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Original Research

Examining the effect of a Mini Med School using social cognitive career theory

Examen de l'effet d'une mini-faculté de médecine à l'aide de la théorie socio-cognitive de la carrière

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Abstract

Background: Diversity of professionals within the healthcare system enhances patient outcomes. Existing literature indicates that Mini Medical School (MMS) Programs can increase medical school diversity by engaging youth from underrepresented backgrounds (URiM+); however, there is limited understanding of the mechanisms by which this happens. Further research could refine these programs and improve their effectiveness. Grounded in social cognitive career theory, this study evaluates the impact of a single-day MMS on URiM+ students' knowledge and confidence in pursuing medicine.

Methods: Female and gender-diverse youth were invited to urban or rural single-day MMS events organized by medical students. These MMS programs included clinical skills activities and a lecture about becoming a physician. Participants completed a pre- and post-event survey and quiz assessing their interest, knowledge, and confidence in pursuing a medical career.

Results: Participants at both MMS events reported increased confidence about pursuing a career in medicine. Both subjective and objective measures of knowledge about a career in medicine increased. Interest in pursuing a career in medicine, however, did not increase significantly in either group. A significant positive correlation was found between participants' self-confidence in becoming a physician and their perceived knowledge of how to become a physician.

Conclusions: We found that these single-day MMS programs increased participants' knowledge about the steps to pursuing a career in medicine, and their confidence in their ability to do so, but did not significantly increase their interest. When considering the impacts of MMS programs from a social cognitive career theory lens, program organizers should consider ensuring that their MMS curriculum includes practical tools for success, as this will contribute to supporting URiM+ students in viewing themselves as future physicians and contributing to the aim of diversifying the medical profession.

Résumé

Contexte : La diversité des professionnels de la santé contribue à de meilleurs résultats pour les patients. Selon la littérature, les programmes des mini-facultés de médecine (MFM) peuvent favoriser une plus grande diversité au sein des facultés de médecine en mobilisant des jeunes issus de groupes sous-représentés (GSRM+). Toutefois, les mécanismes expliquant cette influence restent peu clairs. Des recherches supplémentaires pourraient permettre d'optimiser ces programmes et d'en renforcer l'efficacité. S'appuyant sur la théorie socio-cognitive de la carrière, la présente étude examine l'effet d'une journée dans un programme de MFM sur les connaissances et la confiance des étudiants issus de GSRM+ quant à leur capacité à envisager des études de médecine.

Méthodes : Des jeunes filles et des jeunes de divers genres ont été invités à participer à des journées dans le cadre de programmes de MFM organisées en milieu urbain ou rural par des étudiants en médecine. Le programme comportait des ateliers pratiques de compétences cliniques et une présentation sur la profession médicale. Les participants ont rempli un questionnaire et répondu à un quiz avant et après l'activité pour évaluer leur intérêt, leurs connaissances et leur confiance à poursuivre une carrière en médecine.

Résultats : Dans les deux contextes (urbain et rural), les participants ont rapporté une hausse de leur confiance à poursuivre des études médicales. Les mesures subjectives et objectives des connaissances sur la carrière médicale ont également augmenté. En revanche, l'intérêt pour la médecine n'a pas connu de progression significative. Une corrélation positive a été observée entre la confiance des participants à devenir médecin et leur perception de leurs connaissances sur les démarches à entreprendre.

Conclusions : Les programmes de MFM d'une journée ont permis d'améliorer la compréhension des parcours menant à la médecine ainsi que la confiance des participants en leur capacité à suivre cette voie, sans toutefois renforcer leur intérêt. À la lumière de la théorie socio-cognitive de la carrière, les organisateurs devraient intégrer des outils pratiques et concrets dans les MFM afin de soutenir les jeunes issus de GSRM+ à se projeter comme futurs médecins, contribuant ainsi à la diversification du corps médical.

