

The Changing Paradigm of Contemporary U.S. Allopathic Medical School Graduates' Career Paths: Analysis of the 1997–2004 National AAMC Graduation Questionnaire Database

Donna B. Jeffe, PhD, Dorothy A. Andriole, MD, Heather L. Hageman, MBA, and Alison J. Whelan, MD

Abstract

Purpose

During the last 15 years, the proportion of U.S. allopathic medical graduates planning to pursue alternative careers (other than full-time clinical practice) has been increasing. The authors sought to identify factors associated with contemporary medical graduates' career-setting plans.

Method

The authors obtained anonymous data from the 108,408 U.S. allopathic medical graduates who completed the 1997–2004 national Association of American Medical Colleges Graduation Questionnaire (GQ). Using multinomial logistic regression, responses to eight GQ items regarding graduates' demographics, medical school characteristics, and specialty choice were tested in association with three career-

setting plans (*full-time university faculty; other*, including government agencies, non-university-based research, or medical or health care administration; or *undecided*) compared with *full-time (nonacademic) clinical practice*.

Results

The sample included 94,101 (86.8% of 108,408) GQ respondents with complete data. From 1997 to 2004, the proportions of graduates planning full-time clinical practice careers decreased from 51.3% to 46.5%; the proportions selecting primary care and obstetrics–gynecology specialties also decreased. Graduates reporting Hispanic race/ethnicity or no response to race/ethnicity, lower debt, dual advanced degrees at graduation, and psychiatric-specialty choice were consistently *more* likely to plan to pursue alternative careers. Graduates selecting

an obstetrics–gynecology specialty/subspecialty were consistently *less* likely to plan to pursue alternative careers. Being female, Asian/Pacific Islander, Black or Native American/Alaskan, and selecting non-primary-care specialties were variably associated with alternative career plans.

Conclusions

As the medical student population becomes more demographically diverse, as graduates increasingly select non-primary-care specialties, and as dual-degree-program graduates and alternative career opportunities for physicians expand, the proportion of U.S. graduates planning full-time clinical practice careers likely will continue to decline.

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In 1990, 65% of U.S. allopathic medical graduates intended to pursue full-time (nonacademic) clinical practice careers.¹ In recent years, however, this proportion of medical graduates has steadily decreased with concomitant increases in the proportions of U.S. allopathic medical graduates planning alternative careers.

Coincident with these shifts in career intentions, there have been marked changes in the demographic characteristics of the U.S. allopathic medical school population in terms of both gender and race/ethnicity, and the

proportions of women and nonwhite graduates have increased.² In addition to the changing demographic composition of U.S. medical schools, there has been a declining interest in primary care specialties among contemporary U.S. medical graduates³ and increases in the number and scope of dual-degree program offerings⁴ as well as in the range of alternative career opportunities for physicians.¹ Therefore, we sought to identify factors associated with contemporary medical graduates' plans to pursue careers other than full-time clinical practice.

Method

We analyzed anonymous data from the 1997–2004 national Association of American Medical Colleges (AAMC) Graduation Questionnaire (GQ) completed by graduates of all U.S. allopathic medical schools, limiting our analysis to graduates who responded to

nine questions asked in each of the eight survey years. We also limited our analysis to graduates who responded *yes* to the question *Do you plan to become board certified in a specialty?* because we wanted to evaluate specialty choice in relation to career-preference settings, and the GQ specialty-choice question could only be completed by respondents indicating plans to become specialty board certified. The institutional review board at Washington University School of Medicine approved this study.

From the 12 GQ response choices for the item *Indicate your career intention from the activities listed below*, we created four categories of graduates' career-setting plans: *full-time, nonacademic clinical practice* in various private-practice settings or a hospital setting; *full-time university faculty* in basic science teaching/research or clinical teaching/practice/research; *other nonclinical practice* in state/federal agencies, medical/

Please see the end of this article for information about the authors.

