

Building Research Foundations in Medical Students: Impact of a Scholarly Concentration Program on Longitudinal Research Development at the University of Wisconsin School of Medicine and Public Health

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ABSTRACT

Introduction: The declining number of physician-scientists, due in part to limited early research exposure and a lack of institutional support, may slow discoveries that improve population health. Prior studies suggest that early research experiences promote interest in academic medicine careers, yet disparities in research participation may emerge early.

Objectives: This study evaluated research participation among medical students at the University of Wisconsin School of Medicine and Public Health, focusing on potential disparities and the impact of a funded, mentored summer scholarly concentration program on completing a Path of Distinction in Research (POD-R), a track for longitudinal research training and productivity.

Methods: We analyzed data from 794 students who graduated between 2020 and 2024. Key variables included participation in the scholarly concentration program, POD-R completion, and sociodemographic factors. Logistic regression models assessed sociodemographic and academic predictors of participation in each program.

Results: Among the cohort, 75% (N=592) participated in the scholarly concentration program and 19% (N=153) completed POD-R. No significant differences were found by gender, underrepresented in medicine status, or Wisconsin residency. Participation in the scholarly concentration program was strongly associated with POD-R completion (OR, 3.75; 95% CI, 2.14–6.58).

Conclusions: Participation in an early, inclusive, funded scholarly concentration program increased the likelihood of students from different backgrounds taking the next step in their research development. Such programs may play a critical role in strengthening the development of physician-scientists and promoting equity in academic medicine.

INTRODUCTION

Advancing scientific knowledge is a cornerstone of academic medicine and underpins the delivery of high-quality patient care. Physician-scientists uniquely bridge clinical practice and scientific inquiry, yet there is persistent concern about their dwindling numbers. Between 2011 and 2020, the number of US physicians who reported research as their major professional activity declined from 13 557 to 12 289—a decrease of approximately 9.4%.^{1,2} Early research immersion fosters critical thinking, deepens engagement with evidence-based medicine, and inspires future clinician-investigators.³⁻⁵ Recent shifts in medical school curriculum and the change of the United States Medical Licensing Examination Step 1 to pass/fail have further amplified the importance of research exposure for demonstrating strengths important for residency competitiveness.⁶ Early research experiences significantly boost students' scholarly output and long-term interest in research,⁷ reinforcing the pipeline of future physician-scientists.⁸

Many medical schools have developed scholarly concentration programs—longitudinal, mentored research tracks embedded in the curriculum—to foster early student engagement in scientific inquiry, spark interest in research careers, and ultimately help rebuild the physician-scientist pipeline. Such programs typically provide stipends, help students develop specific research skills, and often incorporate these opportunities without lengthening overall training time.⁹ Participants frequently report heightened interest in research, enhanced scholarly productivity, and successful match-

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ing into more competitive residencies.^{3,4,10} However, evidence suggests disparities emerge early in these pathways. A cohort study of 31 474 medical graduates showed that women and Black/Hispanic students had lower publication rates than men and White peers.¹¹ At Yale University, a 13-year review found women authored 50.9% of theses but received only 30.9% of top awards.¹²

In early 2000, the University of Wisconsin School of Medicine and Public Health (UW SMPH) developed a mentored scholarly concentration program for medical students not enrolled in an MD/PhD dual-degree program during the summer between the first 2 years of medical school. UW SMPH has dedicated significant resources and developed processes to support equitable access to research opportunities for all students: (1) all students who wish to participate are guaranteed a mentored research placement; (2) students receive a summer stipend and travel funding support to present research findings; (3) faculty provide one-on-one mentorship and conduct writing workshops tailored to beginners, guiding them through research planning and proposal development; (4) research opportunities are introduced early and often in the medical school curriculum; and (5) faculty from statewide academic campuses are eligible to serve as mentors, ensuring that rural and urban health track students can engage in research. These efforts to eliminate barriers to research opportunities have been highly effective: program records show participation in the elective program rose from 17% of UW SMPH medical students in 2002 to 75% in 2024.

