

Factors associated with selection of practice in primary care and rural health among medical and nursing students in China

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ABSTRACT

Background. China has a shortage of physicians and nurses in primary care and rural health. This study explores factors that influence the choices of medical and nursing students in China to select a career in primary care, or in rural health. **Methods.** A total of 3826 medical students and 1771 nursing students were surveyed in China. Data were analysed using descriptive statistics, Chi-squared tests, and logistic regression models. **Results.** The majority of medical and nursing students were willing to practice primary care (55% and 59%, respectively). Yet, only 16% and 5% of medical and nursing students, respectively, desired to work in a village or small city. The most common reasons cited to not practice primary care is the lack of opportunities for clinical skills improvement, academic and personal development, and networking. Medical students who were living in a rural residence between ages 1 and 15 years were more likely to report a willingness to work in a rural location (OR: 2.18, 95% CI: 1.33–3.58) or in primary care (OR: 1.72, 95% CI: 1.31–2.25). **Conclusion.** More efforts are needed to understand how preferences among medical and nursing students influence their career choices and change in choices over time. Understanding the concerns of students can help to tailor interventions in healthcare education and training to increase student satisfaction with their career choice and enrolment counts in medical and nursing fields.

Keywords: career preference, China, healthcare workforce, medical student, nursing student, primary care, provider recruitment, rural health.

Introduction

At least half of the global population still lack full access to essential health services, and the estimated worldwide shortage of health workers is nearly 18 million (World Health Organization 2021). China, with its population of 1.4 billion, comprises approximately 20% of the world's population and especially needs more healthcare staff to take care of its people (National Bureau of Statistics of China 2017). China had 3.35 million physicians and 3.79 million registered nurses by the end of 2017 (Zhou et al. 2018), but the shortage of physicians and nurses is still significant.

China's healthcare workforce is grossly understaffed and overwhelmed, with a ratio of one general practitioner (GP) for every 6666 people, compared with the WHO's international standard of one GP for every 1500–2000 people (Wee 2018). According to the World Bank in 2017, the number of nurses in China per 1000 people is 2.73 (Zhou et al. 2018). Although this nursing ratio is smaller than the international average of four to five nurses per 1000 people (Yang and Hao 2018), the annual enrolment of approximately 44 000 nursing undergraduates and 31 000 nurses in junior colleges is insufficient to meet China's increasing population demands (Zhou et al. 2018).

Like many other countries in the world, China needs more physicians and nurses in primary care because primary care forms the foundation of a strong healthcare system (Shi 2012). Primary health care can cover the majority of a person's health needs throughout their lifespan, including prevention, treatment, rehabilitation, and palliative care (World Health Organization 2021). Access to primary care is positively associated with enhanced access to healthcare services, better health outcomes, and a decrease in

costly hospitalisations and number of emergency department visits (Shi 2012). Furthermore, in contrast to specialty care, primary care is associated with a more equitable distribution of health in populations (National Academies of Sciences, Engineering, and Medicine 2021). In other words, primary care can help to counteract the effect of poor economic conditions on health (Shi 2012). Obstacles to accessing primary care may include lack of access to quality health care, lack of access to healthy food choices, and a lack of educational and employment opportunities (Centers for Disease Control and Prevention 2019).

Shortage of a rural health workforce is a worldwide issue (Strasser *et al.* 2016; Beattie *et al.* 2022). There is also a demand for more healthcare workers in China's villages and small cities – in contrast to medium and large cities – to alleviate the ongoing rural/urban maldistribution (Hou and Ke 2015; Li *et al.* 2015). Much of rural areas in China are geographically isolated, with structures such as rugged mountainous terrain. Thus, transportation to urban hospitals can be lengthy, exhausting, and expensive. At this time, village doctors struggle and fail in general to adequately meet the growing healthcare needs in rural areas due to a multitude of reasons, which may include lack of continuing medical or nursing education, lower education level overall, and fewer opportunities for educational training to enrich their performance (Ni *et al.* 2016; Liu *et al.* 2018). Rural healthcare requires a particular skill set; for example, healthcare providers need to treat a range of illnesses and perform a wide variety of procedures, often without specialised training (MacQueen *et al.* 2018). Other barriers to selection of practicing rural health may include that these health providers feel isolated and face challenges related to potential emotional and academic difficulties associated with being the only healthcare provider in a sparsely populated area (Mareck 2011; Miller 2011). Consequently, patients go to large hospitals in urban areas to access medical service, leading to overcrowding in these hospitals (Ni *et al.* 2016). Despite policy measures to strengthen and promote primary care, many Chinese patients, particularly those residing in urban areas, continue to choose higher level hospitals with long wait times (Liu *et al.* 2018). Because it takes 3–8 years to train medical and nursing students, how can China attract more health workers to dedicate their careers to serving in primary care and rural areas?

