specialty choice and studies conducted in other nations.

The Role of Diversity in Higher and Medical Education

As previously stated, the literature on socioeconomic background and higher education is limited. Walpole (2003) comments that researchers have spent more time on “mainstream”

students or “students from different racial and ethnic groups as well as those of different genders and sexual orientations” in part because of concerns over equitable access for these groups. Also, socioeconomic background is a less defined population than any of these other groups and lower socioeconomic groups are not as “politically mobilized” (p. 45-46). Much of this section is predicated on the use of racial and cultural diversity as many tend to draw applicable conclusions for those from lower socioeconomic backgrounds.

In general, the use of race or ethnicity in college admissions is high controversial topic that stretches beyond the walls of the institution into the homes of most college-bound aspirants. The initial argument for the use of race or ethnicity in admissions was to be a remedy from past discrimination through affirmative action. However, the *Grutter* decision rests on a different argument that diversity brings educational benefits for all students. This shift has existed for sometime as Sullivan (1977) points out that the admission of black medical students has moved away from a case where the primary concern was discrimination towards “concerns about effective preparatory education, motivation of black students to study medicine, and financial aid” (p. 189). In the case of medical education, a Gunderman (2004) points out the argument for diversity in the education of medical students is ultimately tied closely to the production of more culturally competent physicians who will practice in underserved areas. Additionally, it is argued that the decision to offer admission to applicants is too closely tied to scores on standardized tests which typically put minority applicants at a disadvantage.

On the other hand, Gunderman points out that those who oppose the use of race or ethnicity argue the definition of diversity is too closely tied to only race or ethnicity, fails to redress those factors that have led to the achievement gap and allows for preferential

treatment for individuals rather than using criteria that award admission based on merit. The use of socioeconomic background as a proxy for race or ethnicity has appeal as it is seen as a more equitable approach and politically more supported by both liberal and conservative viewpoints (Magnus and Mick, 2000). A case in point to this argument is the passage of House Bill (HB) 1641 through a Republican controlled legislature and approval by a Republican Governor. Bowen, Kurzweil and Tobin (2005) cite that giving preference in undergraduate admissions based on socioeconomic background broadens representation from lower-income and first-generation college students, promotes social mobility, gives opportunity to students who have overcome adverse conditions, and those who have been admitted in the past do well academically. However, critics have argued that the use of socioeconomic background or social class alone does not address the achievement gap that minorities seem to possess in relation to non-minorities regardless of socioeconomic background (Bowen and Bok, 1998).

The rationale for cultural diversity in higher education has two main facets. First, it provides an intrinsic educational value for students. Hurtado (2007) points out that cultural diversity on campus enhances learning in both classroom and co-curricular aspects of the college experience. Informal interactions among diverse populations provides greater "complex thinking" skills about "people and their behavior, cultural and social awareness, and perspective-taking skills" (p. 191). Also, students have reported a greater sense of understanding about societal issues like poverty and the overall concept of the public good. In general, Hurtado argues that cultural diversity improves society by creating more pluralistic citizens with a greater and more positive appreciation of equality and multiculturalism.

The second point is driven on a more utilitarian approach. In the majority opinion written in *Grutter*, Justice O'Connor cited briefs filed by corporate chief executive officers and retired military officers that the benefits of cultural diversity are valuable in the workplace in both the business sector and the military in which both engage a multitude of cultures in their endeavors. Bowen and Bok (1998) point out that providing more access for minorities in higher education leads to more social mobility and greater diversity in the professions. Minorities who were given the opportunity to attend some the nation's more elite institutions that otherwise might have been rejected went on to earn advanced degrees, enter successful careers in the business sector and become leaders in community and government activities.

The rationale for cultural diversity in medical education rests on similar arguments found elsewhere in higher education. It is believed that a culturally diverse medical student body provides numerous benefits both educationally and to the overall health care system. Educationally, diverse student populations will provide better cultural competence for all students through classroom and co-curricular interactions. A second argument for cultural diversity rests with outcomes whereas minority physicians are more likely to provide care for medically underserved populations.

Three studies provide support for the value of cultural diversity in medical education. One study conducted by Whitla et al. (2003) indicated that among surveyed medical students at Harvard and the University of California-San Francisco there are three specific areas where medical students felt cultural diversity improved the educational process. One, students felt a greater exposure to people from different cultures even more so than in their undergraduate or K-12 education. Second, students felt that diversity provided more viewpoints on issues

discussed in the classroom. Third, students felt that greater diversity led to more concern regarding cultural competence as well as access and equity in the health care system.

A second study completed by Elam et al. (2001) surveyed 349 students at four southeastern U.S. medical schools. One of the key findings of the study was that student viewpoint of diversity was greatly influenced by their diversity of their classroom environment. The results of survey indicated that students believe that a diverse class brought more value to their medical education through classroom experiences. One cited example is that diverse classrooms are more likely to discuss the applicability of scientific material to different racial or ethnic groups. However, differences occurred when examined by gender whereas women perceived the discussion of diversity more positively than men.

A more recent study by Saha, Guiton, Wimmers and Wilkerson (2008) surveyed over 10,000 medical school graduates on their perceptions for preparation for treating patients from diverse backgrounds. Their study concluded that medical school graduates from the most diverse medical schools rated their preparation significantly higher for treating patients from diverse backgrounds than those who attended the least diverse medical schools. The results of survey also found that white medical school graduates from more diverse medical schools had higher levels of support for greater access to medical care.

The second point of the argument to support cultural diversity in medical education is related to outcomes. There have been a number of reports published in recent years that have called for more diversity among medical school matriculants. However, these reports never mention socioeconomic background as one of those diversity factors. The Institute of Medicine's report, *The Right Thing to Do, The Smart Thing to Do*, released in 2001 called upon

increases in diversity in medical education to create a more diverse and culturally competent physician workforce. In 2004, the Sullivan Commission, named after its chair former Secretary of Health and Human Services Louis Sullivan, published a report that called upon not the admission of more culturally diverse students, but also the expansion of training programs for all students to better serve a multicultural society. Also in 2004, the Institute of Medicine published an additional report regarding the addition of more diversity in the health professions, which included recommendations for diversity being a part of the accreditation process. In Texas, the report titled, *Code Red: The Critical Condition of Health in Texas* called for not only increasing the number of physicians in the state by 20%, but also that this group be "representative of the state population" (p. 180).

The notion that minority physicians are more likely to practice in underserved areas than non-minority physicians is well documented. Komaromy et al. (1996) examined physician practice locations in California along with a survey of 718 primary care physicians. The results of study indicated that areas with high minority populations are more likely to be medically underserved areas. In addition, minority physicians practiced in areas with higher minority populations than non-minority physicians. Finally, the study pointed out that black physicians were more likely to care for Medicaid patients than non-minority physicians and Hispanic physicians were more likely to care for uninsured patients than non-minority physicians.

In addition to practice location there is some literature that suggests that the quality of health care is improved by having more minority physicians. More specifically, patients from minority backgrounds tend to rate their doctor-patient relationships higher when they are treated by minority physicians. Saha, Komaromy, Koepsell & Bindman (1999) examined patient

survey data on their relationship with their regularly seen physician. It was found that black and Hispanic patients rated their visit higher when they were seen by a physician of similar race or ethnicity than regularly being seen by a physician from a different racial or ethnic background. Another study by Saha, Taggart, Komaromy and Bindman (2000) found that minorities have a stronger preference for medical care by physicians with the same racial or ethnic background than white patients do. The compelling factor reported in this study was that all racial and ethnic groups chose in part their physician because of language comprehension issues in the doctor-patient relationship.

The Study in Historical Context

Much of the discussion regarding socioeconomic make-up of the medical profession seems to be historical in nature. Kenneth Ludmerer has probably written the most detailed description of medical education in the United States from the nineteenth century through its transition into the twentieth century. He notes up until the time of the Flexner Report in 1910, a number of medical schools operated as for-profit enterprises where faculty were paid by the students directly. Typically these institutions had minimal or no real admissions requirements. It was not uncommon that medical schools admit students primarily on the basis the ability to pay rather than academic qualification. Interestingly, in the past three decades a number of for-profit medical schools have emerged the Caribbean and Central America to educate those who were unable to gain admission to a U.S. medical school. It is also worth noting that there is one for-profit accredited medical school in the United States—Rocky Vista University College of Osteopathic Medicine. Additionally, medicine was not as prestigious as a profession as it is now, and it was not uncommon for a frontier physician to earn two incomes (one from medical

practice and the other through other work) in order to make a reasonable living (Ludmerer, 1985).

However, medical education in the United States underwent significant reforms, including changes in the admissions standards, increases in physician licensing standards by states, and tougher accreditation requirements for medical schools (Ludmerer, 1985; Ludmerer, 1999). While there were many benefits from these reforms, the establishment of world-class medical facilities and the training of better prepared physicians, critics point out that these reforms disenfranchised a number of populations including minorities and lower income groups. The new college course requirements made the opportunity to attend medical school difficult for those who were unable to pay for the additional expenses for their education. Those who could afford college education, did so by attending academically weaker institutions and thus, unable to compete or succeed in medical school. A number of the medical schools that were located in rural and underserved areas were unable to meet the new accreditation demands imposed upon them and subsequently closed (Ludmerer, 1985).

