Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Osteopathic Medical School Graduates' Perceptions of Bias in the Transition to Residency in the United States: a national cross-sectional survey

Mark Ronald Speicher

mspeicher@aacom.org

American Association of Colleges of Osteopathic Medicine

Gevork Harootunian

American Association of Colleges of Osteopathic Medicine

Research Article

Keywords: Osteopathic medicine

Posted Date: August 18th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10397976/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

The number of US DO Seniors increased by more than 10% between 2020 and 2023. While the number of US DO Senior applicants to the Match increased by 13.0%, the proportion of DO Seniors among all matched PGY-1 applicants rose only modestly (from 18.4% to 19.6%). This study examines US DO Seniors' reported experiences of perceived bias due to their degree during the residency selection process, and assesses whether perceived bias varies by specialty type, sex, race/ethnicity, and match outcome.

Methods

This is a cross-sectional survey study of a nationally representative sample of graduating students at all Colleges of Osteopathic Medicine. The survey opened after the 2023 NRMP Match® and closed in July 2023. Bias items in the survey had a response rate of 55%.

Results

A total of 2,435 students (62%) self-reported experiencing perceived bias due to their degree. The extent varied depending on the matching process, with the military match having the lowest rates of reported perceived bias (27%). Experiences of perceived bias were not associated with race or ethnicity; there was a strong association between sex and perceived bias ($p < 0.001$). There was also a strong association between procedural and non-procedural specialties ($p < 0.001$), with procedural specialty applicants experiencing greater rates of perceived bias.

Conclusions

Most US DO students reported perceptions of degree bias that impacted their transitions to residency. These perceived biases may result in harm to these students and may affect access to care especially for rural or underserved patients.

Background

Students at Colleges of Osteopathic Medicine in the United States make up nearly 30% of all medical students in the United States [1]; while these students train in a system of osteopathic medical education that differs from allopathic training in the U.S., students receiving both DO (doctor of osteopathic medicine) and MD (doctor of medicine) degrees in the U.S. train in the same ACGME-accredited residency programs as both groups progress toward full licensure as physicians. Between the National Residency Matching Program's (NRMP) first Single Match® in 2020 and the 2023 Match®, the number

of US DO Seniors (active applicants) increased by 855 (13.0%)[2] while the number of US DO Seniors in all residency matches (US DO Seniors seeking GME) increased by 942 (13.7%).[3] The increase in DO applicants to residency has been accompanied by higher match and placement rates; placement rates in residency for US DO Seniors in 2023 exceeded the rates for US MD Seniors,[4] but the proportion of US DO Seniors entering residency programs for certain specialties including dermatology, neurological surgery and orthopaedic surgery,[3] has declined.

While a full explanation for this phenomenon has not been provided, researchers analyzing individual specialty data[5–10] have concluded that US DO Seniors are less qualified than their US MD Senior counterparts when applying for competitive specialties because of differences in average USMLE scores, in research output, and in academic clinical experiences. Research into the selection of US DO Seniors by surgical specialty and subspecialty programs also notes the bias of residency faculty and program directors as a possible source of disparities in the selection of allopathic and osteopathic residents.[11] Cognitive and/or unconscious biases may play a role which may help explain the variation in the selection of osteopathic residents even within the same specialty.[12]

Many studies on bias in residency selection focused on the biases regarding race, ethnicity, and gender; additionally, studies of osteopathic medical students have focused on differences in performance in the Match® and differences in clinical training and research experiences between US DOs and US MDs.[5–11] However, no studies have focused on students' experiences of what they perceive to be bias disfavoring the DO degree. In the current study, we analyzed data from a nationally representative sample of US DO Seniors to explore the students' reports of experiences they perceive as degree bias in the transition to residency. More specifically, we examined closed and open-ended survey items to understand what proportion of US DO Seniors perceived that they experienced bias because of their degree.

Methods

The primary outcome of this study, reported experiences of perceived degree-based bias in the transition to residency, was operationalized through self-reports from survey respondents. This approach measures perceived bias rather than objectively verified differential treatment. Establishing that bias occurred would require comparative data (e.g., similarly qualified MD applicants), program-level selection information, and research designs capable of ruling out alternative explanations such as differences (like those already reported in the literature, including examination scores, research productivity, and specialty competitiveness). This cross-sectional survey of US DO seniors does not allow us to differentiate between actual discriminatory treatment and other factors that may shape applicants' interpretations of their experiences. However, perceptions of bias are themselves consequential: they influence career decisions, well-being, and professional identity development regardless of their accuracy or provability, and they may signal a possible explanation of differential treatment warranting investigation through comparative designs. We must therefore interpret our

findings as characterizing the prevalence and nature of *perceived* bias among osteopathic medical students rather than establishing that bias definitively occurred.

This cross-sectional study used a constructivist approach in developing survey questions to elucidate the types and context of bias that osteopathic medical students perceive that they experience in the transition to residency through questions about their experiences across the activities necessary to be selected for a residency program. Following a literature review on bias (including degree bias) in the transition to residency, a question set was constructed and validated by author M.S. and several formal groups within the American Association of Colleges of Osteopathic Medicine: a group of osteopathic physicians responsible for the clinical education and training of students at their Colleges of Osteopathic Medicine (COMs); a group of advisors responsible for advising students in the transition to residency; a group of COM graduates who went through the transition to residency, and a group of students of AACOM-member COMs. This resulted in a 63-item set. The “Experiences of Bias” section of the survey included both quantitative and qualitative items on students’ experiences of perceived bias in applying for and taking visiting student rotations; in completing the Electronic Residency Application Service (ERAS) application; in the interview process; and in their communications with residency programs.

