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Abstract:	<p>Background The shortage of healthcare workers is becoming a serious global problem. The underlying reasons may be specific to the healthcare system in each country. Over the past decade, medicine has become an increasingly unpopular profession in China due to the heavy workload, long-term training, and inherent risks. The ongoing COVID-19 pandemic has placed the life-saving roles of healthcare professionals under the spotlight. This public health crisis may have a profound impact on career choices in the young generation of Chinese.</p> <p>Methods We conducted a questionnaire-based online survey on high school students and their parents from 24 provinces (or municipalities) of China. We investigated the change of interest in medical study due to the outbreak of COVID-19 and the motivational factors. Pearson correlation analysis was used to assess the correlation of static or dynamic interest of medical career selection with the reported number of COVID-19 cases. Maslow's Hierarchy of Needs was used to explore underlying motivations for selection of medical-related degrees. The logistic regression model was adopted to analyze the main factors associated with students' choices.</p> <p>Findings A total of 21,085 students and 21,009 parents were included in the study. We observed an increased preference for medical study since the outbreak of COVID-19 in both students (17.5% to 29.6%) and parents (37.1% to 47.3%). Contribution to society and interest in medicine was rated as the main motivations. Additionally, students who were female, in the resit of graduate year and outside of Hubei province were significantly associated with a keen interest in medical study.</p> <p>Interpretation This first multi-center cross-sectional study explores the positive change and noble motivations of students' preferences in medical study during the COVID-19 pandemic. A longitudinal study is required to determine the persistence of their choices.</p>

COVID-19 outbreak improves attractiveness of careers in medicine in China: a cross-sectional survey in high school students and parents

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Abstract

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Methods We conducted a questionnaire-based online survey on high school students and their parents from 24 provinces (or municipalities) of China. We investigated the change of interest in medical study due to the outbreak of COVID-19 and the motivational factors. Pearson correlation analysis was used to assess the correlation of static or dynamic interest of medical career selection with the reported number of COVID-19 cases. Maslow's Hierarchy of Needs was used to explore underlying motivations for selection of medical-related degrees. The logistic regression model was adopted to analyze the main factors associated with students' choices.

Findings A total of 21,085 students and 21,009 parents were included in the study. We observed an increased preference for medical study since the outbreak of COVID-19 in both students (17.5% to 29.6%) and parents (37.1% to 47.3%). Contribution to society and interest in medicine was rated as the main motivations. Additionally, students who were female, in the resit of graduate year and outside of Hubei province were significantly associated with a keen interest in medical study.

Interpretation This first multi-center cross-sectional study explores the positive change and noble motivations of students' preferences in medical study during the COVID-19 pandemic. A longitudinal study is required to determine the persistence of their choices.

Funding The Local High Level University Construction Project of Shanghai, China.

Keywords: COVID-19; medical study; senior high school students; motivation; parents.

Research in context

Evidence before this study

We searched the PubMed, Ovid-Embase, Web of Science Core Collection, CNKI, and the Cochrane Library for studies published in English and Chinese from their inception up to May 1, 2020, under “(motivat*) OR (coronavirus*) AND (select* OR choice OR choose) AND (medical study* OR medical student*) have been used. We also manually searched the references listed in the identified articles. All articles addressing attitudes towards medical career were included, particularly those conducted in high school students, medical students, young doctors and parents.

In the literature, many studies have focused on the career path of existing medical students, but very few have investigated the determinants for the pursuit of medical study in high school students. Similar studies have been conducted in European, Lebanese, and Indian students, but none has been reported in Chinese students so far, or in relation to COVID-19.

Added value of this study

- The attractiveness of a medical career is improved in China due to the outbreak of COVID-19, and the increase of interest is observed in all subgroups and across the nation.
- The underlying motivations for selecting medical study are predominantly societal and scientific, with contribution to society as the top reason to study medicine in both students and parents’ datasets, followed by interest in medicine.
- Intrinsic factors associated with medical study include gender, region, academic year and infectious disease literacy. These factors may be significant predictors for the choice of medical study in students.

Implications of all the available evidence

- This study offers insights to prepare for the impacts of COVID-19 on perception of medical degrees across different regions in China.
- The predominantly societal and scientific motivations reflect the public focus on healthcare during the pandemic of COVID-19 and the widely held beliefs in society that doctors are healers with benevolent hearts.

- Understanding the dynamic change of motivation may help medical educators, researchers and policymakers to restructure the medical education to make it more appealing to high school students.

