

The Impact of Preferential Medical Education System and Socioeconomic Status on Substantial GP Development in China

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ABSTRACT

Objective: This study intends to find out the association between senior high school graduates' SES and their undergraduate students' program selection and further explore the its impact on medical education system and substantial GP development.

Methods: The study adopted a quantitative method. Specifically, one-way ANOVA was used initially to compare the SES among high school graduates from different programs. Then multi-nominal logistic regression was used to predict and find out the specific SES changes and accurate odds ratio among different programs.

Results: The results indicated that there were significant mean differences in SES among the four programs (Medical Science; Science & Engineering; Humanities & Arts; Social Science) at $P < .05$ level [$F=5.244$, $p=.002$, $\eta^2=.045$]; The mean score for social science ($M = 12.35$, $SD = 3.36$) was significantly different from science & engineering ($M = 14.06$, $SD = 4.35$). The mean score for social science was significantly different from medical science ($M = 14.12$, $SD = 3.14$). Moreover, the results of Multinomial Logistic Regression Analysis showed that compared with the Social Science program (reference group), higher SES significantly increased the likelihood of students entering Humanities & Arts, Science & Engineering, and Medical Science, with the effect being strongest for Medical Science.

Conclusion: This research explored the current situation of medical students' SES level and illustrated the preference of medical education system in China as well as its' negative impact on GP development and PHC (primary healthcare) improvement. It is recommended that comprehensive and thorough reforms are needed encompassing both enrollment and education quality aspects.

Keywords: medical education system; SES; substantial; GP development, PHC

INTRODUCTION

According to the Alma-Ata Declaration, the main task of the primary healthcare system (PHC) is to provide universally accessible basic healthcare for individuals and families in the community (Hone et al., 2018). As the first level in the national health system, it is the key to achieving "Health for all" (Hall & Taylor, 2003). With the evolution of the global disease spectrum, mortality spectrum and the trend of population aging, strengthening the construction of primary health care system has become the core task of the development of medical and health undertakings in various countries (Bitton et al., 2017). Primary health care (PHC) in China is mainly provided by primary health care institutions, which provide basic diagnosis and treatment of common and frequently-occurring diseases, chronic disease and elderly health management, public health and emergency response services (Li et al., 2020).

General practitioners (GP), as the providers of first contact, continuous, coordinated and comprehensive patient-centered health care and treatment services, are the core human resources of the primary health care system, and their substantial and sustainable development is the key to realizing the function of hierarchical diagnosis and treatment and improving the efficiency of the use of medical and health resources (Kuhlmann et al., 2024). At present, the cultivation of general practitioners in China is mainly through continuing education, GP transfer

training and “5+3” clinical medicine program, which refers to 5 years’ undergraduate medical education and 3 years’ standardized residency training (SRT) and in SRT phase, medical graduates completed their initial medical career choice, such as GP or other specialists (Su & Zhao, 2023).

Despite the continuous encouragement of national policies and the vigorous publicity of the society, the development of general practitioners in China still faces the serious problems of insufficient quantity and lower quality to be improved. First, according to the guidelines issued by the General Office of the State Council, “by 2030, every 10,000 urban and rural residents will be equipped with five qualified general practitioners.” Although the number of general practitioners has been growing in recent years, with 3.28 qualified general practitioners per 10,000 urban and rural residents by 2022, a considerable proportion of (assistant) general practitioners have only obtained certificates and have not yet registered and obtained practicing qualifications. According to regulations, general practitioners who have not obtained practicing qualifications shall not provide general practice services.

Secondly, in the overall general practitioner team, the number of general practitioners who have become general practitioners through short-term transfer training accounts for more than half (Yang et al., 2024). The quality of these general practitioners is somewhat different from that of general practitioners who have received “5+3” undergraduate education and standardized residency training in terms of job competence and professionalism (Su & Zhao). The problem of heterogeneity of general practitioners at the grassroots level is more prominent.