These questions on students’ experiences of perceived bias due to their DO degree were part of a larger, annual survey of all osteopathic graduating seniors in the Class of 2023. The graduating senior survey asked about students’ experiences of many aspects of their undergraduate osteopathic medical education.

Survey Administration

The survey was distributed via email to all U.S. DO seniors, either directly by their College of Osteopathic Medicine (COM) or centrally by the American Association of Colleges of Osteopathic Medicine (AACOM) at the COM’s request. Prior to distribution, each COM reviewed survey procedures and was asked to notify students of the survey’s importance, request that it be completed only once, and discourage forwarding of the survey link. The survey was administered through AACOM’s secure Qualtrics platform. Because the Graduating Seniors Survey (GSS) collects some identifying information, questions about experiences of perceived bias were optional. Uniquely assigned survey links and identifying information were used to prevent duplicate responses.

Question types and responses

Of the 63 items regarding bias, 9 were open-ended questions where respondents could expand on their experiences as students about to receive the DO degree in the transition from their COM to their residency program. Of the 3,928 respondents that provided bias information, 3,005 (77% of respondents to the bias section) provided at least one response to the open-ended items.

Nonresponse and response bias analysis

To assess potential nonresponse bias, we compared the demographics of survey respondents to those of the entire population of osteopathic medical students graduating in the Class of 2023. This analysis included race/ethnicity, sex, and matched specialty using chi-squared tests. Second, we assessed the response bias by examining whether students who were less successful in the match process were more likely to report perceiving experience of bias.

Analysis plan for close-ended responses

The analysis of the survey results consisted of both quantitative and qualitative methods to explore US DO seniors' experiences of perceived bias. The primary outcome was experience of perceived degree-based bias, derived from the survey item, "Did you experience bias in the residency selection process because of your DO degree?" (Yes, No, Unsure). For analysis, responses of "Yes" were coded as experiencing bias, while "No" and "Unsure" were combined to represent respondents who did not definitively report experiencing perceived bias.

Quantitative analysis of closed-ended questions used descriptive statistics to summarize the distribution of reported experiences. Analyses were conducted using available responses for each item and no imputation was performed. For analyses involving specialty type, residency specialties were classified as procedural or non-procedural based on established categorizations of clinical practice (Supplement 1). Cross-tabulations and chi-square tests were conducted to identify any significant associations between demographic variables (e.g., sex, race/ethnicity), specialty, match outcomes, and reported experiences of perceived bias. To assess robustness, we conducted additional logistic regression analyses including procedural specialty and match success to evaluate whether associations with match outcome persisted after accounting for specialty type.

Analysis plan for text/open-ended responses

Topic modeling, by Latent Dirichlet Allocation (LDA) was used for to analyze open-ended questions to identify recurring patterns in the reports of experiences of perceived bias, which were summarized into themes through author review. To prepare the text data, responses were preprocessed through stop-word removal, including a custom list, lemmatization, and other common cleaning norms. The text was then tokenized using 1- and 2-word n-grams. Tokens with less than five responses were removed. Document-frequency distributions were examined to assess whether any terms appeared in an overwhelming majority of responses; no content-bearing terms occurred in more than approximately one-third of responses, and therefore no terms were removed based on high frequency alone. We evaluated multiple models with different topic numbers. The optimal number of topics for each variable was selected based on the a combination of coherence score and human review to balance model fit

and interpretability. Topics and their top 15 terms were extracted, and manual inspection was used to finalize interpretations.

Reporting of survey items

We included 28 closed-ended and 4 open-ended questions pertinent to the transition to residency, from the 63 total questions in the bias section of the survey for this analysis. Survey results are reported using the CROSS guidelines (Supplement 2).[13] The full survey instrument, including all closed-ended and open-ended questions analyzed in this study, is provided in Supplement 3. This research was reviewed by the WCG IRB and found to be exempt under 45 CFR § 46.104(d)(2). All data manipulation and analysis were conducted using the Python programming language (v3.11), using the following libraries; Pandas (2.1.4), statsmodels (0.14.0), NLTK, scikit-learn, and Gensim libraries.

For both closed- and open-ended responses, ChatGPT (OpenAI, 2024) was used to assist with code development and did not contribute to analytic inference, topic generation, or interpretation.

Results

The survey was provided to 7,123 members of the Class of 2023 between March 31, 2023 and July 16, 2023; 4,146 (58%) returned a survey. Of those respondents, 3,928 (95% of respondents; 55% of all survey recipients) provided answers to the perceptions of bias questions.

Assessment of Nonresponse and Response Bias

The distributions of gender, underrepresented racial/ethnic groups (URM; white and Asian vs. all other groups), specialty type, and placement among survey respondents and the 2023 DO graduate population are shown in Table 1.

