

A Decade of Pathways to Medicine: Program Evaluation and Lessons Learned in Implementing a Local Health-Professions Outreach Program

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ABSTRACT

Pathway programs provide structured opportunities for students to explore healthcare careers and develop familiarity with educational pathways into the health professions. Ongoing evaluation of such programs is essential to gauge their success and inform iterative improvement. In 2013, The Warren Alpert Medical School of Brown University launched the Pathways to Medicine program in partnership with local health professions' schools to provide Rhode Island high school students with structured educational experiences, mentorship, and career exploration opportunities in healthcare fields. Herein we describe the design and structure of the Pathways to Medicine program and summarize internal program evaluation data from 2013–2022 related to participant engagement and post-program educational trajectories. Insights from participant feedback and program metrics informed targeted modifications, including expanded partnerships and enhanced support structures. These findings illustrate how iterative, systematic program evaluation can guide the evolution of pathways initiatives and support continuous improvement in program design and delivery.

KEYWORDS: educational pathways; medical education; career; mentorship

INTRODUCTION

Awareness of health careers and familiarity with educational pathways are important components of a student's career exploration. However, significant systemic and contextual factors can shape the accessibility of learning opportunities for many youths, both in Rhode Island and nationally.^{1–3} In medicine, commonly cited challenges to the pursuit of a career in healthcare include prohibitive costs, escalating expectations for academic and extracurricular preparation, and variable access to mentorship and pre-medical experiential opportunities.^{4,5} Similar challenges persist across other health professions' training pathways, including physician assistant,^{6,7} pharmacy,⁸ and nursing programs.⁹ These barriers yield downstream consequences for the healthcare workforce, contributing to persistent gaps in the development of future clinicians. One important manifestation is the

rapidly widening disparity between the need and availability of primary care physicians (PCPs), both locally and nationally.¹⁰ In Rhode Island, there will be an estimated shortage of approximately 100 PCPs by 2030 (roughly 11% of the current workforce), which is attributed to a mismatch in new graduates entering the healthcare workforce in Rhode Island compared to the expected retirement of existing PCPs and population growth.^{11,12} These patterns, observed both regionally and nationally, have prompted increasing institutional attention toward educational strategies that broaden knowledge of and access to health professions and strengthen early-career development. Pathway programs have emerged as a promising solution to this issue, offering structured exposure to support students' interest in, and understanding of, support for healthcare careers.^{13,14}

Instituted in 2013, Pathways to Medicine ("Pathways") is a mentorship program hosted by The Warren Alpert Medical School of Brown University that provides structured opportunities, individualized mentorship, and early career exploration of the health professions for Rhode Island high school students.¹⁵ Pathways leaders at Brown University have collaborated with numerous other graduate-level healthcare programs in Rhode Island to represent a cross-section of the myriad healthcare professions. Collaborating professional schools include the physician assistant (PA) programs at Johnson & Wales University and Bryant University, the nursing schools at the University of Rhode Island and Rhode Island College, and the pharmacy school at the University of Rhode Island. Additionally, Pathways is internally supported by faculty from the center for community engagement and pathways programming at The Warren Alpert Medical School.

Each summer, a student leadership team advertises and promotes the Pathways to Medicine program via a dedicated website, information sessions, and outreach emails distributed to Rhode Island high schools, fostering longitudinal partnerships across diverse public school communities. Interested students apply through a brief application describing their interests and goals, while mentors from participating health professions' schools are recruited through a parallel application process. Mentors and participants are selected based on application merit, with the number of accepted students determined by available mentors to maintain at least a 1:1 mentor-to-participant ratio and ensure

consistent, individualized engagement. Each participant is paired with a health-professions' student mentor for longitudinal guidance. Pathways to Medicine is led by four to six second-year medical students from The Warren Alpert Medical School, all former mentors, with additional student liaisons from partnering institutions, supporting interschool and interprofessional coordination and collaboration.

