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Patient preference of first medical service in Shenzhen, China: a cross-sectional study

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Abstract

Objectives

To explore the characteristics of Shenzhen citizens' preference of their first medical institution and their influencing factors at various medical levels and understand their attitudes towards community health services.

Methods

1612 subjects with the age of 18 and above were stratified randomly sampled among 10 districts in Shenzhen and conducted with a self-designed questionnaire. Multivariate logistic regression analysis was performed to explore the influencing factors on the subjects' actual and expected preferred first medical institution.

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Results

The effective response rate of questionnaires was 93.05%. Over 50% of the subjects preferred municipal and district hospitals as their first choice and 27.5% would choose medical institutions depending on specific circumstances. Univariate analysis indicated that age, education, income, medical insurance, housing conditions and census register were significant in terms of actual and expected preferred first medical institution. Medical technology and convenience were the main factors in choosing a medical institution. Main factors on the subjects' actual and expected preferred medical institution were different. With actual preferred first medical institution as dependent variable, education, household registration and monthly income were the main factors (χ^2=11.95, P = 0.001); whereas with expected preferred first medical institution as dependent variable, occupation, types of medical insurance participation and household registration were the main factors (χ^2=15.130, P = 0.034).

Conclusion

Shenzhen citizens with high education, high-income, or census register, preferred high-level medical institutions for the first visit. Medical resources were not successfully optimized, especially to community health service centers.

Keywords: healthcare preference, medical service, influential factor

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Summary box

What is already known?

► Shenzhen had made some progress on the reform of hierarchical diagnosis and treatment system, such as strengthening the construction of community health centers, and establishing a community general practioner contract system.

► Problems of difficulty in registering and seeing a doctor in large hospitals and insufficient utilization of resources in primary medical institutions have not yet been fundamentally resolved.

What are the new findings?

► This study described the characteristics of Shenzhen citizens' preference of their first medical institution and their influencing factors at various medical levels and understand their attitudes towards community health services.

► Shenzhen citizens with high educational level, or high-income levels, or Shenzhen census register, are more inclined to choose high-level medical institutions for the first visit.

► The medical resources were not successfully optimized, especially to community health service centers.

What do the new findings imply?

► Shenzhen government should increase the investment in medical services as the investment in medical resources doesn't match the growth of its economy, which lagged far behind first-tier cities in China.

► Shenzhen government should also better allocate the medical resources among medical institutions at different levels and strengthen the ability and publicity of community health service centers.

Introduction

Benefited from the reform and opening policy in 1980s, Shenzhen has experienced an impressive gross domestic product growth and rapid economic development, yet accompanied by sharp demographic challenges. According to Shenzhen Bureau of Statistics, the permanent population reached 13.438 million by the end of 2019, which was 40.37 times the population in 1980, with an average annual increase of 9.95%.[1] With continuous population growth, the non-resident population, generally characterized by low education levels, low incomes, low residential stability, and young age,[2] accounted for 63% of the entire population. Because of high property prices, most non-residents had to purchase or rent self-built or village houses instead. Gradually and eventually, a special spatial pattern occurred, which might cause differences in the choice of medical service, compared with the residents.[3]

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Compared with the rapid population growth, Shenzhen is suffering from a conspicuous insufficiency of medical resources. Shenzhen's medical expenditure in 2018 was 28.1 billion yuan, only accounting for 1.1% of GDP, far lower than the national average (6.43%). The number of beds per 1,000 people in Shenzhen at the end of 2019 was 3.83 , also far below the national average of 6.30. In China, healthcare is provided almost exclusively by state-owned public general hospitals at the primary, secondary, and tertiary levels. Citizens are free to choose healthcare facilities without being restricted by a gatekeeping mechanism and may bypass primary care and choose these higher-level facilities regardless of disease severity.[4-6] The disparity of medical resources in high-level and primary healthcare is obvious in many places , resulting in the phenomenon that high-level hospitals are usually overcrowded whereas primary healthcare is almost empty.[7]

Hierarchical diagnosis and treatment is an important part of China's medical system reform, which aims to direct patient flow by changes in coverage and diversifying reimbursement rates.[8] Although Shenzhen had made some progress on the reform of hierarchical diagnosis and treatment system, problems of difficulty in registering and seeing a doctor in large hospitals and insufficient utilization of resources in primary medical institutions have not yet been fundamentally resolved. In order to better promote the reform of the hierarchical diagnosis and treatment system, it is vital important to first understand the citizens' choices of healthcare provider types and the associated factors. A previous systematic review analyzed a considerable body of studies and identified factors on the selection of healthcare, such as individual, facility, context and composite factors, influencing facility choice in China.[9] However, as China's youngest city, Shenzhen may be different from traditional cities due to its characteristics, such as living spaces and population composition. Therefore, to better promote the reform of the hierarchical diagnosis and treatment system in Shenzhen, the current study aims to: (1) explore the citizens' preference of first medical service and their influencing factors at various medical levels; (2) understand citizens' views and attitudes towards community health services.

Methods

Participants

Subjects were selected according to the outpatient records of Shenzhen Medical System in 2017. According to the pilot study, the awareness rate of the hierarchical diagnosis and treatment system was 40%, with the maximum permissible error of 2.5% and confidential level of 95%, the sample size was calculated as 1475. Considering possible invalid questionnaires, 1612 subjects were investigated with appropriate expansion of sample size. Stratified sampling was performed and the number of the participants varied according to the number of residents in each district. 50~220 households were first selected among 10 districts according to the population size. One resident at the age of 18 and above was then selected from each household. The Inclusion criteria:

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living in Shenzhen for ≥6 months, agreeing to sign an informed consent form, good mental state and clear consciousness. Exclusion criteria: subjects suffering from severe mental illness or cognitive communication difficulties. All the subjects participated voluntarily and provided written informed consent.

Data collection

Selected subjects were first inquired by telephone to ensure that they understand and agree to the survey. Questionnaire entitled "Questionnaire on medical preference and behavior of Shenzhen residents" was conducted by face-to-face. Items were initially selected through literature and determined after three expert consultations. Final version of the questionnaire was determined after the modification from a pilot study. The investigation was conducted by uniformly trained investigators, and the quality is strictly controlled throughout the whole investigation.

Statistical analysis

All data were entered by two researchers simultaneously by Epidata 3.02. SPSS 25.0 was used for data cleaning, sorting and statistical analysis. Descriptive statistics were used to describe participants' characteristics. The relationships between medical service seeking preference and various factors were analyzed by χ^2 tests. Multivariate logistic regression analysis, with inclusion criteria of 0.05 and exclusion of 0.10, was performed to explore the factors affecting the preference of medical service. All tests were two-way and the significance level was set at $P < 0.05$.

Ethnic statement

The study was approved by the Ethics Committee of the Affiliated Hospital of Guangdong Medical University (ethical approval number: YJ2017045-1). All participants were aware of the aims and objectives of the study, informed that participation was voluntary and their data would remain confidential, and provided written informed consent.

Patient and public involvement

There has been no patient and/or public involvement in the study design, data analysis and writing of the current study. The brief results were emailed to each participant after the investigation.

Results

Test for the questionnaire

The reliability and validity of the questionnaire were good with an overall internal consistency, a Cronbach α coefficient of 0.826, Kaiser-Meyer-Olkin index of 0.791 and the cumulative contribution rate of 6 factors of 81.959%.

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Subjects' characteristics

The characteristics of the participants are shown in **Table 1**. The average age was 34.3 ± 10. 0 years and the age composition were close to that of Shenzhen residents in 2010 population census. The number of subjects from each district were 210(14.0%) in Futian district, 210(14.0%) in Luohu district, 210(14.0%) in Nanshan district, 50 (3.3%) in Yantian district, 260 (17.3%) in Baoan district, 260(17.3%) in Longgang district, 150(10.0%) in Longhua district, 50(3.3%) in Pingshan district, 50(3.3%) in Guangming district and 50(3.3%) in Dapeng new district.

Table 1 Basic characteristics of participants

Category	n (%)	Category	n (%)
Sex		**Monthly incomes (CNY)**	
Male	733(48.9)	<3000	158(10.5)
Female	767(51.1)	3000~	479(31.9)
Age(years)		5000~	626(41.7)
<20	56(3.7)	10000~	158(10.5)
21-30	607(40.5)	15000~	53(3.5)
31-40	520(34.7)	≥30000	26(1.7)
41-50	204(13.6)	**Housing conditions**	
≥51	113(7.5)	Self-purchased housing	351(23.4)
Educational level		Renting policy housing	114(7.6)
Junior high school and below	222(14.8)	Renting housing in Urban Villages	618(41.2)
High school/technical secondary	581(38.7)	Renting commercial housing	170(11.3)
junior college	431(28.7)	Dormitory	94(6.3)
Undergraduate	242(16.1)	Others	153(10.2)
Post undergraduate	24(1.6)	**Medical insurance**	
Occupation		Level 1	663(44.2)
public institutions	153(10.2)	Level 2	336(22.4)
professional and technical	224(14.9)	Level 3	187(12.5)
Enterprise managers	156(10.4)	Uninsured	314(20.9)
Enterprise staff	208(13.9)	**Marital status**	
Individual industrial and commercial households	228(15.2)	Single	435(29.0)
		Married	1065(71.0)

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Worker	342(22.8)	**Census register**	
Unemployed	53(3.5)	Registered	531(35.4)
Others	136(9.1)	Non-registered	969(64.6)

Actual and expected preferred first medical institution

In terms of actual first medical institution, as the proportion of choosing private medical institution was very small and a clear stated medical preference would help us analyze the needs and influencing factors, we excluded 25 subjects choosing private medical institution, and 412 choosing medical institutions depending on specific circumstances. Further analysis was conducted in remaining 1063 subjects with specific preferences. The percentages of actual and expected preferred first medical institutions between sexes were shown in **Table 2**. Over 50% of the subjects chose municipal or district hospitals as first choice. There is no statistically significant difference in the actual medical institution selection among municipal, district-level, street-level and community health service between two sexes (χ^2=5.034，*P*=0.169).

Similarly, in terms of expected preferred first medical institution, as no subject would choose private medical institution and 396 would choose according to specific circumstances, we excluded these 396 subjects and further analysis was conducted in the remaining 1104 subjects with specific preferences. Over three-quarters of the subjects expected to choose municipal and district-level hospitals for the first visit. There was no statistically difference among 1104 subjects with specific first medical institution choice between two sexes (χ^2=2.843，*P*=0.416).

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Table 2 Selection of actual and expected preferred medical institutions in subjects with different demographic characteristics（*n*，%）

	Variables	Actual selection					Expected selection				
		Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total	Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total
Sex	Male	154(29.8)	143(27.7)	73(14.1)	146(28.3)	516(100.0)	318(59.6)	147(27.5)	38(7.1)	31(5.8)	534(100.0)
	Female	162(29.6)	161(29.4)	54(9.9)	170(31.1)	547(100.0)	328(57.5)	165(28.9)	52(9.1)	25(4.4)	570(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Age	<21	6(18.8)	2(6.3)	2(6.3)	22(68.8)	32(100.0)	17(45.9)	10(27.0)	8(21.6)	2(5.4)	37(100.0)
	21~	131(32.1)	112(27.5)	53(13.0)	112(27.5)	408(100.0)	262(59.3)	120(27.1)	39(8.8)	21(4.8)	442(100.0)
	31~	98(26.2)	121(32.4)	46(12.3)	109(29.1)	374(100.0)	211(55.5)	124(32.6)	28(7.4)	17(4.5)	380(100.0)
	41~	56(35.4)	44(27.8)	16(10.1)	42(26.8)	158(100.0)	96(62.7)	42(27.5)	7(4.6)	8(5.2)	153(100.0)
	≥51	25(27.5)	25(27.5)	10(11.0)	31(34.1)	91(100.0)	60(65.2)	16(17.4)	8(8.7)	8(8.7)	92(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Education	Junior high school and below	28(20.0)	29(20.7)	15(10.7)	68(48.6)	140(100.0)	81(52.9)	41（26.8)	19(12.4)	12(7.8)	153(100.0)
	High school / technical secondary	102(25.1)	123(30.3)	46(11.3)	135(33.3)	406(100.0)	232(55.0)	134（31.8)	35(8.3)	21(5.0)	422(100.0)
	junior college	95(29.3)	99(30.6)	47(14.5)	83(25.6)	324(100.0)	196(59.9)	97（29.7)	20(6.1)	14(4.3)	327(100.0)
	undergraduate and above	91(47.2)	53(27.5)	19(9.8)	30(15.5)	193(100.0)	137(67.8)	40（19.8)	16(7.9)	9(4.5)	202(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

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	Variables	Actual selection					Expected selection				
		Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total	Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total
Monthly income	<3000	37(32.7)	28(24.8)	9(8.0)	39(34.5)	113(100.0)	74(60.2)	29 (23.6)	13(10.6)	7(5.7)	123(100.0)
	3000~	65(19.0)	74(21.6)	48(14.0)	155(45.3)	342(100.0)	194(52.3)	107(28.8)	50(13.5)	20(5.4)	371(100.0)
	5000~	123(28.4)	158(36.5)	54(12.5)	98(22.6)	433(100.0)	246(57.3)	149(34.7)	19(4.4)	15(3.5)	429(100.0)
	10000~	54(44.3)	37(30.3)	12(9.8)	19(15.6)	122(100.0)	88(72.7)	17(14.0)	7(5.8)	9(7.4)	121(100.0)
	≥15000	37(69.8)	7(13.2)	4(7.5)	5(9.4)	53(100.0)	44(73.3)	10(16.7)	1(1.7)	5(8.3)	60(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Medical insurance	Level 1	179(36.2)	149(30.1)	51(10.3)	116(23.4)	495(100.0)	316(65.2)	129(26.6)	27(5.6)	13(2.7)	485(100.0)
	Level 2	55(21.1)	92(35.2)	40(15.3)	74(28.4)	261(100.0)	136(50.9)	89(33.9)	24(9.0)	18(8.3)	267(100.0)
	Level 3	23(16.7)	44(31.9)	17(12.3)	54(39.1)	138(100.0)	71(45.2)	51(32.5)	22(14.0)	13(8.3)	157(100.0)
	uninsured	59(34.9)	19(11.2)	19(11.2)	72(42.6)	169(100.0)	123(63.1)	43(22.1)	17(8.7)	12(6.2)	195(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Housing conditions	Self-purchased housing	110(39.6)	92(33.1)	25(9.0)	51(18.3)	278(100.0)	168(62.7)	71(26.5)	15(5.6)	14(5.2)	268(100.0)
	Renting policy housing	15(20.2)	36(48.0)	11(14.7)	13(17.3)	75(100.0)	41(53.9)	22(28.9)	6(7.9)	7(9.2)	76(100.0)
	Renting housing in Urban Villages	93(21.9)	114(26.8)	65(15.3)	153(36.0)	425(100.0)	222(49.8)	154(34.5)	50(11.2)	20(4.5)	446(100.0)
	Renting commercial housing	56(39.2)	29(20.3)	8(5.6)	50(35.0)	143(100.0)	103(70.5)	30(20.5)	8(5.5)	5(3.4)	146(100.0)

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Variables		Actual selection					Expected selection				
		Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total	Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total
	Dormitory	13(23.2)	14(25.0)	4(7.1)	25(44.6)	56(100.0)	51(65.4)	17(21.8)	6(7.7)	4(5.1)	78(100.0)
	Others	29(33.7)	19(22.1)	14(16.3)	24(27.9)	86(100.0)	61(67.8)	18(20.0)	5(5.6)	6(6.7)	90(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
	Single	86(33.5)	58(22.6)	35(13.6)	78(30.4)	257(100.0)	192(64.6)	59(19.9)	31(10.4)	15(5.1)	297(100.0)
Marital status	Married	230(28.5)	246(30.5)	92(11.4)	238(29.5)	806(100.0)	454(56.3)	253(31.4)	59(7.3)	41(5.1)	807(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
	Registered	138(34.7)	140(35.2)	34(8.5)	86(21.6)	398(100.0)	254(65.3)	100(25.7)	21(5.4)	14(3.6)	398(100.0)
census register	Non-registered	178(26.8)	164(24.7)	93(14.0)	230(34.6)	665(100.0)	392(54.8)	212(29.7)	69(9.7)	42(5.9)	665(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

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Demographic characteristics and preferred first medical institution

The demographic characteristics, including age, education, income, medical insurance, housing condition, marital status and census register, grouped by the selection of actual and expected preferred medical institutions were presented in **Table 2**.

Age

Significant differences were both observed in the level of actual (χ^2=33.257, *P*=0.001) and expected medical institutions (χ^2=23.415, *P*=0.024) among different age groups. In terms of actual first medical institution, the largest proportion of choosing municipal medical institutions as their first choice were observed in the age group of 21~30 and 41~50 years. The largest proportion of choosing community health service center were observed in the age group of ≤20 years, with the proportion of 68.8%. In terms of expected first medical institution, with age increase, subjects expect to choose higher level of medical institution. The proportion of choosing municipal hospital was the largest in each age group, ranging from 45.9% to 65.2%.