Theoretically, medical education system, as the provider of human resources for the healthcare service market, should align its development model and content with market demands (Birch et al., 2009). The different roles of general practitioners and specialists in healthcare services necessitate a clear distinction and close cooperation between their work domains and service populations to achieve the goals of rational resource utilization and effective operation of the healthcare system (Gao et al., 2024). However, the mismatch and misalignment issues are prevalent in current healthcare system. Preferential medical education system for specialists and higher SES (socioeconomic status) medical graduates hinders the substantial development of general practitioners in China.

In China, in 2022, average college entrance exam scores of clinical medicine students nationwide is 544.49, much higher than national first-tier university college entrance exam average scores line 515. Also in 2022, clinical medical students from urban areas accounts for 59.65% and clinical medical students graduating from key high schools and model high schools accounts for 50.85% (NCDME, 2022). These data manifest that medical students are the elites group compared with students from other disciplines.

However, among these medical graduates, since GPs are primarily positioned in grassroots healthcare institutions, which are generally equipped with poorer working conditions and have limited career prospects, numerous studies have stated that GP are usually come from lower socioeconomic status (SES) background. Therefore, this study aims to find out the association between senior high school graduates’ SES and their undergraduate students’ program selection and further explore the its impact on medical education system and substantial GP development. The research questions are proposed as follows:

RQ1: What are the patterns of university program choices among high school graduates?

RQ2: How does socioeconomic status (SES) influence high school graduates’ choice of university program?

RQ3: How does a medical education system shaped by socioeconomic status (SES) influence the development and practice of general practitioners (GPs)?

METHODS

Methods inquiry should be based on research assumptions (Punch, 2013). This research aims to investigate the associations between senior high school students’ SES and their undergraduate program selection, hence, quantitative method were employed, as it is quite suitable for ensuring relationships among variables and making predictions (Hair et al., 2019a). Additionally, cross-sectional data and correlational design were adopted in this research.

Population and Sampling of the Study

The target population consists of senior high school graduates in order to illustrate the preference of medical education compared with other programs linking with students' SES. The population consists of 2023 cohort senior high school graduates in Guizhou province. According to the statistical data produced by the Ministry of Education, the total number of 2023 cohort senior high school graduates in Guizhou province is 318, 658.

In order to ensure the representativeness of the sample, stratified random sampling was adopted. Firstly, the total number of senior high schools in Guizhou Province is 505, which can be divided into 3 types that involve model senior high schools, regular senior high schools in urban areas and regular senior high schools in rural areas. Then, by applying the ratio and random sampling technique, in total 9 schools were selected from diverse types of schools with 4910 students. Next, based on the Research Advisors table and Krejcie and Morgan's formula (Krejcie & Morgan, 1970), 356 graduates was sampled. Finally, according to the ratio, the number of samples to be selected from each type of school is determined. The following chart shows the selecting and calculating details.

$$n = N * Z^2 * P * (1 - P) / e^2 \div [N-1 + Z^2 * P * (1 - P) / e^2]$$

where n = the sample to be selected

N = total population

Z = critical value (95%) confidence level (1.96)

P = sample proportion (0.5)

e = margin error

$$n = 4910 * (1.96)^2 * 0.5 * (1-0.5) / (0.05)^2 \div [N-1 + (1.96)^2 * 0.5 * (1-0.5) / (0.05)^2]$$

$$n = 4910 * 0.9604 / 0.0025 \div [4910 - 1 + 0.9604 / 0.0025]$$

$$n = 4910 * 384.16 \div [4910 - 1 + 384.16]$$

$$n = 4910 * 384.16 \div 5293.16$$

$$n = 4910 * 0.073$$

$$n = 356$$

Thus, 356 students were sampled.

Table 1 Stratified Random Sampling

Type of Senior High Schools	No. of Senior High Schools	Schools Selected	No. of Students	Students Selected
Model Senior High Schools	134	2	1900	138
Regular Senior High Schools (urban Areas)	317	6	2760	200
Regular Senior High Schools (Rural Areas)	54	1	250	18
Total	505	9	4910	356

Data collection

The data of all variables have records in related administrative departments of sampled schools, so this research applied secondary data since they are more convincing, objective and benefit the accuracy of the possible results better than the survey response.

