Diversity, Equity, Inclusion, and Justice

Evaluating Methodology for Increasing Diversity in US Residency Training Programs: A Scoping Review

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ABSTRACT

Background There remains limited understanding of effective strategies to increase diversity, equity, and inclusion within residency programs—highlighting the need for a comprehensive review of current interventions.

Objective To synthesize literature regarding interventions to increase the representation of populations underrepresented in medicine (URiM) within US residency programs.

Methods A scoping review of studies published from January 2000 to July 2023 was conducted. Data were extracted from PubMed, Embase, Cochrane Library, and Scopus. URiM was defined by race, ethnicity, and gender. Studies were included if an intervention was implemented by a graduate medical education residency program but were excluded if they did not describe a defined intervention or if they were published outside of the United States. Study interventions were categorized into 5 areas: applicant factors, selection measures, application screening, interviews, and post-interview communication.

Results Initial search captured 2683 titles and abstracts; 257 full-text articles were reviewed, with 27 eligible articles meeting inclusion criteria. Eligible articles were categorized as: applicant–12 (44%), selection–8 (30%), screening–17 (63%), interview–8 (30%), and post-interview–4 (15%). Many articles addressed multiple interventions that positively impacted URiM composition, making it difficult to isolate the effect of individual interventions. Common, effective interventions included holistic reviews, clerkships, and standardized interviews.

Conclusions This review demonstrates that interventions aimed at increasing diversity in residency programs vary in their approaches, but consistent evaluation and evidence of effectiveness are lacking from the current literature.

Introduction

Initiatives aimed at increasing the representation of individuals underrepresented in medicine (URiM) within graduate medical education (GME) are crucial to cultivating a diverse physician workforce. This lack of representation not only raises concerns of fairness but also impacts the quality of patient care.[1-3] A growing body of evidence demonstrates that when patients are treated by physicians who share similar backgrounds, outcomes improve due to better communication, trust, and cultural understanding.[4-7] In an increasingly diverse and multiracial society, equitable representation in medicine is essential to reflect and address the needs of all communities.[5]

While many institutions have implemented diversity initiatives, substantial gaps remain across most medical specialties—particularly in competitive fields such as surgery, orthopedics, and cardiology.[8-12] Barriers such as limited mentorship, narrow definitions of merit based on test scores, and unequal access to research opportunities disproportionately affect individuals from underrepresented racial, ethnic, and gender groups.[13-17] Existing reviews have tended to focus on single specialties or narrow demographic groups, offering program directors limited guidance on how to intervene earlier in the pipeline.

This scoping review synthesizes published interventions designed to increase racial, ethnic, and gender diversity in residency programs. By identifying patterns across specialties and highlighting common practices, this review aims to provide GME leadership with a comprehensive and practical summary of approaches to support diversity, equity, and inclusion (DEI) within recruitment practices.

Methods

We conducted a scoping literature review to evaluate measures taken to promote racial, ethnic, and gender diversity among residents of US residency programs within any medical or surgical specialty. A scoping review was selected because, upon examining the literature, we determined a systematic review or meta-analysis was not feasible due to heterogeneous data

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and the inclusion of multiple interventions within a single study.

The literature search was conducted in July 2023 and was limited to studies published from January 2000 to July 2023, using the following databases: PubMed, Embase, Cochrane Library, and Scopus. Phase 1 involved screening titles and abstracts for relevance to the topic of interest. Phase 2 involved an evaluation of the full text to ensure studies met our inclusion criteria. The search methods were reported using relevant items of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis for Scoping Reviews (PRISMA-ScR) checklist.[18] Major Medical Subject Heading (MeSH) terms used for the systematic search created by Associate Librarian, M.P., included DEI, reduce bias, mitigate bias, minimize bias, minority groups, cultural diversity, internship, residency, residency education, residency training, resident education, resident training, graduate medical education, medical internship, medical resident, residency program, and residency internship. This process was completed with the assistance of review software (Covidence).

Eligibility Criteria

Studies were included if they integrated a clear intervention(s) to increase racial, ethnic, or gender diversity in residency recruitment. Studies were eliminated if no specific action item was integrated to increase diversity (eg, a review of social media posts mentioning diversity initiatives). Studies published outside of the United States or those related to medical student or fellowship recruitment were excluded.

Title/Abstract and Full-Text Review

Author roles and qualifications at the time of literature review were as follows: L.M.B. was a second-year otolaryngology resident, H.C.M. was an assistant professor, D.M. was a first-year medical student, M.P. was an associated librarian, S.H.C. was an associate professor, E.E.H. was an associate professor, and J.A.A., the senior author, was a professor who has contributed to several subspecialty consensus statement publications. After removing duplicates, 3 authors (H.C.M., L.M.B., D.M.) independently reviewed the titles and abstracts. The full-text review was completed by L.M.B. and H.C.M. E.E.H. and J.A.A. completed a calibration exercise to review 5% of the abstracts and titles with >90% agreement that these studies met the criteria for full-text review. Upon full-text review, any remaining discrepant opinions between H.C.M. and L.M.B. regarding whether an article met all eligibility requirements for inclusion were resolved by E.E.H. and J.A.A.