Monthly sessions held in the Fall semester of each academic year cover topics including an introduction to acquiring vital signs, exposure to the cadaver lab,¹⁶ skills workshops such as suturing and ultrasound, and college/career preparatory panels. The program culminates in a final poster presentation, in which participants create an academic poster based on a healthcare topic of their choice and present it during a final symposium. Participants are also provided with opportunities to connect with healthcare professionals and engage in shadowing opportunities at local Rhode Island physician practices, further establishing their network and exposure to healthcare careers. Here, we describe a retrospective evaluation of the Pathways to Medicine program in its first decade, with the goals of characterizing program development to understand participant trajectories following high school graduation, and identifying areas for refinement to improve future program iterations.

EVALUATION METHODS

Data Sources

Participant information was collated across Pathways cohorts from 2013 to 2022, using participant application forms from routine program enrollment and optional post-program assessments, including focus groups and surveys. All collected information was anonymized and saved on a secure institutional, cloud-storage service. Participants were excluded from analysis if they did not complete the entire program, defined as greater than three absences and/or failure to submit the final presentation. If a student participated in Pathways more than once ($n = 4$), only data from their initial participation was included.

To characterize post-program educational and career trajectories, publicly available information was reviewed using online sources including LinkedIn, institutional webpages, news articles, and other publicly accessible online profiles. Searches were conducted between May 2024 and February 2025 using names provided in program applications, and when available, additional contextual information (e.g., high school attended, graduation year, and hometown). A participant was considered "locatable" if their cross-matched profile contained at least one additional piece of information relevant to educational or career trajectory analysis, including, but not limited to, current occupation or university matriculation. Participants with cross-referenced profiles but no additional information relevant to evaluation were excluded from further analysis ($n = 209$).

Although rigid metrics were employed to minimize incorrect participant profile identification for analysis, no contact was made with participants, their families, faculty, or staff from participating high schools, or any other institutional entities to verify any data. This work was conducted as a program evaluation of an existing educational initiative. All data were collected as part of routine program operations or obtained from publicly available sources. No additional data collection, intervention, or participant contact occurred for research purposes. In accordance with institutional policy, this evaluation did not meet the definition of human subjects research and was exempt from Institutional Review Board review.

Data Analysis

Health-related degrees and careers were defined as any degree, major, or job related to patient care or human health, including, but not limited to, physical therapy, counseling, research, clinical trial coordinator, psychology, and medical assistant. Health professions' careers were defined as a subset of health-related careers, including those represented by the Pathways program: medicine (MD/DO), pharmacy (PharmD and pharmacy technician), physician assistant (PA), and nursing (degree and certificate programs). Of note, demographic information, including self-reported race/ethnicity, was not collected prior to 2020 and was therefore excluded from this initial evaluation.

All collected data were anonymized by assigning an arbitrary number to each Pathways participant. Data were compiled in Prism 10 (GraphPad Software, Boston, MA, USA) and plotted to identify trends across years.

RESULTS

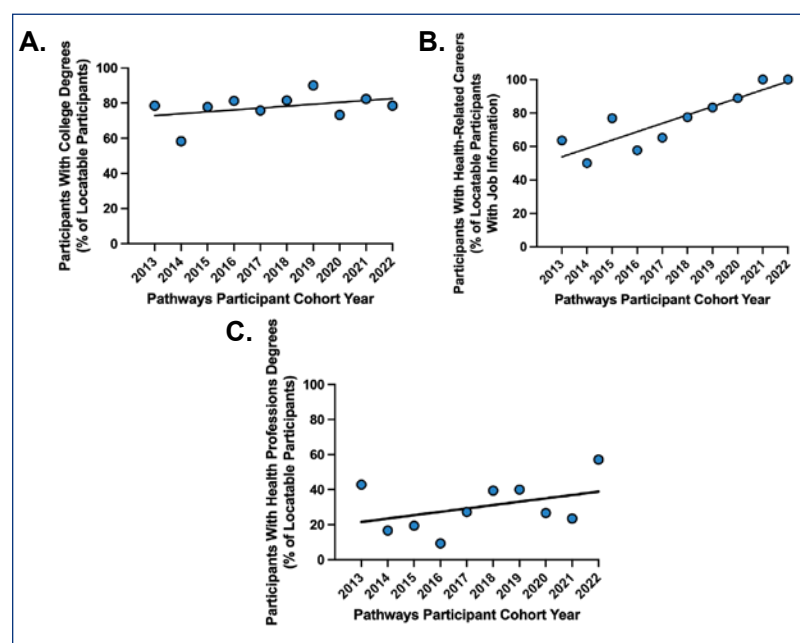
Pathways to Medicine has hosted students from 26 high schools across Rhode Island since 2013, including public schools ($n = 21$, one of which is online), private schools ($n = 2$), and public technical career schools ($n = 3$). A total of 455 participants enrolled in Pathways to Medicine over this time, representing an average annual cohort of 46 participants [Table 1]. Participants hailed from many communities across Rhode Island, including, but not limited to, Barrington, Bristol, Coventry, Central Falls, Cranston, Cumberland, East Providence, Johnston, Lincoln, North Smithfield, North Providence, Pawtucket, Providence, Riverside, Smithfield, Warren, Warwick, West Warwick, and Woonsocket. Participants were supported by 507 mentors across the six health professional schools, representing an average annual cohort of 51 mentors per year, with a mentor-participant ratio of 1.1:1. Among the 455 participants, 246 (54.1%) were locatable via our online search strategy and were therefore included in analysis.

