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# Changing Faces: Factors Associated with the Intention to Pursue Plastic Surgery and Practice in Underserved Areas

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**Background:** Improving the number of plastic and reconstructive surgeons who provide care to patients in underserved communities is critical to achieving health equity. We aimed to identify factors associated with graduating medical students' intentions to pursue plastic surgery and practice in underserved areas.

**Methods:** De-identified data for US medical school graduates were obtained from the Association of American Medical Colleges for students who matriculated in academic years 2007–2008 and 2011–2012. Data collected included self-reported demographic and future practice intentions. Multivariate analysis was conducted to determine indicators of students' interest in plastic surgery, and their intention to practice in underserved areas.

**Results:** Of the 57,307 graduating US medical students in our cohort who completed the Graduation Questionnaire, 532 (0.9%) reported an intention to pursue plastic surgery. Hispanic [adjusted odds ratio (aOR): 1.45; 95% confidence interval (95% CI), 1.07–1.98] and multiracial (aOR: 1.59; 95% CI, 1.03–2.45) students were more likely to pursue plastic surgery compared with other surgical specialties. Among students interested in plastic surgery, compared with non-Hispanic White students, Black (aOR: 6.15; 95% CI, 1.96–19.26) students were more likely to report intention to practice in underserved areas. Students with community-engagement experiences were more likely to report intention to practice in underserved areas.

**Conclusions:** Diversity among medical trainees pursuing plastic and reconstructive surgery is critical for maintaining and expanding plastic surgery services rendered in underserved areas. These findings suggest that student demographics and experiences with community-engagement experiences are positive indicators of practicing in underserved communities. (*Plast Reconstr Surg Glob Open* 2023; 11:e5177; doi: 10.1097/GOX.0000000000005177; Published online 11 August 2023.)

## INTRODUCTION

The Health Resources and Services Administration defines a medically underserved area as a region in which there is a shortage of physicians within a specified geographic area.<sup>1</sup> In the United States, where there were

2.2 plastic surgeons per 100,000 people in 2021,<sup>2</sup> over 25 million people were geographically isolated from a plastic surgeon; such geographic variation in healthcare access predominantly has an adverse impact on rural and older residents.<sup>3</sup> As plastic surgeons are uniquely positioned to provide comprehensive surgical care, given their broad surgical skillsets, the unequal distribution of plastic surgeons has led to healthcare inequity in breast reconstruction, craniosynostosis, cleft palate care, and hand reconstruction.<sup>3–7</sup> Shortages of surgical specialists, including plastic surgeons, have been reported in emergency medicine settings and in underserved areas,<sup>8,9</sup> making it imperative for medical institutions to commit to promote medical students' and residents' interest in plastic surgery to consider practicing in medically underserved areas.

Previous studies have shown that demographic and medical school experiences are correlated with a medical

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trainee's intent to practice in underserved areas.<sup>10</sup> With joint efforts focused on the growth of pipeline programs, ethnic minority-specific scholarships/grants, and mentorship programs by diversity offices, medical institutions and governing bodies have led initiatives to increase admission of students historically underrepresented in medicine (URiM). Trainees of medical institutions that prioritize diversity and inclusion have shown greater cultural competency and improved ability to care for diverse patient populations,<sup>11</sup> correlating with observations that female and URiM students are more likely report intention to practice in underserved areas.<sup>10</sup>

Currently, despite female students representing half of all medical school graduates, they represent only 32% of plastic surgery residents and 14% of all plastic surgeons.<sup>12</sup> The increase in diversity of the plastic surgery resident workforce lags behind the growth in diversity in the US population.<sup>13</sup> Female and URiM students also face additional challenges after entering plastic surgery training. Described as the "plastic ceiling," additional gender and racial/ethnic disparities exist in representation amongst academic faculty and leadership.<sup>14,15</sup>

There is a persistent lack of diversity among all academic surgeons<sup>16</sup> and academic plastic surgeons, in particular.<sup>17</sup> Efforts to attract and recruit medical trainees to careers in plastic and reconstructive surgery should be focused on plugging the leaky pathway for women and students from minoritized groups. To inform these efforts, we expand on current knowledge by exploring demographics, financial situations, and medical school experiences that are associated with graduating medical students' interest in plastic and reconstructive surgery and intention to practice in underserved areas. This study expands on current knowledge by providing additional insight into factors associated with students' intention to pursue a career in plastic surgery and interest in practicing in underserved areas.

