ORIGINAL ARTICLES

Variation in Predictors of Primary Care Career Choice by Year and Stage of Training

A National Survey

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CONTEXT: **It is not known whether factors associated with primary care career choice affect trainees differently at different times or stages of medical education.**

OBJECTIVE: **To examine how role models, encouragement, and personal characteristics affect career choice at different stages (medical school vs residency) and periods (1994 vs 1997) of training.**

DESIGN: **A split-panel design with 2 cross-sectional telephone surveys and a panel survey in 1994 and 1997.**

PARTICIPANTS: **A national probability sample of fourth-year students (307 in 1994, 219 in 1997), 645 second-year residents in 1994, and 494 third-year residents in 1997. Of the fourth-year students interviewed in 1994, 241 (78.5%) were re-interviewed as third-year residents in 1997.**

MAIN OUTCOME MEASURE: **Primary care (general internal medicine, general pediatrics, or family medicine) career choice.**

RESULTS: **Having a primary care role model was a stronger predictor of primary care career choice for residents (odds ratio [OR], 18.0; 95% confidence interval [95% CI], 11.2 to 28.8 in 1994; OR, 43.7; 95% CI, 24.4 to 78.3 in 1997) than for students (OR, 6.5; 95% CI, 4.3 to 10.2; no variation by year). Likewise, peer encouragement was more predictive for residents (OR, 5.4; 95% CI, 3.3 to 8.9 in 1994; OR, 16.6; 95% CI; 9 .7 to 28.4 in 1997) than for students (OR, 2.1; 95% CI, 1.3 to 3.2; no variation by year). Orientation to the emotional aspects of care was consistently associated with primary care career choice across stages and years of training.**

CONCLUSIONS: **The effect of peer encouragement and role models on career choice differed for students and residents and, in the case of residents, by year of training, suggesting that interventions to increase the primary care workforce should be tailored to stage of training.**

KEY WORDS: **medical education; primary care; career choice; role models.**
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Physicians have multiple opportunities during the course of their career to decide whether they will practice primary care.[1–4] Although studies frequently cite the fourth year of medical school as the critical stage at which the primary care work force is defined, for many a decision about primary care occurs later.[5–7] Students who enter internal medicine and pediatrics decide during their residency whether to subspecialize. During the second and third year of their postgraduate training, not medical school, these individuals declare their intentions regarding primary care practice. Previous investigations have shown that of graduating students who enter the primary care fields of internal medicine, pediatrics, and family medicine, 35%, 63%, and 89%, respectively, ultimately pursue primary care careers.[8,9] Little is known about those factors that might affect a resident's final career path.

Given these different decision points, it is possible that the factors that influence a primary care career choice vary by stage of training. Secular trends may also play a role, as evidenced by the varying proportion of students entering primary care in different decades.[1,10,11] Furthermore, factors affecting primary care career choice may be unique to a single cohort of students or residents. The effect of stage of training, secular trends, or characteristics unique to a single group—phenomena generally referred to as age, period, and cohort effects[12]—in determining who will practice primary care is not well understood. Disentangling the complex influences on career choice at different stages of training and in different years would provide evidence to support interventions at various phases in the "pipeline" to promote the production of generalist physicians.

We specifically sought to determine whether relationships within the medical school and clinical arena previously shown to affect career choice, such as exposure to role models[13–16] and encouragement or absence of encouragement from peers and senior clinicians,[17,18] were associated differently with primary care career choice for residents and students and for those who trained in 1994 versus those who trained in 1997. We also studied whether key variables previously identified as correlates of primary care career choice for medical students,[19] such as gender,[9,20–27] age,[9,22,28] race,[22,24,29,30] size of one's hometown,[31–34] and marital status,[22,35] were differentially associated with career choice at different stages of training and different points in time. To achieve this aim, we surveyed fourth-year medical students and residents in 1994 and 1997. Those fourth-year students who participated in the study in 1994 were invited to respond as third-year residents in 1997.

Because we interviewed 2 nationally representative cross-sectional samples of students and residents at 2 different points in time as well as a panel (a longitudinal cohort) of respondents when they were students in 1994 and residents in 1997, we were able to explore whether the association of personal characteristics and relationships with primary care career choice varied by stage of training (known as an "age" effect), or according to secular trends (a "period" effect). The panel data enabled us to measure individual change over time in the effects of the variables under study. We hypothesized that if the correlates of primary care career choice for fourth-year students in 1994 changed when they became residents in 1997 to a profile more similar to that of the residents we had interviewed in 1994, then those correlates would be specific to stage of training. If, however, the cross sections of respondents in the same stage of training differed by the year they were interviewed, we would infer that secular trends played a role in affecting career choice. Because we had only 1 cohort represented in this analysis, we were limited in our ability to discern whether the differences we noted over time were unique to a particular class of individuals (a "cohort" effect).

