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A Quantitative Study on the Predictive Ability of MCAT Scores on the Pre-Clinical Grade Point Averages of Black Medical Students

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Dedication

This manuscript is dedicated to the persons who have provided me with their unwavering support throughout this journey – my family. You have lifted me in times of doubt, done without me when I was absent, and celebrated me every step of the way. I absolutely could not have done this without you. I hope that you are as proud of me as I am of all of you. To my husband - Reginald Horne, my daughters – Gabrielle Horne, Cassidy Horne, and ShaVaughn Horne Barney, my parents – Benjamin and Charity Cannon, and my in-laws – Richard and Jannis (resting in power) Horne, thank you from the bottom of my heart!

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Abstract

The purpose of this study was to examine the predictive ability of MCAT scores on the pre-clinical grade point averages of Black medical students. Underrepresented in medicine students, including students of color and those from low socioeconomic backgrounds have often been prevented from pursuing medical education. This is due to the heavy reliance on numeric metrics including undergraduate grade point averages and MCAT scores for admissions decisions. (DeCarvalho et al., 2018; Linville, 2015; Reede, 1999). The research questions employed in this study focused on the relationship between MCAT scores and pre-clinical grades of Black students and the relationship between secondary variables including undergraduate GPAs, socioeconomic status, or the tier of undergraduate institution attended on the relationship of the two primary variables.

This study was quantitative in nature and grounded in Practice Theory. Practice Theory was chosen to stimulate alteration of inequitable structures which lack representation and inclusion for marginalized and underrepresented citizens. Pearson correlations and multiple regressions were used to answer the research questions. This study added to existing data by supporting the need to eliminate absolutes from academic numeric metrics when using them in medical school admissions decisions, indicating the need to develop admissions rubrics which give value to non-quantifiable experiences, and to employ EDI personnel with the ability to forge multidimensional relationships with underrepresented applicants. Results showed a significant, yet weak, positive correlation between MCAT scores and pre-clinical GPAs for Black medical students. Only undergraduate GPAs and the number of EDI staff predicted pre-clinical GPAs and neither of these variables affected the relationship between the primary variables.

Keywords: medical education; standardized test scores; equitable admissions

Chapter One

Introduction

It is forecasted that, by the year 2043, there will no longer be a white majority in the United States (U. S.) population (Muskal, 2012). This occurrence will result in a "majority – minority" nation with a substantial increase in the number of Black citizens (Brown, 2016). The shift, while significant, does not coincide with the trends observed in the population of practicing physicians. The striking lack of representation in the number of Black physicians is acutely illustrated in the number of Black males matriculating into medical schools. Despite gains seen in the number of Black males beginning and completing undergraduate programs, similar gains have not been observed in medical school admissions. In 1971, 626 Black men entered medical school. By 2014, this number had not only not increased, but had decreased to 515 (Bright, et al., 2018; Chen et al., 2018). In 2017, Blacks comprised 14% of the population, but accounted for only 4% of practicing physicians (Talamantes et al., 2019). These statistics indicate a substantial gap in the number of Black students matriculating into medical school relative to their representation in the general population.

Compounding the significance of the dearth of Black physicians is the predicted shortage of physicians overall. Dall et al. (2016) report that the need for physicians will outpace supply by 2025, resulting in a physician deficit somewhere between 46,000 and 90,000. This phenomenon is due to increases in: the number of citizens, the age of the population, and the need for medical services. Between 2013 and 2025, demand for the physician workforce will increase between 11% and 17% while the supply of available physicians is projected to only increase by 9%. Perhaps the greatest need for increases in the number of practicing physicians is evident during health crises such as the COVID-19 pandemic. With over one million confirmed

cases in the U. S. as of late April of 2020, the need for an increase in the physician workforce is acutely critical in times such as these (Centers for Disease Control and Prevention, 2020).

The increase in the number of Black citizens, coupled with an enduring scarcity of Black physicians, presents an even greater conundrum for the persistence of health disparities in the Black community. Health disparities are the avoidable, systematic dissimilarities observed in health outcomes between groups (Centers for Disease Control and Prevention, 2018). The observed differences result in increased morbidity and mortality among minoritized**,** underprivileged, and disadvantaged populations. Chronic medical conditions tend to cause inequitable outcomes for persons of color**,** including the Black community. Examples of such diseases and conditions include diabetes, cardiovascular disease, cancer, stroke, and Human Immunodeficiency Virus (HIV) infection (Milburn et al., 2019). In addition to the inequitable outcomes resulting from the aforementioned chronic medical conditions, disease and death, resulting from the pandemic of COVID-19 have disproportionately affected persons of color, particularly the Black community. In April of 2020, Black citizens comprised 30% of the total population of Chicago, Illinois, but accounted for 68% of the coronavirus deaths (Reyes, et al., 2020). Increased transmission of the virus has been linked to social and economic inequities including: mass incarceration; homelessness or inadequate housing; higher rates of unemployment; prolonged preexisting medical conditions; and more inconsistent access to quality healthcare (Patton, 2020).

Black physicians provide unique advantages when seeking to reduce and eliminate health disparities. They are more likely to select medical specialties including family and internal medicine, pediatrics, and general obstetrics and gynecology, which provide primary care for members of the population (Xierali & Nivet, 2018). Further, Black physicians**,** more than their

white and Asian counterparts**,** tend to provide care in medically underserved areas, often rendering care to poor, uninsured, or underinsured patients (DeCarvalho et al., 2018). This places them in a prime position to effect change and combat health disparities, which disproportionately affect persons of color resulting in increased levels of morbidity and mortality. Given that studies indicate better communication, increased levels of trust, and stronger adherence to treatment when patients and physicians share common identities (Torres, 2018), it is advantageous to promote the growth of the Black physician population.

Efforts to increase the number of Black physicians in U. S. communities will succeed only after leaks in the educational pipeline are repaired. Such leaks include: application completion, matriculation, completion of medical education, and retention of practicing Black physicians (Bright et al., 2018). Obstacles to their admission must be considered, diminished, and eventually removed. Previous efforts employed to combat longstanding educational inequities included quotas and affirmative action (Garces & Mickey-Pabello, 2015). These initiatives**,** while making strides in increasing diversity, were deemed discriminatory to white students. They were subsequently challenged before the Supreme Court, declared unconstitutional, and either greatly reduced or eliminated (Gruhl & Welch, 1990).

Generation of more Black physicians is directly tied to matriculation of more Black students into medical school. Prior to enrolling in medical school, Black students have faced a substantial number of hurdles. Recognized barriers include shortages of mentorship and programming opportunities specifically targeting underrepresented in medicine students and the presence of systemic racism including racial profiling and subtle bigotry. Additional barriers include lower levels of literacy than their white counterparts leading to intense and generational poverty; lower educational expectations leading to lower educational attainment; and inequities

in cultural and human capital (Bright, et al., 2018; Gewin, 2014; Southgate, et al., 2015). While these injustices present a seemingly insurmountable path toward medical education, those who manage to navigate this landscape must also demonstrate cognitive mastery of premedical material deemed necessary to demonstrate the ability to handle the rigor of medical education. This mastery is most often gauged using numeric metrics, which include standardized test scores and undergraduate grade point averages (GPAs).

Problem Statement

The Medical College Admissions Test (MCAT) has been ostensibly used to certify which students are capable of completing medical education (McGaghie, 2002). It was put in practice to provide standardization in the consideration of students who attended undergraduate institutions with varying curricula and grading standards. While seeking to "level the playing field" for medical school applicants, the MCAT has been indicated as a source of marginalization for underrepresented in medicine students. Underrepresented in medicine students include Black, Hispanic, Native American, and students with low socioeconomic statuses. Although previous studies have not produced evidence that the MCAT's design is fundamentally biased against Blacks and other persons of color (Davis et al., 2013; Elks et al., 2018; Lucey & Saguil, 2020), bias has been associated with other standardized tests. Examples include biases shown to be associated with the American College Test (ACT) ("stubborn racial scoring gap persists on the ACT standardized college admission test," 2004), the Graduate Record Examination (GRE) (Sampson & Boyer 2001), and the Scholastic Aptitude or Assessment Test (SAT) (Santelices & Wilson, 2010). However, systemic elements including racism, food insecurity, inequitable educational opportunities, and generational poverty are indicated as likely contributors to disparities in MCAT scores between those who are

underrepresented and those who are well-represented in medicine (Das, 2020; Girotti et al., 2020; Roberts, 2020).

Black students are often denied admission to medical schools because of lower academic metrics including MCAT scores (DeCarvalho et al., 2018; Linville, 2015; Reede, 1999). This denial is detrimental to increasing the number of Black physicians. Emulating dissimilarities on other standardized tests and undergraduate GPAs, average MCAT scores for Black students are lower than their white counterparts (Elks et al., 2018; Fenton et al., 2016; Lucey & Saguil, 2020). Hindering the admission of Black students decreases the number of practicing Black physicians and the diversity of medical school student bodies (Attiah, 2014; Boatright et al., 2018).

Differences in scores between well-represented and underrepresented in medicine groups have been recognized as consequences of structural racism rather than academic ability (Eskander et al., 2013; Lucey & Saguil, 2020). Inequitable circumstances experienced by students throughout their educational tenure have been offered as explanations. Examples of such circumstances include housing, criminal justice systems, poor school quality and low expectations from teachers. These occurrences pose the MCAT as a measure of opportunity rather than academic ability (Eskander et al., 2013).

There is also conflicting data on whether MCAT scores predict student success in medical school (White et al., 2009). While some studies substantiate the correlation between standardized test scores and academic success for white students, others suggest that the correlation may not be true for minority students (Kirby et al., 2007). It is unclear which factors predict successful academic performance of Black medical students. While many admissions offices rely heavily on MCAT scores, other potential influences include undergraduate GPAs, socioeconomic statuses, and tier/selectivity of undergraduate institution. A gap in the current

literature exists due to conflicting assumptions and assessments on how much emphasis should be placed on MCAT scores in admissions decisions. While some feel that their significance is paramount, others feel that relying solely on these scores disregards other potential better predictors of academic success (Adam et al., 2015; Ranasinghe et al., 2012; Ray & Brown, 2015).

Statement of Purpose

Using Black students who have completed the pre-clinical medical school curriculum, this study determined if there is a correlation between MCAT scores and pre-clinical medical school grades for this demographic. Further, this study examined the impact of additional factors, including undergraduate GPAs, socioeconomic statuses, and tier/selectivity of undergraduate institution. Previous research has shown that these and additional factors significantly affect the academic outcomes of medical students (Andriole et al., 2017; Libbrecht et al., 2014). Determining which factors predict the pre-clinical academic performance of Black students will open the door to advance equitable outcomes and effect change in the medical school admissions process.

Both cognitive and non-cognitive elements may play a role in the academic success of Black medical students (Miller-Matero et al., 2018). Academic success can be measured using various mechanisms and at various points in a medical student's academic career. This study was designed to determine if a correlation exists between the MCAT scores and the pre-clinical GPAs of Black students. Additionally, data was obtained to reveal the influence of additional factors on this relationship. The following two research questions guided the study: 1) Is there a significant relationship between MCAT scores and pre-clinical GPAs of Black medical students? 2) Do undergraduate GPAs, socioeconomic status, or the tier of undergraduate institution

attended mitigate the predictive ability of MCAT scores on pre-clinical grade point averages of Black medical students?

Study Significance and Implications

This investigation has significance and practical implications in the realm of medical school admissions. This research provides admissions committee personnel with the data useful in changing the methods used to consider Black applicants including the consideration of and provision of increased weight to non-cognitive characteristics. Such changes are critical in addressing the current shortages in the number of Black physicians. Increases in the number of Black physicians can help reduce health disparities observed in underserved and minoritized communities. Additional knowledge will adjust the narrative relative to underrepresented in medicine students with the removal of the deficit lens relative to their credentials while refocusing it on their circumstances and experiences.

Definition of Terms

AAMC – American Association of Medical Colleges; a not-for profit organization focused on influencing health care through medical education, patient care, medical research, and diversity inclusion, and equity in health care. Administrator of the MCAT, American Medical College Application Service (AMCAS), and the Electronic Residency Application Service.

ACT – American College Test; standardized test used for college admissions in the U. S.

AMCAS – American Medical College Application Service; a consolidated application processing service used by most U. S. medical schools as the application system for their first-year classes.

Black – designation for individuals who have ancestors from Africa. For the purposes of this study, this designation includes individuals who identify as African American, African, and

Afro-Caribbean. It is also inclusive of individuals who identify as multi-racial if one of their identities includes African ancestry.

GMAT – Graduate Management Admission Test; computer adaptive standardized test used in admission to graduate management programs such as an MBA.

GRE – Graduate Record Examination; standardized test commonly used as an admissions requirement for graduate programs in the U. S. and Canada.

Holistic review - mission-aligned admissions processes which consider the experiences, attributes, and academic metrics of applicants along with the applicant's potential to enhance learning, practice, and teaching.

LCMC – Liaison Committee on Medical Education; accrediting body for educational programs at allopathic medical schools in the U. S. and Canada. Sponsored by the American Association of Medical Colleges and the American Medical Association.

LSAT – Law School Admission Test; standardized test administered by the Law School Admissions Council for prospective law school candidates.

MCAT – Medical College Admissions Test; computer-based, standardized test for potential medical students in the U.S., Australia, Canada, and the Caribbean Islands.

SAT – Scholastic Aptitude or Assessment Test; standardized test administered by the College Board used for college admissions in the U. S.

Chapter Two

Literature Review and Theoretical Framework

Chapter two will provide the historical foundation for the necessity of novel practices in medical school admissions relative to Black applicants. This examination begins with diversity in the realm of medical education. Tenets considered here are the history of medical education, early efforts designed specifically to increase the number of Black physicians, and barriers faced by Black applicants and students during medical school. Further deliberation offers the benefits of medical school diversification along with factors that promote and oppose this diversification. Consideration concludes with the MCAT and its role in the medical school admissions process. This reflection includes the utilization and validity of standardized testing, the history of the MCAT and its evolution along with an examination of medical school admissions processes including traditional and holistic review. The historic custom of relying primarily on standardized test scores when making medical school admissions decisions and in using them as predictive factors of academic success in medical students has had an adverse effect on the expansion of diversity in medical education. Finally, this study utilizes Practice Theory to envision the removal of unequitable practices currently employed in medical education admissions in reference to Black medical students. The focal point of this research determines the relationship between MCAT scores and pre-clinical GPAs of Black medical students. Moreover, it determines if additional student characteristics mitigate this relationship.

Literature Review

The history of higher education in the U. S. involves an evolution of purpose and function. Originally focused on the preservation and expansion of Christianity, this opportunity was available only to wealthy white men (Altbach et al., 2005; Ford, 2017). Expansion of curricula and courses of study, along with increased access for women and underrepresented

groups, led to increased desire and competition for admission. This competition generated a need to make selective admissions decisions and to determine which factors would be useful in predicting student success.

Diversity and Medical Education

Between 2002 and 2008, there was a consistent decrease in the number of U. S. Black medical students (Lett et al., 2019; Samuel, 2019). In 2009, the medical school accreditation body, the Liaison Committee on Medical Education (LCME), strengthened the diversity requirements for accreditation. This act sought to ensure the implementation of practices and policies leading to the economic, racial, cultural, and gender diversity of medical school student bodies. During the 2008-2009 academic year, 1,095 (399 male and 696 female) Black students graduated from U. S. medical schools, representing 6.85% of the total number of graduates. In comparison, 10,414 (5,577 male and 4,837 female) white students, representing 65.1% and 3,384 (1,645 male and 1,739 female) Asian students representing 21.2% of the total number of graduates completed medical school (Snyder & Dillow, 2011, p. 450). A decade later, during the 2018-2019 academic year, 1,238 Black students (479 male and 759 female) graduated from U. S. medical schools. This number accounted for 6.2% of the total number of graduates. This number pales in comparison to the 10,879 (5,953 male and 4,926 female) white graduates and the 4,299 (2,135 male and 2,164) Asian graduates, which represent 54.6% and 21.6% respectively of the total number of graduates (American Association of Medical Colleges, 2019). These statistics do not represent significant growth or increases from ten years prior.

History of Medical Education

Medical education in the U. S. was initiated in 1765 at what became known as the University of Pennsylvania. Founding professors John Morgan and William Shippen, Jr.

received their medical education at the University of Edinburgh in the United Kingdom and were eager to establish formalized training in the U. S. (Fee, 2015). Formalized medical education was conceived to supplement its institutional predecessor, which was described as an apprenticeship for students who had previously participated in informal presentations and classes, mainly in Anatomy (Flexner, 1910).

Early medical education in the U. S. was void of standardized regulations and much of the early medical training occurred outside of traditional university settings. Medical education standards began being contemplated in the late 1800s. Early admissions criteria were meager with many schools allowing matriculation without completion of secondary education. During this time, medical education requirements lagged behind those of law and theology schools. Typical applicants were unable to financially afford both undergraduate education and medical school. Modifications in medical education emerged around 1880 through the American Medical Association (AMA), which established the Committee on Medication (CME). Along with forming the CME, the AMA introduced state licensing laws which provided a regulatory mechanism and the origins of standardized medical professionalism. In this era, both oral and written examinations covering classical and clinical skills began being utilized as formal entrance requirements (Tristam, 2016).

An additional transformation in medical education began in 1910 with the publication of the Flexner Report. The CME sought to standardize medical education and eliminate medical schools which it deemed sub-standard. The CME carried out this initiative by contracting with the Carnegie Foundation, who in turn selected Abraham Flexner to survey all 150 existing medical schools in North America. These schools varied in all aspects including admissions and graduation requirements, curricula, and assessment methods (Tristam, 2016).

The resulting Flexner Report directly affected the state of medical education. Two significant recommendations issued by Flexner were to increase the minimum prerequisites and entrance requirements for medical school and to reduce the number of medical schools in an effort to decrease the number of insufficiently trained physicians (Barzansky & Gevitz, 1992). Within 25 years of the report's publication, only 66 of the surveyed medical schools were still in existence. This was a direct consequence of Flexner's recommendation that all proprietary medical schools be closed and that all medical schools should exist through a connection with a university (Duffy, 2011).

The Flexner Report negatively impacted the medical education of women and Black students. Prior to the report, women had slowly begun to carve a small niche in the realm of medical education. By 1900, the number of female physicians had increased to 5.6%. Only a handful of higher education institutions permitted coed medical education, resulting in the establishment of seven women's medical colleges. By 1930, following the delineation of acceptable standards in the Flexner Report, only one of the women's medical colleges remained open. The percentage of female medical school graduates fell to 2.9% and this percentage remained below 5% until the 1970's (Barkin et al., 2010).

Early Efforts to Increase the Number of Black Physicians

Similar to that for women, medical education for Black students was extremely limited. By 1860, only nine northern medical schools admitted Black students (Duke University Medical Center Library and Archives, n.d.; Harley, 2006). Between 1868 and 1904, 14 medical schools were established for Black students and were responsible for the education of the majority of Black physicians. Most of these institutions existed through the endeavors of religious associations, including The Freedman's Aid Society of the Methodist Episcopal Church and the

American Baptist Home Mission Society (Savitt, 2006). Prior to the Flexner Report, seven of these medical schools remained in operation and were visited by Flexner during his survey of North American medical education (Steinecke & Terrell, 2010). By 1923, following the release of the report, only two of these medical schools, Meharry Medical College and Howard University Medical School, remained open (Duke University Medical Center Library and Archives, n.d.; Harley, 2006). Within ten years, the effect on the production of Black physicians was realized. There was a 5% decrease in the number of Black physicians between 1932 and 1942 and a 12% increase in the number of white physicians during the same period (Savitt, 2006).

Efforts to increase the number of Black physicians following the Flexner Report continued. Two Black medical schools, Charles R. Drew Medical School in Los Angeles, CA and Morehouse Medical College in Atlanta, GA were founded in 1966 and 1975 respectively (Harley, 2006). Another critical component of the education of Black physicians is the existence of undergraduate Historically Black Colleges and Universities (HBCUs). Black students who attended HBCUs had a greater propensity to major in physical and biological sciences than those who attended primarily white institutions (Fryer & Greenstone, 2010; Whittaker & Montgomery, 2012). HBCUs served to increase the number of science degrees earned by Black undergraduate students (Hlavinka, 2020). Subsequently, undergraduate HBCUs have been, and continue to be the top producers of both Black medical school applicants and graduates (Gasman et al., 2017; Hlanvinka, 2020). In conjunction with medical schools founded to intentionally provide opportunities for medical education for Black students, medical societies including the Medico-Chirugical Society in 1884 (Cobb, 1943) and the National Medical Association (NMA) in 1895

(Morris, 2007) were established to promote equity and justice for Black physicians and to work toward the elimination of health disparities.

Supplementary to the efforts of Black medical schools and undergraduate HBCUs were endeavors of the American Association of Medical Colleges (AAMC). In 1968, the AAMC, in conjunction with the AMA, began encouraging all existing medical schools to expand their enrollments to include all qualified applicants regardless of race (Steinecke & Terrell, 2010). The AAMC also begin surveying its member medical schools to delineate their efforts to enroll racially and ethnically diverse student bodies, publishing their findings in the Minority Student Opportunities in United States Medical Schools report. During this timeframe, workshops were conducted to emphasize consideration of not only the preparation of applicants for medical education, but also their propensity for successful completion of medical education. These steps were the precursors and building blocks of the holistic review of medical school applicants.

