Assessing factors for choosing a primary care specialty in medical students: A longitudinal study

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ABSTRACT

A shortage of primary care physicians exists in the US, and medical schools are investigating factors that influence specialty choice. To better understand the factors associated with medical students choosing primary care specialties, a longitudinal annual survey from 2013 to 2019 was administered to students at the University of Iowa Carver College of Medicine, starting pre-matriculation. A logistic regression model examined factors of interest. Matching into a primary care specialty (family medicine, internal medicine, pediatrics) for residency was the primary outcome. Our study compared factors students reported in annual surveys: demographics, mentorship, debt, and lifestyle. Factors significantly associated with primary care specialty included pre-medical and medical school research, a family member in primary care, student age and gender. 28% of men chose primary care, and 47% of women. Although there was no gender difference in rates of medical education debt (N = 286, \( \chi^2(1) = 0.28, p = 0.60 \)), men were more likely to report being influenced by debt (N = 278, \( \chi^2(1) = 10.88, p = 0.001 \)), and students who reported debt-influenced specialty choice were one-third as likely to enter primary care (N = 189, 95% CI [0.11–1.06], p = 0.06). For men, potential salary was negatively associated with entering primary care (p = 0.03). Women were more likely to have a mentor in primary care (N = 374, \( \chi^2(1) = 13.87, p < 0.001 \)), but this was not associated with an increased likelihood of entering primary care for men or women. Having a family member who practices primary care was associated with a 2.87 times likelihood of entering primary care (N = 303, 95% CI [1.14–7.19], p = 0.03). The decision to enter primary care is influenced by many factors; a key gender differentiator is that men’s specialty choice is more negatively influenced by financial concerns.

Introduction

The American medical system faces a shortage of primary care physicians (PPs), with a projected shortage of 46,000 PPs by 2025 in the US [1]. The most pervasive shortages are found in rural and underserved areas [2]. The reduced access for patients leads to overutilization of acute care providers for routine or preventable health care [3,4]. The dearth of PPs is consequential for the overall quality of healthcare in the USA, as nations with robust primary care systems demonstrate better healthcare outcomes and lower costs [4,5]. The shortage persists despite the number of residency positions in the core primary care specialties of internal medicine, pediatrics, and family medicine (the specialties defined as comprising primary care in this study) reaching an all-time high in 2018 [1].

In response to this shortfall, many medical schools have striven to change student selection criteria and pursue curricular changes to increase the number of students choosing a primary care specialty. Strategies implemented by medical schools include mandatory primary care rotations, loan forgiveness, longitudinal programs, and rural track programs. Meta-analyses conducted by Pfarrfaller et al. (2015) found that longitudinal interventions throughout medical school are the most effective [6], but there is still a need for more research to identify effective and cost-effective targets for interventions at multiple stages in the medical education process.

In this study, we examine the factors associated with entering a primary care specialty in order to better guide future interventions and policy changes. We employ a theoretical framework based on work from Pfarrfaller et al. (2015), in which factors affecting specialty choice are organized into conceptually linked groups which reflect individual characteristics, preferences, and experiences. Specifically, we examine financial considerations, including debt and future salary potential; mentorship and early exposure to PPs; lifestyle and job preferences; and demographics.
In addition to these conceptual groups, we examine the role of gender, which varies dramatically across different medical specialties. Women comprise an increasing majority of domestic PP residents, accounting for 52.9% of total domestic residents in family care, internal medicine, and pediatrics in 2019 [7]. This includes female majorities in family medicine (54.9%) and pediatrics (75.3%), and a female minority in internal medicine (42.2%) [7].

The study was conducted at University of Iowa Carver College of Medicine (UICCM). The medical school has 150 students per class, and is a large allopathic medical school with significant research funding. It is located in Iowa, a predominantly rural, Midwestern state, and on average 70% of each matriculating class are residents of the state of Iowa.

Our analysis uses a unique, prospective dataset from University of Iowa Carver College of Medicine (UICCM), comprised of comprehensive surveys administered annually containing questions about background, current goals, debt, and other factors. Our long-running study has a large sample size and multiple cohorts with repeated, regular surveys. This allows us to examine the importance of various factors, such as the subjective importance of time spent in patient contact, both early in medical school and after having matched. The added depth also allows for subcategorization of students by demographics and other characteristics – as well as a more integrative picture of microsystem factors, like mentorship and research experiences, with macrosystem factors including debt burden and future employment prospects.

Methods

Data were procured via the Carver College of Medicine Specialty Choice survey, a series of surveys given annually to medical students at UICCM, beginning in 2013 and still ongoing. This study was approved by the University of Iowa Institutional Review Board. The most recent data were recorded after the 2019 Match, and thus our data set includes 2013, 2014, and 2015 matriculants. The survey is given to all students, with an average completion rate of roughly 70% per cohort. Survey design was based on literature review and discussions with medical students and residents, who endorsed certain factors as being important in their specialty selection. Each student was surveyed at the beginning of each year, as well as after the match in 4th year. We define primary care in this study as internal medicine, pediatrics, and family medicine.

For all descriptive statistics, only those students for whom there is information on their specialty match are reported. The majority of three cohorts have now completed medical school and are included in the data. Of these, N = 374 students provided specialty match data by the summer of 2019. Descriptive statistics comparing those who did or did not match into primary care specialties are presented in Table 1, and further descriptive statistics are presented in Appendix Tables A2-A4.