## METHODS

De-identified, individual-level data were provided by the Association of American Medical Colleges (AAMC) data warehouse for a national cohort study of 92,080 US matriculants to MD-granting medical schools between academic years 2007–2008 and 2011–2012. Students were followed for at least 5 years until June 2017, when 88,059 (95.7%) of all students had graduated. The AAMC Graduation Questionnaire (GQ) is a national annual survey of graduating medical students. Between 2012 and 2017, the GQ response rate varied between 79.0% and 82.4%. Students completed surveys voluntarily, and responses are confidential. De-identified records were obtained from the GQ databank and merged across survey years before analysis. The study's data include the following variables from the AAMC student records system, and GQ: self-reported sex, race/ethnicity, age at matriculation, degree program at graduation, planned practice specialty, intention to practice in underserved area, total student debt upon medical school graduation, scholarship awarded during medical school, and participation

## Takeaways

**Question:** What is the association between students' sociodemographic characteristics and medical school experiences with their intention to pursue plastic and reconstructive surgery and practice in underserved areas?

**Findings:** Female and Black students were significantly less likely than their White peers to pursue plastic surgery. Black students and students with community-engagement experiences were more likely to practice in underserved areas.

**Meaning:** Diversity in the plastic surgery workforce is critical to providing high-quality care. To promote equitable surgical care, it is essential to support the pathway to plastic surgery for female and Black students, and students with a history of community-engagement experiences.

in electives during medical school. Students who did not have complete demographic data or did not indicate an intention for career specialty or practicing in underserved areas were excluded from analysis. The study was approved by Albany Medical College institutional review board.

Data were categorized for analysis. Age at matriculation was categorized as age 23 or older at matriculation compared with younger than 23 years of age at matriculation. Self-reported racial/ethnic categories included non-Hispanic (NH) White, NH Black or African American, NH Asian, NH American Indian or Alaskan Native, NH Hawaiian Native or Other Pacific Islander, Hispanic, multiracial (reported more than one NH racial group), and unknown/other. Total student debt at graduation had five categories: no debt; less than \$100,000; \$100,000–\$199,999; \$200,000–\$299,999; and greater than or equal to \$300,000. Degree program at graduation was categorized as MD-only, Bachelor's-MD, MD/PhD, and MD/other advanced degree (eg, MD-MBA, MD-MPH) program. Students who reported an intention to pursue plastic surgery were classified as "plastic." Students who reported intention for orthopedics, general surgery, urology, otolaryngology, neurosurgery, colorectal surgery, vascular surgery, thoracic surgery, or ophthalmology were classified as "other surgical specialty." Students who reported intention for any other specialty were classified as "non-surgery." Students' intentions to practice in underserved areas were classified as "yes" and compared with a combined category of "no/undecided."

Descriptive statistics for demographic factors were generated to report frequencies and percentages, and chi-square tests were performed to determine associations between each categorical variable and students planning to pursue plastic surgery, other surgical specialties, and nonsurgical specialties and planning to practice in underserved areas). Multivariate logistic regression models were conducted to estimate the adjusted odds ratios for the effects of covariates (eg, sex, total debt at graduation, ethno-racial group) on students' intention to pursue plastic surgery (versus surgical specialty or nonsurgical specialty) and practice in underserved areas (yes versus undecided/no). Adjusted odds ratio and 95% confidence

intervals (aOR; 95% CI) are reported. All statistical analyses were performed using STATA (StataCorp) 16.1.

## RESULTS

### Intention to Pursue Plastic Surgery

Among 88,059 graduates, 57,307 (65.1%) completed the GQ and had complete demographic data; 532 (0.9%) reported an intention to pursue plastic surgery (Table 1). A higher proportion of students intending to pursue plastic surgery and other surgical specialties were men (59.4% and 67.4%, respectively), whereas a higher proportion of students intending to pursue nonsurgical specialties (51.9%) were women ( $P < 0.001$ ). There were significant differences in the proportions of students intending to pursue plastic surgery compared with other surgical and nonsurgical specialties by race and ethnicity ( $P < 0.001$ ). Compared with their proportional representation in the sample overall, lower proportions of students intending to pursue plastic surgery were NH Asian (16.5%) and NH Black/African American (2.8%) students, whereas greater proportions of students intending to pursue plastic surgery

were NH American Indian/Alaska Native/Hawaiian Native/Other Pacific Islander (0.6%), Hispanic (9.2%), and NH multiracial (4.5%) students ( $P < 0.001$ ). Also, compared with their representation in the sample overall, a lower proportion of students intending to pursue plastic surgery were in MD/PhD programs (1.9%), whereas a greater proportion of students intending to pursue plastic surgery were in MD/other advanced degree programs (4.5%,  $P < 0.001$ ). In addition, lower proportions of students intending to pursue plastic surgery (12.8%) and other surgical specialties (18.1%) reported plans to practice in underserved areas, compared with each group's representation in the sample overall ( $P < 0.001$ ).