Barriers Faced by Black Medical School Applicants and Students

Efforts exerted by HBCUs and the Black medical societies were enacted to combat the barriers faced by persons of color, particularly Black students, in the pursuit of medical education. Specific barriers included the ability to afford higher and medical education (Hadinger, 2016; Hlavinka, 2020), the lack of mentors and social support, and the lack of academic preparation for effective handling of premedical and medical education (Gasman et al., 2017). Financial disparities observed between Black and white families often shape opportunities regarding medical education. Comparisons in the level of wealth display stark differences, illustrating differences in opportunity. Median levels of wealth for Black and white families were $17,600 and $171,000 respectively in 2016 (Lucey & Saguil, 2019). Pew Research reported that, in 2015, Black students were three times more likely to live below the

poverty line than their white counterparts (Patten & Krogstad, 2015). Many Black medical students are the first in their families to pursue both higher education and subsequently medical education (Ishitani, 2003; RTI International, 2019; Saenz et al., 2007). First generation Black college students often experience an inability to demonstrate and utilize their cultural strategies in the college environment, a conflict which most white college students do not experience (Wilkins, 2014). Coping mechanisms used to make friends, fit in, and gain social capital are often ineffective in their new educational settings. Additionally, many Black students have never interacted with, or even seen a Black physician (Pat 2019; Rao & Flores, 2007). Those who are able to reach the level of medical education report the difficulty of not being able to discuss the medical education process with their families, as many of their parents have no point of reference for understanding the medical education environment (Gasman et al., 2017; Odom et al., 2007). The absence of tangible, relatable, and available role models affect the ability of Black students to visualize themselves as potential physicians (Sobowale, 2020; Thomas et al., 2011). The ability to successfully pursue both premedical and medical education has been linked to academic preparation at the high school level (Freeman et al., 2016). Decline in interest in premed studies at the undergraduate level coincided with self-actualized, insufficient grasps of science education at the secondary level (Barr et al., 2008).

Despite the existence of increased representation of Black students at undergraduate HBCUs, the advancement to medical education has the propensity to offer subsequent challenges to these students, particularly in majority institution environments. Students accustomed to the nurturing and supportive, yet structured environments of HBCUs often struggle with the lack thereof of these situations in majority institutions (Rodriguez et al., 2017). Barriers for Black students can include lack of cultural continuity in the new academic environments including the

presence of obstructive and unaccommodating academic environments. Students report struggles with prejudice and discrimination which can augment any experienced academic difficulty causing students to not perform to their full potential (Chang et al., 2011; Laurencin & Murray, 2017; Odom et al., 2007). The barrier to medical education for Black students most germane to this study is the overreliance of medical school admissions on numeric metrics including standardized test scores (Lucy & Saguil, 2019).

Medical School Diversification Benefits

The diversification of medical school student bodies is needed because of predicted shortages of practicing physicians nationwide, the predicted eclipse of a white majority in the U.S. population, and the role of a more diverse medical profession in reducing persistent health disparities. Projections of population trends predict significant changes in the racial and ethnic make-up of the citizens of the U. S. The end of a white majority along with exponential increases in the population of current racial and ethnic minority groups and the total elderly population is forecasted (Hadinger, 2016; Humes et al., 2011; Passel & Cohn, 2008). Despite surges in the number of Black citizens, their representation in the medical profession has not increased at the same rate, and in some cases has decreased (Castillo-Page, 2016; Grumbach & Mendoza, 2008; Nivet & Castillo-Page, 2016; Talamantes et al., 2019).

The lack of representation of Black physicians has major implications for both medical education and patient care. Black physicians are more likely to choose primary care specialties, practice medicine in urban areas, and to spend at least a portion of their professional time providing care where they receive reduced or no compensation (Corbie-Smith et al., 2000; Komaromy et al., 1996; Mensah & Sommers, 2016; Walker et al., 2012). Primary care physicians treat many conditions including obesity, hypertension, diabetes, and heart disease

which disproportionately affect Black citizens. A dearth of Black physicians exacerbates the existence of health disparities by limiting the number of practicing physicians prone to tackle them (Alsan et al., 2019).

In concordance with the tendencies to effect change with their chosen specialties and patient populations, generating a diverse physician population may also impact compliance with medical advice and adherence to treatment. Studies indicate that Black patients have reported increased levels of communication and trust following treatment by physicians with whom they share identities and experiences (Baugh, 2018; Metz, 2017; Terregino et al., 2019; Torres, 2018). This goodwill can translate into increased adherence to treatment plans, yielding better health outcomes.

Factors Impacting Medical School Diversity

A number of factors drive the need to promote diversity in medical education by eradicating potential barriers. Medical education oversight agencies, including the LCME, have mandated demonstration of adherence to diversity standards in order to receive accreditation (Boatright et al., 2018). Maintenance of accreditation requires implementation of policies, procedures, and programming designed to create and maintain pipeline programs specifically targeting underrepresented in medicine applicants. Studies have shown that increasing diversity in medical education provides enhanced educational experiences for all participants, whether they are well-represented or underrepresented in the population (Addams et al., 2010; Grabowski, 2017). Additionally, diversity in medical education promotes increased preparation of all medical students to provide treatment for the increasingly diverse population (Cohen et al., 2002).

While the aforementioned factors seek to promote diversity in medical education, other initiatives have worked in opposition to the expansion of diversity. Policies, including affirmative action, have been either limited or eliminated, resulting in a decrease in the number of underrepresented students (Garces & Mickey-Pabello, 2015; Mensah & Sommers, 2016). Historically, higher education institutions, including medical schools, have relied heavily on numeric metrics to determine admissions thresholds (Gliatto et al., 2016; McGaghie, 2002). Agencies have used these metrics to rank institutions, thereby granting "prestige" to those with higher numbers (Heller et al., 2014). This causes schools to select applicants who provide the desired academic metrics, often at the expense of diversity. According to the 2020 version of U.S. News and World Report, the average MCAT score for students enrolled in the top ten medical schools for students interested in research was 520 (Hess, 2020). During this time, the average MCAT score for Black applicants was 498 (American Association of Medical Colleges, 2019). Diversity in the student populations is compromised due to the tendency of underrepresented students to have lower numeric metrics including MCAT scores (American Association of Medical Colleges, 2018; Davis et al., 2013; Lucey & Saguil, 2019). These actualities suggest that attaining the value of diversity in medical education is hampered by primary reliance on numeric metrics to determine admissions.

MCAT and Medical School Admissions

The second theme examined in this literature review considered the MCAT and its role in the medical school admissions process. It includes the utilization and validity of standardized tests. It offers the history and development of the MCAT, along with a chronicle of medical school admissions processes including traditional and holistic review of medical school applicants.

Utilization and Validity of Standardized Tests

There are factors correlated with the prediction of academic success which include both cognitive and non-cognitive factors. Non-cognitive factors include academic self-beliefs (Mattern & Shaw, 2010), emotional control and social competence (Lafavor, 2017), mode of course instruction (Vella et al., 2016), self-efficacy (Robbins et al., 2004, Roszkowski, 2019), and grit (Akos & Kretchmar, 2017). Cognitive factors, where ability and aptitude have been historically measured with numeric metrics, were proposed as a leveling field for individuals with varying backgrounds, experiences, and educational histories. Two of the most prominently used instruments for such measurements have been grades or grade point averages and standardized test scores.

With utilization dating back to the third century, standardized testing has remained a constant tool in the selection of candidates for prominent positions. Beginning in imperial China, individuals were tested in order to become eligible for civil service positions (Himelfarb, 2019; Huddleston & Rockwell, 2015). Subsequently in the nineteenth century, Francis Galton established the foundation of standardized testing which entailed the proctoring of a sequence of duplicate exams to a substantial number of persons followed by statistical analysis of the results (Miller & Lovler, 2018). Binet and Simon furthered the practice through the creation and administration of an examination designed to measure the ability to reason, comprehend, and exercise judgement of school children in the early 1900s (Boake, 2002).

In the twentieth century, military necessities fostered the rapid advancement of testing during World War I due to the need to select individuals capable of handling military production (Headrick & Sheng, 2013). Because of this long history, by the 21st century standardized testing has become ingrained in the American experience. Testing instruments are currently used in a

wide variety of settings, including primary, secondary, and post-secondary education. College admission, scholastic advancement, clinical credentialing, and professional licensure all utilize standardized testing to deem individuals worthy of the chosen arenas of practice or expertise (Himelfarb, 2019). Evolution of the utilization of standardized testing yielded a novel discipline combining statistics, education, and psychology – psychometrics (Cronbach, 1975).

Standardized test quality is evaluated using validity and reliability. Validity references the level of affiliation between the testing instrument and the paradigm it is proposed to assess (Florida Center for Instructional Technology, n.d.; Himelfarb, 2019; Visone, 2009). Reliability is the dependability with which the testing instrument measures a given paradigm ((Florida Center for Instructional Technology, n.d.; Himelfarb, 2019; Vison, 2009). Historically, it references the level of consistency of participant scores on one instrument over time. Internal consistency, an additional element of reliability, references the level to which discrete test components are interconnected and subsequently generate comparable results (Himelfarb, 2019). Both validity and reliability are thought to be improved if: precautions are provided against elimination of students from the examinations; the level of ambiguity of the results is acknowledged, evaluated, and reported; and the envisioned positive and the unintentional negative effects of the test are assessed (Holloway, 2001; Linn, 2000).

Perceived benefits of standardized testing include efficiency and objectivity (Huddleston & Rockwell, 2015). The tests have been touted as mechanisms to: detect and meet student needs (U.S. Department of Education, 2015); allow students to self-monitor their learning and self-demonstrate their achievements (Munter & Haines, 2019); and to create a level method of evaluation for students educated in various environments at various educational institutions. Investigators have also offered critiques of standardized testing usage. One such critique

suggests that the examinations are not valuable if the results are not examined alongside other gauges of scholastic progress. Another argument challenges the ability of a timed examination, given at a specific period in time, to gauge the aptitude of individuals over time (Addison & McGee, 2015). Still others assert that some standardized tests target the affiliated institution as the unit of investigation rather than the tested individuals (Klein et al., 2007). Perhaps the greatest critique is the conflicting data on the predictive ability and the resultant marginalization of underrepresented groups caused by standardized tests (Aburas & Nurunnabi, 2018; Koretz et al., 2016).

In the realm of higher education, standardized tests including the Scholastic Aptitude or Assessment Test (SAT) and the American College Test (ACT) have been employed in undergraduate admissions (Manhattan Review, 2019; Purnell, 2016). These tests were envisioned to measure the propensity for learning of admitted students by assessing theoretical reasoning ability and to gauge practical knowledge. Often used by admissions committees in a "gatekeeping" process for admittance to graduate and professional schools, additional standardized tests are employed. First administered in 1948, the Graduate Record Examination (GRE) was utilized to gauge vocabulary, mathematics, and analytical writing ability in anticipation of success in graduate level programs (Educational Testing Service, 2019). Similarly, the Law School Admission Test (LSAT) in 1948 and the Graduate Management Admission Test (GMAT) in 1954 were first administered to gauge readiness for law school and business school admission respectively (Graduate Management Admission Council, 2020; Knezevish, 2012). With precursors endorsed and put into practice beginning in 1928, the MCAT was first administered in 1948 to prospective medical students (Eskander et al., 2013).

MCAT History and Development

In the 1920s, U. S. medical schools had attrition rates that ranged from five to fifty percent. The high attrition rates, coupled with the desire to systematize medical school admissions procedures, spurred the development of a standardized test for medical school admissions. The high attrition rates were seen as misuses of faculty energy and time and student tuition (McGaghie, 2002). The test was offered as a mechanism to determine an applicant's readiness for medical education.

Prior to implementation of the MCAT, admissions requirements at the first U. S. medical school established at the University of Pennsylvania included the following: the person had to be a man, at least twenty-four years old; he had to have earned an M.B. (bachelor's) degree at least three years prior; and he had to write and publicly defend a thesis. Acceptance into the M.B. program required the man to validate knowledge of natural and experimental philosophy, mathematics, and Latin (McConaghy, et al., 2019).

The first iteration of the MCAT was termed the Scholastic Aptitude Test for Medical Students, or the Moss Test. Utilized between 1928 and 1946, it was developed and implemented by a group led by psychologist and physician, F. A. Moss. Areas of assessment were scientific vocabulary, memory, and logical reasoning (Pigg & Kroopnick, 2015). In 1946, the test was renamed the Professional School Aptitude test followed quickly in 1948 by its final renaming – the Medical College Admissions Test. These two iterations added quantitative and verbal sections to the original test and included a novel emphasis on liberal arts through an "Understanding Modern Society" section (McGaghie, 2002). In 1962, this section was expanded, reconfigured, and renamed the "General Information" section. In 1977, the MCAT was altered again with introduction of a larger concentration on scientific problem solving and a

removal of the liberal arts content (Pigg & Kroopnick, 2015). This iteration was conceived with consistent and explicit focus on the reduction of social and cultural biases (McGaghie, 2002). The iteration of the MCAT implemented in 1991 introduced a writing sample to the exam. This modification was added to reveal a student's capability of developing, synthesizing, and presenting concepts in a logical and clear manner (Pigg & Kroopnick, 2015). The currently employed MCAT was implemented in 2015. The redesign was deemed necessary in 2004 in order to reflect the then current challenges being experienced by physicians (Kaplan et al., 2012). Modifications in this version were employed to transform the assessment from measuring the amount of information that a student had retained to measuring the student's ability to utilize the information that they had retained. It also included a foundational inclusion of assessment of biochemistry knowledge and concepts. The writing sample was replaced by a section on reasoning and critical analysis. Additional sections of this version are psychological, social, and biological foundations of behavior, biological and biochemical foundations of living systems, and chemical and physical foundations of biological systems. Each section of the MCAT receives a scaled score ranging from 118 to 132. The four scores are combined to generate a total score ranging from 472 to 528. The midpoint score for the exam is 500 (American Association of Medical Colleges, 2016). MCAT scores are scaled in an effort to offset small differences in the level of difficulty between sets of exam questions (American Association of Medical Colleges, 2015). According to the 2021 rankings done by U. S. News & World Report, the top medical schools for research are Harvard, Johns Hopkins, and the University of Pennsylvania (U. S. News & World Report, 2020). Average MCAT scores for these schools are 519, 521, and 522 respectively (U. S. News & World Report, 2020).

Role of MCAT in Medical School Admissions

The MCAT, together with undergraduate GPAs, became a significant part of the traditional approach for the review of medical school applicants. Supplementary components of this approach are the applicants' personal statements along with letters of recommendation from undergraduate or post baccalaureate faculty members. Applicants with high undergraduate GPAs and who performed well on the MCAT were sensed to possess the fortitude necessary to handle the rigor of undergraduate medical education. A more holistic review of medical school applicants emerged after an endorsement from the U. S. Supreme Court (Witzburg and Sondheimer, 2013). The governing body purported the utility of assessing each applicant individually and considering nonacademic characteristics. The sanction given by the Supreme Court stimulated a gradual shift toward this method by several medical schools. A more concerted effort to embrace this method was realized when the Holistic Review Project was initiated in 2007 by the AAMC (St. George's University, 2018).

Holistic review led the criteria for admissions at individual schools to be linked to the goals and mission of the universities. While these varied from institution to institution, a commonly used instrument, the Experiences-Attributes-Metrics (E-A-M) model began to be widely used (American Association of Medical Colleges, 2016). The E-A-M model added consideration of life experiences, including clinical experience as well as work experience when assessing a potential applicant. The attribute component augmented consideration of applicants by deliberating on qualities such as leadership skills, professionalism, and knowledge of medicine. The metrics component included the traditional numeric metrics of GPA and MCAT scores with the addition of examination of grade trends of applicants. These additional

considerations were unable to be ascertained when solely or primarily relying on numeric metrics (St. George's University, 2018).

Support and Critiques of the MCAT. Proponents of use of the MCAT as a major determining factor in medical school admissions cite its predictability of student success. These studies include the correlation of MCAT scores with performance during the first year of medical school (Busche et al., 2019). Studies have touted its predictability of students successfully moving from year one to year two in medical school curriculum (American Association of Medical Colleges, 2018) and its correlation to election to the Alpha Omega Alpha medical honor society (Gauer & Jackson, 2017). Additional studies provide data positively correlating MCAT scores with scores on the United States Medical Licensing Examination (USMLE) (Gullo et al., 2015; Julian, 2005).

Under the guise of possessing the ability to predict student success, the MCAT and other standardized testing instruments and numeric metrics, often further minoritize those traditionally underrepresented in higher education (Fleming & Garcia, 1998; Williams, 1983). This includes Black, first-generation college students, and those whose families have lower socioeconomic statuses. Researchers contend that medical school admissions should not rely solely on numeric metrics due to their inability to assess non-cognitive characteristics including qualities reflected in altruistic and effective physicians (Reede, 1999; Smith 2011). These qualities include the desire to serve underserved populations and the tendency to pursue primary care as a specialty. MCAT scores of Black students have been shown to be consistently lower than those for white and Asian students (American Association of Medical Colleges, 2018; Davis et al., 2013; Hadinger, 2016; Linville, 2015; Lucey & Saguil, 2019; Reede, 1999). Between 2015 and 2017, 186,450 persons, 10% of whom identified as Black sat for the MCAT. The mean score for Black

students during this time was 493.5 while that of their white and Asian counterparts was 502.3. Similar differences were observed between the scores of students who received fee assistance for the exam (mean score of 496.4) versus those who did not (mean score of 500.7) as well as between those whose parents did not have a bachelor's degree (mean score of 496.3) versus those who had received a bachelor's degree or higher (mean score of 501.8). The 2015 version of the MCAT included implementation of scientific competencies, an emphasis on methodical reasoning, and a broader focus on subject material including the social and behavioral sciences than the previous version (Schwartzstein et al., 2013). Modifications in the scoring mechanisms for this edition were intentionally designed to foster consideration of a range of scores as opposed to just the highest scores (American Association of Medical Colleges, 2018). These revisions were implemented in efforts to foster admission of more diverse medical school classes.

Differences observed between MCAT scores of Black and white are similar to those seen for other professional school standardized tests. Divergent scores on the GRE, GMAT, and LSAT have led to inequitable admissions for Black students in various graduate programs (Miller & Stassun, 2014; Moneta-Koehler et al., 2017), business schools (Cross & Slater, 1998), and law schools respectably (Jackson, 2018; Jaschik, 2019; Taylor, 2019). These differences are also mirrored in the undergraduate standardized tests (ACT and SAT), as well as in the standardized tests given between kindergarten and high school (Davis et al., 2013; Lucey & Saguil, 2019; Toldson & Ford, 2019).

Further evidence in support of a decrease in the primary reliance on standardized test scores is their propensity to marginalize students of color. While originally designed as a "gateway" to higher education for students from all upbringings and experiences, instead of an

opportunity for members of elite societal classes, the SAT has been shown to exhibit socioeconomic advantage and privilege, rather than intelligence or ability (Gershon, 2015; Grodsky, et al., 2008). Variances in socioeconomic statuses are indicative of the level of parental education, family income, social income and the opportunity to learn (Fischer et al., 1996; Grodsky, et al., 2008).

Sustained primary reliance on MCAT scores to deem applicants capable and worthy of the pursuit of medical education ignores the existence of the MCAT's propensity to assess opportunity versus ability. Students traditionally underrepresented in medical education tend to be overwhelmingly persons of color and from low socioeconomic backgrounds (Lucey & Saguil, 2019). These students tend to be marginalized in the areas of housing, discipline in school systems, and in the evaluations that they receive from their educators. With funding for public education relying heavily on revenue from property taxes, "redlined" areas with high levels of Black residents, often translates into poorly funded school systems. These schools are also less likely to have high quality college advisors or offer advanced placement coursework (Musu-Gillette et al., 2017). Black students, when compared to their white peers, are also more likely to receive more severe punishments when being disciplined in school. This occurrence can lead to less time in the classroom to focus on education (U. S. Department of Education Office of Civil Rights, 2014). Even Black students from middle class and high socioeconomic statuses have been subject to low expectations from their teachers who discouraged them from pursuing higher education (Gershenson & Papageorge, 2018).

While shown to be predictive of academic success for white students, standardized tests have been shown to not correlate with academic success for Black students and other students of color (White et al., 2009). These tests, including the MCAT, quantify levels of exposure and

opportunity rather than levels of intelligence. Students whose backgrounds include low socioeconomic statuses, growing up in rural and urban environments, limited access to educational opportunities and resources, and limited parental education experience huge disadvantages when compared to those of persons of privilege (Lucey & Saguil, 2019).

An additional argument against the primary reliance on MCAT scores for medical school admissions decisions is the conflicting research on the ability of the MCAT to predict academic success. MCAT scores have been shown to moderately (Callahan, et al., 2010) and strongly correlate (Dienstag, 2011; Dunleavy et al., 2013), as well as not correlate (White, et al., 2007) with academic performance in medical school. MCAT scores were shown to both moderately (Hu et al., 2015) and strongly (Donnon et al., 2009; Gohara, 2011) contribute to the ability to predict success of medical students on medical licensing examinations. Supplementary studies have indicated that MCAT scores neither over nor under predict academic performance and that a wide range of scores are linked to academic success (Lucey & Saguil, 2020).

Efforts to increase diversity in medical education mandate a decrease in the primary or sole reliance on numeric metrics to determine admissions decisions. Determination of the relationship between MCAT scores and pre-clinical GPAs, along with other student characteristics, which could affect this relationship, is significant. The potential development and implementation of novel admissions rubrics capable of "leveling the playing field" for Black applicants could serve to facilitate more equitable and unbiased admissions practices.

Theoretical Framework: Practice Theory

The literature review offers data delineating both historical and contemporary inequitable circumstances surrounding medical school admissions for Black students. A substantial factor in the determination of those students deemed capable of completing medical education is their

ability to earn a sufficient MCAT score. Noted inconsistencies in the MCAT's ability to predict academic success, along with an urgent need for expanded diversity in medical school student bodies, merits the implementation of novel practices for admissions personnel. The theoretical framework for this study, Practice Theory, will seek to provide a mechanism in support of modification of these practices.

Theory Origins

Practice Theory is grounded in the work of Estela Bensimon and her development of The Equity (Diversity) Scorecard ("Equity Scorecard – Theory of Change," 2012). Bensimon, director of the Center for Urban Education at the University of Southern California, developed this initiative to facilitate change at higher education institutions. It was introduced to steer them toward equitable experiences and outcomes for marginalized populations, particularly for students of color. Practice Theory, an extension and consequence of the Equity Scorecard framework, enables the replacement of inequitable practices with those providing fairness and impartiality.

