

## Research Article

# Signed Up with Family Doctors and Health Education among Internal Migrants in China: A Nationwide Cross-Sectional Study

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Health education is one of the most effective and efficient ways to achieve the goal of universal health coverage and the sustainable development goals. The equity of access to health services (especially services from community healthcare centers) for internal migrants is an important issue of global concern. However, due to the registration system, long-term residence plan, education level, and other determinants, it is more difficult for internal migrants to enjoy equitable health education compared with local residents. At present, there is no research on signing up with family doctors mainly from community healthcare centers among internal migrants and their impact on access to health education services. In this nationwide cross-sectional study, we used the migrant population dynamic monitoring survey (MDMS) in 2018 to assess the disparities in signing up with a family doctor and its association with health education among internal migrants in China. Among the 151,892 participants, a total of 11.26% migrants had signed up with a family doctor and 81.37% internal migrants had received health education. There was a significant association between signing up with a family doctor and health education in the univariate model (aOR = 1.113; 95% CI: 1.095, 1.132) and the multivariate model (aOR = 1.107, 95% CI: 1.089, 1.126). Meanwhile, age (aOR<sub>interaction</sub> = 0.996, 95% CI: 0.994, 0.997), migration time (aOR<sub>interaction</sub> = 0.927, 95% CI: 0.907, 0.948), and migration range (aOR<sub>interaction</sub> = 0.994, 95% CI: 0.992, 0.997) also had an impact on the relationship between signing up with family doctors and health education. Due to the health education inequalities among internal migrants in China, we need to improve health education access and utilization of internal migrants. As signed up with family doctors was significantly associated with health education among migrants in China, we recommended that the government and healthcare facilities promote health education through family doctors. The number and professional ability of family doctors should also be improved especially in areas with weak healthcare service resources in the future.

## 1. Introduction

Promoting universal health coverage has received great attention all over the world [1, 2]. As a goal which all people obtain health services without risking financial hardship from unaffordable out-of-pocket payments, universal health coverage emphasized the importance of accessing health services [3]. Meanwhile, the sustainable development goals (SDGs) are also related to the reduction of health inequalities nationally

and worldwide, and one of their aims is to provide equitable health services for all people [4]. The community healthcare centers have proven to be one of the most convenient places for people to get access to healthcare [5]. Some health promotion programmes based on community healthcare centers are also helpful for improving health coverage sustainability [6].

In recent years, China has achieved great development in universal health coverage to reduce health inequality

between residents [7]. However, as previous studies have shown, there was still a gap of equitable and accessible health services between some low-income and lower-middle-income countries and some developing districts [8, 9]. The COVID-19 pandemic has also placed enormous strain on public health worldwide [10, 11]. Therefore, it is an urge for policymakers and members of healthcare facilities (especially primary healthcare facilities) to find out the determinants of universal health coverage and health awareness among the public in order to promote the health status of residents [2].

As an essential way to improve people's health awareness and promote public health, health education is considered as one of the most effective and efficient ways or free health services aimed at improving people's health awareness and keeping a healthy lifestyle [12]. Health education is also advantageous to health literacy, which is proven to be one of the social determinants of health [12]. However, in some developing countries and areas, due to the limitation of financial revenue, people's relatively poor health status, and the need for a huger investment in health, it is more difficult to achieve the goal of universal health coverage and provide equitable education for all people [13, 14].

Meanwhile, although health education services could improve people's health literacy and promote health behaviour, some individuals such as internal migrants were still unable to get access to health education due to the registration system (also known as "hukou"), long-term residence plans, limited education attainment, and so on [15]. In China, according to the seventh national census of China, the total number of migrants was 375.82 million in 2020, which showed that great attention should be paid to the growth of migrants [16]. The great inequalities of the health education services among the disadvantaged groups should be eliminated or narrowed in order to improve the health of the entire population [17].