Table 1
Comparison of respondents to 2023 DO graduate population

Variable	Level	Survey %	Population %	χ^2 p-value
Gender	Male	47.6%	49.3%	0.096
	Female	52.4%	50.7%	
URM status	URM	11.6%	10.1%	0.022
	Not URM	88.4%	89.9%	
Specialty type	Procedural	29.6%	30.9%	0.163
	Non-procedural	70.4%	69.1%	
Placement type	Military	4.3%	4.5%	0.668
	Early	0.5%	0.5%	
	NRMP	89.5%	88.8%	
	SOAP	5.6%	6.2%	

The nonresponse bias analysis revealed differences in URM distribution between respondents and the broader population of osteopathic medical student graduates. However, further chi-squared analysis demonstrated that race/ethnicity was not significantly associated with reported experiences of bias ($p = 0.09$). As a result, these variations should not significantly impact the analyses, and we determined that weighting adjustments were unnecessary.

Quantitative Results (Closed-Ended Items)

When asked if they experienced what they perceived as bias in the residency selection process because of their DO degree, 62% of respondents reported experiencing perceived bias. The experience of perceived bias varied significantly by the match process. Among respondents participating in the National Resident Matching Program (NRMP) and the Supplemental Offer and Acceptance Program (SOAP), 63% and 69% reported experiencing what they perceived as bias. In contrast, military residency match processes reported much lower rates of perceived bias, with 27% of respondents experiencing what they perceived as bias. Specialty-specific match processes exhibited the highest rates of perceived bias, with 100% of respondents in the ophthalmology match and 84% in the urology match reporting perceived bias. Additionally, 36% of respondents did not rank certain specialties or programs because the program either stated that it would not rank osteopathic graduates or had no DOs among its trainees.

Perceived biases in Visiting Student Rotations (VSRs) respondents reported that they experienced included a requirement for USMLE scores, differences in fees, and even whether a VSR would accept osteopathic applicants. While osteopathic medical students are only required to take the COMLEX

examination for graduation and licensure, many US DO students feel pressured to also take the USMLE; in our study, 66% of students planned on taking the exam, and 58% reported being required to provide a USMLE score for at least one VSR. Of those who did not have a USMLE score, 18% reported that they were not permitted to do one or more VSRs as a result.

During the interview process, 86% of respondents reported being interviewed by at least one attending DO physician, and 90% were interviewed by at least one DO resident or trainee.

However, a striking 21% of DO students were asked why they went to a DO school rather than an MD school. A slightly lower percentage, 17%, reported that they were made to feel uncomfortable about their medical education or clinical training. Of survey respondents, 27% reported that they felt that others in the residency selection process viewed the respondent's osteopathic training as a disadvantage, while only 12% perceived that others viewed it as an advantage. More disheartening is that 32% of respondents reported feeling that their own osteopathic training was a disadvantage to their residency selection process, while 20% saw it as an advantage. Response distributions for all closed-ended survey items are presented in Additional file 1: Table S1.

Descriptive percentages corresponding to all chi-square analyses are presented in Table 2.

Table 2
Associations Between Reported Degree Bias and Demographic, Specialty, and Match Characteristics

Variable	Level	N	% Bias = Yes	Chi2	p_value
Gender (N = 3816)	Female	2004	64	12.9215	0.0003
	Male	1812	58		
URM (N = 3619)	Yes	552	58	2.8957	0.0888
	No	3067	62		
Specialty Category (N = 3656)	non-procedural	2576	56	131.0685	< 0.0001
	procedural	1080	76		
Match Type (N = 3737)	NRMP Match	3307	63	87.9915	< 0.0001
	SOAP	209	71		
	Military Match	159	31		
	Ophthalmology Match	10	100		
	Urology/Urologic Surgery Match	20	85		
	Other	32	47		
Match Success (N = 2038)	Top 5	1729	64	4.0523	0.0441
	Not Top 5	309	70		

The table summarizes the prevalence of reported experiences of perceived bias across match outcome, specialty category, and demographic characteristics, alongside associated χ^2 statistics and p-values. Analyses used all available responses for each comparison; consequently, denominators varied across characteristics. No imputation was performed. We found no significant association between URM and the experience of perceived bias ($p = 0.0888$). However, there was a strong association between sex and bias ($p = 0.0003$). There was also a strong association between procedural and non-procedural specialties ($p < 0.0001$), with applicants to procedural specialties experiencing greater rates of bias.

To address concerns that students who were less successful in the match process might report higher rates of bias, we examined the relationship between match result and perceived bias. In unadjusted analysis, using a chi-squared, students who did not match within the top five programs on their rank order list (hereafter, “Top 5”) reported higher rates of perceived bias ($p = 0.0441$). However, further analysis, using logistic regression models adjusted for specialty category, revealed that this relationship was no longer significant ($p = 0.131$), while the effect of procedural versus non-procedural specialties

remained ($p < 0.001$). These findings suggest that observed differences by match outcome are largely explained by specialty.

Although the effect of specialty is strong for all DO students, the effect is greater for females in procedural specialties, with 81% perceiving bias in their residency application and selection experiences This is worth noting statistically, among other reasons, given that there are more female than male respondents.

