OPEN Research Article

Academic Orthopaedic Surgeon Financial Compensation in the United States: Trends and Distribution

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Dr. Grauer: North American Spine Society Past Board Member, North American Spine Society Journal Editor-in-chief, and Journal of the American Academy of Orthopaedic Surgeons Deputy Editor. None of the following authors or any immediate family member has received anything of value from or has stock or stock options held in a commercial company or institution related directly or indirectly to the subject of this article: Jayaram, Futela, Day, and Dr. Malhotra.

JAAOS Glob Res Rev 2025;9: e25.00112

DOI: 10.5435/JAAOSGlobal-D-25-00112

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ABSTRACT

Introduction: The overall trends in academic orthopaedic surgery compensation are not well studied. The aim of this study was to assess trends and distribution of academic orthopaedic surgery financial compensation and consider in relation to academic rank, sex, and race/ethnicity.

Methods: The 2017 to 2023 American Association of Medical Colleges Faculty Salary Surveys were used, which collect information for full-time faculty at US medical schools. Financial compensation data for orthopaedic faculty, across subspecialities, were stratified by year, academic rank, sex, race/ethnicity, and geographic region. Trends in median, 25th, and 75th percentile compensation were assessed.

Results: Responses for 2,601 faculty members across orthopaedic departments were available, including 82 instructors, 1,176 assistant professors, 668 associate professors, 487 full professors, 104 chiefs (lead a division within the larger department), and 84 chairs (head an entire academic department). Median faculty compensation increased on an average of 1.80% to 6.93%, with the greatest increase at the chief and chair levels and smaller increases for instructors and professors of varying rank. From 2017 to 2013, women were consistently compensated less than men at all ranks except chairs. In 2023, women in academic orthopaedic surgery made less cents-on-the-dollar relative to men of equal rank across all ranks. Asian assistant professors made 0.90 cents-on-the-dollar, and Hispanic/Latino and Black/African American assistant professors made 0.87 cents-on-the-dollar compared with White faculty of equal rank. However, among professors, these groups had higher median compensation (1.06 to 1.1 cents-on-the-dollar) compared with White professors. The geographic variations of compensation were within the range of 15k for assistant professors, 32k for associate professors, 196k for chiefs, 95k for professors, and 83k for chairs.

Conclusion: This study summarizes trends of academic orthopaedic faculty compensation and shows salaries barely keeping pace with inflation and persistent compensation inequities, which highlights the need for fair, transparent compensation models and additional studies of factors impacting physician compensation.

The US healthcare landscape is evolving, with practices facing high workloads, economic strains, physician shortages, and elevated rates of work-related burnout.[1] Orthopaedics is particularly affected by these challenges because the demand for musculoskeletal care continues to rise alongside the need for specialized surgical expertise.[2,3] Physician compensation can help address increased work demands; however, trends in academic orthopaedic compensation and associated factors are not well described.

Previous studies have documented increasing trends in physician compensation.[4] A survey conducted by the Medical Group Management Association reported that mean specialist physician compensation rose from $378,600 to $399,300 between 2008 and 2017.[5] This trend also holds within orthopaedic surgery. The AMN Healthcare 2023 Review of Physician and Advanced Practitioner Recruiting Incentives report indicated that the average orthopaedic surgeon's salary increased by more than 18% from 2017 to 2023.[6] Similarly, according to Medscape's annual Physician Compensation Survey (2013 to 2023 editions), the average annual salary for orthopaedic surgeons rose by 41.5% from $405,000 to $573,000.[7]

Several previous studies have assessed factors correlating with physician compensation disparities.[8] Women physicians have historically earned up to 28% less than their male counterparts in equivalent specialties and career stages,[9] likely contributing to lower job satisfaction and increased burnout. A 2022 to 2023 survey of 730 members of the American Association of Hip and Knee Surgeons revealed that after multivariable analysis and controlling for confounders, women surgeons earned 14.4% less than their male equivalents.[10] However, this study is limited by its sample size and generalizability across all orthopaedic surgery subspecialties. Another large cross-sectional analysis of the Centers for Medicare and Medicaid Services data set showed that male orthopaedic surgeons earned, on average, $59,000 more per year than their female counterparts ($P < 0.001$).[11] However, this study did not account for variables such as race, ethnicity, or region.

Race and ethnicity have also been correlated with physician compensation.[12] A cross-sectional analysis by Mensah et al[13] found a significant negative correlation between underrepresented minority and female representation and faculty compensation across various academic ranks. In a related study, an analysis by Vandenberg et al[14] found that among 1,952 anesthesiologists, those from racial and ethnic minority populations had a 26% lower likelihood of being in a higher compensation range compared with White anesthesiologists.