Introduction

Healthcare systems around the world are grappling with a growing shortage of physicians who provide care to patients who have difficulty accessing effective healthcare. This shortage threatens equitable and effective healthcare delivery and underscores the need for innovative solutions to cultivate physicians willing to work in these underserved areas.[1–5] Physicians from underserved areas and communities are more likely to choose to care for those communities, prompting the creation of pathway programs targeted to youth from underrepresented in medicine (URiM) backgrounds with the aim of graduating physicians more likely to serve a diverse patient community.[6–12]

Although the Association of American Medical Colleges (AAMC) specifically defines URiM in terms of ethnic and racial populations,[a13] it is important to acknowledge additional barriers to pursuing medical careers, such as socioeconomic status, immigration status, geographic location, gender, sexual orientation, family educational status, and social capital.[14–19] Many of these barriers have been extensively discussed in literature; however, a newer concept of social capital has emerged in recent years. Here, social capital refers to the absence of family members working in healthcare, which is analogous to the challenges faced by first-generation university students.[17–19] For the purposes of our study and to address the gap in AAMC's definition of URiM, we are using the term URiM+, which includes the racial and ethnic identities from the AAMC's definition of URiM, as well as the marginalized identities listed above.

While existing studies have demonstrated the effectiveness of pathway programs in fostering interest in pursuing a medical career among URiM+ youth, these programs are rarely intentionally designed or examined using a specific theoretical framework.[20–27] As a result, much of the literature about the effectiveness of pathway programs presents findings about the outcomes of these programs, with little attention paid to why they work. We propose that examining pathway programs through the lens of social cognitive career theory (SCCT) can help identify where and how these programs have a positive effect on URiM+ youth. This lens will help build a stronger evidence base for the key factors that contribute to more effective and impactful pathway programs.

SCCT is derived primarily from Bandura's social cognitive theory applied to the context of career choices and decisions.[28] SCCT explains that a person's sense of self-efficacy, combined with their outcome expectations, influences their career goals.[29–37] Simplified, SCCT posits that people develop an interest in careers that they can picture themselves doing and that they think they would be good at.[28,30] Although self-confidence is not directly incorporated in the SCCT model, it is an important consideration with its relation to contextual factors, learning experiences and therefore, self-efficacy. Self-confidence, distinct from task-specific self-efficacy, is a generalized belief in a person's ability to pursue a career, which can be eroded by barriers or encouraged by support systems. It further provides resilience and pursuit of learning experiences, which may thereby increase their sense of self-efficacy. According to SCCT, it would be useful for pathway programs to provide learning experiences that increase knowledge, self-efficacy, and confidence for URiM+ youth to empower their belief that they can succeed at being accepted into medical school and becoming physicians.[34,35]

Mini Medical School (MMS) programs are one example of pathway programs.[1–3,20,21,25,26,38] MMS programs engage URiM+ youth with hands-on learning opportunities and mentorship to motivate them to consider medicine as an attainable career goal. URiM+ youth may otherwise not be aware of career options and prerequisites to achieve a career as a physician and thus would not picture themselves as being in that career.[23,27,29]

MMS programs are becoming increasingly commonplace, with a study identifying 658 such pathway programs in the United States alone in 2021.[39] While few studies investigate longitudinal MMS outcomes, evidence suggests that MMS programs are effective in their ultimate aim of diversifying medical school matriculation. Of 58 MMS alumni, Chang et al reported that of the respondents who had not yet completed undergraduate study, 82% intended to pursue medicine; of respondents who had obtained an undergraduate degree, 50% were enrolled in medical school.[38] As another example, Patel et al reported that of the 12/16 MMS alumni who responded to their two-to-three year follow-up survey, all respondents were enrolled in post-secondary studies with the intent to pursue careers in healthcare.[40]

As introduced by the framework outlined by Young et al, pathway programs ought to be routinely evaluated to ensure that their outcomes are achieved, although the authors do not mention that the evaluation should include an examination of what elements of pathway programs are

[a] The term URiM is originally defined by the AAMC. There have been no formally recognized adaptations of this term by AFMC or CFPC that we could find for a Canadian context.

contributing to the observed outcomes.[41] Many MMS programs invite individuals to apply to the program, resulting in a group of self-selected participants who are more likely to hold a pre-existing interest in medicine.[20,42] In contrast, non-self-selected participants who are enrolled as a part of a mandatory cohort may not have an interest in medical careers. These are the individuals from URiM+ populations who could be a target of MMS programs, with the goal to inspire interest in medical careers in these individuals to attain the outcome of increased diversity of future physicians.

Our goal in this study was to begin to address the gap in literature regarding the factors in pathway programs that contribute to increasing knowledge and self-confidence in URiM+ youth. To do this, we delivered an existing MMS curriculum to a non-self-selected high school population and examined participants' interests, knowledge, and self-confidence about pursuing a career in medicine in an urban and rural setting through an SCCT lens.

