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THE EVALUATION OF THE EFFECTIVENESS OF TWO PIPELINE PROGRAMS FOR  
MATRICULATION AND RETENTION OF MINORITY STUDENTS IN A MEDICAL  
SCHOOL PROGRAM

BY

Natalie G. Johnson

A doctoral project submitted to the faculty of the Medical University of South Carolina  
in partial fulfillment of the requirements for the degree  
Doctor of Health Administration  
in the College of Health Professions

Committee Members

Jami Jones, PhD (committee chair)

Kit Simpson, DrPH

Willette Burnham-Williams, PhD

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Abstract of Dissertation Presented to the  
Medical University of South Carolina  
In Partial Fulfillment of the Requirements for the  
Degree of Doctor of Health Administration

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Chairperson: Jami Jones, PhD  
Committee: Kit Simpson, DrPH  
Willette Burnham-Williams, PhD

Abstract

There is a constant need for diversity in the physician workforce, which means that there is also a critical need to diversify the medical school population. The Liaison Committee on Medical Education, the accrediting body of all U.S. medical schools monitors the compliance of medical education programs with recognized accepted standards including includes diversifying the physician workforce through pipeline programs and partnerships. The objective of this project is to evaluate outcomes of the Medical University College of Medicine's Summer Institute (SI) program and the Postbaccalaureate Reapplication Program (PREP) in matriculating and retaining underrepresented minorities (URM) in medicine students. Out of one-hundred and thirty-five underrepresented in medicine pipeline program participants between 2006-2016, sixty-two (46%) successfully graduated from the College of Medicine at the Medical University of South Carolina. Data suggest that the PREP and SI pipeline programs are effective in matriculating minority

students to medical school and retaining them to graduation. Future studies should evaluate the effectiveness pipelines programs and include additional variables to identify the specialties of medical school graduates and variable to determine if they are working in underserved areas.

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## CHAPTER I INTRODUCTION

### 1.1 Background and Need

There is a constant need for diversity in the physician workforce, which means that there is also a critical need to diversify the medical school population. In 2016, underrepresented Minorities (URM) in medicine individuals (African Americans, Hispanics, American Indians or Alaskan Natives) represented 13.7% of the national average of medical students (Acosta, Poll-Hunter, & Eliason, 2017; Deas et al, 2012). Data from the Association of the American Medical Colleges (2020) report that for the 2020-2021 academic year, URM individuals represent 15% of the national average of medical students, and 12% URM individuals represent the national average of first year medical students. Zimmerman and Anderson (2019), examined the trends in health equity in the U.S. by reviewing 25 years of data from the Centers for Disease Control and the Behavioral Risk Factor Surveillance System, with a focus on race/ethnicity, sex and income. Their findings revealed that there has been some improvement to bridge the race/ethnic gap; however, there is still a significant lack of progress on health equity. Health equity can be addressed by bridging the gap among diverse students that matriculate to medical school. Research studies show that the outcome of the health of underserved patients are better when they are treated by physicians that look like them (Acosta, Poll-Hunter, and Eliason, 2017, AAMC, 2015).

In 1991, the Association of American Medical Colleges (AAMC) initiated the Project *3000 by 2000* campaign (Thomson and Denk, 1999), which meant that the national goal for U.S. medical schools was to enroll a total of 3000 students by the year 2000. From 1969-1979, total URM enrollment increased by 4.9% (3.1% - 8.0%), and from 1990 – 1994 the URM percentage increased from 9.2% (n = 1,470) to 12.4% (n = 2014). In 1997, the URM matriculation rate was

at an enrollment rate of 10.9% (n = 1,170). This steady decrease has led for the need to increase the diversity in medical schools by way of pipeline initiatives and aligning those initiatives to medical school missions (Thomson and Denk, 1999; Taylor 2018). The Association of American Medical Colleges (AAMC), publishes data annually to include the demographics of medical students at all U.S. medical colleges, graduation rates, and demographics of all U.S. physicians (attending and residents) at teaching hospitals. This data is updated and published on an annual basis. The AAMC also reviewed the number of African-American males enrolled in medical school over a 10-20-year period, as there has been a shortage of African-American male physicians in the U.S. for quite some time (AAMC, 2015). The AAMC continues to track the number of African-American males on a regular basis as well as health disparity issues regarding the underserved, underinsured/uninsured, and patients in rural areas.