Education

Subjects with different educational backgrounds had different preferences for actual ($\chi2$=67.169, P<0.001) and expected medical institutions ($\chi2$=20.079, P=0.017). Those with high educational level are more inclined to choose high-level medical institutions for the first visit. Linear trends were observed between education levels and actual ($\chi2$=54.189, P<0.0001). or expected medical institutions ($\chi2$=20.079, P=0.017).

Income

Significant differences were both observed in the level of actual (χ^2=127.362,*P*<0.001) and expected medical institutions (χ^2=57.767, *P*<0.001) among subjects with different income level. Linear trends were observed between monthly income levels and actual (χ χ^2 =62.024, *P*<0.0001). or expected medical institutions (χ^2=5.569, *P*=0.018). Those with high monthly income levels are more inclined to choose high levels for the first visit medical institutions. In terms of expected medical institution, over 50% of the subjects in all monthly income groups would choose municipal hospital as their first medical institution, of which, the largest proportion were observed in the group of 10000-14999 yuan and over 15000 yuan, with the corresponding proportion of 72.7% and 73.3%.

Medical insurance

Significant differences were both observed in the level of actual ($\chi2$=69.656, *P*<0.001)

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and expected medical institutions ($\chi2$=39.734, P<0.001) among subjects with different medical insurance levels. Linear trends were observed between medical insurance levels and actual (χ^2=26.885, P<0.0001) or expected medical institutions ($\chi2$=10.450, P=0.001). Subjects with lower level of medical insurance are more inclined to choose community health service center. In terms of expected medical institution, the proportion of choosing municipal hospital was the highest, ranging from 45.2% to 65.2%

Housing conditions

Subjects with different housing conditions had different preferences for actual (χ^2=84.040, P<0.001) and expected medical institutions (χ^2=38.790, P=0.001). In terms of actual medical institution, the proportions of subjects with self-purchased houses and rented commercial houses choosing municipal hospitals as their first medical institution, were the highest, with the corresponding proportions of 39.6% and 39.2%, respectively. The proportion of the subjects with renting policy housing who choose district-level hospitals was highest, reaching 48.0%. The proportion of the subjects living in dormitory who choose community health service center was highest, reaching 44.6%. In terms of expected medical institution, the proportion of choosing municipal hospital was the highest, in all groups with different housing conditions. Comparatively, the overall proportion of choosing community health service center was only 5.1%, ranging from 3.4% to 9.2% in all groups.

Marital status

There is no statistically significant difference in the actual medical institution selection and marital status (χ^2=6.738, P=0.081). The proportions of choosing municipal hospital and community health service center in single subjects were the highest, with the corresponding percentage of 33.5 and 30.4. However, significant difference was observed between marital status and expected medical institutions (χ^2=15.348, P=0.002). The proportion of expecting municipal hospital was highest in both single and married subjects, with the corresponding percentage of 64.6 and 56.3, respectively. Only 5.1% of the subjects would choose community health service center.

Census register

Significant differences were both observed in the level of actual ((χ^2=35.141, P<0.001) and expected medical institutions (χ^2=14.263, P=0.003) among subjects with different census register. In terms of actual medical institution, subjects with Shenzhen census register were more inclined to choose municipal and district-level hospitals, with the corresponding percentage of 34.7 and 35.2, respectively. Subjects without Shenzhen census register were inclined to choose community health service center, with the percentage of 34.6.Comparatively, subjects with and without Shenzhen census register

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both expect   municipal hospital, and district-level hospital as the second choice.

Medical technology and convenience are the main factors in choosing a medical institution

Major factors on the selection of medical institution were shown in **Table 3**. Over 70% of the subjects considered medical technology and convenience as the main factors in choosing a medical institution. 14.04% and 12.68% of the subjects considered service attitude and medical price, respectively, in choosing a medical institution. Only 2.80% considered according to specific circumstances.

Table 3 Major factors on the actual and expected selection of first medical institution (*n*，%)

Major factors	Municipal hospital	District-level	Street-level hospital	Community health service	Total
Medical technology	350（73.5）	96（20.2）	15（3.2）	15（3.2）	476(100.0)
Convenience	127（42.1）	126（41.7）	30（9.9）	19（6.3）	302(100.0)
Attitude of service and medical ethnics	93（60.0）	29（18.7）	24（15.5）	9（5.8）	155(100.0)
Price	57（40.7）	55（39.3）	20（11.8）	8（5.7）	140(100.0)
Others	19（61.3）	6（19.4）	1（3.2）	5（16.1）	31(100.0)
Total	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

Understanding of the community first diagnosis system

Subjects didn't have a high level of understanding of the community first diagnosis system, as shown in **Table 4**. Only 3.67% of the subjects were very familiar with the community first diagnosis system whereas 59.53% were less familiar or unfamiliar. In subjects who were unfamiliar with the community first diagnosis system, only 18.7% agree with this system while 71.70% hold an indifferent attitude. Subjects with better understanding of the community first diagnosis system were more in favor of the community first diagnosis system （χ^2=177.805，P<0.0001）. There is a linear trend between the understanding and agreement on the community first diagnosis. （χ^2=145.327，P<0.0001）.

Table 4 Analysis of the understanding and agreement on the community first diagnosis system(*n*，%)

Whether understanding community first	agree	disagree	Doesn't matter	Total
Very familiar	32（58.2）	10（18.2）	13（23.6）	55（3.67）
Quite familiar	99（61.9）	16（10.0）	45（28.1）	160（10.67）

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Moderately familiar	221（56.4）	32（8.2）	139（35.5）	392（26.13）
Less familiar	210（42.3）	64（12.9）	223（44.9）	497（33.13）
Unfamiliar	74（18.7）	38（9.6）	284（71.7）	396（26.40）

Main factors affecting participants' preference of medical institution

We established two logistic regression models to explore the factors on the selection of medical institution. The independent variables and their definitions are the same, while the dependent variables are different, which were the actual and expected first medical institution in model 1 and 2, respectively.

Dependent variable is further classified in two categories, with street-level hospital, community health service center and private hospital as "0", municipal and district-level hospitals as "1". Independent variables, including age, education, occupation, census register, marital status, monthly income, housing conditions and medical insurance, were selected from statistically significant single factor analysis on the preferred first medical institution. Occupation and housing conditions were dummified, with other occupation, other housing condition as a reference. Other independent variables including ≤20 years, junior high school and below, Shenzhen household registration, unmarried, monthly income ≤3000 and uninsured as the reference.

In model 1, education, household registration and monthly income affected subjects' actual medical institution. There was a statistically significant difference of the regression equation (χ^2=11.95, P = 0.001), with -2Log=1357.646 and correction coefficient of determination r^2=0.505. Education, household registration and monthly income can explain 65.5% of the reasons on the subjects' choice actual first medical institution. Subjects with higher the education level, higher the monthly income level, were more inclined to choose municipal or district-level hospitals. Compared with Shenzhen household registration, non-Shenzhen household registration was more inclined to choose street-level hospitals and community health service centers, as shown in **Table 5**.

In model 2, occupation, medical insurance levels and household registration affected subjects' expected medical institution. There was a statistically difference of the logistic regression, with -2Log=830.499 (χ^2=15.130, P = 0.034). The prediction accuracy rate is 86.8%. Subjects with higher medical insurance levels were more inclined to choose city-level or district-level hospitals. Compared with Shenzhen household registration, non-Shenzhen household registration was more inclined to choose street hospitals and community health service centers, as shown in **Table 5.**

Table 5 Logistics regression analysis of the factors affecting subjects' actual and expected first medical institution.

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	Variable	b	S_b	Wald χ^2	P	OR	OR 95% CI
Actual selection	Constant	-0.176	0.346	0.260	0.610	0.838	-
	Education	0.258	0.075	11.838	0.001	1.295	1.118, 1.500
	Census status	-0.632	0.138	20.883	0.000	0.532	0.405, 0.697
	Monthly income	0.343	0.073	21.747	0.000	1.409	1.220, 1.627
Expected selection	Constant	2.462	0.438	31.552	0.000	11.732	-
	Occupation	-	-	14.843	0.038	-	-
	Occupation (1)	1.151	0.453	6.441	0.011	3.160	1.299, 7.684
	Occupation (2)	0.222	0.335	0.442	0.506	1.249	0.648, 2.406
	Occupation (3)	0.793	0.402	3.899	0.048	2.211	1.006, 4.859
	Occupation (4)	0.710	0.365	3.792	0.052	2.035	0.995, 4.159
	Occupation (5)	0.995	0.384	6.721	0.010	2.705	1.275, 5.742
	Occupation (6)	0.484	0.322	2.264	0.132	1.623	0.864, 3.050
	Occupation (7)	0.007	0.465	0.000	0.988	1.007	0.405, 2.505
	Census register	-0.457	0.221	4.270	.039	0.633	0.410, 0.977
	Medical insurance	-0.161	0.082	3.846	.050	0.851	0.725, 1.000

Discussion

This study demonstrated the preference and associated factors of choosing a medical institution for the first visit in Shenzhen citizens. Generally, over 50% of the subjects were willing to select municipal and district-level medicals institutions for the first visit. Those with high educational level, or high-income levels, or Shenzhen census register, were more inclined to choose high-level medical institutions. Over 70% of the subjects considered medical technology and convenience as the main factors in choosing a medical institution. If feeling unwell, main factors on the subjects' preferred medical institution and their actual first visit were different. When conditions permit, occupation, types of medical insurance participation, and household registration are the main factors that affected subjects' expected medical service selection. In addition, education, household registration and monthly income affected subjects' actual first medical service selection.

Medical technology and convenience

The finding that medical technology and convenience are the main factors in choosing

a medical institution, is consistent with previous studies in which participants indicated to prioritise organizational factors.[10] A previous study also indicated that compared with the situation in the other regions in China, residents in Shenzhen can access general hospitals timelier, but inaccessibility to medical resources among communities existed in this first-tier Chinese city.[3] The number of beds per 1,000 people in Shenzhen at the end of 2019 was 3.83, far below the national average of 6.30 and Shanghai of 10.42.[11] In addition, Shenzhen also lagged behind Shanghai in terms of the overall spatial accessibility, where the score of physicians was above 2 in half of the districts and even more than 9 in some districts.[3, 12] Moreover, more than 97% of the residents in Shanghai had access to a medical facility including community healthcare centers within a 15-min walking distance.[13]

Dilemma of first diagnosis at the community health service center

Some of our findings may reflect initial effects of reform implementation. Under the current hierarchical diagnosis and treatment system, subjects in the current study were not very familiar with the first diagnosis system of community health service centers, most of whom even didn't know whether the community health service center has the ability of the first diagnosis and question about the service capacity. These phenomena will undoubtedly hinder the implementation of the hierarchical diagnosis and treatment system and it is also not conducive for residents to effectively cooperate with the implementation of the hierarchical diagnosis and treatment system.

It should be noted that subjects' willingness on community health service centners was not strong. Only 21.1% of the subjects would choose community health center as their initial visit, inconsistent with a previous study conducted in Shenzhen in which the willingness on community health centers was high among patients with health insurance, who were female, and who were familiar with gatekeeper policy.[14] The main reason was the distrust of the community health centers. In response to subjects' questioning the level of medical technology in primary medical institutions, it is strongly recommended to establish a standardized general practitioner training system in a planned and step-by-step manner to train high-quality general practitioners through multiple channels. At the same time, in order to fully utilized the role of general practioners as the "gatekeeper", the basic medical and public health service capabilities should also be improved. On the one hand, it is highly recommended to increase the publicity of the hierarchical diagnosis and treatment system via various approaches. On the other hand, the capacity of community health services should be improved to meet the medical needs of the public as well as the allocation of medical resources should be optimized, especially to distribute sufficient resources to community health service centers, including the types and quantities of medicines.

Disease severity may affect patients' preference

Although we reported that, if feeling unwell, main factors on the subjects ' expected

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and actual first visit were different, we failed to further explore the influences of the diseases severity. A previous study indicated that the distance is of less importance as illness is more severe.[15] Self-assessment of disease severity may also play a special and important role in the selection of first medical service. In case of perceived minor or sever illness, factors influencing choice of medical service on urban and rural respondents were different.[16] In the case of perceived minor illness, no matter rural or urban residents, stated many factors which caused them not to access the system at the lower, primary level, among whom, indicated to choose it nevertheless because of the higher quality of care outweighing the higher cost of transportation, service and medication, as well as inconvenience of the complex physical environment.

Income and medical investment affect participants' selection

Subjects with high educational level, high monthly income level, or favorable housing conditions, such as self-purchased or rented commercial houses, are more inclined to choose high-level medical institutions for the first visit. These findings are consistent with a previous systematic review which also revealed that higher income, higher education, and urbanization are associated with access at high levels.[9] However, take the government capital investment in health services into account, it is vital important to further increase investment in medical and health services as well as pay more attention to population's health. Shenzhen's medical and health resources don't' match the status and role of its first-tier cities, especially its economy volume. The investment in medical and health services in Shenzhen is far from enough. In the whole year of 2019, the investment of medical and health services in Shenzhen is 33.548 billion yuan, accounting for 7.37% of local fiscal expenditures. Although the investment in health is increasing year by year, the total health expenditure as a percentage of GDP in Shenzhen only accounted for 1.25, far below that of 5.20 in Guangdong and 6.43 in the whole nation. In addition, the per capita health service expenditure is 2496.35 yuan,[1] far below the national average of 4702.8 and Guangdong average of 4581.96.[11] By the end of 2019, the number of certified (assistant) doctors per 1000 population in Shenzhen is 3.01,[1] far below the national and Guangdong Provincial city average of both 4.10.[11]

Limitations

Several limitations of this study need to be addressed. **First**, although the study sample was representative as a result of randomly sampling according to the proportion of population from all districts of Shenzhen, owing to the large floating population in Shenzhen, the interpretation and extrapolation of the characteristics of preference for the first medical service to the entire city population should be with great caution. **Second**, we did not further explore the diseases severity on the patients' preference of their initial visit. Self-assessment of disease severity may play a special and important role in the selection of first medical service. Convenience, such as the distance, is of less importance as illness is more severe.[15] Third, as the study focused on the

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participants of 18 and above, we could not collect information on the preference of the first medical service from children or their parents. Shenzhen is a city with young population age structure and due to the two-child policy recently imposed by the Chinese government, pediatrician shortage has become an increasingly important issues, parents' choice to a high-level medical institution may be affected due to the shortage of specialists.[17] **Last but not least**, although the subjects were randomly selected from 10 districts, we did not consider the effects of geographical characteristics on the residents' preference of first medical service. Shenzhen is a long and narrow city from east to west and a shorter city from north to south, the allocation and accessibility of medical resources may, to a certain extent, affect people's willingness and preference to medical service.

Conclusion

In general, over 50% of the subjects are willing to select municipal and district-level medicals institutions for the first visit. Those with high educational level, or high-income levels, or Shenzhen census register, are more inclined to choose high-level medical institutions for first visit. Medical technology and convenience were considered as the main factors in choosing a medical institution.

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Contributors

DJ and XZ conceived and designed the study. XJ, LK, LX and HS conducted the field work. DJ and ZX conducted the field work and did the initial analyses of the data and wrote the manuscript. CH commented on the interpretation of the data. DJ, XJ and XJ revised and reviewed the manuscript. All authors have seen and approved the final version the abstract for publication.

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2, 3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2, 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4, 5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	N/A
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6, 7
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study— eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	N/A
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg	8

		demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	8, 9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	23, 24, 25
		(*b*) Report category boundaries when continuous variables were categorized	8, 9
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-23
Discussion			
Key results	18	Summarise key results with reference to study objectives	25
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	30, 31
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	25-30
Generalisability	21	Discuss the generalisability (external validity) of the study results	31
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	32

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Patient preference and attitude of first medical service in Shenzhen, China: a cross-sectional study

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Patient preference and attitude of first medical service in Shenzhen, China: a cross-sectional study

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Abstract

Objective: To explore the characteristics of Shenzhen citizens' preference of their first medical institution and their influencing factors at various medical levels and understand their attitudes towards community health services.

Design: Cross-sectional survey

Participants: 1612 subjects with the age of 18 and above were stratified randomly sampled among 10 districts in Shenzhen and conducted with a self-designed questionnaire. The effective response rate of questionnaires was 93.05%. All patients participated in the study voluntarily, provided written informed consent, and possessed the ability to complete the questionnaire.

Main outcome measures: We measured and compared the participants' expected and actual preference of their first medical service and their influencing factors at various medical levels.

