



AOA Critical Issues in Education

Increasing Diversity in Orthopaedic Surgery Residency

A Case Report of One Program's Experience Using Pipeline Programs

Hans K. Owuor, BS, Eric J Strauss, MD, FAOA, Toni McLaurin, MD, FAOA, Joseph D Zuckerman, MD, FAOA, and Kenneth A. Egol, MD, FAOA

Investigation performed at Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, New York, New York

Introduction: African American, Hispanic, Asian, and Pacific Islanders are groups who are underrepresented in medicine (URM groups). Similarly, although women comprise more than 50% of medical students in the United States, women comprise a smaller percentage of all orthopaedic surgery trainees. Therefore, underrepresented in orthopaedics (URiO) represents the URM groups and women. The purpose of this study is to examine the impact of specific steps to recruit a qualified, diverse trainee complement within a single academic orthopaedic surgery residency program between 2000 and 2023. We aim to explore changes in the representation of URiO during this period as well as explore the strategies and programs implemented by the department that may have impacted recruitment of a diverse complement of trainees.

Methods: Match lists from a large, academic, orthopaedic surgery residency between 2000 and 2023 were collected and reviewed for racial and gender data. Match lists were then divided into 6-year quantiles to identify any trends in the recruitment of URiO students. Self-reported racial and gender data from Electronic Residency Application Service applicant reports and the Accreditation Council for Graduate Medical Education (ACGME) data books between 2018 and 2022 were collected and reviewed. In addition, the department's strategies implemented during the study period with the goal of enhancing URiO exposure to orthopaedic surgery were also explored.

Results: The department implemented proactive strategies to increase exposure to orthopaedic surgery for URiO students. An increase in URiO representation was noted between 2000 and 2023 with Hispanic, Black/African American, and Native Hawaiian/Pacific Islander resident representation increasing by 5%, 11%, and 1%, respectively. In addition, women representation increased by 27% between 2000 and 2023. The overall attrition rate among URiO residents was 1% with only one resident not completing the program. Self-reported racial and gender data from ACGME data books

continued

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demonstrated that Black/African American, Hispanic, and Native Hawaiian/Pacific Islander residents comprised 5%, 4%, and 0.04%, respectively, of orthopaedic surgery residents between 2018 and 2022.

Conclusions: These results provide insight for other programs to use similar strategies to potentially improve recruitment, retain, and provide support to URiO residents.

Introduction

The Association of American Medical Colleges (AAMC) definition of underrepresented in medicine (URM) is "... those racial and ethnic populations that are underrepresented in the medical profession are relative to their numbers in the general population". Despite accounting for approximately 34.6% of the US population², URM groups comprise only 12% of orthopaedic surgical residents³ and 7.1% of all practicing orthopaedic surgeons⁴ across the country. Similarly, women account for approximately 18% of all orthopaedic residents³ and 5.9% of all practicing orthopaedic surgeons⁴ while accounting for more than 50% of the US population². Underrepresented in orthopaedics (URiO) is the combination of minority populations and women, and although representation of both has increased in orthopaedic surgery, it remains one of the least diverse fields in all of medicine⁵⁻⁹. In addition, studies have demonstrated that attrition rates amongst URiO residents, primarily Black/African American residents, are significantly higher than those of White residents¹⁰. The lack of diversity and the prevalence of high attrition rates emphasize the significance of formulating strategies to recruit, retain, and provide support for residents.

The purpose of this study is to examine the impact of the development and implementation of recruitment strategies to develop and attract a qualified, diverse trainee complement within a single orthopaedic surgery residency program at a large, urban academic medical center from 2000 to 2023 and compare it with the national data on orthopaedic surgery residency programs. The study aims to (1) determine whether changes in the representation of residents identifying as URiO occurred during the period studied and (2) explore the strategies and programs implemented by the institution during this period that may have influenced recruitment of a diverse resident complement.

Methods

We conducted a comprehensive review of match lists from a large urban, academic, university-based orthopaedic surgery residency program for the years 2000 to 2023. Each resident who matched during the study period was individually reviewed for race and gender data. For the purpose of this study, the definition of URiO closely mirrored the AAMC's definition of "URM." Hence, within this study, URiO encompassed the subsequent racial and ethnic categories: "Black/African American," "Hispanic or Latino," and "Native Hawaiian or Pacific Islander." Notably, our URiO definition excluded "Asian" or "Other" because despite Asian Americans constituting 6.3% of the US population², they

represent 12.8% of active orthopaedic residents³ and as such do not represent an "underrepresented" group.