Overall, 193 (78.5%) of the 246 locatable participants have earned a college degree or are enrolled in a degree-granting

Table 1. Pathways participant and mentor demographics

	#	% Participants	% Locatable Participants
Participating Health Professions' Programs	6	—	—
Participating High Schools	26	—	—
Mentors	507	—	—
Average Mentor Cohort Size	51	—	—
MD Mentors (The Warren Alpert Medical School)	249	—	—
PA Mentors (Bryant, JWU)	97	—	—
Pharmacy Mentors (URI)	118	—	—
Nursing Mentors (URI, RIC)	43	—	—
Participants	455	—	—
Average Participant Cohort Size	46	—	—
Mentor:Participant Ratio	1.1	—	—
Locatable Participants	246	54.1	—
Post-Secondary Education	193	42.4	78.5
Advanced/Terminal Degrees	25	5.5	10.2
Participants in Health-Related Careers	118	25.9	48.0
Participants in Health Professions	70	15.4	28.5

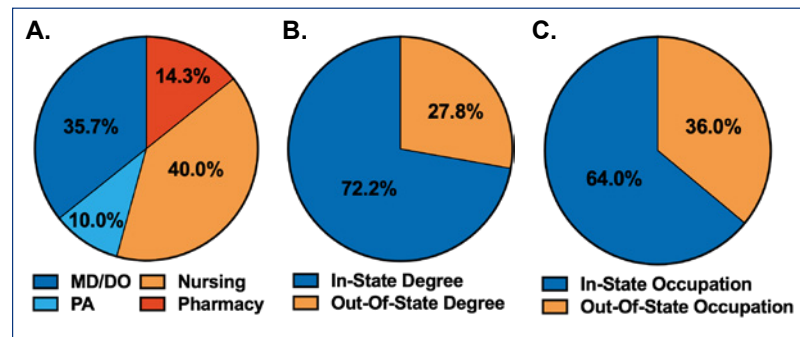
Figure 1. [A] Annual percentage of Pathways participants who earned or are currently enrolled in a college degree program (Associate's or Bachelor's). [B] Annual percentage of Pathways participants involved in health-related careers, or [C] health professions (defined as professions represented by Pathways partner institutions, i.e., medical doctor, physician assistant, pharmacy, and nursing).



institution, representing a consistent rate of Pathways participants earning their first degree each year over the last decade [Figure 1A]. Of participants with an undergraduate degree, 25 (10.2%) went on to earn, or are expected to earn, an advanced degree, including, but not limited to, Master of Science (MS), Master of Physician Scientist Studies (MPAS), Master of Health Science, Master of Nursing, Doctor of Jurisprudence (JD), Doctor of Pharmacy (PharmD), Doctor of Allopathic Medicine (MD), and Doctor of Osteopathic Medicine (DO). Out of all locatable participants with current job information, 118 (48.0%) pursued health-related careers after high school graduation. From 2013–2022, our data show longitudinal increases across cohorts in the number of participants who pursued health-related careers [Figure 1B]. At least 70 (28.5%) locatable participants (59.3% of participants with health-related careers) pursued health professional careers represented by our partner programs. Program-evaluation data further shows consistent entry or intended entry of participants into the health professions [Figure 1C], inclusive of current health professions' students, pre-professional students, and non-degree health professions (certified nursing assistant or pharmacy technician).

