Diversity in Emergency Medicine: Are We Supporting a Career Interest in Emergency Medicine for Everyone?

John Burkhardt, MD, MA*; Stephen DesJardins, PhD; Larry Gruppen, PhD

*Corresponding Author. E-mail: jburkhar@med.umich.edu, Twitter: @DrJohnBurkhardt.

Study objective: Women and students underrepresented in medicine are less likely to apply for residency in emergency medicine. The latter are from racial or ethnic populations that are underrepresented as physicians relative to the general population. The factors that result in lower application rates from women and groups underrepresented in medicine are inadequately described in the literature. This study's objective was to test whether female students and those underrepresented in medicine have lower interest in emergency medicine even after controlling for academic ability, student indebtedness, and common career values consistent with emergency medicine career interest.

Methods: Secondary data analyses were conducted on a cross section of all residency applicants from 2005 to 2010. Data sources included American Medical College Application Service, the Electronic Residency Application Service, and the Graduating Questionnaire. Data linkage was by the Association of American Medical Colleges and provided deidentified to the authors. A binary logistic regression model was fitted with the outcome variable planned career into emergency medicine versus another specialty on the Graduating Questionnaire. The binary logistic regression model independent variables included demographics, student attitudes, debt, grade point average, standardized tests, and medical school experiences.

Results: The binary logistic regression model included 17,067 individuals. Being a woman (odds ratio 0.75) and from a background underrepresented in medicine (odds ratio 0.68) independently correlated with lower emergency medicine interest. Age, medical debt, importance of work-life balance, confidence in specialty choice, and plan to care for underserved populations were positively associated with emergency medicine interest. Importance of specialty competitiveness and importance of mentorship advice were correlated with lower emergency medicine interest.

Conclusion: Female medical students and those underrepresented in medicine were less likely to plan for a career in emergency medicine. This correlation remained significant even when other previously identified factors that have predicted a career in emergency medicine were controlled for. [Ann Emerg Med. 2019;74:742-750.]

Please see page 743 for the Editor's Capsule Summary of this article.

0196-0644/$-see front matter

https://doi.org/10.1016/j.annemergmed.2019.04.008

SEE EDITORIAL, P. 751.

INTRODUCTION

The process by which medical students choose a specialization is incompletely understood but vitally important because it has ramifications for several aspects of the health care system. An obvious and primary effect of student specialty choice is its role in defining the composition of the future physician workforce.[1-3] A second major issue related to the specialty choices of medical students is associated with how representative of society any given field's practitioners are.[4-6] A third, and perhaps less obvious, issue is related to the previous 2: how medical specialty selection directly affects patient care.

Emergency medicine as a specialty has lower rates of application from students underrepresented in medicine and female students than would be expected from the general US population's or graduating medical school classes' demographics.[7,8] For purposes of this study, we have used the definition of students underrepresented in medicine as described by the Association of American Medical Colleges (AAMC): "…those racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population."[9] White and Asian students are classified as

Editor's Capsule Summary

What is already known on this topic

Increasing sex, racial, and ethnic diversity among emergency physicians is desirable but may be challenging.

What question this study addressed

What factors decrease the likelihood that medical undergraduate women and minority students known to be underrepresented in medicine will seek residency training in emergency medicine?

What this study adds to our knowledge

The authors combined and analyzed data from multiple national registries on 17,067 medical school graduates. Lower interest in emergency medicine was independently correlated with sex and ethnic or racial profile. Age, level of indebtedness, plans to practice in an underserved area, and advice from mentors were also predictors.

How this is relevant to clinical practice

Analysis of a large national data set can inform educators in regard to approaches to increasing diversity among emergency medicine specialists.

non–underrepresented in medicine under this definition. Black, Hispanic/Latino, Native American, Native Pacific Islander, and multiracial students are considered from backgrounds underrepresented in medicine under this classification scheme. Although much more complex in its comparisons across racial groups, the respective number of white applicants is higher than would be expected from graduating medical school classes (Table 1). Gender balance is a separate issue from representation underrepresented in medicine but with similar concerning findings. Women make up greater than 50% of the general population, almost 48% of graduating medical students (and increasing), but only approximately 36% of emergency medicine applicants. If application trends are to change, an evidence-based, targeted intervention aimed at addressing potential barriers to entering emergency medicine for female students and those underrepresented in medicine should be developed.

A diverse emergency physician workforce has important patient care ramifications in addition to traditional concepts of societal equity in educational opportunity. Physicians underrepresented in medicine often choose to practice in medically underserved locations at higher rates than other students.[10-12] Medically underserved populations have also reported increased trust in providers underrepresented in medicine, with an associated improvement in clinical use. Physician trust can have measurable patient care outcomes, including compliance with physician recommendations[13] and decreased hospitalizations and emergency department (ED) utilization for the elderly population.[14] More recently, female patients treated by male physicians have been shown to have worse outcomes when evaluated in the ED for acute coronary syndrome.[15] Specifically, they had decreased mortality when cared for by female physicians (male patients had mortality rates similar to those of the female patient–female physician group in both physician gender groups).[15] Therefore, the demographic composition of emergency medical practitioners is more than an issue of social justice because it affects patient trust and patient care outcomes.

