

The Future Face of Surgery—Demographics of Students Interested in Surgery at an Academic Medical Center

Jalee Birney¹ , Dylan T Vance¹, Jodi A. Veach¹, Katelyn Sanner Dixon², Sarah E. Adkins¹, Sarah C. Wilson¹, Heather M Minchew³, Jordan Baker⁴, Lynn Chollet-Hinton⁴, German Berbel² and Lyndsey J Kilgore^{2,3}

¹University of Kansas School of Medicine, Kansas City, KS, USA. ²University of Kansas, Department of Surgery, Kansas City, KS, USA. ³University of Kansas, Department of Neurosurgery, Kansas City, KS, USA. ⁴University of Kansas, Department of Biostatistics and Data Management, Kansas City, KS, USA.

Journal of Medical Education and Curricular Development
Volume 12: 1–6
© The Author(s) 2025
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/23821205241310736



ABSTRACT

BACKGROUND: The demographics of medical schools reveal a growing trend towards greater gender and underrepresented in medicine (UIM) representation among students, yet surgical residency lags behind. This study explores the demographics of first-year medical students (M1s) and their initial career interests.

METHODS: A panel of faculty physicians and fourth-year medical students in surgical and nonsurgical specialties was held for M1s during orientation week. Demographic differences and career interests were collected.

RESULTS: Fifty-six M1s, 31 (55%) female and 13 (24%) UIM, attended the event. While 35 students (62.5%) reported interest in surgery, only 7 (20%) identified as UIM and 16 (46%) as female.

CONCLUSION: Initial interest in surgery is comprised of mostly male and non-UIM students. Throughout medical school, this pattern persists, with current match rates into surgery not reflecting the population of students. Focusing on initial interest to surgery is crucial as it is the foundation for the pipeline of diversifying future surgeons.

KEYWORDS: medical education, pre-clinical students, surgical education

RECEIVED: July 17, 2024. **ACCEPTED:** December 13, 2024.

TYPE: Original Research Article

FUNDING: The authors received no financial support for the research, authorship, and/or publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: Lyndsey J Kilgore, University of Kansas, Department of Neurosurgery, 4000 Cambridge St, MS 2005, Kansas City, KS, USA.
Email: LKilgore@kumc.edu

Introduction

Despite recent progress within medical school enrollment, the racial and ethnic composition of practicing physicians and surgeons still does not fully represent the communities that they serve. Over the last decade, medical schools have begun to see an increase in UIM students and female representation.¹ The AAMC estimated a 10.5% increase in first-year Black medical students and an 8.6% increase in Mexican American students in 2020.² In 2019, females comprised of 50.5% of medical students, up from 46.9% in 2015.¹ While Black and Hispanic representation among medical students has increased, these groups remain underrepresented within the medical field as defined by the Association of American Medical Colleges (AAMC) under the term “Underrepresented in Medicine” (UIM). This disparity, in which Black, Mexican American, Native American, and mainland Puerto Ricans populations have historically had limited representation, contributing to challenges for patients seeking care from providers who share their cultural or ethnic background.²

It is recognized by both the Liaison Committee on Medical Education (LCME) and AAMC that a diverse physician workforce is best equipped to serve the needs of diverse communities.^{3,4}

Physicians from UIM backgrounds are more likely to practice in underserved communities, where a significant portion of the patient populations consists of people of color and the underinsured.⁵ Patients report improved outcomes and greater trust when they share characteristics such as race, background, or socioeconomic status with their physician.⁶ UIM providers tend to achieve increased compliance and patient satisfaction scores when treating minority patients, while greater gender diversity has been correlated with improved patient outcomes, including mortality, complication, and readmission rates among patients treated by female surgeons.⁷ While this is known, the surgical field remains composed of primarily Caucasian males, consistently leaving females and UIM as a minority within this field.^{3,8–11}

Many UIMs choose to pursue residencies in primary care and/or careers practicing medicine outside academic medical centers.^{12,13} This may be attributed to not only interest and pragmatic factors, but also the leaking pipeline of differential opportunities created by medical schools and subsequent residency programs’ assessments for UIMs applicants compared to others.^{12,13} Studies have shown that 41% of UIM students report significant barriers to success, such as lack of support and limited representation, with these barriers effected by



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0

License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access page (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

Table 1. Demographics by interest in surgical versus nonsurgical specialty.