Previous studies have demonstrated regional differences in reimbursements for orthopaedic surgery. Stryker et al[15] analyzed CMS data and found that the Northeast had the highest median hospital payments for total joint arthroplasty. Similarly, Veltre et al.[16] identified notable geographic variation in physician reimbursements for several hand surgeries, including basal joint arthroplasty and both endoscopic and open carpal tunnel release. Such differences may reflect regional variations in reimbursement practices.

This study aimed to analyze the American Association of Medical Colleges (AAMC) Faculty Salary Survey data among academic orthopaedic surgeons to understand recent trends in compensation distribution based on rank, sex, and race/ethnicity in US medical schools.

Methods

Data Source

This study drew data from the AAMC Faculty Salary Survey, which collects information on full-time faculty at US medical schools, regardless of their income source.[17] Institutions report data on behalf of faculty, categorized by their primary appointment department. Most medical schools participate annually (nearly 100% in the past 5 years), and the survey represents approximately 70% of all full-time faculty.

The study was deemed exempt from human subject research guidelines by the local Institutional Review Board because it involved secondary analysis of existing deidentified data. The study adhered to the STROBE reporting guideline.

Data Elements

This study analyzed compensation data from 2,601 orthopaedic faculty members across orthopaedic subspecialties, categorized by rank, sex, race/ethnicity, and

region. Total compensation was calculated as the sum of fixed/contractual compensation, medical malpractice supplements, and bonus/incentive pay, excluding benefits.

The primary outcome measures were median compensation data for orthopaedic faculty from 2017 to 2023, stratified by rank. Median compensation was further analyzed according to sex (in 2023), race/ethnicity (in 2023), and geographical region (in 2023). The AAMC report breaks down salary data by sex as a binary category—men and women. The report does not include data on gender minorities. Differences in median compensation by race/ethnicity were reported as cents-on-the-dollar compared with White faculty of equal rank.

Data Analysis

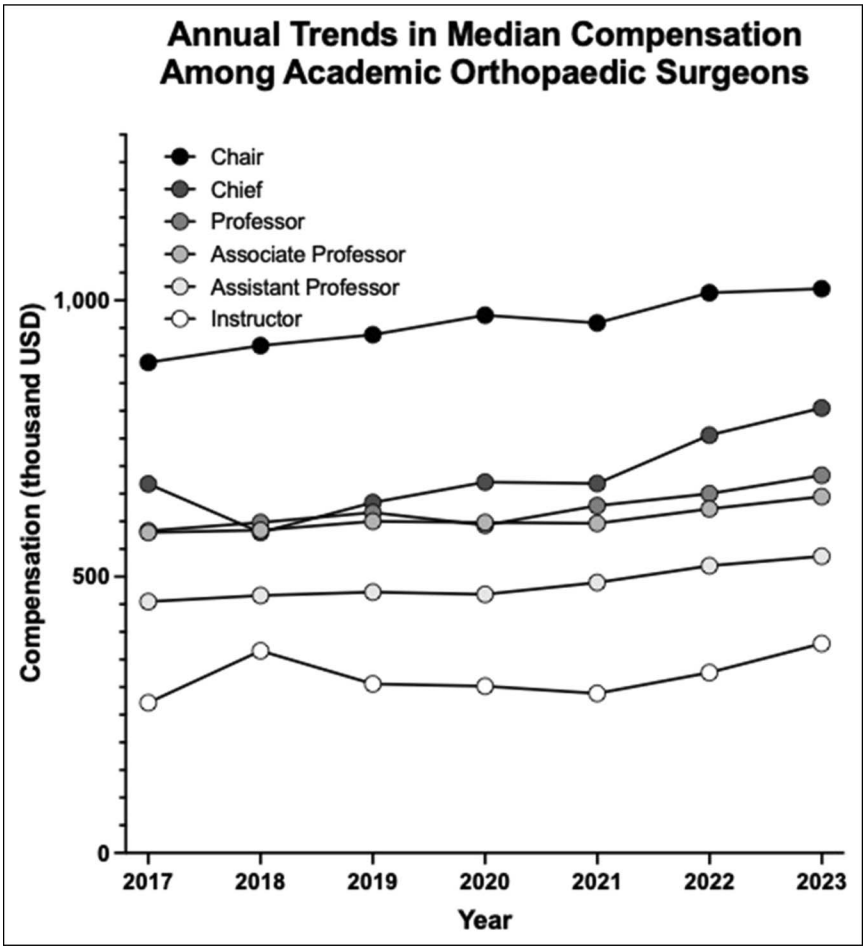
Linear regression analysis was used to evaluate trends in median compensation between 2017 and 2023 across all ranks. Statistical tests were done using Python version 3.10 and the SciPy module, and figures were created using GraphPad Prism version 9 (GraphPad Software). Cents-on-the-dollar values were calculated by dividing the average salary for each sex and ethnicity group by the corresponding salary for men or White individuals of the same rank. This measure indicates the amount earned by each group per dollar earned by their male or White counterparts.