Results: Over 50% of the subjects preferred municipal and district hospitals as their first choice and 27.5% would choose medical institutions depending on specific circumstances. Univariate analysis indicated that age, education, income, medical insurance, housing conditions and census register were significant in terms of actual and expected preferred first medical institution. Medical technology and convenience were the main factors in choosing a medical institution. Main factors on the subjects' actual and expected preferred medical institution were different. With actual preferred

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38 first medical institution as dependent variable, education, household registration and
39 monthly income were the main factors ($\chi 2$=11.95, P = 0.001); whereas with expected
40 preferred first medical institution as dependent variable, occupation, types of medical
41 insurance participation and household registration were the main factors ($\chi 2$=15.130,
42 P = 0.034).
43 **Conclusion:** Main factors on the subjects' preferred medical institution and their
44 actual first visit were different. Patients with high education, high-income, or census
45 register, preferred high-level medical institutions for the first visit.

46 **Keywords:** healthcare preference, medical service, influential factor

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65 **Strengths and limitations**

66 ▪ Characteristics of patients' preference of the first medical institution and their
67 influencing factors at various medical levels and understand their attitudes
68 towards community health services were demonstrated.
69 ▪ Individuals with high educational level, or high-income levels, or census register,
70 are more inclined to choose high-level medical institutions for the first visit.
71 ▪ Does not consider the effects of participants' medical conditions on the selection
72 of medical institutions.
73 ▪ Does not consider the effects of geographical characteristics on the residents'
74 preference of first medical service.

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Introduction

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88 Hierarchical diagnosis and treatment is an important part of China's medical system
89 reform, which initiated in 2015, aims to direct patient flow by changes in coverage
90 and diversifying reimbursement rates.[1] Medical institutions were classified into 3 tiers
91 according to their priority and difficulty to treat; namely, primary medical institution,
92 secondary hospital, and tertiary hospital. [2] This system aims to allow different tiers of
93 medical institutions to undertake diagnosis and treatment tasks based on their
94 specialized functions and service capacities, thus, patients can be assigned to different
95 tiers of medical institutions appropriately, and the difficulty in getting access to
96 medical services can be mitigated.[3] Meanwhile, patients are also encouraged to go
97 firstly to primary institutions, where those with severe diseases will be referred to
98 secondary or tertiary hospitals if necessary, and patients will turn back to primary
99 medical institutions for rehabilitation when they are in stable condition. However, the
100 Chinese healthcare system does not involve a strict general practitioner and referral
101 system, and patient preference and choice of healthcare providers are influenced
102 mainly by personal willingness to seek medical care. In addition, due to the problems
103 of barriers to medical insurance reimbursement, hospitals' distribution of benefits,
104 patients' preferences for seeking medical treatment,[4, 5] the role of primary medical
105 institutions has not been fully exerted and the hierarchical diagnosis and treatment
106 system has not been fully established.
107 In some countries, health services are delivered in a multi-level system, which
108 requires a patient referral procedure by coordinating health services between different
109 levels of health care providers.[6] A good and famous example is the United Kingdom,
110 one of the first countries to follow it strictly, which promulgated the national health
111 service law in 1948 to establish the National Health Service (NHS).[7] Although
112 different countries have different models, all maintain a structure that clearly divides
113 labor in the medical service system, with primary medical and health institutions as
114 the core and large hospitals as the auxiliary bodies.[8] Compared with countries that
115 directly sought the services of specialist doctors, countries with "gatekeeper" system
116 had a lower proportion of the cost of medical services to the gross national product. [9]
117 Shenzhen, as the youngest first-tier city in China, may be slightly different from other
118 first-tier cities. In addition to its impressive gross domestic product growth and rapid
119 economic development, there are unique challenges in terms of the population size
120 and demographic structure, resource allocation. For example, with continuous
121 population growth, the non-resident population, generally characterized by low
122 education levels, low incomes, low residential stability, and young age,[10] accounted
123 for 63% of the entire population by the end of 2019. Because of high property prices,
124 most non-residents had to purchase or rent self-built or village houses instead.
125 Gradually and eventually, a special spatial pattern occurred, which might cause
126 differences in the choice of medical service, compared with the residents.[11]
127 In addition, compared with the rapid economic and population growths, Shenzhen is
128 suffering from a conspicuous insufficiency of medical resources. The medical

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129 expenditure in 2018 was 28.1 billion yuan, only accounting for 1.1% of GDP, far
130 lower than the national average (6.43%). The number of beds per 1,000 people in
131 Shenzhen at the end of 2019 was 3.83 , also far below the national average of 6.30. In
132 China, healthcare is provided almost exclusively by state-owned public general
133 hospitals at the primary, secondary, and tertiary levels and it is well appreciated that
134 the tertiary hospital has the most advanced services capacity, followed by the
135 secondary hospital and primary medical institution. Under these circumstances, as
136 citizens are free to choose healthcare facilities without being restricted by a
137 gatekeeping mechanism, they may bypass primary care and choose these higher-level
138 facilities regardless of disease severity.[12-14] According to the China health statistics
139 yearbook, outpatient services for primary medical and health institutions increased by
140 2%, and by 49% for tertiary hospitals, between 2013 and 2018.[15] These statistics
141 demonstrate that patients shop doctors (from primary providers and large hospitals) in
142 a chaotic manner, there is an insufficient service capacity at primary medical and
143 health institutions, and there is a continued overcrowding in China's hospitals.[16, 17]
144 There were 3,492 medical and health institutions in Shenzhen in 2017, including 610
145 community health service centers. Although 13.96 million people were covered by
146 basic medical insurance and over 4 million residents signed family doctor service
147 agreements, the proportion of citizens who choose to seek medical treatment in
148 community health service center was relatively low, accounting for only about 38%.[18]
149 [19]A large number of patients would rather queue up in higher-level hospitals than go
150 to the nearby primary medical institutions. Thus, to improve the implementation
151 efficiency of the hierarchical diagnosis and treatment system, it seems quite necessary
152 to understand the preference and attitude of their medical institution and the
153 associated influencing factors.
154 To the best of our knowledge, previous studies regarding the preference or attitude of
155 medical choice were mainly focused on the actual health-seeking behavior[20-22], which
156 was defined as the actions taken by individuals who perceive they have an illness to
157 obtain a suitable remedy.[23] This behavior involves a series of decision-making
158 processes governed by both individual characteristics, beliefs and provider-related
159 features. During this process, decisions on whether to seek treatment, from whom to
160 seek treatment, what kind of treatment to seek, as well as how many healthcare
161 resources to use are usually made. Thus, in theory, an individual's healthcare needs do
162 not necessarily turn into effective demand. Similarly, the expected medical institution
163 for an individual's first consultation may be different from the actual selection. The
164 exploration of factors on expected and actual first medical institution may, to some
165 extent, help us determine and figure out the differences between individual preference
166 and attitude of the medical institution, and their actual healthcare-seeking behaviors,
167 which is very crucial for strengthening the hierarchical diagnosis and treatment
168 system, as it also concerns the effective allocation and rational use of medical
169 resources.
170 A previous systematic review analyzed a considerable body of studies and identified
171 factors on the selection of healthcare, such as individual, facility, context and
172 composite factors, influencing facility choice in China.[22] However, as China's

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173 youngest city, Shenzhen may be different from traditional cities due to its
174 characteristics, such as living spaces and population composition. In order to better
175 promote the reform of the hierarchical diagnosis and treatment system, it is vital
176 important to first understand the citizens' choices of healthcare provider types and the
177 associated factors. Therefore, the current study aims to: (1) explore the citizens'
178 expected and actual preference of first medical service and their influencing factors at
179 various medical levels; (2) understand citizens' views and attitudes towards
180 community health services.

181 **Methods**

182 **Participants**

183 Subjects were selected according to the outpatient records of Shenzhen Medical
184 System in 2017. According to the pilot study, the awareness rate of the hierarchical
185 diagnosis and treatment system was 40%, with the maximum permissible error of
186 2.5% and confidential level of 95%, the sample size was calculated as 1475. Taking
187 into account the invalid questionnaire and expansion of sample size by 9%, a total of
188 1612 subjects were finally investigated. Stratified sampling was performed and the
189 number of the participants varied according to the number of residents in each district.
190 Finally, the number of participants from each district were 210(14.0%) in Futian
191 district, 210(14.0%) in Luohu district, 210(14.0%) in Nanshan district, 50 (3.3%) in
192 Yantian district, 260 (17.3%) in Baoan district, 260(17.3%) in Longgang district,
193 150(10.0%) in Longhua district, 50(3.3%) in Pingshan district, 50(3.3%) in
194 Guangming district and 50(3.3%) in Dapeng new district.One resident at the age of 18
195 and above was then selected from each household. The Inclusion criteria: living in
196 Shenzhen for ≥ 6 months, agreeing to sign an informed consent form, good mental
197 state and clear consciousness. Exclusion criteria: subjects suffering from severe
198 mental illness or cognitive communication difficulties. All the subjects participated
199 voluntarily and provided written informed consent.

200 **Data collection**

201 Selected subjects were first inquired by telephone to ensure that they understand and
202 agree to the survey. Questionnaire entitled "Questionnaire on medical preference and
203 behavior of Shenzhen residents" was conducted by face-to-face. Items were initially
204 selected through literature and determined after three expert consultations. Final
205 version of the questionnaire was determined after the modification from a pilot study.
206 In measuring the expected preferred first medical institution, question is "If conditions
207 permit, what type of medical institution would you like to choose for the first
208 consultation?" with the corresponding answer " ① Municipal hospitals ②District
209 hospitals ③Street hospitals ④Private medical institutions ⑤Community health
210 service centers ⑤Other hospitals ⑦Depending on the situation". In measuring the
211 actual preferred first medical institution, question is" If you are unwell, what type of
212 medical institution did you choose?", with the corresponding answer "①Municipal

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213 hospitals ②District hospitals ③Street hospitals ④Private medical institutions
214 ⑤Community health service centers ⑤Other hospitals ⑦Depending on the
215 situation". The investigation was conducted by uniformly trained investigators, and
216 the quality is strictly controlled throughout the whole investigation.

Statistical analysis

218 All data were entered by two researchers simultaneously by Epidata 3.02. SPSS 25.0
219 was used for data cleaning, sorting and statistical analysis. Descriptive statistics were
220 used to describe participants' characteristics. The relationships between medical
221 service seeking preference and various factors were analyzed by χ^2 tests. The
222 difference between the understanding of the community first consultation system and
223 the approval level of the community first consultation system as also performed by
224 χ^2 test and linear trend test. Multivariate logistic regression analysis was performed to
225 explore the factors affecting the preference of medical service. The independent
226 variables were selected by the forward stepwise method with inclusion criteria of 0.05
227 and exclusion of 0.10. All tests were two-way and the significance level was set at P
228 <0.05.

Ethnic statement

230 The study was approved by the Ethics Committee of the Affiliated Hospital of
231 Guangdong Medical University (ethical approval number: YJ2017045-1). All
232 participants were aware of the aims and objectives of the study, informed that
233 participation was voluntary and their data would remain confidential, and provided
234 written informed consent.

Patient and public involvement

236 There has been no patient and/or public involvement in the study design, data analysis
237 and writing of the current study. The brief results were emailed to each participant
238 after the investigation.

Results

Test for the questionnaire

241 The reliability and validity of the questionnaire were good with an overall internal
242 consistency, a Cronbach α coefficient of 0.826, Kaiser-Meyer-Olkin index of 0.791
243 and the cumulative contribution rate of 6 factors of 81.959%.

Subjects' characteristics

245 The characteristics of the participants are shown in **Table 1**. The average age was
246 34.3 ± 10. 0 years and the age composition were close to that of Shenzhen residents in
247 2010 population census.

248 **Table 1 Basic characteristics of participants**

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Category	n (%)	Category	n (%)
Sex		**Monthly incomes (CNY)**	
Male	733(48.9)	<3000	158(10.5)
Female	767(51.1)	3000~	479(31.9)
Age(years)		5000~	626(41.7)
<20	56(3.7)	10000~	158(10.5)
21-30	607(40.5)	15000~	53(3.5)
31-40	520(34.7)	≥30000	26(1.7)
41-50	204(13.6)	**Housing conditions**	
≥51	113(7.5)	Self-purchased housing	351(23.4)
Educational level		Renting policy housing	114(7.6)
Junior high school and below	222(14.8)	Renting housing in Urban Villages	618(41.2)
High school/technical secondary	581(38.7)	Renting commercial housing	170(11.3)
junior college	431(28.7)	Dormitory	94(6.3)
Undergraduate	242(16.1)	Others	153(10.2)
Post undergraduate	24(1.6)	**Medical insurance**	
Occupation		Level 1	663(44.2)
public institutions	153(10.2)	Level 2	336(22.4)
professional and technical	224(14.9)	Level 3	187(12.5)
Enterprise managers	156(10.4)	Uninsured	314(20.9)
Enterprise staff	208(13.9)	**Marital status**	
Individual industrial and commercial households	228(15.2)	Single	435(29.0)
		Married	1065(71.0)
Worker	342(22.8)	**Census register**	
Unemployed	53(3.5)	Registered	531(35.4)
Others	136(9.1)	Non-registered	969(64.6)

249   **Actual and expected preferred first medical institution**

250   In terms of actual first medical institution, as the proportion of choosing private
251   medical institution was very small and a clear stated medical preference would help
252   us analyze the needs and influencing factors, we excluded 25 subjects choosing

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253 private medical institution, and 412 choosing medical institutions depending on
254 specific circumstances. Further analysis was conducted in remaining 1063 subjects
255 with specific preferences. The percentages of actual and expected preferred first
256 medical institutions between sexes were shown in **Table 2**. Over 50% of the subjects
257 chose municipal or district hospitals as first choice. There is no statistically significant
258 difference in the actual medical institution selection among municipal, district-level,
259 street-level and community health service between two sexes (χ^2=5.034, P=0.169).
260 Similarly, in terms of expected preferred first medical institution, as no subject would
261 choose private medical institution and 396 would choose according to specific
262 circumstances, we excluded these 396 subjects and further analysis was conducted in
263 the remaining 1104 subjects with specific preferences. Over three-quarters of the
264 subjects expected to choose municipal and district-level hospitals for the first visit.
265 There was no statistically difference among 1104 subjects with specific first medical
266 institution choice between two sexes (χ^2=2.843, P=0.416).

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267 **Table 2 Selection of actual and expected preferred medical institutions in subjects with different demographic characteristics（*n*，%）**

	Variables	Actual selection					Expected selection				
		Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total	Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total
Sex	Male	154(29.8)	143(27.7)	73(14.1)	146(28.3)	516(100.0)	318(59.6)	147(27.5)	38(7.1)	31(5.8)	534(100.0)
	Female	162(29.6)	161(29.4)	54(9.9)	170(31.1)	547(100.0)	328(57.5)	165(28.9)	52(9.1)	25(4.4)	570(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Age	<21	6(18.8)	2(6.3)	2(6.3)	22(68.8)	32(100.0)	17(45.9)	10(27.0)	8(21.6)	2(5.4)	37(100.0)
	21~	131(32.1)	112(27.5)	53(13.0)	112(27.5)	408(100.0)	262(59.3)	120(27.1)	39(8.8)	21(4.8)	442(100.0)
	31~	98(26.2)	121(32.4)	46(12.3)	109(29.1)	374(100.0)	211(55.5)	124(32.6)	28(7.4)	17(4.5)	380(100.0)
	41~	56(35.4)	44(27.8)	16(10.1)	42(26.8)	158(100.0)	96(62.7)	42(27.5)	7(4.6)	8(5.2)	153(100.0)
	≥51	25(27.5)	25(27.5)	10(11.0)	31(34.1)	91(100.0)	60(65.2)	16(17.4)	8(8.7)	8(8.7)	92(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Education	Junior high school and below	28(20.0)	29(20.7)	15(10.7)	68(48.6)	140(100.0)	81(52.9)	41（26.8)	19(12.4)	12(7.8)	153(100.0)
	High school / technical secondary	102(25.1)	123(30.3)	46(11.3)	135(33.3)	406(100.0)	232(55.0)	134（31.8)	35(8.3)	21(5.0)	422(100.0)
	junior college	95(29.3)	99(30.6)	47(14.5)	83(25.6)	324(100.0)	196(59.9)	97（29.7)	20(6.1)	14(4.3)	327(100.0)
	undergraduate and above	91(47.2)	53(27.5)	19(9.8)	30(15.5)	193(100.0)	137(67.8)	40（19.8)	16(7.9)	9(4.5)	202(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