Characteristic	Overall <i>N</i> = 56 ^a	Nonsurgical <i>N</i> = 21 ^a	Surgical <i>N</i> = 35 ^a	<i>P</i> -value ^b
Year in school				.3
1	53 (95%)	21 (100%)	32 (91%)	
2	3 (5.4%)	0 (0%)	3 (8.6%)	
Gender				.061
Female	31 (55%)	15 (71%)	16 (46%)	
Male	25 (45%)	6 (29%)	19 (54%)	
Do you identify as an underrepresented person in medicine (UIM)?				.5
No	42 (76%)	15 (35%)	27 (64%)	
Yes	13 (24%)	6 (46%)	7 (53%)	
Unknown	1	0		
Sexual identity				.4
Asexual	1 (1.8%)	1 (4.8%)	0 (0%)	
Bisexual	2 (3.6%)	1 (4.8%)	1 (2.9%)	
Gay	1 (1.8%)	0 (0%)	1 (2.9%)	
Lesbian	1 (1.8%)	1 (4.8%)	0 (0%)	
Pansexual	1 (1.8%)	1 (4.8%)	0 (0%)	
Prefer not to disclose	1 (1.8%)	0 (0%)	1 (2.9%)	
Straight (heterosexual)	48 (87%)	17 (81%)	31 (91%)	
Unknown	1	0	1	
Do you identify as a traditional or a nontraditional student?				.7
Nontraditional	13 (24%)	4 (20%)	9 (26%)	
Traditional	41 (76%)	16 (80%)	25 (74%)	
Unknown	2	1	1	
Are you a first-generation college student?				.3
No	45 (80%)	15 (71%)	30 (86%)	
Yes	11 (20%)	6 (29%)	5 (14%)	
Are you a first-generation medical student?				>.9
No	16 (29%)	6 (29%)	10 (29%)	
Yes	40 (71%)	15 (71%)	25 (71%)	
Do you have a physician (any specialty) in your family?				.8
No	41 (75%)	16 (76%)	25 (74%)	
Yes	14 (25%)	5 (24%)	9 (26%)	
Unknown	1	0	1	
Do you have a surgeon in your family?				.7
No	47 (85%)	19 (90%)	28 (82%)	
Yes	8 (15%)	2 (9.5%)	6 (18%)	
Unknown	1	0	1	

^a*n* (%)^bFisher's exact test; Pearson's Chi-squared test

either the presence or absence of mentors.¹⁴ Students are not connected with a mentor sharing a similar background, they are more likely to develop negative perceptions of a career in surgery; thus, illustrating the significance of role models within surgical field.¹⁵ Longitudinal mentorship programs within medical schools have been shown to increase female and UIM representation within the surgical field, demonstrating that mentorship is an important factor in bridging the representation gap.⁷

Significant disparities in female and ethnic representation are evident across various medical specialties, both surgical and nonsurgical.^{11,16} Fields such as obstetrics and gynecology, pediatrics, and allergy and immunology are primarily composed of female practitioners.¹⁷ Conversely, there is minimal female representation in orthopedic surgery, interventional radiology, and neurologic surgery.¹⁷ The most ethnically and racially diverse fields consist of primary care and obstetrics and gynecology, while orthopedic surgery, ophthalmology, and radiation oncology are among the fields with the least diversity.^{16,18,19} This is relevant because students from ethnic and racial minorities often exhibit a stronger interest in underserved settings, underscoring the importance of racial and ethnic diversity in healthcare access at the specialty level.^{16,20} Given the increasing enrollment of females and UIM students matriculating into medical school, there lies an opportunity to explore the decision-making process as they consider careers in either medicine or surgery. Hence, it is imperative to examine the demographics of students interested in surgical specialties at academic institutions to identify the barriers hindering their pursuit of surgical careers.