Results

Study Population/Overall Compensation Trends

The AAMC Faculty Salary Survey data from 2017 to 2023 included responses from 2,601 faculty members in orthopaedic surgery departments, comprising 82 instructors, 1,176 assistant professors, 668 associate professors, 487 full professors, 104 chiefs, and 84 chairs. Trends in median compensation were tabulated from 2017 to 2023 (Figure 1).

Figure 1



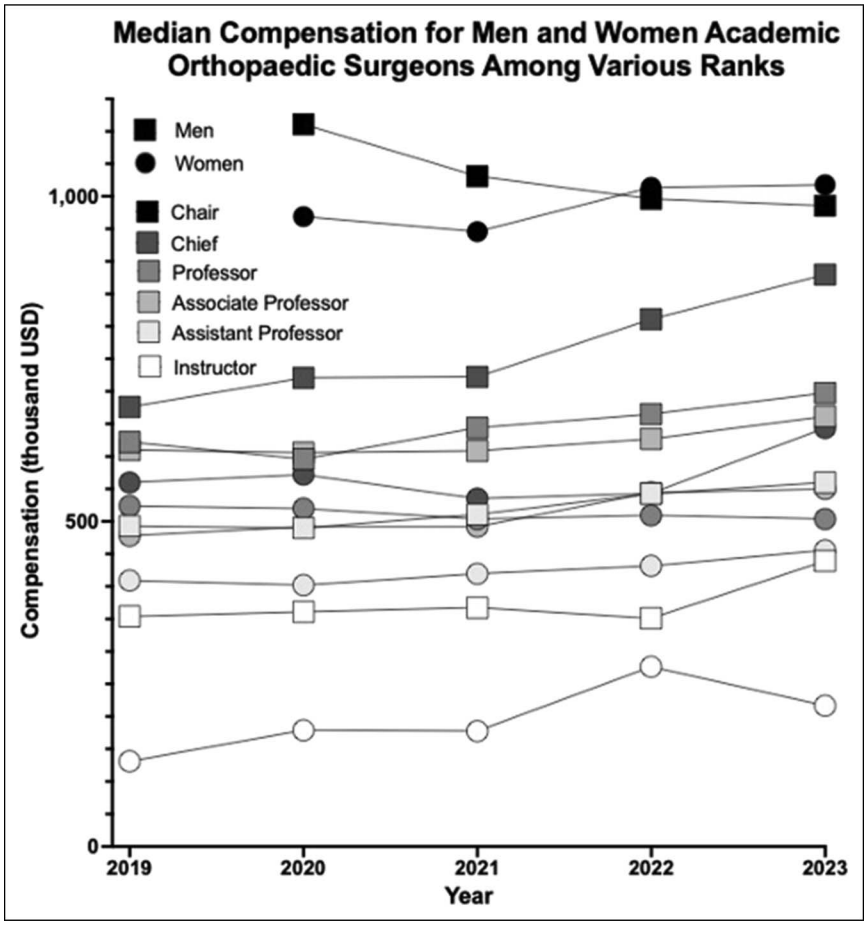
Graph showing the trends in median compensation (USD) for orthopaedic faculty across different academic ranks from 2017 to 2023.

Table 1. **Trends in Median Compensation (in USD) With the Interquartile Range (IQR) for Orthopaedic Surgery Faculty From 2017 to 2023**

Rank	Median Compensation With IQR (1000 USD)							Average Increase (%) Per Year
	2017	2018	2019	2020	2021	2022	2023	
Instructor	272 (72-403)	366 (188-523)	306 (72-475)	302 (82-501)	288 (72-464)	326 (81-503)	379 (182-542)	6.93%
Assistant professor	455 (355-612)	466 (365-633)	472 (380-628)	468 (377-635)	489 (392-646)	520 (404-696)	537 (424-718)	2.82%
Associate professor	580 (435-740)	584 (450-749)	600 (459-761)	598 (450-766)	596 (469-777)	623 (500-813)	645 (524-834)	1.80%
Professor	583 (422-751)	598 (431-744)	616 (449-804)	593 (434-756)	629 (480-772)	650 (479-821)	683 (513-850)	2.73%
Chief	668 (550-852)	580 (477-851)	634 (453-805)	671 (558-979)	669 (525-934)	756 (600-1,016)	805 (876-1,058)	3.53%
Chair	888 (733-1,039)	918 (765-1,073)	938 (776-1,093)	973 (854-1,145)	959 (818-1,148)	1,014 (876-1,181)	1,021 (915-1,256)	2.38%