During this time, the defenders of Chattanooga Medical College put forth an argument that the existence of their school provided a much needed service to students who do have the means to fund a top-tier education. They contend that while this medical school is not well-funded and up to the standards of the nation's elite medical schools, their students were prepared and trained with a "practical education" for work of general medicine (Kaufman, 1976 p. 171).

Flexner (1910), convinced otherwise, dismissed these arguments as he writes in his famous report:

> The existence of many of these unnecessary and inadequate medical schools has been defended by the argument that a poor medical school is justified in the interest of the poor boy. It is clear that the poor boy has not right to go into any profession for which he is not willing to obtain adequate preparation; but the facts set forth in this report make it evident that this argument is insincere, and the excuse which has hitherto been put forward in the name of the poor boy is in reality an argument in behalf of the poor medical school (p. xi).

In general, Flexner is praised for his work in medical education. Even so, his work and the work of other reformers during his time have been criticized in their lack of attention to societal needs and sensitivity to disadvantaged populations.

The subsequent debate between those who would reform medical education and those who defended its lesser qualified institutions has become known as the “poor boy argument” whereas academic requirements were so elevated that prospective medical students from disadvantaged backgrounds were unable to fulfill. This debate is mildly referenced in the context that these students from disadvantaged backgrounds and rural areas found opportunities in osteopathic medical schools where admissions standards were less stringent (Gevitz, 1992).

In addition to changes in admissions standards, discriminatory practices also emerged during this period that greatly limited opportunities for a number of groups including women who were subject to admissions quotas. Jewish applicants were also subject to discrimination by a number of medical schools who felt that they were overrepresented in the student population. Application questions about where they lived, family lineage and personal interviews were used as criteria as ways of identifying them and ultimately as a criterion for denying admission (Sokoloff, 1992). In the years following the Flexner Report, five of the seven nation’s black medical schools were closed which greatly diminished opportunities for African

Americans (Savitt, 1992). While the number of African American students doubled from the Second World War to the 1960s, they only accounted for 2.75% of all medical student enrollments (Sorenson, 1972).

For physicians, the changes in the medical education system in this country helped alter the nature and prestige of the medical profession to where it is now one of the most powerful organizations in the United States on political and social issues. However, it was not only those who wanted to attend medical school were affected by these changes. The distribution of the physician workforce disproportionately left poor communities inadequately staffed to meet their medical needs. While Flexner argued during the time of his report that the new physician workforce would serve the entire nation, newly trained physicians gravitated towards the nation's more affluent areas. This coupled with shortage of physicians due to the closure of a number of medical schools greatly undermined medical care in many parts of the country (Starr, 1982).

As for students, both the reforms and changes in admissions policies sharply altered the medical student population from a broader representative spectrum of society towards a group from the nation's elite. Berliner (1985) states that "of all changes that have ensued in medicine since the publication of the Flexner Report in 1910, the change in class composition of the medical labor force has been the most significant" (p. 113). Johnson (1983) also noted that the medical school enrollment since the Flexner Report into the 1960s was primarily filled by white males from upper-income households. Despite the growth in enrollments of minorities and lower socioeconomic groups through financial aid programs such as the National Health Service

Corps and laws against discrimination, both the economic and cultural diversity of the nation's medical school have yet to be reflective the nation's demographic makeup.

Admissions and Enrollment

As stated earlier, published literature on socioeconomic background and admission to medical school is virtually non-existent. However, there have been two studies that used household income in relation to admissions and enrollment with mixed results. One study by Boerner and Thomae (1983) found only slight differences between admission to medical school and parental income among 28,972 applicants who were divided into three income groups. This seems to be the only admissions study that used a socioeconomic variable as the primary independent variable.

A majority of the literature regarding admissions and socioeconomic background revolve around parental background. More specifically, five different studies questioned whether or not the children of physicians are at any advantage during the admissions process. Pasceralla and Terenzini (1991) comment that the educational attainment of the parents provides some tangible benefit in the educational attainment of the offspring. From this, it can be inferred that the sons and daughters of physicians are at an advantage; each study presented its own nuance and adds to the knowledge base about this distinctive population.

As described in a doctoral dissertation completed by Rose (1986) educational attainment for future physicians is a process that students undergo throughout their undergraduate studies. In general, the study found that those who come from a household with a father who is a physician were more likely to successfully negotiate the premedical course of study. The study examined 1,817 students whom entered college in 1967 with a declared

interested in medicine; those who continue throughout college with this career goal had fathers with high educational status attainment. Furthermore, having a father as a physician and coming from a higher income household were statistically significant among those who persistent through college with the intention of entering medical school.

Lentz and Laband (1989) cite five potential sources of "intergenerational transfers" (p. 398) of knowledge that help the offspring of physician in the medical school selection process: provide motivation by showing the rewards of the profession; help with course selection to develop the best possible academic credentials; assist with completing the application; provide coping mechanisms with the pressures of attending medical school, and assist in knowledge of medical practice. All of which provides them with an advantage over applicants who do not have the equivalent exposure. Using a sample of 8,477 applicants who completed the premedical student questionnaire in 1979, a regression analysis was completed using variables such as parental background, college major, undergraduate college selectivity, Medical College Admission Test (MCAT) scores, grade point average, and grades on specific science and non-science courses. The data found a significant relationship with having a father as a physician is in one's chances in a gaining admission along with grade point average and college selectivity. However, in this study, having a mother who was a physician was not a significant factor in the regression analysis.

The finding of physician gender differences in the study presents itself with a new question of whether or not there is difference in career aspirations of offspring based on which parent holds a degree in medicine. Since nearly half of currently enrolled medical students are women, it is not clear that the gender differences found in this study are present today.

However, a study by Anthony (1998) reviewed Cooperative Institutional Research Program (CIRP) data among premedical students and found similar gender differences. The study used data from 3,871 undergraduate students (1,914 males and 1,957 females). Among males, having a father who is a physician was a better predictor of their interest in medicine than for females who had a father who was a physician. Vice-versa, having a mother who is a physician was more predictive of females to have an interest in medicine than it was for males. Furthermore, scores on the SAT and years of study in biology were predictive of females, but not for males in this study. On the other hand, family income was a predictor for males, but not females.

While educational attainment of the parent is positively correlated with educational attainment of offspring, the impact on the psyche is not always positive. O'Connell and Gupta (2006) surveyed 102 college students and interviewed 23 premedical students at a selective liberal arts college in the Northeast. They found many had at least one family member (father, mother, aunt or uncle, brother, etc.) in the medical profession. While having a member of the family in the profession served as a positive (rewards of the profession) influence on their decision to enter medicine, it was also noted that negative effects were also felt among students in the sample as cited family pressure as a reason why they have chosen the premedical course of study.

One study by Longo, Gorman and Ge (2005) compared the academic credentials of rural and non-rural applicants along with their respective admissions decisions. In a selected sample of University of Missouri-Columbia School of Medicine applicants, it was found that applicants from rural areas actually had higher grade point averages than their non-rural applicants.

Furthermore, there was no statistical difference in performance on the MCAT. Subsequently, the authors state that rural applicants are more likely to gain admission to the medical school. They cite the institution's commitment to rural medicine as a compelling factor in the admissions process. However, for non-rural, this study does not differentiate those who may be from an inner-city environment and those who are from a suburban community. By not dividing non-rural populations, it is not clear how applicants from different types of non-rural areas perform in the admissions process.

Admission at most medical schools requires an interview. These experiences can be quite daunting for those who have never experienced such an effort in a professional school setting. One study examined a number of demographic variables and their relationship between prospective students and faculty members. Elam and Andrykowski (1991) evaluated interview scores of 356 students at the University of Kentucky College of Medicine. Through a regression analysis, students from rural areas perform the same in interview settings as do non-rural medical students when academic qualifications are held constant.

From this literature, it may be thought that medical student populations are homogeneous across all schools. However, differences between schools can also exist as well. Clatworthy and Krueger (1982) compared enrolled medical students at both Ohio State University Medical School and Universidad Autonoma de Guadalajara in Mexico. They found that the school in Mexico had a higher proportion of students who had a father who was a physician 21% versus (vs.) 14% for Ohio State. Furthermore, the number of fathers who were in law or banking was much higher by a 27% to 9% margin, which would indicate that the foreign-

trained medical student was exposed to a student population even more affluent than that of a medical school in the United States.

Two studies were found that examined enrollment of medical students. Most recently, Jolly (2008) found that a majority of entering medical students came from households in the highest income quintile while less than 6% of enrolled medical students represented the lower quintile. Additionally, there was one study that examined the issue of medical student educational debt and socioeconomic background. Bazzoli, Adams & Thran (1986) found that the educational debt of medical school graduates from different socioeconomic backgrounds were the same regardless of type of medical school (public vs. private) attended. However, this study divided socioeconomic background using educational levels into two parts: high school graduates and some college.

Academic Performance

There are numerous studies that attempt to provide predictors for student performance while in medical school. While traditionally these studies centered on academic variables such as MCAT scores, grade point averages, or undergraduate institution, a small sample of work has been done using socioeconomic data as the primary independent variable when examining student performance among medical students in the United States. Over a thirty-year period, only four studies were published.