Open-Ended Question Results

Across the four open-ended questions, respondents provided narrative responses ranging from 10 to 312 words. Mean and median response length and word counts for each open-ended item are presented in Table 3.

Table 3
Average Word and Character Lengths for Each Open-Ended Question

Question	Responses	Mean Words	Median Words	Mean Characters	Median Characters
Please share a brief description of the bias(es), if any, that you experienced.	1561	26	20	150	115
If you had (an) experience(es) of bias in Visiting Student Rotations, please describe.	570	24	17	132	95
Please describe the bias(es) you experienced during the ERAS application.	74	8	5	58	33
Did you have any other experiences of inequity in applying for residency positions through ERAS? - Yes, please explain	233	11	8	84	59

Themes are presented as narrative summaries of LDA-derived topics rather than as results of formal qualitative thematic analysis. Of the four open-ended items, the general DO degree bias and visiting student rotation bias items had sufficient response volume and narrative depth to be carried forward for topic modeling. The two ERAS-related items yielded fewer responses with substantially shorter narrative content and were not carried forward for thematic interpretation. Model-selection diagnostics for all models are reported in Additional file 1: Table S2.

For general DO degree bias, we asked graduating DO students to “Please share a brief description of the bias(es), if any, that you experienced.”, receiving 1,561 responses with a median word length of 20. Four major topics were identified from these responses using LDA. Although the three-topic solution demonstrated better coherence, the four-topic solution was retained following manual review because it

provided greater thematic differentiation and interpretability. The resulting themes and author-derived summaries are presented in Table 4. The most common theme, reported by 36% of respondents, concerned perceived biases related to standardized exams. Students described challenges surrounding the need to take the USMLE exam, despite having taken COMLEX. A sample comment typical of the open-ended responses mentioning this topic was, “Some programs do not accept the COMLEX exams. They will not even look at your application!” The second most common theme, reported by 27% of respondents, related to experiences of what students perceived as bias in interviews for DO (vs. MD) applicants (“I was asked during an interview if I regretted ‘settling’ for a DO school. It was insulting and demoralizing.”), followed by perceived bias in residency acceptance (22%, “After a grueling interview day, the program director ended with: ‘We usually don’t take DOs, but thanks for coming.’ It was crushing.”) and perceived bias in competitive residencies and specialties (16%, “I did not apply Cardiothoracic Surgery, my original dream specialty, because every mentor told me no DO has ever matched there at the places I was interested in. I gave up on my dream before even trying, simply because of my degree.”).

Table 4
Summary of Perceived Experiences of DO Bias Reported

Theme	**Percentage of Responses**	**Common Words**
Perceived experiences of bias related to standardized exams	36%	usmle, required, scores, step, comlex, bias, never, considered
Perceived experiences of bias in interviews for MD vs DO	27%	interview, bias, dos, md, residency, told, accept, despite
Perceived experiences of bias in residency acceptance for MD vs DO	22%	md, audition, applying, offered, accepted, school, apply, rotation
Perceived experiences of bias in competitive residencies and specialties	16%	degree, specialty, residency, felt, applied, interview, match, competitive

We analyzed 570 responses related to reported experiences of what students perceived as degree bias experienced during VSR with a median word count of 17. Although the two-topic solution demonstrated better coherence, the three-topic solution provided greater thematic differentiation and interpretability. A particularly striking response about perceived bias in VSR said, “Being discriminated against on away rotations broke me down. I was told directly that DOs weren’t welcome. I went home feeling ashamed and questioning if I belonged in medicine at all.” Three primary themes emerged, as summarized in Table 5. In addition to previously observed themes around licensing examination requirements, new themes concerning fees and exclusion of all or most DO applicants were identified. Exclusion of DO applicants from VSRs was identified by 38% of respondents, and 34% of respondents reported differences in fees between MD and DO students, with DO students noting they were often charged higher fees or faced discrepancies in the amount required to pay for VSRs.

Table 5
Perceived Experiences of Bias in Visiting Student Rotations

Theme	Percentage of Responses	Common Words
Bias in student rotation access	38%	audition rotation, VSLO, bias, visiting, institution, apply, md, school
Difference in fees	34%	accept, charged, fee, higher, md, pay, school, attending
Standardized exam bias	28%	usmle, required, scores, step, take usmle, comlex, bias, considered

Discussion

Most osteopathic medical students report experiencing what they perceive as bias in seeking a residency. These perceptions echo patterns previously described in sociological studies of residency training, in which informal status hierarchies in medical education shape the experiences of non-USMD trainees independent of objective performance differences while in residency training.[14,15] This bias is also perceived by residents, who report experiencing what they perceive as bias in programs to which they were selected.[15]

The exclusion of osteopathic medical students from residency programs may not be based on differences in performance.[16] Comparisons of DO and MD students, residents and physicians have not demonstrated significant differences in performance or outcomes, and where differences have been detected, they sometimes favor osteopathic physicians.