Analysis

To examine which factors are strongly associated with matching into a primary care specialty, we compare levels of surveyed attributes using 2-sided t-tests and $\chi^2$ tests where appropriate, as well as employ multivariate logistic (logit) regressions to calculate adjusted odds-ratios (OR) for which factors are significantly associated with selection into a primary care specialty. We present results both from pooling genders and by analyzing genders separately. We also pool together data from the three cohorts. We examine data in three tranches: from before medical school, from the first 2 years, and from after match. This was done for both theoretical and practical reasons. On a practical level, response rates for M3 and M4 were comparatively low, likely due to many students being on rotation. On a theoretical level, these 3 tranches are each relevant to different types of potential interventions, for instance pre-matriculation information being useful for admissions, and early medical school experiences relevant to interventions in this time period. All statistical analysis was done using STATA 14.0.

Results

Gender

When controlling for student characteristics measured in the M1 survey, which includes factors determined prior to matriculation, women are 2.13 times (95% CI [1.30–3.54], $p < 0.001$, Appendix Table A1) more likely than men to enter a primary care specialty. Female gender was also significantly associated with entering a primary care specialty when controlling for factors measured through the M2 survey (N = 264, Adjusted OR = 2.06, 95%CI[1.12–3.79], $p = 0.02$, Table 2 Column 4). When controlling for all post-match factors, female gender is still positively associated, but not significantly (N = 189, Adjusted OR = 1.61, 95%CI[0.76–3.41], $p = 0.21$, Table 3 Column 4).

Mentorship and exposure to primary care physicians

Over time, students tended to find mentors in the fields that they ultimately matched into. Thus, when examining the role of mentorship, we primarily consider
Table 1. Descriptive statistics of those who did/did not match into a primary care specialty. Comparison of descriptive statistics of students who matched into internal medicine, pediatrics, or family medicine specialties. Likert scores taken from M1 survey. Pooled Genders.

| Characteristic                     | Matched Into Primary Care Specialty, Pooled Genders. Mean (SD) or N (%) | Did Not Match Into Primary Care Specialty, Pooled Genders. Mean (SD) or N (%) | Test of differences |
|-----------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------|
| Count                             | 137 (36.63%)                                                             | 237 (63.37%)                                                               | -                   |
| Avg. age at matriculation         | 23.3 (1.97), N = 110                                                     | 23.54 (2.41), N = 197                                                      | N = 307, 2-sided t-test, t (305) = 0.87, p = 0.38 |
| Gender is female                  | 77 (56.20%)                                                              | 87 (36.71%)                                                                | N = 374, \( \chi^2(1) = 13.40, p < 0.01 \) |
| Ethnicity is white                | 106 (77.37%)                                                             | 189 (79.75%)                                                               | N = 374, \( \chi^2(1) = 0.29, p = 0.59 \) |
| Physicians in family              | 27 (22.13%)                                                              | 44 (20.95%)                                                                | N = 332, \( \chi^2(1) = 0.06, p = 0.80 \) |
| Undergrad science based major     | 95 (87.96%)                                                              | 173 (88.72%)                                                               | N = 303, \( \chi^2(1) = 0.04, p = 0.84 \) |
| Debt from pre-med education       | 48 (36.36%)                                                              | 89 (40.09%)                                                                | N = 354, \( \chi^2(1) = 0.48, p = 0.49 \) |
| Pre-med research                  | 54 (44.26%)                                                              | 115 (54.76%)                                                               | N = 332, \( \chi^2(1) = 3.40, p = 0.07 \) |
| Pre-med mentor                    | 45 (36.89%)                                                              | 82 (39.05%)                                                                | N = 332, \( \chi^2(1) = 0.15, p = 0.70 \) |
| Ever married                      | 27 (19.71%)                                                              | 54 (22.78%)                                                                | N = 374, \( \chi^2(1) = 0.48, p = 0.49 \) |
| Mentor in primary care specialty  | 29 (21.17%)                                                              | 34 (14.35%)                                                                | N = 374, \( \chi^2(1) = 2.88, p = 0.09 \) |
| Research in medical school        | 91 (66.42%)                                                              | 205 (86.50%)                                                               | N = 374, \( \chi^2(1) = 21.20, p < 0.01 \) |
| Amount of time in patient contact | 2.20 (1.59), N = 108                                                     | 2.46 (1.44), N = 195                                                      | N = 303, 2-sided t-test, t (301) = 0.15, p = 0.15 |
| Quality of life (Likert scale)    | 2.32 (1.67), N = 108                                                     | 2.53 (1.59), N = 195                                                      | N = 303, 2-sided t-test, t (301) = 0.10, p = 0.28 |
| Technical skills necessary (Likert scale) | 2.07 (1.03), N = 108       | 2.13 (1.02), N = 195                                                      | N = 303, 2-sided t-test, t (301) = 0.42, p = 0.63 |
| Med school debt at match          | 90 (87.38%)                                                              | 150 (81.97%)                                                               | N = 286, \( \chi^2(1) = 1.43, p = 0.21 \) |
| Med school debt influenced specialty choice | 9 (9.09%) | 44 (24.58%) | N = 278, \( \chi^2(1) = 9.91, p < 0.01 \) |