Methods

MMS Program

Both events (urban in fall 2023 and rural in spring 2024) offered a single-day version of a local student-run MMS, called Asclepius Medical Camp for Youth (Asclepius) (Table 1).[43] Participants experienced three hands-on clinical skills sessions and received a lecture and panel that provided information about becoming a physician. These activities were bracketed by the pre- and post-camp survey and quiz (Appendix A).

Although MMS has been implemented for various school-aged and post-secondary cohorts, we selected high school students since findings in the literature have demonstrated this to be a defining time for career decisions.[23,44,45]

We used the same objective oral quiz before and after the program to measure participants' knowledge about the factors involved in pursuing a career as a physician. This quiz as administered individually by volunteers who were trained as a group to maximize inter-rater reliability (Table 2). The oral quiz format was selected to elicit recall rather than recognition, and had a maximum score of 10 points. The quiz was developed in 2022 by Asclepius volunteers to reflect locally pertinent knowledge about the steps to becoming a physician, and its formatting was similarly maintained for this study for consistency and comparison.

This study was reviewed and approved by the Research Ethics Board (REB) at the University of Alberta (Pro00118041). Informed consent was obtained from all study participants.

Table 1. Event schedules for the urban and rural Mini Med School events. Each event featured three clinical skills sessions and an information session about how to become a physician, bookended by the pre- and post-MMS survey and quiz

Urban Event	Rural Event
Arrival / Survey / Quiz (30 mins)	Arrival / Survey / Quiz (30 mins)
Introduction (30 mins)	Introduction (15 mins)
Round Robin 1 (30 mins) Group 1: Physical Exam Group 2: Suturing Group 3: Point of Care Ultrasound (POCUS)	Round Robin 1 (35 mins) Group 1: Physical Exam Group 2: Suturing Group 3: Point of Care Ultrasound (POCUS)
Lunch	Round Robin 2 (35 mins) Group 1: Suturing Group 2: Point of Care Ultrasound (POCUS) Group 3: Physical Exams
Round Robin 2 (30 mins) Group 1: Suturing Group 2: Point of Care Ultrasound (POCUS) Group 3: Physical Exams	Lunch
Round Robin 3 (30 mins) Group 1: Point of Care Ultrasound (POCUS) Group 2: Physical Exams Group 3: Suturing	Round Robin 3 (35 mins) Group 1: Point of Care Ultrasound (POCUS) Group 2: Physical Exams Group 3: Suturing
	Girl Guide Camp Songs (25 mins)
How to become a doctor lecture (60 mins) 1st: Pathway to Medicine Lecture	How to become a doctor & nurse lecture (60 mins) 1st: Pathway to Medicine Lecture 2nd: Pathway to Nursing Lecture
	Question and Answer Period (60 mins)
Exit Survey / Quiz (20 mins)	Exit Survey / Quiz (30 mins)
Pick-up	Pick-up

Participants

The participants were a non-self-selecting cohort. All were female or gender-diverse members of the nonprofit organization Girl Guides of Canada (Girl Guides) in Grades 9-12. Girl Guides was selected as a convenience sample given that the author KP had a pre-existing relationship with the volunteer organization, recognizing that women are not currently underrepresented in Canadian medicine and that the purpose of this study is to evaluate the pilot program in a non-self-selecting group. Author KP did not know the individual participants and vice versa; therefore, the likelihood of this influence contributing to bias in the study is low. The rural group, URiM+ by its nature, was selected because these participants are infrequently included in MMS studies; furthermore, the author SS was working in a rural community at the time of the event, providing a unique opportunity to engage with this population. The events were advertised internally within Girl Guides, then group leaders registered their groups of youth for the event.

Table 2. Objective quiz questions and correct answers. The quiz was administered verbally by trained volunteers. Student participants responded to each question in a short answer format verbally by recall. The questions and correct answers are paraphrased in the table for simplicity. The quiz was scored out of 10 possible marks, with the first question valued out of two possible marks and the remainder valued at one mark each. MCAT = Medical College Admissions Test.

