



Propelling Adolescents Toward Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine

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Propelling Adolescents Toward Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine

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Abstract

Despite the growing diversity of the United States population, individuals from many racial and ethnic minority groups and low-income families continue to be underrepresented in the health professions. A diverse healthcare workforce would improve cultural competency and create a system better suited to address the vast health disparities in many disadvantaged communities, yet the current educational pipeline needs to expand opportunities to provide students traditionally underrepresented in medicine (UIM) a path to become a part of the healthcare field. The Propelling Adolescents Towards Careers in Healthcare (PATCH) program was founded to address this gap in the current health professions pipeline to ensure that UIM and economically disadvantaged students in Charlotte, North Carolina have an equal opportunity to pursue a career in healthcare. The PATCH program brings high schoolers from local low-income schools to the hospital every Saturday for 8 weeks, where medical student leaders plan and execute hands-on clinical training activities, simulation experiences, shadowing, one-on-one mentorship, and public health research projects for the scholars. 123 PATCH scholars have completed the program since its inception in 2015, and the overwhelming majority of those surveyed after the program indicated that they planned to attend health professional school and later return to their communities to improve the opportunities and resources there to promote good health. Through the program, the scholars are exposed to medical professions in a way that will not only benefit their career trajectories but ultimately increase the diversity of the healthcare workforce and reduce health disparities of future populations.

Keywords

pipeline program; populations underrepresented in medicine; diverse workforce; medical student leadership

Cover Page Footnote

Maggie Brownrigg, Sagar Patel, Radhika Ghodasara, and Banks Kooken drafted the manuscript and collected data for this study. Kyle Roedersheimer and Melissa Wooten, founders of PATCH, established and implemented curriculum for this program. Iris Cheng supervised, drafted, and finalized manuscript revisions. The authors wish to thank Gary Beck Dallaghan PhD for providing feedback and constructive criticism of manuscript.

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1 Propelling Adolescents Towards Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine
Brown et al.



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ABSTRACT

Despite the growing diversity of the United States population, individuals from many racial and ethnic minorities and low-income families continue to be underrepresented in the health professions. A diverse healthcare workforce would improve cultural competency and create a system better suited to address the vast health disparities in many disadvantaged communities, yet the current educational pipeline needs to expand opportunities to provide students traditionally underrepresented in medicine (UIM) a path to become a part of the healthcare field. The Propelling Adolescents Towards Careers in Healthcare (PATCH) program was founded to address this gap in the current health professions pipeline to ensure that UIM and economically disadvantaged students in Charlotte, North Carolina have an equal opportunity to pursue a career in healthcare. The PATCH program brings high schoolers from local low-income schools to the hospital every Saturday for 8 weeks, where medical student leaders plan and execute hands-on clinical training activities, simulation experiences, shadowing, one-on-one mentorship, and public health research projects for the scholars. 123 PATCH scholars have completed the program since its inception in 2015, and the overwhelming majority of those surveyed after the program indicated that they planned to attend health professional school and later return to their communities to improve the opportunities and resources there to promote good health. Through the program, the scholars are exposed to medical professions in a way that will not only benefit their career trajectories but ultimately increase the diversity of the healthcare workforce and reduce health disparities of future populations.

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2 Propelling Adolescents Towards Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine Brown et al.

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INTRODUCTION

Despite the population growing ever more diverse, racial and ethnic minority groups continue to be underrepresented in higher education and healthcare. In 2017, only 12.2% of Latinos and 15.1% of African-Americans obtained four-year college degrees compared to 23.8% of non-Hispanic Caucasians (United States Census Bureau, 2017). Although approximately one-third of the United States (US) population is African-American and Latino, these groups represent 20% of healthcare professionals and only 15% of physicians (United States Department of Labor, 2019). Beyond providing opportunity for these groups, a diverse healthcare workforce has many other beneficial implications, such as increasing access to high-quality, culturally appropriate healthcare services and advancing cultural competency (Dreachslin et al, 2007). Recent evidence suggests that if more black patients were treated by black doctors, the black-white male life expectancy gap would be significantly reduced (Alsan et al, 2019), yet the low number of doctors of color impedes this type of progress.

