Perceived Effectiveness of a Surgical High School Outreach Program on Career Trajectory of Underserved High School Students

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Abstract

Background: The United States faces a significant physician shortage, projecting a need for 52,000 more primary care doctors by 2025.[1] Underserved communities are disproportionately affected by this shortage. With underrepresented minority healthcare providers being significantly more likely to practice in underserved communities, it is essential to increase diversity in medicine.[2–4] High school outreach programs introducing teenagers from minority populations to the medical field may increase availability of healthcare in socioeconomically disadvantaged areas. Our goal was to determine whether participants in the Urology High School Outreach Program experienced increased interest in pursuing a career in medicine, or STEM-related fields after receiving mentorship and exposure to the medical field. **Methods:** 138 underserved high school students participating in a one-day Urology High School Outreach Program (HSOP) took a pre-survey prior to a physician-led lecture, and five urology-related surgical techniques workshop stations, led by medical students. The sessions culminated with a Q&A panel with the medical students, followed by the post-survey. **Results:** Of the 138 students that participated in the pre-survey, 110 students (79.7%) answered the post-survey. Analysis of these survey responses revealed that the Urology HSOP predominantly served a demographic consisting of Hispanic (39.1%) and Asian (32.7%) backgrounds. Question One, pertaining to the likelihood of pursuing a career in healthcare, saw a statistically significant average increase of 0.11 out of 5 ($p=0.014$). Question Two, pertaining to the likelihood of pursuing a career in STEM, saw the largest significant average increase of 0.34 out of 5 ($p<0.00001$). Question Three, pertaining to interest in developing new technology, saw a statistically significant average increase of 0.28 out of 5 ($p=0.001$). **Conclusion:** In summary, a significant increase in interest towards STEM and medicine careers emerged among Urology High School Outreach Program participants. Further investigation is warranted to ascertain whether these changes are limited to the underrepresented demographic, or extend to all program participants.

Keywords: Urology, Surgery, Diversity, Equity, Inclusion, Student, Outreach

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Introduction

The United States faces a significant physician shortage, projecting a need for 52,000 more primary care doctors by 2025.[1] This scarcity denies quality care to minority and low-income groups. To counter this, increasing underrepresented healthcare providers is vital. Underrepresented minority physicians tend to practice in underserved communities that consist of minorities—individuals with low socioeconomic status, and individuals lacking health insurance coverage.[2–4] Furthermore, minority physicians aid equitable policy advocacy and reduce racial and gender healthcare bias.[5,6] In the context of this significant physician shortage and inequitable access to care, the encouragement of minority groups to enter healthcare is a definite

priority.

Early exposure to medical equipment and mentorship encourages minority representation in healthcare.[7,8] The "Health Care Academy Program" demonstrated that exposure to different healthcare careers significantly increased the interest of underrepresented and underprivileged students in pursuing a healthcare career. Post-program, 86% of 10th graders and 71% of 11th graders reported genuine interest in pursuing a career in health. Participants reported enjoying spending time with medical mentors the most, emphasizing the importance of mentorship (98% strongly agree/ agree).[7] Another study assessed if the youths´ decision to join an out-of-school time program influenced their engagement and experience. The sample consisted of ethnically diverse participants aged 10 to 16 (n = 203) enrolled in nine summer Science, Technology, Engineering, and Math or "STEM" programs targeting underserved youth. A pre-survey was given to the students to determine whether or not they fully desired to attend the program, while subsequent surveys gauged happiness, excitement, concentration, and effort throughout the program. Results demonstrated that both the choice and impact of STEM programs are independently and positively associated with initial engagement. This indicates that although the choice to enroll was a significant predictor of initial engagement, positive experiences during the program helped compensate for reduced engagement associated with a lack of choice.[8]

Healthcare careers, particularly in surgery, continue to exhibit gender and racially-based disparities. The High School Outreach Program (HSOP) targets underprivileged high school students, offering mentorship and early exposure to surgical and medical equipment via medical students. The aim is to inspire high school students facing socioeconomic barriers to pursue higher education in healthcare, by providing them with exposure to mentors in the field. This study aims to ascertain if the Urology HSOP increases interest in medicine or higher education among underserved high school students. The ultimate goal is to heighten these students' inclination toward healthcare careers, or STEM paths, after high school.