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	Variables	Actual selection					Expected selection				
		Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total	Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total
Monthly income	<3000	37(32.7)	28(24.8)	9(8.0)	39(34.5)	113(100.0)	74(60.2)	29 (23.6)	13(10.6)	7(5.7)	123(100.0)
	3000~	65(19.0)	74(21.6)	48(14.0)	155(45.3)	342(100.0)	194(52.3)	107(28.8)	50(13.5)	20(5.4)	371(100.0)
	5000~	123(28.4)	158(36.5)	54(12.5)	98(22.6)	433(100.0)	246(57.3)	149(34.7)	19(4.4)	15(3.5)	429(100.0)
	10000~	54(44.3)	37(30.3)	12(9.8)	19(15.6)	122(100.0)	88(72.7)	17(14.0)	7(5.8)	9(7.4)	121(100.0)
	≥15000	37(69.8)	7(13.2)	4(7.5)	5(9.4)	53(100.0)	44(73.3)	10(16.7)	1(1.7)	5(8.3)	60(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Medical insurance	Level 1	179(36.2)	149(30.1)	51(10.3)	116(23.4)	495(100.0)	316(65.2)	129(26.6)	27(5.6)	13(2.7)	485(100.0)
	Level 2	55(21.1)	92(35.2)	40(15.3)	74(28.4)	261(100.0)	136(50.9)	89(33.9)	24(9.0)	18(8.3)	267(100.0)
	Level 3	23(16.7)	44(31.9)	17(12.3)	54(39.1)	138(100.0)	71(45.2)	51(32.5)	22(14.0)	13(8.3)	157(100.0)
	uninsured	59(34.9)	19(11.2)	19(11.2)	72(42.6)	169(100.0)	123(63.1)	43(22.1)	17(8.7)	12(6.2)	195(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Housing conditions	Self-purchased housing	110(39.6)	92(33.1)	25(9.0)	51(18.3)	278(100.0)	168(62.7)	71(26.5)	15(5.6)	14(5.2)	268(100.0)
	Renting policy housing	15(20.2)	36(48.0)	11(14.7)	13(17.3)	75(100.0)	41(53.9)	22(28.9)	6(7.9)	7(9.2)	76(100.0)
	Renting housing in Urban Villages	93(21.9)	114(26.8)	65(15.3)	153(36.0)	425(100.0)	222(49.8)	154(34.5)	50(11.2)	20(4.5)	446(100.0)
	Renting commercial housing	56(39.2)	29(20.3)	8(5.6)	50(35.0)	143(100.0)	103(70.5)	30(20.5)	8(5.5)	5(3.4)	146(100.0)

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	Variables	Actual selection					Expected selection				
		Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total	Municipal hospitals	District hospitals	Street-level hospitals	Community Health Service	Total
	Dormitory	13(23.2)	14(25.0)	4(7.1)	25(44.6)	56(100.0)	51(65.4)	17(21.8)	6(7.7)	4(5.1)	78(100.0)
	Others	29(33.7)	19(22.1)	14(16.3)	24(27.9)	86(100.0)	61(67.8)	18(20.0)	5(5.6)	6(6.7)	90(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
	Single	86(33.5)	58(22.6)	35(13.6)	78(30.4)	257(100.0)	192(64.6)	59(19.9)	31(10.4)	15(5.1)	297(100.0)
Marital status	Married	230(28.5)	246(30.5)	92(11.4)	238(29.5)	806(100.0)	454(56.3)	253(31.4)	59(7.3)	41(5.1)	807(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
	Registered	138(34.7)	140(35.2)	34(8.5)	86(21.6)	398(100.0)	254(65.3)	100(25.7)	21(5.4)	14(3.6)	398(100.0)
census register	Non-registered	178(26.8)	164(24.7)	93(14.0)	230(34.6)	665(100.0)	392(54.8)	212(29.7)	69(9.7)	42(5.9)	665(100.0)
	Total	316(29.7)	304(28.6)	127(11.9)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

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Demographic characteristics and preferred first medical institution

The demographic characteristics, including age, education, income, medical insurance, housing condition, marital status and census register, grouped by the selection of actual and expected preferred medical institutions were presented in **Table 2**.

Age

Significant differences were both observed in the level of actual (χ^2=33.257, P=0.001) and expected medical institutions (χ^2=23.415, P=0.024) among different age groups. In terms of actual first medical institution, the largest proportion of choosing municipal medical institutions as their first choice were observed in the age group of 21~30 and 41~50 years. The largest proportion of choosing community health service center were observed in the age group of ≤20 years, with the proportion of 68.8%. In terms of expected first medical institution, with age increase, subjects expect to choose higher level of medical institution. The proportion of choosing municipal hospital was the largest in each age group, ranging from 45.9% to 65.2%.

Education

Subjects with different educational backgrounds had different preferences for actual (χ^2=67.169, P<0.001) and expected medical institutions (χ^2=20.079, P=0.017). Those with high educational level are more inclined to choose high-level medical institutions for the first visit. Linear trends were observed between education levels and actual (χ^2=54.189, P<0.0001). or expected medical institutions (χ^2=20.079, P=0.017).

Income

Significant differences were both observed in the level of actual (χ^2=127.362,P<0.001) and expected medical institutions (χ^2=57.767, P<0.001) among subjects with different income level. Linear trends were observed between monthly income levels and actual (χ^2 =62.024, P<0.0001). or expected medical institutions (χ^2=5.569, P=0.018). Those with high monthly income levels are more inclined to choose high levels for the first visit medical institutions. In terms of expected medical institution, over 50% of the subjects in all monthly income groups would choose municipal hospital as their first medical institution, of which, the largest proportion were observed in the group of 10000-14999 yuan and over 15000 yuan, with the corresponding proportion of 72.7% and 73.3%.

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301   *__Medical insurance__*

302   Significant differences were both observed in the level of actual (χ^2=69.656, *P*<0.001)
303   and expected medical institutions (χ^2=39.734, P<0.001) among subjects with different
304   medical insurance levels. Linear trends were observed between medical insurance
305   levels and actual (χ^2=26.885，*P*<0.0001) or expected medical institutions (χ^2=10.450,
306   P=0.001). Subjects with lower level of medical insurance are more inclined to choose
307   community health service center. In terms of expected medical institution, the
308   proportion of choosing municipal hospital was the highest, ranging from 45.2% to
309   65.2%

310   *__Housing conditions__*

311   Subjects with different housing conditions had different preferences for actual
312   (χ^2=84.040，*P*<0.001) and expected medical institutions (χ^2=38.790, *P*=0.001). In
313   terms of actual medical institution, the proportions of subjects with self-purchased
314   houses and rented commercial houses choosing municipal hospitals as their first
315   medical institution, were the highest, with the corresponding proportions of 39.6%
316   and 39.2%, respectively. The proportion of the subjects with renting policy housing
317   who choose district-level hospitals was highest, reaching 48.0%. The proportion of
318   the subjects living in dormitory who choose community health service center was
319   highest, reaching 44.6%. In terms of expected medical institution, the proportion of
320   choosing municipal hospital was the highest, in all groups with different housing
321   conditions. Comparatively, the overall proportion of choosing community health
322   service center was only 5.1%, ranging from 3.4% to 9.2% in all groups.

323   *__Marital status__*

324   There is no statistically significant difference in the actual medical institution
325   selection and marital status (χ^2=6.738, *P*=0.081). The proportions of choosing
326   municipal hospital and community health service center in single subjects were the
327   highest, with the corresponding percentage of 33.5 and 30.4. However, significant
328   difference was observed between marital status and expected medical institutions
329   (χ^2=15.348, *P*=0.002). The proportion of expecting municipal hospital was highest in
330   both single and married subjects, with the corresponding percentage of 64.6 and 56.3,
331   respectively. Only 5.1% of the subjects would choose community health service
332   center.

333   *__Census register__*

334   Significant differences were both observed in the level of actual ((χ^2=35.141,
335   *P*<0.001) and expected medical institutions (χ^2=14.263, *P*=0.003) among subjects

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336 with different census register. In terms of actual medical institution, subjects with
337 Shenzhen census register were more inclined to choose municipal and district-level
338 hospitals, with the corresponding percentage of 34.7 and 35.2, respectively. Subjects
339 without Shenzhen census register were inclined to choose community health service
340 center, with the percentage of 34.6.Comparatively, subjects with and without
341 Shenzhen census register both expect   municipal hospital, and district-level hospital
342 as the second choice.

Medical technology and convenience are the main factors in choosing a medical
institution

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345 Major factors on the selection of medical institution were shown in **Table 3**. Over
346 70% of the subjects considered medical technology and convenience as the main
347 factors in choosing a medical institution. 14.04% and 12.68% of the subjects
348 considered service attitude and medical price, respectively, in choosing a medical
349 institution. Only 2.80% considered according to specific circumstances.

350 **Table 3 Major factors on the actual and expected selection of first medical**
351 **institution (*n*，%)**

Major factors	Municipal hospital	District-level hospital	Street-level hospital	Community health service	Total
Medical technology	350 （73.5)	96 （20.2)	15 （3.2)	15 （3.2)	476(100.0)
Convenience	127 （42.1)	126 （41.7)	30 （9.9)	19 （6.3)	302(100.0)
Attitude of service and medical ethnics	93 （60.0)	29 （18.7)	24 （15.5)	9 （5.8)	155(100.0)
Price	57 （40.7)	55 （39.3)	20 （11.8)	8 （5.7)	140(100.0)
Others	19 （61.3)	6 （19.4)	1 （3.2)	5 （16.1)	31(100.0)
Total	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

352 **Understanding of the community first diagnosis system**

353 Subjects didn't have a high level of understanding of the community first diagnosis
354 system, as shown in **Table 4**. Only 3.67% of the subjects were very familiar with the
355 community first diagnosis system whereas 59.53% were less familiar or unfamiliar. In
356 subjects who were unfamiliar with the community first diagnosis system, only 18.7%
357 agree with this system while 71.70% hold an indifferent attitude. Subjects with better
358 understanding of the community first diagnosis system were more in favor of the
359 community first diagnosis system   (χ^2=177.805，P<0.0001). There is a linear trend
360 between the understanding and agreement on the community first diagnosis.
361 (χ^2=145.327，P<0.0001).

362 **Table 4 Analysis of the understanding and agreement on the community first**
363 **diagnosis system(*n*，%)**

Whether understanding community first	agree	disagree	Doesn't matter	Total

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Very familiar	32 （58.2）	10 （18.2）	13 （23.6）	55 （3.67）
Quite familiar	99 （61.9）	16 （10.0）	45 （28.1）	160 （10.67）
Moderately familiar	221 （56.4）	32 （8.2）	139 （35.5）	392 （26.13）
Less familiar	210 （42.3）	64 （12.9）	223 （44.9）	497 （33.13）
Unfamiliar	74 （18.7）	38 （9.6）	284 （71.7）	396 （26.40）

Main factors affecting participants' preference of medical institution

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365 We established two logistic regression models to explore the factors on the selection
366 of medical institution. The dependent variables are different, which were the actual
367 and expected first medical institution in model 1 and 2, respectively. Dependent
368 variable is further classified in two categories, with street-level hospital, community
369 health service center and private hospital as "0", municipal and district-level hospitals
370 as "1". Independent variables and their definitions are the same, including age,
371 education, occupation, census register, marital status, monthly income, housing
372 conditions and medical insurance, which were selected from statistically significant
373 single factor analysis on the preferred first medical institution. Occupation and
374 housing conditions were dummified, with other occupation, other housing condition
375 as a reference. Other independent variables including ≤20 years, Shenzhen household
376 registration, unmarried as the reference. Monthly income, education and medical
377 insurance as ordered variables.

378 In model 1, education, household registration and monthly income affected subjects'
379 actual medical institution. There was a statistically significant difference of the
380 regression equation (χ^2=11.95, P = 0.001), with -2Log=1357.646 and correction
381 coefficient of determination r^2=0.505. Education, household registration and monthly
382 income can explain 65.5% of the reasons on the subjects' choice actual first medical
383 institution. Subjects with higher the education level, higher the monthly income level,
384 were more inclined to choose municipal or district-level hospitals. Compared with
385 Shenzhen household registration, non-Shenzhen household registration was more
386 inclined to choose street-level hospitals and community health service centers, as
387 shown in **Table 5**.

388 In model 2, occupation, medical insurance levels and household registration affected
389 subjects' expected medical institution. There was a statistically difference of the
390 logistic regression, with -2Log=830.499 (χ^2=15.130, P = 0.034). The prediction
391 accuracy rate is 86.8%. Subjects with higher medical insurance levels were more
392 inclined to choose city-level or district-level hospitals. Compared with Shenzhen
393 household registration, non-Shenzhen household registration was more inclined to
394 choose street hospitals and community health service centers, as shown in **Table 5.**

395 **Table 5 Logistics regression analysis of the factors affecting subjects' actual and**

396 **expected first medical institution.**

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Model	Variable	b	S_b	Wald χ^2	P	OR	OR 95% CI
Actual Selection Model	Constant	-0.176	0.346	0.260	0.610	0.838	-
	Education	0.258	0.075	11.838	0.001	1.295	1.118, 1.500
	Census status	-0.632	0.138	20.883	0.000	0.532	0.405, 0.697
	Monthly income	0.343	0.073	21.747	0.000	1.409	1.220, 1.627
Expected Selection Model	Constant	2.462	0.438	31.552	0.000	11.732	-
	Occupation(Others as the reference)	-	-	14.843	0.038	-	-
	public institutions	1.151	0.453	6.441	0.011	3.160	1.299, 7.684
	professional and technical personnel	0.222	0.335	0.442	0.506	1.249	0.648, 2.406
	Enterprise managers	0.793	0.402	3.899	0.048	2.211	1.006, 4.859
	Enterprise staff	0.710	0.365	3.792	0.052	2.035	0.995, 4.159
	Individual industrial and commercial households	0.995	0.384	6.721	0.010	2.705	1.275, 5.742
	Worker	0.484	0.322	2.264	0.132	1.623	0.864, 3.050
	Unemployed	0.007	0.465	0.000	0.988	1.007	0.405, 2.505
	Census register	-0.457	0.221	4.270	.039	0.633	0.410, 0.977
	Medical insurance	-0.161	0.082	3.846	.050	0.851	0.725, 1.000

Discussion

This study demonstrated the preference and associated factors of choosing a medical institution for the first visit in Shenzhen citizens. Generally, over 50% of the subjects were willing to select municipal and district-level medicals institutions for the first visit. Those with high educational level, or high-income levels, or Shenzhen census register, were more inclined to choose high-level medical institutions. Over 70% of the subjects considered medical technology and convenience as the main factors in choosing a medical institution.

Factors of health-seeking behavior

In theory, an individual's healthcare needs do not necessarily turn into effective demand. The behavior of consuming medical service involves a series of decision-making processes governed by many factors. In addition to whether the residents themselves perceive the need for health services, it is also related to their income level, social status, health security, transportation convenience, risk habits, health awareness, as well as the type and quality of services provided by health facilities.[24] The health-seeking behavior[20-22], which was defined as the actions taken

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413 by individuals who perceive they have an illness to obtain a suitable remedy[23], only
414 occurred if the individual indeed utilize the medical resources. Therefore, the
415 expected medical institution for an individual's first consultation may be different
416 from the actual selection. In the current study, we found that if feeling unwell, main
417 factors on the subjects' preferred medical institution and their actual first visit were
418 different. When conditions permit, occupation, types of medical insurance
419 participation, and household registration are the main factors that affected subjects'
420 expected medical service selection. In comparison, education, household registration
421 and monthly income affected subjects' actual first medical service selection. The
422 exploration of factors on expected and actual first medical institution may, to some
423 extent, help us determine and figure out the differences between individual preference
424 and attitude of the medical institution, and their actual healthcare-seeking behaviors,
425 which is very crucial for strengthening the hierarchical diagnosis and treatment
426 system, as it also concerns the effective allocation and rational use of medical
427 resources.

428 There are many factors that can be associated with healthcare choices, including
429 patient and family factors, provider factors, and environmental factors. In the current
430 study, the finding that medical technology and convenience are the main factors in
431 choosing a medical institution, is consistent with previous studies in which
432 participants indicated to prioritise organizational factors.[25] A previous study also
433 indicated that compared with the situation in the other regions in China, residents in
434 Shenzhen can access general hospitals timelier, but inaccessibility to medical
435 resources among communities existed in this first-tier Chinese city.[11] From the
436 perspective of provider and environmental factors, the perception of provider
437 responsiveness, considering factors such as convenience, waiting time, and
438 confidence, is a strong motivating factor when choosing primary care according to a
439 study among about 40 patients in England.[26] In addition, perceived professionally
440 relevant factors [27, 28] and doctor's quantity also affected patients' choices.[29]
441 Geographical factors were also associated with patients' healthcare decision-making
442 and the use of healthcare services, and to some extent, can constrain individual's
443 ability to make good healthcare choices, yet participants have differing capacities to
444 mobilise resources to overcome the constraints of place.[30]

445 Sociodemographic characteristics such as insurance and income, had a considerable
446 impact on their health care decisions. Geitona *et al*. found that the utilization of health
447 services was mostly determined by health status rather than socioeconomic factors
448 like medical insurance. [31] A study conducted in 14 tertiary hospitals in Shanghai,
449 China, showed that patients' healthcare-seeking preferences were influenced mainly
450 by illness severity and sociodemographic characteristics, and patients who earned
451 higher monthly incomes expressed a preference for first-class providers.[20]

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Dilemma of first diagnosis at the community health service center

Some of our findings may reflect initial effects of reform implementation. Under the current hierarchical diagnosis and treatment system, subjects in the current study were not very familiar with the first diagnosis system of community health service centers, most of whom even didn't know whether the community health service center has the ability of the first diagnosis and question about the service capacity. These phenomena will undoubtedly hinder the implementation of the hierarchical diagnosis and treatment system and it is also not conducive for residents to effectively cooperate with the implementation of the hierarchical diagnosis and treatment system.