Theory Precursor

The Equity Scorecard mandates institutional accountability, utilizing race-conscious proficiency, in the achievement of student success. Conception of the Equity Scorecard commenced in 2001 following recognition of the need to quantify and graphically display the educational outcomes for underrepresented students. These tasks were deemed necessary to attract the attention of institutional administrative leaders and to rally action toward the achievement of equity. Drawing attention to the actuality and depth of existing inequities had been previously found to provoke and stimulate change in ways that few other tactics could ("Equity Scorecard for Higher Education,"2012).

The underpinnings of the Equity Scorecard are the balance scorecard for business developed by Kaplan and Norton (1992) and the higher education scorecard (O'Neil et al., 1999). These prototypes offered four simultaneously considered viewpoints on institutional performance with regards to impartiality in educational consequences including: admissions; retention; institutional openness and accessibility; and excellence (Bensimon, 2004). The admissions perspective considers access statistics, which examine the availability of programs and resources to underrepresented students. It considers the programs enrolled in by this student demographic; whether these programs lead to high demand/high salary career opportunities; whether the students have access to fellowships, internships and financial aid; and the ability of students to transfer from community colleges to four-year colleges or to transition from four-year colleges to graduate and professional schools (Bensimon, 2004).

The retention prospective considers: retention rates by program for underrepresented students; if these students withdraw from challenging programs in disproportionate numbers; and their success in finishing basic-skill courses, as well as, in completing associate, baccalaureate, and certification programs. Institutional openness and accessibility examines the level of support provided by an institution necessary to foster a responsive and accommodating campus environment. Subsequent consideration is given to whether hires of staff, faculty, and administrators increase diversity and whether the racial and ethnic composition of the faculty mirrors that of the student body. The excellence prospective is comprised of achievement and access. The achievement lens considers: the relative completion rates for underrepresented students in competitive programs; how many underrepresented students earn GPAs of 3.5 or better; and the number of high-achieving, underrepresented students in each of the academic disciplines who are deemed qualified to pursue graduate education. The access lens considers

whether courses of study act as “gateways” for some students and “gatekeepers” for other students. It also questions whether majoritized students are encouraged to pursue competitive majors while minoritized students are directed to majors deemed “safe” or less viable in terms of obtaining high salary careers (Bensimon, 2004).

Precursor Components. The Equity Scorecard was developed through a series of steps resulting in a novel approach to addressing educational inequities. The first step required the disaggregation of student data by ethnicity and race. This included not only enrollment data. which was common, but also outcome data as well, which was rare. Both the type of data collected and the way in which it was displayed was novel. The new method challenged institutions to “hold up a mirror” to themselves revealing the educational outcomes of underrepresented students unmistakably and unambiguously. The second step entailed the creation of performance objectives for each of the four perspectives of the scorecard. This provided concrete examples of ways to establish and solidify equity. Step three required the preparation of a report relaying the current status of equity on his or her campus to the presidents of the engaged universities. This step proved to be somewhat challenging due to the fact that the reports desired were those capable of spurring action and change, rather than the status quo of gaining information for the sake of having it, without action. Following the development of statistics, the presentation of reference point data, and the determination of early objectives, the final steps included the establishment of an institutional process capable of monitoring the improvement or lag of outcomes for underrepresented students (Bensimon, 2004; Bensimon & Malcolm, 2012).

Theory Principles and Fundamentals

Like the Equity Scorecard, Practice Theory is rooted in the experiential and interactive learning theory of John Dewey (1938) and the sociocultural learning theory of Lev Vygotsky (1978). It asserts the propensity for educational practitioners to absorb data and alter "practices" when unknown circumstances generate undesired results. This theory ascribes the causes of malfunctioning educational processes to the institution's customs, policies, and procedures. These elements are capable of being amended through actions of institutional practitioners and leaders. Dewey's work stressed the need to unveil authentic conditions to ensure that pertinent and effectual standards would be formed. Vygotsky's work emphasized connection between cognitive development and social interaction. He felt that the learning environment of students was paramount in their ability to "co-construct" knowledge (McLeod, 2018).

Practice Theory infers that educational inequity outcomes are characterized as unspecified conditions generated by a miscarriage of practice (Bensimon & Malcom, 2012). While there may be numerous reasons for, or causes of the aforementioned dysfunction, Practice Theory limits ascribing the miscarriages to customs, strategies, and structures of the institution under consideration (Bensimon & Malcolm, 2012). This theory facilitates the evolution of practitioners into representatives of fairness and justice for marginalized students, particularly, students of color. These inequities are indicative that current "practices" are inadequate, ineffective and mandate change ("Equity Scorecard – Theory of Change," 2012).

Focusing the disparities in student outcomes on the institution necessitates that practitioners consider the problems to belong to the institution rather than to the affected student demographic(s). The ideals surrounding Practice Theory conflict with conventional educational

norms in that institutions are not typically systematized to learn about themselves (Dill, 1999; Dill 2014; Garvin, 1993; Mathews et al., 2016).

Efforts, which define discrimination and inequity as glitches in institutional rituals, offer mechanisms, which favor action and transformation. Practice Theory conceptualizes that the discrimination and inequitable circumstances experienced by marginalized students are long-standing. These circumstances result from disparities in elements including housing, health, income, and wealth (Cameron & Heckman, 2001; Darling-Hammond, 1998; Hacker, 2003; Koedel, 2017; Noguera et al., 2015) which have separated the U. S. into distinct and disproportionate communities of those with surplus and those with deficits. Such disparities have produced a schism in the U. S. resulting in the generation of imbalanced and disconnected domains. The existing facets of social inequality propagate educational inequalities. These inequalities can be addressed when analyses, such as those employed in the Equity Scorecard, are undertaken, expediting the "unpacking" of the challenges via collection of qualitative and quantitative data.

Practice Theory contradicts student success theories which postulate that negative and inequitable educational outcomes are the result of substandard student traits and academic training. This thought is grounded in deficit theory which "blames the victim" for any negative educational outcomes (Eller, 1989). Deficit theory further minoritizes populations, which are already marginalized without considering the inadequacy of the systems and environments in which they must exist and function. Conversely, Practice Theory, analogous to several contemporary student success frameworks, champions the achievement of ethnically and racially diverse college student populations. Examples of these frameworks include Museus' Culturally Engaging Campus Environments (Museus & Quaye, 2009; Museus, 2013) and Inclusive

Excellence, which was disseminated by the American Association of Colleges and Universities (Williams et al., 2005).

Despite the prospect of Practice Theory's ability to effect change in the realm of medical school admissions, there have been some documented challenges to similar interventions. Previous studies report a dearth of concern or opposition to institutional procedures that subsidize racial inequities in student outcomes (Armstrong et al., 2012; Sikora, 2017); educational practitioners' incapability to comprehend and adequately respond to the ethnic and cultural lives of their students (Bensimon, 2007; Sikora, 2017); and the inability to retrieve enough significant data suitable for analysis and dissemination (Dowd, Malcom, Nakamoto, & Bensimon, 2012: Sikora, 2017).

Theory Connection to Research Problem

The objectives of this dissertation research are grounded in the generation of data capable of effecting change in the arena of medical school admissions. Numeric metrics including undergraduate GPAs and standardized test scores have been historically used to determine which students receive interviews and subsequent admission to medical schools. Conflicting data exists in the ability of MCAT scores in predicting academic success in both well-represented and underrepresented in medicine students (White et al., 2009). Data generated from this study can potentially provide evidence suggesting alternative characteristics of medical school applicants for emphasis and consideration in admissions decisions. Transformation in the methods used to make admissions decisions have the ability to effect change in the levels of diversity in medical school student bodies and health disparities found in Black communities.

A self-conducted preliminary study has shown that Black medical students with MCAT scores lower than their peers often earn equal or higher scores in the pre-clinical coursework.

These findings suggest the need for additional or alternative admissions practices in the determination of who receives admission to the nation's medical schools. These practices should examine and consider additional student characteristics capable of underscoring and forecasting successful student attributes. This study seeks to utilize Practice Theory to remove the "deficit" view of Black medical school applicants by altering the policies, procedures, and processes utilized in medical school admissions.

Chapter Three

Methodological Approaches

This study employed a quantitative research approach. The research determined the relationship between the MCAT scores and pre-clinical GPAs of Black medical students. Supplementary assessments were performed to determine if additional variables modified or influenced this relationship. The two research questions that guided this study are: 1) Is there a significant relationship between MCAT scores and pre-clinical GPAs of Black medical students? 2) Do undergraduate GPAs, socioeconomic status, or the tier of undergraduate institution attended mitigate the predictive ability of MCAT scores on pre-clinical grade point averages of Black medical students?

The study was examined using a transformative worldview. The transformative worldview is applicable due to its tendency to confront inequities, exclusion, and subjugation commonly experienced by marginalized and minoritized communities (Creswell, 2014). This worldview's provocation for advocacy for disenfranchised individuals aligns directly with the utilization of both a quantitative research approach and with the theoretical framework utilized for this study – Practice Theory. Similar to transformative worldview, Practice Theory promotes alteration of systems that lack representation, inclusion, and social justice. Both transformative

worldview and Practice Theory can endeavor to remove the "deficit" lens from the Black student demographic, which is often presumed to lack ability and potentiality for the pursuit of medical education.

Research Design

A quantitative approach was employed for this study due to the ability of this approach to ascertain and assess the association or connectedness between variables. This approach uses statistical mechanisms to analyze numerical values, which represent the variables under consideration. Quantitative research utilizes deductive reasoning while accounting for potential biases and ancillary interpretations of the relationships between the variables. It seeks demonstration of replicability to aspire toward reliability of the generated results (Creswell, 2014). Quantitative research is beneficial in that it permits the utilization of studies employing smaller groups to make implications concerning larger groups that would be prohibitively expensive to examine. It is generally descriptive, experimental, quasi-experimental, or correlational in nature (Bloomfield & Fisher, 2019). Correlational research, which was employed is this study, elucidates the association between two or more variables. In addition to determining whether an association exists, the direction and strength of an association can be ascertained. While not designating causality, correlational research is often expanded to include use of multiple independent variables in order to predict their collaborative association with a dependent variable. Research is undertaken to verify whether revealed associations can be determined to be statistically significant (Swanson & Holton, 2005).

Utilization of a quantitative research approach employing a correlational research design aligns effectively with the research questions of this study. Exposing a potential association or lack thereof between MCAT scores and pre-clinical GPAs of Black medical students offers

novel insight into procedures and mechanisms currently utilized by medical school admissions personnel. Inclusion of examination of additional student characteristics can potentially provide a more comprehensive inventory of relevant entities affecting academic preparedness and fitness.

This project was an ex post facto study. Ex post facto studies begin with the examination of independent variable(s) that have already occurred or previously been collected. The researcher then considers the dependent variable(s). Finally, the independent variable(s) are considered retrospectively to determine the effects on the dependent variable or the relationship between the two (Kerlinger, 1964). This method is considered useful in suggesting causal affiliations between conditions and incidents. It is described as defining the grounds for certain existences or non-existences. This is accomplished by contrasting the conditions which accompany the observed effects and by noting the elements present when a given effect is present or absent (Lord, 1973). While beneficial in providing support for hypotheses concerning the relationships between variables, this method can be limited due to its inability to test the hypotheses. The ascertained associations may not be the only ones that exist and perhaps may not be the most vital associations. The researcher, while gaining support for the observed relationships, must also consider other competing hypotheses which may justify the observed results (Mouly, 1970). This study was ex post facto due to the examination of relationship between variables that have already been collected during the medical school admissions and matriculation processes.

Sample Population

While gaining admission to medical school is often an arduous yet gratifying process for applicants, this step serves as a fundamental precursor to undergraduate medical education, which leads to licensure and the ability to practice as a medical professional. The level of

achievement in completion of each step of the medical school process determines the level of success in reaching both personal and professional milestones. The culmination of undergraduate medical education involves not only completion of the curricular requirements but also acceptance into the residency program of choice for the student. Stages in the medical education process include pre-clinical education during the first two years and clinical education during the final two years of medical school.

Pre-clinical education consists of science education including body structure and function; disease diagnoses and treatments; and basic medical concepts. This stage also includes fundamental medical competencies such as taking medical histories and providing basic physical examinations. Evaluation during this stage varies among medical schools. Methods include pass/fail, honors/pass/fail, honors/high pass/pass/fail, numerical grades, and letter grades (American Association of Medical Colleges, 2016). Regardless of the system employed, grades earned during this time are vital to the determination of class rank, which is significant for determination of placement in graduate medical education programs or residencies.

The clinical education portion consists of comprehensive, hands-on patient interactions during rotations or clerkships. During the third year of medical education, these clerkships encompass the major medical specialties including surgery, psychiatry, pediatrics, obstetrics and gynecology, and internal medicine. During the fourth year, medical students are afforded the ability to explore various specialties through enrollment in electives. These electives are offered both at the student's home institution and at other medical institutions. Students often seek visiting elective rotations at institutions where they are interested in attending for residencies. Evaluation during this stage also varies among medical schools. Methods include pass/fail,

honors/pass/fail, honors/high pass/pass/fail, numerical grades, and letter grades (American Association of Medical Colleges, 2016).

The two stages of medical education also include two of the three "steps" of the licensure process. Licensure requires successful completion of the United States Medical Licensure Examination (USMLE), which is a standardized test. Step one of the USMLE, covering mastery of the sciences essential to the practice of medicine, is usually given towards the end of the second year of medical education. There are a small number of schools that don't require completion of step one until the end of the clinical education phase and an even smaller number that don't have any time requirement for step one other than prior to graduation (American Association of Medical Colleges, n.d.). Step two, covering mastery of clinical skills and knowledge, is usually completed in either the third or the fourth year of medical education (United States Medical Licensing Examination, 2020). On January 26th of 2022, the step one exam transitioned from a scored exam to pass/fail (Chretian, 2022). Previously, scores on these exams ranged from one to three hundred. The passing score for step one was 194 and the current passing score for step two is 209 (Kaplan, 2020). Ranking in the medical school classes, largely based on the pre-clinical grade point averages, together with step scores, predominantly determine the level of residency competitiveness which students are deemed eligible to pursue (Parmer et al., 2019). In 2020, the average step one score of students who obtained residences in Neurological Surgery and Interventional Radiology (considered highly competitive) was 250 while the average scores for students who obtained residences in Family Medicine and Psychiatry were 220 and 226 respectively (National Residency Matching Program, 2020). The significance of pre-clinical grade point averages in the subsequent determination of physician specialty, coupled with the historical reliance on MCAT scores as predictors of which students

are capable of handling medical education is substantial. Particularly since the MCAT has been demonstrated to hinder diversification of student bodies due to the actuality of certain populations, including Black students, earning lower scores on this and other standardized exams. This occurrence merits elucidation of the association between MCAT scores and pre-clinical GPAs for Black students.

The study participants included recent medical school graduates and current medical students. This demographic was selected because it contains students who were administered the latest and currently employed iteration of the MCAT and who have completed pre-clinical coursework. The current MCAT was introduced in April of 2015 (Kaplan et al., 2012). The participants will represent four cohorts of medical school classes. These cohorts attended or will attend medical school during 2015 - 2019, 2016 – 2020, 2017 – 2021, and 2018 – 2022. An example of a cohort timeline is as follows: the first cohort matriculated in 2015; completed the pre-clinical phase and more than likely step 1 in 2017; completed the required clinical rotations in 2018; and completed the elective clinical rotations, step 2, and graduated in 2019. During this timeframe, approximately 1850 Black students per year were accepted into medical schools in the U. S. (American Association of Medical Colleges, 2020). A subset of this demographic was ineligible for, and not included in the study because the 1991 iteration of the MCAT was still accepted after the 2015 MCAT had begun being administered. The length of time of acceptance of the previously administered MCAT, first implemented in 1991, varied by institution. Distinction between students who were administered the 1991 MCAT and those who were administered the 2015 MCAT were apparent due to differences in the score scales for each iteration. The study focus included all factions of Black students along with other racial and ethnic demographics. Black students included those who identify as African American, African,

Afro-Caribbean, as well as those who identify as multi-racial as long as one of the identities is Black.

Institutional Profiles

There are currently 155 accredited allopathic medical schools in the U. S. (American Association of Medical College, n.d.) All are MD-granting institutions, fall under the purview of the American Association of Medical Colleges and are accredited by the Liaison Committee on Medical Education. In 2019, 53,371 persons applied for admission with 21,869 gaining acceptance (American Association of Medical Colleges, 2019). Data for this study was obtained from three medical schools. For the purposes of this study, the schools will be referred to as School A, School B, and School C. A fourth school (School D) originally agreed to provide data for the study but when contacted to provide the data, did not respond to the investigator.

School A, founded in 1845, is located in an urban area in the southern region of the U. S. It is a private institution with a student body of approximately 800 students. Currently 9% of the student body is Black at School A. The average MCAT score for the classes, which entered in 2019 and 2020, was 509. Average undergraduate grade point averages for these classes were 3.52 and 3.50 respectively.

School B. founded in 1931, is located in an urban area in the southern region of the U. S. It is a public institution with an undergraduate student body of approximately 800 students. Currently 15% of the undergraduate student body is Black at School B. The average MCAT scores for the classes, which entered in 2018 and 2019, were 507 and 509 respectively. Average undergraduate grade point averages for these classes were 3.68 and 3.74 respectively.

School C, founded in 2014, had its first class matriculate in 2017. It is located in an urban area in the western region of the U. S. It is a public institution with an undergraduate

student body of approximately 240 students. 8% of the inaugural class identified as Black at School C. As of 2020, the average MCAT score for students at school C is 508 and the average undergraduate grade point average is 3.6. Demographic breakdown of the schools is illustrated in Table 1. The Liaison Committee on Medical Education currently accredits all three schools.

Table 1. Demographic Compositions of Medical School Settings

School Designation	Community	Student Body	Black
A	Urban/Private	800	9%
B	Urban/Public	800	15%
C	Urban/Public	240	8%

Variable Selection

Due to the correlational nature of this research study, the primary goal was to assess the statistical relationship between two variables. The independent variable considered was MCAT scores and the dependent variable under consideration was pre-clinical GPAs ("6.2 Correlational research – Research methods in psychology," 2017). Determination of this relationship helped assess the validity and reliability of MCAT scores as a measurement of educational readiness for Black students.

MCAT scores were chosen due to their dominant role in medical school admission procedures. The current iteration of the MCAT was implemented in 2015. Changes from its predecessor include: a stronger emphasis on knowledge usage ability rather than knowledge retention; an addition of a foundational inclusion of biochemistry knowledge and concepts; and an addition of critical analysis and reasoning. It contains four equally weighted sections with scaled scores ranging from 118 to 132 for total scores ranging from 472 to 528. The four sections are biological and biochemical foundations of living systems; chemical and physical foundations of biological systems; critical analysis and reasoning; and psychological, social, and

biological foundations of behavior. Historically Black applicants, along with other underrepresented in medicine persons, have been denied admission to medical schools partially due to lower MCAT scores (Davis et al., 2013: Terregino et al., 2020). MCAT scores of the study participants from the three participating medical schools were examined. Participant data was removed for students who took the previous iteration of the MCAT or for students who were not required to take the MCAT.

Pre-clinical GPAs were selected due to their existence as a measurement of a medical student's ability to handle the rigor of medical education. Medical students are not allowed to proceed to the latter components of the medical education process including licensure examinations and clinical rotations until they have successfully completed the pre-clinical coursework. Pre-clinical GPAs from the three participating medical schools were standardized. Institutions employing a non-numerical evaluation system provided the numbers corresponding to the employed evaluation terms. All scores were converted to the 4.0 GPA scale and rounded to the hundredths place.

Secondary to determining the relationship between MCAT scores and pre-clinical GPAs in Black medical students, this study sought to determine the effects of additional independent variables on this relationship. The additional independent variables that were examined are undergraduate GPAs, socioeconomic status, tier of undergraduate institution attended, and number of medical school personnel dedicated to equity, diversity and inclusion. Undergraduate GPAs were chosen due to their prominent role in medical school admissions decisions. Similar to MCAT scores, undergraduate GPAs have been historically lower for Black applicants when compared to their white and Asian counterparts (Elks et al., 2018; Fenton et al., 2016; Lucey & Saguil, 2019). Undergraduate GPAs were standardized. All scores were converted to the 4.0

GPA scale and rounded to the hundredths place. Socioeconomic statuses of the study subjects were ascertained from institutions who provided the data. This data was garnered from the student-reported socioeconomic statuses from the American Medical College Application Service (AMCAS) applications. Aligning with MCAT scores and undergraduate GPAs, socioeconomic statuses of Black applicants tend to be lower than white applicants (O'Donnell & Robinson, 2019; The Journal of Blacks in Higher Education, n.d.). Tier of undergraduate institution attended uncovered the effect of undergraduate institution prestige or ranking on the primary variable relationship. Institutions with higher rankings tend to have fewer Black students (McGill, 2015; The Journal of Blacks in Higher Education, 2019). Undergraduate institution rankings were based on the Carnegie classification of institutions of higher education undergraduate profile classifications. Rankings were designated based on the following categories: 1 – four-year, full-time, more selective institutions, 2 – four-year, full-time selective institutions, 3 – four-year, full-time inclusive institutions, 4 – four-year, medium full-time selective or more selective institutions, 5 – four-year, medium, full-time inclusive institutions, 6 – four-year, higher part-time institutions, and 7 – unknown. Tier one institutions are described as having full-time enrollment for a minimum of eighty percent of undergraduates and a selectivity between the 80^{th} and 100^{th} percentile among baccalaureate institutions. Examples include Princeton, Harvard, and the University of Southern California. Tier two institutions are described as having full-time enrollment for a minimum of eighty percent of undergraduates and a selectivity between the 40^{th} and 80^{th} percentile among baccalaureate institutions. Examples include Bard College, CUNY City College and Rutgers. Tier three institutions are described as having full-time enrollment for a minimum of eighty percent of undergraduates with test score data indicative of their willingness to extend admission to students with a wide span of scholastic

achievement and preparation. Examples include St. Michael's College, the University of South Carolina, and Virginia State University. Tier four institutions are described as having full-time enrollment between sixty and seventy-nine percent of undergraduates and a selectivity between the 80th and 100th percentile among baccalaureate institutions. Examples include Florida Atlantic University, The University of Alabama at Birmingham, and The University of Utah. Tier five institutions are described as having full-time enrollment between sixty and seventy-nine percent of undergraduates with test score data indicative of their willingness to extend admission to students with a wide span of scholastic achievement and preparation. Examples include Columbus State University, Idaho State University, and Lamar University. Tier six institutions are described as having at least forty percent of undergraduates at these institutions who are enrolled part-time. Examples include the University of Alaska Anchorage and Brigham Young University – Idaho. Tier seven institutions are those not listed in the Carnegie classification of Institutions of higher education. Examples include the University of Toronto and Queen's University at Kingston.