Of the participants involved in the health professions, 28 (40.0%) entered or plan to enter nursing programs, 25 (35.7%) pursued or plan to pursue an MD/DO degree, 10 (14.3%) enrolled or plan to enroll in pharmacy programs, and 7 (10.0%) completed or plan to complete a PA degree [Figure 2A]. As of this evaluation, 36 (51.4%) of the health professions' students were currently enrolled in or had completed a terminal health professions' degree, 31 (44.3%) were pre-professional students preparing to apply into one of the health professions' programs, and 3 (4.2%) did not earn a post-secondary degree but were working in a related health professions career. Of the 36 health professions' students/degree holders, 26 (72.2%) remained in-state for their degree, and 10 (27.8%) went out-of-state [Figure 2B]. Based on current occupation information regarding the subset of 25 participants who already completed their health professions degree or did not pursue one, 16 (64.0%) remained in or returned to Rhode Island to work in their profession, and 9 (36.0%) left or remained out-of-state [Figure 2C].

Figure 2. [A] Total percentage of locatable participant involvement in the subset of health professions represented by Pathways (n = 70 participants). [B] Percentage of health professions' participants who pursued their degree within or outside of Rhode Island (n = 36 participants). [C] Percentage of health professions' participants with current occupation data whose occupations are within or outside of Rhode Island (n = 25 participants).



DISCUSSION

Findings from our program evaluation suggest that Pathways participants over the last decade consistently enrolled in higher education and healthcare careers after completing the Pathways program. A substantial portion of participants who pursued health-related careers did so in the health professional fields represented by Pathways program mentors, suggesting alignment between the program content and participants' educational and professional trajectories.

Participant Impact and Educational Pathways

Pathways to Medicine emphasizes broad exposure to the healthcare professions and aims to nurture scientific passion and instill confidence in participants so they can successfully pursue careers in healthcare. For students interested in pursuing a career in healthcare, mentorship, encouragement, and support are crucial factors in successfully pursuing these interests and achieving their goals. Much of what Pathways participants learn throughout the program is translatable to academic and career success in high school, college, and beyond. To that end, a particular metric of interest is the number of high school students who, after participating in Pathways, receive a college degree (Associate's or beyond). Our data indicate that high school students participating in Pathways to Medicine pursue higher education at an overall rate of 78%, higher than the estimated state average of 39.2%.¹⁷

While many factors influence college enrollment, our program data suggest that Pathways may support students' exposure to healthcare careers, access to information about higher education, and connections with mentors who are willing to guide students through the application process. It is also encouraging to see longitudinal increases in locatable participants entering health-related fields following high school. Our findings also suggest that a substantial

proportion of participants who enter the health professions remain in Rhode Island for both education (72.2%) and early-career placement (64.0%). This retention may be supported in part by networking facilitated by Pathways mentors and events. While state-level retention data exists for physicians after residency (38.5% to 77.5% nationally and 42.9% in Rhode Island from 2013 to 2022),¹⁸ comparable data are not available for the other health professional programs included in our evaluation. Although direct comparisons are limited, the observed in-state retention among Pathways participants may indicate a positive influence of the program on career trajectory and local workforce development.

Although these findings cannot be attributed to program impact alone, they highlight the importance of education surrounding the many

options for those interested in pursuing a healthcare-related career and underscore differences between program participants and broader population benchmarks.^{19,20} Qualitative feedback from surveys and post-program focus groups has further contextualized these findings. Participants frequently expressed appreciation for sessions outlining and differentiating between healthcare professions, individual mentorship time, and skill development relevant to higher education, including workshops covering college application tips, resume writing, research involvement, and scientific poster creation.