FIGURE 1
Categories of Interventions Used in the Residency Application Process to Increase URiM Representation

Abbreviations: URiM, underrepresented in medicine; GME, graduate medical education.

As demonstrated in FIGURE 1, 5 categories were used to organize articles following the processes of applying to residency: applicant factors, selection measures, application screening, interviews, and post-interview communication. These were developed by the author group to compartmentalize interventions based on the chronological order of the residency application process. Applicant factors included increasing awareness of programs to a diverse applicant pool through outreach efforts, mentorship pathways, and away rotations. Program selection included institutional-level interventions, in which programs focused on internal factors such as bias training, diversity of faculty, or intentional mission statements. Application screening referred to interventions aimed at the residency review process: blinding aspects of applications, formalized rubrics, and holistic reviews. The interview category involved standardized interview questions or increasing URiM faculty visibility on interview day. Post-interview interventions included additional communication with applicants to emphasize

commitment to diversity. Most of the articles addressed multiple interventions within a single article.

After analyzing each article, H.C.M. and L.M.B. assigned a quality assessment using the Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence.[19] The study was institutional review board exempt.

Results

Study Characteristics

After removing 27 duplicates, the initial search captured 2683 titles and abstracts. A full-text review of 257 articles determined the set of articles for final review. A total of 27 articles were ultimately included based on the specified criteria (TABLE and FIGURE 2).

The final 27 articles were divided into the categories listed above and noted in FIGURE 1, based on the interventions addressed. The number of articles included in each category is found in FIGURE 3. Some were included in multiple categories, making the total percentage greater than 100%. Numerous specialties were represented in this scoping search. Interventions took place between 2005 and 2022. A summary of interventions and quality assessment is expanded in the TABLE.

Applicants

The most common theme throughout this category was the successful increase in residency diversity following the implementation of funded visiting clerkship rotations. Of the 27 articles meeting final inclusion criteria, 8 (30%) supported medical student clerkships to increase clinical or research exposure to a specialty.[20-27] Importantly, these programs were typically funded by the hosting departments, and most included stipends to cover living expenses. Funded rotations, outreach efforts, and scholarships successfully increased recruitment and matching rates of URiM candidates to programs.

Programs hosted outreach events to reach a more diverse applicant pool. Most outreach to URiM residents and medical students was offered at local, regional, and national meetings.[22,27-29] Several programs provided early mentorship to URiM students through interactions with current URiM residents informally or through the Alliance of Minority Physicians.[20] Lall et al reached potential applicants by forming relationships with historically black colleges and universities.[30] Other outreach avenues included GME-wide recruitment programs in the form of virtual URiM recruitment diversity brunches.[31] Outreach events or points of contact with applicants have demonstrated effectiveness in increasing the number of URiM applications programs receive.

Selection

The focus of the selection interventions revolved around intentional efforts by departments to prioritize diversity efforts. Strategies within this category included highlighting a program's commitment to diversity throughout the residency application process, particularly during interviews.[26,32-34] The required buy-in by the department was explicitly mentioned as a part of the strategy.[26,28,35] Several programs dedicated representatives of the institution's diversity committee to work alongside the GME and individual departments to develop specific diversity plans.[36,37] Diversity plans consisted of revising mission statements and creating diversity task forces. Anti-bias training for those individuals involved in the recruitment and selection process of residents was prioritized.[20,33,37] Programs committed to ongoing evaluation of their diversity efforts and their outcomes through these taskforces.[29,34,37] Ultimately, these selection interventions underscored a deliberate and sustained commitment by departments to prioritize diversity throughout the residency recruitment process.

Screening

The most commonly reported change among programs was the adoption of a holistic application review process.[21,22,27,30,32,34,38-42] While the specifics of these "holistic residency application reviews" were not always clearly defined, the overarching goal was to align the selection process with each institution's mission and values. Studies that focused exclusively on implementing holistic review models reported increases in the number of URiM applicants who were interviewed and matched.[38,40-42] To support reviewers in applying holistic principles, several programs developed structured scoring systems that emphasized desirable applicant attributes—ranging from academic performance to personal experiences.[30,33,41,43] For example, one program introduced a "distance traveled" question, which prompted reviewers to consider applicants' contextual lived experiences and challenges; faculty reported gaining new insights that influenced their decisions.[39]

To reduce implicit bias, one study removed applicant names and photographs during review. Interestingly, URiM applicants had higher interview rates in the unblinded condition, suggesting that full anonymization may not always benefit diversity goals.[44] Other strategies to improve equity in the review process included replacing United States Medical Licensing Examination Step 1 cutoffs with alternative

