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A Current Landscape of Gender, Racial, and Ethnic Diversity Dynamics in United States Orthopedic Surgery Residency Programs

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Abstract

Diversity within orthopedic surgery has been slow to progress. Diversity within the physician population has been shown to exhibit advantages in overall patient care. Although representation of underrepresented minorities and females is increasing, orthopedic surgery continues to diversify at a slower rate compared to other surgical subspecialties. The overall objective of this study is to delineate the current landscape of gender, racial, and ethnic diversity within orthopedic surgery programs from 2019 to 2023, with an aim of promoting progress and inclusivity in surgical training and practice.

Keywords: Orthopedic, Residents, Diversity, Disparities, Underrepresented, Residents

Abbreviations: AAMC: Association of American Medical Colleges, URiM: under-represented in medicine, URM: underrepresented minorities, SOMOS: Society of Military Orthopedic Surgeons, IODA: International Orthopaedic Diversity Alliance, AALOS: American Academy of Latino Orthopaedic Surgeons, BWOS: Black Women Orthopaedic Surgeons, WOGO: Women Orthopaedist Global Outreach, RJOS: Ruth Jackson Orthopaedic Society, WOW: Women in Orthopaedics Worldwide, AWS: Association of Women Surgeons, IMG: International Medical Graduates, MSOP: medical student outreach programs

Introduction

While strides have been made to enhance diversity in the medical field, the progress has yet to be consistent across all specialties, including orthopedic surgery **[1-3]**. The Association of American Medical Colleges (AAMC) defines under-represented in medicine (URiM) as racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population-including American Indian or Alaska Native; Black or African American; Hispanic, Latino, or of Spanish Origin;

and Native Hawaiian or Other Pacific Islander **[4]**. In 2003, the AAMC adopted the term URiM to replace underrepresented minorities (URM) in order to include other racial and ethnic groups that are not represented equally in medicine beyond the four groups of "Blacks, Mexican-Americans, Native Americans, and mainland Puerto Ricans" **[5]**. For simplicity's sake, we will be using the term URM to report on the current state of diversity.

In 2017, URM individuals comprised only 6% of all orthopedic surgery residents, marking a less than 2% increase over 6 years **[3]**. Similarly, orthopedic surgery maintains the lowest representation of women among medical specialties **[6]**. Though women comprised over half of all medical students in the United States in 2019, they constituted only 16.0% of active orthopedic surgery residents, and only 6.5% of practicing orthopedic surgeons **[7,8]**. A recent study analyzing racial and gender diversity in orthopedic surgery applicants and residents spanning from 2007 to 2019 revealed an increase of female and minority candidates among orthopedic residency applicants **[9]**. While the overall number of minority applicants increased, there was no change in the number of African American and Latino/Hispanic applicants **[9]**. Furthermore, the study uncovered a 10% decline in the representation of minority orthopedic surgery residents over the same time frame **[9]**.

Recent studies underscore the significance of mentorship and early exposure in fostering interest amongst women and URM in orthopedics **[10]**. Targeted initiatives have led to the establishment of numerous programs dedicated to fostering diversity in orthopedics, thereby attracting more individuals to explore careers in this field **[11]**. The culture of orthopedic surgery has shifted to emphasize the importance of a diverse workforce with racial and cultural competence. To our knowledge, there are a multitude of established national orthopedic organizations whose goals are to advance diversity by supporting URM medical students and residents: Nth Dimensions, The J. Robert Gladden Orthopedic Society, Pride Ortho, The Society of Military Orthopedic Surgeons (SOMOS) E. Anthony Rankin Scholarship Program, International Orthopaedic Diversity Alliance (IODA), American Academy of Latino Orthopaedic Surgeons (AALOS), Black Women Orthopaedic Surgeons (BWOS), and the Perry Initiative. These organizations have created communities for URM students and residents to receive mentorship, skills development, shadowing experiences, residency support, scholarships, and networking opportunities **[12-16]**. Increased membership and participation in these initiatives, as well as increased URM orthopedic applicants, demonstrate the necessity and demand to continue these programs.

Women are considered as another underrepresented group in orthopedic surgery, while increasing, every year they make up a mere 20.14% of U.S. orthopedic surgery residents in a 2023 report **[17]**. Some of the major organizations working on helping this gender disparity are The Perry Initiative, Women Orthopaedist Global Outreach (WOGO), Ruth Jackson Orthopaedic Society (RJOS), Women in Orthopaedics Worldwide (WOW), and Association of Women Surgeons (AWS). As these organizations continue to gain momentum, there are growing communities of URM and female medical professionals considering careers in orthopedic surgery. The sustained commitment to these diversity-enhancing initiatives will be crucial for achieving a more balanced and representative orthopedic workforce, ultimately enriching the field with varied perspectives and improving patient care outcomes **[18]**. The overall objective of this study is to delineate the current landscape of gender, racial, and ethnic diversity in orthopedic surgery programs within the United States from 2019 to 2023, with an aim of promoting progress, equity, and inclusivity in orthopedic surgery training and practice.