Correspondence should be addressed to Dr. Jeffe, Research Associate Professor of Medicine, Division of Health Behavior Research, Department of Medicine, Washington University School of Medicine, 4444 Forest Park Ave., Suite 6700, St. Louis, MO, 63108; telephone: (314) 286-1914; fax: (314) 286-1919; e-mail: (djeffe@im.wustl.edu).

health care administration without practice, or as a nonuniversity research scientist; or *undecided*. We examined relationships between graduates' career-setting plans and each of eight variables descriptive of graduates' demographics, medical school characteristics, and specialty choice. Demographic questions included the year GQ was completed (1997–2004), gender (female versus male), race/ethnicity (black, Hispanic, Asian/Pacific Islander, Native American/Alaskan, or no response versus white), and total debt (no debt, \$1–49,999, \$50,000–99,999, \$100,000–149,999 versus \$150,000 or more). Medical school characteristics included school ownership (private versus public), school region (Northeast, South, West versus Midwest), and graduation from a dual-advanced-degree program (combined MD/PhD or MD/other advanced degree versus MD only, including BA or BS/MD programs). We created six specialty-choice categories: (1) surgical specialties/subspecialties (general surgery, colon and rectal surgery, neurological surgery, otolaryngology, plastic surgery, orthopedic surgery, thoracic surgery, urology, and other surgical specialty [from 1999 on]), (2) obstetrics–gynecology, (3) facilities-based specialties (radiology, anesthesiology, emergency medicine, and pathology), (4) psychiatry, (5) primary care specialties (internal medicine specialty/subspecialties, pediatrics specialty/subspecialties, and family practice), and (6) other specialties. (Specialty categories were developed after a personal communication with Edward Salsberg, director, AAMC Center for Workforce Studies, October 16, 2006.)

Unadjusted logistic regression models tested the significance of associations between each predictor variable and graduates' career-setting plans. Predictor variables associated with the dependent variable in unadjusted models at a Bonferroni-corrected $P < .006$ (to correct for multiple comparisons) were to be included in a multivariable, multinomial logistic regression model. We report descriptive statistics for each variable of interest as well as adjusted odds ratios (OR) and 95% confidence intervals (95% CI) of the multivariate model to identify independent predictors of the three career-setting plans (*full-time university faculty*, *other nonclinical practice*, and *undecided*), each compared with *full-time nonacademic clinical practice* as the reference category. All tests

were performed using SPSS version 13.0.1 (SPSS, Inc., Chicago, IL).

Results

A total of 108,408 graduating medical students completed the 1997–2004 GQ, representing 85.8% of the 126,325 U.S. allopathic medical school graduates in those years.² Our analysis included data from 94,101 graduates (86.8% of 108,408) who indicated they planned to become specialty board certified and responded to all the 1997–2004 GQ items we considered in relation to graduates' career-setting plans. As shown in Table 1, the proportion of GQ respondents indicating full-time clinical practice career plans decreased from 51.3% in 1997 to 46.5% in 2004. By comparison, the proportion of graduates reporting full-time university faculty, other nonclinical practice, or being undecided about their career plans increased over time.

Other trends observed during the same period included a decrease from 1997 to 2004 in the proportion of graduates selecting primary care (53.4% to 35.1%) and obstetrics–gynecology (8.2% to 6.2%) specialties and concomitant increases in facilities-based specialties (12.4 to 24.2%), psychiatry (3.7% to 4.7%), surgical specialties (15.9% to 19.1%), and all other specialties (6.5% to 10.7%). There also was a decrease in the proportion of white graduates (from 68.5% in 1997 to 64.3% in 2004) and an increase in proportion of women graduates (from 42.2% in 1997 to 46.7% in 2004). The proportion of dual-degree graduates did not change remarkably during this time period—MD/PhD graduates varied from a high of 2.5% in 2000, 2001, and 2003 to a low of 2.0% in 2002, and MD/other-degree graduates varied from 0.3% in 2004 to 1.5% in 2002.

Table 1 gives the descriptive statistics of each predictor variable by career-setting category. Because each variable was significantly associated with career-setting plans in unadjusted tests (each $P < .001$), they all were included in the multivariable model. Table 2 shows the results of the multivariable multinomial logistic regression analysis, which identified independent predictors of each of the three career-setting plans of interest (i.e., full-time university

faculty, other nonclinical practice, and undecided) compared with full-time clinical practice as the reference category. The reference category for each predictor variable is indicated by OR = 1.00.