Compelled by the American Association of Medical Colleges' and the Liaison Committee on Medical Education's focus on the attainment of a more diverse and equitable medical workforce, many medical schools have either established or amplified existing offices dedicated to diversity and inclusion. Examination of the level of workforce specifically dedicated to equitable outcomes determined the effect of this institutional investment on student outcomes. The number of personnel for each participating medical school was ascertained from the school's website. Delineation of the proposed study variables are outlined in Table 2 below.

Table 2. Study Variable Definitions

Variable	Definition	Values	Variable Type
Pre-Clinical Grade Point Average	The grade point average of medical students who have completed the 1st two years of medical education	Ordinal (0.0 – 4.00)	Dependent
MCAT Score	The combined score (all 4 Sections) on the MCAT 2015 exam	Ordinal (472-528)	Independent
Undergraduate Grade Point Average	The grade point average of medical students earned prior to medical school matriculation	Ordinal (0.0 – 4.00)	Independent
Tier of Undergraduate Institution	The tier of undergraduate institution attended based on rankings from the Carnegie Classification of Institutions of Higher Education	Nominal (1, 2, 3, 4, 5, 6) or 7)	Independent
Socioeconomic Status (SES)	Determined either by self-identification on AMCAS applications	Nominal Low SES /Not Low SES	Independent
Race	Historically defined as persons who possess similar social and biological experiences (McKee, 1993; Fish, 1995). For this study, category of identification within the community; a person can belong to only one group.	Nominal (Black, White, Hispanic, Asian, American Indian or Alaska) Native, Native Hawaiian or Pacific Islander, Two or more races, or Unknown	Background
Medical School Diversity and Equity Staff	The number of medical school staff dedicated to Diversity and Equity	Ordinal (0 - 5)	Independent

Data Collection

Data containing the aforementioned variables were gathered from the designated institutions' Admissions, Student Affairs or Medical Education personnel or their designees. First, the Offices of Admissions and Student Affairs were asked to provide a student identification number designation for each study participant void of all identifying information. This designation, along with the race, gender, MCAT scores, undergraduate GPAs, socioeconomic statuses, and names of undergraduate institution for each participant were placed in an excel spreadsheet. The socioeconomic status of each study participant was determined by self-reported socioeconomic status retrieved from students' AMCAS applications. Next, the directors of the Offices of Medical Education or the University Registrars used the student identification number for each study participant to add the pre-clinical grade point averages to the spreadsheet. Once this spreadsheet was provided to the researcher, the undergraduate institution of each study participant was tiered utilizing the Carnegie classification of institutions of higher learning undergraduate profile classifications. All variables for each study participant were included.

Data Analysis

Comprehensive consideration of this study's variables was achieved using two quantitative methods – a Pearson correlation and a multiple regression (Field, 2013). Both methods are part of the Statistical Package for the Social Sciences (SPSS). The Pearson correlation was performed to ascertain the existence and strength of the linear relationship between the primary independent variable (MCAT scores) and the dependent variable (pre-clinical GPAs).

Performance of the Pearson correlation generated a correlation coefficient (*r*) which quantified the direction and intensity of linear relationships between pairs of continuous variables on a regression plot. Results from this test indicated whether a linear relationship exists between the variables and if it is statistically significant. The intensity of an existing linear relationship was determined by how close the association is to being represented by a perfectly straight line. The values of the correlation range from -1 to +1. -1 represents a perfectly negative linear relationship, +1 represents a perfectly positive linear relationship and 0 indications no relationship. The Pearson correlation is frequently used to quantify correlations among pairs of variables as well as correlations within and between sets of variables (Kent State University, 2020; Mukaka, 2012).

After the Pearson correlation, a multiple regression was performed to further examine the data obtained in the Pearson correlation by determining the impact of the secondary independent and the background variables on the primary variables' relationship. Stepwise multiple regressions help to determine which individual or combination of independent variables has the greatest significance on the dependent variable. In this analysis, the predictor values were inserted into or removed from the regression equation and an analysis was performed to determine the contribution of each variable (Ghani & Ahmad, 2010; Statistics Solutions, 2020). This ability aligns well with the goals of the second research question. This question sought to determine the effects of undergraduate GPA, tier of undergraduate institution, socioeconomic status, race, gender, and the number of medical school diversity and equity staff on the relationship between MCAT scores and pre-clinical GPAs for medical students. Determination of these effects will provide additional assistance to medical school personnel when evaluating applicants. Clarifying academic success predictors for Black students can potentially remove the

existing deficit lens that is often ascribed to Black applicants; stimulate an increase in both medical student diversity the physician workforce; and effect change in the occurrence of health disparities which disproportionately affect underrepresented citizens. A multiple regression was performed using the aforementioned secondary independent variables. This method permitted the variation of several factors and allowed examination of their relationship to the primary variables and to each other.

Validity

The validity of the current study was limited by the level of which the discoveries could be ascribed to the population of the sampled demographic (Creswell, 2014). While the results may be pertinent to the Black students at the designated medical school(s), limitations may prevent expansion of generalizations to other medical schools. Variations in institutional mission, applicant pools, and patient populations preclude blanket generalities.

Ethical Implications

Ethical implications to consider include the personal and professional positionality of the researcher. Her position as director of the Office of Multicultural Affairs and member of the Admissions Committee at a medical school provided unique motivation to effect change in the diversity and admission arenas. One of her primary charges when her office was created, and she assumed the position was to increase diversity in the undergraduate medical school classes. The historical perceived association between MCAT scores and the ability to handle medical education along with the history of lower MCAT scores for underrepresented in medical education students provided a huge barrier in accomplishing this task. The ability to disprove an association between MCAT scores and academic success for Black students would be a major

advancement in medical education. Care was taken to ensure that study participant data was de-identified by supplementary research personnel to combat biases held by the researcher.

Chapter Four

Results

The goals of this study were to ascertain the existence of relationship between MCAT scores and grades in the first two years of medical school for Black medical students. A Pearson's correlation was employed to determine this relationship. Additionally, a multiple regression was employed to determine the effect of secondary variables on the relationship between MCAT scores and pre-clinical grades. The research questions addressed in this study were: is there a significant relationship between MCAT scores and pre-clinical GPAs of Black medical students and do undergraduate GPAs, socioeconomic status, tier of undergraduate institution attended, or number of staff dedicated to equity, diversity, and inclusion mediate the predictive ability of MCAT scores on pre-clinical GPAs of Black medical students? This chapter provides the descriptive statistics utilized in the study followed by the inferential statistics calculated using SPSS software.

Descriptive Statistics

The original data set was comprised of records from 1,961 students from three institutions. 748 records were received from School A, 974 records were received from School B, and 239 records were received from School C. After initially agreeing to provide data for this study, School D did not do so. This data set included records from all students from the respective medical schools who had completed two years of pre-clinical coursework. Data cleaning resulted in the elimination of students who: were not required to take the MCAT, took the version of the MCAT used prior to 2015, or whose records did not contain a pre-clinical GPA

yielding a final data set of 1,321. Of the final data set, 562 (42.5%) were from School. A, 527 (39.9%) were from School B, and 232 (17.6%) were from School C. The number of records per institution and the percentage of records in the overall data set is illustrated in Table 3.

Table 3. Data Set Records by Institution

School Designation	Student Records	Percentage of Total
A	562	42.5%
B	527	39.9%
C	232	17.6%
D	0	0%
Total	1321	100%

Descriptive statistics were calculated and reported for each of the variables for each institution. The focus of this study examined the relationship between two primary variables (MCAT scores and pre-clinical GPAs) with emphasis on the race of the students. Additional work was done to determine the effect of four secondary variables (undergraduate GPAs, tier of undergraduate institution attended, socioeconomic status, and number of medical school staff dedicated to equity, diversity, and inclusion) on the relationship between the two primary variables.

Pre-Clinical GPAs

This study sought to determine the predictive ability of MCAT scores on the pre-clinical GPAs of medical students. Pre-clinical GPAs were selected because they are the first measurements of a medical student's ability to manage the rigor of medical school curriculum. This measurement occurs prior to: the USMLE "step" exams; the exams given at the end of each clinical rotation (occurring in the last two years of undergraduate medical education); election to alpha omega alpha (AOA) medical honor society; and the residency match process.

The pre-clinical GPAs were converted to a four-point scale from pre-clinical class average percentages (Schools A and C) or from a three-point pre-clinical GPA used for AOA honor society selection purposes (School B). Table 4 provides the mean, standard deviation, and range of the pre-clinical GPAs across the three schools which provided data for the study. The mean, standard deviation, and range for pre-clinical GPAs for the entire data set were 3.18, 0.572, and 3.09, respectively. School A had the highest average pre-clinical GPA (3.32) of the 3 schools. School B had an average pre-clinical GPA of 3.05 and School C, 3.14. The standard deviation of School B was noticeably higher than those of Schools A and C indicating that the values for School B were more dispersed. Uncommon ranges were observed for the pre-clinical GPAs of Schools B and C indicating the presence of very low values.

Table 4. Mean, Standard Deviation, and Range of Pre-Clinical GPAs across Institutions

	School A	School B	School C	Total
Mean	3.32	3.05	3.14	3.18
Standard Deviation	0.253	0.823	0.29	0.572
Range	1.41	3.09	2.54	3.09

MCAT Scores

MCAT scores were selected as the primary dependent variable due to their touted ability to predict the readiness of medical school applicants While historically considered to standardize applicants with a variety of experiences, including undergraduate institution attended, they have also been described as discriminatory to those underrepresented in medical education who tend to have lower MCAT scores than those well-represented in medical education. Table 5 provides the mean, standard deviation, and range of the MCAT scores across the three schools which provided data for the study. The mean, standard deviation, and range of MCAT scores for the entire data set were 508.8, 5.563, and 37, respectively. While the mean

MCAT score is highest for School A, the mean scores for Schools B and C are very close to that of School A. This indicates that the three schools had similar admissions criteria for their applicants. The standard deviations for all three schools were high (>1) indicating that the MCAT scores were more dispersed relative to the mean. School B had the highest range of MCAT score values with the range of School A falling almost exactly in the center of the ranges of Schools B and C.

Table 5. Mean, Standard Deviation, and Range of MCAT Scores across Institutions

	School A	School B	School C	Total
Mean	509.8	507	509.3	508.8
Standard Deviation	4.987	6.058	5.130	5.563
Range	32	37	26	37

Race

As displayed in Table 6, Black students comprised only 8.7% (115) of the total data set. The number of Black students from each school were 54 (School A), 45 (School B), and 16 (School C). The overwhelming majority of the data set accounting for 59.0% (779 students) were White. Asian students, who are historically not underrepresented in medical education, comprised 17.9% (236 students) of the data set. Along with Black students, Hispanic, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander students are historically underrepresented in medical education and accounted for 3.8% (50 students), 0.3% (4 students), and 0.1% (1 student) respectively. Individuals who identified with two or more races comprised 3.9% (52 students) of the data set while those who did not identify a race comprised 6.4% (84 students) of the data set. Differences in the percentages of various races could be related to the location of the three institutions. Schools A and B are both located in urban areas in the southern region of the U.S. School C is located in an urban area in the western region of the U. S.

Noticeable differences for School C include lower percentages of Black and White students and higher percentages of Hispanic and Asian students. The number of data sets from each racial category signify a need to increase opportunities for those underrepresented in medical education.

Table 6. Race (Number and Percentage) of Study Participants across Institutions

	School A	School B	School C	Total
Black	54 (9.6%)	45 (8.5%)	16 (6.9%)	115 (8.7%)
White	303 (54.9%)	362 (68.7%)	114 (49.1%)	779 (59.0%)
Hispanic	20 (3.6%)	0 (0%)	30 (12.9%)	50 (3.8%)
Asian	111(19.8%)	67 (12.7%)	58 (25.0%)	236 (17.9%)
American Indian or Alaska Native	3 (0.5%)	1 (0.2%)	0 (0%)	4 (0.3%)
Native Hawaiian or Pacific Islander	0 (0%)	0 (0%)	1 (0.4%)	1 (0.1%)
Two or more races	31 (5.5%)	19 (3.6%)	2 (0.9%)	52 (3.9%)
Unknown	40 (7.1%)	33 (6.3%)	11 (4.7%)	84 (6.4%)
Total	562 (100%)	527 (100%)	232 (100%)	1321 (100%)

Undergraduate GPAs

Secondary variables undergraduate GPA, tier of undergraduate institution attended, SES and number of EDI personnel were employed to determine their ability to affect the relationship between the primary variables (pre-clinical GPAs and MCAT scores). Table 7 provides the mean, standard deviation, and range of undergraduate GPAs across the three schools. The mean, standard deviation, and range for undergraduate GPAs for the entire data set were 3.62, 0.292, and 1.72, respectively. Undergraduate GPAs were highest at School B, followed by School C,

and lowest at School A. This occurrence may be directly related to the next secondary variable, tier of undergraduate institution attended. School A having a higher percentage of students attending higher-tiered institutions may correlate with more rigorous programs of study resulting in lower undergraduate GPAs. It is also noted that Schools B and C are public institutions while School A is private. The standard deviations for all three schools were low indicating that the undergraduate GPAs were less dispersed relative to the mean. School A had the lowest range of undergraduate GPAs and the ranges of Schools B and C were almost identical (difference of 0.01).

Table 7. Mean, Standard Deviation, and Range of Undergraduate GPAs across Institutions

	School A	School B	School C	Total
Mean	3.55	3.70	3.66	3.62
Standard Deviation	0.265	0.298	0.298	0.292
Range	1.41	1.71	1.72	1.72

Undergraduate Institution Tier

Table 8 provides information detailing the tier of undergraduate institution attended by study participants. The majority of study participants attend either a tier one (74.9%) or a tier two (13.1%) institution, with most of those students attending either School A or School B. Due to the majority (39.2%) of study participants from School C attending a tier four undergraduate institution, tier four institutions comprised a larger than expected percentage of total study participants (8.7%). Tiers three, five, six, and seven contained 1.4%, 0.5%, 0.8%, and 0.8%, respectively of the total study participants. Higher-tiered institutions tend to have lower numbers of underrepresented in medicine students while lower tiered institutions tend to have higher numbers of underrepresented in medicine students. School C's higher number of students from lower tiers of undergraduate institutions exhibit more inclusive admissions practices providing

increased access to medical education. School C, founded in 2014, is also a much younger institution than Schools A and B founded in 1845 and 1931, respectively. The more recent founding of School C aligns with societal and educational shifts to increase the accessibility to medical education. Such shifts can potentially result in the diversification of the physician population.

Table 8. Undergraduate Institution Tier (Number and Percentage) of Study Participants across Institutions

	School A	School B	School C	Total
Tier 1	490 (87.2%)	412 (78.2%)	87 (37.5%)	989 (74.9%)
Tier 2	31 (5.5%)	101 (19.2%)	41 (17.7%)	173 (13.1%)
Tier 3	10 (1.8%)	4 (0.8%)	4 (1.7%)	18 (1.4%)
Tier 4	17 (3.0%)	7 (1.3%)	91 (39.2%)	115 (8.7%)
Tier 5	3 (0.5%)	1 (0.2%)	2 (0.9%)	6 (0.5%)
Tier 6	4 (0.7%)	1 (0.2%)	5 (2.2%)	10 (0.8%)
Tier 7	7 (1.2%)	1 (0.2%)	2 (0.9%)	10 (0.8%)
Total	562 (100%)	527 (100%)	232 (100%)	1321 (100%)

Socioeconomic Status

Table 9 provides information detailing the SES of study participants. The majority of study participants (84.1%) were not from a low SES background. School C had the highest percentage (37.1%) of students from a low SES background while Schools A and B had lower percentages at 13.2% and 9.5%, respectively. Along with having more students from a low SES background, School C also had higher percentages of both students of color and those who attended lower-tiered undergraduate institutions. Students of color, those attending lower-tiered undergraduate institutions, and those from low SES backgrounds all have been historically

underrepresented in medical education. These findings reinforce School C's actuality as being more accessible to this student demographic.

Table 9. Socioeconomic Status (Number and Percentage) of Study Participants across Institutions

	School A	School B	School C	Total
1 (Low SES)	74 (13.2%)	50 (9.5%)	86 (37.1%)	210 (15.9%)
2 (Not Low SES)	488 (86.8%)	477 (90.5%)	146 (62.9%)	1111(84.1%)
Total	562 (100%)	527 (100%)	232 (100%)	1321 (100%)

Institutional Equity, Diversity, and Inclusion Staff

Table 10 provides information detailing the number and percentage of EDI staff per study participant. While School B had the highest number of EDI personnel (five) and School A had the lowest number (one), School C had the highest percentage (1.3%) per study participant. This data indicates School C's focus on inclusion through their personnel investment in EDI staff. With School C being the youngest of the three institutions, founded in 2014, this percentage signals intentionality toward fostering an EDI infused culture. This intentionality is substantiated by other variables of this study including race (higher percentages of underrepresented students), undergraduate institution tier (higher percentages of students having attended lower-tiered schools), and SES (higher percentages of students from low SES backgrounds). Such intentionality will aid the institution in maintaining accreditation standards relative to EDI and serve to diversify the physician population.

Table 10. Institutional Diversity and Equity Staff (Number and Percentage per Study Participant)

School Designation	Number of EDI Staff	Percentage per Study Participant
A	1	0.2%
B	5	0.9%
C	3	1.3%

Inferential Statistics

To address the research questions of this study, Pearson correlations were run to measure the extent of the relationship between MCAT scores and pre-clinical GPAs for medical students, by the total data set and by racial groups. Following the correlation a multiple regression was run to determine if undergraduate GPAs, socioeconomic status (SES), tier of undergraduate institution attended, or the number of staff dedicated to equity, diversity, and inclusion (EDI) mediate the predictive ability of MCAT scores on the pre-clinical GPAs of Black medical students. Initially, the significance of the entire model was tested followed by tests of each independent variable to determine their significance for the entire data set and for the individual races contained in the data set.

Research Question 1

The first research question, while primarily focused on Black students, needed to confirm a significant association between MCAT scores and pre-clinical GPAs. Pearson correlations were employed to determine this relationship. For the total data set (all races), MCAT scores significantly correlated positively with pre-clinical GPAs. Although the relationship between the two variables was statistically significant, the strength of the total correlation was low as evident by the correlation coefficient ($r = 0.229$, Table 11). The positive direction of the correlation denotes that as MCAT scores increase, pre-clinical GPAs increase.

While a low positive correlation existed for the total data set, significant, positive correlations varied, depending upon various racial groups. Black, White, Hispanic, Asian, and unknown racial groups displayed significant, positive relationships ($r = 0.345$, $r = 0.140$, $r = 0.358$, $r = 0.336$, $r = 0.236$, respectively). Correlations were insignificant between MCAT scores and pre-clinical GPAs for American Indian or Alaska Native students or students of two or more races. The correlation could not be computed for Native Hawaiian or Pacific Islander students because there was only one student in the data set. Similar to the results generated by the total data set ($r = 0.229$), the strength of the correlations for white and unknown racial students were low, ($r = 0.140$, $r = 0.234$, respectively), while the associations for Black, Hispanic, and Asian racial groups reflected moderate associations ($r = 0.345$, $r = 0.358$, $r = 0.336$, respectively.) Table 11 provides correlation data by racial group for the total data set.

Table 11. Correlation Data for MCAT Scores and Pre-Clinical GPAs

Race	Number	r	p
Black	115	.345	.000
White	780	.140	.000
Hispanic	49	.358	.011
Asian	237	.336	.000
American Indian or Alaska Native	3	.894	.295
Native Hawaiian or Pacific Islander	1	N/A	N/A
Two or more races	52	.198	.159
Unknown	84	.234	.032
Total	1321	.229	.000

Research Question 2

A multiple regression was run to determine if undergraduate GPAs, socioeconomic status (SES), tier of undergraduate institution attended, or the number of staff dedicated to equity, diversity, and inclusion (EDI) mediate the predictive ability of MCAT scores on the pre-clinical GPAs of Black medical students. MCAT scores contributed significantly to the regression model, [$F(1, 1319) = 72.937$, $p < .001$] and accounted for 52% of the variation in pre-clinical GPAs. Undergraduate grade point averages contributed significantly to the regression model, [$F(1, 1319) = 40.411$, $p < .001$] and accounted for 29% of the variation in pre-clinical GPAs. Socioeconomic status did not contribute significantly to the regression model, [$F(1, 1319) = 2.734$, $p = .098$] and accounted for 1% of the variation in pre-clinical GPAs. Tier of undergraduate institution attended did not contribute significantly to the regression model, [F(1,

1319) = 1.922, p = .166] and accounted for 1% of the variation in pre-clinical GPAs. The number of staff dedicated to EDI contributed significantly to the regression model, [F(1, 1319) = 66.097, p < .001] and accounted for 48% of the variation in pre-clinical GPAs. This study, while primarily focused on Black students, generated results for students from other racial categories.

Undergraduate GPAs predicted the pre-clinical GPAs for Black students (β =.500, p = .002). Undergraduate GPAs also predicted the pre-clinical GPAs for White students (β = .373, p <.001), and Asian students (β = .626, p <.001). Undergraduate GPAs did not predict the pre-clinical GPAs for Hispanic students (β = .159, p = .197), students from two or more races (β = .432, p = .138), or from students from unknown races (β = .256 p = .221). Table 12 provides regression data for undergraduate GPAs for all races.