Table 1. Students underrepresented in medicine: US Census versus US medical school graduates versus emergency medicine applicants.

Racial and Ethnic Categories	2016 US Census Estimates, %	2016–2017 Medical School Graduates, %	2017–2018 Emergency Medicine Applicants, %
American Indian/Alaskan Native	1.30	0.16	0.16
Black	13.30	5.55	3.92
Hispanic/Latino/Spanish origin	17.80	5.10	5.13
Native Hawaiian/Pacific Islander	0.20	0.06	0.06
Other		1.82	1.90
Multiple race/ethnicity	2.60	7.66	7.13
Asian	5.70	20.81	19.54
White	61.30	56.48	59.58
Unknown		1.01	0.98

Underrepresented in medicine as defined by AAMC: Comparison of racial and ethnic background of individuals in the general US population, graduating medical students in the United States, and applicants to emergency medicine residency programs in the United States. Data sources: AAMC Data Warehouse and US Census Bureau.

Studies focused on medical career choice, including those related to emergency medicine, have generally relied on surveys of candidates that ask subjects to retroactively consider several factors related to their decisions.[16-18] The most commonly reported findings from such surveys in emergency medicine suggest that differences in career choices are often based on income preferences and perceptions of work-life balance.[19-21] The ability to care for underserved populations has also been described as a draw to the field of emergency medicine by students underrepresented in medicine.[22] However, the current literature has several important gaps. First, it was not designed to examine whether the identified career preferences explained the persistently limited numbers of emergency medicine applicants from women and students underrepresented in medicine. Second, previous studies have not controlled for the importance of academic performance and match competitiveness on medical specialty career selection. Third, previous research has generally considered only a limited number of factors in any single study or had relatively small samples of students. Fourth, earlier methodological approaches have not included multivariate regression to compare and control for the relative effect sizes of all of the preceding factors robustly. As such, how these factors combine and contribute to a lack of diversity in emergency medicine is not clear from the current literature. We hypothesize that being a female student or one underrepresented in medicine is independently related to interest in a career outside of emergency medicine, even after controlling for all other factors included in our model.

MATERIALS AND METHODS

Study Design

The study uses secondary data of 46,776 students who applied for residency from 2005 through 2010. The specific 6-year cohort from 2005 to 2010 was selected for several reasons, including the relative stability of survey responses, survey formats, selection factors consistency, and AAMC data availability. Institutional review board review was solicited, and the study was found not to require additional regulation or assessment. Statistical analyses included fitting a binary logistic regression model with career specialty plan as the dependent variable, and student demographics, academic characteristics, and personal values as explanatory variables. Career specialty interest was derived from the response to the specific item "When thinking about your career, what is your intended area of practice?" on the AAMC Graduating Questionnaire. Responses were then recoded as either "emergency medicine" or all other specialty choices collapsed into a single response, "not emergency medicine."

Multiple nationally representative data sets were combined to create the sample used in the analysis. Data sources were combined with common individual identifiers (AAMC identification) by the AAMC and provided to the authors in a deidentified version. The data used in this study were made available after an initial research proposal data request through the AAMC Web site,[23] followed by refinement in collaboration with AAMC data operations and data stewards from 2015 to 2017. Inclusion of United States Medical Licensing Examination scores was made possible through a previous relationship between the AAMC and the National Board of Medical Examiners and a separate data licensing agreement. Active data licensing agreements exist with both entities for purposes of this study.

The contributions from each data source were as follows: The Graduation Questionnaire is a national questionnaire administered by the AAMC to US graduating medical students, including medical school experiences, specialty selection, and future career plans and interests. Additional details about the survey are available at https://www.aamc.org/data/gq/. The AAMC Applicant Matriculant File represents the applicant data from the AAMC's American Medical College Application Service (AMCAS) centralized medical school application processing service. The AAMC Applicant Matriculant File database contains academic and demographic factors of applicants to medical school through AMCAS. All but 9 US medical schools use AMCAS as the primary application method for their entering classes (8 Texas-based schools use a state-specific application).[24] The Electronic Residency Application Service is a national data set of applicant data from the AAMC that are collected through application to the National Residency Match Program. The service is also how program directors receive information about applicants. The United States Medical Licensing Examination Step 1 and Step 2 CK (Clincal Knowledge) were included in the data. These 2 tests are often used as part of the residency application review process.