Our overarching objective was to examine early research participation and longitudinal engagement in research during medical school among UW SMPH students. Given evidence of early disparities,¹¹⁻¹³ a key focus of our study was evaluating whether students across all sociodemographic groups were equally likely to participate in research opportunities, with a focus on gender and underrepresented in medicine (URiM) status. We also examined participation in the summer scholarly concentration program and its association with completing a next tier opportunity, such as the Path of Distinction in Research (POD-R).

METHODS

Setting

UW SMPH is a public medical school in Wisconsin that includes a primary academic medical center located in Madison; statewide

Table 1. University of Wisconsin School of Medicine and Public Health Student Research Overview: Scholarly Concentration Program and Path of Distinction in Research

	Summer Scholarly Concentration (Tier 1) ^a	Path of Distinction in Research (Tier 2) ^a
Description	Mentored summer research for M1–M2 students, introducing basic research skills and scholarship through a single research project	Advanced, integrated research track throughout MD training, culminating in a formal graduation distinction; can include 1 or more projects
Mentors	1 primary mentor, co-mentors optional	1 or more primary mentors who could be the summer scholarly concentration program mentor or another research mentor
Mentor letter of support	Yes	Yes (provided by the summer scholarly concentration program mentor or other mentor)
Time	8–10 full-time weeks during summer	Minimum of 16 full-time weeks; summer research through the summer scholarly concentration program can count but is not a prerequisite
Curricular requirements	Includes structured research skills workshops	Completion of ≥7 research-learning modules and ≥6 research-related activities
Abstract	Required	Required
Research proposal	Required	Required
Manuscript authorship	Encouraged but not required	Required
Local presentation	Required	Required
Regional/national presentation	Encouraged but not required	Required

Abbreviations: M1, medical student year 1; M2, medical student year 2.

^aTier 1= introductory research development; Tier 2= longitudinal research development.

academic campuses with regional hubs in Green Bay, La Crosse, Marshfield, and Milwaukee; and teaching sites throughout the state. As a leading research institution, it plays an important role in providing early opportunities for UW SMPH medical students to engage in research with a faculty mentor. Central funding from multiple sources (including intramural funds from UW SMPH and UW–Madison, federal extramural grants, foundation grants, and industry-sponsored contracts) is available to support all medical students who wish to participate in a scholarly/research project.

Student Research Opportunities

Scholarly concentration program: The Shapiro Summer Research Program, named for a key donor, is UW SMPH’s cornerstone summer scholarly concentration program. It provides a summer stipend for all students interested and eligible to conduct research in the summer between their first and second years. Eligibility requires good academic standing and enrollment in the single degree MD program (ie, not an MD/PhD student). In recent cohorts, an average of 75% of eligible students elected to participate. Early in their medical education, first-year students are introduced to research opportunities at the Annual Medical Student Research Forum, where second-year students present their work to showcase the range of available projects. In

spring of the first year, students select a project from an interactive online database of faculty mentors and write a research proposal related to the faculty mentor's research, with support from scientific writing workshops and dedicated faculty mentor input. All proposals are subject to review and approval by departmental faculty and the Office of Student Research. Proposals are scored using a standardized rubric that assesses the scientific project (ie, background and significance, hypothesis, research design, and methods) and the student-mentor match (ie, student role and motivation, student learning objectives, and mentoring plan). Mentors submit a letter detailing the research project, their mentoring experience, mentoring commitment over the summer, and relevant compliance and enrichment activities planned for the mentee. During the summer program, students are encouraged to participate in research skills training sessions, writing groups, book clubs, and clinical shadowing. Students must submit an abstract and present a poster or podium talk at the Annual Medical Student Research Forum.