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
Aibana O, et al, 2019 Bridging the Gap: Holistic Review to Increase Diversity in Graduate Medical Education[32]	Screening: holistic review of applications Interview: standardized interview encounters and explicitly highlighting commitment to diversity on interview days	Internal medicine	Retrospective review measuring and comparing the proportion of URiM applicants, applications reviewed, interviews, and matriculants preintervention (AY 2015-2016) and for 2 years after pilot interventions (AYs 2016-2017 and 2017-2018).	American Indian, Alaska Native, Black/African American, Hispanic/Latino, Native Hawaiian, or Pacific Islander	· Percentage of URiM applications reviewed increased from 14.1% to 20.4%. · Proportion of URiM applicants interviewed rose from 16.0% to 24.5%. · Proportion of URiM residents matriculating increased from 12.5% to 31.7%.	Level 4
Barceló NE, et al, 2021 Reimagining Merit and Representation: Promoting Equity and Reducing Bias in GME Through Holistic Review[38]	Screening: evaluated the capacity of a holistic review process to facilitate URiM recruitment in residency interview screening and selection	Psychiatry	Retrospective review of 547 applicants to a psychiatry residency program from US allopathic medical schools evaluated for interview selection via 3 distinct screening rubrics—one holistic approach (holistic review; HR) and 2 non-holistic processes: traditional (TR) and traditional modified (TM).	Based on self-identified race/ethnicity in the ERAS application and using frameworks provided by the AAMC and in-state partners	· Relative to traditional, holistic review significantly increased the odds of URiM applicant selection for interview (TR-OR: 0.35 vs HR-OR: 0.84, $P<.01$). · Assigning value to lived experience and de-emphasizing USMLE Step1 scores contributed to the significant changes in odds ratio of interview selection for URiM applicants.	Level 4
Butler PD, et al, 2022 A Blueprint for Increasing Ethnic and Racial Diversity in U.S. Residency Training Programs[20]	Applicant: internal network of mentorship and support to URiM junior faculty, fellows, residents, and medical students; stipends for visiting students with programing for training and mentorship for 4 weeks; and targeted outreach to candidates Selection: GME symposiums and workshops for faculty to learn about implicit bias and URiM recruitment and retention Post-interview: follow-up communication to URiM students	28 GME programs	Retrospective cohort review across numerous GME programs following implementation of diversity efforts from 2014-2015 to 2020-2021.	URiM was defined by AAMC guidelines as those racial/ethnic populations underrepresented in medicine relative to their numbers in the general population	· During the baseline year, URiM applicants represented 12.1% of interviewees and 8.7% of all matched candidates into residency programs. · Over the successive 6 years after incremental implementation of the approach, URiM representation steadily increased to 23.2% of interviewees and 26.4% of matched candidates. · Programs' maximum rank number to fill and USMLE Step 1 scores of matched candidates remained relatively unchanged.	Level 4

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
Caldwell SL, et al, 2021 Does Removing the Photograph and Name Change the Reviewer's Perception of Orthopaedic Residency Applicants?[44]	Screening: removed photographs and names from residency applications	Orthopedic surgery	Propensity matched review of data from the 2018-2019 orthopedic residency application cycle was collected from a single institution with 411 applicants classified as URiM or non-URiM.	Female gender and/or selection of race other than White/European/Asian by the applicant on their ERAS form	· In the regular application cycle, the URiM applicant was 3.8 times more likely to get an interview than the matched non-URiM applicant (OR=3.8, *P*=.001). · In the "blinded" condition, the URiM candidate was 2.5 times more likely to get an interview than the non-URiM candidate (OR=2.5, *P*=.03). · In the unblinded condition, the URiM candidate had a higher ranking within their group than the corresponding non-URiM applicant (*P*<.001).	Level 4
Deas D, et al, 2012 Improving Diversity Through Strategic Planning: A 10-Year (2002-2012) Experience at the Medical University of South Carolina[36]	Selection: institutional strategic planning with 2 diversity committee liaisons worked with individual departments to develop department-specific diversity plans	All GME programs	Retrospective review of multifaceted strategies throughout an institution over a 10-year period.	African American, Latino, Native American	· Efforts resulted in a more than threefold increase in URiM residents/fellows with expansions of pipeline and mentoring programs	Level 4
Duong KD, et al, 2021 Association Between Emergency Medicine Clerkship Diversity Scholarships and Residency Diversity[21]	Applicant: visiting elective scholarships for underrepresented students	Emergency medicine (EM)	Cross-sectional time series analysis including 20 EM programs from 2018-2019 evaluating the impact of offering clerkship scholarships for URiM students.	Black, Latinx, Native Hawaiian, Pacific Islander, Native American, and Native Alaskan	· Significant increase in both underrepresented minority EM residents overall and Black and Latinx EM residents in particular.	Level 4
Epstein S, et al, 2022 Implementing a "Distance Traveled" Question to Improve Resident Diversity: Process and Feasibility[39]	Screening: implemented holistic review in the residency application process by developing a "distance traveled" question (DTQ)	Otolaryngology–head and neck surgery	Retrospective review of 498 applications during the 2021-2022 academic year with 218 responses to the optional DTQ.	Not applicable	· Among facility respondents, 20 (77%) felt that the DTQ helped them learn something new about the applicant, and 19 (73%) reported that the DTQ influenced their decision-making about the applicant.	Level 4