Methods of Measurement

Explanatory variables were selected according to our conceptual framework and the literature. We have incorporated each individual's academic metrics and likely match competitiveness, his or her level of educational debt, and concepts from 2 major applicable theoretic frames: bounded rationality theory[25-27] and Bandura's theory of self-efficacy.[28-30] Although a complete discussion of our

theoretic framework is beyond the scope of this article, 3 central concepts from our theoretic approach are key to understanding our design. First, bounded rationality theory integrates an individual's cognitive limitations and incomplete information availability on his or her ability to maximize personal values.[25,26] Second, self-efficacy is one's belief in the ability to influence one's cognitive response to a situation and thus persist in achieving goals despite adversity.[28] Third, self-efficacy is thought to be created through positive academic experiences and mentorship.[28] Study subject demographics are provided in Table E1 (available online at http://www.annemergmed.com), including both the original sample and the effective sample used in the final statistical model. Both groups were generally similar in their interest in a future emergency medicine career, gender distribution, status of being underrepresented in medicine, and other academic variables (Table E2, available online at http://www.annemergmed.com). The variable "underrepresented in medicine" represents a binary recoding of a self-reported racial/ethnic identity to students either non–underrepresented in medicine (white or Asian students) or underrepresented in medicine (groups as demarcated in Table 1). Table 2 details the distribution of Likertlike survey responses included in the final model. Each of the independent variables considered in the study was placed in a theoretically derived grouping (Table E3, available online at http://www.annemergmed.com) and added one group at a time. A flow diagram illustrating the evolution of the final data set (17,067) from the original parent set (47,393) derived from the combination of the different data sources is shown in the Figure. In review of the decrease in effective sample size caused by survey responses, any missingness is due in large part to changes in survey items included in the actual survey (year to year) and not from individuals not responding to any single item on a survey.

Primary Data Analysis

Interest in a postgraduation career in emergency medicine, the dependent variable, was defined as selecting emergency medicine to the question "When thinking about your career, what is your intended area of practice?" (1=interested in emergency medicine; 0=interested in another medical specialty). This dependent variable was regressed on several factors thought to correlate with interest in a future emergency medicine career. Given the dichotomous nature of the outcome variable, binary logistic regression was used to fit these models.[31] An area under the receiver operating characteristic (ROC) was calculated and a likelihood ratio test was performed comparing more saturated models with simpler, nested models. Finally, submodels that included only female students or those underrepresented in medicine were created and the resultant factor coefficients were compared with the general model.

RESULTS

In the sample, there were more men than women (52.2% versus 47.8%, respectively). Students

Table 2. Aggregate survey responses.

Importance of Factor	Observations	No Influence, No. (%)	Minor Influence, No. (%)	Moderate Influence, No. (%)	Strong Influence, No. (%)
Work-life balance	18,641	1,730 (9.3)	3,458 (18.6)	6,477 (34.8)	6,976 (37.4)
	17,067	1,584 (9.3)	3,161 (18.5)	5,937 (34.8)	6,385 (37.4)
Specialty competitiveness	46,599	17,511 (37.6)	13,293 (28.5)	12,420 (26.7)	3,375 (7.2)
	17,067	6,994 (41.0)	4,963 (29.1)	4,063 (23.9)	1,047 (6.0)
Specialty personality	27,601	198 (1.0)	604 (2.2)	3,756 (13.6)	23,043 (83.5)
	17,067	138 (0.8)	372 (2.2)	2,425 (14.1)	14,132 (82.9)
Specialty content	27,592	169 (0.6)	623 (2.3)	4,654 (16.9)	22,146 (80.3)
	17,067	112 (0.7)	376 (2.2)	2,900 (17.0)	13,679 (80.2)
Average salary	46,600	10,138 (21.8)	14,918 (32.0)	16,051 (34.4)	5,493 (11.8)
	17,067	4,723 (27.7)	5,603 (32.8)	4,974 (29.1)	1,767 (10.4)
Mentor advice	46,562	4,861 (10.4)	7,128 (15.3)	14,866 (31.9)	19,707 (42.3)
	17,067	1,924 (11.3)	2,408 (14.1)	5,208 (30.5)	7,527 (44.1)
Family expectations	46,577	19,197 (41.2)	11,232 (24.1)	10,555 (22.66)	5,593 (12.0)
	17,067	7,945 (46.6)	4,011 (23.5)	3,338 (19.6)	1,773 (10.4)
Debt level	46,574	23,970 (51.5)	11,167 (24.0)	7,888 (16.9)	3,549 (7.6)
	17,067	9,297 (54.5)	3,926 (23.0)	2,683 (15.7)	1,161 (6.8)

Likertlike scale responses to the survey questions on the AAMC Graduating Questionnaire. Each item asks the respondent to rate the importance of the factor in making his or her medical specialty career choice. The top row of each item is the absolute number of responses and the bottom row represents responses included in the final logistic regression model.