Mentor Experience and Program Structure

For program mentors, Pathways to Medicine offers an opportunity for local community outreach and educational engagement with a diverse group of Rhode Island high school students, in addition to interprofessional collaboration. Mentor feedback frequently praised the program's mentorship model, specifically regarding the opportunities for sustained and individualized interaction with assigned participants, in addition to the structured group-based learning activities. Mentors also relayed benefits associated with teaching experience, professional development, and exposure to interdisciplinary perspectives. Constructive feedback from mentors has helped shape session development, program reach, and mentor recruitment strategy, including the designation of student liaisons for each participating health professional school. Implementation of post-program meetings with outgoing student leaders, professional school liaisons, graduating student participants, and incoming program leaders (for future program iterations) have facilitated program continuity and iterative improvement. This underscores the role of interdisciplinary mentorship in shaping program implementation on a year-to-year basis.^{21,22}

Limitations

Several limitations should be considered when interpreting these findings. Reliance on publicly available information may result in incomplete or outdated representations of participants' educational or professional histories. Additionally, the voluntary nature of program participation and application-based selection process may introduce selection effects that influence observed patterns. It is also important to acknowledge that the impact of Pathways on participant trajectories may be confounded by the program's inherent selection of students who may already be more likely to enroll in college and pursue health-related careers.

Future directions

Despite these limitations, our program evaluation highlights opportunities for continued curricular development, including standardizing feedback mechanisms to capture actionable insights and support longitudinal program monitoring, addressing logistical barriers such as transportation, and strengthening existing institutional partnerships. In parallel, ongoing efforts aim to cultivate new relationships with other regional, health professional education programs to expand interprofessional engagement. Broadening these partnerships will foster shared curricular initiatives, promote sharing of limited educational resources like simulation equipment, and facilitate collaborative learning experiences. Collectively, these strategies aim to enhance program implementation and long-term sustainability, refine tracking of program performance for iterative improvements, and ultimately maximize the program's impact on participants.

CONCLUSIONS

Pathways to Medicine is a Rhode Island-based, multi-institutional program that provides structured opportunities for healthcare career exploration among high school students. This retrospective evaluation of the program's first decade describes promising patterns in participant engagement, educational trajectories toward health professions, and identifies areas for ongoing program refinement based on iterative feedback. Our findings illustrate how systematic program evaluation can support the evolution of pathways initiatives within academic institutions. Continued attention to program structure, feedback processes, and institutional collaboration will further inform future iterations of Pathways to Medicine and contribute to the sustained development of educational programming in health professional pathways for future generations of Rhode Island students.