Family doctor services in China, which are aimed at promoting public health and healthcare services mainly in community healthcare centers, originated in 2009, together with the "new medical reform." The family doctor contracting services is a key breakthrough in implementing a graded diagnosis and treatment system and is beneficial to promoting access to health utilization [18]. In order to provide primary health care for the entire population, a multidepartment jointly issued an important document, which further clarified the development goals of family doctor contract services, which has been promoted and developed till now [19]. Family doctors (also called family physicians or general physicians) are generalists who were trained at the postgraduate level to address the majority of the primary care needs of patients of all ages in the communities they serve. In China, through the family doctor contract service system, family doctors provide public services and cost-effective medical services to help patients who lack professional knowledge improve their ability to appropriately choose medical institutions and obtain long-term coordinated healthcare [18]. Health education for residents, especially people with chronic disease or risk factors is one of the basic works of family doctors. Health

promotion could be carried forward by family doctors through health education for signed-up residents. In this case, health education could be promoted by family doctors.

In order to explore the impact of contracting with a family doctor on health education and the potential mechanisms, we proposed the following hypotheses. And based on our hypothesis, we conducted a framework in this study to explain the relationship and the function of interactions (Figure 1).

Family doctors have proven to be beneficial in previous studies [20]. In many countries, especially the United Kingdom, the United States, France, and Singapore, family doctors (or called general practitioners) are essential to primary health care including health education [21]. However, there is a lack of literature showing that this phenomenon is also adaptive in China. However, we found that previous researchers did not examine the association between signing up with family doctors and health education among migrants in China. Based on previous research, we aim at exploring the association between signed-up family doctor and health education among migrants in China using a nationwide cross-sectional survey. As such, this study's first hypothesis is developed.

*Hypothesis 1.* There is a positive association between signing up with a family doctor and health education among migrants in China.

Younger migrants tend to have higher educational attainment level, and they also have more access to information about health program and health education through mass media [16]. Because of a better understanding of the family doctor contract service system, young migrants can make better use of the service content, receive health education, and also have higher health literacy. We assume that we could find greater significance of the association between signed-up family doctors and health education among younger migrants. Hence, we developed the second hypothesis.

*Hypothesis 2.* The positive association between signing up with a family doctor and health education of younger migrants is larger in magnitude.

According to internal migrants in China, they are mainly moving from developing provinces or districts to developed provinces or districts which have more financial income and better health service provision [22]. People who migrate across provinces are more likely to migrate to Guangdong, Shanghai, and other places, and the contracted services of family doctors in these provinces are better developed than those in other provinces [18, 23]. Based on previous studies, we developed Hypothesis 3.

*Hypothesis 3.* The positive association between signing up with a family doctor and the health education of migrants moving across provinces is larger in magnitude.

As previous research has shown, migrants tend to move from developing places to more developed places, for example, from rural areas to urban areas [24, 25]. The districts where migrants inflowed in have better healthcare services

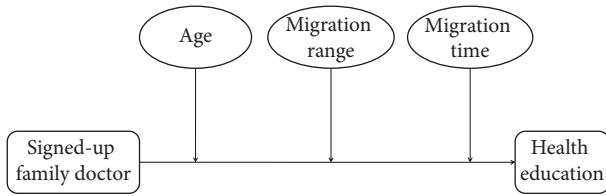


FIGURE 1: The conceptual framework of this study.

and a more complete family doctor team [22]. We assume that the longer migrants move to the destination of distribution, the greater the association between a signed-up family doctor and health education. Therefore, we developed Hypothesis 4.

*Hypothesis 4.* The positive association between signing up with a family doctor and health education of migrants moving longer is larger in magnitude.