METHODS

Sample

We identified a national probability sample of fourth-year medical students in 1994 ($N = 307$) and 1997 ($N = 219$) from the master files of the Association of American Medical Colleges (AAMC). Students were drawn from 121 of the 126 U.S. medical schools; schools located outside the fifty U.S. states and 2-year programs were excluded.

Using the master file of the American Medical Association (AMA), we identified a national probability sample of second-year residents in 1994 ($N = 645$) and third-year residents in 1997 ($N = 494$). It was necessary to vary the residency year from the first survey administration to the second to track those who had been fourth-year students in 1994 into their residency. The 1997 resident sample included residents who had participated in the first survey as fourth-year students ($N = 241$) plus an additional cross-sectional sample of new respondents ($N = 253$) to ensure that the sample represented the universe of eligible residents at that time. International medical graduates were excluded from the sample. To provide reasonable estimates of the population of U.S. students and residents, sample sizes for 1994 were selected to allow reporting of population proportion estimates for each subgroup with 95% confidence intervals (95% CIs) from ±5% to ±10%. For the 1997 sample, means and standard errors of key outcome variables from 1994 were used to determine subgroup sample sizes that would detect cross-sectional and longitudinal subgroup differences of 10% to 18% at .80 power.

The samples were stratified to ensure adequate representation of residents in primary care and from schools participating in the Generalist Physician Initiative. A specialty code was used by the AMA to identify those residents in programs that could potentially lead to primary care careers, such as internal medicine and pediatrics. For analysis, specific weights for each strata were used to ensure that the interview population represented the entire universe of possible respondents, based on national statistics from the AAMC. Weights reflected the inverse probability of selection, adjusted for nonresponse within each sample group.

The Center for Survey Research of the University of Massachusetts, Boston, conducted confidential 20-minute telephone interviews with participants between October 1993 and March 1994 (referred to as 1994), and between March and August 1997. The study was approved by the Human Studies Committee of Harvard Pilgrim Health Care. To ensure adequate response rates, a variety of procedures were used, including support letters from medical leaders from the Robert Wood Johnson Foundation, the AAMC and the AMA; as many as 8 calls per interviewee staggered by day of the week and time of day; and use of hospital paging systems to track residents.

Measures

The survey instruments were developed on the basis of review of the literature about primary care career choice, focus groups of medical students, residents, faculty and deans from across the country, and expert panels. Independent variables consisted of the following:

Demographics: Respondents provided their age, race, gender, and marital status, and selected from among multiple options the approximate size of the town in which they lived when growing up;

Role models: Respondents stated whether they currently had a role model or not and, if answering yes, were prompted to describe the specialty of the role model;

Encouragement: Respondents were asked to state whether faculty and peers currently encouraged them

toward primary care, toward specialties, or toward neither, and students were also asked to describe the encouragement they had received from house staff;
Socioemotional versus technoscientific orientation: Students and residents were asked to state whether they will be a physician who attends primarily to the social and emotional aspects of patient care or to the technological and scientific aspects.

The primary outcome of interest was career choice as stated at the time of the survey. Respondents were asked to state the specific field they had chosen and whether they intended to practice primary care, a specialty, or a combination of the two. Primary care was defined as a physician practicing in general internal medicine, general pediatrics, family practice, or general practice. Those who answered that they planned to practice a medical or pediatric subspecialty or were undecided between primary care and subspecialty medicine were assumed to be located between primary care and specialty (e.g., radiology, pathology) medicine. Therefore, we treated career choice as a 3-level, ordinal outcome—1) primary care, 2) internal medicine or pediatrics subspecialty or undecided between subspecialization and primary care, and 3) specialty practice.

Statistical Analysis

Because we oversampled several subgroups of respondents and used different sampling fractions for each subsample, we developed and used sampling weights in all analyses to adjust for differences in the probability of selection, permitting us to generalize results nationally to the target populations of students and residents within academic health centers. To estimate parameters and their standard errors appropriately,[36] we used a specialized statistical program, SUDAAN, (SUDAAN Software for the Statistical Analysis of Correlated Data, Research Triangle Institute, Research Triangle Park, NC) designed for the analysis of complex probability sample data. We set a predetermined α level of $P < .05$ (2-tailed).