During the study period, a number of proactive strategies were implemented by the department that were designed to increase exposure to orthopaedic surgery for URiO groups with the goal of developing a diverse pool of applicants applying to the residency program. These strategies included: a summer externship program for medical students between their first and second years with designated positions for students identifying as URiO, as well as scholarships to allow fourth-year URiO students to afford travel and lodging to complete a fourth-year elective in orthopaedic surgery, a medical school gap year research program that focused on providing opportunities for URiOs, and the sponsorship of orthopaedic workshops through established organizations (Nth Dimensions, Student National Medical Association [SNMA], and the Perry Initiative) targeted at medical students identifying as URiO.

To identify potential trends in the recruitment of URiO groups, we categorized the match lists into distinct 6-year quantiles: 2000 to 2005, 2006 to 2011, 2012 to 2017, and 2018 to 2023. This allowed us to assess changes over time in the representation of URiO demographics within our residency program.

Racial and gender data were then collected from self-reported information provided by applicants through the Electronic Residency Application Service (ERAS)¹¹ to assess trends in the orthopaedic surgery residency applicant pool. This data were available for the years 2015 to 2022. However, because of limited self-reporting during the initial 3 years (2015-2017), our analysis primarily focused on data from the years 2018 to 2022. Similarly, self-reported racial and gender data from the Accreditation Council for Graduate Medical Education (ACGME) Databooks³ were collected between 2012 and 2022 and reviewed for any trends. These data were then compared with racial and gender data for the program's orthopaedic surgery residents from the same period.

Results

Over the course of 2000 to 2023, the program reported a total of 300 residents selected for training. The resident demographics were as follows: 75 (25%) Asian, 22 (7.3%) Black/African American, 27 (9%) Hispanic, 3 (1%) Native Hawaiian/Pacific Islander, and 172 (57.7%) White. Of the 300 residents, 58 (19.3%) were reported as women, whereas 242 (80.7%) were reported as men. Throughout the study period, 97/98 URiO trainees completed the program successfully (99%). In addition, 230 eligible senior residents sat for their American Board of Orthopaedic Surgery certification examination on completion of the program