Mentorship experiences in the first 2 years of medical school, which are likely to play a greater role in determining specialty choice, rather than being determined by it. 32.54% of female medical students reported a mentor in a primary care specialty in their first 2 years, significantly more than the 14.19% of men (N = 281, \( \chi^2(1) = 13.45, p < 0.001 \)). Of the 41 women who reported having a primary care mentor in their first 2 years, 23 would go on to match into a primary care specialty. When controlling for other variables from the first 2 years of medical school, the relationship between having a primary care mentor in the first 2 years and entering a primary care specialty is not statistically significant for women (N = 116, Adjusted OR = 1.55, 95% CI[0.55–4.35], p = 0.40, Table 2 Column 6). Having a mentor in a primary care specialty in the first 2 years of medical school was also not associated with a significant change in the likelihood of matching into a primary care specialty for men in any tested specification (N = 150, Adjusted OR = 0.57, 95% CI [0.17–1.91], p = 0.37, Table 2 Column 5).

Having a family member who practices family care is positively associated with entering a primary care specialty. The effect is significant at the 0.05 level when pooling genders, with an overall 2.87 times increased likelihood of entering a primary care specialty (N = 303, 95% CI [1.14–7.19], p = 0.03). This effect is stronger in women, who are 3.72 times more likely to enter a primary care specialty (N = 133, 95% CI [0.89–15.48], p = 0.07), and men have a positive but statistically insignificant effect (N = 120, Adjusted OR = 2.76, 95% CI [0.77–9.89], p = 0.12). The proportion of students with a family member who practiced primary care did not differ between genders (N = 332, \( \chi^2(1) = 0.15, p = 0.70 \)). The importance of having a family member who practices primary care is also significant post-match when controlling for other variables as well (N = 189, Adjusted OR = 5.44, 95% CI[1.14–25.91], p = 0.03).

Research

Pre-matriculation research experiences were negatively associated with the likelihood of women entering a primary care specialty for women, but not men. If a woman had pre-matriculation research experience, they had a 0.35 times likelihood of entering a primary care specialty (N = 133, 95% CI[0.17–0.73], p = 0.01), and even if the research was related to primary care had a negative but statistically insignificant association with
Table 2. M1-2 factors associated with matching into a primary care specialty. Dependent variable is matching into a primary care specialty. Primary care is comprised of internal medicine, pediatrics, and family medicine specialties. Adjusted odds ratios are presented, with standard errors in parentheses. Additional controls include whether individuals had a primary care mentor in first 2 years, performed primary care research in first 2 years, the subjective importance of academic vs. private practice opportunities and intellectual stimulation, none of which had significant associations. Lifestyle and debt responses taken from M2 survey. Pseudo $R^2$ is McFadden’s. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ for odds ratio different from 1.

|                              | Pooled Men | Pooled Women | Pooled Men | Pooled Women |
|------------------------------|------------|--------------|------------|--------------|
| Female                       | 2.21***    | -            | 2.06**     | (0.62)       |
| Ethnicity is White           | 0.58       | 0.42*        | 0.63       | 0.54*        |
|                             | (0.20)     | (0.22)       | (0.30)     | (0.19)       |
| Age at Matriculation         | 1.12       | 1.00         | 1.43*      | 1.14         |
|                             | (0.08)     | (0.10)       | (0.26)     | (0.09)       |
| Family Member Practices      | 3.41**     | 2.13         | 6.67**     | 3.53**       |
| Primary Care                 | (1.78)     | (1.47)       | (6.16)     | (2.00)       |
| Married in 1st 2 Years       | 1.70       | 3.36**       | 1.03       | 1.92         |
|                             | (0.65)     | (1.79)       | (0.60)     | (0.78)       |
| Has children in 1st 2 Years  | 0.09**     | 0.72*        | 0.05       | 0.08**       |
|                             | (0.09)     | (0.15)       | (0.09)     | (0.08)       |
| Amount of time in            | -          | -            | -          | 0.81**       |
| patient contact              |            |              |            | (0.09)       |
| Potential Salary             | -          | -            | -          | 0.78*        |
|                             |            |              |            | (0.10)       |
| Quality of Life              | -          | -            | -          | 1.05         |
|                             |            |              |            | 1.17         |
| Responsibilities at home     | -          | -            | -          | 1.15         |
|                             |            |              |            | 1.33         |
| Speciality status/reputation | -          | -            | -          | 1.21         |
| Spouse/partner’s career      | -          | -            | -          | 1.33**       |
|                             |            |              |            | 1.13         |
| Technical skills necessary   | -          | -            | -          | 1.06         |
|                             |            |              |            | 0.87         |
| Debt from Medical Education  | 1.55       | 1.64         | 1.38       | 1.67         |
|                             | (0.66)     | (1.03)       | (0.85)     | (0.76)       |
| Debt Influences Specialty   | 0.99       | 0.61         | 1.49       | 0.91         |
| Preference                   | (0.27)     | (0.26)       | (0.57)     | (0.26)       |
| Constant                     | 0.03**     | 0.48         | 0.00**     | 0.00**       |
|                             | (0.05)     | (1.18)       | (0.00)     | (0.01)       |
| Observations                 | 273        | 153          | 120        | 264          |
| Pseudo $R^2$                 | 0.08       | 0.09         | 0.08       | 0.12         |

entering a primary care specialty ($N = 133$, Adjusted OR = 0.52, 95%CI [0.20–1.37], $p = 0.19$). Conducting primary care research in medical school was not strongly associated with the likelihood of entering a primary care specialty, with the only significant relationship found in our tested regression being positive for men who conducted primary care research in their first 2 years of medical school ($N = 153$, Adjusted OR = 2.64, 95%CI [0.94–2.00], $p = 0.07$, Table 2 Column 2).