At first, a permission and approval letter from a local Institutional Review Board-IRB was obtained before conducting this research. Then, for the SES data of 2023 cohort senior high school graduates, the secondary data of the sampled graduates were collected based on the archival records from each sample school mainly comprising their parents' education level, parents' occupation and family's income. The second variable is program selection made by the senior high school graduates, and the data included four dimensions: medical science, science and engineering, social science, and humanities and arts.

Data analysis

Descriptive analysis serves as the first step for quantitative design. It utilizes the numerical data for describing the characteristics of the data set collected from the samples, which provides a clear picture of the data attributes and necessary information for the whole research (Villamin et al., 2025). Influential analysis considers the association among variables and also can make predictions (Braun & Oswald). Hence, this research adopted both descriptive analysis and influential analysis to revolve the proposed research questions.

Though the sample size is 356, after data collection, and in total 340 samples are obtained, while the missing value is 16. Among them, 10 samples lack parental education level, 5 samples have incomplete parental occupation information, and 1 sample's program information is missing. So the data retrieval rate is 95.5%.

For SES data, the first component is the parental education level, which includes 6 levels (Primary school or below; Junior secondary school; Senior secondary school/Vocational secondary school/Technical school; Junior college; Bachelor's degree; Master's degree or above). Simultaneously, they were sequentially coded from 1 to 6, ranging from primary school or below (1) to Master's degree or above (6).

For the second component, parental occupation, according to Research Report on Contemporary Social Stratification in China (Lu, 2002), classified parental occupation into 10 categories: Government officials and social administrators; Managers of large and medium-sized enterprises; Owners of small and medium private enterprises (small-scale defined as enterprises with 200-300 employees and annual revenue between 3 to 20 million CNY); Professionals and technical specialists (e.g., engineers, doctors, lawyers, teachers, researchers); Lower- and mid-level civil servants, clerks, and general office staff; Self-employed individuals (e.g., small shop owners, food service vendors, artisans); Commercial and service workers (e.g., food service staff, salespeople, customer service representatives); Industrial workers (e.g., workers in manufacturing and construction sectors); Agricultural, forestry, animal husbandry, and fishery workers; Unemployed, underemployed, and jobless individuals in urban and rural areas, they were also sequentially coded from 10 to 1, ranging from Government officials and social administrators (10) to Unemployed, underemployed, and jobless individuals in urban and rural areas (1) (Wang & Wang, 2023).

For the third component, parental income was divided into five levels, including: Below 5,000 CNY; 5,000-8,000 CNY; 8,000-12,000 CNY; 12,000-24,000 CNY; Above 24,000 CNY), and were sequentially coded from 1 to 5, ranging from Below 5,000 CNY (1) to Above 24,000 CNY (5). Then according to the SES calculating formula from related researchers, $SES = (0.82 * \text{parental education level} + 0.81 * \text{parental occupation} + 0.76 * \text{parental income}) / 0.63$, the score of each sample's SES is obtained (Sun and Zhou, 2023; Ren, 2010). Next, for the data of program selection, all programs be selected by the samples were classified into four categories, including social science, coding as 1, humanities and arts, coding as 2, science and engineering, coding as 3 and medical science, coding as 4.

To address the primary research question, SPSS software was employed. Initially, one-way ANOVA was conducted to compare the socioeconomic status (SES) of high school graduates from various programs.

Subsequently, multinomial logistic regression was utilized to predict and ascertain the specific changes in SES and the precise odds ratios across different programs.