Fredericks and Mundy (1967) studied 82 medical students (78 males and 4 females) enrolled in a medical school in the Midwestern United States. The students were divided into 3 social classes and their academic performance was evaluated in comparison the each group.

The study concluded that there was no significant relationship between social class and performance during the first-year of medical study.

In a similar study, Gough and Ducker (1977) evaluated data from 1,195 medical students from the University of California at San Francisco over a twenty year period. These students were divided into 5 social classes using a standardized sociological scale. Academically grades for the first three years of medical study were not different based on class. However, in the fourth of study students from the lower social class groups performed lower than higher social class groups, but it was not statistically significant.

In a study that evaluated medical school persistence and academic difficulty, Fogelman and Zwagg (1981) found that medical students from families with lower socioeconomic backgrounds encountered more difficulty in completing the medical school curriculum. They contend that students from lower socioeconomic backgrounds may encounter more social problems at home or even lower levels of encouragement in their pursuit of a career in medicine because parents are uncertain how to respond to their children's educational pursuits. Despite these problems, the authors contend that there is a need for a more socioeconomic and culturally diverse medical student population.

Fadem, Schuchman and Simring (1995) examined data from 192 students from a New Jersey medical school who graduated in 1994 and 1995. Parental income information was found from financial aid documents and used to determine their socioeconomic background. The study found that parental income was correlated significantly with performance on the MCAT and the United State Medical Licensing Examination (USMLE), the first of three required examinations for physician licensure in the United States. However, the results were not the

same for all student groups as the correlation between performance among minority men and non-minority women was not statistically significant.

The most recent work was completed by Cooter et al. (2004) examined a sample of 1,464 medical students at Jefferson Medical College who were enrolled between 1992 and 2002. For analysis, the sample was divided into three income brackets: top 25%, middle 50% and lower 25%. In general, they found that the lower 25% group had the lowest level of academic performance during the basic portion of the curriculum (Years 1 and 2) and lower scores on Year 3 clinical rotations. The lower income group also had significantly lower scores on Step 2 of the USMLE and had a higher rate of academic difficulty. However, there was no perceived difference in the performance among all groups in residency training as indicated by rating from residency program directors.

Residency and Specialty Choice

Intuitively, it is believed that medical students from lower socioeconomic backgrounds will more likely to enter a primary care (family medicine, pediatrics, obstetrics and gynecology or general internal medicine) fields than their peers from higher socioeconomic groups. With the increased demand for primary care physicians, this topic becomes of greater interest to medical educators as they attempt to graduate more physicians who will ultimately practice in these much needed specialties. In their development of theoretical model for determining whether a student decides between primary care medicine and specialty medicine Bland, Meurer and Maldonado (1995) use a wide range of variables for student demographic background, institutional culture, curriculum design to student perceptions of various specialties. Through this process they found it difficult to understand the relationship between

race or ethnicity, as well as socioeconomic background and specialty choice because the variables are often interrelated or used interchangeably within the research. Outside the intuitive belief that there is a relationship between socioeconomic background and relation to career specialty, a limited body of published work is available to support this belief.

In addition to academic performance Gough and Decker (1977) also analyzed career outcomes of 1,195 medical students from the University of California at San Francisco based on which one of five social classes these students were from. They found statistically significant numbers of lower social class origin students enter general medicine as opposed to students from higher social class origin groups. Among the lowest social class group, 27.3% of select a general medicine field as opposed to just 9.3% of those from the highest social class group.

In his doctoral dissertation, Condon (2001) surveyed a sample of 367 students enrolled in medical schools in the New York City area to determine whether or not there are differences in specialty preferences among them from different social class groups. In this sociological study, parent's income, education and occupation were found to be significant at .01 level as students from lower income household, educational attainment or occupations were more likely to express an interest in general medicine over a specialty. However, lower income students have the highest level of indecision. When gender is added, women prefer generalist medicine over men, but class still remains a predominant factor with lower social class women having a greater interest in generalist medicine over higher social class women. While minorities were more likely to express an interest in generalist medicine, social class was not a predictor as their interest was higher across social class groups. However the sample size was very small for minority students was very small with only 61 minority student participants.

More related to the selection process for residency training rather than career outcomes, Taggart, Wartman and Wessen (1987) surveyed 1,631 medical students surveyed across 80 medical schools in April 1982 about their specialty preferences and the residency selection process. The graduating medical students perceived social background as one least important characteristics used by residency programs in ranking applicants for selection to their program.

Along the lines of career specialty outcomes, location of practice is also an issue that has been studied by medical educators. More specifically, studies have been conducted with the intent of finding ways to increase interest or eventually place more medical school graduates in rural medical practice. As stated earlier in the historical literature, physician practices have moved further from rural areas in favor of more affluent urban communities in the period after the Flexner Report. Interest in career outcomes more specific to rural medicine can be found not only in literature relevant to this nation, but in other nations as well.

In their evaluation of medical school graduates Kassebaum, Szenas, and Schuchert (2005) found a relationship between socioeconomic variables and future career paths for medical school graduates. The study looked at 7,848 graduates of Doctor of Medicine (MD) schools in 1995. They found that among these physicians, those having a rural hometown increased likelihood of general medical practice. Also, in reverse of that trend, those who came from households with family incomes above $100,000 were less likely to enter general medicine.

In a previous study, Kassebaum and Szenas (1993) found that among a 1988 entering cohort of 8,457 medical students, those who were from a rural hometown were four times as

likely to express interest in a rural medicine career than those who were not from a rural hometown. Additionally, the study examined the results of graduation survey given to medical students in 1992 and found that the percentages remained consistent.

In related research, Bowman et al. (1996) examined longitudinal data from 30,789 medical students to determine what characteristics were present from those who "maintained" an interest in family medicine from those who either "lost interest" or where "never interested" (p. 714). The data revealed that those who gained interest in family while attending medical school had some of the same socioeconomic characteristics as those who either maintained an interest in family medicine and those who lost their interest in family medicine including size of hometown, father' education and spouse's hometown (when applicable).

Location of the medical school may also be related to location of medical practice. Newton, Grayson and Whitley (1998) surveyed 649 medical students at two different medical schools: the Brody School of Medicine at East Carolina and New York Medical College. A regression analysis was on what influences their decision to either select or not select a primary care career. There are ten demographic and thirteen student interest items (income, prestige, work conditions) used in the analysis. Unlike the previous studies regarding eventual choice of entering a medical career, this study found that parental educational attainment or any demographic variable except for marital status was not significant in their choice whether to pursue primary care as a career. However, among the East Carolina students, they were more likely from a rural area.

One study also evaluated parental educational background and race or ethnicity as it relates to choice of medical specialty. Boucree, Epps & Pisano (1988) evaluated parental

educational background and planned area of medical practice among Tulane medical students. The study found that minority students are more likely to come from households with lower educational attainment than those who were non-minority students. The results also found that parental educational background was a predictor of medical school graduate residency training choice for non-minority students, but not for minority students.

Studies Conducted in Other Nations

The question of whether or not socioeconomic background is related to medical school admissions or medical education extends beyond the borders of the United States. With different systems of higher education (for example, medical school admissions in England occurs after the equivalent of high school as opposed to while in college in the United States), generalization should be of concern as the sampled populations may differ as well as the value systems of that culture. However, in reviewing the literature, the findings were nearly identical to similar studies conducted in the United States.

Recent literature on socioeconomic background and medical education can be found England where there have been both quantitative and qualitative studies which examined admissions data as well as the process students underwent when considering a career in medicine. Seyan, Greenlaugh and Dorling (2004) compared admissions data in England from 1996 to 2000 by race and socioeconomic group in relation to the overall population of the country. They found “massive inequalities” when viewing admissions as a standardized ratio between admitted applicant by social class in relation to the total population (p. 1545). The highest social class group was overrepresented by nearly six times among admitted medical students in relation overall population while the lowest social class had only 1/5 of the

representation in relation to the population. When race or ethnicity was included in the analysis, some ratios were even wider when considering that no black applicants were admitted from the lowest social class throughout the four years examined. Interestingly, Asians had the highest overall representation with a ratio nearly forty-two times greater than their percentage of the population.

This finding seems to contradict previous studies by Johnson (1971) and McManus and Richards (1984) who found among social class, their appeared to be no difference in the ratio between admitted and non-admitted applicants. The Johnson study used 1966 data collected by mail survey from 453 applicants and admitted students. McManus and Richards found no difference between the socioeconomic representation between applicants and admitted students among the 1,361 applicants who applied to St. Mary's medical school in during 1980-1981. However, both studies were unlike the study by Seyan, Greenlaugh and Dorling (2004), this study looked at the ratio among applicants, not the general population. Johnson also noted that the applicant pool was not reflective of the nation's demographic population and there was a large representation from the highest social class groups.