Full-time university faculty

As shown in Table 2, graduates who reported decreasing levels of debt, dual-degree graduation, being Hispanic, Asian/Pacific Islander, or providing no response to the question about race and ethnicity, being female, graduating from private institutions or from institutions in the Northeast and West, graduating in more recent years, and selecting surgical, psychiatry, or other specialties were more likely to report planning a full-time university faculty career compared with full-time clinical practice. Graduates from medical institutions in the South and who selected obstetrics–gynecology or facility-based specialties were less likely to plan a full-time university faculty career compared with full-time clinical practice.

Other, nonclinical-practice setting

Graduates who reported decreasing levels of debt, dual-degree graduation, being Hispanic, Black, Native American/Alaskan, or providing no response to the question about race and ethnicity, graduating from institutions in the Northeast and West, graduating after 1998, and selecting psychiatric specialties were more likely to report planning other, nonclinical practice careers compared with full-time clinical practice. Graduates who reported being Asian/Pacific Islander, graduating from medical institutions in the South, and who selected surgical, obstetrics–gynecology, facilities-based, or other specialties were less likely to plan other, nonclinical practice careers compared with full-time clinical practice.

Undecided

Graduates who reported decreasing levels of debt, dual-degree graduation, being Hispanic, Black, Asian/Pacific Islander, or providing no response to the question about race and ethnicity, graduating from private medical schools and from medical schools in the Northeast and West, graduating after 2001, being female, and selecting surgical, psychiatric, or other specialties were more likely to report being undecided about career-setting plans compared with full-time clinical practice. Graduates who selected

Table 1
Descriptive Statistics, by Respondents' Career-setting Plans on the 1997–2004
Graduation Questionnaire (GQ)

Measure	No. total (N = 94,101)	No. (%) full-time clinical practice (n = 46,171)*	No. (%) university faculty (n = 27,815)*	No. (%) other nonclinical practice (n = 6,255)*	No. (%) undecided (n = 13,860)*
GQ year					
1997	12,596	6,456 (51.3)	3,594 (28.5)	746 (5.9)	1,800 (14.3)
1998	12,125	6,184 (51.0)	3,388 (27.9)	714 (5.9)	1,839 (15.2)
1999	11,319	5,610 (49.6)	3,377 (29.8)	802 (7.1)	1,530 (13.5)
2000	12,541	6,379 (50.9)	3,575 (28.5)	865 (6.9)	1,722 (13.7)
2001	12,507	6,148 (49.2)	3,729 (29.8)	815 (6.5)	1,815 (14.5)
2002	12,425	5,926 (47.7)	3,762 (30.3)	874 (7.0)	1,863 (15.0)
2003	11,587	5,282 (45.6)	3,647 (31.5)	838 (7.2)	1,820 (15.7)
2004	9,001	4,186 (46.5)	2,743 (30.5)	601 (6.7)	1,471 (16.3)
Gender					
Male	53,845	27,048 (50.2)	16,285 (30.2)	3,573 (6.6)	6,939 (12.9)
Female	40,256	19,123 (47.5)	11,530 (28.6)	2,682 (6.7)	6,921 (17.2)
Race/ethnicity					
White	63,074	32,420 (51.4)	17,674 (28.0)	4,194 (6.6)	8,786 (13.9)
No response	929	392 (42.2)	292 (31.4)	81 (8.7)	164 (17.7)
Black	6,222	3,000 (48.2)	1,620 (26.0)	576 (9.3)	1,026 (16.5)
Hispanic	5,910	2,875 (48.6)	1,555 (26.3)	495 (8.4)	985 (16.7)
Asian/Pacific Islander	17,371	7,190 (41.4)	6,564 (37.8)	795 (4.6)	2,822 (16.2)
Native American/Alaskan	595	294 (49.4)	110 (18.5)	114 (19.2)	77 (12.9)
Total debt					
\$150,000 or more	13,681	6,888 (50.3)	4,222 (30.9)	584 (4.3)	1,987 (14.5)
\$100,000–\$149,999	22,964	12,119 (52.8)	6,484 (28.2)	962 (4.2)	3,399 (14.8)
\$50,000–\$99,999	27,164	14,066 (51.8)	7,426 (27.3)	1,524 (5.6)	4,148 (15.3)
\$1–\$49,999	14,799	6,509 (44.0)	4,522 (30.6)	1,728 (11.7)	2,040 (13.8)
No debt	15,493	6,589 (42.5)	5,161 (33.3)	1,457 (9.4)	2,286 (14.8)
Degree program					
MD only	91,016	45,761 (50.3)	25,546 (28.1)	6,090 (6.7)	13,619 (15.0)
MD/other	875	284 (32.5)	358 (40.9)	102 (11.7)	131 (15.0)
MD/PhD	2,210	126 (5.7)	1,911 (86.5)	63 (2.9)	110 (5.0)
School region					
Midwest	25,838	13,814 (53.5)	6,948 (26.9)	1,370 (5.3)	3,706 (14.3)
Northeast	29,051	11,241 (38.7)	11,103 (38.2)	2,488 (8.6)	4,219 (14.5)
South	28,977	16,274 (56.2)	6,706 (23.1)	1,734 (6.0)	4,263 (14.7)
West	10,235	4,842 (47.3)	3,058 (29.9)	663 (6.5)	4,219 (14.5)
School ownership					
Public	56,526	30,506 (54.0)	13,812 (24.4)	3,856 (6.8)	8,352 (14.8)
Private	37,575	15,665 (41.7)	14,003 (37.3)	2,399 (6.4)	5,508 (14.7)
Specialty preference					
Primary care	40,903	20,781 (50.8)	11,249 (27.5)	3,004 (7.3)	5,869 (14.3)
Surgical	15,805	6,680 (42.3)	6,261 (39.6)	880 (5.6)	1,984 (12.6)
Obstetrics–gynecology	6,354	3,666 (57.7)	1,482 (23.3)	344 (5.4)	862 (13.6)
Facility based	18,086	9,754 (53.9)	4,602 (25.4)	1,023 (5.7)	2,707 (15.0)
Psychiatry	3,789	1,261 (33.3)	1,092 (28.8)	486 (12.8)	950 (25.1)
Other	9,164	4,029 (44.0)	3,129 (34.1)	518 (5.7)	1,488 (16.2)