Enrichment and pipeline programs targeting groups underrepresented in medicine (UIM) have been developed to increase the diversity of the healthcare workforce (Danner et al, 2016). Successful programs like the Stanford Medical Youth Science Program (SMYSP) and MERIT Health Leadership Academy at Johns Hopkins (MERIT) have demonstrated a positive impact on students' confidence in professional settings and their commitment to a career in healthcare (Winkleby, 2007 and Johns Hopkins Medicine, 2018). Other programs exist to support pre-medical students currently enrolled in college to gain competency in interviewing skills, testing confidence, professionalism, and knowledge of health disparities, but no such programs target minority students from high need schools in Charlotte, North Carolina (Fritz et al, 2016).

In the Charlotte Mecklenburg School (CMS) system in 2018, 92.9% of Caucasians graduated from high school, compared to 84.4% of African-Americans and 73.7% of Latinos. Based on CMS's college and career readiness data extrapolated from students' academic performance, 81% of Caucasian students were predicted to be college prepared compared to 38% of African American students and 40% of Latino students (Charlotte Mecklenburg School System, 2018). A recent initiative led by Atrium Health and the University of North Carolina's Gillings School of Global Public Health demonstrated significant geographic overlap of Charlotte's impoverished communities with its Black and Latino populations (Atrium Health, 2019). These starkly segregated regions also house nearly all of CMS's Title I designated schools which receive federal funds on the basis of having the highest student concentrations of poverty. The socioeconomic segregation reflected in Charlotte's public schools serves as a formidable barrier for students in their efforts to achieve academic success and access higher educational opportunities.

INTERVENTION

Three medical students who were former Title I schoolteachers developed Propelling Adolescents Towards Careers in Healthcare (PATCH) in 2015 at Carolinas Medical Center (CMC) in Charlotte, North Carolina. The former educators recognized the systemic barriers that minority students faced, limiting their access to the educational and professional opportunities necessary to

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3 Propelling Adolescents Towards Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine Brown et al.

achieve their career goals. The mission of PATCH is to provide Charlotte's underserved students with an equal opportunity to pursue a career in healthcare, ultimately producing a more diverse healthcare workforce and reducing health disparities in Charlotte's urban communities. The aim of this paper is to describe this innovative program which was conceived, implemented and continues to be sustained entirely by medical student volunteers.

Recruitment, Eligibility, and Selection

PATCH applicants were recruited for the program during their sophomore year of high school. Eligibility criteria included: 1) attendance at a CMS Title I high school or 2) qualification for the National School Lunch program, a proxy for low socioeconomic status. Recruitment involved visiting Title I high schools and coordinating with school faculty to publicize the opportunity to students. Workshops familiarizing students with the application and introducing elements of the program were conducted to encourage student interest in the program. The application consisted of short essays regarding the applicants' interest in both the PATCH program and the healthcare field, in addition to school transcripts and a space to explain any low grades, failed classes, or extenuating circumstances. Students were required to submit one teacher evaluation, asking teachers to rate students on academic effort, interaction with peers, respect for faculty, leadership capability, initiative, and maturity. Over the past five years, PATCH has received between 60 and 110 applications in each cycle.