Over the study period, median compensation increased across all ranks. Specifically, there were increases of approximately $107K for instructors, $84K for assistant professors, $65K for associate professors, $100K for full professors, $137K for chiefs, and $133K for chairs ($P < 0.05$ for each). The highest average annual increase in median compensation, in percentage, occurred at the instructor level (6.93%), while smaller percentage increases were observed at the senior rank levels (Table 1).

Figure 2



Graph showing the trends in median compensation for men and women faculty members in orthopaedic surgery across various ranks, from the years 2019 to 2023.

Sex

Trends in median compensation for male and female faculty members between 2019 and 2023 are shown in Figure 2. Throughout the study period, men were consistently compensated more than women at all academic ranks, except at the chair level. In 2023, the compensation differences among individual ranks were $222K (102%) for instructors, $104K (23%) for assistant professors, $112K (20%) for associate professors, $194K (39%) for professors, $236K (37%) for chiefs, and $32K (3%) for chairs.

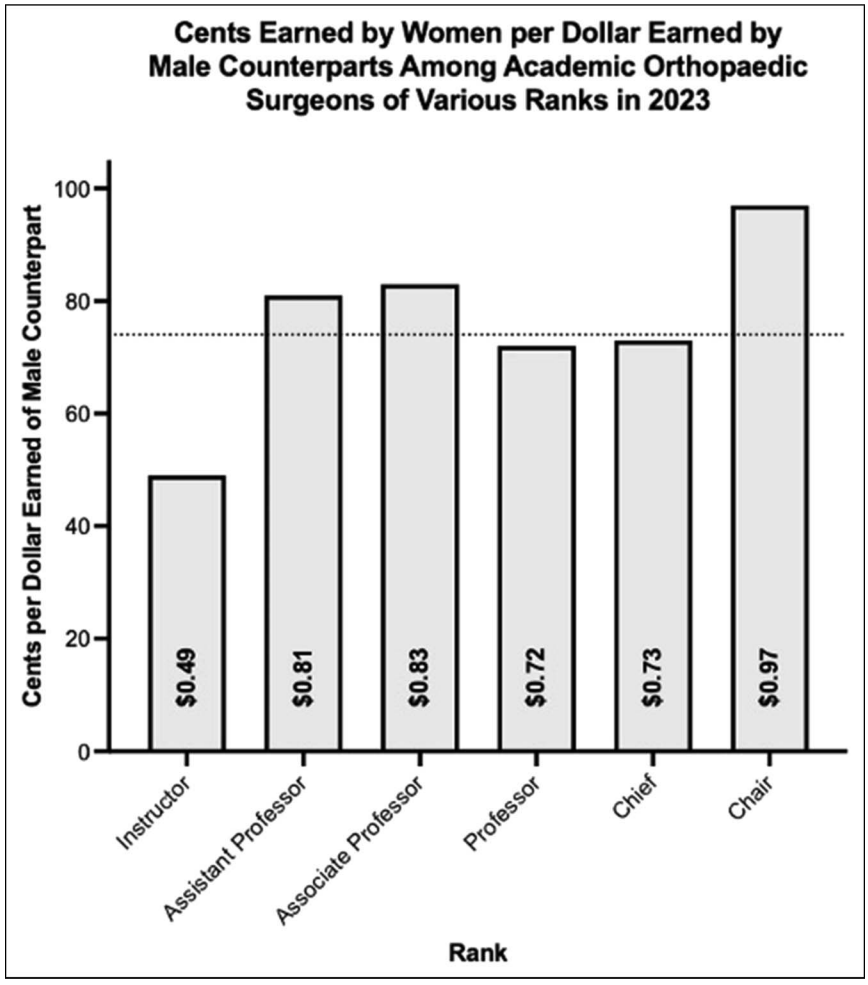
Cents-on-the-dollar values for male and female faculty members in 2023 are shown in Figure 3. At the instructor rank, women earned 49 cents-on-the-dollar compared with their male counterparts, 81 cents-on-the-dollar at the assistant professor rank, 83 cents-on-the-dollar at the associate professor rank, 72 cents-on-the-dollar at the professor rank, 73 cents-on-the-dollar at the chief rank, and 97 cents-on-the-dollar at the chair rank. Overall, according to average total compensation adjusted for rank, women earned 74 cents-on-the-dollar compared with men (Figure 3).