## 2. Methods

*2.1. Data Collection.* We used data from the Migrant Population Dynamic Monitoring Survey (MDMS), which is a nationally representative demographic and health survey conducted by the Migrant Population Service Center of the People's Republic of China (PRC). This survey used a sampling method called probability proportional to size (PPS), which is a stratified, multi-stage and proportional scale sampling technique. In this research, the investigators use a "multistage" method, in which the sampling is divided into three stages. The first stage is to select townships (towns and streets) by the PPS method. The second stage is to select village (neighborhood) committees in the selected townships (towns, streets) according to the PPS method. The third stage is to select individual survey objects from the village (neighborhood) committee [16].

In the aspect of "proportional scale sampling," the sample allocation proportion between each layer is inconsistent with its proportion in the population. Participants in this survey were migrants who lived in one destination city for more than one month. All of the above information was from the technical documents of 2018 migration population dynamic monitoring survey (MDMS), which was published in 2021 and needed to be downloaded from the online website in PDF version for reading (<https://www.ncmi.cn/phda/dataDetails.do?id=CSTR:A0006.11.A000T.201906.000225>). This 2018 MDMS data included information about demographic, socioeconomic, migration, and health variables for migrants. We excluded sample without information about family monthly income and got a final sample of 151,892 migrants in this study (Figure 2).

*2.2. Measurements.* All questions to this survey were asked face-to-face with respondents and collected by interviewers. In order to conduct this research, the interviewers were trained before the investigation, and the investigators included the investigation instructors and investigators for better management. This survey included various questions

including family members, income and expenditure, health, public service utilization, and so on.

*2.2.1. Dependent Variables.* The independent variable was health education. Respondents were asked the question: "Have you ever received health education?" and the answers were "yes" or "no." The health education rate was calculated by dividing the number of people who ever received health education by the total number of people and then multiplying the number by 100%.

*2.2.2. Independent Variable.* The independent variable was the signed-up with family doctor. Respondents were asked the question: "Have you ever signed up with a family doctor?" and the answers were "yes" or "no." The signed-up with family doctor rate was calculated by dividing the number of people who ever signed up with family doctors by the total number of people and then multiplying the number by 100%.

*2.2.3. Control Variables.* The control variables of this research included demographic variables, socioeconomic variables, and migration-related variables. The demographic variables included age, gender, household registration, and marital status. Age was measured by 2018 minus birth year of migrants, which was a continuous variable. Gender was a dummy variable which we assigned 0 for female respondents and 1 for male respondents. Household registration was also called the "hukou" system in China, which was assigned 0 for rural area and 1 for urban area. Marital status included three answers which were "single," "married or having a relationship," and "divorced or widowed."

The socioeconomic variables included education attainment and family monthly income. Education attainment was measured by four answers: "middle school or below," "high school," "junior college" and "university or above." Family monthly income was a continuous variable which was measured by the question "In the past year, what is the average monthly total income of your family?"

Migration related variables included migration time and migration range. The migration time was measured by the year people migrated to the local places. The migration range included three answers: "cross-provincial migration within the country," "cross-city migration within province," and "intercounty migration within the city."

*2.3. Analysis.* In this research, chi-square tests were used to analyze the differences between health education and other variables. Odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated using binary logistic regression analysis.

We conducted our research using the following steps. In the first step, the descriptive statistics which included frequency and range and chi-square tests were calculated. We used univariate logistic regression to analyze the association between health education and signing up with a family doctor in the next step. Furthermore, we added control