Background

The outbreak of “coronavirus disease 2019” (COVID-19) has overwhelmed the healthcare system in many countries. The world is experiencing the problem of the healthcare worker shortage, particularly in China, a country facing exacerbated declining number of doctors during the past decade. In China, medicine is not perceived as a notable career as it was in history.¹ Due to the commercialization of healthcare services and limited investment in health, Chinese medical staff, although having heavy workloads and low salaries, were not fully trusted and respected. The increasing violence against doctors and the reform of China’s medical education system have not only demotivated young doctors and medical students to pursue a career in medicine, but also discouraged parents with medical background to support their children to study medicine.^{2,3} A recent survey revealed a dramatic decrease of young doctors from 2005 to 2014, which poses a significant concern for society with rapid population aging and emerging infectious diseases.⁴

Since the beginning of COVID-19 outbreak, thousands of healthcare workers across the country joined the frontline workforce in Wuhan. The whole country witnessed and was greatly moved by their professionalism, contribution and sacrifice.⁴ The positive attitudes toward medical staff, as well as the severity of the COVID-19 may increase the attractiveness of careers in medicine across the nation. In current literature, many studies have focused on the career path of existing medical students,^{5,6} but very few have investigated the determinants for the pursuit of medical study in high school students. Similar studies have been conducted in European, Lebanese and Indian students, but none have been reported in a Chinese population thus far.⁷⁻⁹

While the ongoing pandemic of COVID-19 is affecting millions of people’s lives, we initiated an online questionnaire-based survey in China to evaluate whether the outbreak may affect the preference of medical study in senior high school students and their parents.

Methods

Study population

During the period between 26 February and 4 March, 2020, a self-administered questionnaire was designed using the online survey tool Sojump (Shanghai Information Co.), and was released by WeChat platform using snowball sampling. From 42,557 surveys that were delivered, 56 students (and 20 parents) were excluded due to unclear locations, 392 grandparents were also removed. The effective numbers of participants were 21,085 students and 21,009 parents from 233 senior high schools in 24 provinces (96 cities), including 776 students and 802 parents from Wuhan, a city suffering the most from the COVID-19 outbreak. The geographic distribution of participants is illustrated in Fig. 1. This study was approved by the Institutional review board of the Fudan University School of Public Health. Informed consent was waived because the questions were answered anonymously.

Data collection

The questionnaire was designed to collect the demographic data, preferences for medicine-related degrees, and potential motivational factors. Students' questionnaire included sex, name of high school, academic year, performance level, and occupation of parents; degree preferences include willingness to learn medicine (prior and post COVID-19 outbreak), preferred medical career (clinician, public health practitioner, pharmacist, nurses or others), main motivations for selecting or unselecting medical study. An Infectious Disease-Specific Health Literacy Scale (IDSHL) developed by Tian *et al.*¹⁰ was adopted to assess student's health literacy. Information collected from parents included sex, name of high school attended by their child, educational level, occupation, attitude toward their child studying medicine, main reasons for supportive or unsupportive attitude. Date and time for completion of the questionnaire were auto-recorded by the Sojump system.

The number of COVID-19 cases across China was obtained through the website of National Health Commission of the People's Republic of China (http://www.nhc.gov.cn/xcs/xxqzbd/qzbd_index.shtml). The data that was assessed including the number of daily reported new case regional and national (26th February - 4th March, 2020) and the number of accumulated

cases in the participants' provinces and around the country (until 4th March, 2020). Percentage of regional cases was calculated as below:

$$\text{Percentage of regional cases} = \frac{\text{Regional accumulated cases}}{\text{Total number of accumulated cases}} * 100\%$$

Hubei province was censored in the correlation analysis as it variates from other data points.

Statistical analysis

The characteristics of participants were summarized. The number and proportion of participating students who had positive attitude towards medical career and the number and proportion of supportive parents were stratified by age, parents' education level, medical background, geographic region, academic performance, and IDSHL score. Chi-square (χ^2) test was used to compare the difference in percentages between groups. Interquartile range (IQR) for each subgroup was calculated from schools with more than 100 students, and quartile 1 and quartile 3 were presented. Pearson correlation analysis was used to assess the regional or time correlation of medical degrees selection and number of COVID-19 cases. For logistic regression analysis, both univariate and multivariate analysis were performed to assess the main factors associated with selection of medical study. A *P* value of <0.05 was considered statistically significant. Full names of the provinces investigated are listed in Appendix. Table 3. All the data were analyzed by SAS (v9.4) or R (v3.6.1) software.

Results

Characteristics of the study population

A total of 21,085 students and 21,009 parents spanning 24 provinces or municipalities completed the questionnaire. The geographic distribution of participating students and parents are shown in Fig. 1. The demographic characteristics and medical study preferences of the sampled students and parents are shown in Table 1 and Appendix Table 1. Of the respondent students, 57% were females, 2.7% came from Hubei province. The distribution of students in Year 1, Year 2, Graduate year, and Resit graduate year were

32.4%, 27.7%, 37.3%, and 2.6%, respectively. According to student self-evaluation, 73.2% of the students were predicted to have academic performance qualified for top-tier universities. Only 1.3% of the students claimed to have had acquaintance with diagnosed COVID-19 cases. According to their report, 36.0% and 33.4% of the fathers and mothers, respectively, had a degree of University diploma or above. The median IDSHL score in the students was 73 (out of 100). In the parents' survey, 4.9% of the parents indicated they worked in healthcare.

Increased preference for medical study since COVID-19

Overall, we found the percentage of students who selected medical study increased significantly from 17.5% (IQR: 13.9-20.9) to 29.6% (IQR: 23.6-35.6) over the course of the COVID-19 outbreak. A similar trend was observed across subgroups. Female students seemed to have a higher positive attitude toward studying medicine before and after the outbreak, compared to male students (percentage change: 13.4% vs. 10.9%). Despite the relative smaller sample size of Hubei participants, we observed a lower increase in preference towards medical study in these students, compared with those outside of Hubei province (percentage change: 8.2% vs. 12.3%). For IDSHL literacy, students with higher score (>73) had a higher growth of interest in medical study, compared to those below the median score (Percentage change: 12.6% vs. 11.7%).