The analyses reported in this paper are drawn from 3 inter-related samples. The first two are cross sections of the respondents at the same stage of training over the 2 time periods: fourth-year students in 1994 and 1997, and residents in 1994 and 1997. The third is a panel dataset that includes only those respondents who were surveyed in 1994 as students and again in 1997 as residents. By studying these groups at 2 points in time, including the longitudinal tracking of the responses of a single group, we are able to make some distinctions between age and period effects.

For each of the cross sections, we conducted a 3-phase analysis. We first identified the predictors of career choice by employing a "changing parameters" analysis,[37] which entailed fitting models with 3 terms: a single substantive predictor, the variable for time, and the interaction between the two. The presence of a significant interaction effect with time indicates that the effects of the predictor differ over time; for example, the effect differed for students in 1994 versus those in 1997. In the presence of a significant interaction, we employed linear contrasts to test the effects of the substantive predictor in each year.

Retaining predictors that had a significant main effect or a significant interaction with time, we fit a series of multiple ordinal logistic regression models to examine the simultaneous effects of these predictors and their interactions.[38–40] We employed the proportional odds model, which posits a cumulative logit link with the ordinal response variable and contrasts "at or above k" versus "below k" on the dependent variable (for example, primary care versus internal medicine and pediatric subspecialties and specialties). In the final fitted models for the cross sections, interactions with time indicated period effects. We confirmed that the models met the proportional odds model parallel slopes assumption and conducted standard checks, such as checking for zero cells, for the presence of interactions and confounding. Ten residents from 1994 and 11 in 1997, and 1 student in 1994 were missing data describing their specialty choice and were therefore excluded from further analyses. We used nonparametric methods to compare the excluded group of residents with those retained in the analysis on key analytic variables such as socioemotional orientation and encouragement to pursue primary care, and found no significant differences.

Finally, to test whether the effects of the predictors differed between students and residents, we next combined the 2 cross-sectional datasets and tested for the presence of interactions between the predictors and level of training (student versus resident). The effects of faculty encouragement, presence of a role model, and peer encouragement were in fact different for these 2 groups, and we therefore maintained separate analyses for the student and resident cross sections.

For the panel data, an interaction with time indicates that the effect of a predictor varies depending on the stage of training of the respondent (student or resident). In the presence of an interaction with time, a main effect suggests that there was a significant effect of the predictor either when respondents were fourth-year students or when they became residents. Here again, we used linear contrasts to test the specific effects of predictors for respondents at each stage of training.

RESULTS

Response rates and participant characteristics are described in Table 1. In 1994 and 1997, the proportion of fourth-year students expressing an intention to enter primary care was 25.9% and 24.4%, respectively, and of those with intentions to pursue a specialty career, 57.7% and 45.9%. The proportion of students planning to subspecialize or still deciding between primary care and

subspecialty practice increased from 16.4% to 29.8% (χ^2 = 10.4, df = 2, $P < .006$). Among residents, the percentage intending to enter primary care and the specialties did not change between 1994 and 1997 (27.1% to 30.8% for primary care; 56.7% to 57.0% for specialties).

Cross-sectional Analyses

Univariate Analyses. Gender, socioemotional status, presence of a primary care role model, and peer and house staff encouragement toward primary care were associated with a primary care career choice for students, with role model having the strongest effect (Table 2). Having a primary care rather than a specialist role model showed the strongest effect, and was associated with 6.5 times greater odds (95% CI, 4.2 to 10.2) of a student planning to pursue primary care rather than a subspecialty (or undecided between primary care and subspecialty) or specialty career; having a primary care role model versus no role model was associated with a 2.8 times greater odds (95% CI, 1.6 to 5.0) of planning a primary care career. Age, marital status, size of hometown, race, and encouragement from faculty were not associated with primary care career choice.

We identified similar univariate correlates of career choice for residents, with the addition of encouragement from faculty to enter primary care as a significant correlate of primary care career choice in 1997 (Table 3). Having a primary care rather than a specialist role model emerged as an even stronger predictor than for students, with residents in 1994 18.0 times as likely (95% CI, 11.2 to 28.8) and in 1997 43.7 times as likely (95% CI, 24.4 to 78.3) (1997 data not shown) to plan to practice primary care rather than a specialty or subspecialty (or to be undecided between primary care and subspecialization). Having a primary care role model also made a difference compared with having no role model, with residents in 1994 9.0 times as likely (95% CI, 5.3 to 15.4) and in 1997 24.3 times as likely (95% CI, 10.7 to 55.3) to plan to practice primary care (data not shown).