**Earnings and debt**

83.91% of students reported being in educational debt by the end of medical school. There was no significant difference in the rate of having debt between students who did or did not match into primary care ($N = 286$, $\chi^2(1) = 1.43$, $p = 0.23$), and having debt did not have a significant effect on the likelihood of entering into a primary care specialty ($N = 189$, Adjusted OR = 2.02, 95%CI [0.74–5.50], $p = 0.17$). However, students who reported post-match that debt had a significant impact on their specialty choice were 67% less likely to enter a primary care specialty ($N = 189$, 95% CI [0.11–1.06], $p = 0.06$). 26.79% of women reported that medical school debt had an impact on their specialty choice, compared to just 10.09% of men, a significant difference ($N = 278$, $\chi^2(1) = 10.88$, $p < 0.001$). Students were also asked about the importance of potential salary in their specialty choice, and there was a significant negative relationship for men at their M2 survey. For each 1 point increase in the subjective importance of potential salary, men were 34% less likely to ultimately matching into a primary care specialty ($N = 148$, 95%CI [0.45,0.96], $p = 0.03$). This relationship persisted at post-match as well ($N = 108$, Adjusted OR = 0.50, 95%CI[0.27–0.94], $p = 0.03$). For women, there was no significant relationship between the importance of potential earnings and likelihood of entering a primary care specialty. Men on average rated the importance of potential salary significantly higher than women ($N = 362$, 2-sided t-test, $t(360) = 2.64$, $p = 0.01$).
### Table 3. Post-match factors associated with matching into a primary care specialty. Dependent variable is matching into a primary care specialty. Primary care is comprised of internal medicine, pediatrics, and family medicine specialties. Adjusted odds ratios are presented, with standard errors in parentheses. Lifestyle and debt responses taken from match survey. Additional controls include whether individuals had a primary care mentor in first 2 years, performed primary care research in first 2 years, the subjective importance of academic vs. private practice opportunities and intellectual stimulation, none of which had significant associations. Pseudo R² is McFadden’s. *** p < 0.01, ** p < 0.05, * p < 0.1 for odds ratio different from 1.

|                                | Pooled | Men | Women | Pooled | Men | Women |
|--------------------------------|--------|-----|-------|--------|-----|-------|
| Female                         | 1.76*  | -   | -     | 1.61   | (0.59)| (0.62)|
| Ethnicity is White             | 0.66   | 0.65| 0.59  | 0.57   | 0.57| 0.51  |
| (0.27)                         | (0.39)| (0.35)| (0.27)| (0.41)| (0.38)|
| Age at Matriculation           | 1.18** | 1.03| 1.46** | 1.11   | 0.88| 1.99** |
| (0.10)                         | (0.12)| (0.25)| (0.11)| (0.15)| (0.36)|
| Family Member Practices Primary Care | 4.05** | 2.62| 7.22  | 5.45** | 5.71| 8.18  |
| (2.83)                         | (2.41)| (8.94)| (4.34)| (6.87)| (10.93)|
| Married in Medical School      | 1.10   | 2.08| 0.93  | 1.26   | 4.03| 0.85  |
| (0.52)                         | (1.41)| (0.65)| (0.69)| (3.52)| (0.78)|
| Had Children in Medical School | 0.22** | 0.30| 0.26  | 0.22   | 0.15| 1.62  |
| (0.20)                         | (0.34)| (0.46)| (0.23)| (0.20)| (3.23)|
| Primary Care Mentor in 1st 2 Years | 1.45 | 0.67| 2.23  | 1.30   | 0.71| 2.4   |
| (0.59)                         | (0.50)| (1.17)| (0.59)| (0.64)| (1.46)|
| Conducted Primary Care Research in Medical School | 0.83  | 1.54| 0.54  | 0.93   | 2.61| 0.45  |
| (0.23)                         | (0.78)| (0.28)| (0.36)| (1.71)| (0.29)|
| Amount of time in patient contact | -     | -   | -     | 0.99   | 0.83| 1.09  |
| Potential Salary               | -      | -   | -     | 0.73   | 0.50**| 0.95 |
| (0.15)                         | (0.16)| (0.18)| (0.18)| (0.46)| (0.46)|
| Quality of Life                | -      | -   | -     | 0.65** | 0.55*| 0.57* |
| (0.12)                         | (0.18)| (0.18)| (0.18)| (0.52)| (0.52)|
| Responsibilities at home       | -      | -   | -     | 1.44*  | 1.55| 1.47  |
| (0.29)                         | (0.55)| (0.46)| (0.46)| (0.52)| (0.52)|
| Speciality status/reputation   | -      | -   | -     | 1.37   | 1.50| 1.50  |
| (0.27)                         | (0.46)| (0.52)| (0.52)| (0.52)| (0.52)|
| Spouse/partner’s career        | -      | -   | -     | 1.29   | 1.75**| 1.35 |
| (0.21)                         | (0.50)| (0.34)| (0.34)| (0.34)| (0.34)|
| Technical skills necessary     | -      | -   | -     | 0.54***| 0.42**| 0.54** |
| (0.09)                         | (0.12)| (0.15)| (0.15)| (0.15)| (0.15)|
| Debt from Medical Education    | 1.53   | 1.86| 1.17  | 2.02   | 2.62| 1.58  |
| (0.70)                         | (1.20)| (0.82)| (1.03)| (2.10)| (1.30)|
| Debt Influences Specialty Preference | 0.29** | 0.24**| 0.39  | 0.33*  | 0.34| 0.32  |
| (0.16)                         | (0.17)| (0.34)| (0.20)| (0.29)| (0.34)|
| Constant                       | 0.01*  | 0.15| 0.00**| 0.18   | 97.07| 0.00** |
| (0.02)                         | (0.42)| (0.00)| (0.49)| (418.00)| (0.00)|
| Observations                   | 197    | 111 | 86    | 189    | 108 | 81    |
| Pseudo R²                      | 0.08   | 0.08| 0.11  | 0.19   | 0.29| 0.21  |

