

# Sociodemographic Disparities in the Establishment of Health Records Among 0.5 Million Migrants From 2014 to 2017 in China: a Nationwide Cross-sectional Study

**Jun Wang**

Renmin University of China

**Jingmin Zhu**

University of Birmingham

**Xueyao Wang** (✉ [3045725097@qq.com](mailto:3045725097@qq.com))

Renmin University of China

**Yue Che**

Renmin University of China

**Yang Bai**

Renmin University of China

**Jue Liu**

Peking University

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## Research

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# Abstract

**Background:** Migrants account for a large part of China's population. Many policies and inventions have been taken to improve access to public health services and the health of migrants. China's Basic Public Health Services (BPBS) are a series of public health services in this policy domain, which aims at promoting the access of public health services and improve health equity of residents. The establishment of health records is the fundamental service of BPBS. However, there is little known about the establishment of health records among migrants in China, which hinders the more efficient provision of health services for migrants, and health equity is difficult to achieve. Based on the research gap, this study aims at showing the sociodemographic disparities in the establishment rate of health records, and identifying priorities and recommendations for promoting health equity of migrants in China.

**Methods:** This study used national data from China Migrants Dynamic Survey (CMDS) from 2014 to 2017 to evaluate the sociodemographic disparities in the establishment rate of health records and utilization of relevant public health services. The study included 539926 respondents. Following the descriptive statistics of migrants, we showed the establishment rate of health records by sociodemographic characteristics and migrating related characteristics. Multivariate analysis was conducted to explore the associations between sociodemographic characteristics, migrating related characteristics and the establishment of health records.

**Results:** The establishment rate of health records among migrants in the sampled years were 22.99%, 38.44%, 27.29% respectively, and 29.18% in general, and there existed heterogeneity in the establishment rate of health records by sociodemographic characteristics and migrating related characteristics. Female migrants who were older, from middle age, married or living with partner, with higher educational attainment, with urban household registration, migrated for longer time, migrated for the reason of studying or family issues, migrated in province were more likely to establish health records.

**Conclusion:** There existed sociodemographic disparities in the establishment rate of health records and inequalities in the utilization of health records services among migrants in China. Migrating related characteristics also had impact on the establishment status. Policies should take both supply side and demand side of health services to improve the health equity of migrants, which means that relative departments should continue to invest in primary healthcare centers to improve their ability to provide services as well as migrants' health literacy.

## Introduction

Migrants are a large population in China, and the equity in the utilization of health services of migrants is an important policy issue as well as academic issue. According to the Communiqué of the Seventh National Census of China, as of November 1, 2020, the number of migrants in China reached 375.8 million, accounting for 26.03% of the total population. Compared with the data of the sixth national census in 2010, the number of migrants increased by 154.4 million, an increase of 69.73%. The migrants

have made a huge contribution to China's economic development and economic growth. Especially since the Reform and Opening-up in 1978, a large number of rural residents have entered the cities, which has promoted China's urbanization and industrial upgrading, and has improved their ability to support families on a microscopic level and promotes the accumulation of social wealth on a macro level.

The Chinese government has always attached great importance to the health of the migrants. Beginning in 2009, the Chinese government began to provide all the Chinese people with free basic public health services to promote the equity of health services and further improve the health of residents, which is called Basic Public Health Services (BPHS)[1][2]. This project requires all primary healthcare centers to provide basic public health services for all residents in the jurisdiction, including registered population and migrants[3]. Since 2009, the items of basic public health services have continuously increased, and the compensation for each person served by primary healthcare centers has also increased. Supplemental Table 1 shows the relevant information about China's BPHS items and funding[4].

Many scholars have conducted researches on BPHS provided for the migrant population in China. Zhang et al(2017) showed that internal migrants in more developed eastern regions used less public health services. Sociodemographic status, years of living in the city of residence. The range of migrating were associated with the utilization of public health services[5]. Zhu et al(2019) focused on health education, and their study showed that as far as HIV education, there existed significant regional disparities among migrants in China[6]. Guo et al(2019) focused on chronic disease education. They found that only 33.9% of the participants received chronic disease education, and the percentage and methods of receiving education varied across different age groups[7]. Tang et al (2021) found 36.2% of migrant older adults receiving free physical examinations, which is an important item of BPHS[8]. Establishing health records is an important item of China's BPHS. It is essential for understanding the health status of the migrants and better providing health services to residents. It is also the basis for providing other BPHS for the migrants. However, we found that there is still a lack of researches on the establishment of health records among migrants, and little is known about the sociodemographic disparities in the establishment rate of health records. To address this knowledge gap, we used national data from China Migrants Dynamic Survey(CMDS) to evaluate sociodemographic disparities in the establishment of health records among 0.5 million migrants from 2014 to 2017 in China.