Pre- and Post-Camp Quiz Questions	Answers (Points)	Urban Event		Rural Event		ANOVA
		Pre-Camp Average (± SEM) *(N* = 47)	Post-Camp Average (± SEM) (*N* = 46)	Pre-Camp Average (± SEM) *(N* = 20)	Post-Camp Average (± SEM) (*N* = 19)	P-values 1. Location 2. Timing 3. Location* Timing
Test before Med School	MCAT (2)[a]	1.00 (±0.11)	1.78 (±0.06)	0.8 (±0.14)	1.47 (±0.14)	1. p=0.031 2. p<0.001 3. p=0.641
Training Requirement after High School	Undergrad degree (1)	0.34 (±0.07)	0.83 (±0.06)	0.3 (±0.11)	0.79 (±0.10)	1. p=0.645 2. p<0.001 3. p=0.982
Undergraduate Degree Requirement	All are acceptable (1)	0.19 (±0.06)	0.80 (±0.06)	0.05 (±0.05)	0.68 (±0.11)	1. p=0.082 2. p<0.001 3. p=0.886
Length of Undergraduate Degree	4 years (1)	0.68 (±0.07)	0.96 (±0.03)	0.55 (±0.11)	1.00 (±0.00)	1. p=0.532 2. p<0.001 3. p=0.213
Extracurricular Activities Requirement	Yes (1)	0.96 (±0.03)	0.99 (±0.02)	0.85 (±0.08)	1.00 (±0.00)	1. p=0.278 2. p=0.032 3. p=0.103
Length of Medical School	4 years / (3 years if they mentioned McMaster or University of Calgary) (1)	0.32 (±0.07)	0.93 (±0.04)	0.55 (±0.11)	0.89 (±0.07)	1. p=0.205 2. p<0.001 3. p=0.073
Training Requirement after Medical School	Residency (1)	0.40 (±0.07)	0.83 (±0.06)	0.1 (±0.07)	0.74 (±0.10)	1. p=0.017 2. p<0.001 3. p=0.190
Naming at least 3 Medical Specialties	All medical specialties and their specific name (1)[b]	0.43 (±0.07)	0.61 (±0.07)	0.3 (±0.11)	0.37 (±0.11)	1. p=0.054 2. p=0.183 3. p=0.543
Naming at least 3 Allied Health Professions	Any allied health professions (1)[b]	0.28 (±0.07)	0.83 (±0.06)	0.2 (±0.09)	0.42 (±0.12)	1. p=0.004 2. p<0.001 3. p=0.048

[a]There is 1 point for knowing a test exists and 1 point for knowing the title of the exam is MCAT; [b]One point is awarded for naming 3 correctly

Data analysis

Study data were collected and managed using REDCap electronic data capture tools (REDCap Consortium, Nashville) hosted at the University of Alberta. Statistical tests were conducted using SPSS Version 26.0 (IBM).

The results of the verbal quiz were analyzed using ANOVA for timing, location, and their interactions. Statistical tests for the self-reported survey are summarized in Table 3. All tests were two-tailed as no directional hypotheses were established *a priori*. Statistical significance was set at $p < 0.05$.

Authors who interpreted the free text responses (KP, SS, and SR) maintained reflexivity in considering their position, influence, and biases to keep an open mind to the perspectives shared by the study participants.

Results

Participant demographics

Forty-seven high-school-aged youth attended the urban event, while twenty youth attended the rural event. The urban and rural groups did not differ significantly in ethnic demographics ($p = 0.50$) as 2.3% of participants at the urban event and 8.7% of rural event participants identified as belonging to an underrepresented ethnicity (defined as Black, Indigenous, or Filipino by the University of Alberta Faculty of Medicine and Dentistry). Twenty-two percent of participants at the urban event and 8.5% at the rural event identified as facing financial barriers, which was not statistically different by Fisher's Exact Test ($p = 0.48$). Seventy percent of participants at the urban event and 72% at the rural event identified that they did not have family members who are physicians, which was not different by Chi-squared ($p = 0.89$). There were no significant differences between the urban and rural participant demographics.

Table 3. Subjective survey questions, responses and the statistical test(s) used for analysis.

Investigative Parts	Statistical Test(s)
Demographic - Underrepresented Population	Fisher's Exact Test
Demographic – Barrier to Pursuing Medicine	Fisher's Exact Test
Demographic – Financial Barrier	Fisher's Exact Test
Barriers – Lack of academic resources	Fisher's Exact Test
Barriers – Financial Resources	Chi-Square Test
Barriers – Lack of Time	Fisher's Exact Test
Barriers – Language Barriers	Fisher's Exact Test
Barriers – Societal Barriers	Chi-Square Test
Barriers – Inadequate Guidance and Mentoring	Fisher's Exact Test
Barriers – Others	Fisher's Exact Test
Perceived knowledge about medicine	Levene's Test of Variance ANOVA
Perceived knowledge about the process of getting into medicine	Levene's Test of Variance Whitney-Mann U test
Correlation between knowledge of medicine and process of getting into medical school	Spearman's Correlation
Interest in Medicine	Levene's Test of Variance Whitney-Mann U test
Perceived possibility of getting into medical school	Levene's Test of Variance ANOVA
Correlation between perceived possibility of getting into medical school and Perceived Knowledge about the process of getting into medical school	Spearman's Correlation
Comparison of rural vs urban correlations	Fisher's z-transformation
Longitudinal Knowledge Retention of Urban Group only	Independent Samples T-test