* Percentages in parentheses are the percentages of the row total in column 2.

Table 2

Multivariable Multinomial Logistic Regression Model Showing Likelihood of Graduates' Career-Setting Plans on the 1997–2004 Graduation Questionnaire (GQ) (N = 94,101)*

Predictor variables	Adjusted odds ratio (95% CI)		
	University faculty (n = 27,815)	Other nonclinical practice (n = 6,255)	Undecided (n = 13,860)
GQ year			
1997	1.00	1.00	1.00
1998	1.00 (0.94–1.06)	1.04 (0.93–1.16)	1.08 (1.00–1.16)
1999	1.08 (1.02–1.15)	1.36 (1.22–1.51)	0.98 (0.90–1.05)
2000	1.02 (0.96–1.09)	1.36 (1.22–1.51)	0.98 (0.90–1.05)
2001	1.10 (1.04–1.17)	1.35 (1.21–1.50)	1.05 (0.98–1.14)
2002	1.18 (1.12–1.26)	1.55 (1.40–1.73)	1.13 (1.04–1.22)
2003	1.26 (1.18–1.34)	1.73 (1.55–1.92)	1.23 (1.14–1.33)
2004	1.26 (1.17–1.34)	1.63 (1.45–1.84)	1.28 (1.18–1.39)
Gender			
Male	1.00	1.00	1.00
Female	1.12 (1.09–1.16)	1.01 (0.95–1.07)	1.44 (1.38–1.49)
Race/ethnicity			
White	1.00	1.00	1.00
No response	1.25 (1.07–1.47)	1.51 (1.18–1.93)	1.42 (1.18–1.71)
Black	0.96 (0.90–1.02)	1.60 (1.45–1.76)	1.18 (1.09–1.28)
Hispanic	1.07 (1.00–1.14)	1.42 (1.28–1.58)	1.26 (1.16–1.36)
Asian/Pacific Islander	1.46 (1.41–1.52)	0.69 (0.63–0.75)	1.34 (1.27–1.41)
Native American/Alaskan	0.80 (0.64–1.00)	3.30 (2.63–4.14)	1.01 (0.78–1.30)
Total debt			
\$150,000 or more	1.00	1.00	1.00
\$100,000–\$149,999	1.18 (1.12–1.25)	1.12 (1.00–1.25)	1.13 (1.06–1.20)
\$50,000–\$99,999	1.30 (1.23–1.37)	1.72 (1.55–1.91)	1.26 (1.18–1.34)
\$1–\$49,999	1.38 (1.30–1.47)	4.14 (3.72–4.60)	1.28 (1.18–1.38)
No debt	1.39 (1.31–1.47)	3.29 (2.96–3.65)	1.33 (1.24–1.43)
Degree program			
MD only	1.00	1.00	1.00
MD/other	1.89 (1.61–2.22)	2.58 (2.04–3.26)	1.44 (1.16–1.77)
MD/PhD	24.19 (20.14–29.05)	2.40 (1.76–3.26)	2.75 (2.12–3.56)
School region			
Midwest	1.00	1.00	1.00
Northeast	1.62 (1.56–1.69)	2.12 (1.97–2.29)	1.28 (1.21–1.35)
South	0.84 (0.80–0.87)	0.90 (0.83–0.97)	0.95 (0.91–1.00)
West	1.22 (1.16–1.29)	1.24 (1.12–1.37)	1.22 (1.14–1.31)
School ownership			
Public	1.00	1.00	1.00
Private	1.63 (1.58–1.69)	1.06 (0.99–1.13)	1.22 (1.16–1.27)
Specialty preference			
Primary care	1.00	1.00	1.00
Surgical	1.80 (1.72–1.88)	0.88 (0.81–0.96)	1.17 (1.10–1.24)
Obstetrics–gynecology	0.78 (0.73–0.84)	0.65 (0.57–0.73)	0.77 (0.71–0.84)
Facility based	0.87 (0.83–0.91)	0.72 (0.67–0.78)	1.05 (0.99–1.10)
Psychiatry	1.59 (1.45–1.73)	2.62 (2.34–2.94)	2.66 (2.43–2.91)
Other	1.27 (1.20–1.34)	0.83 (0.75–0.92)	1.29 (1.21–1.38)