Race/Ethnicity Distribution

The breakdown of median compensation by race/ethnicity was analyzed using data from the 2023 AAMC Faculty Salary Survey (Figure 4). Owing to low sample sizes, median values were not displayed for the following underrepresented racial/ethnic groups: American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and individuals identifying with multiple races.

Compared with White faculty of the same rank, Asian instructors earned 106 cents-on-the-dollar. Among assistant professors, Asian faculty earned 90 cents-on-the-dollar, Black/African American and Hispanic/Latino faculty each earned 87 cents, and faculty of

Figure 3



Graph showing the median compensation (USD) for women faculty, plotted as cents-on-the-dollar compared with men faculty, across various ranks in the year 2023. Horizonal line represents average total compensation adjusted for rank.

other races earned 102 cents-on-the-dollar. For associate professors, Asian faculty earned 99 cents-on-the-dollar, Black/African American faculty achieved parity at 100 cents, Hispanic/Latino faculty earned 81 cents, and faculty of other races earned 77 cents-on-the-dollar. Among professors, Asian faculty earned 108 cents-on-the-dollar, Black/African American faculty earned 106 cents, and Hispanic/Latino faculty earned 110 cents. At the chief level, Asian faculty earned 106 cents-on-the-dollar. Race-wide breakdown was not available for the chair rank in the AAMC Faculty Salary Survey due to low-sample sizes.

Geographical Region Distribution

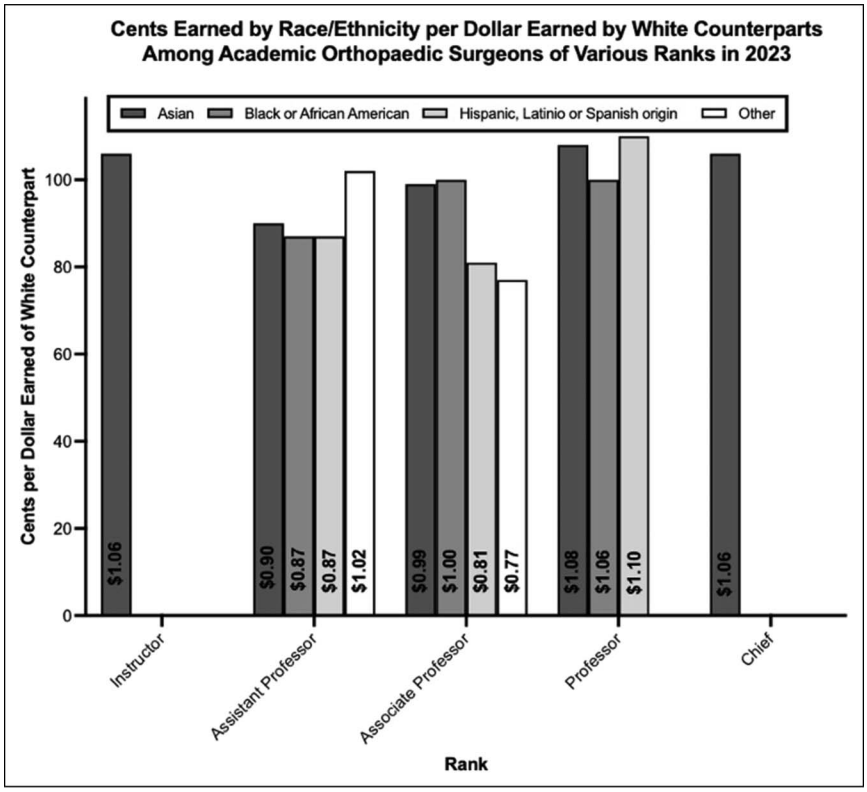
Breakdown of median compensation according to region of the United States is plotted in Figure 5. Faculty members in the northeast region consistently had the highest median compensation at all ranks. Data were not available for rank of instructor.

Discussion

This study demonstrates that faculty compensation increased by an average of 1.80% to 6.93% per year from 2017 to 2023, with the greatest rise at the instructor level and smaller increases at senior ranks. A persistent gender-based compensation disparity was observed, with a widening trend from 2019 to 2023 for professors and chiefs, while compensation gaps for assistant and associate professors remained relatively unchanged. Black/African American, Hispanic/Latino, and Asian assistant professors had lower median compensation than White faculty of the same rank by 13%, 13%, and 10%, respectively.