The Liaison Committee on Medical Education (LCME), which is sponsored by the AAMC and the American Medical Association (AMA), is the accrediting body of all U.S. medical schools and serves the public and medical students by monitoring the compliance of medical education programs with recognized nationally accepted standards of educational quality. This includes diversifying the physician workforce through pipeline programs and partnerships (LCME 2017). Many U.S. medical schools have mapped all of their programs to the standards of LCME, and as a result, have implemented pipeline programs to increase the diversity of their medical student population (Hafferty, Grbic, and Hafferty, 2019; Jacob, 2015). LCME sets certain standards and elements that must be met by all U.S. medical schools in order to maintain accreditation. During the accreditation and re-accreditation process, which occurs every seven years, medical schools must demonstrate that they are actively meeting those standards by displaying programs that have been implemented at their institution that are in relation to each standard as well as the

outcomes of those programs. Standard 3 of the LCME covers academic and learning environments as it relates to diversity: *“A medical school ensures that its medical education program occurs in professional, respectful, and intellectually stimulating academic and clinical environments, recognizes the benefits of diversity, and promotes students’ attainment of competencies required of future physicians”* (LCME, 2017). Specifically related to diversity, is element 3.3 (Diversity/Pipeline Programs and Partnerships) within standard 3: *“A medical school has effective policies and practices in place, and engages in ongoing, systematic, and focused recruitment and retention activities, to achieve mission-appropriate diversity outcomes among its students, faculty, senior administrative staff, and other relevant members of its academic community. These activities include the use of programs and/or partnerships aimed at achieving diversity among qualified applicants for medical school admission and the evaluation of program and partnership outcomes”* (LCME 2017).

Table 1, “Pipeline Programs and Partnerships” is a table that must be completed by all U.S. medical schools during the time for reaccreditation. Schools that have not implemented pipeline programs or have not developed partnerships may receive “unsatisfactory” from LCME and run the risk of losing its accreditation, or being placed on probation. Schools that demonstrate that they have implemented pipeline programs and developed partnerships, but have no outcomes, may receive a “satisfactory” rating from LCME, but will be monitored for a certain amount of time. Within the given time frame, the medical school will have to provide an updated detailed report to LCME regarding the element. The updated report will determine the status regarding the future of the school’s accreditation standing. Element 3 and standard 3.3 has motivated many medical schools to prioritize diversity and inclusion within their environment. As a result, the diversity of matriculants into medical school programs has slightly increased, as well as the

diversity of the physician workforce (Andriole and Jeffe, 2011; Andriole et al, 2015; Bouye, McCleary and Williams, 2016).

**Table 1: Pipeline Programs and Partnerships**

<b>Table 3.3-6   Pipeline Programs and Partnerships</b>				
List each current program aimed at broadening diversity among qualified medical school applicants. Provide the average enrollment (by year or cohort), target participant group(s) (e.g., college, high school, other students), and a description of any partners/partnerships, if applicable. Add rows as needed.				
Program	Year Initiated	Target Participants	Average Enrollment	Partners

Source: Liaison Committee on Medical Education, 2017

### **Medical College Admissions Test Scores and Undergraduate Grade Point Averages**

The Medical College Admissions Test (MCAT) and the undergraduate Grade Point Average (GPA) are very important factors in determining acceptance to medical school as both display academic competencies in a variety of sciences. The MCAT has four sections that include Biological and Biochemical Foundations of Living Systems, Chemical and Physical Foundations of Biological Systems, Psychological, Social, and Biological Foundations of Behavior, Critical Analysis and Reasoning Skills, and the highest MCAT score that be achieved is 528; however, research shows that individuals that score at least 500 are successful in medical school (AAMC, 2020). Grade Point Averages are reviewed in the following variances: cumulative biology, chemistry, physics, and math; grade trend; cumulative total; and cumulative total from postbaccalaureate premedical programs. Various individual experiences are also reviewed when considering medical school admission, but the MCAT and GPA must meet the minimum threshold required by each medical school (AAMC, 2020). This underscores the importance of implementing pipeline/post-baccalaureate programs that focus on MCAT preparation and an improved GPA.