### Lifestyle and job preferences

A number of questions were asked pertaining to the importance of various job and lifestyle attributes in preferring or selecting a specialty. Academic vs. private practice opportunities and intellectual stimulation were not significantly related to choosing a primary care specialty in either M2 or post-match survey.

Amount of time in patient contact was significantly negatively related to matching into a primary care specialty at M2 when pooling genders, with each increase in importance level related to a 19% lower likelihood of matching into primary care (N = 264, 95%CI[0.66–0.99], p = 0.04, Table 3 Column 4). Specialty status/reputation was only significantly positively related to choosing a primary care specialty for men at M2 (N = 148, Adjusted OR = 1.46, 95%CI [1.01–2.12], p = 0.05, Table 2 Column 5).

Quality of life was not significantly related to choosing a primary care specialty at M2, but significantly negatively associated for both men and women post-match, which each increased level of importance of quality of life related to a 35% lower likelihood of matching into a primary care specialty (N = 189, 95% CI[0.45–0.93], p = 0.02, Table 3 Column 4).

The importance of technical skills necessary was not related to specialty choice in M2, but post-match, was significantly negatively related for both men and women, with a pooled genders effect of a 46% lower likelihood (N = 189, 95%CI[0.39–0.75], p < 0.01, Table 3 Column 4).

### Discussion

#### Mentorship and exposure to primary care providers

Having a medical mentor in a given specialty is a medical career choice factor frequently examined in the literature. Some have found strong positive associations between having a medical mentor in a given specialty and matriculating into that field [6,8]. There are, though, difficulties in identifying a causal relationship between mentorship and specialty match. One plausible conclusion is that
exposure to a mentor itself leads to the increased likelihood of matching into their specialty. What may overstate the effect of mentorship, is that students frequently choose their own mentors in a given specialty, to increase their competitiveness. This occurs by way of letters of recommendation and the faculty member’s professional network. That is, students may develop preferences for the specialty before finding a mentor in the specialty, and so there may not be much of an effect of mentorship per se. Thus, policy changes based on such findings (e.g., increasing opportunities for exposure to role models) have an uncertain effect.

In our analysis, we attempt to overcome some of these challenges by focusing on mentorship experiences in the first 2 years, a time period when a student’s specialty preferences are not yet fully formed, and they are less likely to have sought a mentor in a field to bolster their match competitiveness. We find that having a primary care mentor is not significantly associated with matching into a primary care specialty, but that women are substantially more likely than men to have a primary care mentor.

Having a family member primary care practitioner was strongly associated with an increased likelihood of entering a primary care specialty, and this effect was particularly strong for women. There are several possible, non-exclusive explanations for this finding. The first is that exposure to primary care physicians could increase interest in primary care practice—learning more about a specialty and associated lifestyle as an individual grows up could make it more appealing. The second is that having a family member who is a primary care practitioner could be correlated with a broader set of common values in the family, which favors entering primary care.

Lifestyle and job factors

Survey responses to lifestyle and personality factors were stronger predictors of matching into a primary care specialty the further along students progressed in their medical education. This is not entirely surprising, considering the limited exposure to specialties and clinical medicine during the orientation period. However, it does speak to an opportunity that increasing student awareness of some lifestyle and professional differences between medical specialties early in their medical education may influence their preferences. Relatedly, attempts to increase interest in primary care should account for the limited exposure and experience of pre-clinical medical students. Students may not be aware of desirable aspects of each specialty until their clinical clerkships. For instance, the importance of time spent in patient contact as assessed in year 2 is negatively associated with entering a primary care specialty, but this negative association is gone post-match.

Earnings and debt

Medical school debt is a subject of increasing scrutiny. For the graduating class of 2018, 75% of students had student loan debt, with an average indebtedness of ~$200,000; with standard federal interest rates and repayment plans, this can grow to more than 400k with accrued interest through the life of the loan [9]. Numerous students matriculate into medical school with several hundred thousand dollars of existing student loan debt. Some argue that these costs drive students into high-paying subspecialties, in order to shed oneself of his/her debt burden as early as possible. By the time of match, 240 of 286 (83.91%) of students reported being in debt from medical school. We do not find that having debt alone significantly explains choosing a primary care specialty, and the proportion of students in debt from medical school did not differ across primary care or non-primary care specialties, or across genders. A limitation of our study is that in initial survey years students were only asked about having debt, not levels of debt, although this has now been changed [11]. Find that high debt levels are associated with lower selection into primary care specialties in public schools, which can be assessed with future cohorts of our ongoing study.