The increase in median faculty compensation has barely kept pace with US inflation, which averaged 3.69% annually from 2017 to 2023.[18] Medical care prices have historically risen even faster, with the long-term average US healthcare inflation rate at 5.14%.[19,20] The literature, though sparse, suggests academic orthopaedic surgeons earn less than their private practice counterparts, a trend observed across specialties.[21,22] This discrepancy may be influenced by a shortage in the orthopaedic workforce,[23] driven by the growing demand for services from an aging population, which outpaces the number of new graduates.[3,24] Higher starting compensation may help address

Figure 4



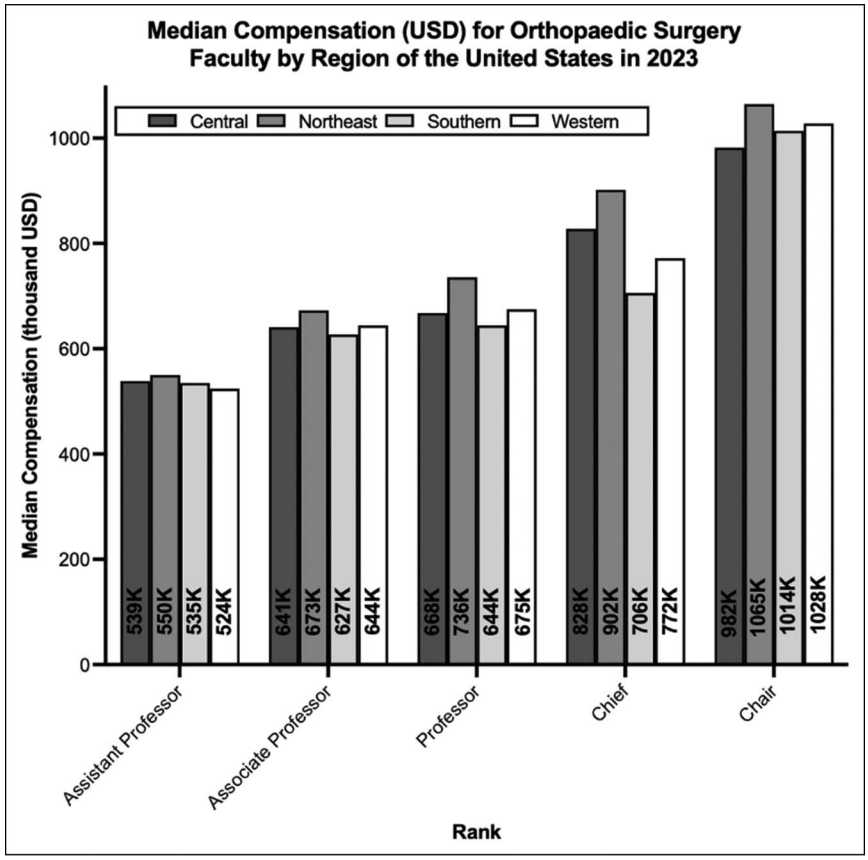
Graph showing the median compensation (USD) by race/ethnicity, plotted as cents-on-the-dollar compared with White faculty in the year 2023. Omitted bars denote missing median data.

recruitment challenges, but variability remains high at the instructor level. Recent trends indicate that academic medical centers are expanding into communities to build larger networks,[25] yet major institutions are often more affected by healthcare reform penalties, which affect care costs.[26] Benchmarking community-based academic orthopaedic salaries remains challenging and could benefit from comparisons with nonacademic benchmarks, such as Medical Group Management Association data.[27]

Equitable salaries are critical for fostering diversity, equity, and inclusion.[9] Orthopaedic surgery has one of the lowest representations of women among medical specialties, with only 16% of residents in 2020 and 10% of active academic surgeons in 2022.[28,29] This study highlights a consistent compensation gap across nearly all ranks over the past 5 years. Catenaccio et al[30] found lower starting salaries for women in 42 of 45 medical specialties, with slower salary growth in 22 of them. Delays in promotion further constrain women's earning potential.[30] Even in departments with a higher representation of women, median compensation disparities persist, driven by institutional and cultural factors.[9] Faculty compensation is influenced by base pay, clinical and research productivity, and administrative duties.[31] Differences in earnings for women and underrepresented minorities (URMs) may also arise from personal factors and career choices.[9] Marginalized groups often face disparities in negotiation offers compared with White counterparts.[32] Addressing these structural norms and misconceptions is essential to achieving pay equity. Research suggests that structured compensation plans can quickly reduce pay gaps.[33]

URM representation among orthopaedic surgeons remains low, with only a 1.2% increase in URM residents from 2012 to 2020, compared with larger gains in other fields.[2] The *Journal of Bone and Joint Surgery* recently reported an 8% increase in Asian American orthopaedic surgeons since 2019, although their overall representation remains at 13% in 2023.[34] This study found that among assistant professors, Asian, Black/African American, and Hispanic/Latino faculty earned 10%,

Figure 5



Graph showing the median compensation (USD) for orthopaedic surgery faculty, by region of the United States in the year 2023.