## **Diversity at the Medical University of South Carolina**

The College of Medicine (COM) at the Medical University of South Carolina (MUSC) implemented a strategic diversity plan in 2002 with the goal of increasing diversity among its medical school population which included students, residents, and faculty (Deas et al, 2012). The development and implementation of the strategic diversity program was supported by the dean of the College of Medicine both financially and through his commitment to uphold the goals and mission of the plan. This was done by holding administrators accountable for diversity efforts in recruiting, hiring, mentoring, retaining and promoting URMs and women faculty; and by interviewing and matching URM residents, and most importantly, recruiting those residents for faculty positions. The COM dean also had the same commitment to all pipeline programs for URM students interested in becoming physicians. Although the first pipeline program under the auspices of the COM was implemented prior to the launch of the strategic diversity plan, additional pipeline programs were implemented after 2002 and have been supported fully by the COM dean. Since the implementation of the strategic diversity plan there have been significant increases in the number of URM faculty, residents, and students over time.

In 2001, underrepresented in medicine faculty members had less than forty URM faculty out of eight-hundred total faculty. Currently, URM faculty reside in more than 75% of the College of Medicine departments, and the number of URM faculty has increased by 100% since the implementation of the COM Diversity plan (MUSC, 2020). In 2003, underrepresented in medicine residents and fellows represented less than 3% of total residents and fellows in the COM. Underrepresented in medicine residents currently reside in more than 75% departments of the College of Medicine departments (College of Medicine, 2020). The College of Medicine's first year medical school class for 2018-2019 included thirty-nine (39) underrepresented in

medicine students, which is the largest incoming class of underrepresented in medicine individuals in the history of the College of Medicine (College of Medicine, 2020).

Underrepresented in medicine individuals in the College of Medicine currently represent 20% of the student body (AAMC, 2020). The increase in URM students has been attributed to rigorous recruitment and outreach to all students interested in a career in medicine by the COM faculty, staff, and current students, which resulted in minority student participation in COM pipeline programs.

### **The Post-baccalaureate Reapplication Program**

The Post-baccalaureate Reapplication Program (PREP), implemented in 1992, was designed to increase the number of URM, rural and disadvantaged students matriculating in the COM (Deas et al, 2012). PREP participants complete one year (2 semesters) of science courses at the College of Charleston, a local state supported university unaffiliated with MUSC. The courses are carefully selected by the COM's Admissions Committee to ensure that the students are enrolled in courses that will successfully prepare them for the transition to medical school. Academic support is provided to PREP participants through MUSC's Center for Academic Excellence (CAE), the COM Group on Diversity Affairs and the COM Office of Admissions. Students receive monthly academic monitoring to ensure that they meet standards and are engaging with resources, weekly group sessions with the CAE, meetings with current first year medical students who are PREP graduates, forums designed to enhance professional growth, and an opportunity to receive mentoring from our URM physicians. Students who successfully complete their courses with a GPA of at least 3.0 are automatically admitted to the COM. Two (2) to three (3) students participate in the program each year. MUSC provides funding for tuition and fees for designated participants. It is the responsibility of the students to pay all expenses



incurred (that may not be fully covered by MUSC funding), which can be paid through receiving federal financial assistance. The highly motivated students who are selected for PREP spend the year strengthening their academic skills and deepening their understanding of basic science subject areas that are critical to success in medical school. PREP is fully funded by the COM and the cost is approximately \$18,000 per student.

### Key components of PREP

Students spend the year in an individually designed academic program that combines undergraduate science coursework at the College of Charleston. This cooperative program between the College of Charleston and Medical University of South Carolina uses a cross registration procedure to create individually designed course schedules to meet the needs of each PREP student. Study skills seminars and test preparation training provide integral components of the program. PREP students spend time in clinical “shadowing” experiences with MUSC physicians, and they meet once a month with the Associate Dean for Diversity Affairs who provides support and structure, arranges speakers on relevant topics, and assigns each PREP student a medical student mentor (former PREP participants when possible) for the year. This mentor makes sure students are aware of student organizations, student community service and social activities during the year. The awareness in campus medical student activities is seen as particularly important in the socialization to the culture of the Medical University of South Carolina.