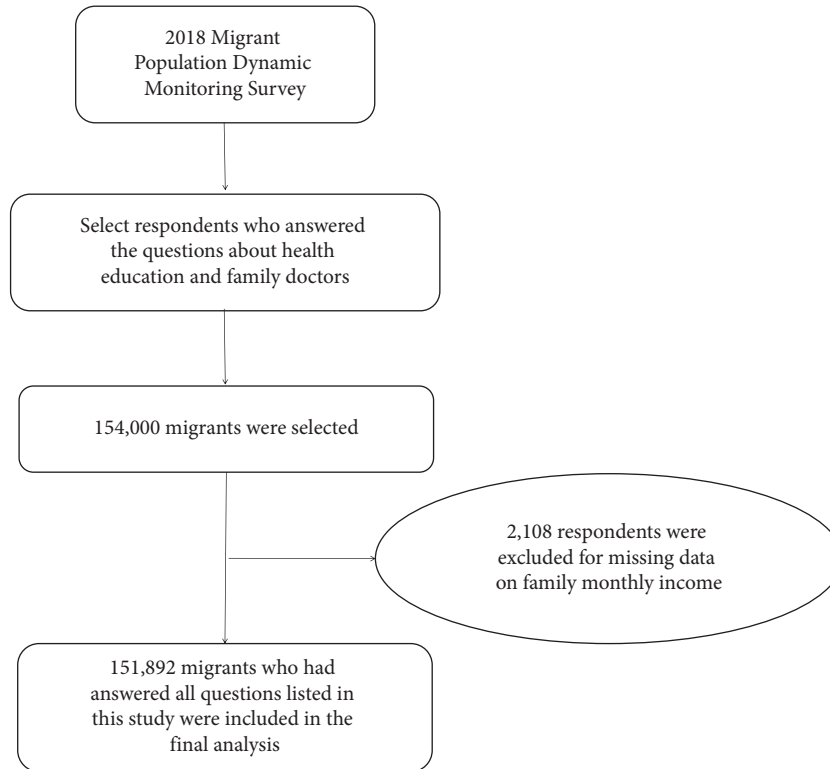


FIGURE 2: The flow diagram of the selection process of sample.

variables to our model including demographic, socioeconomic, and migration-related variables. In order to test the role of age, migration time, and migration range, we also added interaction variables. All statistical analyses were performed using Stata 15.0, and all tests are two-sided. The significance level for all analyses was set at  $p < 0.05$ .

### 3. Results

**3.1. Descriptive Results.** A total of migrants in China were included in the study sample, of which 123594 migrants had ever received health education (81.37%). Table 1 summarized the descriptive statistics of the demographic, socioeconomic, and migration-related status of the respondents. 68.75% of the migrants were from rural areas compared to the people from urban areas only took up for 31.25%, which was similar to the overall demographic structure of migrants. Male and female participants took up for 51.41% and 48.59%, respectively. The results showed that most respondents were married or were having a relationship (97.20%). Migrants with middle school or below education levels made up 58.21%, which was the largest population in this research. People with high school, junior college, and university or above made up 22.39%, 11.54%, and 7.87%, respectively.

The table illustrated that the respondents migrating from one province to another made up for 50.54%, which was more than people migrating cross-city within province and cross-county within city taking up 32.83% and 16.63%, respectively. Healthy respondents were far more than unhealthy people in the total sample which was 86.82% and

13.18%. Only 11.26% migrants had ever signed up with the family doctor while more than 80 percent participants had received health education.

Furthermore, from the results of chi-square tests we found that health education was significantly associated with age, marital status, household registration, education attainment, family monthly income, migration time, migration range, health status and signed-up family doctor of migrants ( $p < 0.001$ ). We also found that gender was also associated with health education ( $p = 0.037$ ).

**3.2. Association between Health Education and Signed-Up Family Doctor.** In the univariate model (Model 1), a significant association between health education and a signing up with a family doctor was found (OR = 1.113; 95% CI: 1.095, 1.132). When adding demographic, socioeconomic, and migration-related factors, we also found a significant association (OR = 1.107; 95% CI: 1.089, 1.126) (Model 2).

What was more, we added interactions in model 3, model 4, and model 5. In model 3, older age showed a negative impact on the relationship between health education and signing up with a family doctor (OR = 0.996; 95% CI: 0.994, 0.997). A negative impact on the association was also shown regarding migration range within cities and provinces rather than cross-provinces (OR = 0.927; 95% CI: 0.907, 0.948). The association between health education and signing up with a family doctor was less significant among migrants moving longer (OR = 0.994; 95% CI: 0.992, 0.997) (Table 2).