13%, and 13% less, respectively, than White peers. This gap diminishes for Asian and Black/African American faculty at the associate professor rank but widens to 19% for Hispanic/Latino faculty. At the professor rank, Asian, Black/African American, and Hispanic/Latino surgeons earned 8%, 6%, and 10% more than White faculty, based on a cents-on-the-dollar analysis.

This study has several limitations. The data are collected by AAMC from US medical schools, and reporting may not be consistent across institutions. Compensation methodology is complex, and analyses using aggregate data risk misinterpretation when comparing dissimilar individuals. Salary differences may be partly because of different tracks (clinicians versus clinician-scientists), and AAMC does not report stratified data. This analysis also does not take into consideration factors that might influence salary differences such as call compensation, productivity-related bonus, and years in service within a rank (which may disproportionately affect certain subgroups). In addition, the AAMC Faculty Salary Survey lacks granularity regarding subspecialty data within orthopaedics, which precluded analysis at this level. Furthermore, the data did not account for differences in the representation of women and underrepresented groups in orthopaedic subspecialties, which may contribute to some of the observed differences in compensation.

Conclusion

This study summarizes trends in academic orthopaedic faculty compensation by rank, sex, race/ethnicity, and geography. This information should be helpful for academic orthopaedic leadership to formulate fair, transparent compensation models. The findings of persistent compensation disparities in academic orthopaedic surgery underscore the need for additional studies to assess the effect of factors not examined in the current analysis. The study results highlight the need for higher academic orthopaedic salaries as compensation has not even kept pace with inflation. This is especially true for early career physicians because it is crucial for attracting and retaining top talent and preparing the next generation of orthopaedic surgeons.

References

1. Association of American Medical Colleges. *The complexities of physician supply and demand: Projections from 2019 to 2034*. Association of American Medical Colleges; https://digirepo.nlm.nih.gov/master/borndig/9918417887306676/9918417887306676. (2021).

2. McQuivey KS, Deckey DG, Christopher ZK, et al: Surgical ergonomics and musculoskeletal pain in orthopaedic surgery residents: A multicenter survey study. *J Am Acad Orthop Surg Glob Res Rev* 2021;5:e20.00119.

3. U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis: *National and Regional Projections of Supply and Demand for Surgical Specialty Practitioners: 2013-2025*. Rockville, MD, Maryland, 2016.

4. Malhotra A, Futela D, Joshi R, et al: Recent trends in academic versus nonacademic radiologist compensation and clinical productivity. *J Am Coll Radiol* 2025;22:486-494.

5. Hsiang WR, Gross CP, Maroongroge S, Forman HP: Trends in compensation for primary care and specialist physicians after implementation of the affordable care act. *JAMA Netw Open* 2020;3:e2011981.

6. Bishop J. *Orthopedic Surgeon Pay Jumps 18% in 6 Years*. Becker's Healthcare: Becker's Spine Review; www.beckersspine.com/orthopedic/orthopedic-surgeon-pay-jumps-18-in-6-years/ (15 Aug 2023).

7. Becker's ASC Review: *The Rise Of Orthopedist Pay: A 10-Year Timeline*. https://www.beckersasc.com/outpatient-spine/the-rise-of-orthopedist-pay-a-10-year-timeline.html.

8. Malhotra A, Futela D, Khunte M, et al: Salary equity in academic medicine physicians. *Am J Med Sci* 2024;368:167-169.

9. Association of American Medical Colleges. *Exploring Faculty Salary Equity at U.S. Medical Schools by Gender and Race/Ethnicity*. 2021.

10. Ramkumar PN, Bernstein JA, Landy DC, et al: Determinants of salary variation and the gender pay gap: A survey of the American Association of Hip and Knee Surgeons (AAHKS) surgeon member workforce. *Arthroplasty Today* 2024;30:101554.

11. Avila A, Sato EH, Acuña AJ, Vasavada K, Kamath AF: Gender differences in reimbursement among orthopaedic surgeons: A cross-sectional analysis of Medicare claims. *J Am Acad Orthop Surg* 2023;31:e570-e578.