Medical School Comparisons

MD and DO medical education programs share similar curricula, with students typically spending much of their first 12–24 months in the classroom and the remainder of their training in a clinical setting. There are, however, important differences. COM curricula generally emphasize clinical care over research, and include more time on musculoskeletal anatomy, neuromuscular medicine and osteopathic manipulative techniques, leading to disparities in research experiences (favoring US MD students)[17] and in musculoskeletal knowledge (favoring US DO students),[18] though overall medical knowledge is largely the same.[19]

Osteopathic medical training in the US utilizes a community-based distributed model of clinical training while allopathic students are more likely to train in large academic health centers which exposes them to more structured clinical care and research experiences.[17] The lack of association with academic health centers has been cited as a reason that DO students have difficulty matching to residency programs in their desired specialty, especially procedural specialties.[5] However, this does not explain what students

perceive as bias in other specialties or explain the need for DO students to take the USMLE to be competitive in residency selection.

Residency Comparisons

Comparisons of residency performance between MD and DO residents have often been based on scores on examinations leading to board certification, but these studies[20,21,22] have not shown clinically meaningful differences in examination performance. Additionally, milestone data exist to compare allopathic and osteopathic graduates,[23] and these data show no differences in learning trajectories or Milestones assessments across four medical specialties[24] (Family Medicine, Internal Medicine, Pediatrics, and Emergency Medicine).

Comparisons of Practicing Physicians

Assessments of care provided by practicing physicians using Medicare fee-for-service data for hospitalized patients[25] and primary care outpatient visits,[26] a study of performance scores on 124 quality measures,[27] and an analysis of a random sample of hospitalized Medicare beneficiaries treated by general internists[25] all found no differences between MDs and DOs. Additionally, a study of treatment of patients with lower back pain found no significant difference in opioid prescribing for low back pain between osteopathic and allopathic physicians,[28] but did find that patients of osteopathic physicians had statistically significantly and clinically meaningfully better outcomes in back pain intensity, overall physical functioning, and health-related quality of life compared to the patients of allopathic physicians.

While clinical performance was comparable between MD and DO physicians, several studies found differences in perceived empathy and communication that favor osteopathic physicians [26,27] and which are likely to improve outcomes.[29]

Impact of Perceived Bias

These findings, taken together, suggest that there is no justification for excluding osteopathic graduates from any residency training program based on general concerns about clinical performance. In fact, their inclusion may offer benefits, as their positive impact on patients and colleagues through their communication and empathy may improve health outcomes for the program.

The disproportionate experiences of what is perceived as bias reported by female osteopathic medical students in the residency selection process highlights persistent structural inequities within medical education and training. Female respondents in procedural specialties reported the highest rates of experiences of perceived bias (81.2%), consistent with broader evidence of gender-based disparities in medicine, particularly in male-dominated fields. Procedural specialties are often associated with traits stereotypically viewed as masculine, such as assertiveness and technical skill, which may contribute to implicit biases among residency program directors and faculty. For instance, female applicants are more likely to face questions about their commitment to demanding specialties and balancing professional and personal responsibilities.[30]

Existing research demonstrates that experiences of bias have significant consequences, including increased stress, burnout, and psychological distress, as well as reduced diversity in procedural specialties.[31,32] Student's experiences of perceived bias in the transition to residency are likely associated with ill-being in graduating osteopathic medical students, as other experiences of bias and marginalization have been.[33] In addition to harming students by contributing to both student ill-being and to student disappointment in the inability to have a career in a top-choice specialty or program, avoiding the selection of osteopathic graduates will negatively impact residency programs that have programmatic goals of reducing health disparities by increasing access to primary and specialty care for underserved populations, since osteopathic physicians are more likely than their allopathic counterparts to provide primary care[34] and specialty care [35] in rural and other underserved areas. Regardless of a residency program's goals, perceived biases, especially if they reflect actual discriminatory practices, may keep DOs out of certain specialties or programs will make care less available to those in rural or underserved areas.

Limitations

While this study provides valuable insights into the perceived experiences of osteopathic medical students, several limitations inherent to survey-based research should be acknowledged. First, self-reported data introduces the possibility of response bias or subjective interpretation of survey items, particularly as respondents may differ in their perceptions of bias. Other variables may relate to the respondent's objectivity and interpretation regarding survey questions, especially in a survey given to students who had recently experienced the Match®. Some of these concerns were addressed by our analysis which uncovered no significant association between reports of bias and matching lower on the student's rank order list. Additionally, the degree of interest in the subject may influence the level of response to a survey. The survey's response rate (55%) may serve to mitigate this weakness to some extent. Furthermore, our nonresponse bias analysis indicated only race/ethnicity differed statistically from our population and that factor was not associated with bias. The differences in bias reports from students trying to match to a procedural specialty compared to those from non-procedural specialties reflect actual differences in match rates between those two groups of students.[36] These reports warrant further investigation using comparative data on US MD applicants to determine whether the perceptions reflect actual differential treatment. Even absent such confirmation, the prevalence of these perceptions is a signal that processes in residency selection merit closer scrutiny, given the potential consequences for educational diversity, student well-being, and access to care in communities served by osteopathic physicians.