Methods

Demographic information was sourced from two primary databases: the AAMC Report on Residents **[19]** and the AAMC ERAS® Statistics **[20]** spanning from 2019 to 2023. Key demographic variables assessed for diversity included race, ethnicity, and gender. Race categories comprised White, Black or African American, Asian, and Other, while ethnicity was categorized as Hispanic/Latino or non-Hispanic/Latino, aligning with The AAMC FACTS glossary **[4]**. To ensure statistical relevance, only racial or ethnic groups exceeding a 3% representation in the general U.S. population, as per the U.S. Census Bureau, were individually listed. Groups falling

below this threshold, such as American Indian/Alaskan Native, multiracial, unknown, and others, were amalgamated into an "Other" category. Therefore, the population categories we used were Black or African American; Hispanic, Latino, or Spanish Origin; Native Hawaiian or other Pacific Islander; and Other. To gain a clearer picture of the current landscape in the U.S. medical school graduates, we did not include International Medical Graduates (IMGs) or non-U.S. citizens or non-permanent residents in our resident analysis. While we acknowledge the fluidity of gender, the self-reported sex of applicants was categorized as men and women according to the FACTS glossary **[4]**. Statistical analysis was conducted using a two-proportion z-test to determine the changes in proportions over time. This method was employed to assess the significance of the observed changes in the resident and applicant demographics from 2019-2020 to 2022-2023.

Results

Trends in URM Groups in Orthopaedic Surgery Applicants

From 2019 to 2023, the total count of URM applicants within orthopedic surgery remained relatively stable, ranging from 388 to 394 **(Figure 1)**. Minor fluctuations were observed within specific racial and ethnic categories. The proportion of Black or African American applicants showed minimal change, decreasing slightly from 8.0% to 7.6%. Similarly, the percentage of Hispanic, Latino, or Spanish origin applicants fluctuated between 8.9% and 8.3%. There was an increase in the Native Hawaiian or Other Pacific Islander applicant group, rising from 0.1% to 0.5% (2 to 8 applicants). Meanwhile, the proportion of applicants categorized as "Other" varied from 4.9% to 5.8% (87 to 103 applicants).