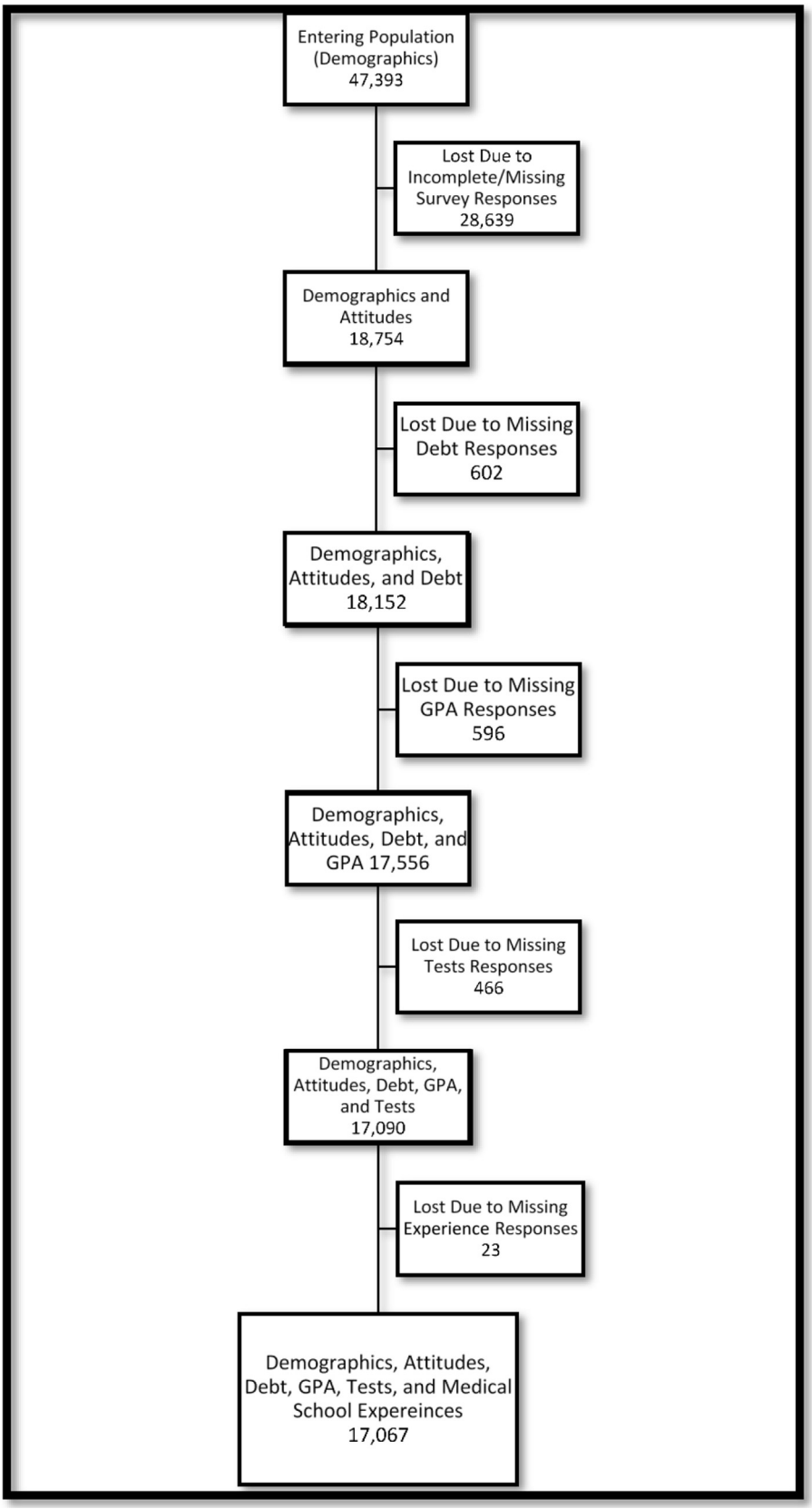

Figure. Evolution of the final data set.

Table 3. Odds of a planned career in emergency medicine at graduation.