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
Gardner KA, et al, 2020 Can Better Selection Tools Help Us Achieve Our Diversity Goals in Postgraduate Medical Education? Comparing Use of USMLE Step 1 Scores and Situational Judgment Tests at 7 Surgical Residencies[45]	Screening: utilized unique situational judgment tests (SJTs) and scoring algorithms to replace traditional USMLE Step 1 cutoff scores	General surgery	Retrospective review of 7 general surgery programs during the 2018-2019 application cycle after they lowered their traditional USMLE Step 1 cutoff (220 to 240) to 210 and invited all otherwise eligible candidates to take their unique SJT.	Women, racial/ethnic minorities	· Approximately 35% of applicants who were invited to take the SJT would not have met traditional USMLE Step 1 cutoffs. · Comparison of USMLE-driven versus SJT-driven assessment results demonstrated statistically different percentages of URiMs recommended, and including the SJT allowed an average of 8% more URiMs offered an interview invitation ($P<.01$).	Level 4
Garrick JF, et al, 2019 The Diversity Snowball Effect: The Quest to Increase Diversity in Emergency Medicine: A Case Study of Highland's Emergency Medicine Residency Program[35]	Screening: no USMLE Step 1 filter, increased weight of gestalt score Selection: Diversity Committee, attending and resident buy-in Interview: diversity applicant week during interviews with dinner and URiM outreach	Emergency medicine	Retrospective review from 2006 to 2017 at a single institution where, in 2006, the faculty began a diversification initiative to increase the number of underrepresented minority residents using a multifaceted approach.	Not specified	· Compared with the graduating classes of 1990 to 2009, the proportion of underrepresented minorities in the graduating classes of 2010 to 2021 significantly increased, from 12% to 27% as did the overall proportion of non-White residents, from 24% to 47%.	Level 4
Green-McKenzie J, et al, 2021 Outcomes of an Intervention to Increase Physicians Underrepresented in Medicine in Occupational Medicine Training[28]	Applicant: outreach to URiM residents and medical students at local, regional, and national meetings, creation and distribution of descriptive brochures, and supervised 1-day observerships Selection: Inclusion and Diversity Committee consisting of the program director and past/current residents	Occupational and environmental medicine	Single institution retrospective review of the creation of a diversity committee with targeted outreach over a 20-year period (1997-2017).	Residents who self-identified as Black, Hispanic, or American Indian	· Only 6% graduated during the first decade of the program (1997-2007); this increased to 23% during the following decade subsequent to establishing the Inclusion and Diversity Committee.	Level 4
Grullon K, et al, 2023 Impact of Considering United States Medical Licensing Examination Step 1 Pass/Fail on Diversity in Dermatology Residency Recruitment[46]	Screening: considered the USMLE Step 1 examination score as pass/fail	Dermatology	Retrospective, multiyear, cross-sectional study among applicants to the dermatology residency program during the 2018-2019 and 2020-2021 application cycles, the latter excluding use of USMLE Step 1 cutoff scores as a screening tool.	Applicants who self-identified as Black/African American, Hispanic/Latino or of Spanish origin, American Indian or Alaskan Native	· Statistically significant upward trend in the number of URiM applicants offered an interview from 10.4% to 37.7% across the application cycles.	Level 4

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
Guh J, et al, 2019 Antiracism in Residency: A Multimethod Intervention to Increase Racial Diversity in a Community-Based Residency Program[37]	Selection: multifaceted diversity initiative: mission statement revision, a diversity task force, an antiracism curriculum, and an ongoing system to evaluate progress	Family medicine	Retrospective review of a comprehensive diversity initiative within the department from 2014 to 2017.	URiM: AAMC definition including Black people, Latinx people, and Native Americans mURiM (modified URiM): all POCs except for people of Chinese, Korean, and Indian descent	· From 2014 to 2017, the proportion of POCs among the residents increased from 28% to 68%. · Faculty diversity increased from 9% to 27% over the same period.	Level 4
Hoff LM, et al, 2022 An Initiative to Increase Residency Program Diversity[22]	Applicant: visibility at academic conferences for URiM trainees, development of targeted marketing materials, and a visiting student program supported by networking with URiM residents Screening: holistic application review Interview: applicant interviews with URiM faculty and interview dinners with URiM residents	Categorical pediatrics, child neurology, and medical genetics	Multiple iterative tests of change and quasi-experimental time series design to implement interventions focused on increasing visibility of our URiM trainees and faculty to medical students and residency applicants from 2017-2021.	Black or African American, Latino or Hispanic, and American Indian or Pacific Islander	· The percentage of URiM residents increased to 16% in 2018, 26% in 2019, 19% in 2020, and 21% in 2021 (a 4-year average of 22% URiM residents; $P<.001$).	Level 4
Lall DM, et al, 2021 Recruitment of a Diverse Emergency Medicine Residency Program: Creating and Maintaining a Culture of Diversity, Equity, and Inclusion[30]	Applicant: development of a long-standing relationship with a historically Black college and university for outreach Screening: holistic application review and standardized review of applications with scoring system Interview: recruited a core group of diverse faculty interviewers	Emergency medicine	Iterative process over from 2 decades of deliberate innovation, implementation, and reflection with multifaceted approach to build and maintain a diverse, inclusive residency program.	Female, Black/African American; Hispanic/Latinx, Native American, Native Alaskan, or Pacific Islander	· Since 2007, the program has consistently had a higher percentage of residents who are women, Black/African American, and overall URiM when compared to national norms.	Level 5
Llado-Farrulla M, et al, 2021 In Search of Workforce Diversity? A Program's Successful Approach[23]	Applicant: 4-week visiting clerkship program targeting URiM and establishment of reliable outreach for URiM candidates by means of the Alliance of Minority Physicians Screening: AAMC-endorsed holistic review of residency applications	Plastic and reconstructive surgery	Retrospective review of the demographics of the program's residents assessed over the past 9 academic years (2011-2020).	Females and African Americans, Latinos, and Native Americans/Alaskan Native	· Linear increase from 0% (for 2011 to 2012) to 29% (for 2019 to 2020). · This study revealed a steady proportion (27% in 2011-2012 to 29 in 2019-2020) of female surgical residents during this same period.	Level 4