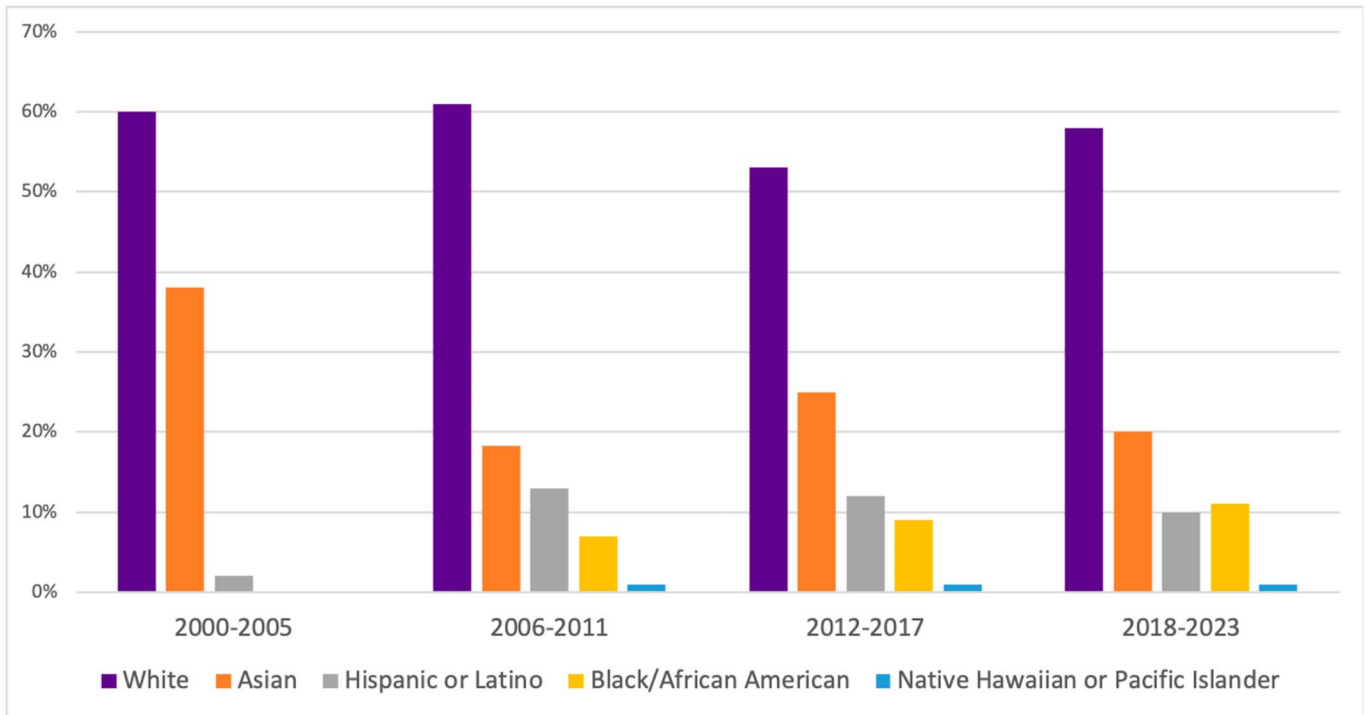


Fig. 1
Racial demographics of medical students who matched at our program from 2000 to 2023.

with 219 passing the examination on their first attempt (95.2% passing rate). Of those 230, 64 were URiO residents with 61 passing the examination on their first attempt (95.3% passing rate). Ultimately, all residents successfully passed parts 1 and 2 of the ABOS certification.

The period from 2000 to 2023 exhibited a notable increase in URiO representation within the demographic com-

position that matched. Specifically, the representation of Hispanic residents increased from 2% in the first quantile (2000-2005) to 10% in the last quantile (2018-2023) (Fig. 1). Similarly, the representation of Black/African American residents increased from 0% in the first quantile to 11% in the last quantile. The representation of Native Hawaiian/Pacific Islander residents increased from 0% in the first quantile to 1%

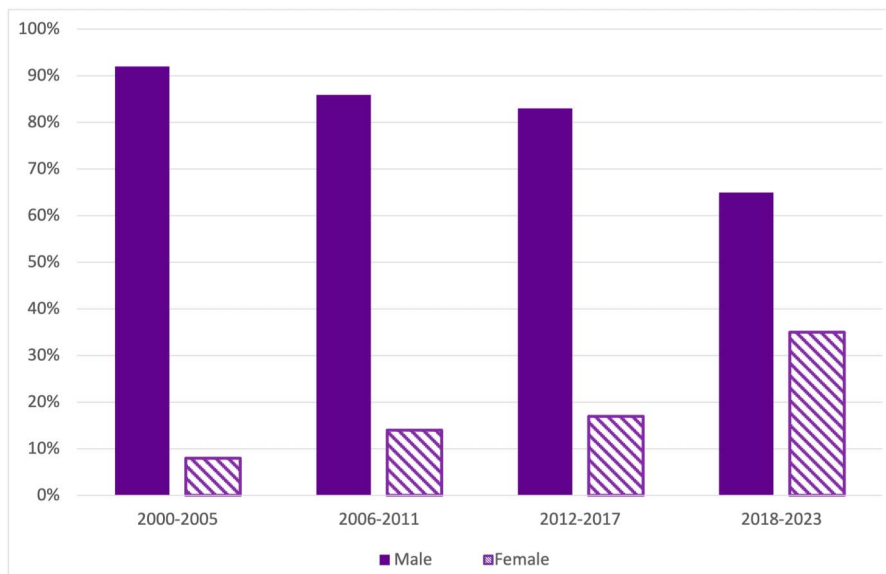


Fig. 2
Gender demographics of medical students who matched at our program from 2000 to 2023.