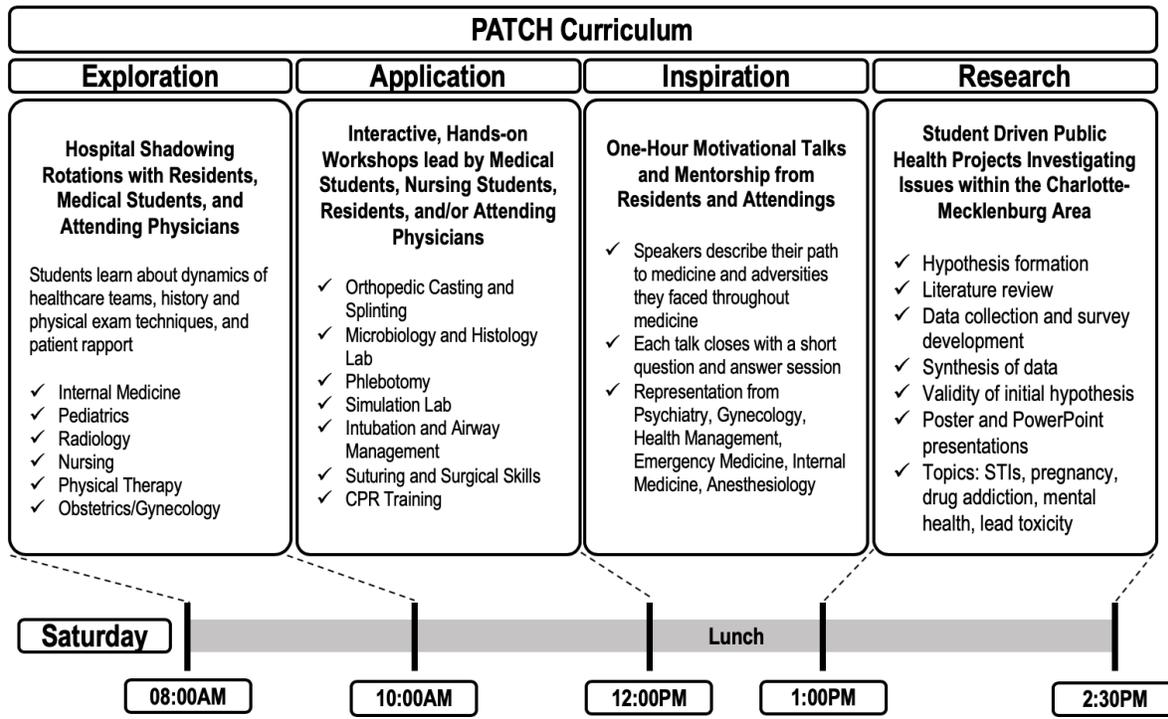
Applications were evaluated with standardized rubrics, with components including curiosity in healthcare careers, resiliency during hardships, academic performance, and character. Priority was given to students attending Title I high schools, males (as the applicant pool is dominated by female students), and students with limited health science exposure. Approximately 40 to 50 students were selected for a campus visit where students rotated through standardized interviews with multiple assessors that explore the students' background, experiences, exposure to healthcare, and motivation. During the interview day, applicants also had the opportunity to learn clinical skills and engage with former PATCH alumni about their experiences with the program. From these interviews, 25-30 applicants were selected in each cohort.

Curriculum and Planning

The PATCH program was held at Carolinas Medical Center, the flagship hospital of Atrium Health, and was free of charge to participants. Funding was provided by the University of North Carolina (UNC) School of Medicine, Atrium Health, and in-kind donations with an annual budget of less than \$5,000. All program leaders and volunteers were unpaid and associated with UNC School of Medicine, and the healthcare professionals who contributed to the sessions within the program donated their time from various medical and dental residency programs within Atrium Health. During the latter part of their sophomore year, PATCH scholars took part in an eight-week curriculum held on consecutive Saturdays. Figure 1 depicts an overview of the daily curriculum.

4 Propelling Adolescents Towards Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine
Brown et al.

Figure 1. Overview of the PATCH curriculum including exploration, application, inspiration, and research components with an example of a typical Saturday schedule.



In the mornings, scholars rotated through shadowing groups, then participated in interactive workshops where they practiced a wide range of hands-on medical skills. Following the workshops, scholars were provided lunch with scheduled time to engage with UIM healthcare professionals who shared their personal journeys and challenges, exposing the scholars to different healthcare fields and increasing their social capital. In the afternoons, the scholars worked in teams with students from other high schools to develop and implement survey-based public health projects to understand healthcare disparities and issues in their own communities. Medical students guided them through the stages of the research process as scholars investigated topics and collected their own data through electronic surveys. Scholars analyzed and discussed data, formulated innovative solutions to selected public health problems, and improve their public speaking skills. Research groups shared oral presentations and research posters at the PATCH closing ceremony in front of audiences of 70-150 family, friends, and supporters of the PATCH program.

After completing the sophomore curriculum, scholars could opt into an ACT preparation workshop as juniors to review test-taking strategies and content material from an expert tutor. During their senior year, scholars were offered college guidance workshops that were led by a professional college guidance counselor who assisted in refining college essays, guiding college selection and applying for financial aid. Other sessions focused on professionalism and personal finance coaching. The tutors were given a small honorarium, but their work was primarily on a volunteer basis.

RESULTS

Recruitment Outcomes

Since 2015, 123 high school students have participated in PATCH with a 100% completion rate. Figure 2 shows the demographic characteristics of PATCH scholars. Nearly half of our alumni attended a Title I high school, and the remaining scholars were enrolled in local magnet or charter schools but qualified for the program due to participation in the National School Lunch Program.