## Methods

### Study design and data source

This is a nationwide cross-sectional study in China. Data was collected by 2014, 2016, 2017 waves of CMDS in China. The three waves of CMDS were conducted annually by China's Health Commission, China population and development research center, Chinese center for disease control and prevention, Health Commission of 31 provinces and Xinjiang Production and Construction Corps in mainland China. The national survey aimed at understanding the living condition and public services utilization of migrants, enhancing the efficiency of related policies. CMDS used a probability proportional to size

(PPS)sampling method which is a stratified, multi-stage and proportional scale sampling. The survey covered 436 cities and counties in mainland China. The participants of the survey were migrants aged above 15 years whose household registration is not at the current residence, and had resided in the place for more than a month for working or living. All the participants received an informed consent.

### **Data collection**

The questionnaire of the survey is designed uniformly, including sociodemographic information, occupation, willingness to migrate or resident and public services utilization. All provinces carried out face-to-face survey with smart phones or pads installed with a specially developed interview system. All the participants are directly interviewed by investigators with unified training. The sample contained 539926 participants.

### **Establishment rate of health records**

The primary outcome in the present study is the establishment rate of health records. The migrants were asked the question: Have you established the health record at the current community? (yes, no, or not sure). The establishment rate of health records is calculated by dividing the number of participants who have established health records (answering yes) by the total number of participants.

### **Associated factors**

**Sociodemographic characteristics** We included six sociodemographic characteristics: sex (female or male), age (65 years and above, 55–64 years, 45–54 years, 35–44 years, 25–34 years, 15–24 years), regions (east, middle, or west), marital status (married/living with partner or never married/divorced/widowed), educational attainment (above college degree, college, high school and equivalent or middle school and below), and household registration status (urban or rural)

**Migrating related characteristics** We included three migrating related characteristics: length of migration (11 years and above, 6–10 years or 0–5 years), reasons of migration (working/business or studying/family issues), and range of migration (out of province or in province)

### **Statistical analysis**

Statistical analyses were carried out by using Stata version 16.0 (StataCorp LLC. Texas, USA). Sociodemographic information and the establishment rate of health records were showed using descriptive statistical analysis. The associated factors of the establishment status of health records were investigated by performing binary logistic regression and using the odd ratio (OR) and 95% confidence intervals (CIs). A two-side p value less than 0.05 was considered as statistically significant.

## **Results**

### **Basic characteristics of migrants**

A total of 539926 migrants were included in this study, 200937 in 2014, 16900 in 2016, and 169989 in 2017, respectively. Table 1 shows the characteristics of the sampled population. The percentage of male participates were higher than female of for the sampled years, and 54.38% were male of all the migrants. The age range of the most participates were from 15 to 44 of the three years. The east region had the most participates for three years which takes account of more than half of the sampled population, while the middle region had the least participates. 79.55% of the migrants were married or living whit partner. More than 60% migrants obtained an education of middle school or less. More than 80% of the migrants' household registration status was agricultural, with a percentage of 83.72% in general. 69.46% of the migrants had stayed at the destination place for 5 or less years. As the reasons of migration, 85.29% of the migrants came to the destination to work or do businesses.

Table 1  
Sociodemographic characteristics and migrating related characteristics among migrants in China,  
Migrants Population Dynamic Monitoring Survey 2014, 2016 and 2017 (N = 539,926)