Table 12. Regression Data for Undergraduate GPAs and Pre-Clinical GPAs

Race	β	p
Black	.500	.002
White	.373	.000
Hispanic	.159	.197
Asian	.626	.000
American Indian or Alaska Native	N/A	N/A
Native Hawaiian or Pacific Islander	N/A	N/A
Two or more races	.432	.138
Unknown	.256	.221
Total	.337	<.001

While possessing the ability to predict pre-clinical GPAs, undergraduate GPAs did not mediate the predictive ability of MCAT scores on pre-clinical GPAs, therefore the predictive ability has an independent affect. Table 13 provides regression data for MCAT scores and pre-clinical GPAs mediated by undergraduate GPAs for all races.

Table 13. Regression Data for MCAT Scores and Pre-Clinical GPAs Mediated by Undergraduate GPAs

Race	β	p
Black	-2.09	.151
White	1.17	.098
Hispanic	-.590	.778
Asian	.061	.962
American Indian or Alaska Native	29.10	.605
Native Hawaiian or Pacific Islander	N/A	N/A
Two or more races	3.73	.109
Unknown	1.80	.327
Total	2.25	<.001

The number of staff dedicated to EDI predicted pre-clinical GPAs for Black, White, Asian, and students with two or more races but not for Hispanic students and students of unknown race. For Black students $\beta = -.104$, $p = .001$, White students $\beta = -.067$, $p = .000$, Asian students $\beta = -.113$, $p = .000$ and students with two or more races $\beta = -.156$, $p = 000$. For Hispanic students $\beta = -.083$, $p = .058$ and for students of unknown race $\beta = -.008$, $p = .809$. An unexpected result is that the relationship between the number of staff dedicated to EDI and pre-clinical GPAs is a negative one. Table 14 provides regression data for the number of staff dedicated to EDI for all races.

Table 14. Regression Data for Number of Staff Dedicated to Equity, Diversity, and Inclusion and Pre-Clinical GPAs

Race	β	p
Black	-.104	.001
White	-.067	.000
Hispanic	-.083	.058
Asian	-.113	.000
American Indian or Alaska Native	N/A	N/A
Native Hawaiian or Pacific Islander	N/A	N/A
Two or more races	-.156	.000
Unknown	-.008	.809
Total	-.069	<.001

Socioeconomic status did not predict pre-clinical GPAs for any racial group. For Black students $\beta = -.083$, $p = .491$, White students $\beta = -.037$, $p = .601$, Hispanic students $\beta = .022$, $p = .781$, Asian students $\beta = -.034$, $p = .652$, students from two or more races $\beta = .213$, $p = .342$, and students of unknown race $\beta = .080$, $p = .600$. Similarly, tier of undergraduate institution attended did not predict pre-clinical GPAs for any racial group. For Black students $\beta = -.037$, $p = .442$, White students $\beta = -.024$, $p = .257$, Hispanic students $\beta = -.007$, $p = .784$, Asian students $\beta = -.034$, $p = .236$, students with two or more races $\beta = -.013$, $p = .837$, and students of unknown race $\beta = -.020$, $p = .670$. Tables 15 and 16 provide regression data for SES and tier of undergraduate institution attended for all races, respectively.

Table 15. Regression Data for Socioeconomic Status and Pre-Clinical GPAs

Race	β	p
Black	-.083	.491
White	-.037	.601
Hispanic	.022	.781
Asian	-.034	.652
American Indian or Alaska Native	N/A	N/A
Native Hawaiian or Pacific Islander	N/A	N/A
Two or more races	.213	.342
Unknown	.080	.600
Total	.071	.098

Table 16. Regression Data for Tier of Undergraduate Institution Attended and Pre-Clinical GPAs

Race	β	p
Black	-.037	.442
White	-.024	.257
Hispanic	-.007	.784
Asian	-.034	.236
American Indian or Alaska Native	N/A	N/A
Native Hawaiian or Pacific Islander	N/A	N/A
Two or more races	-.013	.837
Unknown	-.020	.670
Total	-.020	.166

Conclusion

The results revealed that there is a significant moderate correlation between MCAT scores and the pre-clinical GPAs of Black medical students. This moderate significant relationship also exists for Hispanic and Asian students. White and unknown race medical students displayed a low significant relationship, while a significant relationship does not exist for American Indian or Alaska Native students or students of two or more races. Undergraduate GPAs, SES, tier of undergraduate institution attended, or number of staff dedicated to EDI do not mediate the predictive ability of MCAT scores on pre-clinical GPAs of Black medical students. The lack of mediation is also seen in White, Hispanic, Asian, American Indian, or Alaska Native, Native Hawaiian or Pacific Islander students as well as in students of two or more races or students of unknown race.

Chapter Five

The purpose of this study was to determine the predictive ability of MCAT scores on the pre-clinical grade point averages of Black medical students. Additional factors including undergraduate GPAs, socioeconomic statuses, tier/selectivity of undergraduate institution attended, and the number of staff dedicated to EDI, were also utilized to determine their effect on the relationship of the two primary variables. The research questions used to guide this study were: 1) Is there a significant relationship between MCAT scores and pre-clinical GPAs of Black medical students? and 2) Do undergraduate GPAs, socioeconomic status, the tier of undergraduate institution attended or the number of staff dedicated to EDI mitigate the predictive ability of MCAT scores on pre-clinical grade point averages of Black medical students? This study is significant due to its capacity to inform policies and procedures employed in medical school admissions. These policies and procedures will have an impact on the current and future demographics comprising the physician community and subsequently the persistence, or lack thereof, of health disparities. This study is novel due to its emphasis on pre-clinical grades. Previous studies focused on other variables including persistence in medical school (Spring et al., 2011; Vergel et al., 2018; Winston et al., 2013), advancement along the curriculum (DeMuth et al., 2018), USMLE scores (Blenda et al., 2021; Wang et al., 2021), election to AOA (Buja, 2019; Gauer & Jackson, 2017), and specialty selection (Avery Jr et al., 2011; Esposito et al., 2021; Nguyen & Bounds, 2019). This chapter will include a discussion of the findings, including those predicted and unexpected, recommendations including implications on policies and practice, as well as future studies and study limitations.

Discussion

Findings from this study yielded the existence of a statistically significant, yet weak, positive correlation between MCAT scores and pre-clinical GPAs for the total data set which includes all races. Variations in the relationships between the two primary variables existed among the racial groups. While significant, positive relationships existed for Black, white, Hispanic, Asian, and unknown racial groups; they did not exist for American Indian or Alaska Natives or individuals of two or more races. The correlations were weak for white and unknown race groups and stronger for Black, Hispanic, and Asian groups. When examining the effect of the secondary variables, only undergraduate GPAs and number of EDI staff predicted pre-clinical GPAs. Neither of these variables affected the relationship between the two primary variables. Therefore, their predictive ability had an independent effect.

The results generated from this study offer three key areas of significance. First, the existence of a correlation between MCAT scores and pre-clinical grade point averages for Black students necessitates the need for admissions personnel to develop and implement authentically holistic rubrics. These rubrics, when employed in medical school admissions policies and procedures, can serve to facilitate physician diversification. Second, the level of connection between EDI personnel and Black students, not the number of EDI personnel, is critical. Finally, Practice Theory is germane in removing the deficit lens from students and applying it to the systems which admit, educate, and train these students.

Need for Holistic Admissions

With MCAT scores historically being used along with other numeric metrics as a predictor of medical school readiness, it has been shown in many instances to not be an accurate indicator of medical school capability (Seal et al., 2020). What was initially proposed as a

"field-leveling" instrument became a "gate-keeping" instrument which prevented many students, particularly racially and ethnically underrepresented students, from pursuing medical education. The tendency for underrepresented students to score lower on the MCAT than well-represented students corresponds with similar results observed with other standardized tests (Fernandes et al., 2016; Jones et al., 2020; Williams et al., 2021). The need for a diverse community of physicians has become critical to the current physician shortage (Abrahams et al., 2021; Vick et al., 2018), the increase in the number and age of U. S. citizens (Petterson et al., 2012), and the existence of health disparities (Boydstun & Cossman, 2016; Harris et al., 2015). Health disparities necessitate the need for more underrepresented physicians due to their propensity to select and practice in primary care specialties (Xierali & Nivet, 2018), provide discounted or reduced care (DeCarvalho et al., 2018), and have greater patient adherence to treatment from their patients (Torres, 2018). Holistic admissions practices have been shown to result in an almost immediate increase in student diversification (Hubbeling, 2017; Seo, 2021; Sklar, 2019). These practices give consideration to life experiences including: work history; familial dynamics including level of support and financial stability, or lack thereof; and quality of secondary, post-secondary, and post-baccalaureate education.

The need to decrease the reliance on standardized test scores have seen a recent surge (Belasco et al., 2015; Moneta-Koehler et al., 2017). The COVID-19 pandemic ushered in the practice of waiving standardized test scores for college admissions (Corridon, 2021). The recent decrease in COVID-19 cases has not resulted in the complete reversal of this practice. In fact, institutions have decided to extend (Stirgus, 2022) and in some cases suspend (UT News, 2020) the standardized test score requirement. This will move the equity needle, facilitating an increase in diversity and eventual inclusion.

While results from this study indicate a positive correlation between MCAT scores and pre-clinical GPAs for Black medical students for the total data set, the correlation is low and also varies among the institutions which provided data for the study. The absence of a correlation for one institution indicates that other factors may be in play and indicate the need for the consideration of other factors when making admissions decisions. The actuality that all of the data subjects were able to complete the pre-clinical curriculum at their respective institutions, coupled with the existing shortage of underrepresented primary care physicians, necessitates the need to alter admissions policies and procedures. Genuinely holistic practices should be investigated, developed, and implemented. This practice will require research to determine additional factors critical in measuring medical school readiness and capability. These factors should move beyond numeric metrics which decrease the opportunity for those historically underrepresented in the population and in medical education to be provided the opportunity to join the medical education and medical practice communities.

Connection Level Versus Number of Personnel

The variable of the number of personnel dedicated to EDI was utilized to indicate a perceived dedication to EDI efforts by the institutions which participated in the study. Monetary, programmatic, and FTE recent investments by medical schools across the U.S. have been observed in response to calls from civil rights and social justice organizations (Copeland & Tarver, 2020; Otten et al., 2021) along with accrediting bodies (Gilliam et al., 2020) to approach this conundrum with intentionality. It was hypothesized by the study investigator that an increase in the number of EDI personnel would correspond with an increase in the pre-clinical grades of Black and other underrepresented-in-medicine students. The results demonstrated a negative correlation indicating that there were other factors in play.

The investigator detected and determined that the level of involvement of the EDI personnel was critical. Inquiry into the level of involvement from the EDI personnel from the institution with lowest number revealed that the institution had a high level of involvement with the underrepresented students. Examples included knowing the students on a personal level and being involved with them intimately from premedical advisement, recruitment, admission, matriculation, graduation, and residency. Understanding familial, socioeconomic, academic, and physical and mental health challenges and triumphs proved vital in providing and sustaining academic support. The institution with the highest level of EDI personnel was shown to be active in the recruitment and support of the affected student demographic, but not at the level of the aforementioned institution (A. Wallace, personal communication, January 13, 2022). Exterior or adjacent, versus internal and integral, is significant in these interactions and relationships. Exterior and adjacent connections, while intentional and sincere in purpose, tend to be superficial. An example of this type of connection would be "knowing" applicants only in the context of the information that is found in a medical school application. Conversely, internal and integral connections facilitate the development of intimate relationships, fostering multilayered and multifaceted connections which strengthen academic development and growth. Examples of this type of connection include knowledge of familial experiences including education levels and socioeconomic status, as well as social factors which affect an applicant's educational journey such as homelessness, familial incarceration, or financial responsibility for siblings. The increased level of relatability and empathy expressed from the institution with the least number of EDI personnel may also be because the personnel member was also a student while serving in their EDI position. Another caveat to this result is the fact that the institution with the lowest number of EDI personnel also had the students with the highest undergraduate grade point

averages and highest MCAT scores. Conceivably, the academic readiness of this group of students compensated for the decreased need of a higher number of EDI personnel.

Practice Theory Relevance

The utilization of Practice Theory for this study was determined to be decidedly suitable. Tenets of this theory focus highly on the need to survey the EDI environment in efforts to assay the strengths, weaknesses, opportunities, and challenges of the given community (Cameron & Heckman, 2001; Darling-Hammond, 1998; Hacker, 2003; Koedel, 2017; Noguera et al., 2015). This survey provides leaders with clear, insightful, and pointed information concerning the EDI atmosphere (Dill 2014; Mathews et al., 2016). Most importantly, it supports the removal of the deficit lens from the affected students and places it on the institution (Bensimon & Malcolm, 2012). This shift directly affects the ability of minoritized and marginalized students to obtain access, admission, and academic success at institutions which previously denied their existence, refuted their fit, and downplayed their significance and ability to contribute to the overall body of knowledge (Eller, 1989).

Results from this study offer a low, yet significant positive correlation between the MCAT scores and the pre-clinical grades of Black medical students. This correlation, however, does not alleviate the need to reconsider the significance and overreliance placed on standardized test scores when considering underrepresented in medicine applicants. Data has shown that despite lower MCAT scores, these students can complete pre-clinical, clinical, as well as graduate medical education (Murphy, 2022; Reiter & MacCoon, 2006)). This result indicates a deficiency in the medical education system as opposed to deficiencies in the underrepresented in medicine applicants. This tenet of Practice Theory indicates a need to change the "Practice" of

medical school admissions to meet the needs of underrepresented studies and the needs of the population in providing them with diverse and inclusive medical care.

Unexpected Findings

The study generated several unexpected findings. The correlation between MCAT scores and pre-clinical grade point averages, although weak, was unanticipated. The study investigator had previously observed many instances where admitted medical students with lower standardized test scores had some of the highest pre-clinical grades among their contemporaries. Knowledge of these students' personal histories led the investigator to believe that other factors were in play, resulting in the lower standardized test scores (Anonymous, personal communication, April 23, 2022). An additional unforeseen observation was that while there was not a correlation between MCAT scores and pre-clinical GPAs at one of the study institutions, the correlation did exist for the other study institutions and for the total data set. Explanations for these differences could lie in the differences between the study institutions. The lack of correlation was observed in a private, medical school versus the other schools which are public. Students at the private medical school had higher MCAT scores and a higher number of students who attended the highest tier of undergraduate institutions. Underrepresented students who attended the private medical school could have possibly faced more academic rigor prior to medical school which could negate the ability of a lower standardized test score to manifest into lower pre-clinical GPAs.

The lack of the ability of SES to predict pre-clinical GPAs and also to mitigate the relationship between MCAT scores and pre-clinical GPAs was also unexpected. This defies the commonly accepted thought that individuals from low socioeconomic backgrounds are at such an educational disadvantage that despite their academic aptitude, their experienced challenges

will preclude their ability to achieve high and sustained academic success (Browman et al., 2017; Fischer et al., 2016; Jury et al., 2017). This lends itself to the fact that there must be other factors in play. Students who manage to reach the level of academic pursuit of medical education quite often have managed to navigate the system of medical education regardless of their socioeconomic status. Since many have attended top tier undergraduate institutions, it is possible that the gaps between the "haves" and the "have-nots" has been attenuated and offset with the "playing-field" leveled in the realm of higher education. Underrepresented students who succeed in adverse conditions often are described as possessing more grit and resilience due to their familiarity with challenges and struggles which well-represented students do not often face (Alzerwi, 2020; Mirza et al., 2021; Ursua et al., 2021).

Recommendations

Data generated in this study suggests the need to alter policies and procedures related to the recruitment and admission of medical school applicants. The unearthing of the correlation between MCAT scores and pre-clinical grades of Black medical students indicates a need to modify historically employed systems to ensure the continuation and expansion of equity, diversity, and inclusion initiatives to further the diversification of medical education and medical practice. Implications for admissions policies and procedures include: the need to decrease the primary dependency on numeric metrics including the eradication of absolutes, thresholds, and cutoffs of these metrics; the need to develop rubrics which utilize authentically holistic admissions; the need to employ EDI personnel committed to establishing and maintaining multifaceted and multilayered relationships with underrepresented in medicine students; and the need to purposefully, intentionally, and transparently employ Practice Theory in the assessment of the academic environment.

Implications for Admissions Policies and Procedures

This study purports a need to eliminate absolutes/thresholds/cutoffs from academic numeric metrics when they are used in admissions decisions. Being that underrepresented in medicine students, particularly students of color, historically score lower on standardized tests, using these metrics as primary determinants for admissions decisions unquestionably obstructs diversity in medical education and medical practice (Stirgus, 2022). The need to fortify diversity and inclusion efforts have been heralded by accreditation agencies and is necessitated by the overall shortage of practicing physicians in the U.S. and the increasingly aged and racially and ethnically diverse population. The more diverse population includes a significant number of citizens who have been disproportionately affected by health disparities. These disparities are most often treated by primary care physicians. Primary care physicians with shared identities with their patients result in increased adherence to medical advice potentially resulting in decreased health disparities (Baugh, 2018; Metz, 2017; Terregino et al., 2019; Torres, 2018).

This study suggests the need to investigate and create rubrics which give value to life experience, family circumstances, financial deficits and burdens, and exposure to quality secondary, undergraduate, and post baccalaureate premedical education (Mighty, 2022). Such practices account for the alternate experiences of underrepresented in medicine students which may not align with those of their well-represented counterparts. Considering these experiences may demonstrate that medical school capability may be present, even when unevidenced by numeric metrics. Previous instances where this has occurred have proved successful in increasing the diversification of higher education as well as medical education institutions (Capers et al., 2017; Capers, 2020; Davis et al., 2013).

Next steps in the utilization of the data generated in this study should be to determine how medical school applicants should be evaluated. This evaluation should consider how much credence should be given to lived experiences including familial circumstances, the ability to leverage social capital and other relationships, in addition to the commonly emphasized numeric academic metrics in the pursuit of medical education. While numeric evaluations such as standardized tests given in the premedical education phase will help prime students for similar exams employed in medical and graduate medical education, they should not be the deciding factor for admission. Value should also be ascribed to experiences which demonstrate a history of service to one's community and the willingness to continue this service after the completion of medical education. Ascribing appropriate values to the aforementioned characteristics will serve to foster a more equitable medical education community and provide opportunities to other historically underrepresented groups including first-generation college students and those with disabilities. An obstacle to the creation and implementation of such holistic practices lies in the ability to evaluate the growing number of medical school applicants. While a truly holistic method of applicant evaluation is warranted and desired, medical school admissions committees also need ways to assess and determine which students are granted admissions from a growing number of applicants.

The value in employing EDI personnel committed to developing and nurturing multidimensional relationships with underrepresented in medicine applicants is supported. These relationships, which are often initiated during the student recruitment phase, facilitate the acquaintance of medical school admissions personnel with knowledge of the total student. Such relationships allow student potential and readiness to be seen beyond quantitative assessments, particularly those which may be inherently biased against students of color. EDI personnel

should be given leeway and latitude to develop in-depth relationships with applicants/students. Focus should move away from "box-checking" to seat a minimum number of students from underrepresented demographics and toward the fostering of deliberate and sustained relationships. These connections provide validation and sustenance, which is beneficial particularly when challenges arise during the academic process.

Previous literature promoting and supporting the diversification of medicine and medical education emphasizes the need to hold medical schools accountable for the exclusionary measures faced by persons underrepresented in medicine (Medical Schools Council, 2021). Exclusions mentioned often include those in the: recruitment, selection, and the medical school environment; curriculum; and clinical placement. Holistic review is offered as an essential element necessary to determine those applicants who are not only prepared for the arduous curriculum, but those dedicated to serving others, able to work collaboratively, and competent to provide care in a global society (Oakland University William Beaumont School of Medicine, 2019). Holistic review underscores the significance of an applicant's "lived" experience and places the magnitude of this element alongside traditional, quantifiable metrics (Bates et al., 2020). Results from this study offer the ability of EDI personnel to utilize knowledge and understanding of these lived experiences in order to endorse not only the seating of diverse medical student bodies, but the academic achievement of this vital demographic. Efforts by the AAMC and other entities have endeavored to ensure that this group has organizations which support the professional development of EDI personnel to help them promote the advantages of the diversification and increase of inclusivity in medical practice. One such organization is the AAMC sponsored Group on Diversity and Inclusion (American Association of Medical Colleges, n.d.). Organizations outside of medical education, but with similar functions include

the National Association of Diversity Officers in Higher Education (National Association of Diversity Officers in Higher Education, 2022). Continued professional development for EDI personnel should be mandated and resourced. The ability of EDI personnel to engage with underrepresented in medicine students deeply and intentionally is valuable and necessary.

A final recommendation would be to support a more widespread use of Practice Theory and its component, the Equity Scorecard. when assessing medical school admissions policies and procedures. The Equity Scorecard would enable the medical school to assess its environment using an equity lens. Incorporation of the Equity Scorecard would impart culpability for the pedagogical outcomes of underrepresented students. Exposure of any shortcomings or inadequacies would be situated on the institution and not on the students ("Equity Scorecard for Higher Education," 2012). Addressing these directly would remove the deficits often attributed to students and facilitate a move toward more equitable admissions, curriculum, and administrative practices. Several universities have implemented the use of the Equity Scorecard to attack the organizational obstructions and challenges faced by underrepresented studies. These institutions include Central Washington University (Central Washington University, n.d.), the University of Wisconsin (University of Washington Oshkosh, 2017), and Loyola Marymount University (Robinson-Armstrong et al., 2007).

Utilization of Practice Theory will facilitate the development of a more empathetic and accommodating environment for underrepresented medical students post-matriculation. Admission without subsequent support will prove futile. Provision of academic, financial, along with physical and mental health support is critical in ensuring that students who are "medical school capable" are also "medical school ready". Supplying these needs will support success in medical education as opposed to mere survival. Execution of Practice Theory in the unveiling of

deficiencies and inequitable practices employed in medical education help validate the use of initiatives to correct historical injustices including denial of access.

Future Directions

Data generated in this study provided the answers to quantitative questions concerning the predictive ability of standardized test scores on academic achievement in the pre-clinical years of medical education. Additional insight in to the "how and why" of pre-clinical academic performance by Black medical students could be ascertained using a qualitative study examining the life experiences and various circumstances/environments in existence at their chosen medical schools. Alternatively, the use of a mixed-method study combining components of a quantitative study and a qualitative study may provide a more extensive explanation of the generated quantitative data.