Adjusted logistic regression models were conducted to estimate the effect of the aforementioned covariates on the likelihood of pursuing a career in plastic surgery (Table 2). Female students were more likely than male students to pursue plastic surgery versus other surgical specialties (aOR: 1.41; 95% CI, 0.18–1.69), but they were less likely to pursue plastic surgery versus nonsurgical specialties (aOR: 0.62; 95% CI, 0.52–0.74). Compared with NH White students, Hispanic students (aOR: 1.45, 95% CI, 1.07–1.98) and NH multiracial students (aOR: 1.59, 95% CI,

**Table 1. Characteristics of Graduation Questionnaire Participants from US Medical Schools Who Matriculated in Academic Years 2007–2008 through 2011–2012**

Characteristics	Specialty Intentions, n (%)				P
	Total	Plastic Surgery	Other Surgical Specialty	Nonsurgical Specialty	
	57,307	532	11,376	45,399	
<b>Sex</b>					<0.001
Male	29,829 (52.0%)	316 (59.4%)	7670 (67.4%)	21,839 (48.1%)	
Female	27,488 (48.0%)	216 (40.6%)	3706 (32.6%)	23,560 (51.9%)	
<b>Race/ethnicity</b>					<0.001
Non-Hispanic White	35,716 (62.3%)	333 (62.6%)	7379 (64.9%)	28,000 (61.7%)	
Non-Hispanic Asian	10,526 (18.4%)	88 (16.5%)	2029 (17.8%)	8406 (18.5%)	
Non-Hispanic Black/African American	2880 (5.0%)	15 (2.8%)	452 (4.0%)	2413 (5.3%)	
Hispanic	4130 (7.2%)	49 (9.2%)	716 (6.3%)	3370 (7.4%)	
Non-Hispanic American Indian/Alaska Native/Hawaiian Native/other Pacific Islander	196 (0.3%)	3 (0.6%)	30 (0.3%)	163 (0.4%)	
Non-Hispanic multiracial	1532 (2.7%)	24 (4.5%)	315 (2.8%)	1192 (2.6%)	
Non-Hispanic unknown/other	2327 (4.1%)	20 (3.8%)	452 (4.0%)	1855 (4.1%)	
<b>Age at matriculation</b>					<0.001
<23 years old	25,794 (45.0%)	280 (52.6%)	5237 (46.0%)	20,274 (44.7%)	
≥23 years old	31,523 (55.0%)	252 (47.4%)	6139 (54.0%)	25,125 (55.3%)	
<b>Degree program at graduation</b>					<0.001
MD	52,383 (91.4%)	485 (91.2%)	10,509 (92.4%)	41,382 (91.2%)	
Bachelor's/MD	1655 (2.9%)	13 (2.4%)	332 (2.9%)	1309 (2.9%)	
MD/PhD	1695 (3.0%)	10 (1.9%)	250 (2.2%)	1433 (3.2%)	
MD/other advanced degrees	1584 (2.8%)	24 (4.5%)	285 (2.5%)	1275 (2.8%)	
<b>Total debt at graduation</b>					0.007
No debt	7984 (13.9%)	73 (13.7%)	1634 (14.4%)	6276 (13.8%)	
<100,000	8494 (14.8%)	71 (13.3%)	1696 (14.9%)	6725 (14.8%)	
\$100,000–\$199,999	15,573 (27.2%)	133 (25.0%)	2956 (26.0%)	12,480 (27.5%)	
\$200,000–\$299,999	13,740 (24.0%)	130 (24.4%)	2770 (24.3%)	10,839 (23.9%)	
≥\$300,000	4233 (7.4%)	56 (10.5%)	872 (7.7%)	3303 (7.3%)	
No response	7293 (12.7%)	69 (13.0%)	1448 (12.7%)	5776 (12.7%)	
<b>Intention to practice in underserved areas</b>					<0.001
No or undecided	41,718 (72.8%)	459 (86.3%)	9274 (81.5%)	31,985 (70.5%)	
Yes	15,297 (26.7%)	68 (12.8%)	2055 (18.1%)	13,174 (29.0%)	
No response	292 (0.5%)	5 (0.9%)	47 (0.4%)	240 (0.5%)	