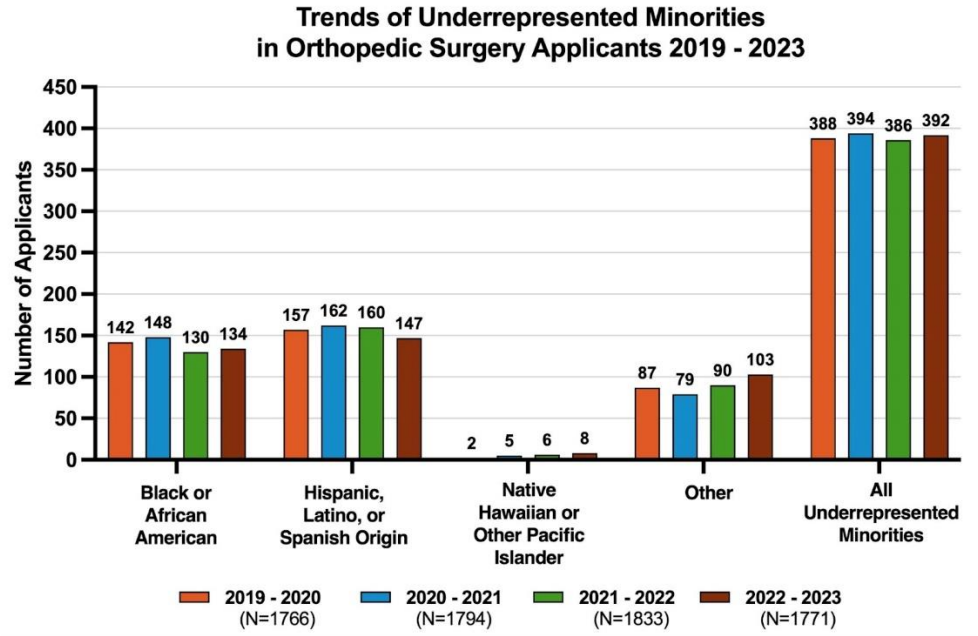

Figure 1: Trends of URM Orthopedic Surgery Applicants

Trends in URM Groups in Orthopaedic Surgery Residents

While the overall number of URM applicants remained steady, there was a rise in the number of URM residents from 562 in 2019-2020 to 688 in 2022-2023 **(Figure 2)**, reflecting an increase from 13% to 16%, which is statistically significant (p = 0.001). There was a discernible increase in Black or African American residents from 175 to 234, and Hispanic, Latino, or Spanish origin residents from 252 to 299 during the 2019-2023 period. The percentage of Black or African American residents significantly rose from 4.2% to 5.4% (p<0.001). Hispanic, Latino, or Spanish origin residents saw a slight increase from 6.0% to 6.9%, which was not found to be statistically significant (p = 0.09). Conversely, the number of Native Hawaiian or Other Pacific Islander residents slightly decreased from 16 to 10 residents, or from 0.4% to 0.2% (p = 0.2). Meanwhile, the percentage of residents categorized as "Other" saw a slight increase from 119 to 145 residents, or from 2.8% to 3.3% (p = 0.06).

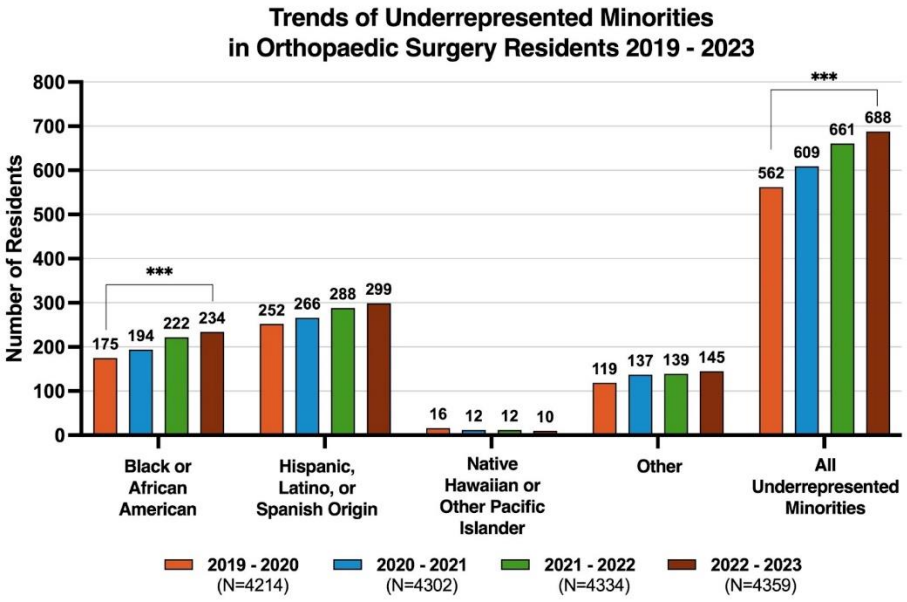

Figure 2: Trends of URM Groups in Orthopedic Residents

Trends in Sex-Based Differences in Applicants and Residents

A notable trend was the increasing number of female applicants to orthopedic surgery programs. The total number of female applicants rose from 334 to 400, peaking at 400 in 2021-2022 and dropping to 367 in 2022-2023, averaging approximately 16.2% of applicants per year (P = 0.1) **(Figure 3)**. Similarly, the count of active female residents also showed an annual increase, from 665 to 868 over the same period, demonstrating statistical significance (p<0.001) **(Figure 4)**. There is a greater gender disparity between male and female residents with osteopathic training compared to those with allopathic training **(Figure 4)**. Although there has been a small rise in the number of osteopathic female residents in orthopedic surgery from 2019 to 2023, this group still represents less that 2% of all orthopedic surgery residents. The number of osteopathic male residents has continued to increase from 2019 to 2022; however, it experienced a marginal decrease in the 2023 cycle. Female allopathic residents have continued to rise from 2019 to 2023; however, male allopathic residents have slowly declined over this time period **(Figure 4)**.