RESULTS

Demographic information of the respondents

According to Table 1, the majority of respondents are female, they number 190, and account for 55.88% of the total samples, while the males amount to 150, accounting for 44.12%. Among all respondents, 122 are from regular high schools in urban areas (35.89%), slightly outnumbering samples from regular schools in rural areas (102, 30%). The sizes of samples from national model high schools and provincial model high school are relatively low, with a smaller proportion from the national model high school (48, 14.12%).

Table 2 Demographic Data

Variables	Category	Frequency	Percentage (%)	Cumulative Percentage (%)
Gender	Male	150	44.12	44.35
	Female	190	55.88	100
Type of high school	Regular HS in Rural Areas	102	30.00	30.00
	Regular HS in Urban Areas	122	35.89	65.89
	Provincial Model HS	68	20.00	85.89
	National Model HS	48	14.12	100
	Total	340	100	100

(Source. Author's Creation)

Patterns of university program choices among high school graduates

At first, based on the table 2, the mean value of high school graduates' SES is 13.54, while the standard deviation is 3.86 based on the computing value through the formula mentioned in data analysis section. Regarding high school graduates' program selection, we could see that most of them selected science and engineering and social science, and the percentages are 32.94% and 32.35%, respectively. This is followed by medical science (91, 26.76%). while high school graduates selecting humanity and arts program represented the smallest size (27, 7.94%).

Table 3 The Results of Descriptive Analysis

Variables	Sample Size (N)	Minimum	Maximum	Mean	SD
SES	340	3.79	26.70	13.53	3.86
Variables	Category	Frequency	Percentage (%)	Cumulative Percentage (%)	
Program	Social Science	110	32.35	32.35	
	Humanities & Arts	27	7.94	40.29	

	Science and Engineering	112	32.94	73.23
	Medical Science	91	26.76	100
	Total	340	100	100

(Source: Author's Creation)

Comparison and Prediction of High School Graduates' SES and Program Selection

In response to the second research question, one-way ANOVA was conducted to compare the differences in SES by different programs. There were significant mean differences in SES among the four programs (Social Science, Humanities & Arts, Science & Engineering, Medical Science) at $P < .05$ level of significance [$F = 5.244$, $p = .002$, $\eta^2 = .045$]. Post hoc comparison using the Tukey HSD test indicated that the mean score for social science ($M = 12.35$, $SD = 3.36$) was significantly different from science & engineering ($M = 14.06$, $SD = 4.35$) at the .05 level of significance. The mean score for social science ($M = 12.35$, $SD = 3.36$) was significantly different from medical science ($M = 14.12$, $SD = 3.14$) at the .05 level of significance. The effect size was interpreted using the conventions proposed by Cohen (2013), where partial η^2 values of .01, .06, and .14 represent small, medium, and large effects, respectively. Hence, the effect size is small ($\eta^2 = .045$), meaning that 4.5% of variance of SES is attributed to the program.

Table 4 The Results of Comparison of SES by Programs

Programs	<i>n</i>	Mean	SD	<i>F</i>	<i>p</i>	η^2
				5.244	.002**	.045
Social Science	110	12.35	3.36			
Humanities & Arts	27	14.11	4.88			
Science & Engineering	112	14.06	4.35			
Medical Science	91	14.12	3.14			

(Source: Author's Creation)

Table 5 Multiple Comparisons

(I) Programs	(J) Programs	Mean Differences (I-J)	S.E.	Sig.
Social Science	Humanities & Arts	-1.77	.81	.14
	Science & Engineering	-1.71*	.51	.01**
	Medical Science	-1.78*	.54	.01**
Humanities & Arts	Science & Engineering	.06	.81	1.00
	Medical Science	-.01	.83	1.00
Medical Science	Science & Engineering	-.06	.54	.99

Note:*** $P < .001$, ** $P < .01$, * $P < .05$; Dependent variable: SES.