Variables	OR (OR Standard Error)	OR 95% CI	Logit Coefficient (Standard Error)	Logit Coefficient 95% CI
Women	0.75 (0.047)	0.664 to 0.850	−0.29 (0.063)	−0.410 to −0.163
Age, y	1.03 (0.010)	1.007 to 1.048	0.03 (0.010)	0.007 to 0.047
Underrepresented in medicine	0.68 (0.064)	0.567 to 0.819	−0.38 (0.094)	−0.568 to −0.200
Work-life balance	2.18 (0.093)	2.009 to 2.375	0.78 (0.043)	0.698 to 0.865
Specialty competitiveness	0.82 (0.031)	0.759 to 0.879	−0.20 (0.037)	−0.276 to −0.129
Specialty personality	1.06 (0.091)	0.897 to 1.258	0.06 (0.086)	−0.108 to 0.229
Specialty content	0.90 (0.066)	0.775 to 1.034	−0.11 (0.074)	−0.255 to 0.033
Expected salary	1.13 (0.046)	1.044 to 1.225	0.12 (0.041)	0.043 to 0.203
Advice from mentor	0.71 (0.020)	0.675 to 0.753	−0.34 (0.028)	−0.393 to −0.284
Family expectations	0.96 (0.028)	0.909 to 1.018	−0.04 (0.029)	−0.095 to 0.018
Importance of debt	0.99 (0.039)	0.917 to 1.070	−0.01 (0.039)	−0.087 to 0.068
Had premedical debt	1.06 (0.067)	0.940 to 1.204	0.06 (0.063)	−0.062 to 0.185
Received scholarship	1.01 (0.062)	0.899 to 1.143	0.01 (0.061)	−0.107 to 0.133
Medical school debt in $10,000	1.02 (0.004)	1.007 to 1.023	0.01 (0.004)	0.007 to 0.023
Non–medical school debt in $10,000	0.98 (0.021)	0.941 to 1.022	−0.02 (0.021)	−0.061 to 0.022
Cumulative science grade point average (per 1-point increase)	1.00 (0.002)	0.998 to 1.007	0.00 (0.002)	−0.002 to 0.007
Cumulative overall grade point average (per 1-point increase)	0.99 (0.003)	0.988 to 0.998	−0.01 (0.003)	−0.012 to −0.002
MCAT total score (per 1-point increase)	1.03 (0.009)	1.017 to 1.052	0.03 (0.009)	0.016 to 0.050
USMLE Step 1 score (per 1-point increase)	0.99 (0.002)	0.982 to 0.991	−0.01 (0.002)	−0.018 to −0.009
USMLE Step 2 CK score (per 1-point increase)	1.01 (0.002)	1.007 to 1.015	0.01 (0.002)	0.007 to 0.015
Number of publications (per publication)	0.96 (0.009)	0.945 to 0.982	−0.04 (0.010)	−0.056 to −0.018
Research experience	0.85 (0.018)	0.811 to 0.882	−0.17 (0.022)	−0.210 to −0.125
Awarded AOA before application	0.77 (0.077)	0.637 to 0.939	−0.26 (0.099)	−0.451 to −0.062
Confidence in specialty choice	1.39 (0.080)	1.245 to 1.559	0.33 (0.057)	0.219 to 0.444
Plan to practice with underserved populations	1.71 (0.077)	1.570 to 1.870	0.54 (0.045)	0.451 to 0.626
Constant	0.02 (0.016)	0.00458 to 0.0925	−3.88 (0.773)	−5.387 to −2.380

USMLE, United States Medical Licensing Examination; AOA, Alpha Omega Alpha.
Observations: 17,067; Standard errors in parentheses. Hosmer-Lemeshow goodness of fit is nonsignificant; area under the ROC=0.7629.

underrepresented in medicine represented 15.7% of individuals in the sample compared with the combined group of white and Asian students (83.6%). The overall model is presented in Table 3. Likelihood ratio test indicated significant improvement in model fit with each variable group addition compared with the simpler, previous model. Area under the ROC was 0.7629, indicating fair accuracy in predicting an interest in a career in emergency medicine within the study cohort. Nonsignificant Pearson's and Hosmer-Lemeshow goodness-of-fit tests were consistent with equal model fit across subgroups within the effective sample. The following individual results represent the relative change associated with each variable when others were kept constant.

Answering our research question, being a woman and being from a background underrepresented in medicine were associated with a lower odds ratio (OR) of an interest in emergency medicine, even after controlling for other possibly confounding factors. Women had odds of a planned career in emergency medicine specialty that were 25% lower than that of their male peers (OR 0.75; 95% confidence interval [CI] 0.66 to 0.85). Students underrepresented in medicine had odds of a planned career in emergency medicine that were 32% lower than that of their majority peers (OR 0.68; 95% CI 0.57 to 0.82). Comparisons of logistic coefficients between the general model of all students and submodels consisting of only female students and those underrepresented in medicine demonstrated generally consistent effect sizes across all attitudinal factors. This is consistent with each factor's having a similar effect in predicting specialty selection in the general model and in both subgroups (Appendix E1, available online at http://www.annemergmed.com).[32]