To address the questions of how to increase the willingness and/or desire for medical and nursing students in China to serve in primary care and rural areas, it is imperative to consider these students' perspectives in this matter. There is scant literature available that focus on nursing and medical education in China from the students' viewpoints; therefore, the objective of this study is to explore factors that influence the choices of medical and nursing students in China to select a career in primary care, and in rural health.

Methods

A total of 3826 medical students from 18 medical schools and 1771 nursing students from 15 nursing schools in China were surveyed cross-sectionally via a 71-item questionnaire in Mandarin. Medical and nursing schools were defined as higher educational institutions that operated an undergraduate medical or nursing programs, respectively.

The questionnaire addressed the following six domains: personal characteristics, academic characteristics, professional literacy evaluation, faculty and academic resource evaluation, financial situation, and future plans on where to practice on graduation. The questionnaire was designed by the research team and shared electronically with designated school administrators to print and administer as hard-copy forms to students, most typically at the end of one of their mandatory lectures.

Besides typical demographic factors such as sex and age, and dependent variables of whether the participant self-reported willingness to practice primary care or in a rural location, this study also examined relationships of unique variables as follows. For example, we examined factors such as the location of the participant's: (1) childhood residence from ages 1 to 15 years; (2) high school; and (3) immediate residence before entering professional school. Studies show that participants from rural locations would more likely desire to return to their rural communities to work (MacQueen *et al.* 2018). Rural location is defined as a village or small city.

Additionally, we looked at whether the participant's university was located in the eastern, western, or central regions of China. The rationale is that western China has less healthcare staff than other regions (Yang and Hao 2018) and is less economically advanced (Hou and Ke 2015), less populated, and more rural/remote (National Bureau of Statistics of China 2017). In our sample, 5 of 18 medical schools and 4 of 15 nursing schools are located in the western region. We also considered if the participant attended a Project 211 university. Project 211 was initiated in 1995 by the Ministry of Education of the People's Republic of China, with the intent of raising the research standards of high-level universities and cultivating strategies for socio-economic development; China has 116 institutions of higher education designated as 211 Project institutions (Ministry of Education of China 2008). In our sample, 6 of 18 medical schools and 4 of 15 nursing schools have this designation; two medical schools and three nursing schools are both located in the western region and are part of a designated Project 211 university.

Last, we considered whether the participant held a leadership role in any student organisation at their university. The hypothesis is that participants without leadership roles may be less willing to work in a rural or primary care setting, as these independent working environments with limited staff often have a higher demand for leadership roles held by physicians and nurses, in comparison to an urban or large

hospital with many specialists, and consequently more administrative leadership (Marek 2011; Spehar et al. 2017).

Descriptive statistics were considered overall and by willingness to practice in primary care and in a village or small city using approximated Chi-squared tests of homogeneity of unadjusted odds. Logistic models predicted willingness to work in primary care and a desire to practice in a village or small city by multivariate descriptive variables. Standard errors (s.e.) were clustered at the school level to adjust for correlations between similarities in variables that may impact students from the same school. Regressions were run to check for interactions between variables.

Ethics approval

Ethical approval for this study was obtained from Peking University Institutional Review Board (No. 2015017). On the first page of the questionnaire, an introduction about the survey was provided, including aims and main contents of the survey, and a promise to keep the data confidential. Participation in the survey was voluntary and consent was sought from all participants.