Period Effects. Findings for residents varied by period of survey administration, with at least a doubling of the odds for entering primary care rather than specialties in 1997 for those with the following characteristics: reporting having a primary care (versus a specialist or no) role model, receiving encouragement for primary care rather than specialties from faculty and peers, and having a socioemotional orientation rather than a technoscientific orientation. These significant interactions with time suggest a possible period effect, or secular trend, for the factors affecting primary care career choice for residents. For students, the effect of the predictors did not vary by period surveyed, suggesting that there was no secular effect in these domains for fourth-year medical students.

Multivariate Analyses. Multiple ordinal logistic regression models estimated separately for residents and students showed that, with the exception of faculty encouragement, all main effects in univariate analyses remained significant (Table 4). The only interaction effect that remained in the model for residents was that between peer encouragement and time. This interaction (odds ratio, 3.3; 95% CI, 1.5 to 7.3) indicates that the effect of peer encouragement for

Table 1. Fourth-year Medical Students and Residents: Characteristics of Study Population*

	Year 4 (*N* = 525)		Residents (*N* = 1,118)		Panel (*N* = 236)	
	1994 (*N* = 306)	1997 (*N* = 219)	1994 (*N* = 635)	1997 (*N* = 483)	Year 4 Students 1994	Residents 1997
Mean age, y	27.0	24.3	28.7	30.9	26.8	30.2
Married	36.7	44.5	57.6	64.9	37.4	66.1
Female	36.4	39.5	35.8	38.9	34.4	
White	72.2	73.0	73.8	71.6	71.9	
Home town size						
Large city (>500,000)	18.8	12.6	15.1	17.9	20.3	
Suburb of large city	32.3	22.7	25.8	26.2	31.5	
Moderate city (50,001–500,000)	15.9	16.8	18.2	18.9	13.2	
Small city (10,001–50,000)	17.7	23.0	17.4	18.2	18.1	
Town (2,501–10,000)	8.0	15.6	14.4	12.6	8.9	
Rural (<2,500)	7.3	9.3	8.8	5.6	8.0	
Specialty choice						
Primary care	25.9	24.4	27.1	30.8	22.6	30.2
IMPS or undecided between primary care and IMPS	16.4	29.8	16.2	12.2	17.6	9.4
Specialty	57.7	45.9	56.7	57.0	59.8	60.4
Response rates	92.5	86.6	77.2	78.6		78.5†

* *All data are reported as weighted percentages unless otherwise indicated.*

† *Reponse rate for panel represents the percent of 1994 Year 4 students who were followed up as residents in 1997.*

IMPS, internal medicine/pediatrics subspecialty.

Table 2. Predictors of Specialty Choice for Fourth-year Medical Students (Weighted Percentages)

	Distribution of Sample*		1994, % Choosing†			1997, % Choosing†			
	1994 (*N* = 306)	1997 (*N* = 219)	Primary Care (*N* = 83)	IMPS or Undecided (*N* = 60)	Specialty (*N* = 163)	Primary Care (*N* = 54)	IMPS or Undecided (*N* = 67)	Specialty (*N* = 98)	Fitted Odds Ratios for a Single-predictor Model (95% CI)‡,§
Role model									
Primary care	36.4	38.0	48.4	18.8	32.8	46.1	29.8	24.2	6.54 (4.20 to 10.18)‖
Specialist	42.2	41.4	14.9	12.1	73.0	4.9	29.2	65.9	$P < .0001$
No role model	21.3	20.6	30.3	3.3	66.4	21.6	35.9	42.4	2.83 (1.59 to 5.05)¶
									$P < .0001$
Peer encouragement									
Toward primary care	24.0	30.9	40.3	19.2	40.5	40.0	27.5	32.5	2.06 (1.31 to 3.24)#
Toward specialties	48.6	41.2	29.2	13.1	57.6	19.6	34.1	46.2	$P < .0001$
Toward neither	27.4	28.0	23.5	6.1	70.4	12.7	29.6	57.7	3.08 (1.80 to 5.25)**
									$P < .0001$
House staff encouragement									
Toward primary care	23.9	34.1	41.6	10.2	48.2	40.6	31.5	27.9	2.09 (1.35 to 3.24)#
Toward specialties	59.3	42.7	28.1	13.8	58.2	17.1	31.6	51.2	$P < .001$
Toward neither	16.2	22.7	23.4	12.6	64.1	12.5	26.5	61.0	2.85 (1.63 to 4.95)**
									$P < .0001$
Socioemotional orientation									
Socioemotional	46.5	42.7	44.5	17.2	38.2	40.3	28.5	31.2	3.45 (2.32 to 5.13)
Non-socioemotional††	53.5	57.3	18.1	8.7	73.2	11.8	32.5	55.6	$P < .0001$
Gender									
Female	36.4	39.5	40.7	15.4	44.0	32.5	29.2	38.4	1.94 (1.31 to 2.87)
Male	63.6	60.5	24.5	11.1	64.4	18.4	31.9	49.7	$P < .001$