Path of Distinction in Research (POD-R): POD-R is an elective, advanced option for longitudinal research development for UW SMPH medical students (see Table 1 for an overview of key scholarly concentration program and POD-R requirements). POD-R confers honors at graduation for students who go beyond the required curriculum to gain research skills and build a portfolio that contributes to the advancement of science and medical practice. Requirements include a minimum of 16 full-time weeks of research, significant authorship contribution to at least 1 manuscript, presentation of research at local and regional or national meetings, and completion of research-related learning and leadership activities. Activities completed during the scholarly concentration program (eg, manuscript writing) may count toward POD-R requirements. Approved in 2016, POD-R succeeded the Research Honors program, which graduated its first class in 2004 and its last in 2019, and is comparable in rigor to other PODs at UW SMPH.

Data

Participants and Measures: The analytic sample included all UW SMPH MD graduates from 2020 to 2024, excluding those enrolled in the MD/PhD dual degree program. Sociodemographic and academic data were obtained from institutional and departmental records.

- Sociodemographic variables were self-reported and included gender (male/female), Wisconsin residency status (yes/no), and age (continuous). In accordance with the UW SMPH definition, students were classified as URiM if they identified as Hispanic, Black, American Indian, Native Hawaiian, Cambodian, Laotian, and/or Vietnamese. This classification was based on self-reported race/ethnicity and coded as a binary variable (yes/no).
- Academic variables included participation in the scholarly

Table 2. Descriptive Statistics (N=794)

Variables	N (%) or Mean (SD)
Sociodemographic Characteristics	
Gender	
Female	400 (50.4%)
Male	394 (49.6%)
Underrepresented in medicine	
Yes	188 (23.7%)
No	605 (76.2%)
Missing	1 (0.1%)
Wisconsin resident	
Yes	599 (75.4%)
No	195 (24.6%)
Age at matriculation (in years)	23.8 (2.3)
Academic Characteristics	
Scholarly concentration program	
Yes	592 (74.6%)
No	202 (25.4%)
Path of Distinction in Research	
Yes	153 (19.3%)
No	641 (80.7%)
Graduation class	
2020	155 (19.5%)
2021	160 (20.2%)
2022	165 (20.8%)
2023	149 (18.8%)
2024	165 (20.8%)

concentration program (yes/no) and completion of POD-R (yes/no).

Data Analysis: All statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 30.0 (IBM Corp). Binary logistic regression models were used to predict participation in scholarly concentration program and completion of POD-R. All models were multivariate adjusted for relevant covariates. Additional analyses examined whether the effect of scholarly concentration program participation on POD-R completion varied by gender, URiM status, Wisconsin residency, or age by including interaction terms (eg, scholarly concentration program participation × gender).

The Institutional Review Board (IRB) quality improvement tool determined IRB review was not required because, in accordance with federal regulations, the project does not constitute research as defined under 45 CFR 46.102(d).

RESULTS

Descriptive statistics are presented in Table 2. The final analytic sample included 794 students (50.4% female; mean age, 23.8 ± 2.3 years at matriculation). Nearly one-quarter identified as URiM (23.7%) and three-quarters (75.4%) were Wisconsin residents.

Who participated in the scholarly concentration program?

Substantial interest in research was evident: 74.6% of first-year stu-

dents participated in the scholarly concentration program (Table 2). A multivariate binary logistic regression examined predictors of participation (Table 3). No significant differences were found by gender, URiM status, or Wisconsin residency. Older students had lower odds of participation (OR, 0.904; 95% CI, 0.85–0.97; $P < .01$), indicating that for each additional year of age, the odds of participation decreased by approximately 10%.

Who completed POD-R? Since its first graduating class in 2020, 153 medical students (19%) successfully fulfilled the requirements and graduated with POD-R (Table 2). A series of multivariate binary logistic regression models examined the impact of sociodemographic characteristics (Model 1) and academic factors (Model 2) on POD-R completion (Table 4). No statistically significant associations were found between gender, URiM status, being a Wisconsin resident, or age and POD-R completion (Model 1). Incorporating academic predictors in Model 2 (Table 4) revealed a strong, statistically significant association between scholarly concentration program participation and POD-R completion. Students who participated in the program had 3.75 times higher odds of completing POD-R than those who did not (OR, 3.75; 95% CI, 2.14–6.58; $P < .001$).