The questions are paraphrased in the table for simplicity. ANOVA was applied when Levene's test indicated that the assumption of homogeneity of variance was met; otherwise, the Mann-Whitney U test was used for comparisons. Fisher's Exact Test was used in cases where the Chi-Square test had expected cell counts below 5.

In the survey, participants identified their perceived barriers to pursuing a career in medicine from a set list, with an open text space to identify "other" barriers (Figure 1). Urban participants most frequently identified concerns about job uncertainty and work-life balance, followed by financial concerns, as barriers to pursuing a career in medicine. Urban participants identified "other" barriers as self-doubt (twice), mental health challenges (twice), and lack of interest. Rural participants identified academic concerns, financial difficulties, and concerns about a career as a physician as their major barriers to pursuing a medical career. Rural participants identified "other" barriers as lack of familiarity with medicine (twice), uncertainty about commitment to pursue medicine, and being of a URiM+ demographic.

Knowledge

Objective measure: Oral quiz. At the rural event, the response rate for the quiz was 100% (20/20) for the pre-camp quiz, and 95% (19/20) for the post-camp quiz. At the urban event, the response rate for the objective quiz was 100% (47/47) for the pre-camp quiz and 98% (46/47) for the post-camp quiz. The statistical results are summarized in Table 2. Rural students performed significantly worse than their urban counterparts on the quiz questions for recalling the Medical College Admission Test (MCAT), residency training, and naming three allied health professions. At both the urban and rural events, participants gained objective knowledge about careers in medicine, as there were significant differences in pre- versus post-event responses for both MMSs for all questions except for naming three physician specialties.

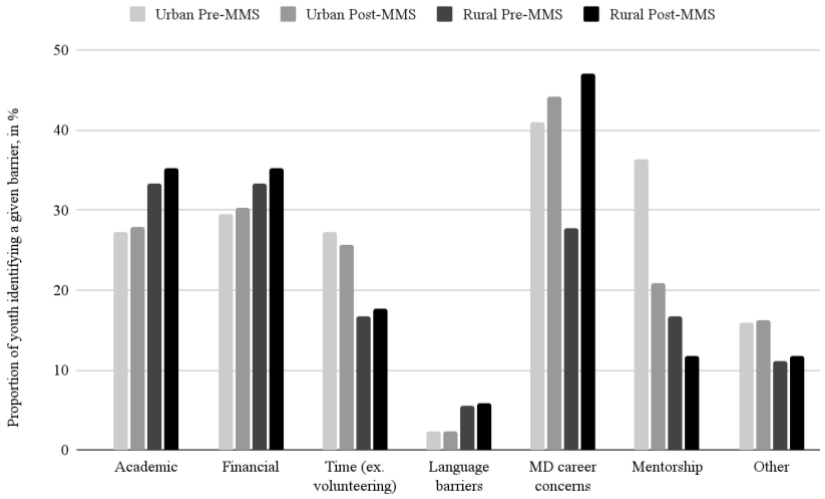

Figure 1. Barriers to becoming a physician.

Youth at the urban and rural events identified their perceived barriers to becoming a physician in the pre- and post-event surveys. Urban participants most frequently identified societal concerns with a medical career, such as work-life balance or job uncertainty. Rural participants identified academic, financial, and medical career concerns most frequently as barriers.

Subjective measure: Self-report survey. At the urban event, 94% (44/47) of participants completed the pre-event survey and 92% (43/47) completed the post-event survey. At the rural event, 90% (18/20) completed the pre-event survey and 85% (17/20) completed the post-event survey.

Knowledge about medicine

There was a significant increase in the participants' perception of knowledge about medicine between pre- and post-event for both rural and urban events. This perceived knowledge about medicine was strongly and significantly correlated to perceived knowledge about how to become a physician.