**Table 2. Graduation Questionnaire Participants' Intention for Plastic Surgery Compared with Other Surgical Specialty or Nonsurgical Specialty (N = 57,307)**

Characteristics	Intention to Pursue:	
	Plastic Surgery versus Other Surgical Specialty	Plastic Surgery versus Non-Surgical Specialty
Sex		
Male	(Ref)	(Ref)
Female	1.41 (1.18–1.69)	0.62 (0.52–0.74)
Race/ethnicity		
Non-Hispanic White	(Ref)	(Ref)
Non-Hispanic Asian	0.89 (0.69–1.13)	0.85 (0.67–1.08)
Non-Hispanic Black/African American	0.69 (0.41–1.17)	0.56 (0.34–0.95)
Hispanic	1.45 (1.07–1.98)	1.24 (0.92–1.68)
Non-Hispanic American Indian/Alaska Native/Hawaiian Native/other Pacific Islander	2.13 (0.65–7.05)	1.65 (0.52–5.21)
Non-Hispanic multiracial	1.59 (1.03–2.45)	1.77 (1.16–2.69)
Non-Hispanic unknown/Other	0.92 (0.58–1.46)	0.9 (0.57–1.42)
Age at matriculation, y		
<23	(Ref)	(Ref)
≥23	0.75 (0.63–.90)	0.67 (0.57–0.80)
Degree program at graduation		
MD	(Ref)	(Ref)
Bachelor's/MD	0.87 (0.46–1.65)	0.55 (0.29–1.03)
MD/PhD	0.77 (0.43–1.36)	0.76 (0.43–1.33)
MD/other advanced degrees	1.80 (1.17–2.76)	1.61 (1.07–2.44)

Values given are adjusted OR (95% CI).

1.03–2.45) were more likely to pursue plastic surgery versus other surgical specialties, and NH multiracial students also were more likely to pursue plastic surgery versus nonsurgical specialties (aOR: 1.77; 95% CI, 1.16–2.69). NH Black/African American students were less likely to pursue plastic surgery versus nonsurgical specialties than NH White students (aOR: 0.56; 95% CI, 0.34–0.95). Compared with younger students, those who were aged 23 years or older at matriculation were less likely to pursue plastic surgery versus other surgical specialties (aOR: 0.75, 95% CI, 0.63–0.90) and versus nonsurgical specialties (aOR: 0.67, 95% CI, 0.57–0.80). Compared with MD-only students, students graduating from MD/other advanced degree programs were more likely to pursue plastic surgery over both other surgical (aOR: 1.80, 95% CI, 1.17–2.76) and nonsurgical (aOR: 1.61, 95% CI, 1.07–2.44) specialties.

**Intention to Practice in Underserved Areas**

Among 532 plastic surgery students in the study sample, 527 (99.1%) responded with their intention to practice in underserved areas, and 68 (12.9%) students reported intention to practice in underserved areas (Table 1). Female students were as likely as male students to report intention to practice in underserved areas (aOR: 0.76, 95% CI, 0.41–1.33). NH Black/African American (versus NH White) students (aOR: 6.15, 95% CI, 1.96–19.26) and

**Table 3. Intention to Practice in Underserved Areas among Graduation Questionnaire Participants Interested in Pursuing Plastic Surgery**

Characteristics, N = 527	Total Students	Intention to Practice in Underserved Areas	
		N (%)*	aOR (95% CI)
Sex			
Male	315	36 (11.4%)	(Ref)
Female	212	32 (15.1%)	0.76 (0.43–1.33)
Race/ethnicity			
Non-Hispanic White	332	34 (10.2%)	(Ref)
Non-Hispanic Asian	86	12 (14.0%)	1.58 (0.70–3.58)
Non-Hispanic Black/African American	15	6 (40.0%)	6.15 (1.96–19.26)
Hispanic	49	9 (18.4%)	2.17 (0.88–5.36)
Non-Hispanic American Indian/Alaska Native/Hawaiian Native/other Pacific Islander†	3	1 (33.3%)	—
Non-Hispanic multiracial	23	4 (17.4%)	1.87 (0.54–6.44)
Non-Hispanic unknown/other	19	2 (10.5%)	1.39 (0.29–6.74)
Age at matriculation			
<23 years old	278	29 (10.4%)	(Ref)
≥23 years old	249	39 (15.7%)	1.74 (0.97–3.12)
Total debt			
No debt	73	6 (8.2%)	(Ref)
<100,000	70	14 (20.0%)	2.76 (0.93–8.18)
\$100,000–\$199,999	132	16 (12.1%)	1.56 (0.56–4.36)
\$200,000–\$299,999	130	19 (14.6%)	1.67 (0.60–4.64)
≥ \$300,000	56	8 (14.3%)	1.51 (0.47–4.87)
No response	66	5 (7.6%)	NA
Degree program at graduation			
MD	482	58 (12.0%)	(Ref)
Bachelor's/MD <sup>2</sup>	10	0 (0.0%)	—
MD/PhD	22	8 (36.4%)	1.19 (0.14–10.16)
MD/other advanced degrees	13	2 (15.4%)	4.81 (1.79–12.94)

\*Percentages shown for the number of students planning to pursue plastic surgery are of row total of each variable category.