	2014		2016		2017		Overall	
	N	%	N	%	N	%	N	%
<b>Sociodemographic characteristics</b>								
<b>Sex</b>								
male	117647	58.55	88088	52.12	87871	56.69	293606	54.38
female	83290	41.45	80912	47.88	82118	48.31	246320	45.62
<b>Age</b>								
15-24	40062	19.94	26648	15.77	23906	14.06	90616	16.78
25-34	77057	38.35	65709	38.88	65473	38.52	208239	38.57
35-44	56747	28.24	45193	26.74	44741	26.32	146681	27.17
45-54	24036	11.96	23566	13.94	26651	15.68	74253	13.75
55-64	3035	1.51	5659	3.35	6499	3.82	15193	2.81
65-			2225	1.32	2213	1.30	4438	0.82
<b>Region</b>								
East	101984	50.75	82000	48.52	86995	51.18	270979	50.19
Middle	33986	16.91	29000	17.16	28999	17.06	91985	17.04
West	64967	32.33	58000	34.32	53995	31.76	176962	32.78
<b>Marital status</b>								
Never married/ Divorced/widowed	48006	23.89	31929	18.89	30472	17.93	110407	20.45
Married/living with partner	152931	76.12	137071	81.11	139517	82.07	429519	79.55
<b>Educational attainment</b>								
<=Middle school	133812	66.59	104296	61.71	103186	60.70	341294	63.21
High school or equivalent	41289	20.55	37682	22.30	37224	21.90	116195	21.52
College	25183	12.53	26214	15.51	28687	16.88	80084	14.83

Notes: missing data, age, 506 (0.09%); rage of migration,163 (0.03%).

	2014		2016		2017		Overall	
>College	653	0.32	808	0.48	892	0.52	2353	0.44
<b>Household registration status</b>								
Agricultural	170904	85.05	140441	83.10	140687	82.76	452032	83.72
Nonagricultural	30033	14.95	28559	16.90	29302	17.24	87894	16.28
<b>Migrating related characteristics</b>								
<b>Length of migration</b>								
0–5	153208	76.25	115601	68.40	106203	62.48	375012	69.46
5–10	28177	14.02	30435	18.01	34681	20.40	93293	17.28
>=11	19552	9.73	22964	13.59	29105	17.12	71621	13.26
<b>Reasons of migration</b>								
other	23855	11.87	27711	16.40	27872	16.40	79438	14.71
Working or business	177082	88.13	141289	83.60	142117	83.60	460488	85.29
<b>Rage of migration</b>								
In province	98534	49.04	85977	50.87	86199	50.71	270710	50.14
Out of province	102403	50.96	82860	49.03	83790	49.29	269053	49.83
Notes: missing data, age, 506 (0.09%); rage of migration,163 (0.03%).								

### Sociodemographic disparities in the establishment of health records among migrants

In full sample, the establishment rate of health records among migrants were 22.99%,38.44%,27.29% respectively, and 29.18% in general. Of all the groups, there existed a sharp increase of the rate followed by a decline in 2017. Table 2 shows the establishment rate of health records among migrants by sociodemographic characteristics and migrating related characteristics. The establishment rate of health records among female migrants is higher than that of male migrants. The gap between the two groups was the largest in 2016. The participants aged 65 and above reported highest establishment rate of health records, 45.71% of 2016,35.96% of 2017 and 40.43% in general. The participants aged 15 to 24 had the lowest portion of establishing health record(19.82% of 2014,34.33% of 2016,27.70% of 2017 and 26.09% in general). Among the three regions, the migrants of west region showed the highest rates of establishing health record (28.33%), followed by the middled region (28.03%) and the east region (17.91%) in 2014. Then in 2016 and 2017, the middle region showed the highest rates (53.53%,43.23% respectively), and the east region had the lowest portion (30.57%,25.52% respectively). Migrants who were married or living with partner had the higher rate of establishing health records than those who were

never married, divorced, or widowed. Migrants who had college degree had the highest rates in 2014 and 2017 and migrants who had education above college had the highest rate in 2016. In terms of household registration status, the finding shows that migrants with urban household had higher establishment rate of health records.

### **Establishment rate of health records among migrants by migrating related characteristics**

As far as the groups by migration characteristics, in 2014, there was a tendency that migrants who migrating for longer time has higher rate of establishing health record. Then in 2016 and 2017, migrants who had migrated for 6 to 10 years had highest rate of establishing health records (39.25%,30.66% respectively). Compared with migrants who had migrated for the reason of working or business, migrants who migrated for other reasons had higher portion of establishing health record. Migrants who had migrated in province had higher rate than those who had migrated out of province.