There were, though, substantial differences based on whether students responded affirmatively to whether their debt impacted their specialty choice. Men were overall much more likely than women to say that their educational debts impacted their specialty choice, and men who responded that their specialty was influenced by debt were significantly less likely to enter a primary care specialty. This trend was also observed in women, but the relationship is not significant in the small sample of men who reported educational debt influencing specialty choice. Working in the same direction, for men but not women, the importance of future salary was negatively and significantly associated with likelihood of entering a primary care specialty.

Further research is necessary to elucidate why the financial considerations of debt and future salary are more influential in pushing men out of primary care than women. It may be related to broader motivations for entering the medical profession, perceived societal expectations, or differences in opportunities to enter higher paying specialties. Understanding more about this gap may help create interventions which encourage more men into selecting primary care specialties and help to alleviate the expected shortage of primary care physicians in the future.
Limitations

There are several limitations to this study. First, specialty is not a perfect proxy for primary care physicians; studies have found that 60% of internal medicine graduates subspecialize, and many primary care physicians are switching to more lucrative hospitalist positions [1]. Family medicine physicians have the most years of direct primary care, with 4–5 times the number of ‘primary care’ career years compared to internal medicine graduates [10]. However, eventual residency specialty is the best estimate at the level of the medical school selection process.

Second, this study only covers three graduating classes at one medical college, limiting the scope of which questions can be answered. Collaborating across institutions would provide a more representative sample of medical students, as well as increase statistical power.

Third, this study has difficulty disentangling medical student preferences for different specialties and their ability to enter them. Integrating longitudinal data with measures of student performance improve this.

Conclusion

Increasing the number of primary care practitioners will require many changes; one key element is medical schools taking greater initiative to increase the number of students entering into primary care. Designing interventions to accomplish this is aided by a better understanding of the characteristics, preferences, and experiences associated with specialty choice.

In this study, we find several factors associated with an increased likelihood of entering primary care specialties, including female gender, having family members who practice family care, and placing a low importance on technical skills at the end of medical school. We also find evidence that the primary care gender gap may be attributable to differences in the subjective importance placed on future earnings and educational debt, with these factors associated with men choosing other specialties.

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Disclosure statement

The authors affirm that they have no conflicts of interest pertaining to this work.

Data Availability

The datasets analyzed in this study are available in anonymized form upon reasonable request to the corresponding author.

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Appendix A.1. Pre-matriculation factors associated with matching into a primary care specialty. Adjusted odds ratios, standard errors in parentheses. Primary care is comprised of internal medicine, pediatrics, and family medicine specialties. Pseudo $R^2$ is McFadden’s. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ for odds ratio different from 1.

| Characteristic                              | Pooled          | Men       | Women     |
|--------------------------------------------|-----------------|-----------|-----------|
| Female                                     | 2.126*** (0.545)| -         | -         |
| Ethnicity is white                         | 0.664 (0.200)   | 0.683 (0.302) | 0.671 (0.286) |
| Age at matriculation                       | 0.994 (0.0586)  | 0.925 (0.0705) | 1.220 (0.150) |
| Science major in undergraduate education   | 0.842 (0.335)   | 0.571 (0.306) | 1.581 (1.028) |
| Debt from undergraduate education          | 0.936 (0.244)   | 1.099 (0.399) | 0.762 (0.298) |
| Mentor in primary care                     | 1.637 (0.563)   | 1.764 (0.887) | 1.810 (0.917) |
| Performed primary care research            | 0.893 (0.312)   | 1.350 (0.686) | 0.522 (0.258) |
| Family member practices primary care       | 2.859** (1.340) | 2.724 (1.777) | 3.719* (2.706) |
| Constant                                   | 0.645 (0.998)   | 4.313 (8.576) | 0.00802 (0.0246) |
| Observations                               | 302             | 169       | 133       |
| Pseudo $R^2$                                | 0.05            | 0.03      | 0.05      |

Appendix A.2. Descriptive statistics of men. Comparison of descriptive statistics of students who matched into internal medicine, pediatrics, or family medicine specialties. Likert scores taken from M1 survey.