†Odds ratios could not be computed due to insufficient sample size.

students who graduated with MD/other advanced (versus MD only) degrees (aOR: 4.81, 95% CI, 1.79–12.94) were more likely to report an intention to practice in underserved areas (Table 3).

Upon examining the effect of each of the different medical school experiences on planning to practice in underserved areas among those interested in pursuing plastic surgery, students with providing health education in the community (aOR: 2.05, 95% CI, 1.17–3.61), and experiences with free clinic for underserved communities (aOR: 2.48, 95% CI, 1.11–5.53), and global health experiences (aOR: 2.22, 95% CI, 1.24–3.97) were more likely to report intention to practice in underserved areas (Table 4).

**DISCUSSION**

Previous literature has demonstrated that diversity among healthcare workers is imperative to mitigate healthcare disparities that permeate our healthcare system,

**Table 4. Association between Each Medical School Experience and Intention to Practice in Underserved Areas among GQ Participants Interested in Pursuing Plastic Surgery**

Medical School Experiences (N = 527)	Total	Intention to Practice in Underserved Areas	
		N (%)*	aOR (95% CI)*
Experience in providing health education in the community			
No	306	31 (10.1%)	Ref
Yes	221	37 (16.7%)	2.05 (1.17–3.61)
Participated in a community-based research project			
No	371	46 (12.4%)	Ref
Yes	156	22 (14.1%)	1.17 (0.64–2.14)
Experience related to cultural awareness and cultural competency			
No	158	12 (7.6%)	Ref
Yes	369	56 (15.2%)	2.02 (0.99–4.11)
Participated in educating students about careers in health professions or biological sciences			
No	251	31 (12.4%)	Ref
Yes	276	37 (13.4%)	0.97 (0.56–1.70)
Experience with a free clinic for the underserved population			
No	133	10 (7.5%)	Ref
Yes	394	58 (14.7%)	2.48 (1.11–5.53)
Experience related to health disparities			
No	171	17 (9.9%)	Ref
Yes	356	51 (14.3%)	1.56 (0.82–2.99)
Global health experience			
No	366	35 (9.6%)	Ref
Yes	161	33 (20.5%)	2.22 (1.24–3.97)
Learned the proper use of the interpreter when needed			
No	148	20 (13.5%)	Ref
Yes	379	48 (12.7%)	0.82 (0.45–1.52)
Learned another language to improve communication with patients			
No	402	53 (13.2%)	Ref
Yes	125	15 (12.0%)	0.96 (0.49–1.88)
Worked on a research project			
No	43	9 (20.9%)	Ref
Yes	484	59 (12.2%)	0.45 (0.19–1.07)

\*Percentages shown are of row totals.

including access to plastic and reconstructive surgical care.<sup>18–23</sup> Disparity in plastic surgery care is further exacerbated in rural and other underserved areas, where there is a scarcity of plastic surgeons.<sup>6,9,24,25</sup> To improve health equity in plastic surgery care, it is imperative that we improve diversity in plastic surgery training pathways,<sup>12</sup> as well as promote interest among trainees to practice in underserved regions.<sup>26,27</sup> Although previous literature has explored diversity in the field of plastic and reconstructive surgery,<sup>12</sup> to our knowledge, this is the first study to have investigated the intentions of students who are interested in pursuing plastic surgery careers and practice in underserved locations.