* *Column percentages: distribution of predictor in total population (column percents add to 100).*

† *Row percentages (row percents add to 100).*

‡ *Fitted odds ratios represent the estimated cumulative odds of choosing a more primary care–oriented career (rather than less oriented toward primary care, such as primary care rather than IMPS, undecided between primary care and IMPS, and specialties) across specified levels of predictor variables (e.g., for female versus male students, or primary care versus specialist role model).*

§ *Results are not shown for the main effect of time (1994 versus 1997) or interactions of time with other predictors because the effect of time was not significant in any fourth-year student models.*

‖ *Primary care versus specialist role model.*

¶ *Primary care versus no role model.*

\# *Encouragement toward primary care rather than specialties.*

** *Encouragement toward primary care rather than toward neither.*

†† *Includes technical-scientific (N = 240) and missing (N = 27). All models were tested with and without inclusion of missing values for socioemotional orientation, and produced similar results.*

IMPS, internal medicine/pediatrics subspecialty; undecided, undecided between primary care and IMPS; 95% CI, 95% confidence interval.

Table 3. Predictors of Specialty Choice for Residents (Weighted Percentages)

	Distribution of Sample*		1994, % Choosing†			1997, % Choosing†			Fitted Odds Ratios (95% CI)‡	
	1994 (*N* = 635)	1997 (*N* = 483)	Primary Care (*N* = 255)	IMPS or Undecided (*N* = 142)	Specialty (*N* = 238)	Primary Care (*N* = 198)	IMPS or Undecided (*N* = 82)	Specialty (*N* = 200)	Main Effect of Predictor§	Interaction with Time (0 = 1994; 1 = 1997)‖
Role model										
Primary care	23.5	28.3	71.0	13.5	15.5	81.8	10.4	7.8	17.97 (11.21 to 28.80)#	2.43 (1.17 to 5.03)
Specialist	54.0	57.8	10.2	16.3	73.6	8.2	13.6	78.2	*P* < .0001	*P* < .05
No role model	22.4	13.8	21.8	18.9	59.3	21.1	9.7	69.2	9.03 (5.29 to 15.43)**	2.69 (1.03 to 7.03)
									P < .0001	*P* < .05
Peer encouragement										
Toward primary care	23.6	29.1	58.3	7.0	34.8	69.1	13.4	17.5	5.44 (3.32 to 8.91)††	3.06 (1.49 to 6.27)
Toward specialties	57.7	52.6	16.0	16.8	67.3	11.0	11.8	77.2	*P* < .0001	*P* < .01
Toward neither	17.9	17.0	22.3	27.4	50.3	28.7	11.3	60.0	3.01 (1.73 to 5.23)‡‡	NS
									P < .0001	
Faculty encouragement										
Toward primary care	41.8	43.6	35.0	11.9	53.1	48.2	10.0	41.9	1.35 (0.95 to 1.93)††	2.91 (1.63 to 5.18)
Toward specialties	47.9	47.0	22.5	20.8	56.7	15.1	14.5	70.4	*P* = .10	*P* < .001
Toward neither	9.7	8.9	15.1	13.1	71.8	30.9	9.2	59.8	2.47 (1.28 to 4.76)‡‡	NS
									P < .01	
Socioemotional orientation										
Socioemotional	40.0	38.2	40.6	13.2	46.2	54.0	9.7	36.4	2.33 (1.63 to 3.32)	2.10 (1.18 to 3.75)
Non-socioemotional§§	60.0	61.8	18.1	18.2	63.7	16.5	13.7	69.8	*P* < .0001	*P* < .01
Gender										
Female	35.8	38.9	35.8	18.6	45.6	40.7	9.8	49.5	1.91 (1.4 to 2.5)	NS
Male	64.2	61.1	22.4	14.8	62.9	24.5	13.7	61.8	*P* < .0001	

* *Column percentages: distribution of predictor in total population (column percents add to 100).*

† *Row percentages (row percents add to 100).*

‡ *Fitted odds ratios represent the estimated cumulative odds of choosing a more primary care–oriented career (rather than less oriented toward primary care, such as primary care rather than IMPS, undecided between primary care and IMPS, and specialties) across specified levels of predictor variables (e.g., having a primary care versus specialist role model).*

§ *In the presence of an interaction with time, a main effect indicates the effect of the predictor on career choice in 1994. Main effects for predictors in 1997 are not shown.*

‖ *An interaction effect indicates that the effect of the predictor changed over time, and the estimated odds ratio represents the factor by which the odds increased or decreased.*

Primary care versus specialist role model.

