



(RESEARCH ARTICLE)



MENTORING STUDENTS IN A PRE-MEDICAL CAREER: A MIXED-METHODS EDUCATIONAL CASE STUDY UTILIZING THE KIRKPATRICK MODEL OF EDUCATIONAL EVALUATION

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ABSTRACT

The evaluation and impact of mentorship in pre-medical education have long been hypothesized as distinct pillars of student success in healthcare. However, student perceptions and long-term outcomes are not yet fully understood, requiring rigorous and lengthy examination to truly determine effectiveness. Despite this gap, numerous current publications showcase positive shifts in student behavior and attitudes toward pursuing medical careers following the establishment of student-mentor relationships.

We present a mixed-methods case study that evaluates student perceptions and tracks outcomes following a medical career exposure event. Out of 319 total attendees, a convenience sample of 85 students (26.6%) completed a comprehensive post-event evaluation measuring satisfaction and career intent. Due to institutional privacy restrictions preventing longitudinal tracking via the registrar database for the entire cohort, long-term career tracking was restricted to a subset of confirmed respondents (n = 2-5) to provide a descriptive proof-of-concept for pipeline retention.

Keywords: Pre-Medical Education, Healthcare Career, Underserved Students, Medical Career

1 INTRODUCTION

Throughout many generations, training and mentorship of medical students and residents have proven to be a great success in terms of outcomes and future career outlooks. However, there is limited literature available that showcases

how early mentorship of pre-medical students in the healthcare field impacts the long run. Healthcare as a discipline is already complex and navigating it later during your career could be challenging and sometimes even frustrating, if mentorship is not identified early in the career. There are running stigmas that exist in academia on how each medical or healthcare student should look like, behave, and even perform to be widely accepted by the society of medical professionals.[1] Therefore, many students find it intimidating or uncomfortable to approach certain specialties by not fully grasping or understanding of what it entails to succeed. This could be further exacerbated by families who live in underrepresented or underserved areas due to their economic disadvantage or simply a lack of role models who could guide them through it. So, choosing a specialty in the medical field or at least being exposed to it, allows students, especially in high-school age, to decide if a certain area of medicine appeals to them or not.

In the American educational system, exposure to mentorship and career is currently present; however, it's not widely utilized by the professionals who are already in the field. This could be due to a lack of engagement by specialists with high school students, or to schools not being aware of available resources that could be utilized. This led many American youth to lack true role-model leadership that could guide and develop the valuable skills they would need. One of the largest national studies conducted by Mentor found that more than 1 in 3 young adults grew up without a mentor to guide them in career and life choices. This gap was further widened by the drop in mentorship from 66% to 60% in the years 2013 to 2022. [2] The decrease is partially attributable to the COVID-19 pandemic. Widespread closures of educational institutions, extracurricular activities, community events, and structured mentoring programs severely limited youth opportunities to establish mentor-mentee relationships over extended durations. While COVID-19 seems like a thing of the past, many educational institutions are still struggling to get back to the normal levels of education and mentorship throughout the nation; as progress in the achievement of certain academic tasks has been abandoned or interrupted, or simply due to financial cuts in educational programs nationwide. As the world itself is continually working to improve all-inclusive education, especially for underserved students, it's becoming very important to find the model that works well and delivers results on demand.

In one of the recent studies conducted by the Institute of Education in Xiamen, China has proven that early exposure to the career positively predicted learning engagement and self-efficacy in outcome expectations. [3] By the end of the program, students in this particular institution showcased a favorable attitude towards their career goals and knew what to expect moving forward. In comparison to the entire world, China has one of the most competitive and strictly merit-based admission criteria to higher education; therefore, this example of a career prediction model in pre-undergraduate students could be an excellent role model to follow for the rest of the world. Understanding how each student learns is a vital part of their educational development, especially since their approach is highly influenced by their surroundings.[4]

Objective

To understand and evaluate the efficacy of pre-medical career mentorship in underserved high school students.

2 METHODS

This study employed a mixed-method approach by utilizing a Kirkpatrick Model as a criterion for judgment of the outcome in pre-medical field mentorship. Authors developed a pilot project program that involved underserved high-school students who were identified as either under-performers or those lacking mentorship by their respective schools. The criteria for selecting students were as follows:

- Absence of mentorship.
- Failed class.
- Dropout due to financial or family issues.
- Prolonged absence in the school year.
- General lack of interest in further education.