Parents were more likely to have a positive attitude toward their children studying medicine than did the students themselves. The outbreak of COVID-19 increased the proportion of supportive parents from 37.1% (IQR 29.7 - 40.8%) to 47.3% (37.5 - 54.6%). The increase was more evident in non-medical professional parents (from 36.7 to 47.1%) than in medical professional parents (from 44.1 to 49.4%) (Appendix Table 1).

Predominant motivators for students to select medical study

In order to further investigate the underlying motivations for the change of

interest in medicine. We used singular choice questions to identify the driving motivations for medical study (Fig. 2). Contribution to society ranked the top reason in both students and parents' datasets, followed by interest in medicine. Interestingly, family expectation accounted for 4.4% of motivations for students. When we categorized the motivators according to the Maslow's hierarchy of needs, which is the most detailed and frequently used theory in education,² we could divide the motivators into Scientific, Societal and Humanitarian domains (Appendix Table 2). Societal factors accounted for the majority of the selection (students vs. parents: 52.6% vs 79.6%), followed by Scientific factors.

On the other hand, demotivating factors were multi-faceted. Based on the nature of multiple-choice questions, we found the predominant demotivation in high school students was lack of interest, followed by concerns regarding violence against doctor, heavy workload, long-term training and heavy responsibility for doctor (Fig. 2 B). Interestingly, in medical professional parents, violence against doctor (65.5%) and heavy workload (64.9%) were listed as the top two reasons for not supporting their children to study medicine (Fig. 2 B).

Factors associated with medical study preference

In order to evaluate the variables that affect students' choice of medical study. Logistic regression analysis was performed, as shown in Table 2. In univariate analysis, we found that students who were female, in the resit year of graduation year, based outside of Hubei and with higher IDSHL score were significantly more likely to select medical study ($P_{uni}<0.05$, $P_{FDR}<0.05$) (Table 2). Educational level of parents seemed to pose an opposite effect, as parents with diploma or university degrees were associated with a decreased percentage of students selecting medical study. Students in the second year of high school also showed a decreased likelihood of selecting medical study. However, after multivariate adjustment, parents' educational level became non-significant, whereas the rest remained significant.

Among the subjects related to medical study, clinical medicine was the most selected course (54.5%), followed by Chinese traditional medicine (14.1%), Pharmacy (6.9%), Chinese pharmacy (5.6%), public health (3.7%), and nursing (2.6%) (Fig. 3).

Correlation of interest in medicine and the severity of COVID-19 epidemic

The preference towards medicine were mapped against the accumulated number of reported COVID-19 cases until 4th March by region (Fig. 4 A). We further conducted correlation analysis in both students and parents to investigate the relationship between preference towards medicine and COVID-19 severity. In order to establish a more robust correlation, only provinces with participant number of more than 100 were included. As shown in Fig. 4 B and 4 C, we did not find a significant correlation between the percentage of selection medical study and the percentage of accumulated regional cases over the entire outbreak period in both the students and parents. However, a potential negative correlation was indicated across regions in both settings.

We also analyzed correlation between change in decision (from no selection or indifference to selection of medical study) and daily reported cases in both students (Fig. 4 D) and parents (Fig. 4 E). In the parents' dataset, we observed a significant positive correlation between the number of daily COVID-19 cases and the change of medical study selection ($r = 0.75$, $P = 0.03$), which potentially indicates that the interest of parents grew along with the rise of daily reported COVID-19 cases. Other analysis revealed no significant correlations with the current sample size.

Discussion

China is witnessing a severe shortage of healthcare professionals for various reasons, including increased demand and high staff turnover.⁶ The most severe shortage was seen in pediatricians, general practitioners, and psychiatrists.¹¹ Although medical education admission has been expanded since 1998, the problems with workforce in healthcare-related areas have not been fully

addressed, including low income for trainee doctors and deterioration of doctor-patient relations.^{12,13} The expansion of medical programs, to meet an increased demand, may in turn reduce the quality of healthcare due to lower admission standards for medical students. The additional 2-4 year training for junior doctors introduced by China has raised doubts about the delayed career development for young doctors, which further demotivated students to embark on a long medical career.^{13,14}

Since the outbreak of COVID-19, the world has witnessed unprecedented collective efforts and strengths of character of many health workers. The world has come together to appraise these frontline workers who risk or sacrifice their lives to contain the outbreak. The roles of doctors, community workers, nurses have become even more essential and visible in the current epidemic, being defined as “key workers” by countries. It is speculated that COVID-19 may provide an opportunity for China to improve the doctor-patient relationship and accelerate positive healthcare system reform.