Additionally, as noted above, this study measures self-reported experiences of what students perceive as bias among US DO seniors, not whether these perceptions reflect actual discriminatory or biased practices in residency selection. Establishing actual bias would require comparative data on US MD applicants at the individual level, program-level selection criteria, and objective measures of differential treatment, which data were beyond the scope of this study. The authors were unable to distinguish accurate perceptions from misattributions or expectations shaped by respondents' experiences in the

transition to residency. We find our reliance on the lived experiences of students to be both a limitation (as described here) and a strength – capturing important perceptions of the residency selection process in the US. Regardless of whether student perceptions accurately reflect program behavior, widespread perception of bias among DO students is consequential to both programs and to the integrity of the residency selection process.

Conclusions

Recommendations from current research focus on making the experiences of osteopathic medical students (e.g. research,[17] advising,[37] and clinical training in academic settings[8]) more like those of US MDs, rather than focusing on the value of the differences in osteopathic training. This desire to make DO students more like MD students may contribute to what students perceive as continued bias by individuals and institutions. Despite equivalent performance,[38] many program directors and others in the Graduate Medical Education hierarchy have been reluctant to accept DO students into many of the most competitive residency programs and specialties.[12] We recommend that both the ACGME and the NRMP take these self-reports seriously and consider mechanisms to investigate whether they reflect actual differences in treatment of osteopathic applicants. Conduct that meets this threshold would be inconsistent with the NRMP Match Code of Conduct for Programs, which requires "ensur[ing] that all interactions with applicants are in an atmosphere that is safe, respectful, and free of harmful bias,"[39] Likewise, the ACGME should view inequitable treatment of osteopathic applicants as a violation of its Common Program and Institution Requirements which call for "a professional, equitable, respectful, and civil environment that is free from discrimination, sexual and other forms of harassment, mistreatment, abuse, or coercion of students, residents, faculty, and staff."[40]

Abbreviations

AACOM
American Association of Colleges of Osteopathic Medicine
ACGME
Accreditation Council for Graduate Medical Education
CFR
Code of Federal Regulations (U.S.)
COM
College of Osteopathic Medicine
COMLEX
Comprehensive Osteopathic Medical Licensing Examination
CORF
Council of Residents and Fellows (AACOM advisory group)
CORP
Council on Residency Placement (AACOM advisory group)

COSGP
Council of Osteopathic Student Government Presidents (AACOM advisory group)
CROSS
Checklist for Reporting Of Survey Studies
DO
Doctor of Osteopathic Medicine
ERAS
Electronic Residency Application Service
GME
Graduate Medical Education
GSS
Graduating Senior Survey (administered by AACOM)
IRB
Institutional Review Board
LDA
Latent Dirichlet Allocation
MD
Doctor of Medicine
NLTK
Natural Language Toolkit (Python library)
NRMP
National Resident Matching Program
PGY
Post-Graduate Year (e.g., PGY-1)
SOAP
Supplemental Offer and Acceptance Program
URM
Underrepresented in Medicine
USMD
U.S.-trained allopathic physician (graduate of an LCME-accredited MD-granting medical school)
USMLE
United States Medical Licensing Examination
VSLO
Visiting Student Learning Opportunities (AAMC application service)
VSR
Visiting Student Rotation

Declarations

The authors acknowledge the work of AACOM's Council on Residency Placement (CORP), Clinical Deans Group, Council of Residents and Fellows (CORF) and Council of Osteopathic Student Government Presidents (COSGP) for their assistance in constructing, selecting and revising survey items; Catherine Golden and Erik Guercio of AACOM in administering the AACOM annual Graduating Student Survey; and Zachary Himmelberger of Motivate Lab (Charlottesville, VA, USA) in providing advice in reporting elements of the survey

Ethics approval and consent to participate

This study was deemed exempt from review by the WCG Clinical and Affiliates institutional review board under 45 CFR § 46.104(d)(2) (Protocol ID U3NHP453920201, Exempt ID 1-1798723-1; April 4, 2023). WCG's affiliates are WIRB (Western Institutional Review Board), its flagship independent ethical review body, and the New England IRB & Midlands IRB, regional ethical oversight groups integrated into the network. AACOM does not require either Colleges of Osteopathic Medicine, or their students, to participate in the annual Graduating Student Survey. All authors confirm that all study methods were performed in accordance with relevant guidelines and regulations, including the Declaration of Helsinki. Informed consent was obtained from all individual participants prior to completing the survey. All investigators completed Collaborative Institutional Training Initiative (CITI Program) training in human subjects research and data ethics prior to conducting the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reasonable request, subject to data use agreements protecting respondent privacy.

Competing interests

The authors declare that they have no competing interests.

Funding

No external funding was received. The study was supported by salary support from the American Association of Colleges of Osteopathic Medicine (AACOM) for the authors. AACOM had no role in the design, analysis, or decision to publish.

Authors' contributions

MRS conceptualized and designed the study, led survey development, interpreted results, and drafted the manuscript. GH contributed to study design and survey development, conducted statistical analysis and

topic modeling, contributed to interpretation, and revised the manuscript critically. Both authors read and approved the final manuscript.

Author approval: All authors have approved this manuscript for submission.

Originality: The content has not been published elsewhere and is not under consideration at another journal.

Prior presentation

Initial results were presented on a single slide at the ACGME Annual Education Conference in February 2024.