In addition to the low level of awareness of the first diagnosis system, iIt should be noted that subjects' willingness on community health service centners was not strong. Only 21.1% of the subjects would choose community health center as their initial visit, inconsistent with a previous study conducted in Shenzhen in which the willingness on community health centers was high among patients with health insurance, who were female, and who were familiar with gatekeeper policy.[32]

The concepts most relevant to hierarchical diagnosis and treatment in the world are the "three-level health care service model" and the "gatekeeper" system, which basically include the "gatekeeper" system and two-way referral system centered on the first diagnosis at the grassroots level. It is not only a matter of seeing a doctor, but also a matter of institutional arrangement, which consists of division of labor among medical institutions, rational allocation of medical resources, maximization of use efficiency, and refinement of patient management services. Health department and health insurance department are mainly promoters of hierarchical treatment system. The implementation of the hierarchical treatment system is conducive to optimizing the allocation of medical and health resources and to reduce the cost of medical treatment, control of medical and health costs.

However, the first diagnosis in a primary health care facility is in a dilemma. From the aspect of patients, their subconscious trust in large hospitals of well-equipped and advanced instruments, doctor's with high skills. From the aspect of health provider,

weaknesses, such as the insufficient service capacity of primary health institutions, the

ambiguous positioning of medical institutions, inability of information share, are quite obvious. [27, 29, 33] For instance, according to the statics of the 2016 Health and Family Planning Statistical Bulletin, 94.2% of the total primary medical and health institutions only provided 55.1% of the total number of diagnosis and treatment, while the first-, second- and third-level hospitals, which accounted for 3.0% of the total number of medical institutions, provided 41.2% of the total number of diagnosis and treatment.[34]

In terms of the mechanism of hierarchical diagnosis and treatment system, there is no incentive mechanism, which is mainly led by the health administrative department by adopting semi-mandatory measures to encourage patients to seek medical treatment in an orderly manner. This administrative hierarchical diagnosis and treatment system is in a passive state and has not formed an effective incentive mechanism.

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494   In order to better promote hierarchical diagnosis and treatment, we should learn more
495   from the successful foreign experience. One particular example is the United
496   Kingdom, which is one of the earliest and strictest western countries that practice the
497   hierarchical diagnosis and treatment system. After years of development and
498   improvement, it has become a typical representative of the British welfare system.
499   Although prominent problems such as rapid growth of medical expenses and low
500   efficiency have become the challenges faced by the NHS,[35, 36] its successful
501   experience and lessons have significant reference for deepening of China's medical
502   reform.

503   To solve the dilemma of first diagnosis at the community health service, several
504   approaches can be referred from other countries' successful experiences. First, in
505   order to improv the ability of primary medical and health services, the management of
506   the general practitioner system and personnel training should be strengthened.
507   Successful experiences were available, such as, the Quality of Health Framework in
508   UK, [37] Royal College of General Practitioners (RACGP) in Australia,[38] and
509   Germany's implementation of accessing management and strict practice qualification
510   review for physicians. [39]**Second**, as referring to the United States, the implementation
511   of strict cost control and incentive measures can be adopted to clarify the diagnostic
512   criteria of disease and specify the length of hospitalization through diagnosis-related
513   classifications (DRGs).[40] Third, payment methods can be more diversified. For
514   example, the option of paying per capita, as referring to Canada, can be added to
515   encourage general practitioners to actively control medical expenses and attract more
516   community residents to sign up for the first consultation.[41]

517   **Disease severity may affect patients' preference**

518   Although we reported that, if feeling unwell, main factors on the subjects ' expected
519   and actual first visit were different, we failed to further explore the influences of the
520   diseases severity as well as comorbidities. When individuals are ill, decisions as to
521   whether to seek medical treatment and which healthcare provider to choose are made
522   by patients and their family members. These choices are influenced mainly by
523   personal preference, disease severity, and economic capacity.[20]A previous study
524   indicated that the distance is of less importance as illness is more severe.[42]
525   Self-assessment of disease severity may also play a special and important role in the
526   selection of first medical service. In addition, in case of perceived minor or sever
527   illness, factors influencing choice of medical service on urban and rural respondents
528   were different. In the case of perceived minor illness, no matter rural or urban
529   residents, stated many factors which caused them not to access the system at the
530   lower, primary level, among whom, indicated to choose it nevertheless because of the
531   higher quality of care outweighing the higher cost of transportation, service and
532   medication, as well as inconvenience of the complex physical environment. [43]

Income and medical investment affect participants' selection

Subjects with high educational level, high monthly income level, or favorable housing conditions, such as self-purchased or rented commercial houses, are more inclined to choose high-level medical institutions for the first visit. These findings are consistent with a previous systematic review which also revealed that higher income, higher education, and urbanization are associated with access at high levels.[22]

Income has long been considered as an important predictor of healthcare utilization and its impacts on individuals' health vary a lot. Generally, there is a positive correlation between income and healthcare use.[24] Wealthy individuals are less likely to underutilize healthcare resources; instead, they spend more money and time on healthcare, whilst individuals with low-income level face greater barriers to accessing adequate health care.[44] Retirees over the age of 60 or individuals without formal employment have more difficulty in accessing medical help, or even give up treatment due to lower incomes.[33, 45]

Investing in the health system not only saves lives, it is also a crucial investment in the wider economy. This is because ill-health impairs productivity, hinders job prospects and adversely affects human capital development. As an internationally accepted indicator, the total health expenditure is considered to be one of the effective ways to understand the health status of a country. According to the requirements of WHO, the total health expenditure in developing countries should not be less than 5% of the total GDP. In recent years, China's health investment has continued to increase, and the burden of the masses to see a doctor has gradually eased. Take the government capital investment in health services into account, it is vital important to further increase investment in medical and health services as well as pay more attention to population's health. Some countries in South East Asia spend very little on health, for example, India spends very little on health: $215 in terms of purchasing power parity per person, which is lower than comparable middle-income countries such as China, Brazil and South Africa. This forces citizen to use their money to pay for the medical services, the use of out of pocket money causes panic to those who cannot manage to pay. There is a need for countries to extend the health funding by looking at a wider picture of investing in human capital.

Thus, from the observation of the current study, we strongly highly recommend cities, with rapid economic growth should speed up the investment in medical resources to solve the problems of the imbalance between economy and health. Take Shenzhen as an example, it's medical and health resources don't' match the status and role of its first-tier cities, especially its economy volume. The investment in medical and health services in Shenzhen is far from enough. In the whole year of 2019, the investment of medical and health services in Shenzhen is 33.548 billion yuan, accounting for 7.37% of local fiscal expenditures. Although the investment in health is increasing year by year, the total health expenditure as a percentage of GDP in Shenzhen only accounted for 1.25, far below that of 5.20 in Guangdong and 6.43 in the whole nation. In addition, the per capita health service expenditure is 2496.35 yuan,[46] far below the national average of 4702.8 and Guangdong average of 4581.96.[47] By the end of 2019,

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576 the number of certified (assistant) doctors per 1000 population in Shenzhen is 3.01,[46]
577 far below the national and Guangdong Provincial city average of both 4.10.[47]
578 Compared with the achievements in economic development, the insufficiency and
579 distribution of medical and health services has become a "short board" that restricts
580 the city's comprehensive development.

581 **Limitations**

582 Several limitations of this study need to be addressed. **First**, although the study
583 sample was representative as a result of randomly sampling according to the
584 proportion of population from all districts of Shenzhen, owing to the large floating
585 population in Shenzhen, the interpretation and extrapolation of the characteristics of
586 preference for the first medical service to the entire city population should be with
587 great caution. **Second**, we did not further explore the diseases severity on the patients'
588 preference of their initial visit. Self-assessment of disease severity may play a special
589 and important role in the selection of first medical service. Convenience, such as the
590 distance, is of less importance as illness is more severe.[42] **Third**, as the study focused
591 on the participants of 18 and above, we could not collect information on the
592 preference of the first medical service from children or their parents. Shenzhen is a
593 city with young population age structure and due to the two-child policy recently
594 imposed by the Chinese government, pediatrician shortage has become an
595 increasingly important issues, parents' choice to a high-level medical institution may
596 be affected due to the shortage of specialists.[48] Selection bias may exist as the study
597 subjects were outpatient patients, we could not demonstrate and compare the
598 preference and attitude of first medical service in inpatients and non-patients. **Last**
599 **but not least**, although the subjects were randomly selected from 10 districts, we did
600 not consider the effects of geographical characteristics on the residents' preference of
601 first medical service. Shenzhen is a long and narrow city from east to west and a
602 shorter city from north to south, the allocation and accessibility of medical resources
603 may, to a certain extent, affect people's willingness and preference to medical service.

604 **Conclusion**

605 In general, over 50% of the subjects are willing to select municipal and district-level
606 medicals institutions for the first visit. Those with high educational level, or
607 high-income levels, or Shenzhen census register, are more inclined to choose
608 high-level medical institutions for first visit. Medical technology and convenience
609 were considered as the main factors in choosing a medical institution.

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613   study design and data collection.

614   **Contributors**

615   DJ and XZ conceived and designed the study. XJ, LK, LX and HS conducted the field
616   work. DJ and ZX conducted the field work and did the initial analyses of the data and
617   wrote the manuscript. CH commented on the interpretation of the data. DJ, XJ and XJ
618   revised and reviewed the manuscript. All authors have seen and approved the final
619   version the abstract for publication.

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626   **Competing interest statement：**

627   No competing interests.

628   **Data sharing:**

629   No additional data available.

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Questionnaire on medical treatment intention and medical treatment

behavior of Shenzhen residents

Dear Citizen:

Providing high-quality medical public services is an important function of the government. In order to understand citizens' perceptions, attitudes and suggestions on medical services in Shenzhen, and to provide reference for deepening the reform of medical services, we conducted this survey. The survey adopts anonymous survey, the survey is purely for research purposes, please fill in carefully and truthfully. Thank you very much for your cooperation! Please tick " √ " in the corresponding option.

Research Group of Shenzhen Academy of Social Sciences

October 2017

1. Gender: ①Male ②Female
2. Age: ___years
3. Education level: ①junior high school and below ②high school/secondary school ③college ④ undergraduate ⑤graduate
4. Occupation (including pre-retirement occupation): ①Company manager ②Company employee ③Worker and service personnel ④Self-employed
⑤ Staff of government agencies and institutions ⑥ Unemployed ⑦ Others
5. Household registration: ① Shenzhen household registration ② Non-Shenzhen household registration
6. District you live in: ①Futian ②Luohu ③Nanshan ④Yantian ⑤Baoan ⑥Longgang ⑦ Longhua ⑧Pingshan ⑨Guangming New District ⑩Dapeng New District
7. Marital status (please skip 8 if you select "Unmarried"): ①Unmarried ②Married ③Divorced ④Widowed
8. Childbearing status: ①Never give birth ②Have given birth
9. Monthly income level: ①Below 3000 yuan ②3000~4999 yuan ③5000~9999 yuan ④ 10000~14999 yuan ⑤15000~29999 yuan ⑥30000 yuan and above
10. Housing status: ① self-purchased housing ② rented policy housing ③ rented private houses in urban villages ④ rented commercial houses ⑤ lived in company dormitories ⑥ others
11. What type of medical insurance do you participate in in Shenzhen?
①Grade 1 (pay monthly fees based on 8% of my total monthly salary, more than 500 yuan per month in 2016, of which individuals need to pay about 100 yuan per month, which will be withheld and paid by the employer)
②Grade 2 (paid monthly at 0.7% of the average monthly salary of on-the-job employees in the city in the previous year, of which the individual pays about 13.5 yuan per month)
③The third gear (paid monthly at 0.5% of the average monthly salary of the on-the-job employees in the city in the previous year, of which the individual pays about 7 yuan per month, which is deducted from the salary)
④ uninsured

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12. If you are unwell, what type of medical institution do you and your family prefer to see a doctor?

①City-level large hospitals ②District-level hospitals ③Street hospitals ④Private medical institutions ⑤Community health service centers ⑤Other hospitals ⑦Depending on the situation

13. If conditions permit, what type of medical institution would you like to choose for the first consultation?

①Municipal hospitals ②District hospitals ③Street hospitals ④Private medical institutions ⑤ Community health service centers ⑥Other hospitals ⑦Depending on the situation

14. In general, what is the most important factor you consider when choosing a medical institution?

①Medical technology ②Convenience of medical treatment ③Service attitude and medical ethics ④Medical price ⑤Others

15. Do you know about the first consultation system in the community (that is, when there is a need for medical treatment [non-emergency], you need to go to the community health service center first)?

①I know very well ②I understand a little bit ③I understand a little bit ④I heard about it, but I don't know much about it ⑤I don't understand at all

16. Do you agree with the community first diagnosis system? ①Agree ②Disagree ③It doesn't matter

17. In the past year, the number of times you went to the city or district hospital for diagnosis and treatment was:

①0 times ②1 time ③2 times ④3 times ⑤4 times ⑥5 times ⑦6 times or more

18. In the past year, the number of visits to the Community Health Service Center was:

①0 times ②1 time ③2 times ④3 times ⑤4 times ⑥5 times ⑦6 times or more

19. What community health services have you used? (Multiple choice)

① Vaccination ② Medical service ③ Check-up service ④ Rehabilitation service ⑤ Health education service ⑥Family planning service ⑦Other service ⑧Never received

20. Do you think the community health service center has the ability and conditions for the first consultation? ①Yes ②No ③Not sure

twenty one. Do you think that the phenomenon of "big hospitals clustered together and grassroots medical institutions deserted" is common in Shenzhen?

① Common ② Relatively common ③ Average ④ Not common ⑤ Not common

twenty two. What do you think is the main reason for the phenomenon of "big hospitals get together and grassroots medical institutions are deserted"? (Multiple choices are allowed, but no more than 3 choices)

①The scope of diagnosis and treatment in hospitals of different levels overlaps, and there is no dislocation development ②The level of primary medical care cannot meet the needs

③The primary medical equipment cannot meet the demand ④The service attitude of the primary medical institution is not good ⑤The price of the primary medical service has no advantage

twenty three. How satisfied are you with Shenzhen's medical public services?

①Very satisfied ②Slightly satisfied ③Normal ④Not satisfied ⑤Dissatisfied ⑥Not sure

24. How satisfied are you with the medical services provided by Shenzhen Community Health Service Center?

①Very satisfied ②Slightly satisfied ③Normal ④Not satisfied ⑤Dissatisfied ⑥Not sure

25. How satisfied are you with the medical services in Shenzhen district and sub-district hospitals?

①Very satisfied ②Slightly satisfied ③Normal ④Not satisfied ⑤Dissatisfied ⑥Not sure

26. How satisfied are you with the medical services in Shenzhen-level hospitals?

①Very satisfied ②Slightly satisfied ③Normal ④Not satisfied ⑤Dissatisfied ⑥Not sure

27．What do you think are the main problems of public medical services in Shenzhen at present? (Multiple choices are allowed, but no more than 3 choices)

①The problem of medical technology level ②The problem of uneven distribution of high-quality medical resources ③The problem of service attitude and medical ethics

④The problem of expensive medical treatment ⑤The problem of difficult medical treatment ⑥ Other problems

28. What do you think are the main problems of the Shenzhen Community Health Service Center at present? (Multiple choices are allowed, but no more than 3 choices)

①The level of medical technology ②The problem of service attitude and medical ethics ③It is difficult to register and seek medical treatment

④The cost of seeing a doctor is high and it is difficult to bear ⑤Other problems (please specify)

29. What do you think are the main problems existing in Shenzhen's district-level hospitals and sub-district hospitals? (Multiple choices are allowed, but no more than 3 choices)

①The level of medical technology ②The problem of service attitude and medical ethics ③It is difficult to register and seek medical treatment

④The cost of seeing a doctor is high and it is difficult to bear ⑤Other problems (please specify)

30. What do you think are the main problems existing in Shenzhen-level large-scale general hospitals? (Multiple choices are allowed, but no more than 3 choices)

①The regional distribution is uneven, and it is inconvenient to seek medical treatment in the original area outside the customs. ②It is difficult to register and seek medical treatment. ③The cost of medical treatment is high and difficult to bear.