Results

Of 3826 medical students, 60% were female and 71% entered medical school between the ages of 16 and 19 years. The mean age was 19 years (s.d.: 1.26). Approximately half (45%) self-identified as an only child. Nearly half of the medical students grew up and lived in a village immediately before enrolment. However, the majority of medical students (56%) attended high school in a small city. Most medical students attended a university in a central region and one-fifth (19%) attended a Project 211 university. About 29% of the medical students held a leadership role in a student organisation. The majority said they were willing to practice primary care (55%) and desired to work in a medium-sized city (54%).

Of 1771 nursing students, the majority (94%) were female and 73% entered nursing school between the ages of 16 and 19 years. The mean age was 19 years (s.d.: 1.07). The majority (73%) self-identified as not an only child. The majority of the nursing students (74%) grew up and lived in a village immediately before enrolment. As true for medical students, the majority of nursing students (59%) attended high school in a small city. Most nursing students attended a university in an eastern region and one-fifth (21%) of them attended a Project 211 university. Approximately 31% held a leadership role in a student organisation. The majority of nursing students said they were willing to practice primary care (59%), but only 5% wanted to work in a village or small city (Table 1).

Students were asked to select all the reasons that applied for why they would not be willing to practice primary care.

The most common reasons cited by medical students to not practice primary care is the lack of opportunities for clinical skills improvement, academic and personal development, and networking. The most common reasons cited by nursing students is low income and benefits, lack of conduciveness to improvement of clinical skills, and lack of networking opportunities (Fig. 1).

Medical students were significantly ($P < 0.001$) more likely to desire to work in a rural location if they were less than 20 years of age (odds ratio (OR): 1.13), lived in a rural residence immediately before enrolment (OR: 2.61), had a rural residence between ages 1 and 15 years (OR: 8.59), or attended high school in a rural location (OR: 3.69). Medical students had a significantly lower likelihood ($P < 0.01$) of wanting to work in a rural location if they were an only child (OR: 0.94), attended a university in the western region (OR: 0.27), or attended a Project 211 university (OR: 0.035). Lastly, medical students with a leadership role in a student organisation had a slightly lower chance of wanting to work in a rural location (OR: 0.35, $P = 0.013$). Similarly for nursing students, a lack of desire to work in a rural location was expressed if they attended a university located in a western region (OR: 0.14, $P = 0.046$) or a Project 211 university (OR: 0.083, $P = 0.002$) (Table 2).

Medical students were significantly ($P < 0.001$) more likely to desire working in primary care if they lived in a rural residence immediately before enrolment (OR: 1.55), had a rural residence between ages 1 and 15 years (OR: 4.27), or attended high school in a rural location (OR: 2.22). Medical students had a significantly lower likelihood ($P < 0.01$) of wanting to work in primary care if they attended a university in the western region (OR: 0.29) or attended a Project 211 university (OR: 0.16). Lastly, medical students with a leadership role in a student organisation had a slightly lower chance of wanting to work in a rural location (OR: 0.38, $P = 0.035$). Regression results for nursing students were not statistically significant (Table 3).

Tables 4 and 5 display statistically significant ($P < 0.01$) multivariate logistic regressions of predictors of desire to work in a rural location or primary care, respectively. A medical student with a rural residence between ages 1 and 15 years was more likely to report a willingness to work in a rural location (OR: 2.18, 95% CI: 1.33–3.58) or in primary care (OR: 1.63, 95% CI: 1.31–2.03). Medical students who attended university in a western region were less likely to work in primary care (OR: 0.70, 95% CI: 0.57–0.86), whereas this factor had the opposite effect on nursing students (OR: 1.74, 95% CI: 1.36–2.22). Medical students who attended Project 211 universities were more likely to work in a rural location (OR: 5.48, 95% CI: 2.91–10.33) and primary care (OR: 1.65, 95% CI: 1.34–2.04). For nursing students, the logistic model overall for rural health was significant at $P < 0.001$, but no single factor was statistically significant in predicting a correlation. They were more likely to work in primary care if they were aged <20 years

Table 1. Characteristics of medical and nursing students in China.