Methods

With approval from the Institutional Review Board (IRB), our goal was to determine the impact of the Urology HSOP on underprivileged high school students. The one-day program, funded by development dollars in the Department of Urology, aims to introduce underprivileged high school students to the medical field. At the start of the program, the students attended a lecture introducing innovations in medicine, urology, and surgical techniques. Subsequently, students rotated through five simulation stations to gain hands-on exposure to various surgical techniques. The simulation stations included suturing, laparoscopic training, endoscopy, DaVinci robotic surgical system training, and renal biopsy under ultrasound guidance. Each station was led by an instructor who demonstrated the technique and explained to the students how the technique is relevant to patient care. Instructors also engaged with students, addressing queries about the college, medical school, or healthcare careers.

The Urology HSOP extended invitations primarily to high schools in lower income regions of Orange County, offering cost-free participation in the program. The program arranges free transportation for socioeconomically disadvantaged students, ensuring good accessibility.

To gauge program effectiveness in boosting interest in higher education, STEM, or medical careers, students completed Google Forms surveys before the introductory lecture and after the program's conclusion. Surveys gathered demographic information, including their race, gender, which high school they attended, grade level in school, their parents' highest level of education, whether their parents worked in healthcare, and perceived barriers to obtaining a STEM degree. The survey asked students both before and after the program, on a scale of one to five, how likely they were to pursue a career in medicine or STEM, and their interest in technological innovation. A unique student identifier matched pre- and post-surveys anonymously. A paired two-tailed t-test was performed, and p-values were calculated.

Results

Of the total cohort of 138 students participating in the pre survey, 110 responses (79.7%) exhibited matching post survey student-generated identifiers. Analysis of these 110 pre- and post-survey responses revealed that the Urology HSOP predominantly served a demographic consisting of Hispanic and Asian backgrounds, accounting for 39.1% and 32.7% respectively. Among these students, 67.3% were female, and 78.2% were in upperclassmen years. Regarding familial attributes, 28.2% of the surveyed students hailed from

households with at least one parent with a postgraduate degree, and 25.5% of these students had at least one parent working in healthcare. A majority of students (54.6%) believed that finances were the greatest barrier to pursuing a degree in STEM.

Post program surveys showed a significant increase in all three questions asked (Figure 1). Question One, pertaining to the likelihood of pursuing a career in healthcare, saw a statistically significant average increase of 0.11 out of 5 ($p=0.014$). Question Two, pertaining to the likelihood of pursuing a career in STEM, saw the largest significant average increase of 0.34 out of 5 ($p<0.00001$). Question Three, pertaining to interest in developing new technology, saw a statistically significant average increase of 0.28 out of 5 ($p=0.001$).

Discussion

Amid the impending threat of a physician shortage in the United States, the imperative to identify qualified candidates to fill these roles intensifies.[1] This issue extends from primary care physicians to surgeons, with 25.91% less surgeons per 100,000 persons.[9] This decline is more evident in urban areas compared to their surrounding areas.[9] Factors contributing to this decline include increased retirement rates in surgeons, coupled with less recruitment of individuals to pursue surgical specialties.[10] A previous study estimated a 16% reduction in the total number of surgeons throughout the United States by 2028, underscoring the gravity of this issue.

Hence, our objective was to heighten underprivileged high school students' inclination toward selecting careers in medicine or STEM disciplines upon high school graduation. This population was selected due to trends that show physicians who identify as an underrepresented minority tend to practice in areas with largely underrepresented and underserved communities.[2–4] Furthermore, analogous previous research has demonstrated that high school student program participation correlates with significant increases in students' aspirations to pursue medical or scientific paths.[7]