Qualitative study possibilities which could be used to expand the knowledge base in this area could include a phenomenological study, an ethnography, or a case study. A phenomenology could capture the "lived" experiences of Black medical students and potentially unveil the unexpected results of the researcher using bracketing. This could allow the significance that such encounters hold for this student demographic to be uncovered and explain occurrences that numeric metrics only cannot. An ethnography, involving the assembly and investigation of the Black cultural group, could allow cultures which are "foreign" to the Black experience to view them during a shared lens facilitating understanding and novel perception. A case study could provide similar results and would entail a profound scrutiny of the experiences of Black medical students and potentially unveil characteristics exhibited in this demographic which contribute to academic performance (Rahmawati, n.d.).

Mixed method studies which could be employed include those employing a triangulation design, an embedded design, an explanatory design, and the exploratory design. The triangulation design would converge dissimilar, but corresponding data, to help understand a research problem. The embedded design converges data sets in which one supports a primary set in a secondary, but supportive way. The explanatory design allows quantitative results to be supported by qualitative data which fortifies the quantitative data. Conversely, the exploratory design allows qualitative results to be supported by quantitative data which fortifies the qualitative data (Creswell, 2014).

Limitations

Limitations to the current study include the number of institutions and hence the number of study subjects in the total data set, the standardization of conveyed data, the types of statistical analyses used, and limiting the study to the use of quantitative methods. Removal of these and other limitations have the potential to expand and extend the current body of knowledge surrounding this subject.

Data Set Quantity

The study investigator conducted a nationwide search in hope of discovering an aggregate of institutions willing to participate in the study through the allocation of study data. It was very difficult for the investigator to convince admissions and student affairs personnel to share this data. Originally, four medical schools agreed to provide data for the study. School D, after first agreeing to participate, did not respond to follow up requests to provide the data, thus decreasing the total number of data points. A second facet of this limitation was the elimination of data points that did not provide sufficient data for the study. This included students which sat for the previous iteration of the MCAT, not the currently employed version, and students who

were not required to take the MCAT. This also decreased the total number of data points for the study. The inclusion of additional institutions and an increase in the number of data points may have affected the relationships between the primary variables, as well as between the secondary variables and the primary variables.

Data Standardization

Medical schools in the U.S. have a variety of ways of evaluating medical students during the pre-clinical years (Carrasco et al., 2018; Short & Bloodgood, 2009; Spring et al., 2011). Such methods included lettered grades (A, B, C, etc.), numerical grades, pass/fail, pass/fail/high pass/honor, etc. (AAMC, 2021). Many do not calculate traditional grade point averages and use other methods to rank their students. The three institutions that provided data for this study all used different methods of student evaluation. This required the investigator to standardize the data points creating a system in which the data points were comparable.

Statistical Analyses Employed

The current study employed the use of Pearson's correlation to determine the relationship between the two primary variables and a multiple regression to determine the effects of the secondary variables on the relationship between the primary variables. Other correlation methods including the Kendall rank correlation, Spearman correlation, or the Point-Biserial correlation may have enhanced the data evaluation and provided clearer results (Statistics Solutions, 2021). Alternative methods to multiple regressions include discriminant analysis, analysis of variance, and factor analysis (Bieber, 1988). Other tests may have explained the relationship better. Discriminant analysis function to determine where observed and expected classifications among variables differ (Alchemer, 2019). Analysis of variance examines the influence of one or more variables by comparing the means of different samples. This method

can potentially control the number of false positives found in the test results (Qualtrics, 2021). Factor analysis allows investigation of models not easily quantified by reducing several variables to a smaller number of easier to comprehend data (Alchemer, 2019). Utilization of one or more of these methods may have provided clearer or more practical results.

Quantitative Versus Mixed Method Studies

This study utilized quantitative methods only. Data generated from the study indicated that additional factors should be examined when determining which students are medical school capable and that interview and subsequent admissions decisions should not be based solely on numeric metrics. A mixed-method study taking the quantitative data and adding qualitative methods to ascertain what additional factors may affect the relationship(s) among the variables employed in this study and how these and other factors interact may be extremely valuable. Supplementary anecdotal information which explained the trends, correlations or lack thereof, will be critical in the construction of the appropriate holistic rubrics which will foster the establish of an equitable, diverse, and inclusive community of physicians. The multiple variances in the narratives of Black medical students are unable to be clarified and expounded through the sole use of quantitative methods.

Conclusion

With the United States quickly becoming a "majority-minority" nation, we are at the precipice, now more than ever, of the need for a diverse community of physicians. Along with the change in the racial and ethnic make-up of the nation, we also have a community of older citizens, and a shortage of practicing physicians, particularly those providing primary care. The propensity of physicians of color to pursue primary care specialties and for primary care physicians to treat conditions found in health disparities which disproportionally affect persons

of color necessitates the need for the diversification of medical education and medical practice. The unique ability for physicians of color to connect with patients of color, facilitates greater adherence to treatment. This is key in the provision of not only altruistic but superior care to the local, regional, and national communities. This provides true fortification to the portion of the medical oath to "honor the profession of medicine and practice with conscience and dignity for the good of humanity (Tulane University School of Medicine, 2021)."

References

6.2 Correlational research – Research methods in psychology. (2017, August 21). Open Text WSU – Simple Book Publishing. https://opentext.wsu.edu/carriecuttler/chapter/correlational-research/

Abrahams, S., Kim, E. J., Marrast, L., Uwemedimo, O., Conigliaro, J., & Martinez, J. (2021). Examination of resident characteristics associated with interest in primary care and identification of barriers to cross-cultural care. *BMC Medical Education, 21*(1). https://doi.org/10.1186/s12909-021-02669-w

Aburas, R., & Nurunnabi, M. (2018). The relationship between admission exam and students' performance on an undergraduate interior design program. *International Journal of Technology and Design Education*, *29*(4), 961-986. https://doi.org/10.1007/s10798-018-9474-z

Adam, J., Bore, M., Childs, R., Dunn, J., Mckendree, J., Munro, D., & Powis, D. (2015). Predictors of professional behaviour and academic outcomes in a UK medical school: A longitudinal cohort study. *Medical Teacher*, *37*(9), 868-880. doi:10.3109/0142159x.2015.1009023

Addams, A.N., Bletzinger, R.B., Sondheimer, H.M., White, S. E., & Johnson, L.M. (2010). Roadmap to diversity: integrating holistic review practices into medical school admission processes. Association of American Medical Colleges. Retrieved from https://members.aamc.org/eweb/upload/Roadmap%20to%20Diversity%20Integrating%20Holistic%20Review.pdf

Addison, J., & McGee, S. J. (2015). To the core: College composition classrooms in the age of accountability, standardized testing, and common core state standards. *Rhetoric Review*, *34*(2), 200-218. https://doi.org/10.1080/07350198.2015.1008921

Akos, P., & Kretchmar, J. (2017). Investigating grit at a non-cognitive predictor of college success. *The Review of Higher Education*, *40*(2), 163-186. https://doi.org/10.1353/rhe.2017.0000

Alchemer. (2019, May 4). *The benefits of performing discriminant analysis on survey data*. https://www.alchemer.com/resources/blog/discriminant-analysis/

Alsan, M., Garrick, O., & Graziani, G. (2019). Does diversity matter for health? Experimental evidence from Oakland. *American Economic Review*, *109*(12), 4071-4111. https://doi.org/10.1257/aer.20181446

Altbach, P. G., Berdahl, R. O., & Gumport, P. J. (2005). The ten generations of American higher education. In *American education in the twenty-first century* (2nd ed., pp. 38-70). Baltimore, MD: The Johns Hopkins University Press.

Alzerwi, N. A. (2020). Grit scores: A predictor of medical school success? [Response to Letter]. *Advances in Medical Education and Practice*, *11*, 537-538. https://doi.org/10.2147/amep.s274616

American Association of Medical Colleges. (2016, January 8). *Holistic review in medical school admissions*. AAMC for Students, Applicants, and Residents. https://students-residents.aamc.org/choosing-medical-career/article/holistic-review-medical-school-admissions/

American Association of Medical Colleges. (2016, May 23). *What to expect in medical school*.

AAMC for Students, Applicants, and Residents. https://students-residents.aamc.org/choosing-medical-career/article/what-expect-medical-school/

American Association of Medical Colleges. (2018). *Using MCAT data in 2019 medical student selection*. Retrieved from https://www.aamc.org/download/462316/data/mcatguide.pdf

American Association of Medical Colleges. (2019, August 19). *Figure 13. Percentage of U.S. medical school graduates by race/ethnicity (alone), academic year 2018-2019.* AAMC. https://www.aamc.org/data-reports/workforce/interactive-data/figure-13-percentage-us-medical-school-graduates-race/ethnicity-alone-academic-year-2018-2019

American Association of Medical Colleges. (2019, October 16). *MCAT scores and GPAs for applicants and matriculants to U.S. medical schools by race/ethnicity, 2019-2020*. Tomorrow's Doctors, Tomorrow's Cures | AAMC. https://www.aamc.org/system/files/2019-10/2019_FACTS_Table_A-18.pdf

American Association of Medical Colleges. (2019, December 9). *The majority of U.S. medical students are women, new data show*. AAMC. https://www.aamc.org/news-insights/press-releases/majority-us-medical-students-are-women-new-data-show

American Association of Medical Colleges. (2020, October 26). *Table A-14.2: Race/ethnicity responses (alone and in combination) of acceptees to U.S. medical schools, 2016-2017 through 2020-2021*. Tomorrow's Doctors, Tomorrow's Cures | AAMC. https://www.aamc.org/media/9406/download

American Association of Medical Colleges. (2021). *Grading systems used in medical school programs*. https://www.aamc.org/data-reports/curriculum-reports/interactive-data/grading-systems-used-medical-school-programs

American Association of Medical Colleges. (n.d.). *Group on diversity and inclusion (GDI)*. AAMC. Retrieved May 12, 2022, from https://www.aamc.org/professional-development/affinity-groups/gdi

American Association of Medical Colleges. (n.d.). *Who we are*. AAMC. Retrieved November 14, 2020, from https://www.aamc.org/who-we-are

Andriole, D. A., Yan, Y., & Jeffe, D. B. (2017). Mediators of racial/ethnic disparities in mentored K award receipt among U.S. medical school graduates. *Academic Medicine*, *92*(10), 1440-1448. doi:10.1097/acm.0000000000001871

Attiah, M. A. (2014). The new diversity in medical education. *New England Journal of Medicine*, *371*(16), 1474-1476. https://doi.org/10.1056/nejmp1408460

Armstong, A.R., Clemons, A., Fissinger, M., & Sauceda, M. (2012). The diversity scorecard at Loyola Marymount University: An exemplary model of dissemination. In Bensimon E.M. & Malcom, L. (Eds.), *Confronting equity issues on campus: Implementing the equity scorecard in theory and practice* (17-44). Sterling, VA: Stylus Publishing.

Avery Jr, D. M., Wheat, J. R., Leeper, J. D., McKnight, J. T., Ballard, B. G., & Chen, J. (2011). Admission factors predicting family medicine specialty choice: A literature review and exploratory study among students in the rural medical scholars program. *The Journal of Rural Health*, *28*(2), 128-136. https://doi.org/10.1111/j.1748-0361.2011.00382.x

Barkin, S. L., Fuentes-Afflick, E., Brosco, J. P., & Tuchman, A. M. (2010). Unintended consequences of the Flexner report: Women in pediatrics. *Pediatrics*, *126*(6), 1055-1057. https://doi.org/10.1542/peds.2010-2050

Barr, D. A., Gonzalez, M. E., & Wanat, S. F. (2008). The leaky pipeline: Factors associated with early decline in interest in premedical studies among underrepresented minority

undergraduate students. *Academic Medicine*, *83*(5), 503-511. https://doi.org/10.1097/acm.0b013e31816bda16

Barzansky, B. M., & Gevitz, N. (1992). *Beyond Flexner: Medical education in the twentieth century*. Greenwood Publishing Group.

Bates, T., Mutha, S., & Coffman, J. (2020). *Practicing holistic review in medical education*. Healthforce Center at UCSF. https://healthforce.ucsf.edu/sites/healthforce.ucsf.edu/files/publication-pdf/Practicing%20Holistic%20Review%20in%20Medical%20Education_102220.pdf

Baugh, R. F. (2018). I am an African American: Distinguishing between African American and African applicants in medical school admissions matters. *Academic Medicine, 93*(9), 1281-1285. doi:10.1097/acm.0000000000002235

Belasco, A. S., Rosinger, K. O., & Hearn, J. C. (2015). The test-optional movement at America's selective liberal arts colleges. *Educational Evaluation and Policy Analysis*, *37*(2), 206-223. https://doi.org/10.3102/0162373714537350

Bensimon, E. M. (2004). The diversity scorecard: A learning approach to institutional change. *Change: The Magazine of Higher Learning*, *36*(1), 44-52. doi:10.1080/00091380409605083

Bensimon, E.M. (2007). The underestimated significance of practitioner knowledge in the scholarship on student success. *The Review of Higher Education, 30*(4), 441-469.

Bensimon, E. M., & Malcom, L. (2012). *Confronting equity issues on campus: Implementing the equity scorecard in theory and practice*. Stylus Publishing, LLC.

Bieber, S. L. (1988). Multiple regression and its alternatives. *The Social Science Journal*, *25*(1), 1-19. https://doi.org/10.1016/0362-3319(88)90050-x

Blenda, A., Chosed, R., Bailes, C., Caldwell, M., & Tucker, M. (2021). Retention of biomedical knowledge in medical students predicts USMLE step 1 scores. *MedEdPublish, 10*(1). https://doi.org/10.15694/mep.2021.000070.1

Bloomfield, J., & Fisher, M. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses' Association, 22*(2), 27-30. https://doi.org/10.33235/jarna.22.2.27-30

Boake, C. (2002). From the Binet–Simon to the Wechsler–Bellevue: Tracing the history of intelligence testing. *Journal of Clinical and Experimental Neuropsychology*, *24*(3), 383-405. https://doi.org/10.1076/jcen.24.3.383.981

Boatright, D. H., Samuels, E. A., Cramer, L., Cross, J., Desai, M., Latimore, D., & Gross, C. P. (2018). Association between the liaison committee on medical education's diversity standards and changes in percentage of medical student sex, race, and ethnicity. *JAMA*, *320*(21), 2267. doi:10.1001/jama.2018.13705

Boydstun, J., & Cossman, J. (2016). Career expectancy of physicians active in patient care: Evidence from Mississippi. *Rural and Remote Health*. https://doi.org/10.22605/rrh3813

Bright, C. M., Price, M. A., Morgan, R. C., & Bailey, R. K. (2018). The report of the W. Montague Cobb /NMA health institute consensus panel on the plight of underrepresented minorities in medical education. *Journal of the National Medical Association, 110*(6), 614-623. https://doi.org/10.1016/j.jnma.2018.03.012

Browman, A. S., Destin, M., Carswell, K. L., & Svoboda, R. C. (2017). Perceptions of socioeconomic mobility influence academic persistence among low socioeconomic status students. *Journal of Experimental Social Psychology, 72*, 45-52. https://doi.org/10.1016/j.jesp.2017.03.006

Brown, L. A. (2016). Population composition, urban neighborhoods, and future scenarios: a crystal ball perspective, from past to future. *The Annals of Regional Science*, *56*(3), 647-670. doi:10.1007/s00168-015-0722-9

Buja, L. M. (2019). Medical education today: All that glitters is not gold. *BMC Medical Education*, *19*(1). https://doi.org/10.1186/s12909-019-1535-9

Busche, K., Elks, M. L., Hanson, J. T., Jackson-Williams, L., Manuel, R. S., Parsons, W. L., … Yuan, K. (2019). The validity of scores from the new MCAT exam in predicting student performance. *Academic Medicine*, 1. doi:10.1097/acm.0000000000002942

Cameron, S. V., & Heckman, J. J. (2001). The dynamics of educational attainment for black, Hispanic, and white males. *Journal of Political Economy*, *109*(3), 455-499. https://doi.org/10.1086/321014

Capers, Q. (2020). How clinicians and educators can mitigate implicit bias in patient care and candidate selection in medical education. *ATS Scholar*, *1*(3), 211-217. https://doi.org/10.34197/ats-scholar.2020-0024ps

Capers, Q., Clinchot, D., McDougle, L., & Greenwald, A. G. (2017). Implicit racial bias in medical school admissions. *Academic Medicine*, *92*(3), 365-369. https://doi.org/10.1097/acm.0000000000001388

Carrasco, G. A., Behling, K. C., & Lopez, O. J. (2018). A novel grading strategy for team-based learning exercises in a hands-on course in molecular biology for senior undergraduate underrepresented students in medicine resulted in stronger student performance. *Biochemistry and Molecular Biology Education*, *47*(2), 115-123. https://doi.org/10.1002/bmb.21200

Castillo-Page, L. (2016). *AAMC facts & figures 2016 - Diversity in medical education*. Retrieved

from American Association of Medical Colleges website: http://www.aamcdiversityfactsandfigures2016.org/

Centers for Disease Control and Prevention. (2018, December 12). Disparities - Adolescent and School Health - CDC. Retrieved December 9, 2019, from https://www.cdc.gov/healthyyouth/disparities/index.htm

Centers for Disease Control and Prevention. (2020, April 20). *Coronavirus disease 2019 (COVID-19) in the U.S*. Retrieved April 28, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html

Central Washington University. (n.d.). *Equity scorecard | Central Washington University*. CWU Central Washington University. Retrieved May 10, 2022, from https://www.cwu.edu/inclusivity/equity-scorecard

Chang, M. J., Eagan, M. K., Lin, M. H., & Hurtado, S. (2011). Considering the impact of racial stigmas and science identity: Persistence among biomedical and behavioral science aspirants. *The Journal of Higher Education, 82*(5), 564-596. https://doi.org/10.1080/00221546.2011.11777218

Chen, J. A., Rodriguez, J. E., & Campbell, K. M. (2018). Examining diversity offices in medical education. *Journal of Best Practices in Health Professions Diversity: Education, Research & Policy, 11*(1), 43-51.

Chretian, K. (2022, January 11). *The step 1 exam is going pass-fail. Now what?* AAMC. https://www.aamc.org/news-insights/step-1-exam-going-pass-fail-now-what#

Cobb, W. M. (1943). The first Negro Medical Society: A history of the medico-chirurgical society of the District of Columbia, 1884-1939. *Journal of the American Medical Association, 121*(2), 159. https://doi.org/10.1001/jama.1943.02840020067029

Cohen, J., Gabriel, B.A., & Terrell, C. (2002). The case for diversity in the health care workforce. *Health Affairs, (21)*5, 90-102.

Copeland, K., & Tarver, E. N. (2020). Diversity, equity, and inclusiveness in higher education. *Higher Education Response to Exponential Societal Shifts*, 313-329. https://doi.org/10.4018/978-1-7998-2410-7.ch015

Corbie-Smith, G., Frank, E., & Nickens, H. W. (2000). The intersection of race, gender, and primary care: Results from the women physicians' health study. *Journal of the National Medical Association*, *92*(10), 472-480. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2608549/

Corridon, P. R. (2021). Admissions to medical school during the COVID-19 era without the MCAT. *Journal of Medical Education and Curricular Development*, *8*, 238212052110148. https://doi.org/10.1177/23821205211014898

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: SAGE.

Cronbach, L. J. (1975). Beyond the two disciplines of scientific psychology. *American Psychologist*, *30*(2), 116-127. https://doi.org/10.1037/h0076829

Cross, T., & Slater, R. B. (1998). The impact of a rollback of affirmative action on the nation's major MBA programs. *Business and Society Review, 100-101*(1), 81-84. https://doi.org/10.1111/0045-3609.00017

Dall, T., West, T., Chakrabarti, R., & Iacobucci, W. (2016). 2016 Update for the complexities of physician supply and demand: projections from 2014 to 2025 final report. IHS, Inc. Retrieved from https://www.aamc.org/dowload/458082/data/2016_complexities_of_ of_supply_and_deman_projections.pdf

Darling-Hammond, L. (1998). Unequal opportunity: Race and education. *The Brookings Review*, *16*(2), 28. https://doi.org/10.2307/20080779

Das, L. T. (2020). The MCAT should be optional. *Inside Higher Ed*. https://www.insidehighered.com/admissions/views/2020/06/08/mcat-should-be-optional-opinion

Davis, D., Dorsey, J. K., Franks, R. D., Sackett, P. R., Searcy, C. A., & Zhao, X. (2013). Do racial and ethnic group differences in performance on the MCAT exam reflect test bias? *Academic Medicine*, *88*(5), 593-602. doi:10.1097/acm.0b013e318286803a

DeCarvalho, H., Lindner, I., Sengupta, A., Rajput, V., & Raskin, G. (2018). Enhancing medical student diversity through a premedical program: A caribbean school case study. *Education for Health*, *31*(1), 48. doi:10.4103/1357-6283.239047

DeMuth, R. H., Gold, J. G., Mavis, B. E., & Wagner, D. P. (2018). Progress on a new kind of progress test. *Academic Medicine, 93*(5), 724-728. https://doi.org/10.1097/acm.0000000000001982

Dewey, J. (1938). *Logic: The theory of inquiry*. New York, NY: Henry Holt

Dill, D. D. (1999). Academic accountability and university adaptation: The architecture of an academic learning organization. *Higher Education*, *38*(2), 127-154.

Dill, D. D. (2014). Ensuring academic standards in US higher education. *Change: The Magazine of Higher Learning*, *46*(3), 53-59. https://doi.org/10.1080/00091383.2014.910043

Dowd, A.C., Malcom, L., Nakamoto, J., & Bensimon, E.M. (2012). Institutional researchers as teachers and equity advocates: Facilitating organizational learning and change. In Bensimon E.M. & Malcom, L. (Eds.), *Confronting equity issues on campus:*

Implementing the equity scorecard in theory and practice (17-44). Sterling, VA: Stylus Publishing.