	Medical students (N = 3826) n (%) or mean (s.d.)	Nursing students (N = 1771) n (%) or mean (s.d.)
Gender		
Male	1523 (39.8)	109 (6.2)
Female	2301 (60.2)	1662 (93.8)
Age when entered health professional school (years)		
13–15	3 (0.01)	1 (0.06)
16–19	2726 (71.3)	1286 (72.9)
20–26	1092 (28.6)	478 (27.1)
Age	19 (1.26)	19 (1.07)
Only child		
Yes	1315 (44.8)	362 (27.5)
No	1619 (55.2)	954 (72.5)
Residence immediately before enrolment		
City	1705 (44.7)	458 (26.0)
Village	2108 (55.3)	1305 (74.0)
Primary place of residency between 1 and 15 years of age		
Large or medium city	892 (23.5)	211 (11.9)
Small city	793 (21.0)	240 (13.6)
Village	2099 (55.5)	1317 (74.5)
Location of high school		
Large or medium city	1339 (35.3)	356 (20.2)
Small city	2133 (56.2)	1047 (59.4)
Village	323 (8.5)	359 (20.4)
Location of university		
Eastern region	623 (16.3)	1008 (57.0)
Central region	2197 (57.4)	396 (22.4)
Western region	1004 (26.3)	364 (20.6)
Project 211 university		
Yes	726 (19.0)	375 (21.2)
No	3098 (81.0)	1393 (78.8)
Leadership role in a student organisation		
Yes	1105 (29.0)	548 (31.0)
No	2710 (71.0)	1217 (69.0)
Willing to practice primary care		
Yes	2015 (54.5)	1012 (58.8)
No	1682 (45.5)	710 (41.2)
Where does student want to practice after graduation		
Large city	1132 (30.3)	867 (49.5)
Medium city	2015 (54.0)	792 (45.3)
Small city	479 (12.9)	85 (4.8)
Village	102 (2.8)	6 (0.34)

(OR: 1.27, 95% CI: 1.12–1.44) or attending universities in a western region (OR: 1.74, 95% CI: 1.36–2.22).

Discussion

Many variables impact the decision of a medical and nursing student to practice in primary care or in a rural location. It is important to consider these factors in order for China to build a larger physician and nursing workforce to serve the country's enormous and expanding population. This study highlights a number of implications and opportunities for improvement for medical and nursing recruitment and education in China.

First, demographic results reveal that although approximately half of medical and nursing students would be willing to work in primary care, not many want to work in rural locations; only 16% and 5% of medical and nursing students, respectively, desired to work in a village or small city. Because approximately 55% and 74% of medical and nursing students, respectively, grew up and lived in a village immediately before enrolment, this means villages are losing an overwhelming majority of health workers from their hometown. This proportion of medical and nursing students who desire to work in a rural location is small, and insufficient to meet the health demands for China's rural population of over 629 million, which accounts for 46% of China's total population (Li *et al.* 2015). Furthermore, the lower desire of nursing students to work in rural health may reflect the fact that there are fewer rural career opportunities for them than for medical students in the country. For example, village clinics are usually staffed with one or several rural doctors but no nurses.

In unadjusted models, medical students were significantly more likely to want to work in a rural location if they: (1) lived in a rural residence immediately before enrolment (OR: 2.61); (2) had a rural residence between ages 1 and 15 years (OR: 8.59); or (3) attended high school in a rural location (OR: 3.69). Because these three factors had similar effects, only the factor with the largest significant impact (Rural residence between ages 1 and 15 years) was included in the logistic regression models; the 2.18-fold increased likelihood of choosing rural health is consistent with the hypothesis that participants from rural locations would more likely desire to return to their rural communities to work (MacQueen *et al.* 2018).

These findings implicate a need to increase recruitment to rural areas; for example, through incentivisation programs and more scholarship and loan repayment programs for students from these areas (Mareck 2011). These findings are consistent with other studies that show rural upbringing and rural recruitment were significantly associated with more positive attitudes towards rural areas (Farmer *et al.* 2015; Pudpong *et al.* 2017; Bounsanga *et al.* 2022). More efforts could be made to promote and incentivise rural health in these universities to medical and nursing students.