** *Primary care versus no role model.*

†† *Encouragement toward primary care rather than specialties.*

‡‡ *Encouragement toward primary care rather than toward neither.*

§§ *Includes technical-scientific (N = 610) and missing (N = 17).*

IMPS, internal medicine/pediatrics subspecialty; undecided, undecided between primary care and IMPS; 95% CI, 95% confidence interval; NS, not significant.

Table 4. Best-fitting Ordinal Multiple Logistic Regression Models Predicting Primary Care Career Choice for Fourth-year Students, Residents, and Panel

	Fourth-year Student Cross Section (*N* = 525)			Resident Cross Section (*N* = 1,118)			Panel: Students in 1994, Residents in 1997 (*N* = 236)		
Independent Variable	**$\hat{\beta}$ (SE)**	**Odds Ratios (95% CI)**	***P* Value**	**$\hat{\beta}$ (SE)**	**Odds Ratios (95% CI)**	***P* Value**	**$\hat{\beta}$ (SE)**	**Odds Ratios (95% CI)**	***P* Value**
Intercept	−3.42 (0.37)	0.03 (0.02 to 0.07)	<.0001	−2.17 (0.20)	0.11 (0.08 to 0.17)	<.0001	−3.15 (0.38)	0.04 (0.02 to 0.09)	<.0001
Year of survey administration*	NS	—	—	−0.52 (0.21)	0.59 (0.40 to 0.89)	<.01	−1.01 (0.49)	0.37 (0.14 to 0.96)	<.05
Primary care role model†	1.55 (0.24)	4.71 (2.91 to 7.60)	<.01	2.24 (0.24)	9.43 (5.85 to 15.20)	<.0001	1.16 (0.35)	3.20 (1.61 to 6.36)‡	<.001
Role model × time interaction§	NS	–	–	NS	–	–	1.89 (0.65)	6.61 (1.83 to 23.94)	<.01
Peer encouragement toward primary care‖	0.64 (0.31)	1.90 (1.03 to 3.51)	<.05	1.01(0.26)	2.75 (1.64 to 4.61)¶	<.0001	0.46 (0.39)	1.58 (0.74 to 3.40)	.24
Peer encouragement × time interaction	NS	–	–	1.20 (0.40)	3.34 (1.53 to 7.28)	<.01	1.74 (0.64)	5.71 (1.62 to 20.13)	<.01
House staff encouragement toward primary care#	0.62 (0.26)	1.86 (1.13 to 3.08)	<.05		Not Applicable			Not Applicable	
Socioemotional orientation**	0.89 (0.22)	2.44 (1.57 to 3.79)	<.0001	0.57 (0.17)	1.76 (1.26 to 2.45)	<.001	0.92 (0.27)	2.52 (1.49 to 4.26)	<.001
Female gender	0.42 (0.22)	1.52 (0.99 to 2.35)	.06	0.41 (0.17)	1.51 (1.08 to 2.10)	<.05	0.39 (0.21)	1.48 (0.97 to 2.26)	.07
Decreasing hometown size	NS	–	–	–	–	–	0.18 (0.07)	1.20 (1.04 to 1.38)	<.05

* *Year coded as 0 = 1994, 1 = 1997.*

† *For student and resident cross sections, primary care is compared with specialist role model (significant estimates for primary care versus no role model are not shown); for panel, primary care is compared with specialist and no role model.*

‡ *In the presence of an interaction with time, this main effect represents the effect of having a primary care role model on career choice when panel participants were fourth-year students. The main effect for panel residents is not shown. Because of the smaller sample size, categories of specialist role model and no role model were combined in the panel analysis.*

§ *This interaction effect indicates that the effect of having a primary care role model increased more than 6-fold upon students' move into residency.*

‖ *Versus encouragement toward neither primary care nor specialties (parameter estimates for encouragement toward primary care versus specialties were not significant).*

¶ *In the presence of an interaction with time, this main effect represents the effect of peer encouragement for primary care (versus neither) on 1994 residents' career choice. The interaction with time of 3.34 shown on the next line indicates that the effect of peer encouragement for primary care (versus neither) on the career choice of 1997 residents was more than triple that of residents in 1994.*

\# *Versus encouragement toward specialties.*

** *Includes techno-scientific (N = 610) and missing (N = 17).*

95% CI, 95% confidence interval; NS, not significant.

primary care more than tripled in 1997 when, compared with residents who were encouraged to enter specialties, the odds were 9.2 times greater that residents encouraged by peers toward primary care actually chose primary care (95% CI, 5.1 to 16.6, not shown).