(Source: Author's Creation)

Furthermore, in order to explore the detailed SES differences of high school graduates in these four programs and analyze the relationship between high school graduates' SES and their program selection as well as investigate whether SES can predict high school graduates' program selection, Multinomial Logistic Regression is applied. Based on the results of Table 5, the model's goodness-of-fit was evaluated using the Likelihood Ratio Test (LRT). The test yielded a statistically significant result, this being $X^2(9) = 77.03$, $p < .05$, indicating that the model with predictors provides a significantly better fit to the data than the null model (i.e., a model with only the intercept). Therefore the full model is considered as having an acceptable overall fit.

According to the results of Multinomial Logistic Regression Analysis, relative to social science, under the premise of humanity and arts, $\beta = .12$, $P = .04$ ($< .05$), SES has a significant positive impact on the program. The odds ratio (OR) value is 1.13, suggesting that for every one-unit increase in SES, the change in the odds increases by 1.13 times (social science---> humanity and arts). Regarding Science and Engineering, $\beta = .09$, $P = .02$ ($< .05$), which means that SES has a significant positive impact on the program. The odds ratio (OR) value is 1.10, showing that for every one-unit increase in SES, the change in the odds increases 1.10-fold (social science---> Science and Engineering). For Medical Science, $\beta = 0.14$, $P = .00$ ($< .05$), it means that SES has a significant positive impact on the program. The odds ratio (OR) value is 1.15, indicating that for every one-unit increase in SES, the change in the odds increases by 1.15 times (Social science---> Medical Science).

Table 6 Model Fitting Information

Model	Model Fitting Criteria	Chi-Square	df	Sig.
Intercept	811.51			
Final	717.00	94.51	15	.00

(Source: Author's Creation)

Table 7 The Results of Multinomial Logistic Regression Analysis

Humanities & Arts	β	S.E.	Wald x^2	P	OR	OR (95% CI)
SES	.12	.06	4.04	.04*	1.13	1.00~1.28
Male	1.26	.46	7.68	.01	3.54	1.45~8.64
Female	0 ^b	.	.	.	.	.
Regular HS in Rural Areas	-.53	.68	.68	.44	1.70	.44~6.54
Regular HS in Urban Areas	-.32	.65	.63	.63	.73	.20~2.62
Provincial Model HS	-.82	.93	.77	.38	.44	.07~2.74
National Model HS	0 ^b	.	.	.	.	.
Science & Engineering	β	S.E.	Wald x^2	P	OR	OR (95% CI)
SES	.10	.04	5.38	.02*	1.10	1.02~1.19
Male	1.92	.31	38.00	.00	6.80	.3.70~12.51
Female	0 ^b	.	.	.	.	.
Regular HS in Rural Areas	.08	.50	.02	.88	1.08	.41~2.88
Regular HS in Urban Areas	-.29	.46	.39	.53	.75	.31~1.84

Provincial Model HS	.65	.51	1.62	.20	1.92	.70~5.23
National Model HS	0 ^b	.	.	.	.	.
Medical Science	β	S.E.	Wald x²	P	OR	OR (95% CI)
SES	.14	.04	11.64	.00***	1.15	1.06~1.24
Male	.31	.33	.87	.35	1.36	.71~2.60
Female	0 ^b	.	.	.	.	.
Regular HS in Rural Areas	1.10	.51	4.62	.03	3.01	1.10~8.20
Regular HS in Urban Areas	-.28	.51	.30	.59	.76	.28~2.05
Provincial Model HS	.56	.56	1.00	.32	1.74	.59~5.16
National Model HS	0 ^b	.	.	.	.	.

Note: ***P<.001, **P<.01, *P<.05; McFadden R² =.11 Cox & Snell R² = .24, Nagelkerke R² =.26;

a. The reference category is social science; b. This parameter is set to zero because it is referent.

(Source: Author's Creation)

The influence of medical education system shaped by socioeconomic status (SES) on development general practitioners (GPs)

The above research results show that among high school graduates, students who choose the Medical Science Program have the highest SES compared with other programs, so it indicates that the medical program has a preference compared with other university programs. However, among the high SES group who choose Medical Science Program, they generally have higher requirements in terms of career expectations and treatment (Yıldız & Khan, 2024; Mitsouras et al., 2019; Torres-Roman et al., 2018), which seriously hinders the possibility of choosing GP as a career after graduation. Therefore, the current favored medical education system is not conducive to the growth and sustainable development of the general practitioner team.