* Each career-setting plan is compared with *full-time nonuniversity clinical practice* as the reference. The reference category for each predictor variable is indicated by adjusted odds ratio = 1.00.

obstetrics–gynecology specialties were less likely to report being undecided about career-setting plans compared with full-time clinical practice.

Discussion

We observed that the proportion of U.S. medical students planning to enter full-time clinical practice at the time of graduation steadily decreased from 1997 to 2004. Moreover, the decline in the proportion of all U.S. graduates who completed the GQ and planned full-time clinical practice continued in 2005 (41.9%) and 2006 (41.4%).^{5,6} This decline, which has major implications for our emerging physician workforce, has coincided with several recent trends in medicine: (1) the increasing demographic diversity of medical school graduates, (2) the expansion of alternative career opportunities (attributable to the overall diversification of the U.S. economy and emergence of career alternatives), and (3) shifting priorities among U.S. allopathic medical students in specialty-choice decisions.⁷

Our findings suggest that graduation of an increasingly demographically diverse medical student population may not result in increasing diversity of the full-time clinical practice workforce. Career intentions for all nonwhite race/ethnicity categories examined in our study differed from the reference group (whites). Black and Hispanic graduates were more likely to be undecided or to be planning other nonclinical practice careers. Asian/Pacific Islander graduates were more likely to plan university faculty careers and to report being undecided, but they were less likely to plan other nonclinical practice careers. Native American/Alaskan graduates were more likely to plan other nonclinical practice careers. Similar to an earlier report,⁸ our findings indicate that as U.S. allopathic medical schools continue to enroll and graduate increasingly demographically diverse student populations, the proportions of graduates planning to enter full-time clinical practice will likely decrease.

Women graduates were more likely than men to be undecided or to indicate plans to pursue full-time university faculty careers. This is an interesting and encouraging finding, because the more equitable representation of women in the medical student and resident

populations⁹ has not yet been realized in the university faculty setting.¹⁰ Perhaps as more women see opportunities to make careers in academic medicine, we will approach true gender parity among university faculty. Identifying possible reasons for the observed gender differences in career-setting plans and long-term follow-up of women graduates' career paths warrant further investigation.