### **The Summer Institute Program**

The Summer Institute (SI) Program is a six-week program designed to help increase MCAT scores and provide professional development opportunities for URM medical school applicants. SI is funded and coordinated through the COM GDA and is a collaboration with COM Student

Affairs, COM Admissions, and the MUSC Center for Academic Excellence. URM applicants with strong applications who applied to the COM but were not accepted are invited to participate. In addition to receiving group and individual tutoring on the MCAT, participants also attend seminars on a range of topics. SI is fully funded by the COM and the cost is approximately \$2,700 per student.

### Key Components of Summer Institute

Students spend six-weeks in an individualized and group rigorous curriculum designed to prepare them to retake the MCAT and hopefully increase their scores. The curriculum includes the components of the MCAT and each component is taught by current MD/PhD and/or MD students. Prior to starting the designed curriculum, SI participants are asked to complete an MCAT practice test. Once they begin the curriculum, they take practice tests weekly, and receive mid-point feedback by the Senior Associate Dean for Diversity Affairs. Participants receive weekly “lunch and learn” sessions facilitated by the CAE and various COM administrators that include but are not limited to: test taking skills, professionalism, student wellness, admissions, physician networking, interviewing, writing personal statements, interviewing, time management, and a session with current students that are former participants of SI. Tutors plan weekend activities for the participants that foster comradery between the tutors and participants. These activities are seen as particularly important in the socialization to the culture of the Medical University of South Carolina as the COM focuses on team-based learning.

### **1.2 Problem Statement**

There is a critical need to diversify the medical school population, as there is a constant need for diversity in the physician workforce (Acosta, Poll-Hunter, & Eliason, 2017; Deas et al, 2012).

The objective of this project is to evaluate outcomes of the Medical University College of Medicine's Summer Institute (SI) program and the Postbaccalaureate Reapplication Program (PREP) in matriculating and retaining underrepresented minorities (URM) in medicine students. SI and PREP were created to increase the number of URM representation in the College of Medicine COM. This project will evaluate the effectiveness of the two pipeline programs in successfully completing the pipeline program, matriculating those minority pipeline program participants to medical school, and retaining those students to graduation. The PREP and SI programs have both contributed to the diversity of medical education and the physician workforce. It is imperative that longstanding transition and pipeline programs are in place to increase diversity among future medical students and physicians. Therefore, both programs need to be evaluated and compared on the basis of their respective effectiveness.

### **1.3 Research Question**

Are pipeline programs effective in matriculating minority students to medical school and retaining them to graduation?

### **1.4 Population**

The study population will include SI and PREP participants from 2006-2016.

## 2 CHAPTER II SCOPING LITERATURE REVIEW

Over time, researchers have approached pipeline program evaluation by publishing the data from their medical schools to show the increase of the matriculation of URM medical students in comparison to the national average. Researches have also reviewed the increase in matriculation of URM students in medical school after the implementation of holistic review to the admissions process (Ellaway et al, 2018). Additionally, researchers publish data regarding pipeline programs that are designed to support the matriculation of URM students to medical school. The pipeline program approach and the examination of the holistic review process has contributed to increasing diversity in U.S. medical schools (Conrad et al, 2016; Grabowski, 2019). A study conducted by Taylor and colleagues (2019) examined the success of the National Cancer Institute (NCI) Comprehensive Partnership to Advance Cancer Health Equity (PACHE) Program. The NCI PACHE program was designed to increase minority representation in cancer research careers through a holistic approach. During the 8-week program, undergraduate and post-baccalaureate student participants were exposed to health care careers specific to cancer research, and participants participated in sessions regarding self-reflection and professional development. A survey from participants (n = 48) from the first three years of the program reported high satisfaction of the program. The forty-eight participants will be tracked for academic success.