Table 2  
Establishment rate of health records among migrants in China of 2014, 2016 and 2017 by sociodemographic and migrating related characteristics

	Establishment rate of health records			
	2014	2016	2017	Overall
	N (%)	N (%)	N (%)	N (%)
<b>Total</b>	46186(22.99)	64957(38.44)	46389(27.29)	157532(29.18)
<b>Sociodemographic characteristics</b>				
<b>Sex</b>				
Male	26117(22.20)	32,228(36.59)	23,010(28.92)	81,355(28.52)
Female	20069(24.10)	32,729(40.45)	23,379(31.17)	76,177(31.85)
<b>Age</b>				
15–24	7940(19.82)	9149(34.33)	5359(27.70)	22448(26.09)
25–34	18064(23.45)	26097(39.72)	18570(31.04)	62731(30.96)
35–44	13724(24.19)	17573(38.88)	12653(30.17)	43950(30.55)
45–54	5696(23.70)	8818(37.42)	7064(28.58)	21578(29.84)
55–64	762(25.11)	2303(40.70)	1799(29.42)	4864(32.85)
>=65		1017(45.71)	944(35.96)	1961(40.43)
<b>Region</b>				
East	18,403(17.91)	24,366(30.57)	14,789(25.52)	57,558(24.14)
Middle	9,525(28.03)	15,525(53.53)	11,518(43.23)	36,568(40.80)
West	18,258(28.33)	25,066(42.01)	20,082(30.03)	63,406(33.42)
<b>Marital status</b>				
Never married/ divorced/widowed	9270(19.31)	10461(32.76)	6663(26.21)	26394(25.05)
Married or living with partner	36916(24.14)	54496(39.76)	39726(30.76)	131138(31.29)
<b>Educational attainment</b>				
<=Middle school	30271(22.62)	38595(37.01)	26967(28.83)	95833(28.90)
High school or equivalent	9630(23.33)	15134(40.16)	10586(31.33)	35350(31.35)
College	6130(24.35)	10884(41.52)	8617(32.62)	25631(32.94)
Notes: missing data, rage of migration,64(0.01%)				

	Establishment rate of health records			
	2014	2016	2017	Overall
	N (%)	N (%)	N (%)	N (%)
>College	155(23.74)	344(42.57)	219(25.86)	718(31.11)
<b>Household registration status</b>				
Rural	38444(22.50)	53291(37.95)	37368(29.39)	129103(29.44)
Urban	7742(25.78)	11666(40.85)	9021(32.88)	28429(33.05)
<b>Migrating related characteristics</b>				
<b>Length of migration</b>				
0–5	33497(21.87)	44228(38.26)	27442(30.22)	105167(29.25)
6–10	7386(26.21)	11947(39.25)	10633(30.66)	29966(32.12)
>=11	5303(27.13)	8782(38.24)	8314(28.57)	22399(31.28)
<b>Reasons of migration</b>				
Other	6700(28.09)	12043(43.46)	8933(34.22)	27676(35.63)
Working or business	39486(22.30)	52914(37.45)	37456(29.15)	129856(29.06)
<b>Rage of migration</b>				
In province	26674(27.07)	39075(45.45)	27424(34.40)	93173(35.26)
Out of province	19512(19.06)	25818(31.16)	18965(25.33)	64295(24.72)
Notes: missing data, rage of migration,64(0.01%)				

### Factors related to health record enrollment status for migrants

In the multivariable model, sex, age, region, marital status, educational attainment, household registration status, length of migration, reasons of migration, rage of migration were associated with the establishment rate of health records, after adjusting for potential factors (Table 3). Compared with migrants who age 15 to 24, migrants aged 25–34 years (aOR = 1.10; 95% CI,1.07–1.12), migrants aged 35–44 years (aOR = 1.08; 95% CI,1.06–1.11), migrants aged 45–54 years (aOR = 1.05; 95% CI,1.02–1.08), migrants aged 55–64 years (aOR = 1.14; 95% CI,1.10–1.19), and migrants aged 65 and above (aOR = 1.48; 95% CI,1.39–1.57) were more likely to establish health record. Compared with migrants whose destination place is the west region, migrants headed to the middle region (aOR = 1.28; 95% CI,1.26–1.30) were more likely to establish health record. Compared with migrants who were never married, divorced, or widowed, those who were married or living with partner (aOR = 1.36; 95% CI,1.34–1.39) were more likely to establish health record. Compared with migrants who received middle school education and below,

migrants whose education level is high school or equivalent (aOR = 1.13; 95% CI,1.11–1.15), College (aOR = 1.24; 95% CI,1.21–1.26), above college (aOR = 1.25; 95% CI,1.14–1.37) had the high possibility to establish health records. Compared with migrants with rural household registration, migrants with urban household (aOR = 1.09; 95% CI,1.07–1.11) registration had a higher likelihood to establish health records.