④The level of medical technology still needs to be improved ⑤Service attitude and medical ethics ⑥Other questions (please specify)

31．What areas do you expect the government to focus on to improve medical services in Shenzhen? (Please select the option you think is important, you can select more than one)

①Strengthen the construction of community health service centers and train high-level general practitioners to serve community residents ②Optimize the regional distribution of large and high-level medical institutions

③Improve the medical level of large hospitals ④Strengthen the construction of medical ethics and medical style ⑤Increase government investment in medical and health care

⑥Deepening the reform of the medical and health system ⑦Others (please specify)

32．How do you think tiered diagnosis and treatment should be improved? (Multiple choices are allowed, select the option you think is important)

①Strengthen the medical level of primary medical institutions ②Strengthen the medical facilities and drug allocation of social health centers

③Improve the service attitude and medical ethics of primary medical institutions ④Implement the contract system of community general practitioners and family doctors ⑤ Mandatory implementation of the first consultation system in the community

⑥ Community health service centers and other primary medical care are responsible for general diagnosis and treatment, while large hospitals are responsible for the diagnosis and treatment of specialists and difficult diseases, implementing differentiated development

Thank you again for your participation!

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2, 3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2, 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4, 5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	N/A
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6, 7
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study— eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	N/A
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg	8

			demographic, clinical, social) and information on exposures and potential confounders	
			(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*		Report numbers of outcome events or summary measures	8, 9
Main results	16		(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	23, 24, 25
			(*b*) Report category boundaries when continuous variables were categorized	8, 9
			(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17		Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-23
Discussion				
Key results	18		Summarise key results with reference to study objectives	25
Limitations	19		Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	30, 31
Interpretation	20		Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	25-30
Generalisability	21		Discuss the generalisability (external validity) of the study results	31
Other information				
Funding	22		Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	32

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Patient preferences and attitudes towards first choice medical services in Shenzhen, China: a cross-sectional study

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Patient preferences and attitudes towards first choice medical services in Shenzhen, China: a cross-sectional study

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Word Count: 5347

Abstract

Objective: This study aimed to explore the characteristics of Shenzhen residents' preferences and influencing factors regarding their first choice of medical institution at various medical levels, and to understand their attitudes towards community health services.

Design: Cross-sectional survey

Participants: A total of 1612 participants at least 18 years of age were randomly sampled with stratification among ten districts in Shenzhen. Data were gathered through a self-designed questionnaire. The effective questionnaire response rate was 93.05%. All patients participated in the study voluntarily, provided written informed consent and were able to complete the questionnaire.

Main outcome measures: We measured and compared the participants' expected and actual preferences and influencing factors regarding their first choice of medical service at various medical levels.

Results: More than 50% of the participants preferred municipal and district hospitals as their first choice, and 27.5% chose medical institutions according to specific circumstances. Univariate analysis indicated that age, education, income, medical insurance, housing conditions and registered permanent residence were significantly

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37 associated with the actual and expected preferred first medical institution. The main
38 factors influencing participants' actual and expected preferred medical institution
39 differed. With the actual preferred first medical institution as the dependent variable,
40 education, monthly income, medical technology, convenience and providers' service
41 attitude, and medical ethics were the main factors (χ^2=212.63, P <0.001), whereas
42 with the expected preferred first medical institution as the dependent variable,
43 occupation, Shenzhen registered permanent residence, education and medical
44 technology were the main factors (χ^2=78.101, P <0.001).
45 **Conclusion:** The main factors influencing participants' preferred medical institution
46 and their actual first visit differed. Patients with high education or income or
47 registered permanent residence preferred high-level medical institutions for the first
48 visit.

49 **Keywords:** healthcare preference, medical service, influential factor

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Strengths and limitations

66 ► We performed stratified sampling to recruit 1612 participants according to the

67 outpatient records of the Shenzhen Medical System in 2017.

68 ► We established two logistic regression models to explore the factors in the actual

69 and expected selection of medical institution.

70 ►Selection bias might have occurred as participants under the age of 18, inpatients or

71 non-patients were not recruited.

72 ► Future research should include larger samples with various age groups and

73 different disease severities.

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10   89   **Introduction**
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13   90   Hierarchical diagnosis and treatment is an important part of China's medical system
14   91   reform, which, starting in 2015, has aimed to direct patient flow through changes in
15   92   coverage and reimbursement rates.[1] Medical institutions were classified into three
16   93   tiers according to priority and difficulty of treatment: primary medical institutions,
17   94   secondary hospitals and tertiary hospitals. [2] This system aims to enable different tiers
18   95   of medical institutions to undertake diagnosis and treatment tasks according to their
19   96   specialized functions and service capacities. Thus, patients could be appropriately
20   97   assigned to different tiers of medical institutions to mitigate difficulties in obtaining
21   98   access to medical services.[3] Patients are encouraged to first visit primary institutions,
22   99   where patients with severe diseases are referred to secondary or tertiary hospitals if
23   100 necessary, and to return to primary medical institutions for rehabilitation when they
24   101 are in stable condition. However, the Chinese healthcare system does not use a strict
25   102 general practitioner and referral system, and patient preferences and choices regarding
26   103 healthcare providers are influenced mainly by personal willingness to seek medical
27   104 care. In addition, because the problems of barriers to medical insurance
28   105 reimbursement, hospitals' distribution of benefits, patients' preferences for seeking
29   106 medical treatment,[4, 5] and the roles of primary medical institutions have not been fully
30   107 exerted, and the hierarchical diagnosis and treatment system has not been fully
31   108 established.
32   109 In some countries, health services are delivered in multi-level systems, through a
33   110 patient referral procedure involving the coordination of health services among various
34   111 levels of health care providers.[6] A notable example is in the United Kingdom, one of
35   112 the first countries to strictly follow such a system, through the national health service
36   113 law, which established the National Health Service (NHS) in 1948.[7] Although
37   114 countries differ in their models used, all maintain a structure that clearly divides labor
38   115 in the medical service system, with primary medical and health institutions at the
39   116 core, and large hospitals as the auxiliary bodies.[8] Compared with countries in which
40   117 the services of specialist doctors are sought directly, countries with "gatekeeper"
41   118 systems have a lower proportion of their gross national products comprising medical
42   119 service costs. [9]
43   120 Shenzhen, the youngest first-tier city in China, may slightly differ from other first-tier
44   121 cities. Beyond its impressive gross domestic product growth and rapid economic
45   122 development, unique challenges are posed by its population size, demographic
46   123 structure and resource allocation. For example, with continual population growth, the
47   124 non-resident population generally had low education, low income, low residential
48   125 stability and young age,[10] and accounted for 63% of the entire population by the end

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126 of 2019. Because of high property prices, most non-residents purchase or rent
127 self-built or village houses. The resultant spatial pattern that has gradually developed
128 might cause differences in the choice of medical service between non-residents and
129 residents.[11]
130 In addition, compared with regions with rapid economic and population growth,
131 Shenzhen has a clear insufficiency of medical resources. The medical expenditure in
132 2018 was 28.1 billion yuan, accounting for only 1.1% of the GDP, a proportion far
133 below the national average (6.43%). The number of beds per 1,000 people in
134 Shenzhen at the end of 2019 was 3.83, far below the national average of 6.30. In
135 China, healthcare is provided almost exclusively by state-owned public general
136 hospitals at the primary, secondary and tertiary levels, and tertiary hospitals have the
137 highest advanced services capacity, followed by the secondary hospitals and primary
138 medical institutions. Under these circumstances, because residents are free to choose
139 healthcare facilities without being restricted by a gatekeeping mechanism, they may
140 bypass primary care and choose —higher level facilities regardless of their disease
141 severity.[12-14]According to the China health statistics yearbook, outpatient services at
142 primary medical and health institutions increased by 2% and 49% for tertiary
143 hospitals between 2013 and 2018.[15]
144 These statistics indicate that patients choose their doctors (from primary providers and
145 large hospitals) in an unstructured manner, the service capacity at primary medical
146 and health institutions is insufficient, and continued overcrowding exists in China's
147 hospitals.[16, 17]
148 There were 3492 medical and health institutions in Shenzhen in 2017, including 610
149 community health service centers. [18] Although 13.96 million people were covered by
150 basic medical insurance, and more than 4 million residents signed family doctor
151 service agreements, the proportion of residents who chose to seek medical treatment
152 in community health service center was relatively low, accounting for only
153 approximately 38%.[19]
154 Many patients prefer to wait for treatment in higher-level hospitals than to visit
155 nearby primary medical institutions. Thus, to improve the implementation efficiency
156 of the hierarchical diagnosis and treatment system, understanding participants'
157 preferences, of attitudes and factors influencing their choice of medical institution is
158 necessary.
159 To our knowledge, previous studies on preferences or attitudes towards medical
160 choice have focused mainly on actual health-seeking behavior, [20-22] defined as the
161 actions taken by individuals who perceive they have an illness to obtain a suitable
162 remedy .[23] This behavior involves a series of decision-making processes governed by
163 individual characteristics and beliefs, as well as provider-related features. This
164 process usually involves decisions regarding whether to seek treatment, from whom to
165 seek treatment, what kind of treatment to seek and how many healthcare resources to
166 use.
167 Thus, in theory, an individual's healthcare needs do not necessarily translate to
168 effective demand. Similarly, the expected medical institution for an individual's first
169 consultation may differ from the actual selection. The exploration of factors affecting

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170 the expected and actual first medical institution may aid in determining the
171 differences between individual preferences/attitudes towards medical institutions and
172 their actual healthcare-seeking behaviors. Such understanding is crucial for
173 strengthening the hierarchical diagnosis and treatment system, because it concerns the
174 effective allocation and rational use of medical resources.
175 A previous systematic review has analyzed a considerable body of studies and
176 identified factors affecting the selection of healthcare, such as individual, facility,
177 context and composite factors, thereby influencing facility choice in China.[22]
178 However, as China's youngest city, Shenzhen may differ from traditional cities
179 because of its characteristics including living spaces and population composition. To
180 better promote reform of the hierarchical diagnosis and treatment system, first
181 understanding residents' choices of healthcare provider types and the associated
182 factors is crucial. Therefore, the current study was aimed at (1) exploring residents'
183 expected and actual preferences and influencing factors regarding the choice of first
184 medical service at various medical levels; (2) understanding residents' attitudes
185 towards community health services.

186 **Methods**

187 **Participants**

188 Subjects were selected according to the outpatient records of the Shenzhen Medical
189 System in 2017. According to a pilot study, the awareness rate of the hierarchical
190 diagnosis and treatment system was 40%, with a maximum permissible error of 2.5%
191 and confidence interval of 95%, and the required sample size was calculated to be
192 1475. To account for invalid questionnaires, the sample size was increased by 9%,
193 and a total of 1612 participants were finally investigated. Stratified sampling was
194 performed, and the number of participants varied according to the number of residents
195 in each district. The final numbers of participants from each district were 210 (14.0%)
196 in the Futian District, 210 (14.0%) in the Luohu District, 210 (14.0%) in the Nanshan
197 District, 50 (3.3%) in the Yantian District, 260 (17.3%)in the Bao'an District, 260
198 (17.3%) in the Longgang District, 150 (10.0%) in the Longhua District, 50 (3.3%) in
199 the Pingshan District, 50 (3.3%) in the Guangming District and 50 (3.3%) in the
200 Dapeng New District. One resident at least 18 years of age was then selected from
201 each household. The inclusion criteria were participants living in Shenzhen for ≥6
202 months and agreeing to sign an informed consent form, with good mental status and
203 clear consciousness. The exclusion criteria were participants with severe mental
204 illness or cognitive communication difficulties. All participants participated
205 voluntarily and provided written informed consent.

206 **Data collection**

207 Selected participants were first contacted by telephone to ensure that they understood
208 and agreed to participate in the survey. A questionnaire entitled "Questionnaire on
209 medical preference and behavior of Shenzhen residents" was administered

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210 face-to-face. Items were initially identified on the basis of the literature and selected
211 after three expert consultations. The final version of the questionnaire was determined
212 after modification on the basis of a pilot study.
213 For measuring the expected preferred first medical institution, the question "If
214 conditions permit, what type of medical institution would you like to choose for the
215 first consultation?" was asked, and the answers were as follows: " ① municipal
216 hospitals, ②district hospitals, ③street hospitals, ④private medical institutions,
217 ⑤community health service centers, ⑥ other hospitals or ⑦depends on the
218 situation." For measuring the actual preferred first medical institution, the question "If
219 you were unwell, what type of medical institution would you choose?" was asked, and
220 the answers were as follows: "①municipal hospitals, ②district hospitals, ③street
221 hospitals, ④private medical institutions, ⑤community health service centers, ⑥
222 other hospitals or ⑦depends on the situation." The investigation was conducted by
223 uniformly trained investigators, and the quality was strictly controlled throughout the
224 entire investigation.

225 **Statistical analysis**

226 All data were entered by two researchers simultaneously in Epidata 3.02. SPSS 25.0
227 was used for data cleaning, sorting and statistical analysis. Descriptive statistics were
228 used to describe participants' characteristics. The relationships between medical
229 service seeking preference and various factors were analyzed with χ^2 tests. The
230 difference between the understanding of the community first consultation system and
231 the approval level of the community first consultation system was also determined
232 with χ^2 and linear trend tests. Multivariate logistic regression analysis was then
233 performed to explore the factors affecting the preferences regarding medical services,
234 and all the potential independent variables were entered by the forced entry method.
235 All tests were two-sided, and the significance level was set at $P < 0.05$.

236 **Ethnic statement**

237 The study was approved by the Ethics Committee of the Affiliated Hospital of
238 Guangdong Medical University (ethical approval number: YJ2017045-1). All
239 participants were aware of the aims and objectives of the study, informed that
240 participation was voluntary and their data would remain confidential, and provided
241 written informed consent.

242 **Patient and public involvement**

243 There has been no patient and/or public involvement in the study design, data analysis
244 and writing of the current study. The brief results were emailed to each participant
245 after the investigation.

7

Results

Testing of the questionnaire

The reliability and validity of the questionnaire were good, with overall internal consistency, a Cronbach α coefficient of 0.826, Kaiser-Meyer-Olkin index of 0.791 and cumulative contribution rate of 6 factors of 81.959%.

Participant characteristics

The characteristics of the participants are shown in **Table 1**. The average age was 34.3 ± 10.0 years, and the age composition was close to that of Shenzhen residents in the 2010 population census.

Table 1 Basic characteristics of participants

Category	n (%)	Category	n (%)
Sex		**Monthly incomes (CNY)**	
Male	733(48.9)	<3000	158(10.5)
Female	767(51.1)	3000~	479(31.9)
Age(years)		5000~	626(41.7)
<20	56(3.7)	10000~	158(10.5)
21-30	607(40.5)	15000~	53(3.5)
31-40	520(34.7)	≥30000	26(1.7)
41-50	204(13.6)	**Housing conditions**	
≥51	113(7.5)	Self-purchased housing	351(23.4)
Educational level		Renting policy housing	114(7.6)
Junior high school and below	222(14.8)	Renting housing in Urban Villages	618(41.2)
High school/technical secondary	581(38.7)	Renting commercial housing	170(11.3)
junior college	431(28.7)	Dormitory	94(6.3)
Undergraduate	242(16.1)	Others	153(10.2)
Post undergraduate	24(1.6)	**Medical insurance**	
Occupation		Level 1	663(44.2)
public institutions	153(10.2)	Level 2	336(22.4)
professional and technical	224(14.9)	Level 3	187(12.5)
Enterprise managers	156(10.4)	Uninsured	314(20.9)
Enterprise staff	208(13.9)	**Marital status**	

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Individual industrial and commercial households	228(15.2)	Single	435(29.0)
		Married	1065(71.0)
Worker	342(22.8)	**Registered permanent residence**	
Unemployed	53(3.5)	Registered	531(35.4)
Others	136(9.1)	Non-registered	969(64.6)

256 Actual and expected preferred first medical institution

257 In terms of the actual first medical institution, because the proportion of choosing
258 private medical institutions was very small, and a clearly stated medical preference
259 would enable analysis of participants' needs and influencing factors, we excluded 25
260 participants choosing private medical institutions and 412 participants choosing
261 medical institutions depending on specific circumstances. Further analysis was
262 conducted on the remaining 1063 participants with specific preferences. The
263 percentages of actual first medical institutions between sexes are shown in **Table 2**.
264 More than 50% of participants chose municipal or district hospitals as their first
265 choice. No statistically significant difference was observed in the actual medical
266 institution selection among municipal, district-level, street-level and community
267 health service between sexes (χ^2=5.034, P=0.169).
268 Similarly, in terms of the expected preferred first medical institution, because no
269 participants indicated that they would choose a private medical institution, and 396
270 indicated that they would choose according to specific circumstances, we excluded
271 these 396 participants and conducted further analysis on the remaining 1104
272 participants with specific preferences. The percentages of the expected preferred first
273 medical institutions between sexes are shown in **Table 2**. More than three-quarters of
274 participants expected to choose municipal and district-level hospitals for the first visit.
275 No statistically significant difference was observed among the 1104 participants with
276 a specific first medical institution choice between sexes (χ^2=2.843, P=0.416).