Data from pipeline programs in other healthcare programs have also been published. Katz and Colleagues (2016) reviewed pre and post data from a two-week residential pipeline program that exposed high school URM participants to a career in nursing while fostering academic success. The program included academic courses, professional development, cultural sessions and shadowing experiences. Survey data reported that the participants' intent to attend college, and

their perception and value of the nursing profession increased. The effectiveness of pipeline programs for a career in dental medicine have also been evaluated. Greenwood and Colleagues (2020) reported that undergraduate students who participated in a 10-week pipeline program designed to prepare those interested in a career in dental medicine for the Dental Admissions Test (DAT) increased their mean average DAT scores. Selected participants had previously taken the DAT and their scores were not sufficient for dental school admissions. After participating in the program, participants were advised to retake the DAT. Data from ninety-eight participants (six-year time period) showed that 55% of them matriculated to dental school, and 30% of them (n = 29) graduated from the host school.

#### Next Steps in Examining the Effectiveness of Medical School Pipeline Programs

The “next step” in examining the effectiveness of medical school pipeline programs is to report on the number of pipeline participants that matriculate to and graduate from medical school. Additionally, of those pipeline participants that graduate from medical school, their specialty and location of practice should be examined. This data can identify if URM physicians are practicing in rural areas. Other authors have examined their pipeline programs by administering pre/post-test surveys to their participants to see if their knowledge of the healthcare career program has increased immediately after their participation in the pipeline program (Katz et al, 2016). One study has noted that they are tracking the progress of their past pipeline participants, which will provide longitudinal data (Taylor et al, 2019). A study conducted by Smitherman and Colleagues (2020) reviewed data from a 50-years premedical postbaccalaureate program at Wayne State University School of Medicine (WSUSOM) and reported that 85% of the participants matriculated to WSUSOM. Of those that matriculated, 87% graduated from WSUSOM and are currently practicing physicians.

There are very few studies that measure the success of their pipeline programs by examining the medical school matriculation and graduation of their pipeline participants. As a result, an extensive amount of literature regarding various pipeline opportunities, and a longitudinal review of the number of SI and PREP participants that became URM medical school matriculants and graduates from the Medical University of South Carolina College of Medicine is needed to address the gap in the literature.

## **3 CHAPTER III METHODOLOGY**

### **3.1 Research Design or Method**

The design of the proposed study is a retrospective analysis of archival data on pipeline program participants, completers, admissions and retention at the Medical University of South Carolina College of Medicine.

### **3.3 Data Set Description**

The data set selected for this project include individuals from the MUSC COM PREP and SI programs that participated between 2006 – 2016. The size includes thirty-three (33) participants from the PREP program, and one hundred and two (102) participants from the SI program, providing a total of one hundred and thirty-five (135) participants from the selected timeframe. The Senior Associate Deans for Medical Education and Diversity Affairs at the COM granted permission to utilize the program data for the purposes of this project.

### **3.4 Variables**

Data sources from SI include the number of participants that enrolled and completed the program, and of those enrolled and completed, the number of participants that matriculated and graduated from the COM. Additionally, the number of completers that matriculated to other colleges at MUSC will be included. Data sources from PREP include the number of enrolled completed the program, and of those enrolled and completed, the number of participants that matriculated and graduated from the COM. The data set will include SI and PREP participant data from 2006-2016.

### **3.5 Data Analysis**

Data analysis include a descriptive analysis evaluating total numbers and percentages using EXCEL, and displays of findings using graphics.

### **3.8 Protection of Human Subjects**

This project is determined by the MUSC Institutional Review Board (IRB) to be quality improvement and is therefore not subject to IRB review or approval.