TABLE 1: Descriptive statistics of demographic, socioeconomic, migration-related variables for migrants ( $N=151892$ ).

	$N$ (%)	$N$	Health education		
			OR	95% CI	$p$ value
Gender			0.973	0.948, 0.988	0.037*
Female	73800 (48.59)	60209			
Male	78092 (51.41)	63385			
Age	151892 (100)	151892	0.982	0.981, 0.983	< 0.001***
Marital status			0.787	0.762, 0.813	< 0.001***
Single	23197 (15.27)	19648			
Married or having a relationship	124447 (97.20)	100600			
Divorced/widowed	4248 (2.80)	3346			
Household registration			1.207	1.173, 1.242	< 0.001***
Rural	104422 (68.75)	84057			
Urban	47470 (31.25)	39537			
Education attainment			1.229	1.211, 1.247	< 0.001***
Middle school or below	88413 (58.21)	69511			
High school	34004 (22.39)	28873			
Junior college	17522 (11.54)	15125			
University or above	11953 (7.87)	10085			
Family monthly income	151872 (100)	151872	0.999	0.999, 0.999	< 0.001***
Migration time	151892 (100)		0.982	0.980, 0.983	< 0.001***
Migration range			1.284	1.261, 1.308	< 0.001***
Cross-provincial migration within the country	76769 (50.54)	60182			
Cross-city migration within province	49859 (32.83)	42071			
Intercounty migration within the city	25264 (16.63)	21341			
Health status			1.610	1.554, 1.667	< 0.001***
Good	131866 (86.82)	108686			
Bad	20026 (13.18)	14908			
Signed-up family doctor			5.522	5.129, 5.947	< 0.001***
Yes	17107 (11.26)	16347			
No	134785 (88.74)	107247			
Health education		151892	—	—	—
Yes	123594 (81.37)				
No	28298 (18.63)				

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

#### 4. Discussion

China has promoted health services and improved the health status of residents through vigorous reforms in the recent years [18]. However, there were still some challenges. As the disadvantaged group, the migrants in China were facing the health inequality in health education, health service utilization, and other fields [15].

From the results, we found that health education was associated with demographic characteristics and socioeconomic characteristics. Female migrants have a higher level of health education attainment, which was also shown in previous studies that female members were more likely to receive health education and change their traditional attitudes of the public health [26]. At present, policymakers and teachers are increasingly concerned about health education, including health education in the curriculum, the improvement of school environment and facilities, and health-related activities [27]. The younger migrants have received better health education than others, which is also shown in our study.

Socioeconomic status has proven to be linked with health status and health equity among entire population [4]. Migrants with higher educational levels have better health

education. This could also be explained by health education in the school and higher health literacy as well as health awareness [27, 28]. People who have urban household registration also received a higher level of health education. The healthcare services and utilization in urban areas are relatively better than the rural areas. People in urban areas also had easier access to health education information [29]. This may also because of the fact that migrants in urban areas were more likely to sign up with family doctors than suburbs or villages [30]. Respondents with longer migration time had less health education than who migrating shorter, which may also be linked with the age and education attainment status. Meanwhile, migrants moving across counties received more health education than those who moved across cities or provinces, which could be explained by the fact that if people just migrate within the city, it is easier for healthcare workers (especially family doctors) to supervise health literacy and health condition of them. As previous studies have shown, migrants with better health status have a better health education attainment. But this may be the result of the reverse causation, which means that people who receive more health education would pay more attention to their health status so that they could enjoy a better health status.

TABLE 2: The association of signed-up family doctor and health education in the univariate and multivariable logistic regression model.