Our results indicate that for each additional $10,000 of medical school debt, the student was approximately 2% more likely to report a planned career in emergency medicine (Table 3). Many of the students' self-reported values in choosing a medical specialty were also significantly correlated with emergency medicine career interest. Students who placed high importance on work-life balance were much more likely to plan an emergency medicine career. Specifically, for each increase in the categoric importance of this factor (for example, from minor influence to major influence), there was an associated 118% increase in the odds (OR 2.18; 95% CI 2.01 to 2.38). In contrast, students who rated specialty competitiveness and the importance of advice by their mentors as one category more important were 18% (OR 0.82; 95% CI 0.76 to 0.88) and 29% (OR 0.71; 95% CI 0.68 to 0.75) less likely to plan a career in emergency medicine, respectively. Students who expressed an interest in working with underserved populations were much more likely (71%) to plan a career in emergency medicine (OR 1.71; 95% CI 1.57 to 1.87). Conversely, as the relative importance of expected salary increased, so did the likelihood of choosing emergency medicine (OR 1.02; 95% CI 1.01 to 1.02). Finally, increased confidence in specialty choice was associated with a 40% increase in the odds of entering emergency medicine over other options (OR 1.40; 95% CI 1.25 to 1.57).

Academic variables were also included in the model to account for potential differences in applicant competitiveness. Students who had been elected to Alpha Omega Alpha before application were much less likely to plan a career in emergency medicine (OR 0.77; 95% CI 0.64 to 0.94). Students with more research experience and increased scholarly production had lower odds of choosing emergency medicine. For each additional research experience, the odds of choosing emergency medicine were 15% lower (OR 0.85; 95% CI 0.81 to 0.89), and for each additional academic publication odds were 4% lower (OR 0.96; 95% CI 0.95 to 0.98). Other academic variables, such as grades and tests, were also statistically significant; however, their effect size was small (to the point of being practically insignificant) and their relative influence on a career in emergency medicine was contradictory (Table 3).

LIMITATIONS

There are several limitations to our study. First, it uses some survey data, and the questions used may not ideally capture the constructs of the conceptual framework used. However, the items included in the AAMC surveys are largely identical to those used in similar career-decision studies in emergency medicine and in other medical fields.[18] In regard to the issue of veracity of the data collected before our analysis, the source of the information is critically important. The academic information contained in this study came directly from the organization that provides the application software. Unlike many other similar studies, there are no self-reported data on scores, grades, and other academic factors from students, which can result in misreporting of such data.

A second potential limitation is a result of using survey-based data, which can be limited by nonresponse issues. In this case, the change of an item in the survey during the timeframe of our analysis limited our sample size to greater than 17,000 subjects (Figure). Although this has the potential to bias the results, there is no clear reason to believe that there are major differences between respondents before and after survey item change (Table E1, available online at http://www.annemergmed.com).

DISCUSSION

The results support our hypothesis that female students and those underrepresented in medicine have less interest in a career in emergency medicine at medical school graduation. This finding is true even when different interests, academic competitiveness, debt load, and other factors are controlled for. To our knowledge, our study provides the first evidence that demonstrates that continued issues with recruiting a diverse emergency medicine workforce may be the result of currently undefined factors. Before this study, stakeholders in emergency medicine could consider several explanations for why female students and those underrepresented in medicine were less likely to choose emergency medicine. Each of these explanations were based on individual student preferences and not a result of external forces on the process. Specifically, explanations that women and students underrepresented in medicine had different values or preferences in comparison to other medical students and those differences resulted in less interest in emergency medicine. Those explanations are not supported by our results. Controlling for the importance placed on career attributes and values that have been shown to be correlated with an interest in emergency medicine, academic competitiveness to match in emergency medicine, and the importance of service to underserved populations in the decisionmaking model did not correct for the observed lower graduating career interest in emergency medicine for female students and those underrepresented in medicine.

In addition to the primary results about future emergency medicine workforce diversity, several other interesting findings were provided as a result of our large-scale,

multivariate analysis. First, students who put a lower priority on the importance of specialty competitiveness were less likely to plan a career in emergency medicine. This finding was true even when academic metrics of match competitiveness were controlled for and thus may be a previously undescribed personality factor correlated with future emergency physicians. Another unexpected result was that the greater the level of importance individuals placed on the advice given by their mentors, the less likely they planned a career in emergency medicine. Our study was not designed to determine the nature of the advice given by mentors or why, for those who considered it most important, it would be associated with choosing a career outside emergency medicine. It may simply be that undecided students are seeking advice from mentors. Medical students have less exposure to emergency medicine than many other choices within the first 2 years of medical school[33] and emergency medicine clerkships generally occur in year 4 of training.[34] Delayed exposure in meeting academic emergency physicians likely results in more undecided students' having mentorship from other specialties.