This study demonstrated that Hispanic and multiracial students were more likely than White students to pursue plastic surgery training compared with other surgical specialties. Multiracial students also were more likely than White students to pursue plastic surgery compared with nonsurgical specialties, whereas Black/African American students were significantly less likely to pursue plastic surgery compared with nonsurgical specialties. There were no other significant associations observed between other racial/ethnic groups and plans to pursue plastic surgery. Despite the higher likelihood of intention to pursue plastic surgery for female and Hispanic students after adjusting

for other demographic factors, the proportion of female residents has increased in plastic surgery residencies, but the proportion of Hispanic residents has not changed.<sup>12</sup> NH Black students were less likely to report an intention to pursue plastic surgery (versus nonsurgical specialties), which is likely reflected in the decreasing proportions of Black residents in plastic surgery.<sup>12</sup> The etiology of this concerning trend deserves further investigation. These findings also demonstrated that multiracial students were more likely to plan to pursue plastic surgery training in each model. Multiracial students have infrequently been studied as a separate racial/ethnic group. With the rapid increase in multiracial individuals in the United States, it is imperative that medical specialties begin to recognize the heterogeneity of this group of individuals. Plastic surgery is centered on identity, from restoring femininity after breast cancer to gender-affirming surgery to harmonize patients' gender identity and appearance. This may resonate with multiracial students, a unique group that has been shown to have distinct and complex identity development.<sup>28</sup> Further research is necessary to fully understand multiracial students' affinity to plastic surgery.

Choosing a medical specialty involves multiple factors, including experience with the specialty, perceived quality of

life, and sense of belonging in the specialty. The latter has been shown to be a particularly important factor for students who are underrepresented in medicine.<sup>29–31</sup> The American College of Surgeons published evidence of a strong association between positive surgeon mentors and interest in a surgical career.<sup>29</sup> However, the lack of minority plastic surgery role models among attending surgeons has been well documented and has not changed in the past decades.<sup>16,17</sup> One key component of mentorship is exposure—for most students, exposure to departments of plastic surgery often does not occur until clinical clerkship year. Current plastic surgeons and departments should invest in inspiring and mentoring underrepresented students by increasing exposure to plastic surgery earlier in the medical training path. This is critical because plastic surgery residency programs are highly competitive<sup>32,33</sup> and require years of preparation to be a competitive applicant through networking opportunities and academic success, such as peer-reviewed publications and Alpha Omega Alpha membership.<sup>34–36</sup> Female and ethnically underrepresented medical school graduates have a significant lower number of publications and were less likely to match compared with their peers.<sup>37,38</sup> Furthermore, financial support would increase accessibility of subinternships for underrepresented students as many of these students are from limited income backgrounds.<sup>39</sup> By providing underrepresented groups with necessary support in the form of mentorship, scholarship, exposure, sponsorship, and research opportunities, plastic surgeons and departments can help foster interest early in underrepresented medical students that can promote and lead to successful plastic surgery careers.

Among students who planned to pursue plastic surgery, Black students were more likely to plan to practice in underserved areas. Patients in rural areas often lack access to specialists, such as breast reconstructive surgeons.<sup>5</sup> However, it is crucial that caring for underserved populations not be shouldered solely by our underrepresented physician workforce.<sup>40</sup> Undergraduate and graduate medical education are in unique positions to restructure medical education to encourage interest in practicing in underserved areas among all students, regardless of demographic characteristics. We found that among graduating medical students who were interested in plastic surgery, those who graduated with MD/other advanced degrees, participated in free clinic and health education in the community and global health experiences were more likely to plan to practice in underserved areas. Community-engaged experiences during medical school were also associated with positive change in students' plans to practice in underserved areas from matriculation to graduation.<sup>41</sup> Our results suggest that more intentionally encouraging all trainees to pursue other advanced degrees, as well as electives that are community-facing, may increase trainee's likelihood of practicing in underserved areas. Although almost a quarter of general surgeons are practicing in underserved areas, only 18.7% of plastic surgeons are practicing in underserved areas.<sup>42</sup> Therefore, by incorporating more cultural awareness and global health experiences during undergraduate and graduate medical training, we may be able to mitigate the shortage in plastic surgeons.

## LIMITATIONS

Our study is based on graduating medical student's self-reported intention to pursue a surgical career. Therefore, this does not account for whether respondents committed to this career pathway or if they attempted to match into another specialty. Furthermore, we did not collect data on residency attrition or final area of practice. Additionally, because these survey responses are self-reported, variability exists in interpretation of many survey questions. For intention to practice in underserved areas, there are several organizations that define the parameters for qualification for underserved areas and populations. As the survey did not distinguish a specific definition, there may be variability in respondents' perception and understanding of an underserved area. Future studies to understand students' intention to specific underserved communities (eg, rural) is essential to inform policy recommendations on workforce development. Lastly, due to a small sample size among students who intended to pursue plastic surgery, we were not powered to closely examine other dimensions of students' backgrounds, such as socioeconomic status,<sup>43</sup> and reported experiences during medical school and intention to practice in underserved areas. We recognized that each experience is unique and may or may not have influence over respondents' career projection. The coronavirus 2019 pandemic has also impacted the medical education of many students and may influence students' intention to practice in underserved areas. Future studies with medical school graduates from recent years would provide insight into how the global pandemic influence students' intention for plastic surgery and practicing in underserved areas.