Since 1997, a growing proportion of medical school graduates have indicated plans to pursue other nonclinical practice careers. The scope of career options in this category described in the GQ included work in state or federal agencies, and medical or health care administration (without practice), nonuniversity research settings, as well as other settings not further defined on the GQ. Opportunities continue to grow for physicians to pursue nontraditional medical careers in biotechnology, entrepreneurial endeavors, and pharmaceutical and health care consulting industries.¹ Medical graduates who pursue these other types of careers might very well make important contributions to the field of medicine. However, the growing proportions of U.S. medical graduates pursuing careers that involve no direct patient care could functionally exacerbate the projected shortage of practicing physicians in the United States.^{11,12}

Related to the observed trend to pursue other nonclinical practice careers, U.S. medical schools are offering an increasingly wider range of dual-advanced-degree programs.⁴ Although there was not an overall increase in number of dual-degree graduates among those graduates responding to the GQ from 1997 to 2004, career plans differed significantly between dual-degree program graduates and their MD-only counterparts, a finding that has been reported elsewhere.¹³ Indeed, we observed that dual-degree graduation was significantly associated with plans to pursue other nonclinical practice careers or full-time university faculty careers, and with being undecided about a career path. Not surprisingly, MD/PhD graduates, who constitute a growing proportion of funded physician–scientists in academia,¹⁴ were 24 times as likely to plan full-time university faculty careers compared with MD-only graduates in

our study. This trend among MD/PhD graduates is not, in itself, of great concern. However, expanding career opportunities outside of full-time clinical practice or academic medicine are of some concern, because these alternative careers may be particularly attractive to medical school graduates with high levels of expertise in other fields (including MD/PhD and other dual-degree graduates) and could contribute to the anticipated national shortage of practicing physicians. Additional research is recommended to explore the career paths of dual-degree program graduates.

Our findings regarding the association between debt load and career-setting plans may have important implications regarding the appropriate design of future initiatives using debt-reduction incentives to influence the career paths of the emerging physician workforce. We observed that graduates with decreasingly lower levels of debt (<\$150,000) were increasingly *more* likely to plan university faculty and other nonclinical practice careers or to be undecided about a career path. This finding suggests that alternative careers actually may be viable options largely (if not only) for graduates with the financial flexibility to explore a wider range of career opportunities outside the traditional, clinical practice of medicine. Therefore, indebtedness at the time of graduation may affect career-planning decisions beyond specialty choice and subspecialty training, which have been studied in relation to student debt with mixed results.^{15–19} To reduce their levels of debt, medical students may assume service obligations with, for example, the military, National Health Services Corps, or the National Institutes of Health Extramural Loan Repayment program, which require graduates to engage in military service, primary care practice in underserved areas, or research for a defined number of years.²⁰ Further research is needed to determine whether and to what extent debt-reduction incentives such as these might encourage students to enter full-time clinical practice.

The associations we observed between graduates' specialty choices and career plans should be considered in the context of recent trends among U.S. allopathic medical students to enter non-primary-care specialties.³ We observed steady declines from 1997 to 2004 in the

proportions of graduates selecting primary care and obstetrics–gynecology as specialty choices, and career-setting plans differed for graduates in each of the specialty categories compared with graduates choosing primary care specialties. Notably, graduates selecting obstetrics–gynecology (compared with primary care specialties) were less likely to report being undecided or to be planning full-time university faculty or other nonclinical practice careers.

Finally, our findings regarding regional and school ownership differences in graduates' career-setting plans should be explored further to determine the extent to which these associations may reflect differences in admissions committees' selection criteria priorities, mission-related curriculum initiatives, and career-counseling systems, and even simply whether medical schools in the Northeast and West are more likely than schools in the Midwest to offer dual-degree programs or to be geographically located in proximity to highly attractive, nontraditional career settings for physicians (such as biotechnology and information technology on the West Coast, or financial markets in the Northeast). Identifying potential explanations for these observed relationships may be particularly worthwhile as U.S. medical schools collectively strive to educate their students to choose career paths that are aligned with projected national physician workforce needs.

A strength of our study centers on the use of a population-based sample (incorporating over 85% of all new allopathic medical school graduates from 1997 to 2004). However, there was a sizable drop in the 2004 GQ response rate to 68.8%, following concerns about possible coercion of students to complete the GQ and lack of confidentiality of their responses.²¹ This drop in response rate might have resulted in a more biased sample than in earlier years, because responses to some GQ questions have been found to differ between students who give permission to release their names on the GQ and students who choose to complete the GQ anonymously.²²