In this study, we found a significant increase in attitudes towards medical study from both high school students and their parents due to the outbreak of COVID-19. The increase of interest has been observed in all subgroups and across the nation. The underlying motivations are predominantly societal and scientific, which reflects the public focus on healthcare in this unusual time. Even though scientific motivation (Interest in medicine: Students vs. parents: 35.0% vs. 13.4%) is regarded as the most important for students' achievement outcomes and positive well-being, societal factors are shown to be the predominant motivators in similar studies carried out in upper-middle income countries.^{12,15} Furthermore, we have investigated intrinsic factors which associated with medical study. We have found factors such as gender, region, academic year and infectious disease literacy to be significant predictors of the choice. In the degree choice results, we have found the majority of students expressed interest in clinical medicine, with public health ranks the 6th on the list of healthcare degrees. This indicates that this outbreak has not raised interest in this important domain as much as we anticipated. Given the number

of Chinese health professionals for disease prevention and control is only about one-fifth of that in US,¹⁶ the demands for more workforce in public health may remain high over the next few years.

We believe the positive change in medical career perception in Chinese students and parents might be inspired by several factors. First, the performance of Chinese medical staff during the COVID-19 outbreak have successfully restored their positive reputation in society. Second, the beliefs that doctors are healers with benevolent hearts are still widely held in society, including in the young generation, which was consistent with findings from Wang, *et al's*.¹¹ Third, the interest may be correlated with the severity of COVID-19. From our correlation analysis, the dynamic change of preference may be linked with reported COVID-19 cases, whether that interest may last still requires further follow-up. This study offers insights to prepare for the impacts of COVID-19 on perception of medical degrees across different regions in China. Understanding the dynamic change of motivation may help medical educators, researchers and policymakers to restructure medical education to make it more appealing to high school students.

The major limitation of this study is the use of snowball sampling method, which may have led to selection bias. However, the large sample size and the small variation in percentage of interest across high schools across the country partly released our concern on the issue. Moreover, due to the nature of cross-sectional study, a longitudinal study is required to determine the persistence of choices among students and parents.

The attractiveness of medical career is significantly improved in China due to the outbreak of COVID-19. It has been anticipated that more top-tier students in China are willing to select medicine as a future career to tackle the issue of medical worker shortage. However, to maintain this enhanced enthusiasm, a more supportive social and working environment for medical professionals are desired.

Contributors

RXZ contributed to data interpretation and writing of the initial manuscript. JFP, LW and YZY contributed to data cleaning and analysis. YLW and HFG contributed to questionnaire design and data collection. WHX conceived and designed the study, revised the manuscript and supervised the quality of the study throughout the conduct of the project. All authors involved in the acquisition, analysis, and interpretation of data, and have read, edited, and approved the final manuscript.

Declaration of interests

The authors declare that they have no conflict of interest.

Data sharing

The datasets generated and/or analyzed during the current study will be open to collaborators who share similar research interest. Website access can be provided upon reasonable request.

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Figure legends

Figure 1. Geographic distribution of participants across China.

Abbrev: S: No. of students; P: No. of parents.

Figure 2. Motivational and de-motivational factors for students and parents to select medical study. A. Distributions of motivations for medical study; **B.** Distribution of de-motivations for medical study.

Figure 3. The ranking of medical-related majors preferred by students.

Figure 4. Preference toward medical study and COVID-19 incidence across China. A. Distribution of the cumulative number of COVID-19 cases (up to March 4th, 2020) and percentage of students (S) or parents (P) selecting medical study; **B.** Pearson correlation analysis of the percentage of students selecting medical studies and the percentage of accumulated positive COVID-19 case in each of 10 provinces accounting for the national accumulated cases; **C.** Pearson correlation analysis of the percentage of parents selecting medical study and the percentage of accumulated positive COVID-19 case in each of 9 provinces accounting for the national accumulated cases; **D.** Pearson correlation analysis of the percentage of students changed to selecting medical study and the number of daily reported new cases across 10 provinces; **E.** Pearson correlation analysis of the percentage of parents changed to selecting medical study and the number of daily reported new cases across 9 provinces.

Supplementary appendix

Supplemental Table 1. Characteristics of parent participants and their expectations for their children to learn medicine before and after the COVID 19 outbreak.

Supplemental Table 2. Motivation domains based on Maslow's hierarchy of needs.

Supplemental Table 3. Full names of provinces or municipalities in the map of

China.

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Table 1. Characteristics of student participants and their interest in studying medicine prior and post COVID-19 outbreak.