In unadjusted models, medical students have a 1.5-fold increased likelihood of wanting to work in primary care if

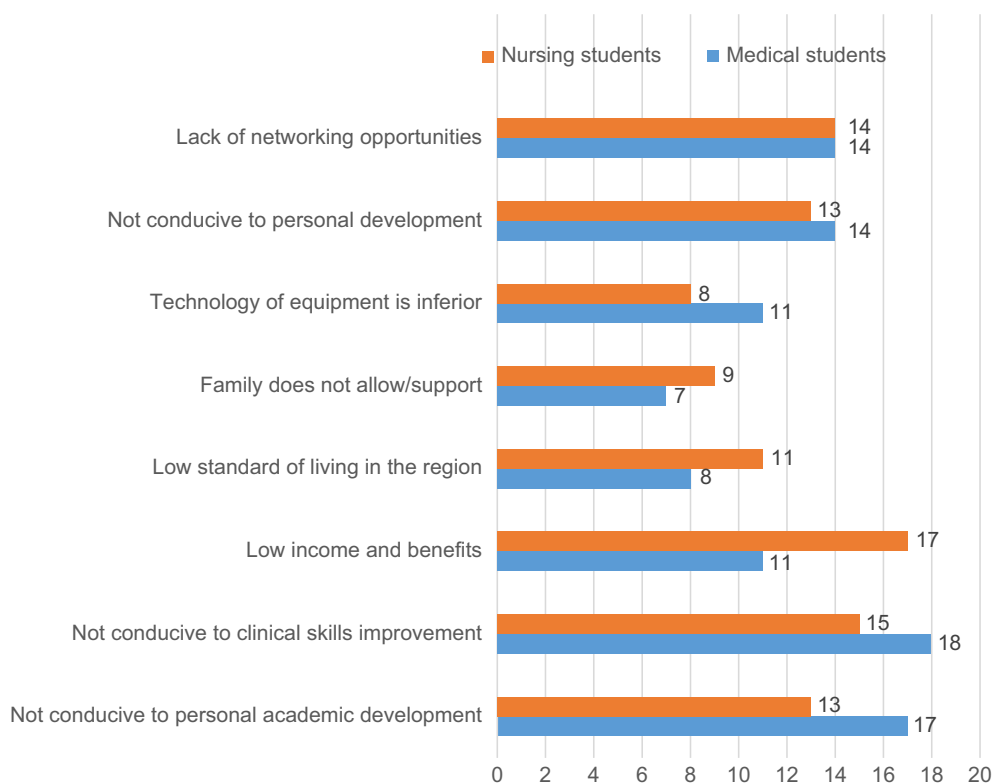


Fig. 1. Reasons cited for not wanting to practice primary care: percentage of medical ($N = 3819$) and nursing ($N = 2075$) students in China who do not want to practice primary care.

Table 2. Factors associated with desire to work in a rural location among medical and nursing students in China: unadjusted odds ratios.

Independent variables	Medical students ($N = 3738$)			Nursing students ($N = 1771$)		
	χ^2	OR (CI)	P-value	χ^2	OR (CI)	P-value
Female	0.30	1.59 (1.35–1.88)	0.58	1.24	29.3 (9.28–92.7)	0.26
Aged <20 years	115.2	1.13 (0.96–1.33)	<0.001*	2.44	1.90 (1.23–2.94)	0.12
Only child	22.9	0.94 (0.80–1.11)	<0.001*	3.38	0.22 (0.11–0.40)	0.066
Rural residence immediately before enrolment	79.7	2.61 (2.18–3.12)	<0.001*	0.02	2.96 (1.84–4.74)	0.88
Rural residence between ages 1 and 15 years	67.0	8.59 (6.59–11.20)	<0.001*	3.81	17.2 (6.98–42.37)	0.051
Rural location of high school	59.3	3.69 (3.03–4.50)	<0.001*	2.86	6.50 (3.54–11.94)	0.091
University located in western region	7.71	0.27 (0.22–0.33)	0.006*	3.97	0.14 (0.073–0.258)	0.046*
Project 211 university	109.4	0.035 (0.022–0.055)	<0.001*	10.12	0.083 (0.039–0.18)	0.002*
Has leadership role in a student organisation	6.12	0.35 (0.27–0.40)	0.013*	1.45	0.31 (0.21–0.54)	0.23

Note: Skipped responses and Don't Know Responses were excluded from the totals for calculation. *Statistical significance with $P < 0.05$. CI, confidence interval; OR, odds ratio.

they lived in a rural residence immediately before enrolment, a 4.3-fold increased likelihood if they had a rural residence between ages 1 and 15 years, and a 2.2-fold increased likelihood if they attended high school in a rural location. In adjusted models, rural residence between ages 1 and 15 years was a significant factor associated with medical students' increased desire to work in primary care.