Our analysis also was limited to those GQ respondents who answered *yes* to the question about their plans to become

board certified in a specialty, because we were interested in looking at specialty choice as a predictor of career-setting plans. Graduates who responded *no* or *undecided* to the board certification question were not permitted to select a specialty (because of the skip-pattern instructions in the GQ). We previously reported that graduates who planned to pursue other nonclinical practice careers (OR = 0.693) or who were undecided about their career plans (OR = 0.786) were significantly less likely to plan to become specialty board certified.²³ However, we were unable, because of the automatic skip pattern on the GQ, to determine the proportion of graduates who reported *no* or *undecided* about becoming specialty board certified but who nevertheless might have entered residency training in a specialty. Thus, a proportion of U.S. allopathic medical graduates who completed the GQ but who planned to pursue other nonclinical practice careers or were undecided were excluded from our analysis. Therefore, our findings likely underestimate the magnitude of the effects of specialty choice on career-setting plans among all U.S. allopathic medical graduates.

In addition, although we analyzed GQ data from an eight-year period, these data were essentially cross-sectional, representing U.S. medical graduates' perspectives at the time of their graduation only. Graduates' career intentions cannot be validated using this database alone. However, there are several challenges to conducting such validation studies, particularly with regard to confidentiality and data ownership issues that arise when linking national-level outcomes data from various data sources. Nevertheless, intention to engage in a specific behavior has been shown to be highly predictive of engaging in the specified behavior,²⁴ and at least one longitudinal study of medical graduates' GQ responses found that graduates who intended to practice in underserved areas were more likely to do so.²⁵ A longitudinal, multiinstitutional (or, ideally, nationally representative) study of individual graduates to follow their professional paths beyond graduation will be important to measure the extent to which an increasingly demographically diverse medical student population, expansion of alternative professional opportunities, increasing numbers of dual-degree program

graduates, and shifting student specialty-choice preferences do indeed affect the proportion of U.S. medical graduates entering clinical practice.

Our findings have important implications for medical schools, which are challenged to prepare graduates to pursue a wide variety of career opportunities, many of which may not involve the traditional, clinical practice of medicine. Career-counseling offices must help students make a variety of decisions regarding choice of specialty and future career paths in the context of a diverse landscape of career opportunities. Although the proportion of graduates with dual advanced degrees did not increase during the last eight years, the diversity of career opportunities for physicians is increasing,¹ as is the range of dual-degree programs being offered at allopathic medical schools across the country.⁴ Medical schools also are challenged to expand the scope of their educational-outcomes measures to be able to capture relevant data for graduates who pursue nonclinical practice careers—graduates who, nevertheless, might make important contributions to the field of medicine through, for example, research and development of new technologies, vaccines, and medications, or financial restructuring of health care delivery systems.

Finally, our study has important implications regarding the likely composition and career preferences of the emerging physician workforce in the U.S., which is largely composed of U.S. allopathic medical graduates. In response to projections of an impending physician shortage in the U.S.,¹¹ major initiatives are being undertaken nationally to expand the size of the U.S. allopathic medical student population.^{26,27} However, our findings suggest that these initiatives alone may not necessarily produce a corresponding increase in the size of the emerging physician workforce committed to full-time clinical practice. Concurrent trends in undergraduate medical education of increasing demographic diversity of our medical student populations, proliferation of dual-degree programs,⁴ opportunities for nontraditional, non-specialty-based careers,¹ and graduates' preferences for non-primary-care specialties³ all likely contributed to the declining interest in

full-time clinical practice among U.S. allopathic medical graduates, because all of these variables were found in this study to be associated with plans to pursue careers that do not involve full-time, direct patient care. This changing paradigm in career-path plans among contemporary medical graduates will likely have a substantial negative impact on the size of the emerging U.S. allopathic medical graduate workforce committed to full-time clinical practice.

Dr. Jeffe is research associate professor, Medicine, Washington University School of Medicine, and director, Health Behavior and Outreach Core, Alvin J. Siteman Cancer Center, St. Louis, Missouri.

Dr. Andriole is assistant dean, Medical Education, and associate professor, Surgery, Washington University School of Medicine, St. Louis, Missouri.

Ms. Hageman is director, Educational Planning and Program Assessment, Office of Medical Student Education, Washington University School of Medicine, St. Louis, Missouri.

Dr. Whelan is associate dean, Medical Student Education, associate professor, Medicine and Pediatrics, Washington University School of Medicine, St. Louis, Missouri.

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