Characteristics		Before COVID-19				After COVID-19			Difference ^e
		Total (%) ^a	No. (%) ^b	Percent. (%) ^c	IQR (%) ^d	No. (%)	Percent. (%) ^c	IQR	
Total		21085	3682	17.5	(13.9, 20.9)	6249	29.6	(23.6, 35.6)	12.1***
Sex	Male	9933 (47.1)	1583	15.9	(11.4, 19.7)	2658	26.8	(20.6, 31.2)	10.9***
	Female	11152 (52.9)	2099	18.8	(15.7, 22.3)	3591	32.2	(27.5, 38.4)	13.4***
Father's education	Primary school or below	1727 (8.2)	276	16.0	(10.7, 21.3)	538	31.2	(18.3, 43.8)	15.2***
	Junior school	5831 (27.7)	962	16.5	(12.0, 20.4)	1767	30.3	(24.6, 35.8)	13.8***
	High school	5934 (28.1)	1060	17.9	(13.2, 20.7)	1774	29.9	(24.2, 35.0)	12***
	Diploma	2972 (14.1)	534	18.0	(12.8, 22.3)	900	30.3	(23.6, 38.0)	12.3***
	University or above	4621 (21.9)	850	18.4	(13.4, 25.6)	1270	27.5	(23.0, 34.4)	9.1***
Mother's education	Primary school or below	2868 (13.6)	446	15.6	(12.3, 23.6)	886	30.9	(24.8, 39.2)	15.3***
	Junior school	6234 (29.6)	1061	17.0	(12.7, 19.7)	1886	30.3	(23.2, 34.6)	13.3***
	High school	4933 (23.4)	853	17.3	(10.6, 22.0)	1443	29.3	(21.2, 36.3)	12.0***
	Diploma	3339 (15.8)	641	19.2	(11.2, 22.5)	1007	30.2	(21.7, 35.3)	11.0***
	University or above	3711 (17.6)	681	18.4	(16.6, 28.2)	1027	27.7	(23.8, 39.5)	9.3***
Region	Hubei	809 (3.8)	100	12.4		167	20.6		8.2***
	Non-Hubei	20276 (96.2)	3582	17.7	(14.4, 21.1)	6082	30.0	(24.0, 35.7)	12.3***
Academic year	Year 1	7032 (33.4)	1193	17.0	(13.5, 19.7)	2155	30.6	(24.2, 34.8)	13.6***
	Year 2	6698 (31.8)	1019	15.2	(10.6, 18.8)	1789	26.7	(19.8, 35.3)	11.5***
	Graduate year	6984 (33.1)	1373	19.7	(12.9, 20.6)	2158	30.9	(22.9, 35.3)	11.2***
	Resit of graduate year	371 (1.8)	97	26.1	(0, 30.8)	147	39.6	(9.1, 100.0)	13.5***
Academic performance	Top-tier	14698 (69.7)	2695	18.3	(14.3, 21.7)	4352	29.6	(24.0, 34.8)	11.3***
	Second-tier	4679 (22.2)	733	15.7	(10.8, 20.0)	1402	30.0	(21.9, 36.6)	14.3***
	Third-tier	687 (3.3)	117	17.0	(0, 20.0)	239	34.8	(25.0, 46.6)	17.8***
	Others	1021 (4.8)	137	13.4	(0.0, 21.1)	256	25.1	(6.3, 37.5)	11.7***
Acquaintance with COVID-19 cases	Yes	328 (1.6)	49	14.9	(0, 33.3)	82	25.0	(0, 50.0)	10.1
	No	20757 (98.4)	3633	17.5	(14.0, 20.9)	6167	29.7	(23.5, 35.8)	12.2***

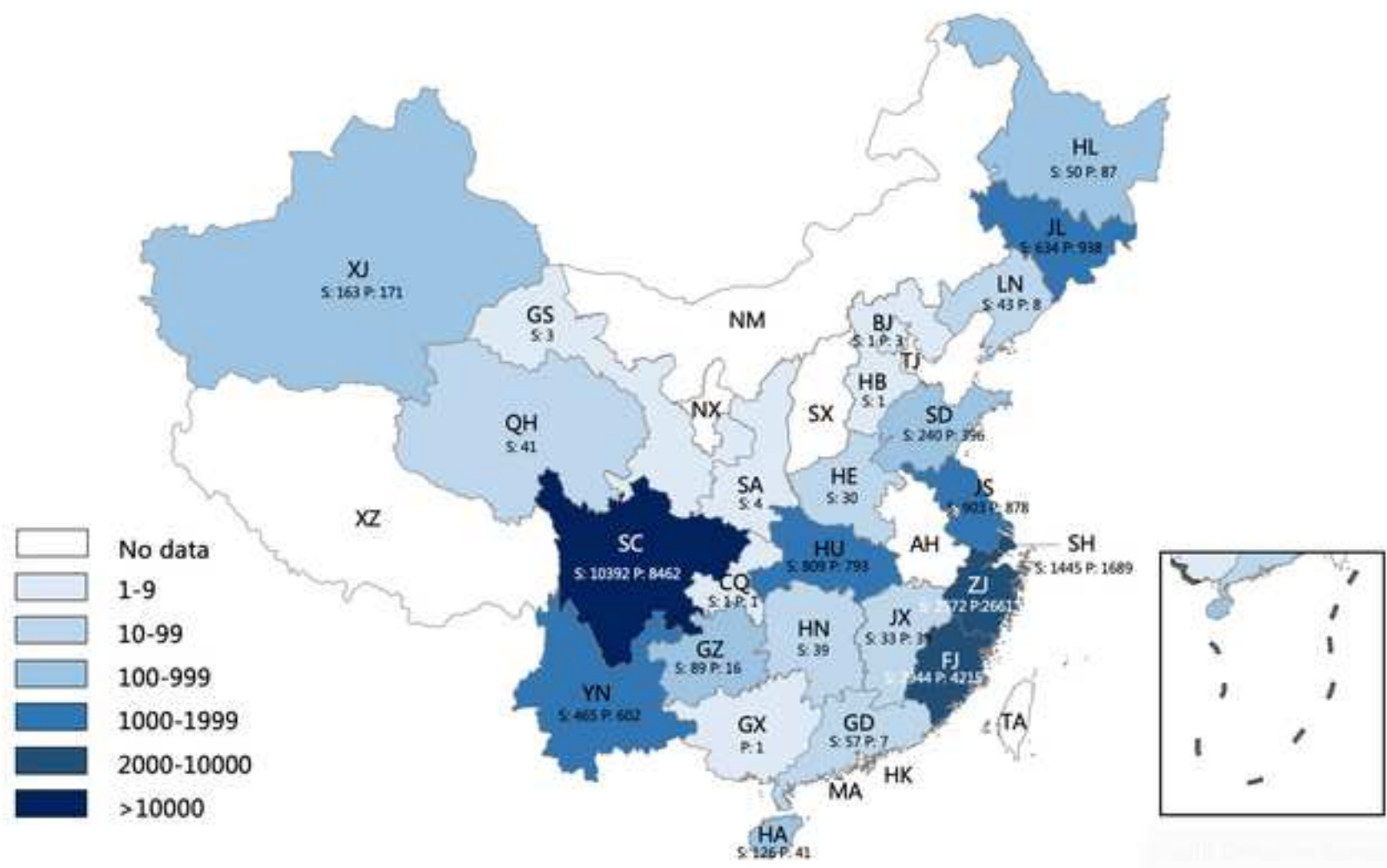
IDSHL score	≤73	10759 (51.0)	1498	13.9	(10.5, 16.5)	2756	25.6	(19.8, 31.0)	11.7***
	>73	10326 (49.0)	2184	21.2	(16.8, 25.5)	3493	33.8	(27.7, 39.1)	12.6***