Mean perceived knowledge about medicine was 4.7/10 (SEM = 0.30) pre-event and 6.6/10 (SEM = 0.26) post-event for the urban session, compared to 4.4/10 (SEM = 0.44) pre-event and 5.9/10 (SEM0 = .42) post-event for the rural session. Levene's test of variance showed no significant difference in responses from urban versus rural participants. There was a significant improvement post-event by two-way ANOVA ($F(1,20.22) = 70.02$, $p < 0.001$).

Mean perceived knowledge about the process of getting into medical school was 3.7/10 (SEM = 0.32) pre-event and 7.3/10 (SEM = 0.22) post-event for the urban session, compared to 3.6/10 (SEM = 0.55) pre-event and 7.8/10 (SEM = 0.40) post-event for the rural session. Levene's test of variance was significant based on the mean ($F(3,118) = 3.32$, $p = 0.022$). As such, the Whitney-Mann U test was used showing a significant difference between pre-event and post-event for urban ($U = 164.00$, $p < 0.001$) and for rural ($U = 28.50$, $p < 0.001$).

In the free text space, several students commented on the success of the program in informing them about this career (Table 4).

Further analysis of the Spearman correlation between self-reported knowledge about medical careers and self-reported knowledge about how to become a physician showed a significant and strong positive relationship in both the urban ($r(87) = 0.67$, $p < 0.001$) and rural ($r(35) = 0.65$, $p < 0.001$) groups. There were no significant differences in the strength of correlations, as assessed by Fisher's z-transformation.

Self-confidence

There was a significant increase in the participants' perception of the possibility of getting into medicine between pre- and post-event for both rural and urban events. This perceived possibility was strongly and significantly correlated to perceived knowledge about how to become a physician.

On the question about how possible they felt it was for them to get into medical school, the mean response was 5.1/10 (SEM = 0.33) pre-event and 6.3/10 (SEM = 0.30) post-event for the urban session; and 4.7/10 (SEM = 0.61) pre-event and 5.4/10 (SEM = 0.67) post-event for the rural session. Levene's test of variance was not significant: a two-way analysis of variance yielded a main effect for the timing ($F(1,23.31) = 4.54$, $p = 0.037$). The main effect of location and the interaction effect were not significant.

An increase in mean self-confidence about the possibility of getting into medical school correlated significantly and strongly with a higher self-reported knowledge of how to become a physician for both the urban ($r(87) = 0.51$, $p < 0.001$) and rural ($r(35) = 0.73$, $p < 0.001$) groups. There were no significant differences between the correlations by Fisher's z-transformation.

Table 4. Select free text responses of MMS participants demonstrating how MMS participation influenced their interest, knowledge, and self-confidence in pursuing a career in medicine.

Response Theme	Select survey response quotations from MMS participants
Interest	"It made me more interested in having a career in medicine"
	"It has taught me many new skills, and has made me more interested in possibly having a career in medicine"
	"Today grew my interest in the medical field and I had so much fun!"
	"I have learned a lot and it has made me very sure that I want to go into the medical field."
	"[…] Before today, I hadn't really considered becoming a doctor or a nurse […] this camp has [just] reinforced my want to work in a hospital, doctor or not."
Knowledge	"[…] all of my career choices require medical school and I didn't know that before […]"
	"It has made me more aware of possible medical careers"
	"It has helped me expand my knowledge about the medical field"
	"I understand more about how ultrasounds work and how to do sutures. As well as I know more about what the doctors are doing in checkups."
	"It has given me knowledge on careers I didn't consider or know were an option before"
	"I learned so much about medicine, how to get in med school and the process of becoming a doctor."
	"Expanded my knowledge on the process of the medical field after high school"
Self Confidence	"[It] made med school seem more approachable"
	"It has given me the opportunity to try hands-on activities and talk to students going through medical school."
	"I learned about stuff and how to do things I couldn't do yesterday which is pretty cool"

In the free text space of the survey, several youth participants described the MMS program's success in providing them with access to mentorship and clinical skills acquisition as proxies for increased confidence (Table 4).

Interest

Gains in interest in a medical career did not achieve statistical significance, and there was no significant difference between rural and urban groups. Mean interest in becoming a physician was 6.0/10 (SEM = 0.39) pre-event and 6.8/10 (SEM = 0.36) post-event for the urban event, and 5.0/10 (SEM = 0.74) pre-event and 5.4/10 (SEM = 0.85) post-event for the urban event.