Two qualitative studies of premedical students in England were also found literature review that examined the attitudes of prospective medical students from different socioeconomic backgrounds. Robb, Dunkley, Boynton and Greenhalgh (2007) interviewed forty-five lower socioeconomic students in London, but who are high academic performers and the potential to gain admission to medical school. The results of the interviews found that these prospective students lacked rudimentary knowledge about applying to medical school such as basic web sites or information on how to study for the entrance exams. Even so, the students

felt that they had strong parental encouragement and expressed good feelings about their overall educational experience in primary and secondary education.

Similar findings were also present in a study by Greenlaugh, Seyan and Boynton (2006), who examined sixty-eight sixteen-year-olds with strong academic records in various secondary schools in England. Like the study by Robb et al., lower socioeconomic students were unaware of basic admissions process or scholarship opportunities. When asked about their chances of gaining admission, lower socioeconomic students self-rated their chances as being 1 in 10 as opposed to the actual admissions ratio of 2 in 3. Another interesting aspect of this study was information about what motivates them towards a career in medicine; higher socioeconomic background students viewed medicine from its intrinsic rewards (personal fulfillment and achievement) while lower socioeconomic students talked more about financial rewards and the "blood and guts" aspect of the profession (p. 1542).

One study was found in regards to academic performance of students in English medical schools. Lumb and Vail (2004) examined scores of 738 medical students on the Objective Structured Clinical Examination (OSCE) in year three of their medical training. The exam is widely used as a tool to assess the student's ability to perform in patient care settings by using standardized patients with mock clinical pathologies. The study found that there was no difference in performance in the exam by medical students from different socioeconomic groups.

In neighboring Scotland, a study by Lumsden, Bore, Millar, Jack, and Powis (2005) was published that examined the use of non-cognitive variables in the admission of medical school applicants in 2002. The study tested 510 medical school applicants using the Personal Qualities

Assessment (PQA), which measured cognitive ability, personality traits and moral/ethical reasoning. Lower socioeconomic background students performed lower, but not significantly, on the cognitive portion of the exam, but scored significantly higher than their higher socioeconomic group peers on the personality portion of the test. The results of the PQA were then compared to the actual admissions decisions of the medical schools. They found that if the results of PQA had been used, the admitted applicant pool may have been more favorable admissions decisions for applicants from the lower socioeconomic backgrounds.

Three studies were found in that examined admissions and medical student populations in Canada. Dhalla et al. (2002) surveyed 981 first-year Canadian medical students and made several observations. Among them, they found that the parents of the students had higher levels of educational attainment in relation to the nation's population (30% of fathers and 19.4% of mothers had a master's or doctoral degree). Furthermore, 17% of the medical students in this study came from households with incomes greater than $160,000 per year as opposed 2.7% of the nation's population with household incomes in that range.

The other two Canadian studies were focused on the question of representation by rural populations among medical students. Hutten-Czapki, Pitblado and Rourke (2005) compared 4,948 rural and urban (Ontario) Canadian medical school applicants in 2002 and 2003 from rural backgrounds. They found rural applicants are fewer (7.3% of applicants while 13% of the population is rural), but had nearly identical academic credentials in terms of MCAT and GPA. Also, rural applicants were just as likely to gain admission as their urban counterparts. In a similar study, Kwong et al. (2005) compared enrolled Canadian medical students from rural and non-rural backgrounds with survey responses from 2,994 medical students. Medical students

from rural backgrounds reported as having lower SES backgrounds at home (household income and parental educational attainment). Also, these students commented more on the financial barriers to attend medical school and reported higher levels of financial stress.

One study was found that examined the relationship between academic difficulty and its potential relationship with parental socioeconomic status among enrolled students in a medical school in Israel. Among the 443 medical students enrolled at Beer-Sheva: Medical School for International Health during 1974-1983, Lazin and Neumann (1991) found no difference between parental socioeconomic background and potential to drop-out of medical school.

In further examining the presence of published literature in medical education on socioeconomic background, three studies were found that were conducted in an Asian countries. Endo (1982) examined social backgrounds of a sample of 194 (170 were males) Japanese medical students. In this sample, nearly half of the students had fathers who were physicians. Of those who had fathers as physicians, nearly 2/3s cited their father as single most important influence to choose medical profession. Interestingly, among those who did not have a father who was a physician, 31% of them also cited their father as the single most important influence in choosing to enter the medical profession.

Another study by Fan et al. (2007) was related with medical students enrolled at Yang Ming University (Taiwan) found correlations between stress levels and parental socioeconomic status. Like many of the other studies, medical students in this country also typically come from higher socioeconomic backgrounds. However, unlike the study by O'Connell with premedical students with physician family members, this study found that medical students from lower parental educational backgrounds (specifically, mothers) experience greater amounts of stress.

The authors believe that this may due to lower levels or preparation or the shame of having mother from an “inappropriate” background (p. 740).

With cultural differences between those in Japan and Singapore, studies from Australia may be more aligned with medical education research from England, Canada and Scotland. However, the literature review has been segregated by geographic region and therefore, the study regarding academic performance among Australian medical student completed by Biggs, Najman, Schulz and Williams (1991) was placed here. This study examined academic performance and persistence among 227 entering medical students at the University of Queensland School of Medicine in 1988. The study evaluated applicant across different parent educational and occupational levels to determine whether differences exist in overall performance and ability to complete the curriculum. In general, the study found that lower socioeconomic background students were less likely to complete their medical education and performed at a lower level in comparison to students who came from higher socioeconomic backgrounds. However, it was not noted that was not a “persistent trend” and statistical significance was not found in all areas (p. 376).

Conclusions

Socioeconomic background research seems to run the entire continuum of medical education from admissions to outcomes. In some respects, the results of the literature review tend to demonstrate some consistency with regards to education status attainment and career outcomes. While this may allay some concerns about the need for a more definitive body of research on this topic, there are some observations regarding the literature review that need to be addressed.

The literature seems to support the sociological models that parental educational background influences educational attainment for the offspring. Within this population, these models may differ among gender and racial groups. With the limited scope of information available and the fact that many of these studies are over fifteen years old makes for uncertainty of whether or not the same conclusions would occur if these were replicated with current data.

Another area of consistency seems to be related to outcomes. This is especially true for medical students from rural backgrounds and their likelihood of returning to a rural area for medical practice. However, the literature is a little suspect in regards to overall practice in primary care vs. specialty care based on socioeconomic background. While the conclusions of the literature seem to support each other, there seems to be an absence of more definitive analysis with socioeconomic background as the primary independent variable.

One area where the research lacks any substance is with the academic performance of students. With only one study published in the last decade, it should be cause for concern that there is little or no empirical research conducted in this area. Most of the remaining work used data for enrolled students dates from the 1950s to the 1970s. Given that the medical student composition of this era is different than those who are enrolled today (especially among women), it would be difficult to conclude that these results can be attributed to the present.

An interesting point throughout the literature review process was the presence of studies conducted by researchers in other countries. While most of the work was found in current and former parts of the British Empire, it does demonstrate that there are research questions related to this topic that extend beyond the borders of this country. Also, another

interesting point was the research tended to focus on the same tangible areas to the U.S. including the admission of students and their academic performance.

Overall, there seems to be a lack of a clear research agenda in this area. Studies seem to be done over time periods (1970s and the early to mid-1990s) as opposed to a continuous examination of data or trends. With the changes in student composition over the past twenty years, it would seem to behoove the medical education community, at least in this country, to develop a more a consistent track record in this area.

As for how the literature will guide the study, two areas seem to give some guidance what the potential outcome of any data analysis will show. First, the study completed by Jolly that found disproportionate representation among entering medical students from upper-income households. However, as previously stated, it is not definitive whether this a product of disproportionate applicant pool or an decision-making process that directly or in-directly favors applicants from higher income groups. It is hopeful that this research will provide a greater understanding of this phenomenon.

Secondly, the recent work done in other nations would lead one to believe that similar findings may be found here in the U.S. While there may be differences in educational systems, the sociological models tend to support the idea that parental socioeconomic status influences the status offspring. It is with this information and results of studies in other venues lead one to believe that socioeconomic status is positively related to admission to medical school. This may be true now as opposed to the previous work done in the early 1980s. Again, a more definitive answer could come as a result of this study as it will narrowly examine a part of the process not previously explored.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Research Design

This study was a non-experimental quantitative analysis of ex-post-facto admissions data maintained by the Texas Medical and Dental Schools Application Service (TMDSAS) in Austin, Texas. Founded in 1968, the medical school application service is unique that it is the only application service in the nation that is dedicated to the processing of applications for medical schools in a single state. It is also unique in that it collects admissions decisions information from all of the state-supported medical schools in Texas. At one point, all medical school applications in Texas are sent to this application service. As such, the service will be able to provide a wealth of data for research.

Description of the Population

Each year, applicants who are interested in attending any of the state-supported medical schools in Texas must submit an application to the TMDSAS. The service manages the primary application form that is used by the medical schools to evaluate applicants for admission. The service also collects official transcripts, scores on the Medical College Application Test (MCAT), letters of evaluation and photos to collate and transmit them to each medical school the applicant chooses to apply. Once the medical schools receive the information, they are free to make decisions on which applicants they ultimately want to accept or deny for admission based on the decision-making processes within their own institution. Information on the final disposition of the applicant is sent back to the application service for data reporting. Ultimately, the application service oversees the traffic rules (a cooperative

agreement between schools to set deadlines monitor multiple admissions offers and govern when offers of admission can be made) for all of participating schools to minimize enrollment problems that may occur with applicants receiving multiple acceptance offers.