Compared with those who migrating for 0–5 years, migrants migrating for 6–10 years (aOR = 1.14; 95% CI,1.12–1.16), 11 and above years(aOR = 1.12; 95% CI,1.10–1.15) had a higher likelihood to establish health records. Compared with those who migrating for the reason of studying or family issues, migrants migrating for working or business (aOR = 0.83; 95% CI,.82-.85) were less likely to establish health records. Compared with those who migrating in province, migrants migrating out of province (aOR = 0.72; 95% CI,.71-.73) were less likely to establish health records.

Table 3  
Factors related to health record enrollment status for migrants

	Univariable analysis		Multivariable analysis	
	cOR(95% CI)	<i>P</i>	aOR(95% CI)	<i>P</i>
<b>Sex</b>				
male	1(Ref)		1(Ref)	
female	1.17(1.16–1.19)	< 0.001	1.14(1.12–1.15)	< 0.001
<b>Age</b>				
15–24	1(Ref)		1(Ref)	
25–34	1.27(1.25–1.30)	< 0.001	1.10(1.07–1.12)	< 0.001
35–44	1.25(1.22–1.27)	< 0.001	1.08(1.06–1.11)	< 0.001
45–54	1.21(1.18–1.23)	< 0.001	1.05(1.02–1.08)	< 0.001
55–64	1.39(1.34–1.44)	< 0.001	1.14(1.10–1.19)	< 0.001
65–	1.92(1.81–2.04)	< 0.001	1.48(1.39–1.57)	< 0.001
<b>Region</b>				
West	1(Ref)		1(Ref)	
Middle	1.37(1.35–1.40)	< 0.001	1.28(1.26–1.30)	< 0.001
East	0.63(0.63–0.64)	< 0.001	0.67(0.66–0.68)	< 0.001
<b>Marital status</b>				
Never married/ Divorced/widowed	1(Ref)		1(Ref)	
Married or living with partner	1.36(1.34–1.38)	< 0.001	1.36(1.34–1.39)	< 0.001
<b>Educational attainment</b>				
<=Middle school	1(Ref)		1(Ref)	
High school or equivalent	1.12(1.11–1.14)	< 0.001	1.13(1.11–1.15)	< 0.001
College	1.21(1.19–1.23)	< 0.001	1.24(1.21–1.26)	< 0.001
>College	1.11(1.02–1.21)	.020	1.25(1.14–1.37)	< 0.001
<b>Household registration status</b>				
Rural	1(Ref)		1(Ref)	
Urban	1.18(1.16–1.20)	< 0.001	1.09(1.07–1.11)	< 0.001
<b>Length of migration</b>				

	Univariable analysis		Multivariable analysis	
	cOR(95% CI)	<i>P</i>	aOR(95% CI)	<i>P</i>
0–5	1(Ref)		1(Ref)	
6–10	1.15(1.18–1.16)	< 0.001	1.14(1.12–1.16)	< 0.001
≥11	1.10(1.08–1.12)	< 0.001	1.12(1.10–1.15)	< 0.001
<b>Reasons of migration</b>				
Studying/family issues	1(Ref)		1(Ref)	
Working or business	0.74(0.73–0.75)	< 0.001	0.83(0.82–0.85)	< 0.001
<b>Rage of migration</b>				
In province	1(Ref)		1(Ref)	
Out of province	0.60(0.59–0.61)	< 0.001	0.72(0.71–0.73)	< 0.001

## Discussion

To our knowledge, this is the first study using national migrants-based data to examine the sociodemographic disparities in the establishment rate of health records among migrants in China. Our research reveals that the establishment rate of health records among the migrants differed in various sociodemographic characteristics, and heterogeneity existed in establish rate of a certain characteristic.

In terms of sociodemographic characteristics, we found that establishment rate of health records of female were higher than that of male's. Compared with young immigrants, older immigrants were more likely to establish health records, which was in line with the previous research. This may be the result of the fact that older people had a higher risk of having chronic diseases and worse health status, so they had a stronger motivation to seek health services. In addition, China's BPHS regards the elderly over the age of 65 as a key service group, which may also be the reason for the higher establishment rate of health records among older people.