The study design's inclusion of attitudinal data in regard to salary and debt, as well as actual debt level as reported in dollars, provided some additional novel findings. Because students placed higher importance on their future expected salary and higher total debt amounts, they were more likely to have reported a planned career in emergency medicine. Previous research has suggested that higher debt levels may affect medical specialty career choice toward higher-paying medical specialties and away from lower-paying ones.[18,21,35,36] Although the effect size observed in our results may seem to translate to a very minor change in behavior, in the case of medical school debt, which can easily reach hundreds of thousands of dollars, the cumulative effect may be quite large. A recent study placed the median medical school debt at $190,000.[37] According to our medical debt estimate, for individuals with median debt we would expect a 38% increase in the likelihood of stating a primary career interest in emergency medicine over those not in debt. The reported importance of debt as a selection consideration was not significant when the amount of debt itself was considered. This may represent a disconnect between self-reported values and actual selection behavior, which to our knowledge has not been previously described in studies that considered only students' self-reported values.

In conclusion, our study was able to better characterize the factors that correlate with a planned career in emergency medicine. Most important, the observed differences in representation of women and students underrepresented in medicine among students who reported their interest in a future in emergency medicine were not explained by differences in career attitudes or any other factor in our data set. This finding should serve as an alert to emergency medicine medical educators to critically analyze what other factors may be influencing decreased interest in emergency medicine. Studying aspects of our own behavior as practicing emergency physicians is a good first step. Examining our specialty's cultural norms, our patterns of social engagement with learners, and the level to which we are welcoming to all medical students must be scrutinized if we are to identify the factors that underlie our results.

Supervising editor: Peter C. Wyer, MD. Specific detailed information about possible conflict of interest for individual editors is available at https://www.annemergmed.com/editors.

Author affiliations: From the Department of Emergency Medicine (Burkhardt) and Department of Learning Health Sciences (Burkhardt, Gruppen), University of Michigan Medical School, Ann Arbor, MI; and the School of Education Center for the Study of Higher and Postsecondary Education, University of Michigan, Ann Arbor, MI (DesJardins).

Author contributions: JB conceived the study and obtained research funding. JB conceived the conceptual framework with input and advice from SD and LG. JB contacted and received the combined database after discussion and formal approval from data stewards. JB analyzed the data. SD provided statistical advice on study design and data analysis. JB drafted the manuscript, and all authors contributed substantially to its revision. JB takes responsibility for the paper as a whole.

All authors attest to meeting the four ICMJE.org authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist. Dr. Burkhardt's work was in part supported by the Society for Academic Emergency Medicine Education Fellowship.

Publication dates: Received for publication November 5, 2018. Revisions received February 18, 2019; March 2, 2019; March 8, 2019, and March 26, 2019. Accepted for publication April 8, 2019.

This material is based on data provided by the Association of American Medical Colleges (AAMC), the National Board of Medical Examiners (NBME), and the American Medical Association (AMA). The views expressed herein are those of the authors and do not necessarily reflect the position or policy of the AAMC, the NBME, and the AMA.