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
Marbin J, et al, 2021 Improving Diversity in Pediatric Residency Selection: Using an Equity Framework to Implement Holistic Review[33]	Selection: required anti-bias training for everyone involved with recruitment and selection Screening: created a shared mental model of desirable qualities in residents and employing a new scoring rubric Interview: inclusion of URiM faculty and trainees in the selection process	Pediatrics	Retrospective review of a single intuition using an equity framework to guide implementation of diversity efforts (2017-2020).	Not specified	· The percentage of entering interns who self-identify as URiM significantly increased from 11% in 2015 to 45% (OR=6.8, *P*=.008) in 2019 and to 35% (OR=4.6, *P*=.035) in 2020.	Level 4
Mason SB, et al, 2017 Pipeline Program Recruits and Retains Women and Underrepresented Minorities in Procedure Based Specialties: A Brief Report[24]	Applicant: 3-phased program: early initial exposure and hands-on experience, clinical and research experience, and mentoring and professional development	General surgery and other procedural-based specialties	Retrospective observational cohort study of the Pipeline Initiatives Curriculum, which enrolled 118 medical students from 40 medical schools (2005-2012).	Women and underrepresented minorities	· Overall, 71% of participants applied to procedure-based specialties and 81 matched into respective residency programs. · The overall Match rate across the 8 cohorts was 72.3%.	Level 4
Nehemiah A, et al, 2021 Looking Beyond the Numbers: Increasing Diversity and Inclusion Through Holistic Review in General Surgery Recruitment[40]	Screening: holistic residency review process	General surgery	Retrospective study comparing the proportion of women and URiM students ranked and matched into categorical positions from 2013-2020 before and after the implementation of the holistic application review process.	Women and URiM students	· Statistically significant increase in the proportion of women (42% vs 61%, *P*<.01) and URiM students (14% vs 20%, *P*=.046) ranked in our program compared with the prior "traditional" approach. · The proportion of matched women (33% vs 54%, *P*=.11) and URiM applicants (14% vs 21%, *P*=.48) also increased after holistic review. · The median USMLE Step 1 scores were equivalent for both ranked (250 vs 250, *P*=.81) and matched (250 vs 249, *P*=.32) applicants before and after the intervention. · The median ABSITE scores for the matched intern classes were lower after initiation of holistic review (519 vs 483, *P*=.01).	Level 4

TABLE

Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
Nellis JC, et al, 2016 Impact of a Mentored Student Clerkship on Underrepresented Minority Diversity in Otolaryngology–Head and Neck Surgery[25]	Applicant: outreach effort consisting of either a 3-month research clerkship or a 1-month clinical rotation with financial assistance and faculty mentorship	Otolaryngology–head and neck surgery (OHNS)	Prospective observational study to describe the impact of a mentored clerkship initiative of 15 students on underrepresented minority medical students interested in otolaryngology–head and neck surgery (2009-2015).	African Americans, Hispanics or Latinos, and Asian Americans	· 15 students participated in a clerkship from 11 medical schools. · Evaluation average scores and comments revealed high student satisfaction with the rotations, mentorship, and exposure to academic medicine. · Participants indicated the rotation favorably impacted their decision to apply for OHNS residency training and increased their interest in academic medicine. · The participants had an average number of 1.7 publications, with 1.18 publications in OHNS journals. · Seven students applied for OHNS residency programs, and 6 matched successfully.	Level 3
Schulz EA, et al, 2023 The Impact of Holistic Review of Urology Residency Applications on Selection for Interview During the COVID-19 Pandemic[41]	Screening: holistic residency review and implantation of a scoring system focused on desirable attributes	Urology	Retrospective cohort review to investigate the impact of a holistic review of urology residency applications (n=282, 300, 367 between 2019 and 2022) on interview selection.	URiM was defined by AAMC guidelines as those racial/ethnic populations underrepresented in medicine relative to their numbers in the general population	· Compared to 2019-2020, URiM representation increased for the 2020-2021 interviewee cohort; however, this was not observed in 2021-2022 (16%, 24.4%, 15.4%, respectively). · Additionally, USMLE Step 1 and 2 scores were similar between interviewee cohorts in the 3 years studied.	Level 4
Sonoda K, et al, 2023 Virtual Brunches to Enhance Recruitment of Residents and Fellows Who Self-Identify as Underrepresented in Medicine[31]	Applicant: GME-wide recruitment programs in the form of virtual URiM recruitment diversity brunches	All GME programs	Retrospective review using survey evaluations of a diversity outreach event with 280 URiM applicants participating within 6 events from 2021-2022.	URiM was defined by AAMC guidelines as those racial/ethnic populations underrepresented in medicine relative to their numbers in the general population	· The percentage of new resident and fellow hires who identify as URiM significantly increased from 10.9% in 2021-2022 to 15.4% in 2022-2023. · The percentage of brunch attendees matriculating into our programs in 2022-2023 was 7.9%.	Level 4
Spector RA, et al, 2019 Reducing Reliance on Test Scores Reduces Racial Bias in Neurology Residency Recruitment[43]	Screening: standardized point system for application review which incorporated clinical grades, extracurricular activities, research, letters of recommendation, board examination scores, and life experiences	Neurology	Retrospective review of the residency application review process to determine at which point the program was eliminating URiM candidates at a higher rate than those who	URiM was defined by AAMC guidelines as those racial/ethnic populations underrepresented in medicine relative to their numbers in the general population	· In 2016, 56% of URiM applicants were screened out by a mandatory minimum USMLE Step 1 score, whereas only 39% of all other groups were disqualified by test scores. · After removing the required minimum test score for application	Level 4