## 4 CHAPTER IV RESULTS

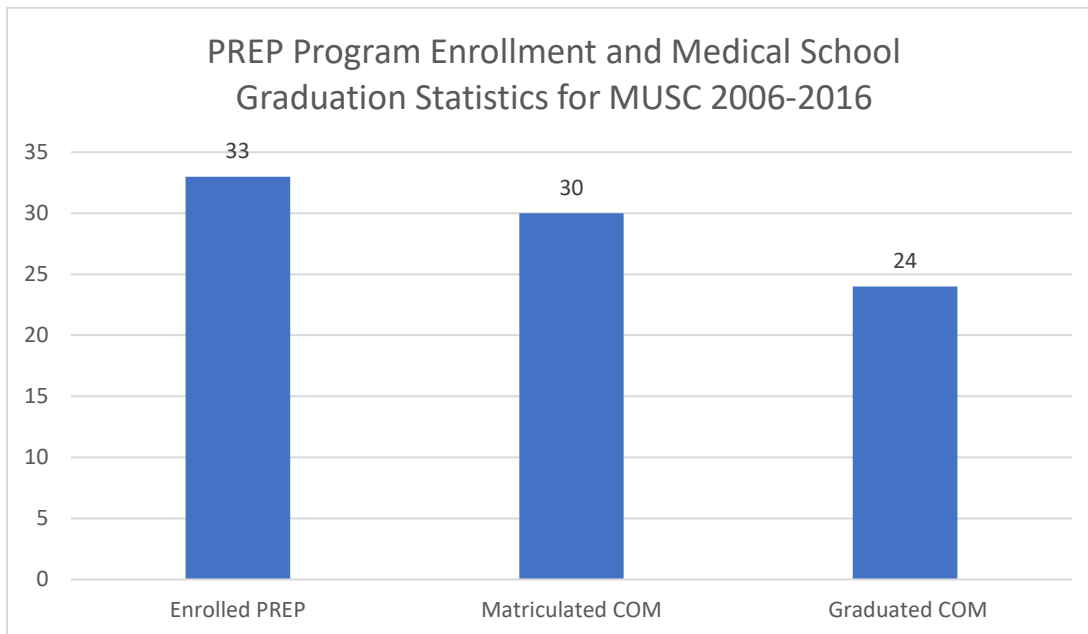
### 4.1 Results/Findings

The objective of this project was to evaluate outcomes of the Medical University College of Medicine's Summer Institute (SI) program and the Postbaccalaureate Reapplication Program (PREP) in matriculating and graduating underrepresented in medicine students (URM).

#### PREP

A total of thirty-three underrepresented in medicine individuals were enrolled in the PREP program between 2006 and 2016. Of those enrolled, thirty (90%) participants completed the program and matriculated to the COM, and of those matriculated, twenty-four (80%) students graduated from the COM. Of the students enrolled in the PREP program, both completers and non-completers, 74% graduated from the COM. Figure 1 depicts PREP numbers of enrollment, matriculation to the COM, and graduation from the COM.

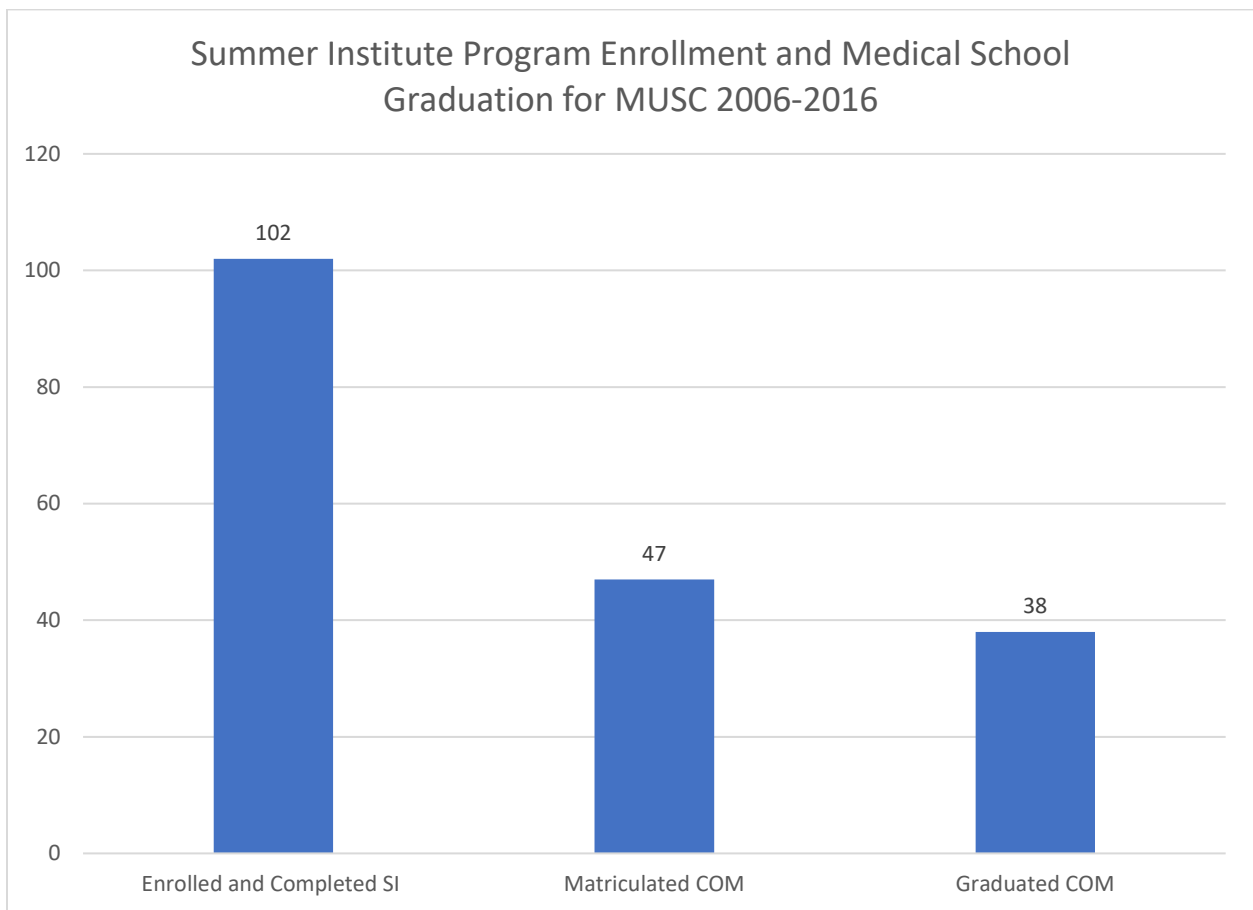
Figure 1: PREP Program Enrollment and Medical School Graduation Statistics for MUSC 2006-2016