The population used for this study was 3,572 applicants for 2005 admission and 3,821 applicants for 2006 admission to state-supported medical schools in Texas. These applicants are those who submitted an online application for admission which was transmitted electronically to at least one medical school. Applicants who did not report a race or ethnicity on their application will be excluded from the final analysis. Also, applicants who designate "international" and "other ethnic group" as their race or ethnicity were excluded from the race or ethnicity analysis since it is not clear which race or ethnic group they would normally belong to. Finally, applicants for the dual Ph.D. Medical Scientist Training Program (MSTP) will be excluded as they are not subject to the same admissions procedures as all other applicants to Texas medical schools. MSTP programs are small, highly selective and they are exempt from Texas residency requirements.

Variables

The data contained one identifier variable, two independent variables and one dependent variable:

TMDSAS Personal Identification Number (PIN) – This was used as a unique record identifier. The PIN is a randomly generated four-digit number created when a prospective student starts an application.

Socioeconomic group – Socioeconomic group is an ordinal variable assigned to each applicant based on responses to seven questions on the medical school application. Applicants

are not made aware which questions were used in the assignment of their socioeconomic group. Upon submission and internal processing of the application, they are placed into one of four groups: A, B, C or D with A being the lowest group and D being the highest group.

Ethnicity – Applicants self-report their ethnicity on the application as one of the following groups: American Indian, Black, Oriental, Mexican American, Puerto Rican, other Spanish, White, other Ethnic Group, Caucasian, or international. Applicants also have the option not to report their race or ethnicity by not responding to this question at which time these applicants are categorized at not-reported. For the purposes of this study, Mexican American, Puerto Rican and other Spanish were combined to create a group designated Hispanic.

Admission status– This variable will serve as the dependent variable. During each admissions year, medical schools who are members of the TMDSAS electronically send information regarding the admissions decisions for each applicant who applied to their respective school. These decisions are maintained in a centralized database to both coordinate the admissions process between the schools and to provide information to external audiences like the premedical advisors or the Association of American Medical Colleges (AAMC). Applications who received an offer from a medical school were coded AC for acceptance offered by that school. Since this is ex-post-facto data, the code AC no longer appears as the applicant's current status. To determine which applicant's received an offer of acceptance, two other codes can be used. The codes M (represents those who were and matriculated) and H (represents those who accepted, but withdrew before matriculation) were used to determine the total number of acceptances given by all of the medical schools.

Source of the Socioeconomic Data

In response to the passage of House Bill (HB) 1641 during the 2001 Texas Legislative Session, the Texas Medical and Dental Schools Application Service created an ad hoc committee of medical school admissions officers from its member schools to examine how applicants were evaluated using the socioeconomic criteria outlined in the legislation and to determine a method of classifying applicants by socioeconomic group.

The initial matrix developed for admissions beginning in 2002 used responses from thirteen questions for applicants describe their socioeconomic background from birth to age 18. Point values were assigned based on the applicant's response to each question. Table 1 lists the categories that were used in the development of this socioeconomic matrix:

Table 1

2002-2003 Socioeconomic Variable Point Values

Category	Points Available
Father's Educational Attainment	0-10
Mother's Educational Attainment	0-10
Area Where Raised	0-5
First-Generation College Student	0-10
Has dependent children	0-5
Bilingual or multilingual	0-5
Size of Household (number of persons)	0-20
Household Income	0-20
Property Value of Home (owned or rented)	0-15
Lived in Subsidized Housing	0-10
Received Federal Lunch Program Benefits	0-10
Responsible for Raising Other Children	0-5
Contributed to Family Income	0-15

If someone other than the father or mother played a significant role in raising the applicant, then that person's educational attainment is used. Once the points are totaled, then the applicant is placed into one of the socioeconomic groups based on the following scale: Group A (50-140 points), Group B (25-45 points), Group C (15-20 points), and Group D (0-10

points). These groupings were designed to create four relatively equal socioeconomic groups. Group A is the group with the least amount of socioeconomic resources and Group D is the group with the highest level of socioeconomic resources. This scale was used for admissions during both the 2002 and 2003 application cycle.

After the 2002 application cycle, the socioeconomic data was collected and analyzed. TMDSAS also consulted a sociologist to review the matrix and recommend any modifications if necessary. As a result, a new socioeconomic matrix was developed which would use seven questions beginning with the 2004 application cycle:

Table 2

2004-Present Socioeconomic Variable Point Values

Category	Points Available
Father's Educational Attainment	0-15
Mother's Educational Attainment	0-15
Area Where Raised	0-10
First-Generation College Student	0-10
Size of Household (number of persons)	0-20
Property Value of Home (owned or rented)	0-15
Contributed to Family Income	0-15

Like the previous scale, if someone other than the father or mother played a significant role in raising the applicant, then that person's educational attainment is used. Additionally, the process continues to use four socioeconomic groups and applicants are placed into one group

based on the point totals gathered from all seven questions: Group A (45-85 points), Group B (30-40 points), Group C (15-25 points), and Group D (0-15 points).

However, unlike the previous scale that generated nearly four nearly similar sized groups, this scale created four groups that were more representative of peer groups within the applicant pool which had a high proportion of applicants from college-educated and relatively affluent backgrounds. As such, the new scale placed more applicants in Categories C and D and fewer applicants in Categories A and B.

Procedure for the Collection of the Data

The data was collected through a written request to the Texas Medical and Dental Schools Application Service, which serves a centralized repository for medical school admissions data in Texas. The information requested is available to the public and such requests require the approval of the executive director. The executive director is an employee of the University of Texas System and is responsible for the overall administration of application service on behalf of the state-supported medical schools. While the individual medical schools ultimately make the decision on whether or not to admit a particular applicant, the TMDSAS collects application materials and provides data processing support.

The data was sent electronically in a comma separated variable (CSV) file format. The TMDSAS PIN number will be sent as a four-digit number, socioeconomic background will be sent as a one character field, ethnicity was sent as a one character field with translate values (for example, letter X equals white, letter S equals other Spanish). Admissions decision had one of three options: M for matriculated, H for withdrawal after acceptance, or blank for no offer of admission. For the data analysis, a new field will be created with the title Admission where

those with the codes M or H were coded with accepted and those left blank are coded not-accepted.

Data Analysis

The data collected from the Texas Medical and Dental Schools Application Service was being imported into Excel® for descriptive analysis. Frequencies for accepted and not-accepted were developed by socioeconomic group. Also for each racial or ethnic group, a separate frequency distribution was developed with those applicants who are accepted and those who are not-accepted. Acceptance rates was calculated for each group by taking the number of accepted applicants and divide them by the total number of applicants within the race or ethnic group. This was done for both the entire 2005 and 2006 samples. For groups with less than 30 applicants, only descriptive data are presented.

Since the membership by socioeconomic group within the applicant pool was not normally distributed, non-parametric statistics was used (Pallant, 2005). For data analysis, the study utilized the chi-square for two-sample cases with one distribution containing frequencies of the accepted medical school applicants and the other distribution being those applicants who were not accepted. The two-sample chi-square allows for the determination of significance across two frequency distributions. This test provides a non-parametric analysis of nominal data that will yield whether the distributions are statistically significant (Hinkle, Wiersma and Jurs, 1998).

For this study, the level of significance was set at .05 which on a 4 X 2 distribution would have a X^2_{cv} of 7.815. To determine expected values for each cell, the following formula was used:

$$\text{Expected Frequency} \quad \frac{f_r \times f_c}{n}$$

The chi-square statistic was calculated using the following formula:

$$X^2 = \sum \frac{(\text{Observed} - \text{Expected})}{\text{Expected}}$$

In addition, a Pearson contingency coefficient will be calculated to determine the extent of the relationship between socioeconomic background and admissions. The contingency coefficient formula is:

$$C \quad \frac{\sqrt{X^2}}{n+X^2}$$

The coefficient is analogous to the Pearson product moment where a coefficient of one is considered a perfect relationship between the variables.

If the distribution was found to be significant, then standardized residuals were calculated to determine which cell (s) were major contributor(s) to the significant X^2 value. The formula for residuals used was:

$$R = \frac{\text{Observed-Expected}}{\sqrt{\text{Expected}}}$$

If the absolute value of the residual is greater than 2.00, then that cell of the distribution was considered a "major contributor to the significant X^2 value" (Hinkle, Wiersma and Jurs, 1998 p. 581).

For Research Question 1, a 4 X 2 distribution were constructed for all applicants who met the criteria for inclusion from the 2005 admissions data. As previously stated, the X^2_{cv} was set at 7.815. When the calculated chi-square statistic exceeds X^2_{cv}, standardized residuals was calculated for each value. In addition to the chi-square analysis, a Pearson contingency coefficient was also calculated.

For Research Question 2, 4 X 2 distributions were constructed for all applicants who met the criteria for inclusion from the 2005 admissions data for each race or ethnic group. The X^2_{cv} was set at 7.815. When the calculated chi-square statistic exceeds X^2_{cv}, standardized residuals was calculated for each value. In addition to the chi-square analysis, a Pearson contingency coefficient was also calculated.