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
			are not from an underrepresented group (2016-2017).		review and modifying the screening process to a more holistic one the following application cycle, 24.5% of URiMs were offered interviews from 20% in 2017 compared to 28.1% from 30.6% of others.	
Swails LJ, et al, 2021 Mission-Based Filters in the Electronic Residency Application Service: Saving Time and Promoting Diversity[42]	Screening: holistic review of residency applications developed by filters to identify applicants with experiences/attributes aligned with the institutional mission using ERAS	Internal medicine (IM), pediatrics, general surgery	Retrospective review to develop and evaluate holistic review principles in screening applicants in the ERAS (2019-2020).	American Indian, Alaska Native, Black/African American, Hispanic/Latino, Native Hawaiian, or Pacific Islander	· Compared to the baseline screening approach utilizing scores, mission-based filters significantly increased the proportions of underrepresented in medicine applicants selected for review in IM (54.8% vs 22.7%, *P*<.001) and pediatrics (63.2% vs 25.3%, *P*<.001).	Level 4
Thompson NB, et al, 2022 Practical Strategies for Underrepresented Minority Recruitment in General Surgery Residency[34]	Selection: previous underperformance in diversity was openly addressed Screening: more detailed, holistic review process Interview: URiM faculty and residents prominently featured during the interview process Post-interview: URiM applicants contacted with follow up emails post-interview	General surgery	Retrospective review of applications from the 2016 to 2022 Match cycles was conducted.	URiM was defined by AAMC guidelines as those racial/ethnic populations underrepresented in medicine relative to their numbers in the general population	· Pre-intervention, URiM candidates represented 4% of total applicants invited. Post-intervention during the 2021-2022 Match cycles, URiM candidates represented 27% of total applicants invited. · Pre-intervention, 1 URiM resident of 24 (4%) matched into the categorical program compared to post intervention were the program matched on average 30% of its incoming categorical class from URiM candidates.	Level 4
Tunson J, et al, 2016 Increasing Resident Diversity in an Emergency Medicine Residency Program: A Pilot Intervention with Three Principal Strategies[26]	Applicant: scholarship-based externship program Interview: increased involvement and visibility of URiM faculty in the interview and review process Post-interview: funded second-look event	Emergency medicine	Retrospective review from 2012-2013 of a single institution focused pilot intervention to increase diversity.	African American/Black, Latino/Latina, Native Hawaiian, Native American, and Vietnamese individuals	· One year after implementation of the pilot intervention, the percentage of URiMs among all applicants invited to interview at the program doubled from 7.1% in AY 2011-2012 and 7.0% in AY 2012-2013 to 14.8% in AY 2013-2014. · Of all interviewees in AY 2013-2014, 17.6% (49 of 279) were URiM, nearly a threefold increase from AY 2012-2013 (6.2%).	Level 4

TABLE
Summary of Scoping Review Results: Interventions to Increase Representation in GME Residency Programs (continued)