Health education	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
Signed-up family doctor (not signed as reference)										
Yes	1.113 (1.095, 1.132)	<0.001***	1.107 (1.089, 1.126)	<0.001***	1.310 (1.235, 1.389)	<0.001***	1.256 (1.206, 1.309)	<0.001***	1.153 (1.124, 1.183)	<0.001***
Gender (female as reference)										
Male			1.007 (0.979, 1.035)	0.622	1.006 (0.978, 1.035)	0.659	1.007 (0.980, 1.036)	0.605	1.007 (0.979, 1.035)	0.632
Age			0.989 (0.987, 0.990)	<0.001***	0.999 (0.995, 1.002)	0.456	0.989 (0.987, 0.990)	<0.001***	0.989 (0.987, 0.990)	<0.001***
Marital status (single as reference)										
Married or having a relationship			1.037 (0.989, 1.087)	0.137	1.042 (0.994, 1.093)	0.091	1.037 (0.989, 1.088)	0.135	1.039 (0.991, 1.090)	0.115
Divorced/widowed			1.040 (0.947, 1.144)	0.404	1.045 (0.951, 1.148)	0.362	1.040 (0.947, 1.143)	0.410	1.043 (0.949, 1.146)	0.384
Household registration (rural as reference)										
Urban			1.103 (1.067, 1.139)	<0.001***	1.103 (1.068, 1.139)	<0.001***	1.102 (1.067, 1.138)	<0.001***	1.103 (1.068, 1.139)	<0.001***
Education attainment (middle school or below as reference)										
High school			1.371 (1.321, 1.423)	<0.001***	1.370 (1.320, 1.422)	<0.001***	1.369 (1.319, 1.421)	<0.001***	1.371 (1.321, 1.423)	<0.001***
Junior college			1.438 (1.366, 1.514)	<0.001***	1.438 (1.366, 1.514)	<0.001***	1.437 (1.366, 1.513)	<0.001***	1.439 (1.367, 1.515)	<0.001***
University or above			1.280 (1.207, 1.358)	<0.001***	1.281 (1.207, 1.358)	<0.001***	1.277 (1.204, 1.355)	<0.001***	1.281 (1.208, 1.358)	<0.001***
Family monthly income			0.999 (0.999, 0.999)	<0.001***	0.999 (0.999, 0.999)	<0.001***	0.999 (0.999, 0.999)	<0.001***	0.999 (0.999, 0.999)	<0.001***
Migration time			0.990 (0.988, 0.992)	<0.001***	0.990 (0.988, 0.992)	<0.001***	0.990 (0.988, 0.992)	<0.001***	1.003 (0.997, 1.009)	0.356
Migration range (cross-provincial migration within the country as reference)										
Cross-city migration within province			1.406 (1.362, 1.452)	<0.001***	1.405 (1.361, 1.450)	<0.001***	1.674 (1.576, 1.778)	<0.001***	1.405 (1.361, 1.451)	<0.001***
Intercountry migration within the city			1.449 (1.392, 1.509)	<0.001***	1.448 (1.391, 1.508)	<0.001***	2.049 (1.836, 2.289)	<0.001***	1.449 (1.391, 1.508)	<0.001***
Health status (good as reference)										
Healthy			1.407 (1.354, 1.463)	<0.001***	1.410 (1.357, 1.466)	<0.001***	1.406 (1.353, 1.462)	<0.001***	1.409 (1.356, 1.464)	<0.001***
Interactions										
Age * signed-up family doctor					0.996 (0.994, 0.997)	<0.001***				
Migration range * signed-up family doctor							0.927 (0.907, 0.948)	<0.001***		
Migration time * signed-up family doctor									0.994 (0.992, 0.997)	<0.001***

This study's first contribution is based on extending research into Chinese migrants. Chinese migrants are proven to be one of the special population in China, and they are faced with a different set of stressors compared with nonmigrants including high mobility, low social status, less health access, and others [24]. To our knowledge, this is the first study that analyzed the association between signing up with a family doctor and health education among internal migrants in China.