Methods

During the first week of medical school classes, first-year students were invited to participate in a panel featuring fourth-year medical students, residents, and attending physicians. Internal medicine, family medicine, general surgery, and neurosurgery were all represented on the panels. This event was advertised for all first-year medical students to attend and learn about individuals' career paths to their desired specialty at a single academic institution. There was no limit on the number of students that could participate. It occurred in the evening of first-year medical trainees' orientation week to ensure as many students as possible could be present and participate. Students were encouraged to submit questions beforehand and were able to freely ask questions during the panel. Each panelist was prompted to introduce themselves, their specialty, and why they chose their field. This was all performed at a single institution during the 2021–2022 school year. The reporting of this study conforms to the Innovations in Education (DoCTRINE) guidelines.²¹ Inclusion criteria were any first- or second-year student at a single institution, third- and fourth-year students were excluded.

After obtaining Institutional Review Board (STUDY00148806) approval and voluntary informed consents from students, a survey was administered to determine UIM status and specialty interest prior to the panel (Table 1).

Statistics

Descriptive statistics (means, medians, frequencies, etc.) were calculated for all variables. Differences in participant demographics were compared by reported interest in surgical versus nonsurgical specialty using chi-square or Fisher's Exact tests as appropriate (Table 1). Analyses were conducted using R (version 4.2.1), and $P < .05$ was used to define statistical significance.

Results

Fifty-six first-year medical students attended the panel. Of the students who attended 31 (55%) identified as female and 25 (45%) as male. When asked if they identified as UIM, 42 students (76%) did not and 13 (24%) did. Among the number of first-year students, 21 (40%) indicated an interest in pursuing a nonsurgical specialty, while 32 (60%) expressed a preference for a surgical specialty. Furthermore, females and UIM students represented the majority (71%) of students expressing interest in a nonsurgical specialty. When asked about generational status, 11 (20%) students who attended the panel reported being a first-generation college student, and 40 (71%) of students reported being a first-generation medical student. Only 8 (15%) students reported having a surgeon family member.

Discussion

Our study revealed that the majority of first-year medical students, at the included institution, interested in surgery were males who did not identify as individuals underrepresented in medicine. This finding aligns with previous studies indicating that the field of surgery is primarily comprised of Caucasian males.²² Other survey questions regarding demographics were of interest including students' sexuality and if they had physicians in their family. It has been found throughout the literature that mentorship has a large impact on students entering surgical subspecialties.^{23,24} Many of the answers of our survey show that there are many first generation in medicine students, which can present a barrier to entering a surgical specialty.²³ Sexual orientation was largely reported as heterosexual (87%) which aligns with current literature findings of LGBTQ+ students feel less welcomed by surgical specialties.²⁵ Overall, there are stigmas that the field of surgery faces that make diverse students stray away from it.

Numerous factors contribute to the lack of diversity in surgery, including the stigma surrounding surgeons and medical students' perception of not feeling welcome in operating rooms (ORs).²⁶ The goal of the panel in this study was to introduce a variety of surgical and nonsurgical specialties to young medical trainees early and in an approachable manner.

The idea was that allowing students of all demographics access to mentorship and accessible information regarding surgical specialties would increase the diversity of first-year medical students who are interested in surgical specialties. Of note, this survey was meant for medical students early in their career and it is expected that students change their mind on the specialty they are most interested in as they progress in their career. One study found that 56% of medical students end up changing their specialty interests from the beginning of medical school to when they apply to residency.²⁷ Research notes the immense importance of mentorship for successful surgical matching as well as for UIM representation within academic medicine.²⁸ Given the importance of hands-on exposure in driving student interest and perceived confidence, an inability to identify mentors that a student is comfortable approaching has far-reaching consequences for student surgical exposure and career choice.²⁹ Furthermore, it is known that students' interest in surgery declines with advancing years in medical school due to intimidating OR etiquette, an absence of visible role models, and unconscious bias.^{26,30} Negative stereotypes associated with surgeons have also deterred students from pursuing a surgical career.³¹ These stereotypes, often credited as a factor in the declining number of applicants to surgical specialties each year, particularly affect women. Hill et al previously reported that women were deterred from surgery because they struggled to identify with female surgeons.³² This suggests that increasing the presence of female residents and attending surgeons around medical students could potentially enhance the number of women entering surgical specialties.