References

1. American Association of Colleges of Osteopathic Medicine. *2025 Osteopathic Medical Education Impact Report*. 2025. https://www.aacom.org/docs/default-source/impact-report-documents/2025-osteopathic-medical-education-impact-report.pdf
2. National Resident Matching Program. *Results and Data: 2023 Main Residency Match®*. . 2023.
3. American Association of Colleges of Osteopathic Medicine. *Report on Osteopathic Medical School GME Placements in 2023 Matches*. 2023.
4. National Resident Matching Program. *Applicant Placement Rate in the Main Residency Match® and Supplemental Offer and Acceptance Program®*. 2023.
5. Brazdzionis J, Savla P, Oppenheim R, et al. Comparison of Osteopathic (DO) and Allopathic (MD) Candidates Matching Into Selected Surgical Subspecialties. *Cureus*. Published online 2023. doi:10.7759/cureus.40566
6. Farsar CJ, Quesada PR, Brown JR. Current Barriers in Pursuing Otolaryngology as an Osteopathic Applicant and Proposed Goals for the Future. *Otolaryngology - Head and Neck Surgery (United States)*. 2022;166(3). doi:10.1177/01945998211029548
7. Cai F, Santiago S, Southworth E, et al. Does the Degree Matter? MD and DO Students Who Match Into OB/GYN Report Different Experiences in US Undergraduate Medical Education. *J Grad Med Educ*. 2023;15(4). doi:10.4300/JGME-D-22-00693.1
8. Heard MA, Buckley SE, Burns B, Conrad-Schnetz K. Identifying Attitudes Toward and Acceptance of Osteopathic Graduates in Surgical Residency Programs in the Era of Single Accreditation: Results of the American College of Osteopathic Surgeons Medical Student Section Questionnaire of Program Directors. *Cureus*. Published online 2022. doi:10.7759/cureus.22870
9. Tvedten EJ, Turnbull JP, Guo W, Motaparthi K. Attitudes toward allopathic and osteopathic candidates in the dermatologic residency application process. *Clin Dermatol*. 2023;41(1). doi:10.1016/j.clindermatol.2022.10.002

10. White PB, Giordano JR, Chen M, et al. Residency Match Rates in Orthopaedic Surgery Based on Sex, Under-Represented in Medicine Status, and Degree Type. *JBJS Open Access*. 2023;8(1). doi:10.2106/JBJS.OA.22.00143
11. Schenarts PJ, Termuhlen PM, Pasley J, Rose JS, Friedell ML. A primer on how to select osteopathic applicants to an allopathic general surgery residency. *J Surg Educ*. 2011;68(3):239-245. doi:10.1016/j.jsurg.2011.01.001
12. Beckman JJ, Speicher MR. Characteristics of ACGME Residency Programs That Select Osteopathic Medical Graduates. *J Grad Med Educ*. 2020;12(4). doi:10.4300/JGME-D-19-00597.1
13. Sharma A, Minh Duc NT, Luu Lam Thang T, et al. A Consensus-Based Checklist for Reporting of Survey Studies (CROSS). *J Gen Intern Med*. 2021;36(10). doi:10.1007/s11606-021-06737-1
14. Jenkins TM. Doctors' orders the making of status hierarchies in an elite profession Tania M. Jenkins. Published online 2020:329.
15. Jenkins TM, Franklyn G, Klugman J, Reddy ST. Separate but Equal? The Sorting of USMDs and Non-USMDs in Internal Medicine Residency Programs. *J Gen Intern Med*. 2020;35(5):1458-1464. doi:10.1007/S11606-019-05573-8
16. Harfouch N, Grunhut J, Hsu A, et al. MD and DO: Differing Medical Degrees and the Associated Perceptions. *Curr Probl Diagn Radiol*. 2021;50(6):820-824. doi:10.1067/j.cpradiol.2020.08.004
17. Matthews CN, Estrada DC, George-Weinstein M, Claeson KM, Roberts MB. Evaluating the influence of research on match success for osteopathic and allopathic applicants to residency programs. *Journal of the American Osteopathic Association*. 2019;119(9). doi:10.7556/jaoa.2019.102
18. Sabesan VJ, Schrotenboer A, Habeck J, et al. Musculoskeletal Education in Medical Schools: A Survey of Allopathic and Osteopathic Medical Students. *J Am Acad Orthop Surg Glob Res Rev*. 2018;2(6). doi:10.5435/JAAOSGlobal-D-18-00019
19. Davis GE, Gayer GG. Comparison of basic science knowledge between DO and MD students. *Journal of the American Osteopathic Association*. 2017;117(2). doi:10.7556/jaoa.2017.022
20. Gomez C, Ranson R, Gianakos A, Miskimin C, Mulcahey MK. Allopathic and Osteopathic Residents Perform Similarly on the Orthopedic In-Training Examination (OITE). *J Surg Educ*. 2023;80(5):714-719. doi:10.1016/j.jsurg.2023.02.006
21. Sliwa JA, Raddatz MM, Kinney CL, Clark G, Robinson L. Allopathic (MD) and Osteopathic (DO) Performance on the American Board of Physical Medicine and Rehabilitation Initial Certifying Examinations. *PM&R*. 2020;12(9):899-903. doi:10.1002/pmrj.12311
22. O'Neill TR, Royal K, Schulte BM, Leigh T. Comparing the Performance of Allopathically and Osteopathically Trained Physicians on the American Board of Family Medicine's Certification Examination. *ERIC*. *American Board of Family Medicine*. Preprint posted online 2009.
23. Howley L, Grbic D, Speicher MR, Roskovensky LB, Jayas A, Andriole DA. The Resident Readiness Survey: A National Process for Program Directors to Provide Standardized Feedback to Medical Schools About Their Graduates. *J Grad Med Educ*. 2023;15(5). doi:10.4300/JGME-D-23-00061.1