Since the year of 2019 we've been actively involved in local schools of New York City to provide the program that will allow underserved high-school students to get a first-hand experience with medical fields such as Emergency Medical Technicians (EMT), Internal Medicine (IM), Medical Assistance (MA), Dentistry, Nursing, Radiology (Rad), Veterinary (Vet), CPR, First Aid, Sexual Health Education, Pathway to Medicine, Professionalism and Leadership.

At the beginning of each session, the written attendance was confirmed by instructors and data captured in our system. After each successful educational session, the written satisfaction survey was distributed and filled out by students. The satisfaction survey was voluntarily filled out, omitting the names of students; therefore, only a limited number of surveys are available to report. The current number of filled surveys stands at n=85.

After capturing the quantitative and qualitative data, the 4-level evaluation criteria were deployed:

- **Reaction** - participants' satisfaction and engagement by utilizing a Likert scale of 1-5 for quantitative data and an open-ended survey for qualitative data capture.
- **Learning** - knowledge and skill acquisition followed by technical questions and answers; self-assessments in instructor taught procedures.
- **Behavior** - application in practice. Observation checklist of learned material and encouragement of new skills within study groups.
- **Results** - active participation in final tasks and inspiration to proceed further. The final feedback, where available, on further persuasion of healthcare careers by participating students.

2.1 Study Design

Our data was gathered in the form of a qualitative survey and attendance confirmation count (quantitative) for the last 6 years (2019-2025); with limited follow-up cases that have become successful upon graduation. Due to institutional privacies and geomobility of NYC residents [5], the longitudinal registrar of long-term success was restricted, unless it was directly reported by graduating students from the program.

A total of 319 high-school students took part in our program from 2019 to 2025 (Table 1). Out of 319 students, the largest attendant class was on Pathway to Medicine which counted (62 students), followed by Sexual Health (60), EMT (34), CPR/First Aid (32), Simple First Aid (24), Internal Medicine (24), Medical Assistant (18), Veterinary Technologist (18), Dental Hygiene (17), Radiology (12), CPR/AED Usage (12), and Pathways to Medicine (6).

Table 1: Breakdown of classes and participating students.

Name of the Class	Abbreviations	Student Count
CPR/AED		12
First Aid	FA	24
CPR/First Aid		32
Emergency Medical Technician	EMT	34
Internal Medicine	IM	24
Medical Assistant	MA	18
Dental Hygiene	DH	17
Pathways to Medicine	PM	62
Professionalism & Leadership	PL	6
Radiology	Rad	12
Sexual Health	SH	60
Veterinary Technician	Vet	18
Total Students		319

Further, the basic statistical formulas were executed to find out the proportion ratio of females and males (Table 2). After basic statistical calculation, our data was analyzed through SPSS 21, using paired t-test.

The total number of satisfactory responses was N=85. Male to Female Ratio (M:F): 135:184 = 0.73, Female to Male Ratio (F:M): 184:135 = 1.36, Male Proportion: 135:319 = 42.3%, Female Proportion: 184:319 = 57.7%.

Table 2: Statistical data on participation

Females to Males Ratio	1.36:1	1.3630
Average Participants Per Group	319/12	26.58
Total Females	57.68%	184
Total Males	42.32%	135

After each successful session, a voluntary satisfaction survey was deployed to participating students in order to gather their feedback and further interest in medicine. Out of 319 students, only 85 decided to participate in voluntary feedback.

The following questions were asked of participants to get qualitative data on their performance (Table 3):

- How satisfied were you with learning about health topics in the series? (Scale 1 to 5)
- How helpful was the series in helping you decide on a career journey? (Scale 1 to 5)
- Did any of the workshops make you interested in a particular health field? If so, which career path are you considering? (Open text answer)
- How satisfied were you with logistics? (Scale 1 to 5)
- Which workshops did you find the most interesting? Pick three.
- What was your least favorite workshop? (Open text answer)
- Any feedback or suggestions? (Open text answer)

Table 3: Survey Results

Total	Learning Satisfaction Mean	Career Helpfulness Mean
85	4.024	3.553

2.2 Combined Statistical method

A paired-samples t-test was conducted to determine if there was a significant difference between participants' Learning Satisfaction and Career Helpfulness ratings. Results indicated that mean Learning Satisfaction ($M=4.02$, $SD=0.92$) was significantly higher than mean Career Helpfulness ($M=3.55$, $SD=1.21$), $t(84)=3.81$, $p<.001$, $d=0.41$. The results are showcased in (table 4) and (table 5) respectively.