Increasing diversity within medicine not only affects surgical culture and medical students but also affects patients. Decreased gender diversity has been associated with poorer patient outcomes.³³ With increasing numbers of graduating female medical students, there has never been a more compelling reason to address gender diversity issues in the male-dominated field of surgery.³³ Psychologists propose that one's perception of competence in a particular domain may affect career choice, potentially contributing to female underrepresentation in male-dominated fields.^{26,34} These trends continue to affect students interested in certain medical specialties. Recent studies have found that increased gender representation within a given specialty results in greater interest in that specialty among female medical students.^{16,35} Unfortunately, this perpetuates a cycle wherein certain specialties, such as surgery, struggle to cultivate environments filled with inclusivity for students of all types. There is also the fact that there are greater barriers to medical education and especially surgical as well including financial. In 1 study, it is found that students from low socioeconomic backgrounds are also underrepresented in medicine.³⁶ Interestingly these students did not perform worse in medical school, they showed to perform similarly among their peers, further showing that students who come from different backgrounds are not worse performers, there

are barriers that limit them from entering the field of medicine at all.³⁶

Burnout and ways to combat it are frequently studied for both medical students and attending physicians as wellness has come to the forefront. When specifically looking at UIM students, a study found that underrepresented students faced higher rates of burnout.³³ There are many factors contributing to burnout, whether it be a lack of peer or mentor support or the burden of increased responsibility and recurrent discrimination that these students are facing every day.³³ Burnout is not only a personal struggle that UIM students face, but also a systemic issue that demands immediate attention.³³ Increasing recognition of this demographic of students' intimate relationship with burnout is not just advisable but essential, considering how burnout is likely to significantly impact UIM students' future careers. Furthermore, racial and ethnic diversity at the specialty level is crucial because it may shape access to health care among underserved communities; racial and ethnic minority medical students have reported greater intent to practice in underserved settings, and there is a skew in their representation across specialties, favoring primary care specialties. In addition, among those interested in surgical specialties, racial and ethnic minority medical students are more likely to report an intent to practice in underserved areas.^{16,20} If we are to make progress at increasing UIM representation among surgeons, it is paramount that these students are both recruited and supported in their initial medical school journey. This will require schools to take steps towards fostering mentorship programs, supporting UIM student experiences, and increasing access to pipeline programs designed to support these demographics of students attending and succeeding in medical school. Once diversity has been improved and UIM student populations feel supported, only then can we make meaningful inroads to increasing the population of UIM students interested in and ultimately matriculating into surgical subspecialties. Until then, all fields of medicine will struggle to diversify if current populations are only maintained, and their growth is not supported.

Limitations

This study was completed at a singular academic medical center and limited to its enrolled population. Students self-selected to participate leading to a smaller sample size and risks sampling bias leading to potential inflation of female and UIM numbers. Conversely, it is possible that there are additional factors affecting student participation such as timing of the panel, intimidation and overwhelm accompanying the first weeks of medical school, or other yet unknown factors. Future iterations of this study will seek to further parse out factors students felt affected their attendance.

Conclusions

This study showed that UIM students at this institution tend to favor nonsurgical specialties. This finding supports the

emerging data that despite the reported increase in diverse students matriculating into medical school, many of the students interested in surgery do not identify as UIM. It is important to address this issue early on in medical training and throughout medical school to ensure that students of all backgrounds feel empowered to pursue a specialty based on their own interests, whether medicinal or surgical. If the findings demonstrated in this study hold true on a broader scale, it is reasonable to state that academic institutions should intensify their efforts in creating accessible information and mentorship opportunities for students of diverse demographics. A larger scale study including a wide range of geographic regions is needed to determine whether this finding is generalizable outside the institution where this study occurred.

Acknowledgments

Thank you to Dr. Julie Broski for helping with the completion of this document as well as the rest of the Building Approachable Surgical Experiences executive board and the department of surgery.

Author Contribution

MJB: conceptualization, methodology, validation, investigation, resources, writing—original and review and editing, data curation, visualization, supervision, project administration. DV: conceptualization, methodology, validation, investigation, resources, writing—original and review and editing, data curation, visualization, supervision, project administration. JV: investigation, resources, writing—original and review and editing, data curation, project administration. KSD: conceptualization, methodology, validation, investigation, resources, writing—review and editing, visualization, data curation, supervision, project administration. SA: conceptualization, methodology, validation, investigation, resources, writing—review and editing, data curation, project administration. SW: investigation, resources, data curation, writing—revision and editing, project administration, data curation. HM: investigation, resources, data curation, writing—revision and editing, project administration, data curation. JB: investigation, resources, data curation, writing—revision and editing, project administration, data curation. LCH: investigation, resources, data curation, writing—revision and editing, project administration, data curation. GB: conceptualization, methodology, validation, investigation, resources, writing—original and review and editing, data curation, visualization, supervision, project administration. LJK: conceptualization, methodology, validation, investigation, resources, writing—original and review and editing, data curation, visualization, supervision, project administration.