Attending university in a western region was significantly associated with medical students' decreased desire to work in primary care, whereas this factor had the opposite effect on nursing students. The reasons may include that medical students usually have a stronger motivation to study for a higher educational degree and then find a job at a large-size hospital than their nursing counterparts. A lack of

Table 3. Factors associated with desire to work in primary care among medical and nursing students in China: unadjusted odds ratios.

Independent variables	Medical students (N = 3707)			Nursing students (N = 1771)		
	χ^2	OR (CI)	P-value	χ^2	OR (CI)	P-value
Female	2.33	1.59 (1.46–1.74)	0.13	1.36	17.07 (13.04–22.35)	0.24
Aged <20 years	25.5	2.14 (1.95–2.35)	<0.001*	4.32	2.45 (2.14–2.81)	0.038*
Only child	1.51	1.31 (1.20–1.43)	0.22	0.06	0.37 (0.31–0.43)	0.80
Rural residence immediately before enrolment	56.4	1.55 (1.42–1.70)	<0.001*	0.21	2.79 (2.42–3.20)	0.65
Rural residence between ages 1 and 15 years	53.9	4.27 (3.82–4.78)	<0.001*	0.95	7.86 (6.47–9.55)	0.33
Rural location of high school	37.5	2.22 (2.02–2.45)	<0.001*	3.01	4.32 (3.69–5.06)	0.083
University located in western region	31.1	0.29 (0.26–0.32)	<0.001*	3.49	0.28 (0.24–0.32)	0.062
Project 211 university	72.1	0.16 (0.14–0.19)	<0.001*	0.15	0.25 (0.22–0.30)	0.70
Has leadership role in a student organisation	4.43	0.38 (0.34–0.42)	0.035*	0.05	0.44 (0.38–0.50)	0.82

Note: Skipped responses and Don't Know Responses were excluded from the totals for calculation. *Statistical significance with $P < 0.05$. CI, confidence interval; OR, odds ratio.

Table 4. Predictors of desire to work in a rural location among medical and nursing students in China: multivariate logistic regression.

Variable	Medical students (N = 3686)		Nursing students (N = 1296)	
	OR (CI)	P-value	OR (CI)	P-value
Female	0.98 (0.79–1.22)	0.88	4.74 (0.83–26.9)	0.079
Aged <20 years	1.21 (1.09–1.35)	<0.001*	1.31 (0.99–1.75)	0.061
Only child	0.84 (0.68–1.05)	0.13	0.88 (0.36–2.17)	0.78
Rural residence between ages 1 and 15 years	2.18 (1.33–3.58)	0.002*	1.48 (0.54–4.06)	0.44
University located in western region	0.81 (0.48–1.34)	0.41	0.84 (0.44–1.59)	0.58
Project 211 university	5.48 (2.91–10.33)	<0.001*	2.08 (0.88–4.91)	0.097
Has leadership role in a student organisation	0.95 (0.74–1.23)	0.71	1.02 (0.67–1.53)	0.94
Constant	0.0001 (1.19E–5–9.86E–4)	<0.001*	0.00001 (1.18E–7–0.0014)	<0.001*

Note: Skipped responses and Don't Know Responses were excluded from the totals for calculation. Standard errors are clustered at the school level. *Statistical significance with $P < 0.05$. CI, confidence interval; OR, odds ratio.

Table 5. Predictors of desire to work in primary care among medical and nursing students in China: multivariate logistic regression.