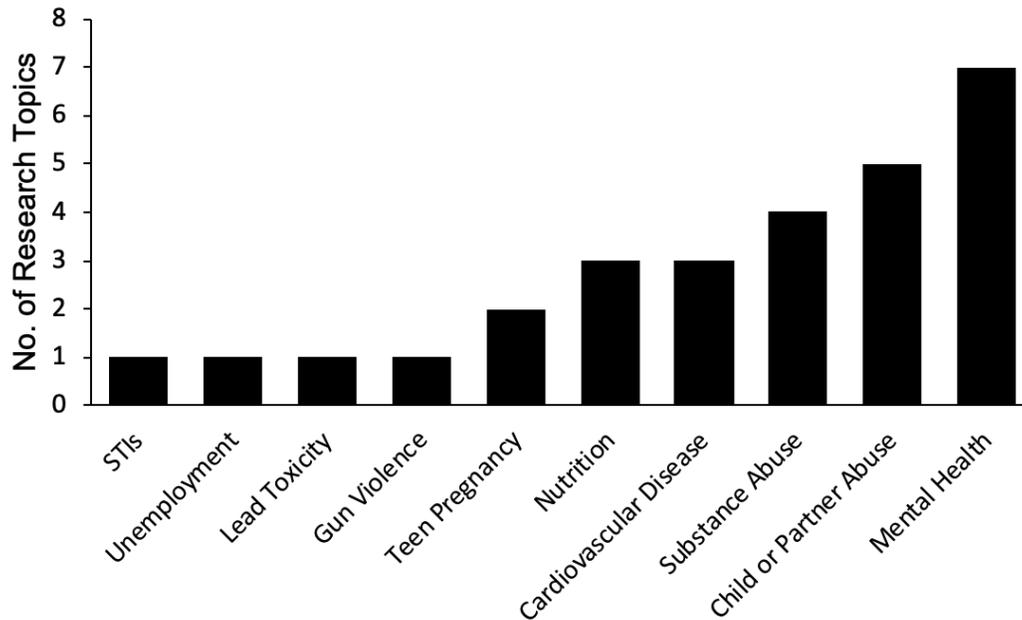
Figure 2. Demographic Information for PATCH Scholars

Characteristics (N=123)	No. (%)
Gender	
Male	22 (17.9)
Female	101 (82.1)
Race/Ethnicity	
African American or Black	74 (60.2)
Latino	25 (20.3)
White, non-Latino	3 (2.4)
Asian or Middle Eastern	16 (13.0)
Unknown	5 (4.1)

Public Health Research Outcomes

For the assigned research project, the groups of scholars chose their own topic, and each year they gravitated towards meaningful and timely public health research areas that resonated with them. The topics chosen elucidated the concerns the adolescents had about the health of the community, and although each cohort of scholars had unique investigative questions, many fell into similar categories. The categories of topics that student groups chose to research are demonstrated in Figure 3.

Figure 3. Distribution of Public Health Research Projects Completed by Teams of PATCH Scholars over 5 years.



College and Career Trajectory Outcomes

In the most recent two cohorts (2019 and 2020), a post-program survey was distributed which 43 of the 57 students completed (75%). Of those scholars, 95% indicated they planned to attend health professional school in the future and 98% said they would ultimately choose to return to their communities to improve resources and opportunities for healthcare. All of the students responded that PATCH made them “feel more confident in their interest in pursuing medicine.”

Based on scholar-reported scores of the 28 juniors who elected to participate in the ACT Preparation course over the past 5 years, there was an average score increase of 2.11 points (out of 36 total) compared to scores on the Pre-ACT taken in the school year prior. The most-improved student increased their score by 7 points, and the standard deviation of growth scores was 2.50 points.

As of Spring 2020, 66 PATCH alumni have completed their fourth year of high school, and of the 45 that have remained in contact, 91% indicate they still plan to pursue a career in health care. Scholars shared their continued intentions to pursue paths to become anesthesiologists, obstetricians, nurse practitioners, public health policy analysts, nurses, physical and occupational therapists, and CEOs of hospital systems. The first PATCH scholars will be graduating from college in 2021, and many had success obtaining college acceptance and financial aid. Among them were students who have received partial and full scholarships to competitive universities including Duke University, University of North Carolina at Chapel Hill, and University of Pennsylvania. In recent years, three PATCH scholarships were awarded through funding by a private donor. Figure 4 depicts the educational successes of PATCH alumni as well as their future career intentions. 40 of the 45 students (89%) attended 4-year universities, four attended 2-year institutions, and one enlisted in the military. Follow-up time was 5-years with 21 scholars who graduated high school lost to follow up.