12. Malhotra A, Futela D, Khunte M, et al: Intersectionality and faculty compensation in academic radiology in U.S. *Acad Radiol* 2024;31:5228-5231.

13. Mensah MO, Owda D, Ghanney Simons EC, et al: US postgraduate trainee racial, ethnic, and gender representation and faculty compensation by specialty. *JAMA* 2023;330:872-874.

14. Vandenberg MT, Kraus M, Misra L, et al: Racial disparities in compensation among US anesthesiologists: Results of a national survey of anesthesiologists. *Anesth Analg* 2023;137:268-276.

15. Stryker LS, Odum SM, Fehring TK: Variations in hospital billing for total joint arthroplasty. *J Arthroplasty* 2014;29(9 Suppl):155-159.

16. Veltre DR, Yakavonis M, Curry EJ, et al: Regional variations of Medicare physician payments for hand surgery procedures in the United States. *Hand (N Y)* 2019;14:209-216.

17. *Understanding & Addressing Faculty Salary Equity*. 2024https://www.aamc.org/data-reports/faculty-salary-equity

18. *CPI Inflation Calculator*. 2024https://www.officialdata.org/us/inflation/2017?endYear=2023&amount=10

19. *US Health Care Inflation Rate*. 2024https://ycharts.com/indicators/us_health_care_inflation_rate

20. *How does medical inflation compare to inflation in the rest of the economy?* 2024https://www.healthsystemtracker.org/brief/how-does-medical-inflation-compare-to-inflation-in-the-rest-of-the-economy/.Wang KY, Puvanesarajah V, Marrache M,

21. Baimas-George M, Fleischer B, Korndorffer JR Jr, Slakey D, DuCoin C: The economics of private practice versus academia in surgery. *J Surg Educ* 2018;75:1276-1280.

22. *Orthopaedic Practice in the US 2018*. AAOS Department of Clinical Quality and Value. 2019.

23. Cerasani M, Omoruan M, Rieber C, et al: Demographic factors and medical school experiences associated with students' intention to pursue orthopaedic surgery and practice in underserved areas. *JB JS Open Access* 2023;8:e22.00016.

24. Hawkins M: *Orthopaedic Surgery: Supply, Demand, and Recruiting Trends White Paper Series*, 2019. https://www.merritthawkins.com/trends-and-insights/article/white-papers/Orthopaedic-Surgery-Supply-Demand-and-Recruiting-Trends/

25. Weintraub M, Ahn D, Herzog I, et al: Retainment of U.S. Orthopaedic Surgeons in Academia from 2016 to 2022. *JB JS Open Access* 2024;9:e23.00111.

26. Rajaram R, Chung JW, Kinnier CV, et al: Hospital characteristics associated with penalties in the centers for Medicare & Medicaid services hospital-acquired condition reduction program. *JAMA* 2015;314:375-383.

27. MGMA DataDive Cost and Revenue Modules can help you improve practice efficiency, keep up with evolving trends and plan for the future. *MGMA Connex*. 2013;13:63.

28. Haffner MR, Van BW, Wick JB, Le HV: What is the trend in representation of women and under-represented minorities in orthopaedic surgery residency? *Clin Orthop Relat Res* 2021;479:2610-2617.

29. Kuhns B, Haws BE, Kaupp S, Maloney MD, Carmody EE, Mannava S: Academic orthopaedics as a driver of gender diversity in the orthopaedic workforce: A Review of 4,519 orthopaedic faculty members. *J Am Acad Orthop Surg Glob Res Rev* 2022;6:e21.00028.

30. Catenaccio E, Rochlin JM, Simon HK: Addressing gender-based disparities in earning potential in academic medicine. *JAMA Netw Open* 2022;5:e220067.

31. Association of American Medical Colleges: *Is Your Salary Equitable? A Guide for Individual Faculty GWIMS Toolkit*.

32. Bowles HR, Thomason B, Macias-Alonso I: When gender matters in organizational negotiations, in *Annual Review of Organizational Psychology and Organizational Behavior*, Vol 9, 2022, pp. 199-223.

33. Morris M, Chen H, Heslin MJ, Krontiras H: A structured compensation plan improves but does not erase the sex pay gap in surgery. *Ann Surg* 2018;268:442-448.

34. Meadows AM, Skinner MM, Faraj MT, et al: Racial, ethnic, and gender diversity in academic orthopaedic surgery leadership. *J Bone Joint Surg Am* 2022;104:1157-1165.