## CONCLUSIONS

This study aimed to identify the growing disparity in diversity amongst graduating medical students pursuing plastic surgery as well as students' intention to practice in underserved areas. Our analysis suggested that positive indicators for students pursuing plastic surgery over other surgical specialties are female sex, Hispanic ethnicity, and multiracial students. Among students who are interested in plastic surgery, intention to practice in underserved areas was associated with experiences with free clinic in underserved areas, health education, and global health. These findings suggest that it is imperative that medical schools and plastic surgery departments invest in URiM students with mentorship, exposure to the plastic surgery field, and other scholarly opportunities to combat the shortage of plastic surgeons in underserved communities in the years to come.

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**REFERENCES**

- Health Resources and Services Administration. Definitions & explanations. Available at <https://www.hrsa.gov/grants/definitions.html>. Accessed October 30, 2020.
- International Society of Aesthetic Plastic Surgery. ISAPS international survey on aesthetic/cosmetic procedures. Available at [https://www.isaps.org/media/vdpdanke/isaps-global-survey\\_2021.pdf](https://www.isaps.org/media/vdpdanke/isaps-global-survey_2021.pdf). Published 2021.
- Bauder AR, Sarik JR, Butler PD, et al. Geographic variation in access to plastic surgeons. *Ann Plast Surg*. 2016;76:238–243.
- Meyerson J, Suber J, Shields T, et al. Understanding the impact and misconceptions of rural plastic surgery. *Ann Plast Surg*. 2019;82:133–136.
- Familusi O, Rios-Diaz AJ, Tilahun ED, et al. Post-mastectomy breast reconstruction: reducing the disparity through educational outreach to the underserved. *Supportive Care in Cancer*. 2021;29:1055–1063.
- Rios-Diaz AJ, Metcalfe D, Singh M, et al. Inequalities in specialist hand surgeon distribution across the United States. *Plast Reconstr Surg*. 2016;137:1516–1522.
- Wu RT, Shultz BN, Gabrick KS, et al. National longitudinal comparison of patients undergoing surgical management of craniosynostosis. *J Craniofac Surg*. 2018;29:1755–1759.
- McConnell KJ, Newgard CD, Lee R. Changes in the cost and management of emergency department on-call coverage: evidence from a longitudinal statewide survey. *Ann Emerg Med*. 2008;52:635–642.
- Rao MB, Lerro C, Gross CP. The shortage of on-call surgical specialist coverage: a national survey of emergency department directors. *Acad Emerg Med*. 2010;17:1374–1382.
- Garcia AN, Kuo T, Arangua L, et al. Factors associated with medical school graduates' intention to work with underserved populations: policy implications for advancing workforce diversity. *Acad Med*. 2018;93:82–89.
- Saha S, Guiton G, Wimmers PF, et al. Student body racial and ethnic composition and diversity-related outcomes in US medical schools. *JAMA*. 2008;300:1135–1145.
- Parmeshwar N, Stuart ER, Reid CM, et al. Diversity in plastic surgery: trends in minority representation among applicants and residents. *Plast Reconstr Surg*. 2019;143:940–949.
- Silvestre J, Serletti JM, Chang B. Racial and ethnic diversity of U.S. plastic surgery trainees. *J Surg Educ*. 2017;74:117–123.
- Moak TN, Cress PE, Tenenbaum M, et al. The leaky pipeline of women in plastic surgery: embracing diversity to close the gender disparity gap. *Aesthet Surg J*. 2019;40:1241–1248.
- Hall JA, Chen W, Bhayana K, et al. Quantifying the pipeline of ethnically underrepresented in medicine physicians in academic plastic surgery leadership. *Ann Plast Surg*. 2021;87:e51–e61.
- Butler PD, Longaker MT, Britt LD. Major deficit in the number of underrepresented minority academic surgeons persists. *Ann Surg*. 2008;248:704–711.
- Butler PD, Britt LD, Longaker MT. Ethnic diversity remains scarce in academic plastic and reconstructive surgery. *Plast Reconstr Surg*. 2009;123:1618–1627.
- Lakhan SE. Diversification of U.S. medical schools via affirmative action implementation. *BMC Med Educ*. 2003;3:6.
- Sarto G. Of disparities and diversity: where are we? *Am J Obstet Gynecol*. 2005;192:1188–1195.