For Research Question 3, a 4 X 2 distribution were constructed for all applicants who met the criteria for inclusion from the 2006 admissions data. As previously stated, the X^2_{cv} was set at 7.815. When the calculated chi-square statistic exceeds X^2_{cv}, standardized residuals was calculated for each value. In addition to the chi-square analysis, a Pearson contingency coefficient was also calculated.

For Research Question 4, 4 X 2 distributions were constructed for all applicants who met the criteria for inclusion from the 2006 admissions data for each race or ethnic group. The X^2_{cv} was set at 7.815. When the calculated chi-square statistic exceeds X^2_{cv}, standardized residuals was calculated for each value. In addition to the chi-square analysis, a Pearson contingency coefficient was also calculated.

For Research question five, medical school matriculants (those whose final application status was M) were placed into separate table by their respective school. The mean composite Medical College Admission Test (MCAT) score was calculated to rank the schools by selectivity (Schools A-G). While one table may have addressed the analysis of the overall distribution, it would not have been possible to ascertain whether specific schools had different socioeconomic distributions in their entering student population. Therefore, 4 X 2 distributions were constructed to compare each medical school side-by-side. Twenty-one distributions were created in order to have a comparison for each medical school. The X^2_{cv} was set at 7.815. When the calculated chi-square statistic exceeded X^2_{cv}, standardized residuals were calculated for each value.

CHAPTER IV

FINDINGS

Descriptive Statistics

The data received from the Texas Medical and Dental Schools Application Service contained 3,572 records for Entering Year (EY) 2005 and 3,821 records for EY 2006. Because of incomplete socioeconomic data eleven records were excluded from the EY 2005 data and one record was excluded from the EY 2006 data. Table 3 provides a breakdown of the EY 2005 applicant pool by socioeconomic background:

Table 3

EY 2005 Applicants by Socioeconomic Background

Group	n
A	437
B	536
C	1,131
D	1,457
Total	3,561

A socioeconomic breakdown is also provided for applicants for the EY 2006 cycle:

Table 4

EY 2006 Applicants by Socioeconomic Background

Group	n
A	424
B	587
C	1,205
D	1,604
Total	3,820

In addition, descriptive statistics were also calculated by both socioeconomic group and race or ethnicity. A breakdown for EY 2005 applicants is provided in Table 5:

Table 5

EY 2005 Applicants by Socioeconomic Background and Race or Ethnicity

	Race or Ethnicity						
Group	White	Asian	Hispanic	Black	Native American	Other	Unknown/Int'l
A	132	93	134	57	2	13	6
B	249	93	97	57	7	20	13
C	635	224	128	78	5	37	24
D	812	402	89	52	8	66	28
Total	1,828	812	448	244	22	136	71

Applicants for the EY 2006 cycle were also examined by both socioeconomic groups and race or ethnicity. The results are presented in Table 6 below:

Table 6

EY 2006 Applicants by Socioeconomic Background and Race or Ethnicity

	Race or Ethnicity						
Group	White	Asian	Hispanic	Black	Native American	Other	Unknown/Int'l
A	106	110	126	55	0	21	6
B	246	125	108	57	6	27	18
C	677	235	131	91	9	39	33
D	869	426	114	69	11	78	37
Total	1,888	896	479	272	26	165	94

Socioeconomic Background and Race Neutral Admissions

For Research Question 1 a chi-square distribution was developed for all applicants. For Research Question 2, chi-square distributions were developed for White, Asian, Hispanic and Black ethnicities. Since the Native American distribution was below 30, only descriptive statistics were provided. Since no specific ethnicity was cited among the group "Other" and "Unknown/International" no statistics were calculated. For each group, applicants were placed into the categories of non-admitted and admitted. For descriptive purposes, the acceptance rate was also calculated and presented in each table. Table 7 displays the distribution for non-

admitted and admitted applicants along with acceptance rates for medical school during EY 2005:

Table 7

Acceptance Rates by Socioeconomic Group EY 2005

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	282	370	700	776
Admitted	155	166	431	681
Acceptance Rate	35.5%	31.0%	38.1%	46.7%

$X^2 = 51.024$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .12.

Also, standardized residuals were calculated for each cell. For this distribution, four groups were revealed as major contributors to the chi-square statistic: The non-admitted applicants for Socioeconomic Group B, the admitted applicants for Socioeconomic Group B, the non-admitted applicants for Socioeconomic Group D and the admitted applicants for Socioeconomic Group D.

For Research Question 2, chi-square distributions were calculated for each ethnic group. For descriptive purposes, the acceptance rate was also calculated and presented in each table. Table 8 contains the distribution among white applicants along with their acceptance rate for EY 2005:

Table 8

Acceptance Rates for White Applicants by Socioeconomic Group EY 2005

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	92	160	378	415
Admitted	40	89	257	397
Acceptance Rate	30.3%	35.7%	40.5%	48.9%

$X^2 = 27.193$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson contingency coefficient was also calculated and it presented with a coefficient of .12.

Also, standardized residuals were calculated for each cell. For this distribution, three groups were revealed as major contributors to the chi-square statistic: The admitted applicants for Socioeconomic Group A, the non-admitted applicants for Socioeconomic Group D and the admitted applicants for Socioeconomic Group D.

Table 9 contains the chi-square distribution and acceptance among Asian applicants for EY 2005:

Table 9

Acceptance Rates for Asian Applicants by Socioeconomic Group EY 2005

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	61	72	149	202
Admitted	32	21	75	200
Acceptance Rate	34.4%	22.6%	33.5%	49.8%

$X^2 = 32.704$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .19.

Also, standardized residuals were calculated for each cell. For this distribution, four groups were revealed as major contributors to the chi-square statistic: The non-admitted applicants for Socioeconomic Group B, the admitted applicants for Socioeconomic Group B, the non-admitted applicants for Socioeconomic Group D and the admitted applicants for Socioeconomic Group D.

Table 10 contains the chi-square distribution and acceptance among Hispanic applicants for EY 2005:

Table 10

Acceptance Rates for Hispanic Applicants by Socioeconomic Group EY 2005

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	77	64	75	50
Admitted	57	33	53	39
Acceptance Rate	42.5%	34.0%	41.4%	43.8%

$X^2 = 2.366$

The chi-square statistic for this distribution did not exceed the X^2_{cv} of 7.815. Therefore, the distribution is not statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .07. Since the distribution was not statistically significant, no standardized residuals were calculated.

Table 11 contains the chi-square distribution and acceptance among Black applicants for EY 2005:

Table 11

Acceptance Rates for Black Applicants by Socioeconomic Group EY 2005

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	36	46	52	33
Admitted	21	11	26	19
Acceptance Rate	36.8%	19.3%	33.3%	36.5%

$X^2 = 5.414$

The chi-square statistic for this distribution did not exceed the X^2_{cv} of 7.815. Therefore, the distribution is not statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .15. Since the distribution was not statistically significant, no standardized residuals were calculated.

Table 12 contains the descriptive statistics for the Native American applicants for the EY 2005 application cycle:

Table 12

Acceptance Rates for Native American Applicants by Socioeconomic Group EY 2005

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	1	5	5	5
Admitted	1	2	0	3
Acceptance Rate	50.0%	28.6%	0.0%	37.5%

Socioeconomic Background and Race Sensitive Admissions

For Research Question 3 a chi-square distribution was developed for all applicants. For Research Question 4, chi-square distributions were developed for White, Asian, Hispanic and Black ethnicities. Since the Native American distribution was below 30, only descriptive statistics were provided. Since no specific ethnicity was cited among the group "Other" and "Unknown/International" no statistical analysis was undertaken. For each group, applicants were placed into the categories of non-admitted and admitted. For descriptive purposes, the acceptance rate was also calculated and presented in each table. Table 13 displays the distribution for non-admitted and admitted applicants along with acceptance rates for medical school during EY 2006:

Table 13

Acceptance Rates by Socioeconomic Group EY 2006

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	298	400	744	874
Admitted	126	187	461	730
Acceptance Rate	29.7%	31.9%	38.3%	45.5%

$X^2 = 56.400$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .12. Also, standardized residuals were calculated for each cell. For this distribution, six groups were revealed as major contributors to the chi-square statistic: The non-admitted applicants for Socioeconomic Group A, the admitted applicants for Socioeconomic Group A, non-admitted applicants for Socioeconomic Group B, the admitted applicants for Socioeconomic Group B, the non-admitted applicants for Socioeconomic Group D and the admitted applicants for Socioeconomic Group D.

For Research Question 4, chi-square distributions were calculated for each ethnic group. For descriptive purposes, the acceptance rate was also calculated and presented in each table.

Table 14 contains the distribution among white applicants along with their acceptance rate for EY 2006:

Table 14

Acceptance Rates for White Applicants by Socioeconomic Group EY 2006

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	65	155	390	463
Admitted	41	91	277	406
Acceptance Rate	38.7%	37.0%	41.5%	46.7%

$X^2 = 9.895$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .07. Also, standardized residuals were calculated for each cell. For this distribution, no cells exceeded the absolute value of 2 and therefore, none of them were major contributors to the statistical significance of the distribution.