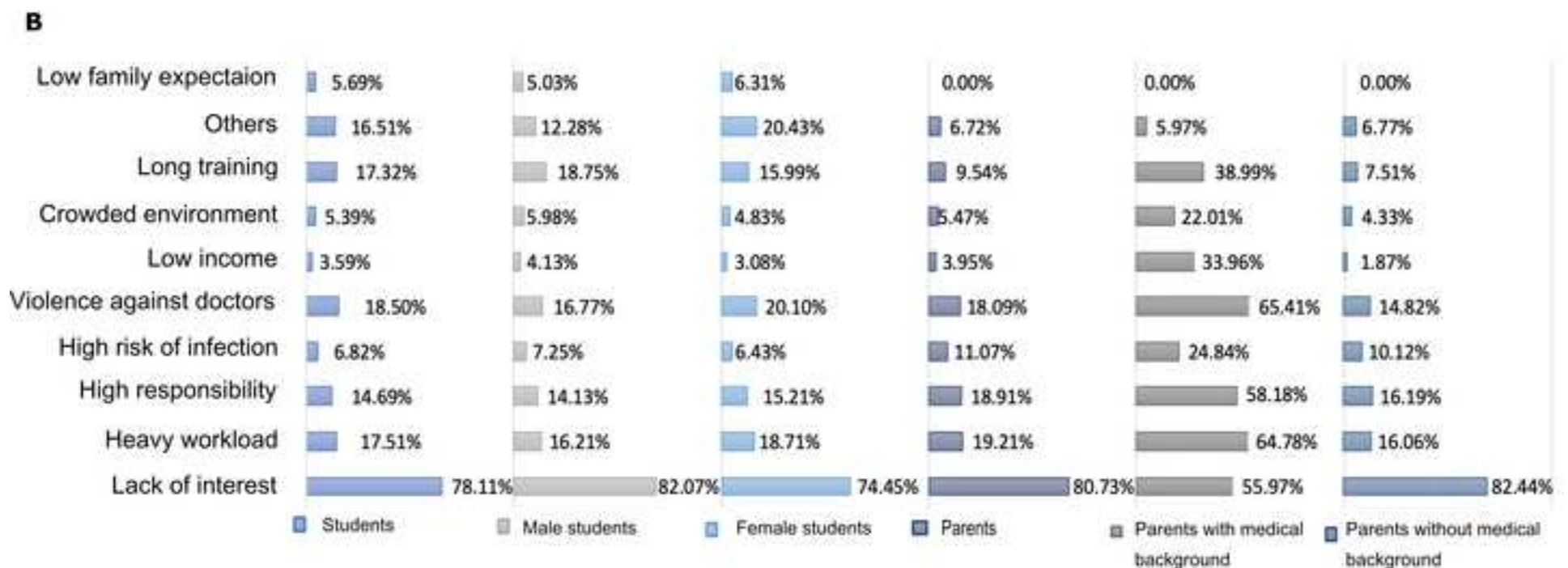
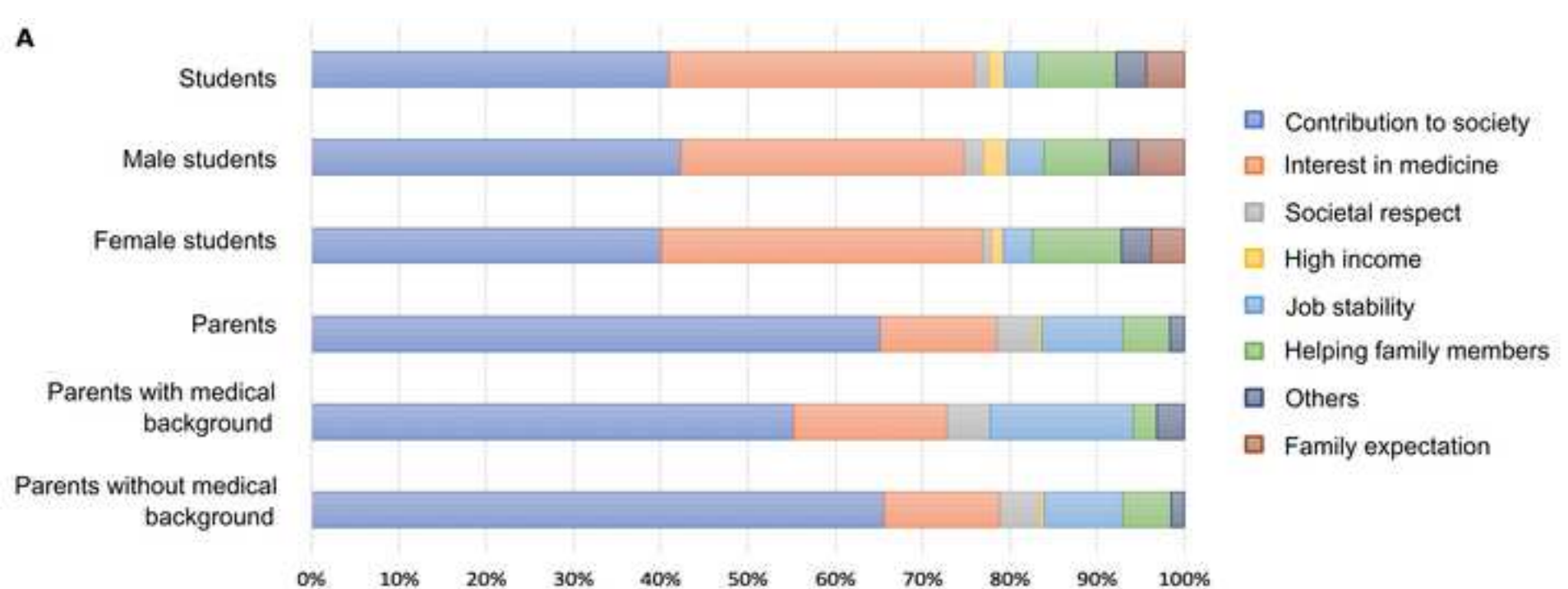
^a Total number of students in all or subgroup and percentage of the subgroup; ^b Number of students who selected medicine; ^c Percent. referring to the percentage of students who selected medicine in the subgroup, each value represents the percentage; ^d IQR: Interquartile range, represented by the Q1 and Q3 value from 36 schools with more than 100 participants. Some subgroups had less than 36 values due to missing data; ^e Difference calculated as the subtraction of the percentage of students selecting medicine during COVID-19 from the percentage before the outbreak. *P* value is derived from Chi-square test in each subgroup. ****P*<0.001