Follow-up analyses investigated whether the effect of scholarly concentration program participation on POD-R completion depended on gender, URiM status, Wisconsin residency, or age. None of these interactions reached statistical significance (all $P > .05$), indicating no evidence that the effect differed across sociodemographic groups.

DISCUSSION

Internal UW SMPH surveys and tracking, consistent with Association of American Medical Colleges data, show rising rates of medical student research participation during medical training.¹⁴ Building on prior work examining the role of faculty mentorship on student scholarly output,¹⁵ we evaluated the continuum of student research programs at UW SMPH—from a short-term, intensive summer research immersion at the outset of medical school to a comprehensive, longitudinal distinction track (POD-R) requiring sustained commitment and research productivity. By providing mentorship and allowing students to pursue research topics aligned with their interests, scholarly concentration programs may strengthen medical students' confidence and self-efficacy in research.¹⁶

Informed by prior research suggesting that disparities in the physician-scientist workforce may emerge early in training,¹¹ a central aim of this study was to assess whether students from diverse sociodemographic backgrounds were equally likely to participate in the scholarly concentration program and to pursue next-tier opportunities such as the POD-R. Our findings indicate that participation rates in both programs were comparable across sociodemographic groups. Importantly, we found no evidence of gender, URiM status, or Wisconsin residency disparities

Table 3. Logistic Regression Models Predicting Participation in Scholarly Concentration Program

	OR (95% CI)
Age	0.904 (0.85 – 0.97)^a
Gender	1.37 (0.99 – 1.89)
Underrepresented in medicine	1.34 (0.85 – 2.10)
Wisconsin resident	1.12 (0.73 – 1.73)

^a $P < .01$.

Table 4. Logistic Regression Models Predicting Path of Distinction in Research at Graduation

	Model 1: Sociodemographic Predictors OR (95% CI)	Model 2: Model 1 + Scholarly Concentration Program OR (95% CI)
Gender	1.03 (0.72 – 1.47)	0.97 (0.68 – 1.39)
Underrepresented in medicine	1.02 (0.63 – 1.65)	0.97 (0.59 – 1.58)
Wisconsin resident	0.90 (0.56 – 1.44)	0.88 (0.54 – 1.42)
Age	0.97 (0.89 – 1.05)	0.99 (0.90 – 1.08)
Scholarly concentration program		3.75 (2.14 – 6.58) ^a

^a $P < .001$.

at either stage of research training, suggesting that these programs effectively support equitable access and retention throughout the research development continuum. While this appears true for the primary factors under investigation, we observed an age disparity in participation in the scholarly concentration program. Although we cannot test this empirically, older students may have other jobs or family commitments that preclude participation. No age difference was evident at the next stage (POD-R), suggesting older students might have engaged in other research opportunities outside UW SMPH.

Limitations

This study has recognized limitations. First, sociodemographic data—including gender, race/ethnicity, age, and residency status—were self-reported. Gender reporting was limited to binary options, which excluded representation of transgender and non-binary individuals. Second, we lacked detailed information on students' prior research experience, limiting our ability to assess whether students with stronger backgrounds or interest were more likely to self-select into the programs. Third, we did not have individual-level data to isolate which program components (eg, stipends, individualized mentorship) contributed most to equitable access and retention. Lastly, due to the observational design, causal inferences cannot be drawn. Future work should integrate more robust metrics, including scholarly productivity (eg, abstracts, manuscripts, presentations) and residency outcomes, to provide a fuller picture of long-term impact and a more nuanced understanding of student trajectories in academic medicine. Finally, although these findings reflect a single institution, other medical

schools could adapt the program's building blocks to align with their resources and curricular schedules.

CONCLUSIONS

We found strong evidence that a scholarly concentration program that provides funding support, research training tailored to beginners, and early cohort-wide engagement can promote equitable access to student research opportunities that progress from basic to longitudinal and sustained development. Importantly, consistency across stages of research development suggests that structured, institutionally supported programs—characterized by dedicated mentorship and financial support—foster more equitable entry and advancement in medical student research and may contribute to a more diverse physician-scientist workforce.

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