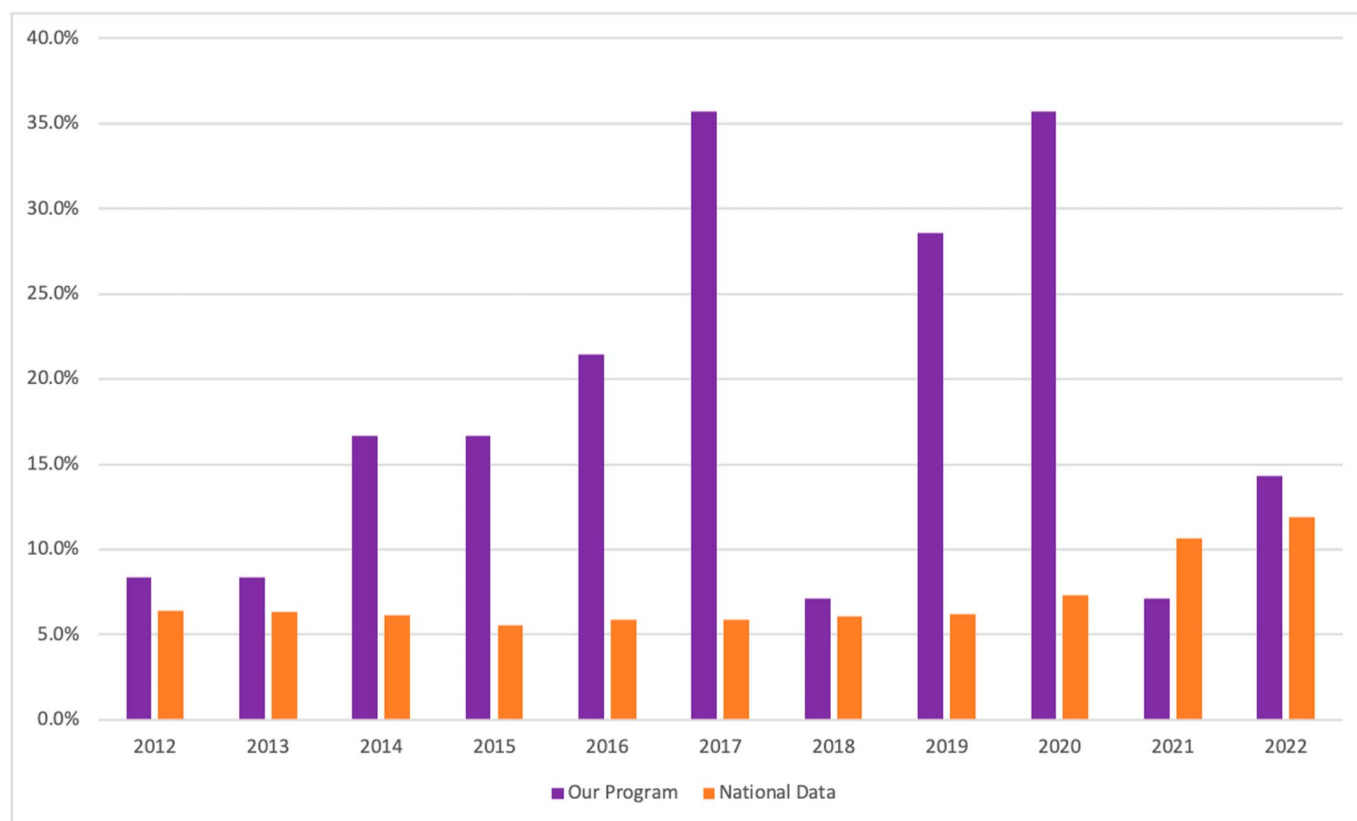


Fig. 3
Racial demographics of our orthopaedic surgery residents in comparison with national ACGME data from 2012 to 2022.

in the last quantile. In addition, the representation of women increased from 8% to 35% during the same timeframe (Fig. 2). It is also important to note that the resident cohort grew from 10 residents per year in 2000 (total resident complement of 50) to 14 residents (total resident complement of 70) during the study period.

Analysis of self-reported race and gender data reviewed from ACGME data books for the period spanning indicated that representation of Hispanic, Black/African American, and Native Hawaiian/Pacific Islander orthopaedic surgery residents combined increased from 6% to 11% between 2012 and 2018 (Fig. 3). Comparatively, representation of Hispanic, Black/African American, and Native Hawaiian/Pacific Islander residents increased from 8% to 14% in our program between 2012 and 2022. In addition, the representation of women increased from 17% to 22% in our program compared with an increase of 13% to 18% of the total orthopaedic surgery resident population from 2012 to 2022 (Fig. 4).

A review of ERAS applicant reports spanning the years 2018 to 2022 showed that Hispanic, Black/African American, and Native Hawaiian/Pacific Islander applicants represented 8%, 7%, and 0.03% of the overall applicant pool, respectively (Fig. 5). During this period, Hispanic, Black/African American, and Native Hawaiian/Pacific Islander residents represented 7%, 11%, and 1% of residents who matched to our program, respectively. During the same period, 20% of all applicants were

women, and 33% of residents who matched to our program were women (Fig. 6).