REFERENCES

1. US Department of Health and Human Services. *The Physician Workforce: Projections and Research Into Current Issues Affecting Supply and Demand*. Rockville, MD: US Dept of Health & Human Services; 2008.
2. Petterson SM, Liaw WR, Phillips RL, et al. Projecting US primary care physician workforce needs: 2010-2025. *Ann Fam Med*. 2012;10:503-509.
3. Professions Health Resources and Services Adminstration: Bureau of Health Professions. *Projecting the Supply and Demand for Primary Care Practitioners Through 2020*. Rockville, MD: Health Resources and Services Administration, Bureau of Health Professions; 2013.
4. Baldwin A, Woods K, Simmons MC. Diversity of the allied health workforce: the unmet challenge. *J Allied Health*. 2006;35:116-120.
5. Sullivan L. *Missing Persons: Minorities in Health Professions, a Report of the Sullivan Commission on Diversity in the Healthcare Workforce*. Battle Creek, MI: WK Kellogg Foundation; 2004.
6. Thompson WA, Denk JP. Promoting diversity in the medical school pipeline: a national overview. *Acad Med*. 1999;74:312-314.
7. Association of American Medical Colleges. Table B3. Number of active residents, by type of medical school, GME specialty, and gender. Report on residents. Available at: https://www.aamc.org/data/493922/report-on-residents-2018-b3table.html. Accessed November 1, 2018.
8. US Census Bureau. *2000 Census Atlas, Glossary*. Suitland, MD: US Census Bureau; 2000.
9. Association of American Colleges. Underrepresented in medicine definition. Available at: https://www.aamc.org/initiatives/urm/. Accessed November 1, 2015.
10. Walker KO, Moreno G, Grumbach K. The association among specialty, race, ethnicity, and practice location among California physicians in diverse specialties. *J Natl Med Assoc*. 2012;104:46-52.
11. DeVille K. Affirmative action and medical education. *Am J Public Health*. 1999;89:1256-1261.
12. US Department of Health and Human Services. *The Rationale for Diversity in the Health Professions: A Review of the Evidence*. Rockville, MD: US Dept of Health & Human Services; 2006.
13. Piette JD, Heisler M, Krein S, et al. The role of patient-physician trust in moderating medication nonadherence due to cost pressures. *Arch Intern Med*. 2005;165:1749-1755.
14. Parchman ML, Burge SK. The patient-physician relationship, primary care attributes, and preventive services. *Fam Med*. 2004;36:22-27.
15. Greenwood BN, Carnahan S, Huang L. Patient-physician gender concordance and increased mortality among female heart attack patients. *Proc Natl Acad Sci*. 2018;115:8569-8574.
16. Svirko E, Lambert T, Brand L, et al. Career choices for emergency medicine: national surveys of graduates of 1993-2009 from all UK medical schools. *Emerg Med J*. 2013;31:556-561.
17. Scott IM, Abu-Laban RB, Gowans MC, et al. Emergency medicine as a career choice: a descriptive study of Canadian medical students. *CJEM*. 2009;11:196-206.
18. Boyd JS, Clyne B, Reinert SE, et al. Emergency medicine career choice: a profile of factors and influences from the Association of American Medical Colleges (AAMC) graduation questionnaires. *Acad Emerg Med*. 2009;16:544-549.
19. Newton DA, Grayson MS, Thompson LF. The variable influence of lifestyle and income on medical students' career specialty choices: data from two US medical schools, 1998-2004. *Acad Med*. 2005;80:809-814.
20. Goldcare MJ, Goldcare R, Lambert TW. Doctors who considered but did not pursue specific clinical specialties as careers: questionnaire surveys. *J R Soc Med*. 2012;105:166-176.
21. Hauer KE, Durning SJ, Kernan WN, et al. Factors associated with medical students' career choices regarding internal medicine. *JAMA*. 2008;300:1154-1164.
22. Boatright D, Simon J, Jarou Z, et al. 167 Factors important to underrepresented minority applicants when selecting an emergency medicine program. *Ann Emerg Med*. 2015;66:S59-S60.
23. Association of American Colleges. Request AAMC data. AAMC data 2018. Available at: https://www.aamc.org/data/479586/requestaamcdata.html. Accessed March 8, 2019.
24. Association of American Medical Colleges. Participating medical schools and deadlines. Applying to medical school. Available at: https://students-residents.aamc.org/applying-medical-school/article/participating-medical-schools-deadlines/. Accessed September 1, 2018.
25. Simon HA. Theories of bounded rationality. In: McGuire CB, Radner R, eds. *Decision and Organization*. Vol 1. Amsterdam, Netherlands: North-Holland Publishing Company; 1972:161-176.
26. Schilirò D. Economic Decisions and Simon's Notion of Bounded Rationality. *International Business Research*. 2018;11:64-75.
27. Burkhardt JC, Smith-Coggins R, Santen S. Residents values in a rational decision-making model: an interest in academics in emergency medicine. *Intern Emerg Med*. 2016;11:993-997.
28. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*. 1977;84:191-215.
29. Betz N, Hackett G. Applications of self-efficacy theory to understanding career choice behavior. *J Soc Clin Psychol*. 1986;4:279-289.
30. Lent RW, Brown SD, Larkin KC. Self-efficacy in the prediction of academic performance and perceived career options. *J Counseling Psychol*. 1986;33:265-269.
31. Rodriguez A, Furquim F, DesJardins SL. Categorical and Limited Dependent Variable Modeling in Higher Education. In: *Higher Education: Handbook of Theory and Research*. Dordrecht, Netherlands: Springer; 2018:295-370.
32. Jann B. Plotting regression coefficients and other estimates. *Stata J*. 2014;14:708-737.
33. Zun LS. 1st- And 2nd-year medical student exposure to emergency medicine. *Teach Learn Med*. 2002;14:164-167.
34. Wald DA, Manthey DE, Kruus L, et al. The state of the clerkship: a survey of emergency medicine clerkship directors. *Acad Emerg Med*. 2007;14:629-634.
35. Rosenblatt RA, Andrilla CHA. The impact of US medical students' debt on their choice of primary care careers: an analysis of data from the 2002 medical school graduation questionnaire. *Acad Med*. 2005;80:815-819.
36. Kahn MJ, Markert RJ, Lopez FA, et al. Is medical student choice of a primary care residency influenced by debt? *MedGenMed*. 2006;8:18.
37. Youngclaus JJ, Fresne J, Bunton SA. *An Updated Look at Attendance Cost and Medical Student Debt at US Medical Schools*. 2017; Available at: https://www.aamc.org/download/482236/data/august2017anupdatedlookatattendancecostandmedicalstudentdebtatu.pdf. Accessed June 6, 2019.