Ethical Approval

The study was approved by the University of Kansas Medical Center Institution Review Board (IRB) through STUDY00148806: Impact

of Building Approachable Surgical Experiences (BASE) on Medical Student Self-Efficacy.

Informed Consent

Institutional Review Board (STUDY00148806) approval and voluntary informed consent from students.

Trial Registration

Not applicable, because this article does not contain any clinical trials.

ORCID iD

Jalee Birney  <https://orcid.org/0000-0002-7909-9538>

Supplemental Material

Supplemental material for this article is available online.

REFERENCES

- Heiser S. The Majority of U.S Medical Students are Women, New Data Show. 2019. 2019.
- Adkins SE, Dixon KS, Minchew HM, et al. Building approachable surgical experiences (BASE) in high school populations. *J Surg Educ.* 2023;80(9):1189-1194.
- Bazargan-Hejazi S, Negrete Manriquez JA, McDermoth-Grimes M, Parra EA, Prothrow-Stith D. Underrepresented in medicine students' perspectives on impactful medical education. *BMC Med Educ.* 2022;22(1):904.
- Dickins K, Levinson D, Smith SG, Humphrey HJ. The minority student voice at one medical school: lessons for all? *Acad Med.* 2013;88(1):73-79.
- Marrast LM, Zallman L, Woolhandler S, Bor DH, McCormick D. Minority physicians' role in the care of underserved patients: diversifying the physician workforce may be key in addressing health disparities. *JAMA Intern Med.* 2014;174(2):289-291.
- Siotos C, Payne RM, Stone JP, et al. Evolution of workforce diversity in surgery(☆). *J Surg Educ.* 2019;76(4):1015-1021.
- Hemal K, Reghunathan M, Newsom M, Davis G, Gosman A. Diversity and inclusion: a review of effective initiatives in surgery. *J Surg Educ.* 2021;78(5):1500-1515.
- Barceló NE, Shadravan S. Race, metaphor, and myth in academic medicine. *Acad Psychiatry.* 2021;45(1):100-105.
- Bonifacio E, Ufomata EO, Farkas AH, Turner R, Corbelli JA. Mentorship of underrepresented physicians and trainees in academic medicine: a systematic review. *J Gen Intern Med.* 2021;36(4):1023-1034.
- Klifto KM, Payne RM, Siotos C, et al. Women continue to be underrepresented in surgery: a study of AMA and ACGME data from 2000 to 2016. *J Surg Educ.* 2020;77(2):362-368.
- Chen-Xu J, Vervoort D. Women in surgery: challenges and opportunities. *International J of Surg: Glob Health.* 2018;1(1):2.
- Agawu A, Fahl C, Alexis D, et al. The influence of gender and underrepresented minority status on medical student ranking of residency programs. *J Natl Med Assoc.* 2019;111(6):665-673.
- Kane K, Rosero EB, Clagett GP, Adams-Huet B, Timaran CH. Trends in workforce diversity in vascular surgery programs in the United States. *J Vasc Surg.* 2009;49(6):1514-1519.
- Odom KL, Roberts LM, Johnson RL, Cooper LA. Exploring obstacles to and opportunities for professional success among ethnic minority medical students. *Acad Med.* 2007;82(2):146-153.
- Acker R, Healy MG, Vanderkruik R, Petrusa E, McKinley SK, Phitayakorn R. Eyes of the beholders: first-year medical students' perceptions of surgeons and the field of surgery. *Am J Surg.* 2022;223(6):1026-1032.
- Nguemeni Tiako MJ, Johnson S, Muhammad M, Osman NY, Solomon SR. Association between racial and ethnic diversity in medical specialties and residency application rates. *JAMA Netw Open.* 2022;5(11):e2240817-e2240817.
- Brotherton SE, Etzel SI. Graduate medical education, 2022-2023. *Jama.* 2023;330(10):988-1011.
- Deville C, Hwang WT, Burgos R, Chapman CH, Both S, Thomas CR Jr. Diversity in graduate medical education in the United States by race, ethnicity, and sex, 2012. *JAMA Intern Med.* 2015;175(10):1706-1708.
- Lett E, Orji WU, Sebros R. Declining racial and ethnic representation in clinical academic medicine: a longitudinal study of 16 US medical specialties. *PLoS One.* 2018;13(11):e0207274.