DISCUSSION

The results of SES differences among high school graduates who access various programs demonstrated that the mean score of those doing the medicine program is the highest among high school graduates who access other programs. It is followed by humanities and arts, science and engineering and social science. It indicates that the SES of students who are in the medical program is higher than students from other programs. The results are consistent with the previous findings for China and other countries.

Studies find that there is minimal SES diversity in the whole higher medical education system because students from low SES backgrounds confront significant obstacles in their desire to become physicians. AAMC data demonstrated a continuously low percentage of medical student matriculants with a parent whose highest level of education completed was less than a Bachelor's degree from 2018 to 2024 (Velasquez et al., 2024). Likewise, in China, clinical medical students from urban areas account for 59.65% and clinical medical students graduating from key high schools and model high schools account for 50.85% in 2022 (NCDME, 2022). Under this climate, higher SES group of medical graduates hardly work as GP at grassroots level.

Therefore, firstly, widening access to medical education and improving the SES diversity of undergraduates majoring in medicine is recommended for both educational equity and healthcare quality and equity. Some research also reported that enlarging the "rural pipeline" for students promotes the quantity and quality of GPs, and leads to substantial improvement of primary healthcare and contributes to the United Nations SDG goal of

“health for all” (Ogden et al., 2020). For example, in China, it should be a policy to expand the enrollment and training scale of the rural free-oriented medical student program, and explore the mechanism of aligning graduate education in general medicine with standardized residency training in general medicine. This would allow students who choose the general practice (including free-oriented medical students) to obtain both a Master’s degree certificate and a standardized training certificate after completing three years of standardized residency training, thereby increasing the attractiveness of choosing general practice and serving grassroots communities.

Secondly, the reform or adjustment of medical school education should better adapt to job requirements, with a focus on cultivating the competencies needed for general practitioners. This includes emphasizing the increase of courses and practical training in general medicine during the education process, covering areas such as chronic disease management, health education, emergency public health response, health psychology, and health insurance policies. At the same time, it is important to focus on cultivating medical students’ concepts of general practice, communication skills, and humanistic qualities in medicine, helping them to develop a generalist mindset and habits in general practice.

Thirdly, the current hardware and software capabilities of general practice education are far behind those of specialized medicine. In medical schools, it is necessary to accelerate the establishment and construction of dedicated departments of general practice in all medical schools nationwide, while also enhancing the hardware facilities of clinical practice training centers and standardized training bases for general practice.

Fourthly, it is necessary to strengthen the soft capability of general practice faculties, selecting individuals with solid teaching abilities and a passion for general practice education as GP instructors. Through centralized and unified online and offline training, standardized lesson preparation, and various forms of observation and communication, the goal of standardization and across-the-board high quality of general practitioners could be achieved.

CONCLUSIONS

This research explored the current situation of medical students’ SES level and illustrated the preference of medical education system in China as well as its’ negative impact on GP development and PHC improvement. It is recommended that comprehensive and thorough reforms are needed encompassing both enrollment and education quality aspects. Moreover, all stakeholders including healthcare delivery system, health insurance payment system as well as inter-departmental governance are all supposed to be improved to support substantial GP development.

Limotations And Further Research

Although this study adopted scientific analysis methods, there are still some limitations. First of all, the study mainly relies on quantitative analysis, subsequent studies can adopt qualitative analysis methods to deeply explore the causes of the current situation. In addition, the sample size of this study is relatively small, and it is recommended to expand the scope of the survey. It should be noted that this study only focuses on Guizhou Province, China, and its conclusions may have certain limitations in terms of generalization.

Ethical Approaval

Ethical approval was granted by the “Research Involving Human Subject Committee” of Guizhou Medical University, Guizhou, China.

Conflict Of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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