Figure 4. College and Career Trajectory for PATCH Students

College Trajectory (N=66)	No. (%)
Type of College	
4-year University	40 (60.6)
2-year University	4 (6.1)
Military	1 (1.5)
Unknown	21 (31.8)
Post-Undergraduate Career Intention	
Physician	20 (30.3)
Nurse/Nurse Practitioner	10 (15.2)
Other Healthcare Field	9 (13.6)
Other/Undecided	6 (9.1)
Unknown	21 (31.8)

DISCUSSION

Increasing opportunities for disadvantaged students to pursue healthcare careers is a complex undertaking and requires a multifaceted approach. The PATCH program is unique compared to other successful pipeline programs in the way it combined multiple aspects of exposure to healthcare fields, providing extensive clinical experience, incorporating longitudinal mentoring during grades 10 through 12, and offering an opportunity to conduct original scientific research (Winkleby, 2007). For many students, the public health research presentation was their first time completing a project of this caliber, and they were able to gain proficiency in public health research while simultaneously reflecting on the way health disparities may impact their own communities. The scholars shared personal experiences about battling mental and physical illnesses, overcoming family adversity during sickness, and growing up in minority and immigrant families. The compelling and relevant presentations have proven to educate the providers, students, leaders, and community members in the audience about pressing public health issues as much as they have taught the students about the principles of research. Through completion of these innovative public health research projects, scholars have demonstrated their understanding of population health disparities, hypothesis-driven research, methodology implementation, and data interpretation; all serve as critical skills for future healthcare professionals.

Further, the programming was developed specifically for disadvantaged students and equipped them with necessary soft skills and social capital to support them in their professional endeavors. It is important for students to see themselves reflected in the careers they seek, and many scholars expressed that meeting racially and ethnically diverse healthcare providers during the PATCH program was empowering and motivating. Through shadowing experiences in various healthcare professions, they recognized the array of healthcare careers available to them and the steps required to become each type of practitioner.

PATCH also created an opportunity for medical students to lead a younger generation of future healthcare providers and improve leadership and interpersonal skills, as three medical students founded the program and 11 subsequent leaders have further developed and led PATCH in the years since. In developing the PATCH infrastructure and curriculum, medical students

8 Propelling Adolescents Towards Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine Brown et al.

refined communication, administrative, and professional skills throughout the implementation of the program. Unlike PATCH, other medical student driven pipeline programs have been funded by fellowships or financed by a larger organization and many have full-time staff members.[5,6,9] Additionally, through forming relationships with the local high school students the medical students benefited from an increased awareness of the communities they serve and a better understanding the social and economic barriers to healthcare access and educational equity. The program offered a mutually beneficial experience of learning and teaching among the participants and leaders alike.

Limitations

There are several limitations to the data reported. We had five years of data with four cohorts of graduates matriculating to college through spring 2020, limiting extrapolation of our data results. The pre- and post-surveys used to compare student attitudes about medical careers before and after PATCH were not distributed to the cohorts prior to 2019. Due to the transient nature of the scholars participating in the program and the rotating leadership roles among medical students each year, several of our scholars were lost to follow-up, hindering our outcome assessment. The lack of a comparison group, such as individuals not accepted into PATCH and those lost to follow up, limits our understanding of the long-term impacts of this enrichment program. Although no students have yet enrolled in graduate programs, as none will have completed their undergraduate education until 2021, this data does suggest that the majority of scholars who completed PATCH intend to pursue healthcare careers.

Future Directions

In the upcoming years, we plan to increase the number of PATCH scholars, integrate more lasting mentorship throughout college in preparation for professional school, add rigorous coursework and internship experiences, and ultimately address the racial disparities in healthcare by building a provider workforce that reflects the growing diversity of the communities it serves. Additionally, we hope to collaborate with an academic public health department to formally evaluate the success of PATCH through survey-based methodology and continued tracking of the educational outcomes of our PATCH alumni to highlight further areas of improvement. As the PATCH scholars continue through their educational journeys, data around the communities in which the scholars choose to work and what impact they have on addressing health disparities will be of special interest. Creating opportunities for young high school students to become interested in pursuing medicine is an important step in creating a more diverse workforce, and in the short life of the PATCH program it has become strikingly clear that the creativity and inspiration UIM scholars provide is crucial to addressing health disparities.

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9 Propelling Adolescents Towards Careers in Healthcare (PATCH): A Medical Student Led Pipeline Program for High School Students Underrepresented in Medicine
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