Compared with the west region, the migrants in the middle region were more likely to establish health records, and the immigrants in the east region were least likely to establish health records. The reason might be that in China, the east part of the country had the most migrants, and the workforce of primary healthcare centers was limited. The professional staff of primary healthcare centers did not have enough time and energy to provide high-quality and enough health services. At the same time, during interviews with the staff of primary healthcare centers, we found that although the remuneration for providing services to each resident was increasing year by year, for some areas with inconvenient transportation, these remunerations may be less than the cost of providing services, which reduced their enthusiasm of providing services [9]. Compared with the migrants with rural household registration, the possibility of establishing health records was higher for migrants with urban household registration. Although in recent

years, China is reforming its household registration system and gradually eliminating the differences in public services between urban and rural areas, China's dual household registration system still affects residents' utilization of public health services. In terms of educational attainment, the higher the degree of education was, the higher the possibility of establishing health records was. The reason was probably that education assisted young migrants in gaining a better understanding of the advantages of establishing health records.

As far as migrating characteristics, longer migration time may be related to higher establishing rates of health records. This may be because that the longer migrants stayed in the place of residence, the more familiar they were with the local health system, and higher the residents' awareness of seeking health services was. Compared with migrants who were migrating for the reason of studying or family issues, people who intended to work or do business were less likely to establish health records. Compared with those who migrated within the province, those who migrated outside the province were less likely to establish health records.

In terms of improving the access of health services, the provision of BPHS is an important measure of the Chinese government. All costs of providing related services are borne by the government, and residents do not have to pay for themselves. In recent years, the Chinese government has also carried out other reforms, such as "family physicians services", which aims to reduce the waiting time for residents to obtain health services and the economic burden of residents improve the efficiency of health services, increase the satisfaction of residents, and improve their health through signing contracts with family physician of primary healthcare centers. Whether it is BPHS or "family physicians service", migrants can get the same services as local residents. However, our research shows that the establishment rate of health records among the migrants remain at a relatively low level, which may hinder the improvement of health equity.

The reasons for the low establishment rate of health records can be analyzed from two aspects. From the supply side, China's health resources are distributed in the shape of "inverted pyramid", which means that health resources are concentrated in secondary and tertiary hospitals. Community health centers have relatively limited health resources. The lack of human resources, coupled with heavy workload of providing BPHS, leading to burnout and high work stress of professional staff, directly affect the provision of BPHS [10]. From the demand side, although BPHS have been implemented for many years, due to the lack of project publicity and health education, migrants' awareness of obtaining BPHS is still relatively low, thus they rarely come to community health centers for BPHS [11].

The health of the migrants is an important social issue and public policy issue. The establishment of health records strengthens the health management of the migrants, which is an effective way to improve the health of the migrants. Therefore, relevant departments should take actions to promote community health centers to provide more effective and high-quality services, and enhance residents' awareness of health management. Measures should be taken to strengthen health education and health literacy of

migrants. At the same time, relative departments should continue to invest in primary healthcare centers to improve their ability to provide better services to meet the needs of residents and migrants.

Our research has several limitations. First, There may be recall bias when participants recalled whether he/she had established a health record, which leads to the underestimation of establishment rate of health records; Second, other factors that may affect the establishment rate of health records (such as family economic status) have not been investigated in the survey, so these variables cannot be included in this study; Third, because this survey is not a continuous survey, this study cannot analyze the long-term trend of establishment rate of health records. However, through 3 years of national survey data, this study provides important basic information and scientific evidence for improving the accessibility of basic public health services and health equity.

## **Conclusion**

Sociodemographic disparities existed in the establishment rate of health records among China's migrants. The associated migrating characteristics, including length of migration, reasons of migration and range of migration, also had impact on the establishment rate of health records. The study revealed heterogeneity in the establishment rate of health records in the subgroups, which policies should take into account. In addition to the reforms of the supply side, the reforms should also focus on the demand side, intending to improve the migrants' awareness of health management.

## **Abbreviations**

BPHS: Basic Public Health Services

## **Declarations**

### **Acknowledgements**

Not applicable.

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### **Availability of data and materials**

The dataset supporting the conclusions of this article was acquired at <https://www.ncmi.cn/phda/dataDetails.do?id=CSTR:A0006.11.A000T.201906.000225>.

## Author Contributions

JW, JZ, XW, and JL were responsible for conceptualization, study design; JL, XW, YB, YC managed, analyzed and interpreted the data. JW, JZ, XW, and JL wrote the first draft of the paper; JL, XW and JW supervised the methods and revised the manuscript. All authors have read and agreed to the final version of the manuscript.

## Ethics approval and consent to participate

The data (CMDS) used in this study was a secondary dataset from a publicly accessible source and have acquired the consent of all individuals who participated in the survey process.

## Consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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