Author, Year, Title	Intervention(s)	Specialty	Methodology	Definition of URiM	Results/Outcomes	Quality Assessment[a]
					· In AY 2013-2014, 23.5% of all new residents were URiM, compared with 5.9% in AY 2011-2012 and 5.6% in AY 2012-2013.	
Williams C, et al, 2023 Representation Matters: One Urology Residency Program's Approach to Increasing Workforce Diversity[27]	Applicant: funded visiting student rotation and implemented targeted outreach Screening: holistic evaluation of applications	Urology	Retrospective review of a 3-pronged approach aimed at increasing the number of interviewed applicants, and subsequently number of URiM residents recruited (2015-2022).	Black/African American, Hispanic/Latino, and American Indian/Alaskan Native/Native Hawaiian, and mainland Puerto Rican	· The number of URiM interviewees significantly increased from 6.1% in 2015 to its peak, 40%, in 2020. · In 2015, there were no URiM residents in the urology residency program but by 2022, the total URiM complement increased to 35%. · There was no significant difference in mean USMLE Step 1 score before compared with after the implementation of our recruitment approach. · The maximum rank number reached to fill the urology residency positions also remained relatively stable throughout the study period.	Level 4
Wusu M, et al, 2019 Matching Our Mission: A Strategic Plan to Create a Diverse Family Medicine Residency[29]	Applicant: increased outreach to URiM students Selection: analyzed recruitment data each year Interview: blinded interviews evolving to a structured interview format with standardized questions and increasing presence of URiM residents and faculty Post-interview: URiM candidates received a follow-up email from a URiM resident or faculty member	Family medicine	Retrospective review regarding the impact of a multifaceted diversity intervention (2010-2017).	Black, Hispanic, and Native American	· From 2014-2017, the total number of URiM applicants increased by 80%. · Evaluating recruitment trends from 2010-2017, there was a statistically significant increase ($P<.001$) in the percentage of URiM applicants from 13.3% to 19.9%. · There was a significant increase ($P=.03$) in the percentage of matched URiMs. Before the intervention, the percentage ranged from 0% to 20% with post-intervention ranging from 25% to 50%.	Level 4

[a] Assigned using the Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence.[19]

Abbreviations: GME, graduate medical education; URiM, underrepresented in medicine; AY, academic year; ERAS, Electronic Residency Application Service; AAMC, Association of American Medical Colleges; USMLE, United States Medical Licensing Examination; POC, people of color; ABSITE, American Board of Surgery In-Training Examination.

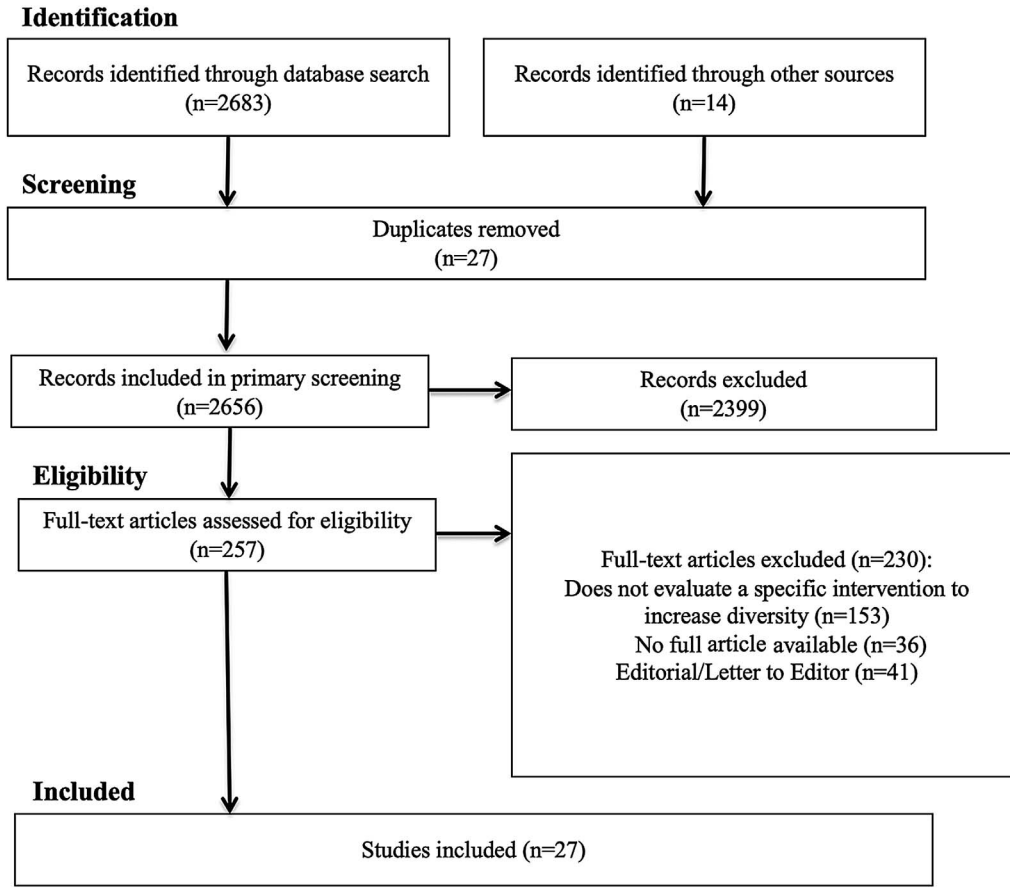

FIGURE 2
PRISMA Study Flow Diagram

assessments, such as situational judgment tests and scoring algorithms tailored to institutional priorities.[45] Two additional studies reduced the weight of Step 1 scores in interview decisions by using Gestalt-based evaluations or treating the score as pass/fail prior to the national shift.[28,35,46]

FIGURE 3
Number of Studies With Interventions Targeting Specific Time Points in the Residency Application Process (FIGURE 1)

Note: The sum of studies is greater than the total number of studies (n=27) as most articles involved multiple interventions targeting different points in the process.