SI

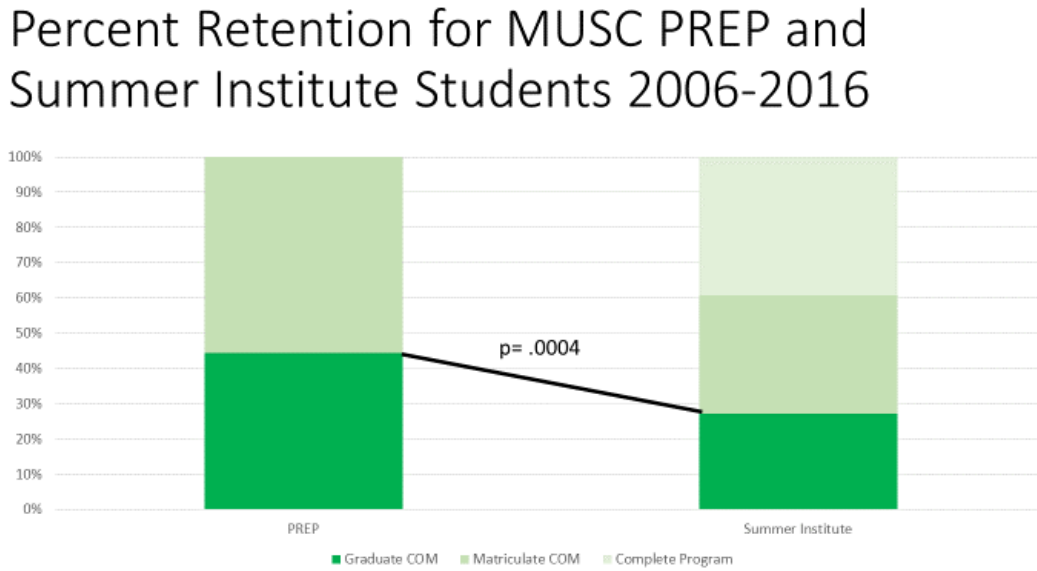
A total of under one-hundred and two (102) underrepresented in medicine individuals were enrolled and completed the SI program between 2002 and 2016. Of the program completers, 63 (62%) matriculated to one of the six MUSC colleges. Of the MUSC matriculants, 47 (46%) program completers matriculated into the COM and of those 81% graduated. Among participants completing the SI program, 38 (37%) graduated from the COM. Three SI matriculants to the COM are currently enrolled, and two of the three students will graduate May 2021.