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277   **Table 2 Selection of actual and expected preferred medical institutions in subjects with different demographic characteristics（*n*，%）**

	Variables	Actual selection					Expected selection				
		Municipal hospitals n(%)	District hospitals n(%)	Street-level hospitals n(%)	Community Health Service Center n(%)	Total n(%)	Municipal hospitals n(%)	District hospitals n(%)	Street-level hospitals n(%)	Community Health Service Center n(%)	Total n(%)
Sex	Male	154(29.8)	143(27.7)	73(14.2)	146(28.3)	516(100. 0)	318(59.6)	147(27.5)	38(7.1)	31(5.8)	534(100.0)
	Female	162(29.6)	161(29.4)	54(9.9)	170(31.1)	547(100.0)	328(57.5)	165(29.0)	52(9.1)	25(4.4)	570(100.0)
	Total	316(29.7)	304(28.6)	127(12.0)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Age	<21	6(18.7)	2(6.3)	2(6.3)	22(68.7)	32(100.0)	17(46.0)	10(27.0)	8(21.6)	2(5.4)	37(100.0)
	21~	131(32.1)	112(27.5)	53(12.9)	112(27.5)	408(100.0)	262(59.3)	120(27.1)	39(8.8)	21(4.8)	442(100.0)
	31~	98(26.2)	121(32.4)	46(12.3)	109(29.1)	374(100.0)	211(55.5)	124(32.6)	28(7.4)	17(4.5)	380(100.0)
	41~	56(35.4)	44(27.8)	16(10.1)	42(26.7)	158(100.0)	96(62.7)	42(27.5)	7(4.6)	8(5.2)	153(100.0)
	≥51	25(27.5)	25(27.5)	10(11.0)	31(34.0)	91(100.0)	60(65.2)	16(17.4)	8(8.7)	8(8.7)	92(100.0)
	Total	316(29.7)	304(28.6)	127(12.0)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Education	Junior high school and below	28(20.0)	29(20.7)	15(10.7)	68(48.6)	140(100.0)	81(53.0)	41（26.8)	19(12.4)	12(7.8)	153(100.0)
	High school / technical secondary	102(25.1)	123(30.3)	46(11.3)	135(33.3)	406(100.0)	232(55.0)	134（31.7)	35(8.3)	21(5.0)	422(100.0)
	junior college	95(29.3)	99(30.6)	47(14.5)	83(25.6)	324(100.0)	196(59.9)	97（29.7)	20(6.1)	14(4.3)	327(100.0)
	undergraduate and above	91(47.2)	53(27.5)	19(9.8)	30(15.5)	193(100.0)	137(67.8)	40（19.8)	16(7.9)	9(4.5)	202(100.0)
	Total	316(29.7)	304(28.6)	127(12.0)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

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	Variables	Actual selection					Expected selection				
		Municipal hospitals n(%)	District hospitals n(%)	Street-level hospitals n(%)	Community Health Service Center n(%)	Total n(%)	Municipal hospitals n(%)	District hospitals n(%)	Street-level hospitals n(%)	Community Health Service Center n(%)	Total n(%)
Monthly income	<3000	37(32.7)	28(24.8)	9(8.0)	39(34.5)	113(100.0)	74(60.2)	29（23.5）	13(10.6)	7(5.7)	123(100.0)
	3000~	65(19.0)	74(21.6)	48(14.1)	155(45.3)	342(100.0)	194(52.3)	107(28.8)	50(13.5)	20(5.4)	371(100.0)
	5000~	123(28.4)	158(36.5)	54(12.5)	98(22.6)	433(100.0)	246(57.3)	149(34.8)	19(4.4)	15(3.5)	429(100.0)
	10000~	54(44.3)	37(30.3)	12(9.8)	19(15.6)	122(100.0)	88(72.7)	17(14.1)	7(5.8)	9(7.4)	121(100.0)
	≥15000	37(69.8)	7(13.2)	4(7.6)	5(9.4)	53(100.0)	44(73.3)	10(16.7)	1(1.7)	5(8.3)	60(100.0)
	Total	316(29.7)	304(28.6)	127(12.0)	316(29.7)	1063(100.0)	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Medical insurance	Level 1	179(36.2)	149(30.1)	51(10.3)	116(23.4)	495(100.0)	316(65.2)	129(26.5)	27(5.6)	13(2.7)	485(100.0)
	Level 2	55(21.1)	92(35.2)	40(15.3)	74(28.4)	261(100.0)	136(50.9)	89(33.3)	24(9.0)	18(6.8)	267(100.0)
	Level 3	23(16.7)	44(31.9)	17(12.3)	54(39.1)	138(100.0)	71(45.2)	51(32.5)	22(14.0)	13(8.3)	157(100.0)
	Uninsured	59(34.9)	19(11.2)	19(11.2)	72(42.7)	169(100.0)	123(63.1)	43(22.1)	17(8.6)	12(6.2)	195(100.0)
	Total	316(29.7)	304(28.7)	127(11.9)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Housing conditions	Self-purchased housing	110(39.6)	92(33.1)	25(9.0)	51(18.3)	278(100.0)	168(62.7)	71(26.5)	15(5.6)	14(5.2)	268(100.0)
	Renting policy housing	15(20.1)	36(48.0)	11(14.6)	13(17.3)	75(100.0)	41(54.0)	22(28.9)	6(7.9)	7(9.2)	76(100.0)
	Renting housing in Urban Villages	93(21.9)	114(26.8)	65(15.3)	153(36.0)	425(100.0)	222(49.8)	154(34.5)	50(11.2)	20(4.5)	446(100.0)
	Renting commercial housing	56(39.2)	29(20.3)	8(5.6)	50(34.9)	143(100.0)	103(70.5)	30(20.5)	8(5.5)	5(3.5)	146(100.0)

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	Variables	Actual selection					Expected selection				
		Municipal hospitals n(%)	District hospitals n(%)	Street-level hospitals n(%)	Community Health Service Center n(%)	Total n(%)	Municipal hospitals n(%)	District hospitals n(%)	Street-level hospitals n(%)	Community Health Service Center n(%)	Total n(%)
	Dormitory	13(23.2)	14(25.1)	4(7.1)	25(44.6)	56(100.0)	51(65.4)	17(21.8)	6(7.7)	4(5.1)	78(100.0)
	Others	29(33.7)	19(22.1)	14(16.3)	24(27.9)	86(100.0)	61(67.7)	18(20.0)	5(5.6)	6(6.7)	90(100.0)
	Total	316(29.7)	304(28.7)	127(11.9)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Marital status	Single	86(33.5)	58(22.5)	35(13.6)	78(30.4)	257(100.0)	192(64.6)	59(19.9)	31(10.4)	15(5.1)	297(100.0)
	Married	230(28.6)	246(30.5)	92(11.4)	238(29.5)	806(100.0)	454(56.3)	253(31.3)	59(7.3)	41(5.1)	807(100.0)
	Total	316(29.7)	304(28.7)	127(11.9)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)
Registered permanent residence	Yes	138(34.7)	140(35.2)	34(8.5)	86(21.6)	398(100.0)	254(65.3)	100(25.7)	21(5.4)	14(3.6)	398(100.0)
	No	178(26.8)	164(24.7)	93(14.1)	230(34.6)	665(100.0)	392(54.8)	212(29.6)	69(9.7)	42(5.9)	665(100.0)
	Total	316(29.7)	304(28.7)	127(11.9)	316(29.7)	1063(100.0)	646(58.4)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

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Demographic characteristics and preferred first medical institution

280 The demographic characteristics, including age, education, income, medical
281 insurance, housing condition, marital status and registered permanent residence,
282 grouped by the selection of actual and expected preferred medical institutions, are
283 presented in **Table 2**.

284 *<u>Age</u>*

285 Significant differences were observed in the levels of both actual (χ^2=33.257,
286 *P*=0.001) and expected medical institutions (χ^2=23.415, *P*=0.024) among the age
287 groups. In terms of the actual first medical institution, the largest proportion of
288 participants indicating municipal medical institutions as their first choice was
289 observed in the age groups of 21-30 and 41-50 years. The largest proportion choosing
290 community health service centers was observed in the 20-year age group, with a
291 percentage of 68.8%. In terms of the expected first medical institution, with
292 increasing age participants expected to choose higher level medical institutions. The
293 proportion of participants choosing municipal hospitals was the largest in each age
294 group, ranging from 45.9% to 65.2%.

295 *<u>Education</u>*

296 Participants with different educational backgrounds had varying preferences for actual
297 (χ^2=67.169, P<0.001) and expected medical institutions (χ^2=20.079, P=0.017). Those
298 with high educational levels were more inclined to choose high-level medical
299 institutions for the first visit. Linear trends were observed between education levels
300 and actual (χ^2=54.189 , *P*<0.0001) or expected medical institutions (χ^2=9.998,
301 *P*=0.002).

302 *<u>Income</u>*

303 Significant differences were observed in the levels of actual (χ^2=127.362, *P*<0.001)
304 and expected medical institutions (χ^2=57.767, *P*<0.001) among participants with
305 differing incomes. Linear trends were observed between monthly income and the
306 actual (χ^2 =62.024，*P*<0.0001) or expected medical institutions (χ^2=5.569, *P*=0.018).
307 Those with high monthly income were more inclined to choose high level first visit
308 medical institutions. In terms of the expected medical institution, more than 50% of
309 the participants in all monthly income groups chose a municipal hospital as their first
310 medical institution, of which the largest proportion was observed in the groups with
311 incomes of 10000-14999 yuan and more than 15000 yuan, at 72.7% and 73.3%,
312 respectively.

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Medical insurance

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314 Significant differences were observed in the levels of (χ^2=69.656, *P*<0.001) and
315 expected medical institutions (χ^2=39.734, *P*<0.001) among participants with differing
316 medical insurance levels. Linear trends were observed between medical insurance
317 levels and actual (χ^2=26.885, *P*<0.001) or expected medical institutions (χ^2=10.450,
318 *P*=0.001). Participants with lower levels of medical insurance were more inclined to
319 choose community health service centers. In terms of the expected medical institution,
320 the proportion choosing municipal hospitals was highest, ranging from 45.2% to
321 65.2%.

Housing conditions

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323 Participants with different housing conditions had different preferences for actual
324 (χ^2=84.040, *P*<0.001) and expected medical institutions (χ^2=38.790, *P*=0.001). In
325 terms of the actual medical institutions, the proportion of participants who had
326 self-purchased houses and or were renting commercial houses who chose municipal
327 hospitals as their first medical institution was the highest, at 39.6% and 39.2%,
328 respectively. The proportion of participants renting policy housing who chose
329 district-level hospitals was highest, at 48.0%. The proportion of participants living in
330 dormitories who chose community health service centers was highest, at 44.6%. In
331 terms of the expected medical institution, the proportion of participants choosing
332 municipal hospitals was highest in all groups with different housing conditions. The
333 overall proportion of participants choosing community health service centers was only
334 5.1%, ranging from 3.4% to 9.2% in all groups.

Marital status

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336 No statistically significant difference was observed in the actual medical institution
337 selection according to marital status (χ^2=6.738, *P*=0.081). The proportions of
338 participants choosing municipal hospitals and community health service centers were
339 the highest for single participants, at 33.5% and 30.4%, respectively. However, a
340 significant difference in expected medical institutions was observed according to
341 marital status (χ^2=15.348, *P*=0.002). The proportion of participants expecting to
342 choose municipal hospitals was highest among both single and married participants, at
343 64.6% and 56.3%, respectively. Only 5.1% of the participants indicated that they
344 would choose community health service centers.

Registered permanent residence

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346 Significant differences were observed in the level of actual (χ^2=35.141, *P*<0.001) and
347 expected medical institutions (χ^2=14.263, *P*=0.003) among participants with different

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348 registered permanent residence. In terms of actual medical institutions, participants
349 with a Shenzhen registered permanent residence were more inclined to choose
350 municipal and district-level hospitals, at 34.7% and 35.2%, respectively. Participants
351 without a Shenzhen registered permanent residence were more inclined to choose
352 community health service centers, at 34.6%. Participants with and without Shenzhen
353 registered permanent residence both expected to choose municipal hospitals and
354 district-level hospitals as their second choice.

355 **Factors influencing the choice of medical institution**

356 Major factors in the selection of medical institution are shown in **Table 3**. More than
357 70% of the participants considered medical technology and convenience the main
358 factors in choosing a medical institution. A total of 14.04% and 12.68% of
359 participants considered service attitude and medical price, respectively, in choosing a
360 medical institution. Only 2.80% considered specific circumstances.

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362 **Table 3 Factors influencing the choice of medical institution (n, %)**

Factors	Municipal hospital	District-level hospital	Street-level hospital	Community health service	Total
Medical technology	350 （73.5）	96 （20.2）	15 （3.2）	15 （3.2）	476(100.0)
Convenience	127 （42.1）	126 （41.7）	30 （9.9）	19 （6.3）	302(100.0)
Attitude of service and medical ethnics	93 （60.0）	29 （18.7）	24 （15.5）	9 （5.8）	155(100.0)
Price	57 （40.7）	55 （39.3）	20 （11.8）	8 （5.7）	140(100.0)
Others	19 （61.3）	6 （19.4）	1 （3.2）	5 （16.1）	31(100.0)
Total	646(58.5)	312(28.3)	90(8.2)	56(5.1)	1104(100.0)

363 **Understanding of the community first diagnosis system**

364 Participants did not have a high level of understanding of the community first
365 diagnosis system, as shown in **Table 4**. Only 3.67% of the participants were very
366 familiar with the community first diagnosis system, whereas 59.53% were less
367 familiar or unfamiliar. In participants who were unfamiliar with the community first
368 diagnosis system, only 18.7% agreed with this system, and 71.7% were indifferent.
369 Participants with better understanding of the community first diagnosis system were
370 more in favor of the community first diagnosis system (χ^2=177.805, P<0.0001). A
371 linear trend was observed between understanding and agreement with community first
372 diagnosis (χ^2=145.327, P<0.0001).

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17 381   **Table 4 Analysis of the understanding and agreement on the community first**
18 382   **diagnosis system(*n*，%)**
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Whether understanding community first	agree	disagree	unconcerned	Total
Very familiar	32（58.2）	10（18.2）	13（23.6）	55（3.67）
Quite familiar	99（61.9）	16（10.0）	45（28.1）	160（10.67）
Moderately familiar	221（56.4）	32（8.2）	139（35.5）	392（26.13）
Less familiar	210（42.3）	64（12.9）	223（44.9）	497（33.13）
Unfamiliar	74（18.7）	38（9.6）	284（71.7）	396（26.40）

383   **Main factors affecting participants' medical institution preferences**

384   We established two logistic regression models to explore the factors in the selection
385   of medical institution. The dependent variables were the actual and expected first
386   medical institution in models 1 and 2, respectively. The dependent variable was
387   further divided into two categories, with street-level hospital, community health
388   service center and private hospital as "0" and municipal and district-level hospitals as
389   "1". Independent variables and their definitions were the same, including age,
390   education, occupation, registered permanent residence, marital status, monthly
391   income, housing conditions and medical insurance, which were selected on the basis
392   of statistical significance in single factor analysis of the preferred first medical
393   institution. The main factors in choosing a medical institution and agreement on the
394   community first diagnosis system were also considered as the independent variables.
395   Occupation, housing conditions, the main factors in choosing a medical institution
396   and agreement on the community first diagnosis system were dummified, with other
397   occupation, other housing condition, medical price and unconcerned attitude towards
398   the community first diagnosis system, as a reference, respectively. Other independent
399   variables included age ≤20 years, Shenzhen registered permanent residence and
400   unmarried status as a reference. Monthly income, education, medical insurance and
401   understanding of the community first diagnosis system served as ordered variables.
402   In model 1, education, monthly income and the main factors in choosing a medical
403   institution affected participants' actual medical institution. A statistically significant

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404   difference was observed in the regression equation (χ^2=212.63, P<0.001), with
405   -2log=1231.393 and correction coefficient of determination r^2=0.244. The prediction
406   accuracy rate was 70.9%. Participants with higher education and higher monthly
407   income, were more inclined to choose municipal or district-level hospitals. As
408   compared with medical price, the main factors considered when choosing large
409   hospitals were medical technology, convenience, providers' service attitude, and
410   medical ethics. Among these factors, medical technology was more important. In
411   addition, the better the participants understood the community first diagnosis system,
412   the more difficult the choice of large hospitals, as shown in **Table 5**.
413   In model 2, occupation, registered permanent residence and the main factors in
414   choosing a medical institution affected participants' expected medical institution. A
415   statistically significant difference was observed in the logistic regression, with -2log
416   =784.420 (χ^2=78.101, P <0.001) and correction coefficient of determination r^2=0.126.
417   The prediction accuracy rate is 86.6%. Participants working in public institutions or
418   enterprises, and those with individual industrial and commercial households were
419   more inclined to choose city-level or district-level hospitals. Compared with
420   participants with Shenzhen registered permanent residence, those without Shenzhen
421   registered permanent residence were more inclined to choose street hospitals and
422   community health service centers. As compared with medical price, medical
423   technology was the main factor considered in choosing a large hospital , as shown in
424   **Table 5.**