Second, this study has shown that there was a significant association between health education and signing up with a family doctor among migrants in China. After we added demographic, socioeconomic, and migration-related variables and interactions, the results were all robust. This meant that family doctors could effectively improve the health education level of migrants. We also found that age, migration time, and migration range could improve the effect on health education brought by family doctors. Based on our results, we suggest that the policymakers should promote the family doctor institution.

Third, and most importantly, our study also has policy implications for policy formulation and policy implementation under the COVID-19 pandemic. As the previous study showed, policymakers must promote the development of public health education to improve health status and health literacy [31]. We suggest that in order to promote health education under the COVID-19 pandemic which has posed a great threat to residents, the government and other healthcare institutions should carry forward the family doctor signing system. Family doctors could use their strong professional knowledge and closer relationship with residents living in the local community than doctors in hospitals to promote health education for migrants who moved to the local community and lack related health knowledge.

But meanwhile, improving the health education of migrants through family doctors is also faced with many challenges. On the one hand, the lack of family doctors both in China and other countries is a threat to meeting the needs of health education among migrants [32]. On the other hand, the professional knowledge and skills of many family doctors did not meet the requirements of providing the health related services to the migrants [33]. Research showed that although the number of qualified family doctors has grown greatly in recent years, these qualified family doctors still only constitute a small proportion of family doctors practicing in China's primary healthcare settings [34]. Therefore, we recommended that policymakers should increase the number of family doctors and improve their professional abilities. At the same time, occupational training and skill assessment could be added to the performance evaluation of family doctors [26, 35]. In addition, the contents of health education provided by family doctors should also be more abundant to better cope with the negative impact brought by the pandemic.

However, our study also had several limitations. First, although this Migrant Population Dynamic Monitoring Survey was conducted since 2010, the key variable "signed up

with a family doctor" was only asked in the 2018 MDMS. Therefore, we only used the cross-sectional data to examine our hypotheses. Second, due to the limitations of the present data, we could only find out the association between health education and signing up with a family doctor rather than the casual relationship. The data limitation also hindered us from evaluating the health education and family doctor development status under the COVID-19 pandemic. Third, the information of family doctors could not be added to our models. As the professional ability of individuals differs, the role of health education for each family doctor was also different. It is not very exact to evaluate the impact of family doctors using a single index.

In our future research plan, we hope we can solve the problem of data shortage and explore the casual relationship between signing up with a family doctor and health education service utilization among migrants using panel data. Propensity Score Matching and instrumental variable strategies can also be used to figure out whether there is reverse causality in the relationship between signing up with family doctors and health education. We will also analyze how signing up with a family doctor impacts health education among Chinese migrants and the potential mechanisms.

## 5. Conclusion

This research showed that there was a significant association between health education and signing up with a family doctor among internal migrants in China. Age, migration range, and migration time were also found to moderate the association. We recommended that the government and healthcare institutions promote health education through family doctors. The number and professional ability of family doctors should also be improved in the future.

## Data Availability

Data are available from the corresponding author upon reasonable request.

## Additional Points

*What Is Known about the Topic?* (i) Health education is one of the most effective and efficient ways to improve people's health knowledge and health literacy. (ii) However, it is more difficult for internal migrants to enjoy equitable health education compared with local residents. (iii) While few studies have explored the association between signed up with family doctors and health education among internal migrants in China. *What This Paper Adds?* (i) Using a nationally representative sample of internal migrants in China, we find that there is significant association between signed up with family doctors and health education status among migrants in China. (ii) Migrants with younger age, shorter migration time and smaller migration scope have higher

possibility to sign up with family doctor and receive health education.

### Ethical Approval

Our study had been granted an exemption from requiring ethics approval by Medical Health and Human Resources Ethics Committee, Renmin University of China.

### Conflicts of Interest

The authors declare that there are no conflicts of interest.

### Authors' Contributions

Jun Wang and Yang Bai contributed equally to this work and should be regarded as co-first authors.

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