Interview

Despite receiving interview offers, URiM students may still face disadvantages during the interview phase that affect their chances of matching. This review found several programs that initiated changes to the interview encounter to reduce bias by asking a standardized question among all applicants.[29,32] One program blinded the interviewers to the interviewee's application to provide a more unbiased assessment.[29] The largest focus of this section, however, was to increase the visibility of the program's existing diversity by having purposeful recruitment of the URiM resident candidates by URiM faculty during the interview day.[22,26,29,32-35,44] These targeted interview day strategies—particularly efforts to increase URiM visibility—were associated with higher URiM representation in matched cohorts.

Post-Interview

Three studies included an additional outreach component to applicants in the form of post-interview email correspondence.[20,29,34] There was no study to

examine the isolated effect of post-interview communication, as these efforts were studied in conjunction with other interventions. Another follow-up opportunity involved hosting a funded second-look event to alleviate any additional concerns students may have regarding a specific program.[26] This extra point of contact was important for applicants to feel confident about the suitability of a program, especially regarding mentorship and acceptance of URiM status.

Limitations of the Literature

The current literature aimed at increasing URiM populations in medical residency programs is heterogeneous, thus limiting the ability to provide summary data, recommendations, or meta-analysis regarding the effectiveness of a particular intervention. Another limitation of the current literature is the frequent combination of multiple interventions within a single article. This limitation makes the degree of impact of a single change within an institution challenging to assess in isolation.

Discussion

The review identified several recurring strategies across the residency selection continuum aimed at increasing URiM representation. These included applicant-focused interventions such as funded clerkships and mentorship; selection and screening reforms like holistic reviews and showcasing departments' diversity efforts; interview modifications to reduce bias and enhance representation; and post-interview efforts such as tailored communication and second-look events to reinforce program commitment to diversity. The literature suggests that a comprehensive, longitudinal approach is necessary to meaningfully support URiM applicants across every phase of the GME selection process.

Efforts to improve diversity in GME reflect broader trends seen in medical school admissions and other professional fields. For example, holistic application reviews have been adopted across GME and undergraduate medical education to broaden access for URiM groups.[47] Similar strategies have emerged in allied health professions, including pharmacy and physical therapy, where these interventions are employed to engage underrepresented students and diversify the workforce.[48,49] These parallels highlight a growing recognition that equity-focused admissions practices are essential for building inclusive, representative institutions aligned with the communities they serve.

Compared to earlier reviews that were limited by specialty scope, timeframe, or narrow definitions of diversity, this study offers a broader cross-specialty synthesis and identifies interventions associated with increased URiM representation across varied institutional contexts.[50-52] However, institutional differences in resources, leadership commitment, and overall culture strongly affect the feasibility and impact of these interventions. Programs with limited URiM faculty or minimal institutional support may find it difficult to implement mentorship or outreach strategies without placing an undue burden on existing URiM trainees and faculty—a phenomenon known as the "minority tax."[53-55] Varying levels of diversity across specialties can also shape a program's prioritization of DEI efforts. By aggregating and contextualizing these findings, this review offers GME programs a foundation to critically evaluate and adapt diversity strategies that are both achievable and aligned with their institutional contexts.

Several limitations of the study should be considered. The nature of a scoping review prioritizes mapping the existing literature over evaluating the quality or effectiveness of interventions, restricting our ability to draw evidence-based conclusions or make definitive recommendations. This methodology is especially constrained when the studies found in our literature review varied widely in design, scope, and reported outcomes. As a result, we cannot assess which recurring strategies are most effective or generalizable across programs. Additionally, potential author biases may have shaped the interpretation of this review. Our lived experiences and identities—including those who identify with groups underrepresented in medicine—may have influenced how we framed findings or interpreted gaps. Alternative explanations for the reported increases in URiM representation—such as concurrent national or institutional policy changes—could not be assessed based on the available data. Future research using systematic review methods or longitudinal outcome evaluations would help determine the relative impact of interventions and guide evidence-based best practices.

Further research should examine how diversity-focused interventions can be adapted to fit the specific needs of various US GME programs and evaluate the long-term outcomes of URiM trainees who match through these enhanced processes. This is especially important as recent legislative changes at the state and national level threaten the sustainability and legality of DEI efforts through bans, funding cuts, and institutional rollbacks.[56] Identifying mechanisms to reduce the minority tax while preserving meaningful engagement from URiM trainees and faculty remains a critical area for future study.

Conclusions

This scoping review summarizes interventions designed to improve racial, ethnic, and gender diversity in US

residency programs. Across specialties, common themes included offering structured clerkship opportunities, adopting holistic application review processes, modifying interview practices to reduce bias, and actively demonstrating a program's commitment to diversity through intentional messaging and outreach, visible role models, and formalized diversity efforts. The interventions described in this study were frequently associated with increased URiM representation among matched residency applicants offering GME programs a concise overview of evidence-based strategies to guide DEI efforts.

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