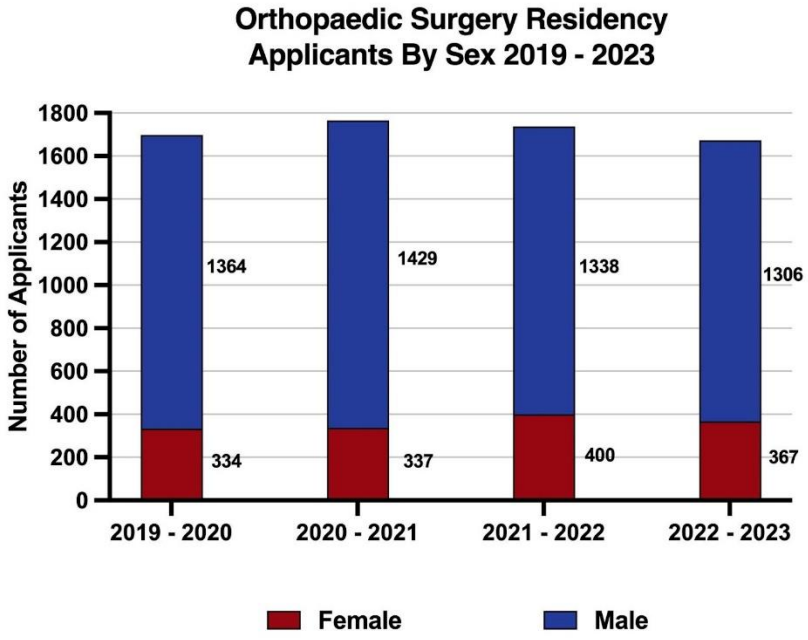

Figure 3: Orthopaedic Surgery Applicants by Sex

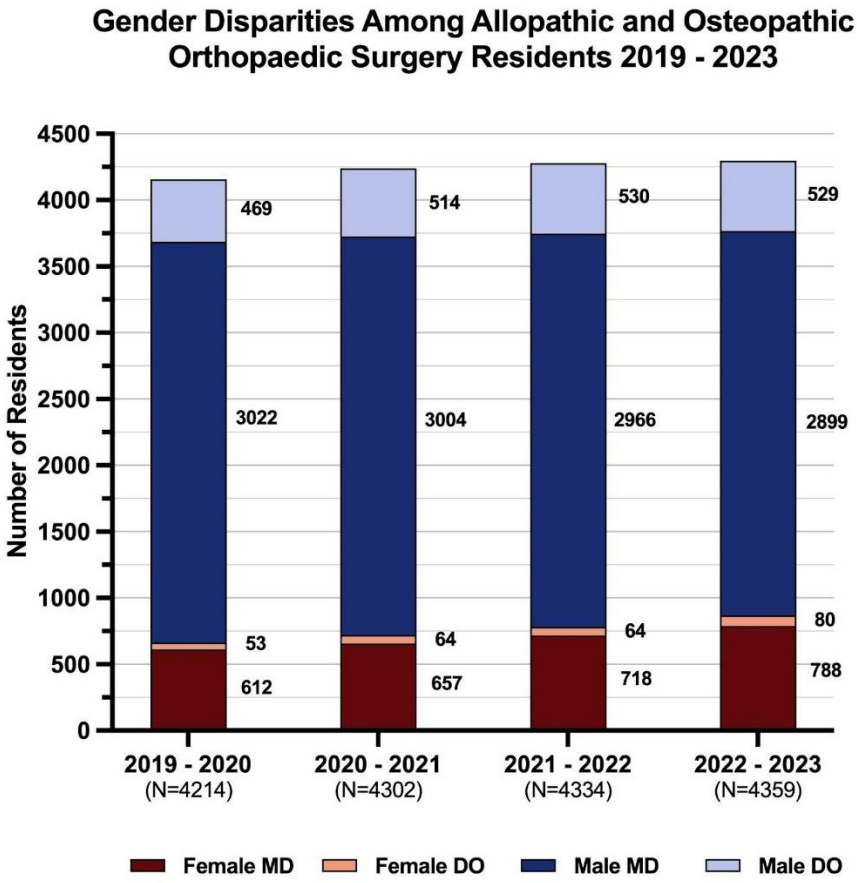

Figure 4: Gender Disparities Among Allopathic and Osteopathic Orthopaedic Surgery Residents

Discussion

In this study, we analyzed demographic trends in orthopedic surgery applicants and residents from 2019 to 2023, focusing on gender, race, and ethnicity. Data was sourced from the AAMC, ERAS, and AAMC Report on Residents **[19,20]**. Our report aims to identify recent shifts in diversity within orthopedic surgery, particularly among URM and women. While the total number of URM applicants remained stable, there was a slight decrease in the amount of Black or African American applicants from 2019-2023. Similarly, there was a fluctuation but an overall decrease in the number of Hispanic, Latino, and Spanish-origin applicants and an increase in the number of applicants who were categorized in the "Other" category. Although the overall number of URM applicants remained steady, there was a statistically significant increase in Black or African American residents and a rise, although not significant, of residents in Hispanic, Latino, or Spanish and "other" groups. These trends suggest a positive movement towards greater diversity in orthopedic surgery programs.