References

- Williams JS, Walker RJ, Egede LE. Achieving Equity in an Evolving Healthcare System: Opportunities and Challenges. *Am J Med Sci.* 2016;351(1):33–43. <https://doi.org/10.1016/j.amjms.2015.10.012>.
- Gomez LE, Bernet P. Diversity Improves Performance and Outcomes. *J Natl Med Assoc.* 2019;111(4):383–392. <https://doi.org/10.1016/j.jnma.2019.01.006>.
- Arvizo C, Garrison E. Diversity and Inclusion: The Role of Unconscious Bias on Patient Care, Health Outcomes and the Workforce in Obstetrics and Gynaecology. *Curr Opin Obstet Gynecol.* 2019;31(5):356–362. <https://doi.org/10.1097/GCO.0000000000000566>.
- Tello C, Goode CA. Factors and Barriers That Influence the Matriculation of Underrepresented Students in Medicine. *Front Psycho.* 2023;14:1141045. <https://doi.org/10.3389/fpsyg.2023.1141045>.
- Rinderknecht FAB, Kouyate A, Teklu S, Hahn M. Antiracism in Action: Development and Outcomes of a Mentorship Program for Premedical Students Who Are Underrepresented or Historically Excluded in Medicine. *Prev Chronic Dis.* 2023;20:E49. <https://doi.org/10.5888/pcd20.220362>.
- Bradley-Guidry C, Burwell N, Dorrough R, Bester V, Kayingo G, Suzuki S. An Assessment of Physician Assistant Student Diversity in the United States: A Snapshot for the Healthcare Workforce. *BMC Med Educ.* 2022;22(1):680. <https://doi.org/10.1186/s12909-022-03717-9>.
- Kibe LW, Schrode KM, Paik S, Frias-Sarmiento D. Underrepresentation of Black Men in Physician Assistant and Associate Training. *JAMA Netw Open.* 2024;7(10), e2441531. <https://doi.org/10.1001/jamanetworkopen.2024.41531>.
- Alonzo N, Bains A, Rhee G, Htwe K, Russell J, De Vore D, Chen XL, Nguyen M, Rajagopalan V, Schulte M, Doroudgar S. Trends in and Barriers to Enrollment of Underrepresented Minority Students in a Pharmacy School. *Am J Pharm Educ.* 2019;83(7):6925. <https://doi.org/10.5688/ajpe6925>.
- Akintade B, González J, Idzik S, Indenbaum-Bates K. Topic: Intentional Diversity in Academia: Recruiting, Admitting, Enrolling, and Retaining Underrepresented Students in Nursing Programs. *J Prof Nurs.* 2023;45:21–28. <https://doi.org/10.1016/j.profnurs.2023.01.004>.
- GlobalData Plc. The Complexities of Physician Supply and Demand: Projections From 2021 to 2036; 2024. <https://www.aamc.org/media/75236/download/attachment>.
- Petterson SM, Cai A, Moore M, Bazemore A. State-Level Projections of Primary Care Workforce, 2010-2030; 2013.
- Borkan J, Coppa D, Flanagan P, Hurwitz D, Saal A, Bowes Y, Nicolella E, Hollmann P. Primary Care Access for All: A Roadmap for Addressing the Primary Care Crisis in Rhode Island. *R I Med J* (2013). 2024;107(4):40–44.
- Brottman MR, Char DM, Hattori RA, Heeb R, Taff SD. Toward Cultural Competency in Health Care: A Scoping Review of the Diversity and Inclusion Education Literature. *Acad Med.* 2020;95(5):803–813. <https://doi.org/10.1097/ACM.00000000000002995>.
- Smith SG, Nsiah-Kumi PA, Jones PR, Pamies RJ. Pipeline Programs in the Health Professions, Part 1: Preserving Diversity and Reducing Health Disparities. *J Natl Med Assoc.* 2009;101(9):836–840, 845–851. [https://doi.org/10.1016/s0027-9684\(15\)31030-0](https://doi.org/10.1016/s0027-9684(15)31030-0).
- Gibson J, Bay A, Omoaregba L, Diaz JA. Pathways to Medicine. *R I Med J.* 2024;107(7): 28–30.
- Painter D, Dewar K. Early Cadaver Lab Exposure Increases Motivation to Pursue Medical Careers in High School Students. *R I Med J.* 2023;10(9):57–58.
- United States Census Bureau. *S1501: Educational Attainment-Census Bureau Table.* <https://data.census.gov/table/ACS ST1Y2023.S1501?g=040XX00US44> (accessed 2025-02-09).

18. *Physician Retention in State of Residency Training, by State*. AAMC. <https://www.aamc.org/data-reports/students-residents/data/report-residents/2023/table-c6-physician-retention-state-residency-training-state> (accessed 2026-03-21).
19. Zavattieri L, D'Anna S, Maillet JO. Evaluation of High-School Health Science Careers Program Impact on Student Retention and Careers. *J Allied Health*. 2007;36(2):81–87.
20. Winkleby MA. The Stanford Medical Youth Science Program: 18 Years of a Biomedical Program for Low-Income High School Students. *Acad Med*. 2007;82(2):139–145. <https://doi.org/10.1097/ACM.0b013e31802d8de6>.
21. Coe C, Piggott C, Davis A, Hall MN, Goodell K, Joo P, South-Paul JE. Leadership Pathways in Academic Family Medicine: Focus on Underrepresented Minorities and Women. *Fam Med*. 2020;52(2):104–111. <https://doi.org/10.22454/FamMed.2020.545847>.
22. Bonifacino E, Ufomata EO, Farkas AH, Turner R, Corbelli JA. Mentorship of Underrepresented Physicians and Trainees in Academic Medicine: A Systematic Review. *J Gen Intern Med*. 2021;36(4):1023–1034. <https://doi.org/10.1007/s11606-020-06478-7>.

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