Duffy, T. P. (2011). The Flexner report - 100 Years Later. *Yale Journal of Biology and Medicine*, *84*(3), 269-276. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3178858/

Duke University Medical Center Library and Archives. (n.d.). *LibGuides: Black History Month: A medical perspective: Education*. LibGuides at Duke University Medical Center. Retrieved August 16, 2020, from https://guides.mclibrary.duke.edu/blackhistorymonth/education#:~:text=POST%2D1865,percent%20from%20white%20medical%20schools.&text=Almost%202%2C400%20physicians%20were%20graduated,to%20the%20end%20of%20WWI

Educational Testing Service. (2019). *GRE Information Bulletin*. ETS Home. https://www.ets.org/s/gre/pdf/gre_info_bulletin_19_20.pdf

Equity scorecard for higher education. (2012). In J. A. Banks (Ed.), *Encyclopedia of Diversity in Education*. Thousand Oaks, CA: SAGE.

Elks, M. L., Herbert-Carter, J., Smith, M., Klement, B., Knight, B. B., & Anachebe, N. F. (2018). Shifting the curve. *Academic Medicine*, *93*(1), 66-70. https://doi.org/10.1097/acm.0000000000001783

Eller, R. (1989). Johnny Can't Talk, Either: The Perpetuation of the Deficit Theory in Classrooms. *The Reading Teacher*, *42*(9), 670-674. Retrieved from http://www.jstor.org/stable/20200272

Eskander, A., Shandling, M., & Hanson, M. D. (2013). Should the MCAT exam be used for medical school admissions in Canada? *Academic Medicine*, *88*(5), 572-580. doi:10.1097/acm.0b013e31828b85af

Esposito, A., Patti, L., Laumbach, S., Polvino, D., Butler, L., & Heinert, S. (2021). 92 the impact of the COVID-19 pandemic on medical student residency specialty selection. *Annals of Emergency Medicine*, *78*(2), S43. https://doi.org/10.1016/j.annemergmed.2021.07.094

Fee, E. (2015). The first American medical school: The formative years. *The Lancet*, *385*(9981), 1940-1941. https://doi.org/10.1016/s0140-6736(15)60950-3

Fenton, J. J., Fiscella, K., Jerant, A. F., Sousa, F., Henderson, M., Fancher, T., & Franks, P. (2016). Reducing medical school admissions disparities in an era of legal restrictions: Adjusting for applicant socioeconomic disadvantage. *Journal of Health Care for the Poor and Underserved*, *27*(1), 22-34. https://doi.org/10.1353/hpu.2016.0013

Fernandes, R., Ha, I. S., McElroy, S. W., & Myers, S. L. (2016). Black-white disparities in test scores: Distributional characteristics. *The Review of Black Political Economy*, *43*(2), 209-232. https://doi.org/10.1007/s12114-015-9230-5

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Thousand Oaks, CA: SAGE.

Fischer, C., Fishman, B., Levy, A. J., Eisenkraft, A., Dede, C., Lawrenz, F., Jia, Y., Kook, J. F., Frumin, K., & McCoy, A. (2016). When do students in Low-SES schools perform better-than-Expected on a high-stakes test? Analyzing school, teacher, teaching, and professional development characteristics. *Urban Education*, *55*(8-9), 1280-1314. https://doi.org/10.1177/0042085916668953

Fischer, C. S., Hout, M., Jankowski, M. S., Lucas, S. R., Swindler, A., & Voss, K. (1996). *Inequality by design: Cracking the bell curve myth*. Princeton University Press.

Fleming, J., & Garcia, N. (1998). Are standardized tests fair to African Americans? Predictive validity of the SAT in black and white institutions. *Journal of Higher Education*, *69*(5),

471 – 495.

Flexner, A. (1910, June). Medical education in America - Rethinking the training of American doctors. *The Atlantic*. https://www.theatlantic.com/magazine/archive/1910/06/medical-education-in-america/306088/

Florida Center for Instructional Technology. (n.d.). *Classroom assessment | Basic concepts*. FCIT | Florida Center for Instructional Technology. https://fcit.usf.edu/assessment/basic/basicc.html

Ford, M. (2017). The functions of higher education. *American Journal of Economics and Sociology, 76*(3), 559-578. Retrieved from https://doi.org/10.1111/ajes.12187

Freeman, B. K., Landry, A., Trevino, R., Grande, D., & Shea, J. A. (2016). Understanding the leaky pipeline: Perceived barriers to pursuing a career in medicine or dentistry among underrepresented-in-medicine undergraduate students. *Academic Medicine*, *91*(7), 987-993. https://doi.org/10.1097/acm.0000000000001020

Fryer, R. G., & Greenstone, M. (2010). The changing consequences of attending historically Black colleges and universities. *American Economic Journal: Applied Economics, 2*(1), 116-148. https://doi.org/10.1257/app.2.1.116

Garces, L. M., & Mickey-Pabello, D. (2015). Racial diversity in the medical profession: The impact of affirmative action bans on underrepresented student of color matriculation in medical schools. *The Journal of Higher Education*, *86*(2), 264-294. doi:10.1080/00221546.2015.11777364

Garvin, D. A. (1993). Building a learning organization. *Harvard Business Review, 74*(4), 78. http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=77115a7e-c24d-4962-b5dd-f77ffc646aec%40sdc-v-sessmgr03

Gasman, M., Smith, T., Ye, C., & Nguyen, T. (2017). HBCUs and the production of doctors. *AIMS Public Health*, *4*(6), 579-589. https://doi.org/10.3934/publichealth.2017.6.579

Gauer, J. L., & Jackson, J. (2017). Association between the medical college admission test scores and Alpha Omega Alpha medical honors society membership. *Advances in Medical Education and Practice*, *Volume 8*, 627-632. doi:10.2147/amep.s145839

Gershenson, S., & Papageorge, N. (2018). The power of teacher expectations: How racial bias hinders student attainment. *Education Next*, 18. https://www.educationnext.org/power-of-teacher-expectations-racial-bias-hinders-student-attainment

Gershon, L. (2015). A short history of standardized tests. The origins of standardized tests. *J Story Daily*. https://daily.jstor.org/short-history-standardized-tests/

Gewin, V. (2014). Diversity: Equal access. *Nature*, *511*(7510), 499-500. https://doi.org/10.1038/nj7510-499a

Ghani, I. M., & Ahmad, S. (2010). Stepwise multiple regression method to forecast fish landing. *Procedia - Social and Behavioral Sciences*, *8*, 549-554. https://doi.org/10.1016/j.sbspro.2010.12.076

Gilliam, C. A., Rooholamini, S., McPhillips, H., Mullett, T., Homer, P., McDade, J., Olszewski, A., Willgerodt, M., & Grow, H. M. (2020). 88. Qualitative assessment of a novel equity, diversity and inclusion (Edi) curriculum for pediatric residents. *Academic Pediatrics*, *20*(7), e41-e42. https://doi.org/10.1016/j.acap.2020.06.109

Girotti, J. A., Chanatry, J. A., Clinchot, D. M., McClure, S. C., Swan Sein, A., Walker, I. W., & Searcy, C. A. (2020). Investigating group differences in examinees' preparation for and

performance on the new MCAT exam. *Academic Medicine, 95*(3), 365-374. https://doi.org/10.1097/acm.0000000000002940

Gliatto, P., Leitman, I. M., & Muller, D. (2016). Scylla and Charybdis: The MCAT, USMLE,and degrees of freedom in undergraduate medical education. *Academic Medicine, 91*(11), 1498-1500. doi:10.1097/acm.0000000000001247

Grabowski, C. J. (2017). Impact of holistic review on student interview pool diversity. *Advances in Health Sciences Education, 23*(3), 487-498. doi:10.1007/s10459-017-9807-9

Graduate Management Admission Council. (n.d.). *GMAC™ history*. https://www.gmac.com/why-gmac/the-gmac-advantage/gmac-history

Grodsky, E., Warren, J. R., & Felts, E. (2008). Testing and social stratification in American education. *Annual Review of Sociology, 34*(1), 385-404. https://doi.org/10.1146/annurev.soc.34.040507.134711

Gruhl, J., & Welch, S. (1990). The Impact of the Bakke decision on Black and Hispanic enrollment in medical and law schools. *Social Science Quarterly, 71*(3), 458. Retrieved from https://search.proquest.com/docview/61173416?accountid=14437

Grumbach, K., & Mendoza, R. (2008). Disparities in human resources: Addressing the lack of diversity in the health professions. *Health Affairs, 27*(2), 413-422. doi:10.1377/hlthaff.27.2.413

Gullo, C. A., McCarthy, M. J., Shapiro, J. I., & Miller, B. L. (2015). Predicting medical student success on licensure exams. *Medical Science Educator, 25*(4), 447-453. doi:10.1007/s40670-015-0179-6

Hacker, A. (2003). *Two Nations: Black and White, Separate, Hostile, Unequal*. Scribner.

Hadinger, M. A. (2016). Underrepresented minorities in medical school admissions: A

qualitative study. *Teaching and Learning in Medicine*, *29*(1), 31-41. doi:10.1080/10401334.2016.1220861

Harley, E. H. (2006). The forgotten history of defunct black medical schools in the 19th and 20th centuries and the impact of the Flexner Report. *Journal of the National Medical Association, 98*(9), 1425-1429. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2569729/pdf/jnma00196-0027.pdf

Harris, D., Aboueissa, A., Baugh, N., & Sarton, C. (2015). Impact of rurality on maternal and infant health indicators and outcomes in Maine. *Rural and Remote Health*. https://doi.org/10.22605/rrh3278

Headrick, T. C., & Sheng, Y. (2013). A proposed measure of internal consistency reliability: Coefficient L-Alpha. *Behaviormetrika*, *40*(1), 57-68. https://doi.org/10.2333/bhmk.40.57

Heller, C. A., Rúa, S. H., Mazumdar, M., Moon, J. E., Bardes, C., & Gotto, A. M. (2014). Diversity efforts, admissions, and national rankings: Can we align priorities? *Teaching and Learning in Medicine*, *26*(3), 304-311. https://doi.org/10.1080/10401334.2014.910465

Hess, A. (2020, April 2). *The top 10 medical schools in the US, according to US news & world report*. CNBC. https://www.cnbc.com/2020/04/01/the-top-10-medical-schools-according-to-us-news-world-report.html

Himelfarb, I. (2019). A primer on standardized testing: History, measurement, classical test theory, item response theory, and equating. *Journal of Chiropractic Education, 33*(2), 151-163. https://doi.org/10.7899/jce-18-22

Hlavinka, E. (2020, June 18). *Racial bias in Flexner report permeates medical education today*. Medical News and Free Online CME | MedPage Today. https://www.medpagetoday.com/publichealthpolicy/medicaleducation/87171

Holloway, J. (2001). The uses and misuse of standadized tests. *Educational Leadership, 59*(1), 77-78. http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=795dcb27-8d53-40e3-854f-a6220d019fe2%40sessionmgr4006

Hubbeling, D. (2017). A proposal for avoiding bias in medical school admissions decisions. *Academic Medicine, 92*(5), 571. https://doi.org/10.1097/acm.0000000000001635

Huddleston, A., & Rockwell, E. (2015). Assessment for the masses: A historical critique of high-stakes testing in reading. *Texas Journal of Literacy Education*, *3*(1), 38-49. https://files.eric.ed.gov/fulltext/EJ1110955.pdf

Humes, K. R., Jones, N. A., & Ramirez, R. R. (2011, March). *Overview of race and Hispanic origin: 2010*. Retrieved from https://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf

Heller, C. A., Rúa, S. H., Mazumdar, M., Moon, J. E., Bardes, C., & Gotto, A. M. (2014). Diversity efforts, admissions, and national rankings: Can we align priorities? *Teaching and learning in medicine*, *26*(3), 304-311. doi:10.1080/10401334.2014.910465

Ishitani, T. T. (2003). A longitudinal approach to assessing attrition behavior among first-generation students: Time-varying effects of pre-college characteristics. *Research in Higher Education*, *44*(4), 433-449. https://www.jstor.org/stable/40197314

Jackson, S. (2018). Addressing inequities precipitated by the LSAT: Schools and nonprofits strive to develop solutions to African Americans' LSAT struggles. *Insight Into Diversity*. https://www.insightintodiversity.com/addressing-inequities-precipitated-by-

the-lsat-schools-and-nonprofits-strive-to-develop-solutions-to-african-americans-lsat-struggles/

Jaschik, S. (2019). Do law schools limit black enrollment with LSAT? *Inside Higher Ed*. https://www.insidehighered.com/admissions/article/2019/04/15/study-argues-law-schools-limit-black-enrollment-through-lsat

Jones, A. C., Nichols, A. C., McNicholas, C. M., & Stanford, F. C. (2020). Admissions is not enough: The racial achievement gap in medical education. *Academic Medicine, 96*(2), 176-181. https://doi.org/10.1097/acm.0000000000003837

The Journal of Blacks in Higher Education. (2019). Black first-year students at the nation's leading research universities. *The Journal of Blacks in Higher Education*. https://www.jbhe.com/2019/01/black-first-year-students-at-the-nations-leading-research-universities-2018/

The Journal of Blacks in Higher Education. (n.d.). *A JBHE check-up on blacks in U.S. medical schools*. Retrieved May 16, 2020, from https://www.jbhe.com/features/47_medicalschools.html

Julian, E. R. (2005). Validity of the medical college admission test for predicting medical school performance. *Academic Medicine, 80*(10), 910-917. doi:10.1097/00001888-200510000-00010

Jury, M., Smeding, A., Stephens, N. M., Nelson, J. E., Aelenei, C., & Darnon, C. (2017). The experience of Low-SES students in higher education: Psychological barriers to success and interventions to reduce social-class inequality. *Journal of Social Issues, 73*(1), 23-41. https://doi.org/10.1111/josi.12202

Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard—Measures that drive

performance. *Harvard Business Review*. Retrieved from https://hbr.org/1992/01/the-balanced-scorecard-measures-that-drive-performance-2

Kaplan, R. M., Satterfield, J. M., & Kington, R. S. (2012). Building a better physician — The case for the new MCAT. *New England Journal of Medicine*, *366*(14), 1265-1268. https://doi.org/10.1056/nejmp1113274

Kaplan. (2020, July 13). *Passing the USMLE: A scoring guide*. Kaplan Test Prep. Retrieved November 21, 2020, from https://www.kaptest.com/study/usmle/passing-scores/#:~:text=The%20current%20USMLE%20Step%201%20passing%20score%20is%20194

Kent State University. (2020, September 3). *LibGuides: SPSS tutorials: Pearson correlation*. Retrieved December 10, 2020, from https://libguides.library.kent.edu/SPSS/PearsonCorr

Kerlinger, F. N. (1964). *Foundations of behavioral research*. Holt, Rinehart, and Winstron.

Klein, S., Benjamin, R., Shavelson, R., & Bolus, R. (2007). The collegiate learning assessment. *Evaluation Review*, *31*(5), 415-439. https://doi.org/10.1177/0193841x07303318

Kirby, E., White, S., & Aruguete, M. (2007). Predictors of white and minority student success at a private women's college. *College Student Journal, 41*(2), 460-465.

Knezevich, L. (2012). *The history and future of the law school admission test*. Law School Admission Council. https://aacraoweb.s3.amazonaws.com/files/KEIYtSg9TWSkgRYWW55w_The%20History%20and%20Future%20of%20the%20Law%20School%20Admission%20Test.pdfweb.s3.amazonaws.com/files/KEIYtSg9TWSkgRYWW55w_The%20History%20and%20Future%20of%20the%20Law%20School%20Admission%20Test.pdf

Koedel, C. (2017). Explaining black-white differences in college outcomes at Missouri public universities. *Review*, *99*(1), 77-83. https://doi.org/10.20955/r.2017.77-83

Komaromy, M., Grumbach, K., Drake, M., Vranizan, K., Lurie, N., Keane, D., & Bindman, A. B. (1996). The role of Black and Hispanic physicians in providing health care for underserved populations. *New England Journal of Medicine*, *334*(20), 1305-1310. doi:10.1056/nejm199605163342006

Koretz, D. (2009). Moving past no child left behind. *Science*, *326*(5954), 803-804. https://doi.org/10.1126/science.1177459

Koretz, D., Yu, C., Mbekeani, P. P., Langi, M., Dhaliwal, T., & Braslow, D. (2016). Predicting freshman grade point average from college admissions test scores and state high school test scores. *AERA Open*, *2*(4), 233285841667060. https://doi.org/10.1177/2332858416670601

Lafavor, T. (2017). Predictors of academic success in 9- to 11-Year-Old homeless children: The role of executive function, social competence, and emotional control. *The Journal of Early Adolescence*, *38*(9), 1236-1264. https://doi.org/10.1177/0272431616678989

Laurencin, C., & Murray, M. (2017). An American crisis: The lack of Black men in medicine. *Journal of Racial and Ethnic Health Disparities*, *7*(6), 317-321. https://doi.org/10.1007/s40615-017-0380-y

Lett, L. A., Murdock, H. M., Orji, W. U., Aysola, J., & Sebro, R. (2019). Trends in racial/Ethnic representation among US medical students. *JAMA Network Open*, *2*(9), e1910490. https://doi.org/10.1001/jamanetworkopen.2019.10490

Liaison Committee on Medical Education. (2020). *Scope and purpose of accreditation*. LCME | Liaison Committee on Medical Education. Retrieved October 9, 2020, from https://lcme.org/about/

Liaison Committee on Medical Education. (2020). *Functions and structure of a medical school - Standards for accreditation of medical education programs leading to the MD degree*. Association of American Medical Colleges and American Medical Association.

Libbrecht, N., Lievens, F., Carette, B., & Côté, S. (2014). Emotional intelligence predicts success in medical school. *Emotion*, *14*(1), 64-73. doi:10.1037/a0034392

Linn, R. (2000). Assessments and accountability. *Educational Researcher*, *29*(2), 4-16. https://doi.org/10.3102/0013189x029002004

Linville, M. D. (2015). *Predicting desired outcomes from applicants' medical school admission data* (Doctoral dissertation). Retrieved from https://search-proquest-com.libproxy.tulane.edu/pqdtglobal/docview/1754416559/59C4487C91FD4DF4PQ/1?accountid=14437

Lord, H. G. (1973). *Ex post facto studies as a research method* (7320). Bureau of Education for the Handicapped (DREW /OE), Washington, D.C. Media Services and Captioned Films Branch. https://files.eric.ed.gov/fulltext/ED090962.pdf

Lucey, C. R., & Saguil, A. (2020). The consequences of structural racism on MCAT scores and medical school admissions. *Academic Medicine*, *95*(3), 351-356. https://doi.org/10.1097/acm.0000000000002939

Manhattan Review. (2019, August 20). *The history of the SAT*. Test Prep for GMAT, GRE, LSAT, SAT, ACT, TOEFL by Manhattan Review. Retrieved April 26, 2020, from https://www.manhattanreview.com/sat-history/

Mathews, S. C., Demski, R., & Pronovost, P. J. (2016). Redefining accountability in quality and safety at academic medical centers. *Quality Management in Health Care, 25*(4), 244-247. https://doi.org/10.1097/qmh.0000000000000107

Mattern, K. D., & Shaw, E. J. (2010). A look beyond cognitive predictors of academic success: Understanding the relationship between academic self-beliefs and outcomes. *Journal of College Student Development, 51*(6), 665-678. https://doi.org/10.1353/csd.2010.0017

McConaghy, M., Silberman, M., & Kalashnikova, I. (2019, May 15). *Penn in the 18th century: Medical school*. University Archives and Records Center. https://archives.upenn.edu/exhibits/penn-history/18th-century/medical-school

McGaghie, W.C. (2002). Assessing readiness for medical education evolution of the medical college admission test. *Jama*, *288*(9), 1085-1090. doi: 10.1001/jama.288.9.1085

McGill, A. (2015, November 23). *The share of Black students at top universities has been stagnant for 20 years*. The Atlantic. https://www.theatlantic.com/politics/archive/2015/11/black-college-student-body/417189/

McKee, J. B. (1993). *Sociology and the race problem: The failure of a perspective*. University of Illinois Press.

McLeod, S. (2018, February 5). *Lev Vygotsky*. Study Guides for Psychology Students - Simply Psychology. Retrieved May 12, 2020, from https://www.simplypsychology.org/vygotsky.html

Medical Schools Council. (2021, October 12). *Medical schools come together to support inclusion and diversity in undergraduate training*. Retrieved May 12, 2022, from

https://www.medschools.ac.uk/news/medical-schools-come-together-to-support-inclusion-and-diversity-in-undergraduate-training

Mensah, M. O., & Sommers, B. D. (2016). The policy argument for healthcare workforce diversity. *Journal of General Internal Medicine, 31*(11), 1369-1372. doi:10.1007/s11606-016-3784-1

Metz, A. M. (2017). Medical school outcomes, primary care specialty choice, and practice in medically underserved areas by physician alumni of MEDPREP, a postbaccalaureate premedical program for underrepresented and disadvantaged students. *Teaching and Learning in Medicine, 29*(3), 351-359. doi:10.1080/10401334.2016.1275970

Mighty, H. (2022, March 24). *Eliminating bias from medical school admissions*. AAMC. https://www.aamc.org/news-insights/eliminating-bias-medical-school-admissions?utm_source=sfmc&utm_medium=email&utm_campaign=aamcnews&utm_content=newsletter

Milburn, N. G., Beatty, L., & Lopez, S. A. (2019). Understanding, unpacking, and eliminating health disparities: A prescription for health equity promotion through behavioral and psychological research—An introduction. *Cultural Diversity and Ethnic Minority Psychology, 25*(1), 1-5. doi:10.1037/cdp0000266

Miller, C., & Stassun, K. (2014). A test that fails. *Nature, 510*(7504), 303-304. https://doi.org/10.1038/nj7504-303a

Miller, L. A., & Lovler, R. L. (2018). *Foundations of psychological testing: A practical approach*. SAGE Publications.