20. Nguyen M, Cerasani M, Dinka LA, et al. Association of demographic factors and medical school experiences with Students' intention to pursue a surgical specialty and practice in underserved areas. *JAMA Surg.* 2021;156(12):e214898.
21. Blanco M PJ, DiCorcia M, Learman LA, Mutcherson B, Huang GC. The DoCTRINE guidelines: defined criteria to report INnovations in education. *Acad Med.* 2022;97(5):689-695.
22. Noel OF, Berg A, Onyango N, Mackay DR. Ethnic and gender diversity comparison between surgical patients and caring surgeons. *Plast Reconstr Surg Glob Open.* 2020;8(10):e3198.
23. Havemann C, Mason HRC, Russell RG, et al. Challenges facing first-generation college graduates in medical school: a qualitative analysis. *JAMA Netw Open.* 2023;6(12):e2347528.
24. ElHawary H, Salimi A, Gorgy A, Fesdekjian L, Seal A, Gilardino MS. Medical student mentorship in surgery: lessons learnt and future directions. *J Surg Educ.* 2022;79(1):129-138.
25. Rosecrance K, Archibald A, Victor R, Lasso ET, Nore C, Barrios C. Medical student perspectives on sexual and gender minority acceptance in surgical specialties and sexual and gender minority education. *J Surg Res.* 2023;289:121-128.
26. Cronin C, Lucas M, McCarthy A, et al. Are we reaping what we sow? Gender diversity in surgery: a survey of medical students. *Postgrad Med J.* 2019;95(1121):119-124.
27. Rachoin JS, Vilceanu MO, Franzblau N, Gordon S, Cerceo E. How often do medical students change career preferences over the course of medical school? *BMC Med Educ.* 2023;23(1):596.
28. Ramanan RA, Phillips RS, Davis RB, Silen W, Reede JY. Mentoring in medicine: keys to satisfaction. *Am J Med.* 2002;112(4):336-341.
29. Adkins SE, Minchew HM, Sanner Dixon K, Chollet Hinton L, Kilgore LJ, Berbel G. A hands-on surgical event to improve medical student operating room confidence. *J Surg Res.* 2023;290:156-163.
30. Beech BM, Calles-Escandon J, Hairston KG, Langdon SE, Latham-Sadler BA, Bell RA. Mentoring programs for underrepresented minority faculty in academic medical centers: a systematic review of the literature. *Acad Med.* 2013;88(4):541-549.
31. Hill EJR, Bowman KA, Stalmeijer RE, Solomon Y, Dornan T. Can I cut it? Medical students' perceptions of surgeons and surgical careers. *Am J Surg.* 2014;208(5):860-867.
32. Hill E, Vaughan S. The only girl in the room: how paradigmatic trajectories deter female students from surgical careers. *Med Educ.* 2013;47(6):547-556.
33. O'Marr JM, Chan SM, Crawford L, Wong AH, Samuels E, Boatright D. Perceptions on burnout and the medical school learning environment of medical students who are underrepresented in medicine. *JAMA Netw Open.* . 2022;5(2):e220115.
34. Beyer S, Bowden EM. Gender differences in self-perceptions: convergent evidence from three measures of accuracy and bias. *Pers Soc Psychol Bull.* 1997;23(2):157-172.
35. Kazerooni EA, Blane CE, Schlesinger AE, Vydareny KH. Medical students' attitudes toward radiology: comparison of matriculating and graduating students. *Acad Radiol.* 1997;4(8):601-607.
36. Griffin B, Hu W. The interaction of socio-economic status and gender in widening participation in medicine. *Med Educ.* 2015;49(1):103-113.