24. Langhan ML, Ngo TL, Yamazaki K, Nesiama JAO, Pence L, Hogan SO. Different letters, same results: a comparison of milestones among US allopathic and osteopathic residents. *Journal of Osteopathic Medicine*. Published online February 9, 2026. doi:10.1515/jom-2025-0093
25. Miyawaki A, Jena AB, Gross N, Tsugawa Y. Comparison of Hospital Outcomes for Patients Treated by Allopathic Versus Osteopathic Hospitalists An Observational Study. *Ann Intern Med*. 2023;176(6). doi:10.7326/M22-3723
26. Licciardone JC. A comparison of patient visits to osteopathic and allopathic general and family medicine physicians: Results from the National Ambulatory Medical Care Survey, 2003-2004. *Osteopath Med Prim Care*. 2007;1. doi:10.1186/1750-4732-1-2
27. Reid RO, Friedberg MW, Adams JL, McGlynn EA, Mehrotra A. Associations between physician characteristics and quality of care. *Arch Intern Med*. 2010;170(16). doi:10.1001/archinternmed.2010.307
28. Licciardone JC, Kellerlee J, Joseph M, et al. The process and outcomes of chronic low back pain treatment provided by osteopathic and allopathic physicians: A retrospective cohort study. *Journal of Osteopathic Medicine*. 2023;123(8). doi:10.1515/jom-2023-0046
29. Licciardone JC, Schmitt ME, Aryal S. Empathy in medicine: Osteopathic and allopathic physician interpersonal manner, empathy, and communication style and clinical status of their patients: A pain registry–based study. *Journal of the American Osteopathic Association*. 2019;119(8). doi:10.7556/jaoa.2019.092
30. Hern HG, Trivedi T, Alter HJ, Wills CP. How Prevalent Are Potentially Illegal Questions During Residency Interviews? A Follow-up Study of Applicants to All Specialties in the National Resident Matching Program. *Academic Medicine*. 2016;91(11):1546-1553. doi:10.1097/ACM.0000000000001181
31. Briggs LG, Riew GJ, Kim NH, et al. Racial and Gender Differences in Medical Student Burnout: A 2021 National Survey. *Mayo Clin Proc*. 2023;98(5):723-735. doi:10.1016/J.MAYOCP.2022.11.003
32. Backović D V, Živojinović JI, Maksimović J, Maksimović M. Gender differences in academic stress and burnout among medical students in final years of education. *Psychiatr Danub*. 2012;24(2):175-181.
33. Teshome BG, Desai MM, Gross CP, et al. Marginalized identities, mistreatment, discrimination, and burnout among US medical students: cross sectional survey and retrospective cohort study. *BMJ*. Published online March 22, 2022:e065984. doi:10.1136/bmj-2021-065984
34. Fordyce Dr. MA, Doescher MP, Chen FM, Hart LG. Osteopathic physicians and international medical graduates in the rural primary care physician workforce. *Fam Med*. 2012;44(6).
35. Griffith S, Power A, Strand M. Pennsylvania otolaryngologists as a model for the implications of practice location of osteopathic vs allopathic surgical subspecialists. *Journal of the American Osteopathic Association*. 2017;117(9). doi:10.7556/jaoa.2017.109
36. Kortz MW, Vegas A, Moore SP, et al. National Resident Matching Program Performance Among US MD and DO Seniors in the Early Single Accreditation Graduate Medical Education Era. *Cureus*.

Published online August 20, 2021. doi:10.7759/cureus.17319

37. Modica A, Ranson R, Williamson T, Ponce BA, Cohn RM, Bitterman AD. Osteopathic Students Have Decreased Match Rates in Orthopaedic Surgery Compared with Allopathic Students. *JBJS Open Access*. 2024;9(2). doi:10.2106/JBJS.OA.24.00027
38. Wray CM, Bryan Carmody J. Equal and No Longer Separate: Examining Quality of Care Provided by Osteopathic and Allopathic Physicians. *Ann Intern Med*. 2023;176(6). doi:10.7326/M23-1165
39. National Residency Matching Program. NRMP Match Code of Conduct. *https://www.nrmp.org/wp-content/uploads/2023/08/NRMP-Match-Code-of-Conduct_Programs.pdf*. *National Resident Matching Program*. Preprint posted online August 2023.
40. Accreditation Council on Graduate Medical Education. ACGME Statement on Medical Education Racial Discrimination. https://www.acgme.org/newsroom/2021/2/acgme-statement-on-medical-education-racial-discrimination-allegations/. February 17, 2021.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- AdditionalFile1TableS2LDAdiagnostics.xlsx
- AdditionalFile1TableS1ResponseDistributions1.xlsx
- BMCBiasSpeicherSupplementaryMaterials.docx