Figure 2: Summer Institute Program Enrollment and Medical School Graduation for MUSC 2006-2016



A chi-square test conducted to determine the comparison of the percent graduating from COM for PREP and SI show that there is a statistically significant higher rate of graduation from COM for the PREP program than for the SI program (see figure 3).

Figure 3: Percent Retention for MUSC PREP and Summer Institute Students 2006-2016



## 5 CHAPTER V DISCUSSION

### 5.1 Discussion of Results

Out of one-hundred and thirty-five underrepresented in medicine pipeline program participants, sixty-two (46%) successfully graduated from the College of Medicine at the Medical University of South Carolina. Of the one-hundred and thirty-five pipeline participants, fifteen students matriculated to the College of Medicine, but did not graduate. Results suggest that the PREP and SI pipeline programs are effective in matriculating minority students to medical school and retaining them to graduation. The pipeline participant completers that did not matriculate to the COM are from the SI program and could have possibly attended medical school at other institutions. The SI program is designed to prepare the participants to become more competitive applicants by increasing their MCAT score, but they are able to apply to and attend other medical schools. The PREP program participants are conditionally accepted to the COM after successful completion of program requirements; and therefore, PREP participants must attend the COM after receiving an overall 3.0 grade point average upon program completion. Although PREP has a statistically significant higher graduation rate than SI, SI program participants could have matriculated in and graduated from other healthcare programs and medical schools at other academic institutions. This would be consistent with the goals of our pipeline programs and would contribute to diversifying the healthcare workforce as a whole.

There is a need to diversify the healthcare workforce as evidenced by the literature (Taylor et al 2019; Greenwood et al 2020; Katz et al 2016). Prior research studies suggest that the outcome of the health of underserved patients are better when they are treated by physicians that look like them (Acosta, Poll-Hunter, and Eliason, 2017, AAMC, 2015); thus, COM graduates that were

participants of SI and PREP are possibly bridging the gap of health equity by contributing to the health outcome of underserved patients.

## **5.2 Limitations**

One limitation of this project is the inability to determine whether SI participants that did not attend MUSC attended medical school or other healthcare programs at other institutions. In addition, it is possible that some of the PREP program participants who did not matriculate to the COM, may have enrolled in and graduated from a different healthcare program subsequently. Knowing the outcome of SI and PREP (PREP withdrawals) participants that did not attend MUSC will greatly increase our understanding of the program outcomes and contribute to the literature regarding the diversity of U.S. physicians.

## **5.3 Future Research**

Given the evidence that pipeline programs are effective in matriculating underrepresented in medicine individuals to medical school, data is needed to determine if pipeline participants attend medical schools that are not the host institution of the pipeline program in which they participated. The specialty and location of those pipeline participants that graduated from medical school will be helpful in determining the number of underrepresented in medicine physicians who are treating patients in underserved areas. A cost-effectiveness analysis of current successful pipeline programs can assist in the development of pipeline programs for institutions that are interested in increasing diversity among their medical student population. Furthermore, future studies evaluating the effectiveness of pipeline programs could consider collecting information on participants (e.g., science GPA) that maybe helpful in identifying criteria that may be predictive of not only success in the pipeline program, but more importantly,

success in matriculating and graduating from a healthcare program. Student graduating could be compared to students who do not graduate on such potential predictors, and these data could be used to increase graduation rates through inclusion as pipeline program selection criteria or with additional educational strategies added into the pipeline program curriculum to mitigate potential risks from such predictors.

#### **5.4 Conclusions**

In general, PREP and SI pipeline programs appear to be effective in matriculating minority students to medical school and retaining them to graduation. There has been a national call to action for several decades to address the low number of underrepresented in medicine students in medical school (Thomson and Denk, 1999), including the Liaison Committee on Medical Education's standard of diversifying the physician workforce through pipeline programs and partnerships. Successful pipeline programs are contributing to the call to action by providing an opportunity for underrepresented in medicine individuals to matriculate to and graduate from medical school. Pipeline participant matriculants and graduates will diversify the physician workforce and hopefully bridge the gap in health disparities by sharing their perspectives among their peers, motivating elementary, middle, high school and college students who are interested in pursuing a career in medicine, and by treating the underserved population.

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