Since it could be argued that having a primary care role model might be a result, rather than a predictor, of career choice, we tested final models with and without this predictor. Removing the role model variable had no effect on the fit of the overall model, and parameter estimates of covariates remained relatively stable (all estimates remained significant and all were within ±2 standard errors of the full model coefficients), indicating that the presence of this variable was not suppressing the effect of other predictors. To further explore the effects of primary care role models on residents, we also fit multivariate models for internal medicine and pediatrics residents only (since those in specialties at the resident level would not be expected to identify a primary care role model), and found that primary care role model remained a significant predictor of entering primary care rather than internal medicine or pediatrics subspecialties (data not shown).

In both student and resident cross sections, those who reported no encouragement for primary care or specialties, and those with no role models, were more likely to plan specialty rather than primary care careers. For example, 61.0% of 1997 fourth-year students who reported no house staff encouragement toward primary care planned to enter a specialty profession, compared with 12.5% who planned careers in primary care (χ^2 = 18.5, df = 2, $P < .001$) (Table 2).

Panel Analyses

Among the panel respondents, 77.7% of those fourth-year students who stated that they would pursue a primary care career reiterated that intention in residency; of those who stated they would be specialists, 95.4% continued within a specialty. Of those residents who had committed to primary care careers as students in 1994, 14.6% planned internal medicine or pediatric subspecialty careers, and 7.7% were completing specialty residencies (data not shown).

Table 4 details the results of the multiple ordinal logistic regression model. Reporting having a primary care role model, peer encouragement, smaller hometown size, and socioemotional orientation to care were associated with primary care career choice. The effect of gender did not reach statistical significance (P = .07). However, women were more likely to describe themselves as socioemotionally oriented than were their male colleagues (among students, 36.6% of men and 57.5% of women described themselves as more likely to attend to the socioemotional aspects of patient care [χ^2 = 16.34, df = 1, $P < .0001$]; among residents, 33.8% of men and 49.9% of women described themselves as socioemotionally oriented [χ^2 = 22.83, df = 1, $P < .0001$]). As with the cross sections, the inclusion of the socioemotional variable in the multiple variable model dampened the effect of gender.

Two correlates of career choice varied by stage of training among the same group of respondents: having a primary care role model, and peer encouragement. The main effect of exposure to a primary care role model (rather than a specialist or no role model) as a fourth-year student was associated with 3.2 times greater odds (95% CI, 1.6 to 6.4) of planning to practice primary care. An interaction effect between role model and time indicates that this relationship became even stronger during residency, when the odds increased by a factor of 6.6 (95% CI, 1.8 to 23.9). For example, as fourth-year students, 46.5% of those who reported having a primary care role model also planned primary care careers; as residents, 77.8% of those who reported having primary care role models planned primary care careers (data not shown). As with the cross sections, removing the variable representing role model did not affect the stability of the other predictors in the model.

Although peer encouragement was not a significant predictor of career choice for the students in the panel, the interaction of this variable with time, with an odds ratio of 5.7 (95% CI, 1.6 to 20.1) indicated that peer encouragement was a significant predictor of career choice when they became residents. Hence, the impact of peer encouragement, as well as the presence of a primary care role model varied by stage of training (an "age" effect).

COMMENT

These nationally representative data suggest that exposure to primary care role models and peer encouragement are even more critical to the career choices of residents, supporting the hypothesis of a "stage of training" effect. Changes between 1994 and 1997 in factors associated with career choice for residents, with no comparable changes between the student cross sections, suggests that residents experienced greater secular change in the factors associated with primary care career choice during the 1990s.

In multivariate models, peer encouragement was a stronger correlate of primary care career choice for residents in 1997 than in 1994. The absence of peer encouragement was more likely to lead students and residents to careers as specialists. Therefore, neutral peers may reinforce the dominant mode of practice within most academic health centers—specialty medicine.