Figure 1: Pre and Post Average Response

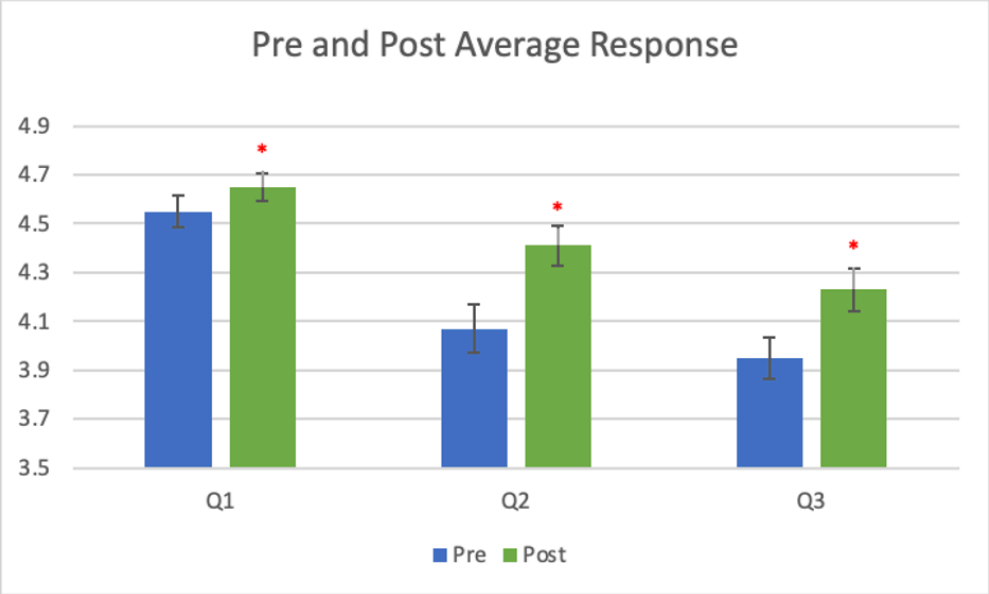

Figure 1: Bar graph comparing pre- and post-averages to the three survey questions. "" indicates significance using a two-sided T-test. Questions one, two and three were:*
Q1: "On a scale of 1 to 5, How likely are you to pursue a career in medicine?"
Q2: "On a scale of 1 to 5, How likely are you to pursue a career in STEM (Science, Technology, Engineering, Mathematics)?"
Q3: "On a scale of 1 to 5, How interested are you in being involved in the development of new technology?"

Our study was conducted with the help of the Urology HSOP, where 138 participants were enrolled in the study. A pre-survey and post-survey were provided at each session and 110 participants provided matching pre- and post-survey matching identification codes. All three of the questions asked of the participants showed a significant increase in their interest to pursue either a career in medicine or STEM disciplines in the future ($p<0.05$). The first question assessed the participants´ likelihood to pursue a career in medicine, and there was an increased interest ($p=0.014$). Question Two determined the participants´ interest in a career in STEM related-fields and showed a significant difference of ($p<0.00001$). Our third question was related to the interest of the participants to develop new technology that is related to medicine, and there was a significant increase in interest ($p<0.001$). These findings are supported by previous studies which show that exposure to surgical and medical equipment increase the interest in participants to pursue healthcare careers.[7,8,11] These findings support the development of nationwide programs aimed at increasing awareness of medical or scientific career paths in high school students.

As the participants of this study were primarily Hispanic (39.1%) and Asian (32.7%), with 67.3% identifying as female, racial and gender-based disparities were accounted for. This demonstrates that the study was primarily conducted for underrepresented minorities where mentorship has been demonstrated, in prior studies, to show an increase in interest of participants´ likelihood to select healthcare and STEM-related fields upon completion of high school.[7] These findings demonstrate how underrepresented communities, exposed to medicine or scientific paths, will increase their interest in the pursuit of those careers in the future.

Limitations in our study include: the lack of a reference group and selecting participants in a non-randomized manner. Since the Urology HSOP selects schools that are underrepresented and underserved, there has been a lack of reference population of participants that represent the overall demographics of the surrounding community. The Urology HSOP has been ongoing for a number of years, and the schools that have been selected to participate have roughly been the same; however, no data was collected prior to our research. This lack of longitudinal data prevents us from assessing yearly patterns, as well as differences between high schools and education level of the participants. We plan to continue to administer surveys for the next five years to see if trends remain, and possibly incorporate different communities into the Urology HSOP.

Conclusion

The goal of research was to determine whether participants in the Urology HSOP would develop greater interest in pursuing careers in medicine or STEM-related fields through exposure and mentorship. A significant increase in career interest within these fields was observed among program participants. Further research is needed to identify if these changes only occur within the underrepresented population, or if there is increased interest in all participants of this program.

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