Discussion

Although diversity in medicine has proven to be beneficial to patient care¹²⁻¹⁴, the field of orthopaedic surgery continues to grapple with the challenge of achieving diversity and representation reflective of the broader population. Our large academic orthopaedic surgery residency program implemented a number of strategies including development of our own and participation in national pipeline programs aimed at increasing diversity of trainees as well as program expansion from 2000 to 2023 as part of a directed effort to address this issue. Compared with national data on orthopaedic surgery residency programs across the United States during the same period, this strategy proved effective. The increased representation of Hispanics, Black/African Americans, and women represented the effectiveness of strategies implemented by our department to develop a more diverse applicant pool, which also resulted in a more diverse residency program. Analysis of the match cohorts from 2018 to 2022 documented that we matched URiO applicants at a higher proportion compared with their representation in the national applicant pool. Despite accounting for 9% of ERAS applicants, Black/African Americans comprised 11% of our residents. Similarly, applicants who identified as women represented 33% of our residents compared with the 20% of the overall applicant pool from 2018 to 2022.



Fig. 4

Gender demographics of our orthopaedic surgery residents in comparison with national ACGME data from 2012 to 2022.

According to a survey by Johnson et al., medical students select orthopaedic surgery based on exposure during medical school to the specialty as well as experiences before medical school that involve contact with an orthopaedic surgeon¹⁵. With this in mind, it is easy to see how some groups of premedical and medical students may have been disadvantaged in this regard. The increase in URiO representation in our residency program was associated temporally with the implementation of specific programs as well as participation in established national programs designed with the goal of increasing the diversity of our applicant pool. Beginning in the early 2000s, our department implemented different strategies targeted at URiO medical students, a pioneering effort that took place long before the principles of diversity, equity, and inclusion were widely recognized and embraced as essential. One of these initiatives was the department of orthopaedic surgery summer externship program, which exposed medical students to the field of orthopaedic surgery during the summer after their first year of medical school. Each year, positions were reserved for URiO medical students who were provided with a scholarship (in the case of financial need) to cover travel and living costs. This strategy was based on studies that have demonstrated pipeline mentorship and establishing a strong orthopaedic clinical curriculum for medical

students increases the odds of them applying to orthopaedic surgery residency¹⁶⁻²⁰. Similarly, the department established a scholarship program specifically for URiO students in their fourth year of medical school to complete a 1-month elective. Both of these programs were initially supported by alumni donors and eventually became part of our department budget. The department also supported an orthopaedic workshop at The SNMA's Annual Conference. This was initiated in the early 2000s through the American Academy of Orthopaedic Surgeons (AAOS). When the AAOS ended their program, our department continued to support this workshop. Each year, the department sent URiO faculty and residents to the workshop to provide an opportunity for students to interact with members of our department. This was especially important because studies have demonstrated that URiO medical students are more likely to apply to a program with a diverse faculty and trainees^{7,8,21}. Our department also offered a gap year research program where students conduct research in various orthopaedic surgery subspecialties such as trauma, joint replacement, foot and ankle, and sports medicine. A study by Egol et al. demonstrated that students who completed a gap year in research at our center matched into orthopaedics at a higher rate than the national average²². It is also important to note that the cohort in