- Komaromy M, Grumbach K, Drake M, et al. The role of Black and Hispanic physicians in providing health care for underserved populations. *N Engl J Med*. 1996;334:1305–1310.
- Nickens HW, Ready TP, Petersdorf RG. Project 3000 by 2000. Racial and ethnic diversity in U.S. medical schools. *N Engl J Med*. 1994;331:472–476.
- Rodby KA, Danielson KK, Shay E, et al. Trends in breast reconstruction by ethnicity: an institutional review centered on the treatment of an urban population. *Am Surg*. 2016;82:497–504.
- Abbott MM, Kokorowski PJ, Meara JG. Timeliness of surgical care in children with special health care needs: delayed palate repair for publicly insured and minority children with cleft palate. *J Pediatr Surg*. 2011;46:1319–1324.
- DeSanti RL, Nair L, Adetayo OA. Increasing diversity in plastic surgery. *Plast Reconstr Surg*. 2018;142:813e–814e.
- Siotos C, Cui D, Lifchez SD, et al. Increasing diversity in plastic surgery. *Plast Reconstr Surg*. 2018;141:202e.
- 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:e214898.
- Barrie U, Williams M, Nguyen M, et al. Characteristics of graduating medical students interested in neurosurgery with intention to practice in underserved areas: implications for residency programs. *Clin Neurol Neurosurg*. 2022;218:107293.
- Waring CDL, Bordoloi SD. "I Don't Look Like Her": race, resemblance, and relationships in multiracial families. *Sociological Perspectives*. 2019;62:149–166.
- Brundage SI, Lucci A, Miller CC, et al. Potential targets to encourage a surgical career. *J Am Coll Surg*. 2005;200:946–953.
- Oser TK, Haidet P, Lewis PR, et al. Frequency and negative impact of medical student mistreatment based on specialty choice: a longitudinal study. *Acad Med*. 2014;89:755–761.
- Barker JC, Rendon J, Janis JE. Medical student mentorship in plastic surgery: the mentee's perspective. *Plast Reconstr Surg*. 2016;137:1934–1942.
- Sarac BA, Janis JE. Matching into plastic surgery: insights into the data. *Plast Reconstr Surg Glob Open*. 2022;10:e4323.
- Asserson DB, Sarac BA, Janis JE. A 5-year analysis of the integrated plastic surgery residency match: the most competitive specialty? *J Surg Res*. 2022;277:303–309.
- Schultz KP, Shih L, Davis MJ, et al. Integrated plastic surgery applicant review: important factors and selection criteria. *Plast Reconstr Surg Glob Open*. 2020;8:e2892.
- Boatright D, Ross D, O'Connor P, et al. Racial disparities in medical student membership in the alpha omega alpha honor society. *JAMA Intern Med*. 2017;177:659–665.
- Nguyen M, Mason HRC, O'Connor PG, et al. Association of socioeconomic status with alpha omega alpha honor society membership among medical students. *JAMA Network Open*. 2021;4:e2110730.
- Nguyen M, Chaudhry SI, Desai MM, et al. Rates of medical student placement into graduate medical education by sex, race and ethnicity, and socioeconomic status, 2018–2021. *JAMA Network Open*. 2022;5:e2229243.
- Nguyen M, Chaudhry SI, Asabor E, et al. Variation in research experiences and publications during medical school by sex and race and ethnicity. *JAMA Network Open*. 2022;5:e2238520.
- Association of American Medical Colleges. Current trends in medical education. 2016. Available at <https://www.aamcdiversityfactsandfigures2016.org/report-section/section-3/>. Accessed October 26, 2021.

40. Ulloa JG, Viramontes O, Ryan G, et al. Perceptual and structural facilitators and barriers to becoming a surgeon: a qualitative study of African American and Latino surgeons. *Acad Med.* 2018;93:1326–1334.
41. Boscardin CK, Grbic D, Grumbach K, et al. Educational and individual factors associated with positive change in and reaffirmation of medical students' intention to practice in underserved areas. *Acad Med.* 2014;89:1490–1496.
42. Association of American Medical Colleges. Report on residents. 2018. Available at <https://www.aamc.org/data-reports/students-residents/interactive-data/table-c2-number-individuals-who-completed-residency-and-are-practicing-medically-underserved-areas>.
43. Nguyen M, Desai MM, Fancher TL, et al. Temporal trends in childhood household income among applicants and matriculants to medical school and the likelihood of acceptance by income, 2014–2019. *JAMA.* 2023;329:1882–1884.