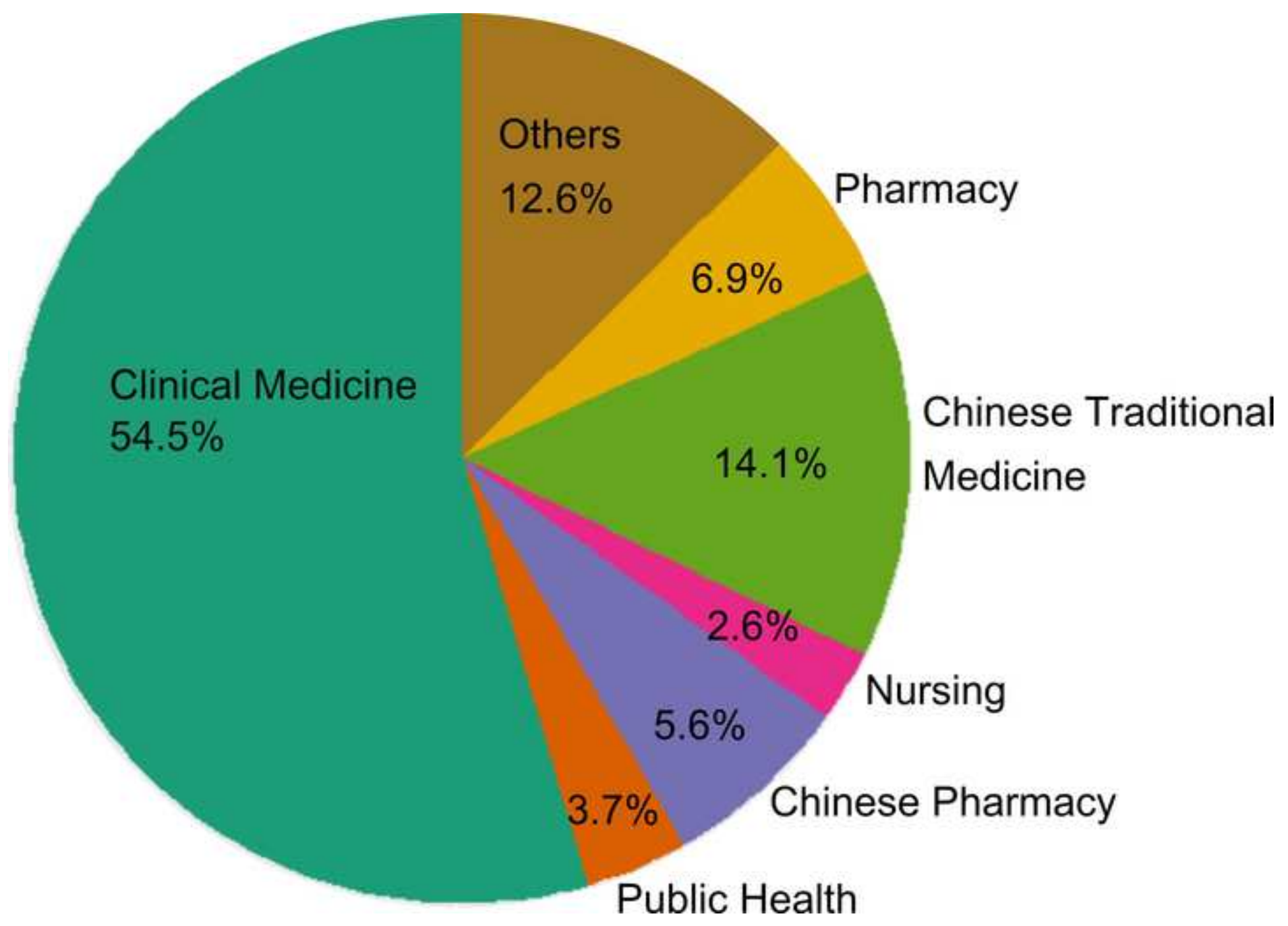
Table 2. Logistic regression analysis for underlying factors associated with medical study.