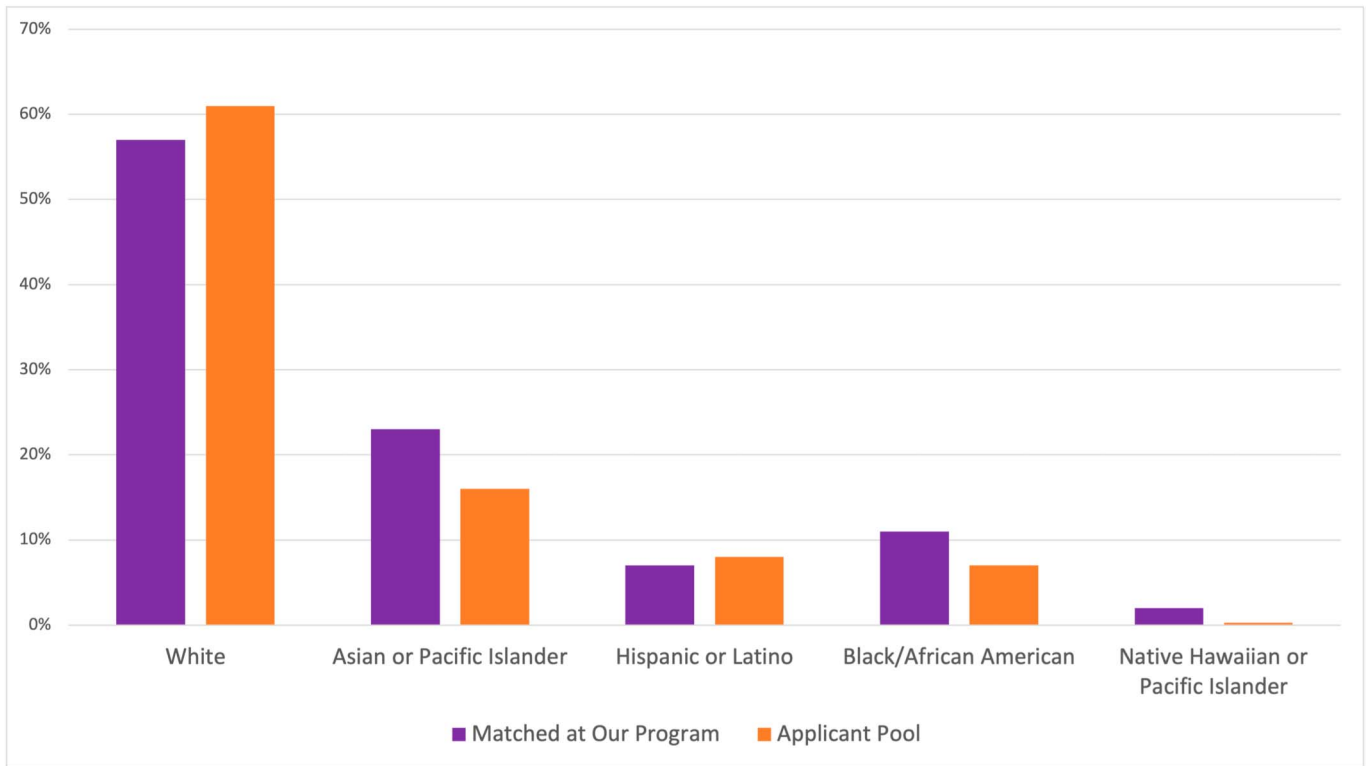


Fig. 5
Racial demographics of students who matched at our program in comparison with ERAS applicant data between 2018 and 2022.

this study comprised 23% women and 40% URM students. These strategies, designed with intentionality, directly target the identified barriers and gaps faced by URiO students. By providing oppor-

tunities such as fourth-year elective scholarships, the summer externship, and the gap year research program, we have not only reduced financial constraints but also exposed students to the field