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425 **Table 5 Logistics regression analysis of the factors affecting subjects' actual and expected first medical institution.**

Variable	Model 1: Actual Selection Model						Model 2: Expected Selection Model					
	B	SE	Wald χ^2	P^b	OR	OR 95%CI	b	SE	Wald χ^2	P^b	OR	OR 95%CI
Constant	-0.292	0.682	0.184	0.668	0.747	-	0.802	0.904	0.788	0.375	2.230	-
Age group	-0.117	0.087	1.836	0.175	0.889	0.751-1.054	-0.017	0.115	0.021	0.885	0.984	0.785-1.232
Education	0.178	0.090	3.904	0.048	1.195	1.001-1.425	0.026	0.117	0.047	0.828	1.026	0.815-1.291
Occupation(Others as the reference)	-	-	7.775	0.255	-	-	-	-	12.919	0.044	-	-
public institutions	-0.164	0.314	0.273	0.602	0.849	0.458-1.571	1.131	0.458	6.094	0.014	3.098	1.262-7.604
professional and technical personnel	-0.224	0.289	0.598	0.439	0.800	0.454-1.409	0.195	0.336	0.335	0.563	1.215	0.629-2.348
Enterprise managers	0.344	0.311	1.225	0.268	1.411	0.767-2.595	0.732	0.403	3.297	0.069	2.080	0.944-4.583
Enterprise staff	-0.340	0.284	1.439	0.230	0.712	0.408-1.241	0.773	0.359	4.619	0.032	2.165	1.070-4.380
Individual industrial and commercial households	0.048	0.279	0.030	0.863	1.049	0.607-1.813	0.924	0.387	5.717	0.017	2.520	1.181-5.377
Worker	-0.235	0.258	0.834	0.361	0.790	0.477-1.310	0.551	0.308	3.196	0.074	1.735	0.948-3.175
Registered permanent residence(Registered as the reference)	-0.324	0.176	3.374	0.066	0.723	0.512-1.022	-0.500	0.250	3.990	0.046	0.607	0.371-0.991
Marital status	0.068	0.186	0.134	0.715	1.070	0.743-1.542	0.161	0.245	0.431	0.512	1.175	0.726-1.900
Monthly income	0.237	0.092	6.588	0.010	1.267	1.058-1.518	0.136	0.126	1.159	0.282	1.145	0.895-1.467
Housing conditions(Others as the reference)	-	-	6.862	0.231	-	-	-	-	4.134	0.530	-	-
Self-purchased housing	0.359	0.296	1.469	0.225	1.432	0.801-2.561	-0.470	0.414	1.290	0.256	0.625	0.278-1.407

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	B	SE	Wald	p	OR	95%CI	B	SE	Wald	p	OR	95%CI
Renting policy housing	0.490	0.363	1.816	0.178	1.632	0.801-3.327	-0.580	0.472	1.511	0.219	0.560	0.222-1.411
Renting housing in Urban Villages	-0.107	0.266	0.162	0.687	0.898	0.533-1.513	-0.279	0.367	0.575	0.448	0.757	0.368-1.555
Renting commercial housing	0.070	0.309	0.051	0.822	1.072	0.585-1.963	0.022	0.459	0.002	0.962	1.022	0.416-2.513
Dormitory	0.088	0.389	0.051	0.822	1.092	0.509-2.340	0.123	0.499	0.060	0.806	1.131	0.425-3.007
Medical insurance	-0.083	0.072	1.327	0.249	0.920	0.798-1.060	-0.153	0.094	2.648	0.104	0.858	0.713-1.032
Major factors(Medical price as the reference)	-	-	71.254	<0.001	-	-	-	-	29.217	<0.001	-	-
Medical technology	1.862	0.233	64.062	<0.001	6.435	4.079-10.151	1.226	0.297	16.982	<0.001	3.407	1.902-6.104
Convenience	1.142	0.237	23.222	<0.001	3.134	1.969-4.988	0.182	0.274	0.442	0.506	1.200	0.701-2.055
Attitude of service and medical ethnics	0.947	0.279	11.565	<0.001	2.578	1.494-4.451	-0.105	0.313	0.112	0.738	0.901	0.488-1.662
Understanding community first diagnosis system	-0.284	0.071	16.130	<0.001	0.753	0.655-0.865	0.075	0.090	0.692	0.405	1.078	0.904-1.285
Agreement community first(Doesn't matter as the reference)	-	-	3.336	0.189	-	-	-	-	3.100	0.212	-	-
Agree	-0.153	0.155	0.973	0.324	0.858	0.633-1.163	0.316	0.210	2.257	0.133	1.372	0.908-2.071
Disagree	0.290	0.262	1.221	0.269	1.336	0.799-2.233	-0.095	0.313	0.092	0.761	0.909	0.493-1.678

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Discussion

428   This study demonstrated the preferences and associated factors in the choice of
429   medical institution for the first visit among Shenzhen residents. Generally, more than
430   50% of the participants were willing to select municipal and district-level medical
431   institutions for the first visit. Those with high education or income levels, or a
432   Shenzhen registered permanent residence, were more inclined to choose high-level
433   medical institutions. More than 70% of the participants considered medical
434   technology and convenience as the main factors in choosing a medical institution.

Factors influencing medical service preference

436   In theory, an individual's healthcare needs do not necessarily translate to effective
437   demand. The behavior of consuming medical service involves a series of
438   decision-making processes governed by many factors. In addition to whether residents
439   themselves perceive a need for health services, the choice is also associated with their
440   income level, socioeconomic status, health security, transportation convenience, risk
441   habits, health awareness, and the type and quality of services provided by health
442   facilities.[24] Health-seeking behavior,[20-22] defined as the actions taken by individuals
443   who perceive that they have an illness to obtain a suitable remedy,[23] occurs only if an
444   individual indeed uses medical resources. Therefore, the expected medical institution
445   for an individual's first consultation may differ from the actual selection. In the
446   current study, we found that if participants were feeling unwell, the main factors
447   influencing their preferred medical institution and their actual first visit differed.
448   When conditions permit, occupation, and registered permanent residence were the
449   main factors affecting participants' expected medical service selection. In
450   comparison, education, and monthly income affected participants' actual first medical
451   service selection. The exploration of factors affecting expected and actual first
452   medical institution may aid in—determining the differences between individual
453   preferences/attitudes towards the medical institution and their actual
454   healthcare-seeking behaviors, a crucial aspect for strengthening the hierarchical
455   diagnosis and treatment system, because it also concerns the effective allocation and
456   rational use of medical resources.

457   Many factors may be associated with healthcare choices, including patient and family
458   factors, provider factors and environmental factors. In the current study, the finding
459   that medical technology and convenience were the main factors in choosing a medical
460   institution is consistent with the results from previous studies in which participants
461   prioritized organizational factors.[25] Healthcare providers' attitudes towards service
462   and medical ethics also affect patients' preferences regarding medical service. A study
463   in England indicated that the perception of provider responsiveness, considering
464   factors such as convenience, waiting time, and confidence, is a strong motivating
465   factor in choosing primary care.[26] In addition, perceived professionally relevant

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466 factors [27, 28] and the number of physicians affect patients' choices.[29] Geographic
467 factors should also be considered, because residents of disadvantaged areas were more
468 aware of the contribution of their location to health disparities than residents of
469 affluent areas, according to a study conducted in Australia.[30]

Dilemma of first diagnosis at the community health service center

471 Some of our findings may reflect the initial effects of reform implementation. Under
472 the current hierarchical diagnosis and treatment system, the participants in the current
473 study were not very familiar with the first diagnosis system of community health
474 service centers, and most did not know whether a community health service center
475 could provide a first diagnosis and questioned the service capacity. These phenomena
476 will undoubtedly hinder the implementation of the hierarchical diagnosis and
477 treatment system and are also unconducive to residents' effective cooperation with the
478 implementation of the system. Beyond the low level of awareness of the first
479 diagnosis system, notably, participants' willingness to visit community health service
480 centners was low. Only 21.1% of the participants indicated that they would choose
481 community health centers for their initial visit, a finding inconsistent with the results
482 of a previous study in Shenzhen, in which the willingness to use community health
483 centers was high among patients who had health insurance, who were female and who
484 were familiar with the gatekeeper policy.[31]
485 The concepts most relevant to hierarchical diagnosis and treatment worldwide are the
486 three-level health care service model and the gatekeeper system, which essentially
487 include the gatekeeper system and a two-way referral system centered on initial
488 diagnosis at the grassroots level. It is not only a matter of seeing a doctor but also of
489 institutional arrangement, which consists of division of labor among medical
490 institutions, rational allocation of medical resources, maximization of use efficiency
491 and refinement of patient management services.
492 However, the first diagnosis in a primary health care facility faces a dilemma. Patients
493 tend to trust large hospitals that are well-equipped with advanced instruments and
494 have highly skilled physicians. From the health provider's perspective, weaknesses
495 such as the insufficient service capacity of primary health institutions, the ambiguous
496 positioning of medical institutions and the inability to share information are quite
497 clear. [27, 29, 32] For instance, according to the statistics of the 2016 Health and Family
498 Planning Statistical Bulletin, 94.2% of the total primary medical and health
499 institutions provided only 55.1% of the total diagnoses and treatments, whereas first-,
500 second- and third-level hospitals, which accounted for 3.0% of all medical
501 institutions, provided 41.2% of the diagnoses and treatments.[33] No incentive
502 mechanisms exist in the hierarchical diagnosis and treatment system, which is
503 generally led by health administrative departments and uses semi-mandatory
504 measures to encourage patients to seek medical treatment in an orderly manner. This
505 administrative hierarchical diagnosis and treatment system is passive and has not
506 included an effective incentive mechanism.
507 The United Kingdom, which has one of the first established and strictest hierarchical

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508 diagnosis and treatment system among Western countries, has become a typical
509 representative of the British welfare system. Although prominent problems, such as
510 rapid growth of medical expenses and low efficiency, have become the challenges
511 faced by the NHS,[34, 35] its successful experiences, particularly its gatekeeper system,
512 may have served as a reference for China's medical reform.
513 To solve the dilemma of first diagnosis by community health services, several
514 approaches may be proposed on the basis of other countries' successful experiences.
515 **First**, to improve the ability of primary medical and health services, the management
516 of the general practitioner system and personnel training should be strengthened.
517 Successful experiences have been described, such as the Quality of Health Framework
518 in UK, [36] Royal College of General Practitioners (RACGP) in Australia,[37] and
519 Germany's implementation of accessing management and strict practice qualification
520 review for physicians. [38] **Second**, referring to the United States, the implementation of
521 strict cost control and incentive measures can be used to clarify the diagnostic criteria
522 for disease and to specify the length of hospitalization through diagnosis-related
523 classifications.[39] **Third**, payment methods can be more diversified. For example, the
524 option of paying per capita, as in Canada, could be added to encourage general
525 practitioners to actively control medical expenses and attract more community
526 residents to sign up for first consultations.[40]

527 **Disease severity may affect patients' preferences**

528 Although we reported that the main factors influencing participants' expected and
529 actual first visits differed, we did not further explore the influences of disease severity
530 and comorbidities. When individuals are ill, decisions as to whether to seek medical
531 treatment and which healthcare provider to choose are made by patients and their
532 family members, mainly according to personal preferences, disease severity and
533 economic capacity.[20] A previous study has indicated that the distance to the provider
534 becomes less important as the illness becomes more severe.[41] Self-assessment of
535 disease severity may also play an important role in the selection of the first medical
536 service. In addition, in cases of perceived minor or severe illness, factors influencing
537 the choice of medical service differed between urban and rural respondents. In the
538 case of perceived minor illness, both rural or urban residents stated many factors
539 causing them not to access the system at the lower, primary level. The respondents
540 indicated that higher quality of care outweighed the higher costs of transportation,
541 services and medication, as well as the inconvenience of the complex physical
542 environment.[42]

543 **Influences of income and medical investment on participants' choices**

544 Participants with high education, high monthly income or favorable housing
545 conditions, such as self-purchased or rented commercial houses, were more inclined
546 to choose high-level medical institutions for their first visit. These findings were
547 consistent with those from a previous systematic review, which has also revealed that

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548 higher income, higher education and urbanization are associated with access at high
549 levels.[22]

550 Income is usually considered a measure of socioeconomic status. To some extent, the
551 definition of the position of income in its hierarchy relative to the prevailing social
552 norm may matter, rather than income itself. The influence of income on medical
553 preferences may involve various factors including socioeconomic status, income and
554 environment. Generally, a positive correlation exists between income and healthcare
555 use.[24] Wealthy individuals are less likely to underuse healthcare resources; instead,
556 they spend more money and time on healthcare, whereas individuals with lower
557 income face greater barriers to accessing adequate health care.[43] A study from Finland
558 has also indicated that retirees over the age of 60 or individuals without formal
559 employment have relatively greater difficulty in accessing medical help or even may
560 not seek treatment because of their lower incomes.[32, 44] A study conducted in 14
561 tertiary hospitals in China has reported that patients' preferences are influenced
562 mainly by illness severity and sociodemographic characteristics, and patients with
563 higher monthly incomes express a preference for first-class providers.[20] In contrast,
564 Geitona *et al*. have suggested that the utilization of primary and secondary healthcare
565 in Greece is determined primarily by health status rather than socioeconomic factors.
566 [45]

567 The relationship between income and health is also demonstrated through investment
568 in medical services. Total health expenditure, an internationally accepted indicator, is
569 widely considered an effective way to understand the health status of a country.
570 Taking the government capital investment in health services into account, further
571 increasing investment in medical and health services, and paying greater attention to
572 population health are crucial. Some countries in South East Asia spend very little on
573 health; for example, India spends $215 in terms of purchasing power parity per
574 person, which is lower than that in comparable middle-income countries, such as
575 China, Brazil and South Africa. A great need exists for countries to extend health
576 funding by taking a broader view of investing in human capital. Thus, on the basis of
577 the observations of the current study, we strongly recommend that cities with rapid
578 economic growth accelerate their investment in medical resources to solve the
579 problems related to the imbalances between the economy and health.

580 **Limitations**

581 Several limitations of this study must be addressed. **First**, although the study sample
582 was representative, as a result of random sampling according to the proportions of the
583 population from all districts of Shenzhen, because of the large floating population in
584 Shenzhen, the interpretation and extrapolation of the observed preferences for first
585 medical service to the entire city population should be performed with great caution.
586 **Second**, we did not further explore the effects of disease severity nonparticipants'
587 preferences regarding their initial visit. Self-assessment of disease severity may play
588 an important role in the selection of first medical service. Convenience, such as
589 distance, becomes less important as an illness becomes more severe.[41] **Third**, because

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the study focused on participants 18 years of age or older, we were unable to collect information on the preferences regarding first medical service from children or their parents. Shenzhen is a city with a young population age structure, and, because of the two-child policy recently imposed by the Chinese government, pediatrician shortage has become an increasingly important issue. Parents' choices regarding high-level medical institutions may be affected by the shortage of specialists.[46] Selection bias might have existed. Because the study participants were outpatient, we could not demonstrate and compare the preferences and attitudes towards first medical service between inpatients and non-patients.

Finally, although the participants were randomly selected from ten districts, we did not consider the effects of geographical characteristics on the residents' preferences regarding first medical service. Shenzhen is long and narrow from east to west and shorter from north to south. The allocation and accessibility of medical resources may somewhat affect people's willingness to use and preferences regarding medical service.

Conclusion

In general, more than 50% of the participants were willing to select municipal and district-level medicals institutions for the first visit. Those with higher education or income levels, or Shenzhen registered permanent residence, were more inclined to choose high-level medical institutions for the first visit. Medical technology and convenience were considered the main factors in the choice of medical institution.

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Contributors

DJ and XZ conceived and designed the study. XJ, LK, ZZ, LX and HS conducted the field work. DJ and ZX conducted the field work and did the initial analyses of the data and wrote the manuscript. CH commented on the interpretation of the data. DJ, XZ and XJ revised and reviewed the manuscript. All authors have seen and approved the final version the abstract for publication.

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No additional data available.

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2, 3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2, 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4, 5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	N/A
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6, 7
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study— eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	N/A
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg	8

		demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	8, 9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	23, 24, 25
		(*b*) Report category boundaries when continuous variables were categorized	8, 9
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-23
Discussion			
Key results	18	Summarise key results with reference to study objectives	25
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	30, 31
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	25-30
Generalisability	21	Discuss the generalisability (external validity) of the study results	31
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	32

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.