Characteristics		No. (%)	Univariate analysis				Multivariate analysis					
			Beta	SE	OR (95%CI)	P	P _{FDR} ^c	Beta	SE	OR (95%CI)	P _{adj} ^a	P _{FDR}
Sex	Male		Ref									
	Female		0.26	0.03	1.30 (1.22-1.38)	<2E-16	<0.0001	0.254	0.03	1.29 (1.22-1.37)	< 2E-16	<0.0001
Father's education	Below high school	7558	Ref									
	High school	5934	-0.03	0.04	0.97 (0.90-1.05)	0.45		-0.013	0.04	0.99 (0.91-.07)	0.76	
	Diploma or above	7593	-0.09	0.04	0.91 (0.85-0.98)	9.66E-03	0.02	-0.100	0.05	0.90 (0.82-1.00)	0.04	0.11
Mother's education	Below high school	9102	Ref									
	High school	4933	-0.06	0.04	0.94 (0.88-1.02)	0.14		-0.034	0.04	0.97 (0.89-.05)	0.44	
	Diploma or above	7050	-0.08	0.03	0.93 (0.86-0.99)	0.027	0.05	-0.055	0.05	0.95 (0.86-1.04)	0.27	
Region	Hubei	809										
	Outside of Hubei	20276	0.50	0.09	1.65 (1.39-1.96)	1.53E-08	<0.0001	0.270	0.09	1.31 (1.10-1.56)	2.78E-07	<0.0001
Academic year	First year	7032										
	Second year	6698	0.193	0.04	0.82 (0.77-0.89)	3.54E-07	<0.0001	-0.199	0.10	0.82 (0.67-1.00)	1.70E-07	<0.0001
	Graduate year	6984	0.012	0.04	1.01 (0.94-1.09)	0.75		-0.004	0.04	1.00 (0.92-1.08)	0.92	
	Resit of graduate year	371	0.396	0.11	1.49 (1.20-1.84)	2.94E-04	8.0E-04	0.349	0.04	1.42 (1.31-1.53)	2E-03	4E-03
Academic performance	Top-tier	4698										
	Second-tier	4679	0.017	0.037	1.02 (0.95-1.09)	0.64		0.025	0.039	1.03 (0.95-1.11)	0.51	
	Third-tier and others	1708	0.030	0.056	0.97 (0.87-1.08)	0.59		0.009	0.059	1.00 (0.90-1.13)	0.88	
Acquaintance with COVID19 cases	No	20757										
	Yes	328	0.237	0.128	0.79 (0.61-1.01)	0.06		0.059	0.14	1.06 (0.81-1.40)	0.67	
IDSHL score^b	≤73	10759										
	>73	10326	0.395	0.030	1.48 (1.40-1.57)	<2.0E-16	<0.0001	0.418	0.03	1.52 (1.43-1.61)	< 2E-16	<0.0001

^a Adjusted by the all the variables as listed in the characteristics; ^b IDSHL: Infectious disease-specific health literacy. ^c The adjusted P value based on Benjamini-Hochberg FDR test.







This preprint research paper has not been peer reviewed. Electronic copy available at: <https://ssrn.com/abstract=3606433>