Table 15 contains the chi-square distribution and acceptance among Asian applicants for EY 2006:

Table 15

Acceptance Rates for Asian Applicants by Socioeconomic Group EY 2006

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	79	87	159	233
Admitted	31	38	76	193
Acceptance Rate	28.2%	30.4%	32.3%	45.3%

$X^2 = 20.438$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .15. Also, standardized residuals were calculated for each cell. For this distribution, only one group was a major contributor to statistical significance of the distribution: the admitted applicants in Socioeconomic Group D.

Table 16 contains the chi-square distribution and acceptance among Hispanic applicants for EY 2006:

Table 16

Acceptance Rates for Hispanic Applicants by Socioeconomic Group EY 2006

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	85	71	75	53
Admitted	41	37	56	61
Acceptance Rate	32.5%	34.3%	42.7%	53.5%

$X^2 = 13.309$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .16. Also, standardized residuals were calculated for each cell. For this distribution, only one group was a major contributor to statistical significance of the distribution: the admitted applicants in Socioeconomic Group D.

Table 17 contains the chi-square distribution and acceptance among Black applicants for EY 2006:

Table 17

Acceptance Rates for Black Applicants by Socioeconomic Group EY 2006

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	46	47	65	41
Admitted	9	10	26	28
Acceptance Rate	16.4%	17.5%	28.6%	40.6%

$X^2 = 12.356$

The chi-square statistic for this distribution exceeded the X^2_{cv} of 7.815. Therefore, the distribution is statistically significant. As part of the analysis, a Pearson Contingency Coefficient was also calculated and it presented with a coefficient of .21. Also, standardized residuals were calculated for each cell. For this distribution, only one group was a major contributor to statistical significance of the distribution: the admitted applicants in Socioeconomic Group D.

Table 18 contains the descriptive statistics for the Native American applicants for the EY 2006 application cycle:

Table 18

Acceptance Rates for Native American Applicants by Socioeconomic Group EY 2006

	Socioeconomic Group			
	A	B	C	D
Non-Admitted	0	3	5	6
Admitted	0	3	4	5
Acceptance Rate	N/A	50.0%	44.4%	45.5%

Medical School Selectivity and Socioeconomic Background

For Research Question 5, Table 19 provides descriptive data for all seven medical schools in terms of the mean Medical College Admission Test (MCAT) score and the number of total matriculants for EY 2006 and the number of matriculants from each socioeconomic group:

Table 19

Medical School Selectivity and Matriculants by Socioeconomic Group for EY 2006

			Socioeconomic Group			
Medical School	Mean MCAT	Matriculants	A	B	C	D
A	26.9	152	19	23	53	57
B	27.7	80	4	14	21	41
C	28.0	216	23	22	66	105
D	28.3	213	17	30	68	98
E	28.7	216	11	30	74	101
F	28.8	138	15	26	43	54
G	32.1	216	23	19	55	119

In addition, two-way chi-square distributions were created to compare each of the seven schools with each other. The X^2_{cv} for each distribution will be set at 7.815.

Medical School A was examined through a two-way chi-square distribution with Medical Schools B, C, D, E, F, and G. In comparison with Medical School B, the chi-square statistic (X^2= 6.724) did not exceed the F_{cv}. In comparison with Medical School C, the chi-square statistic (X^2= 5.068) did not exceed the F_{cv}. In comparison with Medical School D, the chi-square statistic (X^2= 3.648) did not exceed the F_{cv}. In comparison with Medical School E, the chi-square statistic

(X2=7.892) for this distribution exceeded the X^2_{cv} of 7.815. The distributions for Medical Schools A and E are presented in Table 20 below:

Table 20

Medical School Matriculants for Schools A and E

	Socioeconomic Group			
	A	B	C	D
School A	19	23	53	57
School E	18	31	75	93

X^2=7.892

Standardized residuals were calculated but no cells were cited as major contributors to significant distribution. In comparison with Medical School F, the chi-square statistic (X^2= 1.104) did not exceed the F_{cv}. In comparison with Medical School G, the chi-square statistic (X^2=11.868) for this distribution exceeded the X^2_{cv} of 7.815. The distributions for Medical Schools A and G are presented in Table 21 below:

Table 21

Medical School Matriculants for Schools A and G

	Socioeconomic Group			
	A	B	C	D
School A	19	23	53	57
School G	23	19	55	119

X^2=11.868

Standardized residuals were calculated but no cells were cited as major contributors to the chi-square statistic.

Medical School B was examined through a two-way chi-square distribution with Medical Schools C, D, E, F, and G. In comparison with Medical School C, the chi-square statistic (X^2= 5.061) did not exceed the F_{cv}. In comparison with Medical School D, the chi-square statistic (X^2= 2.126) did not exceed the F_{cv}. In comparison with Medical School E, the chi-square statistic (X^2= 1.925) did not exceed the F_{cv}. In comparison with Medical School F, the chi-square statistic (X^2= 4.174) did not exceed the F_{cv}. In comparison with Medical School G, the chi-square statistic (X^2= 6.182) did not exceed the F_{cv}.

Medical School C was examined through a two-way chi-square distribution with Medical Schools D, E, F, and G. In comparison with Medical School D, the chi-square statistic (X^2= 2.381) did not exceed the F_{cv}. In comparison with Medical School E, the chi-square statistic (X^2= 6.001) did not exceed the F_{cv}. In comparison with Medical School F, the chi-square statistic (X^2= 6.351)

did not exceed the F_{cv}. In comparison with Medical School G, the chi-square statistic (X^2= 2.094) did not exceed the F_{cv}.

Medical School D was examined through a two-way chi-square distribution with Medical Schools E, F, and G. In comparison with Medical School E, the chi-square statistic (X^2= 1.563) did not exceed the F_{cv}. In comparison with Medical School F, the chi-square statistic (X^2= 2.884) did not exceed the F_{cv}. In comparison with Medical School G, the chi-square statistic (X^2= 6.755) did not exceed the F_{cv}.

Medical School E was examined through a two-way chi-square distribution with Medical Schools F and G. In comparison with Medical School F, the chi-square statistic (X^2= 6.495) did not exceed the F_{cv}. In comparison with Medical School G, the chi-square statistic (X^2=10.976) for this distribution exceeded the X^2_{cv} of 7.815. The distributions for Medical Schools E and G are presented in Table 22 below:

Table 22

Medical School Matriculants for Schools E and G

	Socioeconomic Group			
	A	B	C	D
School E	11	30	74	101
School G	23	19	55	119

X^2=10.976

Standardized residuals were calculated but no cells were cited as major contributors to significant distribution.

Medical School F was examined through a two-way chi-square distribution with Medical Schools G. In comparison with Medical School G, the chi-square statistic (X^2=12.064) for this distribution exceeded the X^2_{cv} of 7.815. The distributions for Medical Schools F and G are presented in Table 23 below:

Table 23

Medical School Matriculants for Schools F and G

	Socioeconomic Group			
	A	B	C	D
School F	15	26	43	54
School G	23	19	55	119

X^2=12.064

Standardized residuals were calculated. One cell was found as a significant contributor (the high frequency of matriculants from Socioeconomic Group B in medical school F) to the chi-square distribution.

CHAPTER V

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

This study was designed as a quantitative analysis of admissions data to determine the relationship between socioeconomic background and admission to medical school. Specifically, this study used applicant data from the Texas Medical and Dental Schools Application Service (TMDSAS) for Entry Years (EY) 2005 and 2006. In addition to the examination of socioeconomic background for all applicants, the study further examined the relationship across different racial and ethnic groups. The study also examined this relationship in both a race neutral and race sensitive admissions process where it is possible to see this relationship using different admissions criteria. Finally, this study examined whether or not medical school selectivity ((as defined by mean Medication College Admission Test (MCAT) scores)) results in a different socioeconomic makeup of matriculating students.

Research Questions Addressed

The analysis contained in chapter IV provides predictable, but yet complex results. Each question is addressed individually below.

Research Questions 1 and 2 examined medical school admissions in a race neutral context as defined under the Texas Educational Code and the prohibition from using race or ethnicity as defined by the *Hopwood* decision. For Research Question 1, the chi-square analysis (X^2=51.024) shows that there is a statistically significant relationship between socioeconomic background and admission to medical school. In general, higher socioeconomic status leads to a greater chance of gaining admission as shown with Group D having the highest acceptance rate at 46.7%. However, the Pearson Contingency Coefficient indicates that the overall relationship

is relatively small at .12. Interestingly, applicants from Socioeconomic Group A were more than likely to gain admission than those of Socioeconomic Group B in the sample studied. Further discussion about this is addressed in the analysis of Research Question 2.

For Research Question 2, there were mixed results in the chi-square analysis when admissions are evaluated across different racial and ethnic groups. For white applicants, the descriptive statistics and results of the chi-square analysis showed a linear and statistically significant (X^2=27.193) acceptance rate across socioeconomic groups with Group D having the highest acceptance rate at 48.9%.