Miller-Matero, L., Martinez, S., MacLean, L., Yaremchuk, K., & Ko, A. (2018). Grit: A predictor of medical student performance. *Education for Health*, *31*(2), 109.

doi:10.4103/efh.efh_152_16

Mirza, T. I., Yasmeen, R., & Mahboob, U. (2021). Nurturing grit among medical students. *Pakistan Journal of Medical Sciences*, *37*(2). https://doi.org/10.12669/pjms.37.2.2999

Moneta-Koehler, L., Brown, A. M., Petrie, K. A., Evans, B. J., & Chalkley, R. (2017). The limitations of the GRE in predicting success in biomedical graduate school. *PLOS ONE*, *12*(1), e0166742. https://doi.org/10.1371/journal.pone.0166742

Morris, K. (2007). *The founding of the National Medical Association* [Doctoral dissertation]. https://elischolar.library.yale.edu/cgi/viewcontent.cgi?article=1359&context=ymtdl

Mouly, G. J. (1970). *The science of educational research*. Van Nostrand Reinhold.

Mukaka, M. M. (2012). A guide to appropriate use of correlation coefficient in medical research. *Malawi Medical Journal*, *24*(3), 69-71. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3576830/

Munter, C., & Haines, C. (2019). "Students get what flows downward": District leaders' rationalizations of the standardized testing of children. *The Educational Forum*, *83*(2), 160-180. https://doi.org/10.1080/00131725.2019.1567891

Murphy, B. (2022, February 24). *MCAT scores and medical school success: Do they correlate?* American Medical Association. https://www.ama-assn.org/residents-students/preparing-medical-school/mcat-scores-and-medical-school-success-do-they

Museus, S. D. (2013). The Culturally Engaging Campus Environments (CECE) Model: A new theory of college success among racially diverse student populations. In M. B. Paulsen (Ed.), Higher Education: Handbook of Theory and Research (pp. 189-227). New York: Springer.

Museus, S. D., & Quaye, S. J. (2009). Toward an intercultural perspective of racial and ethnic minority college student persistence. The Review of Higher Education, 33(1), 67–94.

Muskal, M. (2012, December 12). Whites to lose majority status by 2043, the census projects. *Los Angeles Times*. Retrieved from https://www.latimes.com/nation/la-xpm-2012-dec-12-la-na-nn-whites-to-lose-majority-status-by-2043-the-census-projects-20121212-story.html

Musu-Gillette, L., de Brey, C., McFarland, J., Hussar, W., Sonnenberg, W., & Wilkinson-Flicker, S. (2017). *Status and trends in the education of racial and ethnic Groups 2017*. National Center for Education Statistics. https://nces.ed.gov/pubs2017/2017051.pdf

National Association of Diversity Officers in Higher Education. (2022). https://www.nadohe.org/

National Resident Matching Program. (2020, July). *Charting outcomes in the match: Senior students of U.S. MD medical schools - Characteristics of U.S. MD seniors who matched to their preferred specialty in the 2020 main residency match*. The Match, National Resident Matching Program. https://mk0nrmp3oyqui6wqfm.kinstacdn.com/wp-content/uploads/2020/07/Charting-Outcomes-in-the-Match-2020_MD-Senior_final.pdf

Nguyen, B., & Bounds, G. (2019). Factors affecting specialty choice among doctors who received tuition scholarships. *Family Medicine, 51*(3), 276-281. https://doi.org/10.22454/fammed.2019.772315

Nivet, M. A., & Castillo-Page, L. (2014). *Diversity in the physician workforce: facts and figures 2014*. Retrieved from American Association of Medical Colleges website: http://www.aamcdiversityfactsandfigures.org/

Noguera, P., Pierce, J., & Ahram, R. (2015). Perpetuating separate and unequal worlds of educational opportunity through district lines: School segregation by race and poverty.

In *Race, Equity, and Education: Sixty Years from Brown* (pp. 45-74). Springer. https://doi.org/10.1007/978-3-319-23772-5_3

Oakland University William Beaumont School of Medicine. (2019). *Holistic review*. https://oakland.edu/medicine/admissions/holistic-review/

Odom, K. L., Roberts, L. M., Johnson, R. L., & Cooper, L. A. (2007). Exploring obstacles to and opportunities for professional success among ethnic minority medical students. *Academic Medicine, 82*(2), 146-153. https://doi.org/10.1097/acm.0b013e31802d8f2c

O'Donnell, J., & Robinson, D. (2019, February 28). After decades of effort, African-American enrollment in medical school still lags. *USA Today*. https://www.usatoday.com/story/news/health/2019/02/28/medical-school-student-african-american-enrollment-black-doctors-health-disparity/2841925002/

O'Neil, H. F., Bensimon, E. M., Diamond, M. A., & Moore, M. R. (1999). Designing and implementing an academic scorecard. *Change: The Magazine of Higher Learning, 31*(6), 32-40. doi:10.1080/00091389909604231

Otten, R., Faughnan, M., Flattley, M., & Fleurinor, S. (2021). Integrating equity, diversity, and inclusion into social innovation education: A case study of critical service-learning. *Social Enterprise Journal*, *18*(1), 182-200. https://doi.org/10.1108/sej-11-2020-0101

Parmer, H., Nichols, C., & Edmonson, A. (2019). Analysis of preclinical academic performance compared to matched residency. *Experimental Biology 2019 Meeting Abstracts*, *33*(1), 442.2.

Passel, J.S. & Cohn, D. (2008). U.S. population projections: 2005 – 2050. Pew Research Center. Retrieved from http://www.pewsocialtrends.org/2008/02/11/us-

population-projections-2005-2050/

Pattani, A. (2019, April 19). Too few black men become doctors. A medical student conference in Philly seeks to change that. *The Philadelphia Inquirer*. https://www.inquirer.com/health/black-male-doctor-shortage-medical-student-conference-diversity-20190419.html

Patten, E., & Krogstad, J. M. (2015, June 14). *Black child poverty rate holds steady, even as other groups see declines*. Pew Research Center. Retrieved August 30, 2020, from https://www.pewresearch.org/fact-tank/2015/07/14/black-child-poverty-rate-holds-steady-even-as-other-groups-see-declines/

Patton, S. (2020, April 11). The pathology of American racism is making the pathology of the coronavirus worse. *The Washington Post*. https://www.washingtonpost.com/outlook/2020/04/11/coronavirus-black-america-racism/

Petterson, S. M., Liaw, W. R., Phillips, R. L., Rabin, D. L., Meyers, D. S., & Bazemore, A. W. (2012). Projecting US primary care physician workforce needs: 2010-2025. *The Annals of Family Medicine, 10*(6), 503-509. https://doi.org/10.1370/afm.1431

Pigg, T., & Kroopnick, M. (2015). The evolution of the Medical College Admission Test (MCAT exam). *Academic Medicine, 90*(4), 541. https://doi.org/10.1097/acm.0000000000000660

Purnell, T. C. (2016). *An examination of students' perceptions of the Louisiana ACT mandate on their postsecondary education decisions* [Doctoral dissertation]. https://digitalcommons.lsu.edu/gradschool_dissertations/444/

Qualtrics. (2021, July 22). *ANOVA (Analysis of variance): Definition & methods // Qualtrics*. https://www.qualtrics.com/experience-management/research/anova/

Rahmawati, Y. (n.d.). *Qualitative Research Design*. Yuli Rahmawati, Universitas Negeri Jakarta. https://yuli-elearning.com/pluginfile.php/4833/mod_resource/content/1/2.%20qualitative%20research%20design.pdf

Ranasinghe, P., Ellawela, A., & Gunatilake, S. B. (2012). Non-cognitive characteristics predicting academic success among medical students in Sri Lanka. *BMC Medical Education, 12*(1). doi:10.1186/1472-6920-12-66

Rao, V., & Flores, G. (2007). Why aren't there more African-American physicians? A qualitative study and exploratory inquiry of African-American students' perspectives on careers in medicine. *Journal of the National Medical Association, 99*(9), 986-993. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2575862/

Ray, R., & Brown, J. (2015). Reassessing student potential for medical school success: Distance traveled, grit, and hardiness. *Military Medicine, 180*(4S), 138-141. doi:10.7205/milmed-d-14-00578

Reede, J. Y. (1999). Predictors of Success in Medicine. *Clinical Orthopaedics and Related Research, 362*, 72-77. doi:10.1097/00003086-199905000-00012

Reiter, H., & MacCoon, K. (2006). A compromise method to facilitate under-represented minority admissions to medical school. *Advances in Health Sciences Education, 12*(2), 223-237. https://doi.org/10.1007/s10459-006-0002-7

Reyes, C., Husain, N., Gutowski, C., St. Clair, S., & Pratt, G. (2020, April 7). Chicago's coronavirus disparity: Black Chicagoans are dying at nearly six times the rate of white residents, data show. *Chicago Tribune*. https://www.chicagotribune.com/coronavirus/ct-

coronavirus-chicago-coronavirus-deaths-demographics-lightfoot-20200406-77nlylhiavgjzb2wa4ckivh7mu-story.html

Roberts, L. W. (2020). The new MCAT exam and the continuing imperative of holistic review in the selection of medical students. *Academic Medicine, 95*(3), 323-326. https://doi.org/10.1097/acm.0000000000003123

Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, *130*(2), 261-288. https://doi.org/10.1037/0033-2909.130.2.261

Robinson-Armstrong, A., King, D., Killoran, D., Ward, H., Fissinger, M., & Harrison, L. (2007). Creating institutional transformation using the Equity Scorecard. *Diversity Digest*, 1-5. https://silo.tips/download/creating-institutional-transformation-using-the-equity-scorecard

Rodríguez, J. E., López, I. A., Campbell, K. M., & Dutton, M. (2017). The role of historically Black college and university medical schools in academic medicine. *Journal of Health Care for the Poor and Underserved*, *28*(1), 266-278. https://doi.org/10.1353/hpu.2017.0022

Roszkowski, M. J. (2019). The relationship of help-seeking inclinations to traditional predictors of academic success and first-semester college GPA. *Journal of College Orientation, Transition, and Retention*, *21*(1). https://doi.org/10.24926/jcotr.v21i1.2858

RTI International. (2019). *First-generation college students: Demographic characteristics and postsecondary enrollment*. Center for First-generation Student Success. https://firstgen.naspa.org/files/dmfile/FactSheet-01.pdf

Saenz, V., Hurtado, S., Barrera, D., Wolf, D., & Yeung, F. (2007). *First in my family: A profile of first-generation college students at four-year institutions since 1971*. Higher Education Research Institute. https://www.heri.ucla.edu/PDFs/pubs/TFS/Special/Monographs/FirstInMyFamily.pdf

Sampson, C., & Boyer, P. (2001). GRE scores as predictors of minority students' success in graduate study: An argument for change. *College Student Journal*, *35*(2), 271.

Samuel, L. (2019, June 19). *As medical schools diversify, they're learning hard lessons along the way*. STAT. https://www.statnews.com/2019/06/17/medical-schools-diversity-hard-lessons/

Santelices, M. V., & Wilson, M. (2010). Unfair treatment? The case of Freedle, the SAT, and the standardization approach to differential item functioning. *Harvard Educational Review*, *80*(1), 106-134. https://doi.org/10.17763/haer.80.1.j94675w001329270

Savitt, T. (2006). Abraham Flexner and the black medical schools. *Journal of the National Medical Association*, *98*(9), 1415-1424. https://thescholarship.ecu.edu/bitstream/handle/10342/3086/Abraham%20Flexner%20black%20medical%20schools.pdf

Schwartzstein, R. M., Rosenfeld, G. C., Hilborn, R., Oyewole, S. H., & Mitchell, K. (2013). Redesigning the MCAT exam. *Academic Medicine*, *88*(5), 560-567. https://doi.org/10.1097/acm.0b013e31828c4ae0

Seal, Z. A., Koek, W., & Sharma, R. (2020). Correlation of Medical College Admission Test scores and self-assessment materials with the United States medical licensing examination step 1 performance. *Cureus*. https://doi.org/10.7759/cureus.7519

Seo, G. T. (2021). Mitigating bias in medical school admissions and the MCAT to optimize equity. *Medical Education*, *55*(12), 1340-1342. https://doi.org/10.1111/medu.14656

Short, J. G., & Bloodgood, R. A. (2009). The impact of pass/Fail grading. *Academic Medicine*, *84*(11), 1470. https://doi.org/10.1097/acm.0b013e3181baa647

Sikora, M. (2017). *Get real: Exploring equity-mindedness at a large, urban and predominantly white institution* (10666732) (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (10666732)

Sklar, D. P. (2019). Diversity, fairness, and excellence. *Academic Medicine*, *94*(4), 453-455. https://doi.org/10.1097/acm.0000000000002588

Smith, S. R. (2011). A recipe for medical schools to produce primary care physicians. *New England Journal of Medicine*, *364*(6), 496-497. doi:10.1056/nejmp1012495

Snyder, T. D., & Dillow, S. A. (2011). Postsecondary Education. In *Digest of education statistics 2010* (p. 450). Claitors Pub Division. https://nces.ed.gov/pubs2011/2011015.pdf

Sobowale, K. (2020). We need more Black Physicians. COVID-19 is threatening an already scarce essential health care resource. *Scientific American*. https://www.scientificamerican.com/article/we-need-more-black-physicians/

Southgate, E., Kelly, B. J., & Symonds, I. M. (2014). Disadvantage and the 'capacity to aspire' to medical school. *Medical Education*, *49*(1), 73-83. https://doi.org/10.1111/medu.12540

Spring, L., Robillard, D., Gehlbach, L., & Moore Simas, T. A. (2011). Impact of pass/fail grading on medical students' well-being and academic outcomes. *Medical Education*, *45*(9), 867-877. https://doi.org/10.1111/j.1365-2923.2011.03989.x

St. Georges' University. (2018, October 23). *More than the MCAT: Understanding the holistic evaluation of medical school applications*. Top Caribbean Medical School - St. George's University. https://www.sgu.edu/blog/medical/understanding-holistic-medical-school-applications-reviews/#:~:text=A%20new%20school%20of%20thought,slowly%20started%20shifting%20their%20approach

Statistics Solutions. (2020, June 23). *Selection process for multiple regression*. https://www.statisticssolutions.com/selection-process-for-multiple-regression/

Statistics Solutions. (2021, April 15). *Correlation (Pearson, Kendall, Spearman)*. Retrieved April 23, 2022, from https://www.statisticssolutions.com/free-resources/directory-of-statistical-analyses/correlation-pearson-kendall-spearman/

Steinecke, A., & Terrell, C. (2010). Progress for whose future? The impact of the Flexner report on medical education for racial and ethnic minority physicians in the United States. *Academic Medicine*, *85*(2), 236-245. https://doi.org/10.1097/acm.0b013e3181c885be

Stirgus, E. (2022, March 23). Georgia system waives ACT, SAT requirements for most universities. *The Atlanta Journal-Constitution*.

The stubborn racial scoring gap persists on the ACT standardized college admission test. (2004). *The Journal of Blacks in Higher Education*, (45), 54-55. https://doi.org/10.2307/4133610

Sun, K. (1995). The definition of race. *American Psychologist*, *50*(1), 43-44. https://doi.org/10.1037/0003-066x.50.1.43

Swanson, R. A., & Holton, E. F. (2005). *Research in organizations: Foundations and methods in inquiry*. Berrett-Koehler Publishers.

Talamantes, E., Henderson, M. C., Fancher, T. L., & Mullan, F. (2019). Closing the gap — Making medical school admissions more equitable. *New England Journal of Medicine, 380*(9), 803-805. doi:10.1056/nejmp1808582

Taylor, A. N. (2019). The marginalization of Black aspiring lawyers. *FIU Law Review, 13*(3), 489-511. https://doi.org/10.25148/lawrev.13.3.8

Terregino, C. A., Saguil, A., Price-Johnson, T., Anachebe, N. F., & Goodell, K. (2020). The diversity and success of medical school applicants with scores in the middle third of the MCAT score scale. *Academic Medicine, 95*(3), 344-350. https://doi.org/10.1097/acm.0000000000002941

The Equity Scorecard - Theory of Change. (2012). In E. M. Bensimon & L. Malcom (Eds.), *Confronting equity issues on campus: Implementing the equity scorecard in theory and practice* (pp. 17-44). Sterling, VA: Stylus Publishing, LLC.

Thomas, B., Manusov, E. G., Wang, A., & Livingston, H. (2011). Contributors of Black Men's success in admission to and graduation from medical school. *Academic Medicine, 86*(7), 892-900. https://doi.org/10.1097/acm.0b013e31821d6f3d

Toldson, I. A., & Ford, D. Y. (2019). Ignoring race and privilege: How the college board's SAT adversity score missed the mark. *Diverse Issues in Higher Education*. https://diverseeducation.com/article/147445/

Torres, N. (2018). Research: Having a black doctor led black men to receive more-effective care. *Harvard Business Review*. Retrieved from https://hbr.org/2018/08/research-having-a-black-doctor-led-black-men-to-receive-more-effective-care

Tristam, S. (2016, May 24). *Development of American medical education*. Grinnell College Health and Medicine in American History. https://lewiscar.sites.grinnell.edu/HistoryofMedicine/uncategorized/development-of-american-medical-education/

United States Medical Licensing Examination. (2020). *United States medical licensing examination | Scores & transcripts*. United States Medical Licensing Examination ®. Retrieved November 21, 2020, from https://usmle.org/data-research/

University of Washington Oshkosh. (2017). *University of Washington Oshkosh Equity Scorecard Report*. https://uwosh.edu/asie/wp-content/uploads/sites/169/2019/10/Equity-Scorecard-Report-15-17.pdf

Ursua, F., Altholz, J., Durning, S., Torre, D., & Dong, T. (2021). Once in the door, grit may matter more: An evaluation of grit in medical students. *Military Medicine*, *186*(1-2), 13-17. https://doi.org/10.1093/milmed/usaa297

U. S. Department of Education. (2015, October 24). *Fact sheet: Testing action plan*. U.S. Department of Education. https://www.ed.gov/news/press-releases/fact-sheet-testing-action-plan

U. S. Department of Education Office for Civil Rights. (2014). *Civil rights data collection: Data snapshot: School discipline*. https://ocrdata.ed.gov/Downloads/CRDC-School-Discipline-Snapshot.pdf

UT News. (2020, June 23). UT Austin Will Temporarily Change Standardized Test Score Requirement. *UT News*.

Vella, E. J., Turesky, E. F., & Hebert, J. (2016). Predictors of academic success in web-based courses: Age, GPA, and instruction mode. *Quality Assurance in Education*, *24*(4), 586-600. https://doi.org/10.1108/qae-08-2015-0035

Vergel, J., Quintero, G. A., Isaza-Restrepo, A., Ortiz-Fonseca, M., Latorre-Santos, C., & Pardo-Oviedo, J. M. (2018). The influence of different curriculum designs on students' dropout rate: A case study. *Medical Education Online*, *23*(1), 1432963. https://doi.org/10.1080/10872981.2018.1432963

Vick, A. D., Baugh, A., Lambert, J., Vanderbilt, A., Ingram, E., Garcia, R., & Baugh, R. (2018). Levers of change: A review of contemporary interventions to enhance diversity in medical schools in the USA. *Advances in Medical Education and Practice, 9*, 53-61. https://doi.org/10.2147/amep.s147950

Visone, J. (2009). The validity of standardized testing in science. *American Secondary Education*, *38*(1), 46-61. https://www.jstor.org/stable/pdf/41406066.pdf

Vygotsky, L., & Cole, M. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.

Wang, L., Laird-Fick, H. S., Parker, C. J., & Solomon, D. (2021). Using Markov chain model to evaluate medical students' trajectory on progress tests and predict USMLE step 1 scores---a retrospective cohort study in one medical school. *BMC Medical Education, 21*(1). https://doi.org/10.1186/s12909-021-02633-8

Walker, K.O., Moreno, G., & Grumbach, K. (2012). The association among specialty, race, ethnicity, and practice location among California physicians in diverse specialties. *Journal of the National Medical Association, 104*(1-2), 46-52.

Whittaker, J. A., & Montgomery, B. L. (2012). Cultivating diversity and competency in STEM: Challenges and remedies for removing virtual barriers to constructing diverse higher

education communities of success. *The Journal of Undergraduate Neuroscience Education*, *11*(1), A44-A51. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3592737/

White, C. B., Dey, E. L., & Fantone, J. C. (2009). Analysis of factors that predict clinical performance in medical school. *Advances in Health Sciences Education*, *14*(4), 623-623. doi:10.1007/s10459-009-9189-8

Williams, D., Berger, J., & McClendon, S. (2005). *Toward a model of inclusive excellence and change in postsecondary institutions*. American Association of Colleges and Universities. https://www.aacu.org/sites/default/files/files/mei/williams_et_al.pdf

Williams, T. B., Prince, L. Y., Allen, A. R., Sterba, K. M., Thomas, B. R., & McGehee, R. E. (2021). Performance measures of racially underrepresented Ph.D. students in biomedical sciences: The UAMS IMSD program outcomes. *PLOS ONE*, *16*(2), e0246683. https://doi.org/10.1371/journal.pone.0246683

Williams, T. S. (1983). Some issues in the standardized testing of minority students. *Journal of Education*, *165*(2), 192-208. doi:10.1177/002205748316500206

Wilkins, A. C. (2014). Race, age, and identity transformations in the transition from high school to college for Black and first-generation white men. *Sociology of Education*, *87*(3), 171-187. https://doi.org/10.1177/0038040714537901

Winston, K. A., Van Der Vleuten, C. P., & Scherpbier, A. J. (2013). Remediation of at-risk medical students: Theory in action. *BMC Medical Education*, *13*(1). https://doi.org/10.1186/1472-6920-13-132

Witzburg, R. A., & Sondheimer, H. M. (2013). Holistic review — Shaping the medical profession one applicant at a time. *New England Journal of Medicine*, *368*(17), 1565-1567. https://doi.org/10.1056/nejmp1300411

Xierali, I. M., & Nivet, M. A. (2018). The racial and ethnic composition and distribution of primary care physicians. *Journal of Health Care for the Poor and Underserved*, *29*(1), 556-570. https://doi.org/10.1353/hpu.2018.0036

Vita

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