| Characteristic                              | Matched Into Primary Care Specialty, Men. Mean (SD) or N (%). | Did Not Match Into Primary Care Specialty, Men. Mean (SD) or N (%). | Test of differences |
|--------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------|---------------------|
| Count                                      | 60 (28.57%)                                                 | 150 (71.43%)                                                    | N = 172, 2-sided t-test, t (170) = 0.84, $p = 0.20$ |
| Avg. age at matriculation                  | 23.63 (1.95)                                                | 24.00 (2.91)                                                   | N = 210, $\chi^2(1) = 0.00$, $p = 1.00$ |
| Ethnicity is white                         | 48 (80.00%)                                                 | 120 (80.00%)                                                   | N = 185, $\chi^2(1) = 0.18$, $p = 0.67$ |
| Physicians in family                       | 11 (21.15%)                                                 | 32 (24.06%)                                                   | N = 170, $\chi^2(1) = 0.39$, $p = 0.53$ |
| Undergrad science based major              | 40 (85.11%)                                                 | 109 (88.62%)                                                  | N = 197, $\chi^2(1) = 0.18$, $p = 0.68$ |
| Debt from pre-med education                | 22 (39.39%)                                                 | 60 (42.55%)                                                   | N = 185, $\chi^2(1) = 0.06$, $p = 0.81$ |
| Pre-med research                           | 28 (53.85%)                                                 | 69 (51.88%)                                                   | N = 185, $\chi^2(1) = 0.22$, $p = 0.64$ |
| Pre-med mentor                             | 18 (34.62%)                                                 | 51 (38.35%)                                                   | N = 210, $\chi^2(1) = 0.02$, $p = 0.89$ |
| Ever married                               | 16 (26.67%)                                                 | 39 (26.00%)                                                   | N = 210, $\chi^2(1) < 0.01$, $p = 0.92$ |
| Mentor in primary care in 1st 2 years       | 6 (10.00%)                                                  | 16 (10.67%)                                                   | N = 210, $\chi^2(1) = 0.02$, $p = 0.89$ ** |
| Research in medical school                 | 46 (76.67%)                                                 | 134 (89.33%)                                                  | N = 210, $\chi^2(1) = 5.62$, $p = 0.02** |
| Amount of time in patient contact (Likert scale) | 2.34 (1.54)                               | 2.45 (1.39)                                                   | N = 170, 2-sided t-test, t (168) = 0.44, $p = 0.66$ |
| Quality of life (Likert scale)             | 2.53 (1.57)                                                 | 2.55 (1.57)                                                   | N = 170, 2-sided t-test, t (168) = 0.07, $p = 0.94$ |
| Technical skills necessary (Likert scale)  | 2.00 (1.04)                                                 | 2.24 (1.07)                                                   | N = 170, 2-sided t-test, t (168) = 1.29, $p = 0.20$ |
| Med school debt at match                   | 42 (87.50%)                                                 | 94 (81.03%)                                                   | N = 164, $\chi^2(1) = 1.00$, $p = 0.32$ |
| Med school debt influenced specialty choice | 3 (5.66%)                                                  | 9 (13.64%)                                                   | N = 119, $\chi^2(1) = 2.06$, $p = 0.15$ |
Appendix A.3. Descriptive statistics of women. Comparison of descriptive statistics of students who matched into internal medicine, pediatrics, or family medicine specialties. Likert scores taken from M1 survey.

| Characteristic                          | Matched Into Primary Care Specialty, Women. Mean (SD) or N (%) | Did Not Match Into Primary Care Specialty, Women. Mean (SD) or N (%) | Test of differences |
|----------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|---------------------|
| Count                                  | 77 (46.95%)                                                     | 87 (53.05%)                                                         | -                   |
| Avg. age at matriculation              | 23.05 (1.93)                                                    | 22.75 (1.29)                                                       | N = 135, 2-sided t-test, t(133) = −1.05, p = 0.30 |
| Ethnicity is white                     | 58 (75.32%)                                                    | 69 (79.31%)                                                        | N = 164, χ²(1) = 0.37, p = 0.54 |
| Physicians in family                   | 16 (22.86%)                                                    | 12 (15.58%)                                                        | N = 147, χ²(1) = 1.26, p = 0.26 |
| Undergrad science based major          | 55 (90.16%)                                                    | 64 (88.89%)                                                        | N = 133, χ²(1) = 0.06, p = 0.81 |
| Debt from pre-med education            | 26 (34.21%)                                                    | 29 (35.80%)                                                        | N = 157, χ²(1) = 0.04, p = 0.83 |
| Pre-med research                       | 26 (37.14%)                                                    | 46 (59.74%)                                                        | N = 147, χ²(1) = 7.49, p < 0.01*** |
| Pre-med mentor                         | 27 (38.57%)                                                    | 31 (40.26%)                                                        | N = 147, χ²(1) = 0.04, p = 0.83 |
| Ever married                           | 11 (14.29%)                                                    | 15 (17.24%)                                                        | N = 164, χ²(1) = 0.27, p = 0.61 |
| Mentor in primary care in 1st 2 years  | 23 (29.87%)                                                    | 18 (20.69%)                                                        | N = 164, χ²(1) = 1.84, p = 0.18 |
| Research in medical school             | 45 (58.44%)                                                    | 71 (81.61%)                                                        | N = 164, χ²(1) = 10.59, p < 0.01*** |
| Amount of time in patient contact      | 2.09 (1.64)                                                    | 2.49 (1.53)                                                        | N = 133, 2-sided t-test, t(131) = 1.41, p = 0.16 |
| Quality of life (Likert scale)         | 2.16 (1.73)                                                    | 2.50 (1.60)                                                        | N = 133, 2-sided t-test, t(131) = 1.15, p = 0.25 |
| Technical skills necessary             | 2.13 (1.02)                                                    | 1.96 (0.91)                                                        | N = 133, 2-sided t-test, t(131) = −1.03, p = 0.31 |
| Med school debt at match               | 48 (87.27%)                                                    | 56 (83.58%)                                                        | N = 122, χ²(1) = 0.33, p = 0.57 |
| Med school debt influenced specialty   | 6 (13.04%)                                                     | 35 (30.97%)                                                        | N = 159, χ²(1) = 5.49, p = 0.02 |

Appendix A.4. Descriptive statistics comparing women and men. Comparison of descriptive statistics of men and women. Likert responses taken from M1 survey.