A similar finding was found among Asian applicants where the chi-square statistic (X^2=32.703) was significant. Group D had the highest acceptance rate; however, Group A outperformed Groups B and C. The low acceptance rate of Group B (22.6%) and the high acceptance rate for Group D (49.8%) were significant contributors based on the standardized residuals.

Among Hispanic applicants, the chi-square analysis (X^2=2.366) indicates that socioeconomic background was not a significant factor in the admission of applicants for EY 2005. In fact, Hispanic applicants from the lowest socioeconomic group (Group A) had the second highest acceptance rate (42.5%) among all of the Hispanic socioeconomic groups.

Among Black applicants, a similar finding was discovered. The chi-square analysis (X^2=5.414) indicates that socioeconomic background was not a significant factor on whether or not applicants would be admitted. Interestingly, applicants from Group A also had the highest acceptance rate at 36.8%.

In addition to the overall distributions for each race or ethnic group, three groups (Asian, Black, and Hispanic applicants) showed instances where applicants from Socioeconomic Group A were more likely to gain admission than those from Groups B and C. In fact, Black applicants from Group A had the highest acceptance rate among all Black applicants from each other socioeconomic group. Overall, this is an interesting finding that within a race neutral context, minority applicants from the lowest socioeconomic group were admitted at a higher rate than their higher socioeconomic peers. It would appear as socioeconomic background became a demographic variable for diversity, it greatest benefit was for lower class minority groups. Also, it is of interest that those who were in the lowest socioeconomic who, at least the data would suggest, were able to overcome adverse conditions to gain admission. It is this population that may be of interest in future studies.

Research Questions 3 and 4 examined the relationship between socioeconomic background and admissions for Entry Year (EY) 2006 in which the medical schools utilized diversity as a new admissions criterion. For Research Question 3, the chi-square analysis showed a statistically significant (X^2=56.400) relationship between socioeconomic group and admission to medical school. In general, higher socioeconomic status leads to a greater chance of gaining admission with those in Group D having the highest acceptance rate at 45.5%. However, the relationship as measured by the Pearson Contingency Coefficient was small at 0.12.

For Research Question 4, the results were quite different from its counterpart Research Question 2. Among white applicants, the chi-square analysis was significant (X^2=9.895).

However, applicants from Group A had a higher acceptance rate than those in Group B which was not the case during the EY 2005 admissions process.

For Asian applicants, socioeconomic background was a significant factor (X^2=20.438) in their acceptance rate for medical school. However, unlike the EY 2005 analysis, the relationship was more linear where Group A had an acceptance rate of 28.2%, Group B had an acceptance rate of 30.4%, Group C had an acceptance rate of 32.3% and Group D had the highest acceptance rate at 45.3%. The acceptance rate among Group D (45.3% of applicants were admitted) was a significant contributor to the distribution.

For Hispanic applicants, the chi-square analysis (X^2=13.309) showed a significant relationship between socioeconomic background and admission to medical school. Unlike the nearly equal acceptance rates for EY 2005, Hispanic applicants for EY 2006 had a more linear relationship where Group A had an acceptance rate of 32.5%, Group B had an acceptance rate of 34.3%, Group C had an acceptance rate of 42.7% and Group D had the highest acceptance rate at 53.5%. The acceptance rate among Group D (53.5% of applicants were admitted) was a significant contributor to the distribution.

For Black applicants, the chi-square analysis (X^2=12.356) showed a significant relationship between socioeconomic background and admission to medical school. Unlike the nearly equal acceptance rates for EY 2005, Black applicants for EY 2006 had a more linear relationship where Group A had an acceptance rate of 16.4%, Group B had an acceptance rate of 17.5%, Group C had an acceptance rate of 28.6% and Group D had the highest acceptance rate at 40.6%. The acceptance rate among Group D (40.6% of applicants were admitted) was a significant contributor to the distribution.

Research Question 5 examined the socioeconomic makeup of matriculants for EY 2006 medical schools students at the seven state-supported medical schools that were member schools of the Texas Medical and Dental Schools Application Service. Of the twenty-one chi-square distributions analyzed, only four revealed statistically significant results. The socioeconomic makeup of EY 2006 matriculants for School G (the most selective school with a mean MCAT of 32.1) was significant with School A (X^2=11.868), School E (X^2=10.976), and School F (X^2=12.064). The socioeconomic makeup of School of EY 2006 matriculants for School A (the least selective school with a mean MCAT of 26.9) was significant with School E (X^2=7.892) and School G (X^2=11.868).

The results of the analysis related to question five seems to indicate that variances in selectivity may have some residual effect in the socioeconomic makeup the medical school population. However, since many of the schools in this sample had similar levels of selectivity, the only instances where differences were found involved the most selective (School G) and least selective schools (School A). School G (most selective) had the highest percentage of Group D matriculants among all the schools examined in this study. What is also striking about this sample is that there were similar socioeconomic distributions for each school despite the vast geographic differences in location.

Implications for Medical School Admissions Research

From an evaluative perspective, it can be argued that the intent of House Bill (HB) 1641 was successful in regards to socioeconomic parity for underrepresented minority applicants for EY 2005. However, without a historical reference point, this argument cannot be conclusive. However, taking into account the EY 2006 data, this point can be made with some degree of

certainty. While HB 1641 can be considered successful on this front, the results do not explicitly state that race neutral admissions through socioeconomic background leads to a critical mass of diverse students in the classroom.

The results of the study indicate three key findings that are applicable to medical education and higher education in general. First, socioeconomic background is related to admission to medical school. This finding coincides with much of the literature available in higher education and sociology where socioeconomic background influences one's social status attainment.

Second, the relationship between socioeconomic background and admission to medical school is different in a race neutral context than it is in a race sensitive context across racial or ethnic groups. It appears from the results of this study that at least in the initial year where race or ethnicity was used as a factor in admissions, underrepresented minority applicants from the lowest socioeconomic group showed decreases while underrepresented minority applicants applicants from the highest socioeconomic group showed increases. While the data represents a relatively brief snapshot, it does, however, show that changes in the admissions policy can ultimately lead to changes in the admissions decisions whether intended or not. This point coincides with the literature in regards to the inconsistent use of demographic variables in medical school admissions. Socioeconomic background is simply not followed to the extent that race or ethnicity is.

Third, the data analyzed indicates that medical schools with different levels of selectivity result in different student populations in terms of socioeconomic background. From the data it appears that the socioeconomic background of medical students from highly selective schools

are different than those with lower levels of selectively especially those on the lower end of the spectrum. Interestingly, School G had the highest proportion of representation from Group D among all schools while School A (least selective) had the lowest proportion of Group D students among its matriculants. However, the data used in the study had many medical schools with similar levels of selectivity so it is difficult to be definitive. Using a different sample of schools may reveal a more definitive answer to this research question.

Areas for Additional Research

While this study revealed that socioeconomic background is a significant factor in medical school admissions, it prompts a number of different questions where additional research will need to be done to provide a greater understanding of this topic. First and foremost, there is clear evidence that a socioeconomic background is a factor, but not the factor in predicting admission to medical school. This study used a socioeconomic matrix that encompasses several variables. A regression model with each individual variable may provide a more in-depth explanation of the relationship between socioeconomic background and admission to medical school.

This study only examined one demographic variable in relation to admission to medical school. The inclusion of additional variables through quantitative analysis may provide a clearer understanding of other criteria like academic grades and test scores also contribute to the admissions decision. Regression models or structural equation modeling can provide greater insight in understanding in what context socioeconomic background can serve.

Race and ethnicity was used one of variables in this study, but those definitions were broad based on how the data was initially collected. With the new federal requirements for the

collection of race or ethnicity from applicants, greater depth can be achieved through a replication of this study with more information regarding specific sub-groups from different cultures. This is especially true among the Asian population which represents a broad spectrum of nations and cultures.

While quantitative research can provide analysis on a large scale, qualitative analysis may provide greater depth in terms of answering more complex questions. For example, there appears to be some anomalies in regards to the admission of applicants from lower socioeconomic backgrounds; in a number of instances, it was found that these students performed quite well in the admissions process as compared to their counterparts from other groups. Focused qualitative analyses such reviews of the application files can provide greater depth about the undergraduate process that a population of students undertook. Interviews with the applicants themselves may reveal more detail about factors that cannot be expressed quantitatively like motivation, work habits or peer groups. These data can provide a wealth of understanding that at present cannot be measured through quantitative statistical tests.

Another type of research that may be conducted is the use of cohort studies. The medical school admissions process as examined in this study only represents a relatively short time frame. Through the use of information technology, for example, tracking a cohort of entering freshmen who apply through the Texas Common Application for undergraduate admission can be tracked in a three-year or four-year cohort to the online Texas medical school application to determine success rate or attrition rate across socioeconomic groups. With these data, more research can be conducted in regards to the educational pipeline among Texas colleges and universities.

Finally, some measure of work both quantitatively and qualitatively can be done looking forwards and examine outcomes of this admissions process in relation socioeconomic groups. A lot of research in medical education is done by using past data to predict future performance. As noted in chapter two, the current research on socioeconomic background and its relationship to academic performance or career paths is quite weak and appears to be mostly depended on intuitive speculation. A more ambitious agenda in this area may provide definitive results which can greatly enhance the literature on this subject.

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