Several participants did voluntarily report their newfound interest in this career in the free text space (Table 4).

Longitudinal data

Six months after the event, a subset of participants retained their higher confidence and perceived knowledge about the career of medicine, but they significantly decreased in their perceived knowledge about how to become a physician.

Twenty-four (of 50) participants from the urban event provided their contact information for consent for follow-up. At the six-month mark post-event, these youth received an email containing a follow-up survey link and an invitation to repeat the objective quiz via Zoom Communications. Unfortunately, no students opted to participate in the follow-up quiz, so objective knowledge data was not assessed longitudinally. Six urban event participants responded to the six-month follow-up survey. Their mean perceived knowledge about the career of medicine was 6.7/10 (SEM = 1.03), compared to 6.6/10 (SEM = 0.04) immediately after the event. This is not statistically significant ($t(47) = 0.12$, $p = 0.91$). Similarly, their mean perceived knowledge about how to become a physician was 5.8/10 (SEM = 1.60), compared to 7.3/10 (SEM = 0.03) immediately post-event. This is statistically significant ($t(47) = 2.32$, $p = 0.025$). The mean sense of self-efficacy was 6.8/10 (SEM = 1.47), similar to 6.28/10 (SEM = 0.05) immediately post-event. This is not statistically significant ($t(47) = -0.66$, $p = 0.51$). Finally, the mean interest in medicine was 7.0/10 (SEM = 2.5), compared to 6.8/10 (SEM = 0.055) immediately after the event. This is not statistically significant ($t(47) = -0.23$, $p = 0.82$). The rural participants were not invited for follow-up given logistical barriers to securing contact information, which is a limitation to the longitudinal findings.

Discussion

We piloted a single-day MMS and used an SCCT lens in our evaluation of this program's ability to encourage participants to envision their potential for a career in medicine. Our MMS successfully increased participants' self-confidence and objective and subjective knowledge about pursuing a career in medicine, which are critical aspects underlying SCCT.

Unlike most other MMS programs, this event did not select for participants with a pre-existing interest in pursuing a medical career, although we acknowledge that some participants had a pre-existing interest in medicine given the relatively high pre-camp interest scores. This enabled us to identify MMS factors that contributed to SCCT-related outcomes for our participants because these participants did not already see themselves as potential physicians. In both the rural and urban events, the URiM+ identities were similar, encompassing those from low SES, female or gender-diverse identities, underrepresented racial/ethnic groups, and, most prominently, those lacking social capital – defined in our study as participants with no family members in medicine. The key difference between the groups was the geographic barriers associated with being rural versus urban. As a result, our findings should be more generalizable for designing MMS programs for outreach to URiM+ groups to inspire them to consider careers in healthcare.

Six months after the MMS, a subset of participants reported higher knowledge scores about the career in medicine and higher confidence in the possibility that they could pursue this career, but their gains in perceived knowledge about how to become a physician were lost. This suggests that effective MMS programs should consider incorporating a longitudinal element, such as mentorship or secondary events, to maintain participants' benefits from attending the MMS as illustrated by SCCT.[15] We recommend a follow-up study with a robust design to assess long-term knowledge retention.

Another important aspect of SCCT is self-efficacy. Classically, self-efficacy is defined as a task-specific self-belief that is influenced by mastery.[28,30,34] Both the urban and rural events included hands-on experiences including suturing, physical exams, and ultrasound. Although not directly measured in terms of mastery, participants were able to imitate and replicate these tasks. Some participants commented that they learned new clinical skills (Table 4). These comments reflect the initial stages of skill acquisition. According to SCCT, the mastery of tasks fosters

confidence in one's abilities. Over time, as participants continue to practice and refine these skills, they will develop a stronger belief in their capacity to perform them, which can positively influence their career choices and pursuit of medicine.

Despite gains in knowledge and self-confidence, our data did not show statistically significant gains in interest in a career in medicine. According to SCCT, interest in a career is influenced by self-efficacy and outcome expectations, both of which are shaped by learning experiences.[28,30] Knowledge and self-confidence can, in theory, reduce the impact of barriers, such as financial, gender, racial challenges or the lack of social capital.[23,30–32] Interestingly, the data we collected presented a strong and significant correlation between participants' knowledge of the medical career *pathway* and their interest in medicine. This correlation suggests that knowledge of and self-confidence in the process could be key factors in increasing interest over time.