| Characteristic                          | Men                              | Women                             | Test of differences |
|----------------------------------------|----------------------------------|-----------------------------------|---------------------|
| Count                                  | 210 (28.57%)                     | 164 (24.45%)                      | -                   |
| Matched into primary care specialty     | 60 (26.88%)                      | 77 (46.95%)                       | N = 374, χ²(1) = 13.40, p < 0.000*** |
| Avg. age at matriculation              | 23.90 (2.68), N = 172            | 22.89 (1.63), N = 135             | N = 374, χ²(1) = 0.36, p = 0.55 |
| Ethnicity is white                     | 168 (80.00%)                     | 127 (77.44%)                      | N = 332, χ²(1) = 0.66, p = 0.35 |
| Physicians in family                   | 43 (23.24%)                      | 28 (19.05%)                       | N = 303, χ²(1) = 0.24, p = 0.62 |
| Undergrad science based major          | 149 (87.65%)                     | 119 (89.47%)                      | N = 354, χ²(1) = 1.60, p = 0.21 |
| Debt from pre-med education            | 82 (41.62%)                      | 55 (35.03%)                       | N = 332, χ²(1) = 0.39, p = 0.53 |
| Pre-med research                       | 97 (52.43%)                      | 72 (48.98%)                       | N = 332, χ²(1) = 0.16, p = 0.69 |
| Ever married                           | 69 (37.30%)                      | 58 (39.46%)                       | N = 374, χ²(1) = 5.80, p = 0.02** |
| Mentor in primary care in 1st 2 years  | 22 (10.48%)                      | 41 (25.00%)                       | N = 374, χ²(1) = 13.87, p < 0.01*** |
| Research in medical school             | 180 (85.71%)                     | 116 (70.73%)                      | N = 303, 2-sided t-test, t(301) = 0.63, p = 0.53 |
| Amount of time in patient contact      | 2.42 (1.43)                      | 2.31 (1.59)                       | N = 303, 2-sided t-test, t(301) = 1.07, p = 0.28 |
| Quality of life (Likert scale)         | 2.55 (1.57)                      | 2.35 (1.69)                       | N = 303, 2-sided t-test, t(301) = 0.48, p = 0.63 |
| Technical skills necessary (Likert scale) | 2.17 (1.07)                  | 2.04 (0.96)                       | N = 286, χ²(1) = 0.28, p = 0.60 |
| Med school debt at match               | 136 (82.93%)                     | 104 (85.25%)                      | N = 278, χ²(1) = 10.88, p < 0.01 |
| Med school debt influenced specialty   | 41 (25.79%)                      | 12 (10.08%)                       | N = 278, χ²(1) = 10.88, p < 0.01 |
Appendix A.2 Choosing a Medical Specialty Career Path

Match Results (M4 2016-2017)

Medical Specialty Legend

A = Anesthesia
K = Orthopaedic Surgery
B = Dermatology
L = Otolaryngology
C = Emergency Medicine
M = Pathology
D = Family Medicine
N = Pediatrics
E = General Surgery
O = Physical Medicine and Rehabilitation
F = Internal Medicine/Medical subspecialties
P = Plastic Surgery
G = Neurology
Q = Psychiatry
H = Neurosurgery
R = Radiology
I = Obstetrics-Gynecology
S = Urology
J = Ophthalmology
T = Other

Please answer the questions below. Sometimes more than one selection may be made.

1) Name ______________________

2) Are you married or in a union with a partner? □ Yes □ No

a) Do you have any dependent children? □ Yes □ No

i) If so, how many children? __________________

3) Did you perform research last year? □ Yes □ No

a) If so, in which medical field from legend above? __________________

4) Do you have a medical mentor now? □ Yes □ No

a) If so, in which medical field from legend above? __________________

b) Is this mentor appointed by the medical school? □ Yes □ No

If you have a mentor, have you been satisfied with his/her advising? □ Yes □ No

5) Are you shadowing or spending time with a medical faculty member on your own? □ Yes □ No

a) If so, in which medical field from legend above? __________________

6) Do you have debt from undergraduate school? □ Yes □ No

7) Will you have debt from medical school? □ Yes □ No

a) Did debt, or lack thereof, play a role in your choice of a medical specialty? □ Yes □ No

8) What specialty did you match into (A-T)?

a) Number of programs applied to ______

b) Number of interviews offered ______

c) Number of interviews attended ______

d) Couples match? Y/N

9) Did you apply to more than one specialty? If mixed, which others?

____________________________________________

10) What were the most appealing things about the program you ranked #1 (choose two):

□ Geography □ Residents/culture

□ Family □ Work-life balance

□ Program reputation □ Opportunities for fellowships

□ Program faculty □ Research opportunities

□ Program size □ Other __________________

□ Curriculum

11) Please indicate to what extent the following factors contribute to your decision in choosing a medical specialty.

| Extremely Important | Somewhat Important | Neutral | Not Likely Important | Not at all Important |
|---------------------|--------------------|--------|----------------------|---------------------|
| a. Academic vs private practice opportunities |
| b. Amount of time in patient contact |
| c. Intellectual stimulation |
| d. Potential Salary |
| e. Quality of Life |
| f. Responsibilities at home |
| g. Specialty status/reputation |
| h. Spouse/partner’s career |
| i. Technical skills necessary |