Table 4: Statistical paired comparison.

Variable	N	Min	Max	Mean (M)	Std. Deviation (SD)
Learning Satisfaction	85	1	5	4.02	0.92
Career Helpfulness	85	1	5	3.55	1.21

Table 5: Paired-Samples T-Test Results

Comparison	Mean Diff. (D⁺)	95% CI of the Diff.	t	df	p	Cohen's d
Learning Satisfaction – Career Helpfulness	0.47	[0.22, 0.72]	3.81	84	< .001	0.41

2.3 Educational Intervention

Each class consisted of medical professionals in their respected field to bring first-hand experience to the targeted high school students. Every session had an introduction and a quick bio of the instructor, followed by hands-on practice of common procedures, student hands-on practice, and post-follow-up question-and-answer sessions. The length of the average program was between 7 and 8 weeks, each being a 2-hour session.

All students are given the freedom to elect the class of their interest and the time of attendance. Upon completion of the chosen workshop, the students were awarded the certificate of completion provided by Complete Health Ventures. This graduation ceremony allowed students and instructors to cement their mentorship relationship and answer any additional questions they might have.

2.4 Kirkpatrick's Method assessment

Our evaluation demonstrates positive outcomes at Kirkpatrick Levels 1 and, to a limited extent, Level 2. Participants expressed high satisfaction with the learning experience and reported favorable perceptions of knowledge acquisition. The statistically significant difference between learning satisfaction and perceived career helpfulness suggests that while the training was educationally effective, greater emphasis on career relevance may enhance participants' perceptions of program value. Due to no follow-up behavioral or organizational outcome data being possible to collect, the evaluation cannot draw conclusions regarding Levels 3 and 4 of the Kirkpatrick model. Future evaluations should incorporate post-training workplace assessments and long-term outcome measures to provide a comprehensive evaluation of training effectiveness.

3 RESULTS

This interventional study was conducted with 319 high school students from New York City public schools. The cohort comprised 184 females (57.68%) and 135 males (42.32%), with an average of 26 students participating per workshop. Of all the sessions offered, the class with the highest enrollment was "Pathway to Medicine" (n=62). Analyzing data gathered over the past six years, we demonstrated high learning satisfaction regarding early pre-medical career exposure workshops ($M=4.02$, $SD=0.92$), representing Level I of Kirkpatrick's Four-Level Training Evaluation Model. Additionally, instructors noted a strong eagerness among students to participate in hands-on, post-lecture exercises, aligned with Kirkpatrick's Level II (learning). These findings suggest that early intervention through mentorship and career guidance positively shapes attitudes toward the medical field. While further follow-up evaluation is still required at Levels III and IV (behavior and results), this study serves as a foundational milestone, demonstrating positive outcomes among underserved NYC high school students seeking mentorship in healthcare and career readiness.

4 DISCUSSION

The preparation of the next generation of healthcare leaders requires a very flexible approach. One-size-fits-all is no longer suitable and requires adjustments in the style of education, especially in geographically diverse cities such as New York City, where many nationalities are mixed among each other. The modern high school students are uniquely positioned before entering young adult life - and we believe that intervention made exactly at this point will make a positive impact on further career development. As it was recently noted nationwide that a shortage of healthcare professionals is imminent and we need to be proactive in bridging the gap for further prosperity, it is our role to prepare competent and motivated healthcare professionals who can truly change and save lives. [6]

In this research, we demonstrated a positive learning satisfaction as a stepping stone of Level 1 of the Kirkpatrick model that can further deepen the desire of high-school students to participate in the healthcare career. Early mentorship has been and will be the cornerstone of professional relationships and further success of any individual if it's implemented early in their career. A friendly yet professional approach to mentorship of the younger generation will serve as further involvement in the community and positive achievements in life. [7]

4.1 Limitations

Due to institutional privacy policies barring full-cohort longitudinal tracking through registrar records, long-term career tracking was limited to a small respondent subset. Accordingly, these tracking data serve strictly as a descriptive proof-of-concept for pipeline retention.

5 CONCLUSION

In conclusion, healthcare and medical education require a diverse yet inclusive approach to attracting the younger generation. Proactive mentorship and early exposure to various specialties—particularly during pre-undergraduate years—can effectively inspire youth to pursue medical careers and help address the ongoing healthcare workforce shortage. For urban high school students navigating career choices, having a dedicated mentor can make a deeply engaging and impactful difference.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript.

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