In multivariate models, faculty encouragement played no role in affecting student or resident career choice, but house staff encouragement was a strong correlate of students' ultimately entering a primary care field. Exposing students to house staff who are themselves inclined to practice primary care and who are vocal about the merits of such a career could influence students' career choices. Since 18.4% of students in 1997 stated that they were committed to neither a subspecialty nor primary care career (data not shown) and 22.3% of our sample actually

switched from an intended primary care career choice as a student to another career choice as a resident, house staff encouragement could play a critical role in affecting the ultimate career choice of almost 40% of medical school graduates. The powerful effect of residents' opinions and values on medical students is widely recognized.[22] Peer culture has been shown to have a powerful influence on student behavior in other settings; teachers other than role models have also been shown, in other academic environments and in other developmental phases, to have a limited role relative to peers, consistent with the limited role of faculty encouragement noted in this investigation.[41–43]

That the strongest predictor of primary care career choice for all respondent groups was exposure to a primary care role model is not surprising, since the effect of such a role model is well established in prior investigations.[9,13–16] Our data suggest that this effect not only endures but increases across levels of training and was not diminished by secular trends in the 1990s. Students who express intentions at the end of medical school to pursue a primary care career are at risk of switching away from primary care during their residency training, as more than 20% of our sample did. Active promotion of exposure to primary care role models by residency programs may reduce the attrition from primary care.

Whether having a primary care role model creates primary care physicians, or those who are already committed to primary care seek out primary care role models who serve to reinforce a pre-existing career choice, is not clear. Further investigation into the timing, nature, and content of these relationships will be necessary to elucidate the true role of these primary care physicians in affecting work force production.

Our finding of an association of orientation to the socioemotional aspects of patient care with primary care career choice is consistent with findings of previous investigators. However, prior research that has confirmed personal values, viewpoints, or personality traits as predictive of specialty choice has relied either on complex measures, such as the Myers-Briggs Type Indicator[44] or the Humanism Scale,[45] or on vague descriptions, such as "personal social values."[9,46] Because our survey item on socioemotional orientation was presented as a forced choice between 2 poles, such a question might be a useful screening tool for applicants to medical schools and residencies. In the context of this study, asking fourth-year students to state whether their orientation was primarily socioemotional had a sensitivity of 72% and a specificity of 60% for predicting specialty choice in the third year of residency. As part of the larger study from which these findings were derived, we tracked first-year students to the fourth year of medical school (data not reported here) and found that this question, asked in the first year of medical school, had a sensitivity of 65% and specificity of 59% for predicting stated career choice in the fourth year.

Gender was a modest predictor of career choice for both students and residents in our cross-sectional analyses and was not a significant predictor in the panel analysis. Although prior research has shown an association between gender and primary care career choice,[20–23,47] many investigations have not used multivariate models to account for the extent to which a socioemotional orientation, rather than gender, explains the seeming predilection of women for primary care careers. Our data provide a more nuanced understanding of the relationships among gender, socioemotional orientation, and primary care career choice and emphasize the importance of socioemotional orientation in selecting a primary care career.[48] While gender is immutable, schools that wish to increase primary care production might be prompted to examine their educational programs to assess the extent to which they support socioemotional orientation and reinforce a focus on the socioemotional aspects of care throughout the span of medical education.

Although the proportion of students entering primary care in 1997 was lower than that reported by other sources, our data include a category for "undecided" which is not incorporated into other measures of primary care work force production. For example, the AAMC, using the same definition of primary care, reported that 39.6% of graduating fourth-year students in 1997 stated that they would enter generalist fields. However, the AAMC calculation did not include in the denominator those who stated that they were "undecided" about specialty choice. If those who were undecided about specialty choice were included in the denominator of the AAMC analysis, as they were in our sample, the proportion choosing generalist careers according to the AAMC would be 23.6%, essentially consistent with our 24.4%.[11]

These data, drawn from a nationally representative sample with excellent response rates, provide evidence of variation in the effect of factors associated with primary care career choice by year and stage of training. These findings suggest opportunities within medical schools and residency programs to increase the proportion of graduates entering primary care. Ensuring that students, especially residents, are exposed to primary care role models could have a substantial effect on final career paths. Similarly, creating an environment in which house staff encourage those in training toward primary care, be that through the screening and selection of house staff to whom students and residents are exposed, or through efforts to redirect anti–primary-care biases of key educators through changes in institutional mission or in-service training, could have an effect on career choice. Finally, explicit attention to supporting socioemotional orientation throughout the course of medical education is likely to yield greater production of primary care physicians.

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