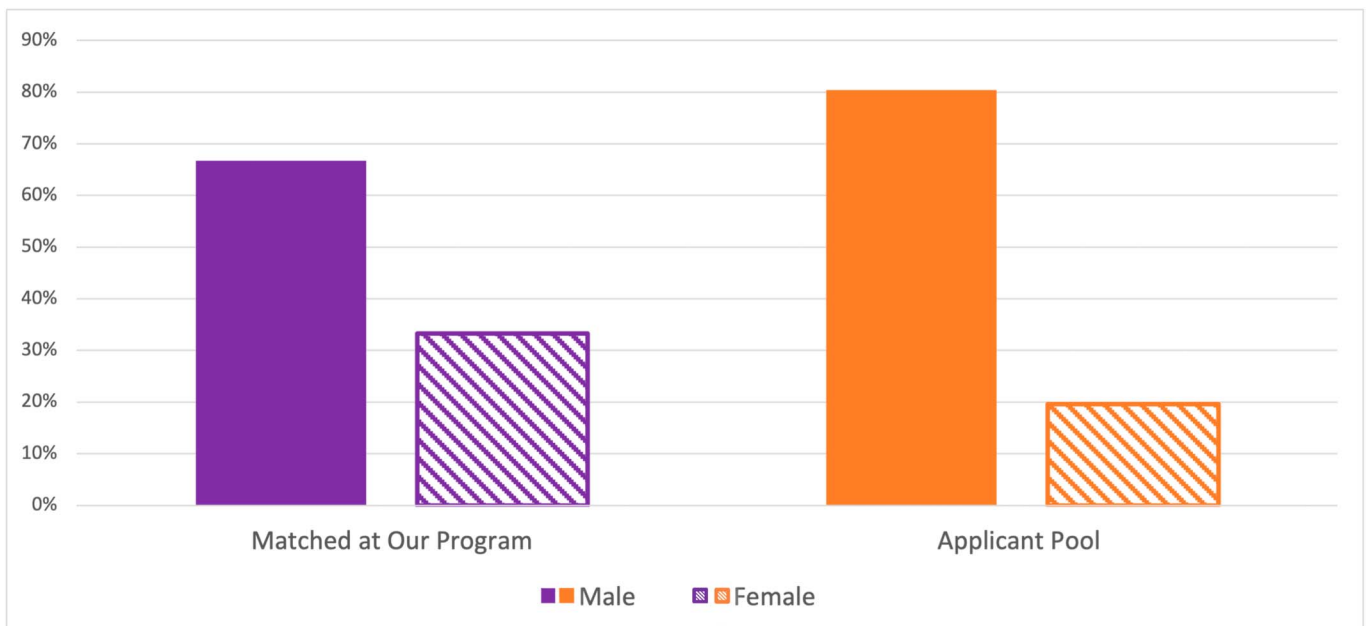


Fig. 6
Gender demographics of students who matched at our program in comparison with ERAS applicant data between 2018 and 2022.

of orthopaedics early and meaningfully. We have continued and expanded the reach of this program in 2022 by sponsoring a fourth-year elective through Personal Rights in Defense and Education for a medical student member of the Lesbian, Gay, Bisexual, Transgender and Queer community.

Another important topic for discussion is attrition rates. A study performed by Haruno et al. showed that across all surgical specialties, residents who identify as Black/African American and/or woman had the highest attrition rates (10.6% and 7.5%, respectively)¹⁰ compared with other residents. In addition, the study demonstrated that orthopaedic surgery had the highest attrition rates for Black/African American residents in comparison with other specialties¹⁰. The high attrition rates represent a combination of factors including a lack of mentorship, lack of representation in leadership roles, and a work environment that may not be supportive of URiO residents. To mitigate these potential issues, our program long ago established a robust faculty advisor program where residents are paired with a faculty member who offers a safe space to discuss challenges, concerns, and experiences. In addition, junior residents are paired with a senior resident to help them navigate residency as they progress through the program. Because of this, only one URiO resident did not complete the program during the study period (99% graduation rate). It is also important to note that URiO had a board examination pass rate similar to the overall pass rate of the program during the study period. This shows that diversifying the program's trainee complement did not negatively affect the program's main outcome of giving residents the knowledge and experience to enter the practice as well-trained, highly competent orthopaedic surgeons well prepared for their board certification examination.

Although we feel this study offers valuable insights, several limitations should be acknowledged. First, the focus on a single institution based in a large, urban setting may limit the generalizability of the findings to other orthopaedic surgery residency programs with differing sizes, resources, and contexts. Second,

the study's selected timeframe from 2000 to 2023 might not capture all relevant trends and external factors that could have influenced the outcomes over time. Third, the reliance on self-reported race and gender data, both from residents and applicants, introduces potential biases and inaccuracies that could affect the reliability of the reported results.

In conclusion, we believe that the program's initiatives and experiences can serve as a model for other institutions seeking to enhance diversity and representation within their programs. The substantial growth in URiO representation, particularly among Hispanic and Black/African American residents, along with increased gender diversity and the overall result of increasing the URiO complements in our program, mirrored the development of focused recruitment and support initiatives over the past 20 years in a single program. This study underscores the importance that targeted efforts, tailored programs, and ongoing commitment may have in achieving greater diversity in the field of orthopaedic surgery. As the medical community strives for equitable representation, the strategies and insights derived from this study can provide a roadmap for advancing diversity and inclusion in orthopaedic residency training programs. ■

Hans K. Owuor, BS^{1,2}

Eric J Strauss, MD, FAOA¹

Toni McLaurin, MD, FAOA¹

Joseph D Zuckerman, MD, FAOA¹

Kenneth A. Egol, MD, FAOA¹

¹Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, New York, New York

²CUNY School of Medicine, New York, New York

E-mail address for K.A. Egol: Kenneth.egol@nyulangone.org

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