Variable	Medical students (N = 3656)		Nursing students (N = 1277)	
	OR (CI)	P-value	OR (CI)	P-value
Female	1.10 (0.95–1.27)	0.20	1.59 (0.99–2.56)	0.054
Aged <20 years	1.07 (0.96–1.19)	0.24	1.27 (1.12–1.44)	<0.001*
Only child	1.06 (0.86–1.30)	0.60	1.16 (0.88–1.51)	0.29
Rural residence between ages 1 and 15 years	1.63 (1.31–2.03)	<0.001*	1.22 (0.82–1.82)	0.33
University located in western region	0.70 (0.57–0.86)	0.001*	1.74 (1.36–2.22)	<0.001*
Project 211 university	1.65 (1.34–2.04)	<0.001*	1.30 (0.97–1.73)	0.076
Has leadership role in a student organisation	0.93 (0.77–1.13)	0.47	0.94 (0.83–1.08)	0.38
Constant	0.097 (0.014–0.65)	0.016*	0.0044 (4.84E–4–0.041)	<0.001*

Note: Skipped responses and Don't Know Responses were excluded from the totals for calculation. Standard errors are clustered at the school level. *Statistical significance with $P < 0.05$. CI, confidence interval; OR, odds ratio.

statistically significant *P*-values for the majority of the odds ratios in the nursing student dataset indicate an effect is most likely small.

A plethora of reasons is cited by students for not wanting to practice primary care. Interventions should be targeted to focus on these identified shortcomings of the medical and/or nursing education programs. For example, students ascertain a need to increase clinical training opportunities in primary care, more opportunities for academic and personal development, as well as networking opportunities, and these cited reasons are consistent with results of other literature on China's physician and nursing workforce (Li *et al.* 2015; Yang and Hao 2018; Zhou *et al.* 2018). Nursing students have also identified low income and benefits as a reason to not want to practice primary care; this need is also consistent with findings from other research on China's physician and nursing workforce (Yang and Hao 2018; Zhou *et al.* 2018).

This study is valuable for a couple of reasons. First, the sample is a robust representation of China's medical and nursing students; in fact, to our knowledge, this was the first nationwide survey of medical students in China to study associations between the students' rural backgrounds and preferences for working in rural areas and in primary care. Most importantly, there is scant literature available to highlight the factors that influence China's medical and nursing workforce from the student perspective. Student perspective is critical to education and recruitment reform because these medical and nursing students comprise the future workforce in China's expanding population. Targeting interventions to address these students' concerns and needs can help to increase numbers and satisfaction in the primary care and rural health workforce.

This study has a few limitations. First, the response rates of medical and nursing students cannot be determined because relevant data were not collected by participating institutions. Second, additional questions could be included in the questionnaire to capture other factors that may influence the medical or nursing students' career decisions. For example, one recent study evaluated the relevance of a self-reported calling to serve in primary care and found that identifying with medicine as a calling may increase the likelihood of pursuing a primary care career (Kao and Jager 2018). Another potential factor to evaluate is the students' perspective on shortening the preparatory years and introducing modern methods of teaching in order to prepare more health providers in a shorter amount of time to meet China's health workforce demands (Al-Shamsi 2017). A third factor to consider is whether the students received sufficient mentorship and support from their university toward selection of primary care or rural health (Kost *et al.* 2019). Fourth, research suggests that not all students enrolled in medical and nursing programs, particularly nursing programs, choose these fields as their first option for study. As a result, their professional commitment towards studying medicine, or nursing in particular, can be challenging (Yu *et al.* 2011; Ren and Wang 2021). For

example, in 2010, only 16% of university nursing graduates in China selected nursing as their first choice major (Wang *et al.* 2016). Similarly, it can be difficult to select a medical career path for multiple reasons. For instance, according to a survey of approximately 6000 Chinese physicians in 3300 hospitals, 59% of doctors had been verbally assaulted and 6% had been physically assaulted (Tussing *et al.* 2014). To address the challenges that make it difficult to choose primary care and rural health as first-choice career paths, more efforts are needed to better understand these barriers from the medical and nursing students' points of view. Last, some of the results should be interpreted with caution because the estimation of logistic regression models may suffer from omitted variable bias. For example, further study may be needed to explore whether medical students attending Project 211 universities were more likely to work in a rural location and primary care.

Conclusion

More efforts are needed to understand how preferences among medical and nursing students are influenced and may change over time. The rapid growth in demand for physicians and nurses and the slow increase in the number of qualified healthcare staff has led to a serious shortage of physicians and nurses in China. With the accelerated growth of the aging population and newborns, this problem will be compounded. There is a dire need to attract more students to work as physicians and nurses; studies targeted at understanding the concerns of students can help to tailor interventions in healthcare education and training to increase student satisfaction with their career choice and enrolment counts, as well as increase funding support to create more availability in schools.

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