Select participant comments illustrate this point, stating that their career goals required medical degrees or the reinforcement of their desire to work in a hospital (Table 4). These statements reflect the role of outcome expectations in shaping interest, as described in SCCT.[28,30] While we did not find an increase in interest as an immediate result of these single day MMS events, participants did demonstrate increased knowledge and self-confidence. This finding adds to our understanding of what parts of this MMS format worked - and what did not - and will allow us to make evidence-guided improvements in future. On a practical level, our findings highlight that in designing or refining pathway programs, it is important to incorporate curricular elements that could contribute to changes in participants' understanding and thinking about medicine as a career. In this study, we found that instructing participants about the process of getting into medical school and engaging youth in hands-on clinical skills increased their knowledge and self-confidence. However, this study further demonstrated that an individual learning experience, such as an MMS program, is insufficient at changing interest long-term on its own but could serve as an important component within a larger pathway program.

There are limitations to this study, including the fact that we included only one MMS program (albeit with both a rural and urban component). This study also had limited longitudinal data to track trends in participants' long-term retention of knowledge and self-efficacy and to appreciate if gains in interest might eventually reach statistical significance, as predicted by SCCT. Additionally, as this was a pilot project, the overall sample sizes were small, particularly for the rural event, which reduced the statistical power of our tests. It is important to note that these findings may not be fully generalizable to all URiM+ groups, particularly for male-identifying students with intersecting identities, or for rural communities with differing demographic factors, such as socioeconomic status. Similar studies may create a more robust URiM+ participant selection and explore similar programming across other geographic regions and participant groups.

Future directions for this MMS initiative aim to target the our study limitations. From the 2023 Asclepius summer camp onward, contact information for attendees was collected with informed consent with permission to contact participants in the future for longitudinal data.

The authors of this study look forward to future applications of Asclepius Medical Camp for Youth to increase inspiration and knowledge in underrepresented youth to pursue a medical career, thereby contributing to the multifaceted strategies required to increase diversity in medicine.

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Appendix A. Subjective survey questions, timing of questions and possible responses.

Survey Questions	Timing	Response Options
The University of Alberta has identified three groups that face institutional barriers to careers in medicine and are thus underrepresented in medical school: Black, Indigenous, and Filipino. Do you self-identify as belonging to one of these three groups?	Pre-Event Post-Event	☐ Yes ☐ No
This camp is aimed for students that are facing barriers (socioeconomic or otherwise) to entering medical school or a career in medicine. Are you a part of this population of students?	Pre-Event Post-Event	☐ Yes ☐ No
Are any of your family members a physician?	Pre-Event Post-Event	☐ Yes ☐ No
On a scale of 1 to 10, how much do you know about the field of medicine?	Pre-Event Post-Event	Likert Scale 1-10
On a scale of 1 to 10, how possible do you think it is for you to get into medical school?	Pre-Event Post-Event	Likert Scale 1-10
On a scale of 1-10, how much do you know about the process of getting into medical school?	Pre-Event Post-Event	Likert Scale 1-10
On a scale of 1-10, how interested are you in going to medical school?	Pre-Event Post-Event	Likert Scale 1-10
Would you consider a career in rural medicine?	Pre-Event Post-Event	☐ Yes ☐ No
This camp targets populations that are facing barriers for getting into medical school or entering a medical career. Please answer the following questions about potential barriers you face. What do you think will be your biggest obstacle(s) in getting into medical school? Check all that apply.	Pre-Event Post-Event	☐ Lack of academic resources for achieving competitive grades ☐ Lack of financial resources ☐ Lack of time for activities such as volunteering ☐ Language barriers for the interview ☐ Societal barriers such as work-life balance concerns or job uncertainty in medicine ☐ Inadequate guidance and mentoring ☐ Other: (Free Text)
Do you feel like your financial situation is preventing you from entering medical school?	Pre-Event Post-Event	☐ Yes ☐ No
On a scale of 1-10, how much does this camp pull you towards serving disadvantaged minorities in your future career?	Post-Event	Likert Scale 1-10
How has participation at this camp affected you?	Post-Event	(Free Text)
In the future, we may wish to follow up with you in relation to this research project. Would you grant permission for us to collect your name and non-school email for the purpose of conducting follow-up communication? If you select 'yes', you will be taken to a separate survey to leave your name and email address. This way, your name is not associated in any way with your answers to this questionnaire.	Post-Event	☐ Yes ☐ No