The number of female applicants has been steadily increasing, reaching a peak in the 2021-2022 application cycles before a decline in 2022-2023. The overall number of female residents has continued to rise, with females accounting for about 20% of the orthopedic surgery resident cohort in the 2022-2023 academic year **[17]**. Although marginally increasing, the osteopathic female orthopedic surgery residents account for less than 2% of all orthopedic surgery residents while females make up 50.7% of 2023 osteopathic medical school graduates, comparable to 51.9% of 2023 allopathic medical school graduates **[4,21]**. Even though there are less overall osteopathic medical graduates each year, the discrepancy of female osteopathic orthopedic residents does not mirror the representation of 13.8% of 2023 U.S. medical graduates who are female with osteopathic training **[4,21]**. This discrepancy highlights the need for targeted initiatives to support and encourage female osteopathic students to pursue orthopedic surgery. One such initiative is The Perry Initiative, which hosts medical student outreach programs (MSOPs) and high school student out-

-reach programs (POPs) to give early exposure to women in orthopedics through hands-on skills labs and case studies, creating an increase in participants entering orthopedic surgery residency programs compared to women who have not **[22]**. These programs offer a wide variety of scholarships, grants, and fellowships for medical students interested in orthopedic surgery, specifically, RJOS saw 80% of their scholarship winners (supporting 65 individual women) currently have a career in orthopedic surgery or are enrolled in an orthopedic surgery residency program **[23]**. These gender diversity organizations have had an evidence-based impact on women pursuing orthopedic surgery and are necessary driving forces for achieving gender parity within orthopedic surgery. The rising number of female residents may inspire more women to pursue careers and participate in gender diversity initiatives in this traditionally male-dominated field, further enhancing gender equity in medicine.

Our findings align with previously published research highlighting the slow but steady progress in diversifying medical specialties. A study by Okike et al. reported similar trends in the increase of women and URM in orthopedic surgery programs, underscoring the importance of ongoing efforts to enhance diversity **[24]**. Additionally, studies have documented the challenges and gradual improvements in gender and racial representation across various medical fields. Our results are consistent with these findings, indicating that while progress is being made, there is still much work to be done **[18,25]**. The significant increase in female residents in our study echoes the findings of Saade et al. 2024, who noted a growing number of women entering surgical specialties **[26]**.

Orthopedic surgery is historically known for its slower pace of diversification compared to other fields like general surgery and pediatrics **[27]**. This disparity suggests that while diversity initiatives are having an impact, orthopedic surgery may require more targeted efforts to overcome its unique barriers. Similarly, Lett et al. identified the importance of mentorship and early exposure in attracting URM and female medical students to surgical specialties **[28]**. Our findings support this notion, as the increase in URM and female residents aligns with the introduction and expansion of mentorship programs like those offered by Nth Dimensions, RJOS, JRGOS, Pride Ortho, and the Perry Initiative. These programs provide crucial support and resources, making the field more accessible and appealing to a diverse range of applicants.

The increasing diversity among orthopedic surgery residents is encouraging and suggests that efforts to recruit and support underrepresented groups continue to grow. Greater diversity in medical training programs can lead to a more inclusive and culturally competent healthcare workforce, ultimately improving patient care and outcomes **[18,29]**. To continue this positive trend, medical schools and residency programs should consider implementing targeted recruitment strategies and support systems for URM and female applicants. Mentorship programs, scholarships, and outreach initiatives can play crucial roles in attracting and retaining diverse talent. Additionally, institutions should foster an inclusive environment that addresses the unique challenges faced by these groups, ensuring their success and well-being throughout their medical careers.

This study has several limitations. The data were obtained from the AAMC ERAS and the AAMC Report on Residents, which might not fully represent demographic diversity across all orthopedic residency programs due to potential inconsistencies in reporting. The categorization of race and ethnicity could obscure detailed trends by grouping diverse identities into broad categories such as "Other." Additionally, while there were noted increases in female and URM residents, the study did not explore retention rates or career progression, leaving it uncertain if these gains translate into long-term representation. The reliance on quantitative data without qualitative insights restricts the understanding of personal experiences and challenges faced by these residents. Furthermore, the study's timeframe of 2019 to 2023 might not be sufficient to fully capture the impact of diversity initiatives, indicating a need for longer-term studies to evaluate sustained trends. These limitations highlight the necessity for ongoing research and more comprehensive data collection to better address barriers to diversity in orthopaedic surgery.

Conclusion

The rising number of female applicants and URM residents in orthopaedic surgery is encouraging. Despite these positive changes, the rate of increase is slow compared to other specialties. Further studies examining URM barriers could aid in the development of more targeted initiatives to achieve an orthopaedic workforce that reflects the patients being served.

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