

Analysis of psychiatrists' Internet service patterns: a cross-sectional study from China's largest online mental health platform

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Abstract

Background: Mental disorders rank among the top ten global health burdens. In China, mental health resources are scarce and unevenly distributed. Against this backdrop, Internet hospitals offer new opportunities for mental health services. As China's largest online mental health platform, Haoxing is crucial for promoting the digitalization of mental health services.

Objective: This study aims to describe the demographics and medical service data of doctors on the Haoxing platform and investigate their associations. It focuses on: 1) doctors' demographic characteristics; 2) features of medical service data; 3) whether doctors' demographics impact service data.

Methods: This study collected demographic and medical service data from 11,333 registered users on the Haoxing platform over a five-year period. Descriptive statistics were conducted using Microsoft Excel 2019, and correlation analysis was performed with SPSS Statistics 26.0.

Results: On the Haoxing platform, registered doctors are most numerous in Guangdong (918), Shandong (808), and Jiangsu (797), with eastern coastal provinces far outnumbering western regions. 87.0% of doctors are from tertiary and secondary hospitals. Gender significantly correlates with professional title, with female doctors having a lower proportion of senior titles ($\chi^2 = 29.285$, $P < 0.001$). Text and image consultations dominate (82.1%). Hainan has the highest consultation conversion rate (0.52), and Inner Mongolia has the highest prescription conversion rate (11.4%). The gender of doctors is not linked to patient or prescription numbers ($Z = 0.715$, $P = 0.475$; $Z = 0.994$, $P = 0.320$) but impacts consultation method choice ($\chi^2 = 677.555$, $P < 0.001$). Professional titles differs in patient and prescription numbers ($H = 565.100$, $P < 0.001$; $H = 360.340$, $P < 0.001$) and affects consultation methods ($\chi^2 = 4463.359$, $P < 0.001$).

Conclusions: This study investigates China's Internet-based mental health services and identifies three key findings. First, resource distribution is uneven, with high-quality services concentrated in eastern developed areas and tertiary hospitals, a disparity exacerbated by Internet platforms. Second, an implicit gender barrier exists: female doctors have similar efficiency but lower senior - title rates, indicating non - performance - based constraints. Third, professional titles strongly influence patient decisions, affecting service scale, prices, and consultation methods, highlighting the consumer nature of authority symbols.

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Original paper

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Keywords: eHealth; internet hospital; online mental health care services; digital health; mHealth;

Introduction

Background

Mental disorders remain one of the top ten global burdens[1]. According to the World Mental Health Report 2022, in 2019, 970 million people worldwide suffered from mental disorders, which means that one in every eight people may have a mental disorder[2]. In China, a mental health survey shows that the lifetime prevalence rate of mental disorders (excluding dementia) is 16.6%, implying that nearly 230 million Chinese people will suffer from mental illness in their lifetime[3].

However, mental health service resources in China are relatively limited. According to statistics from the National Health Commission, as of the end of 2021, the number of psychiatrists in China reached 64,000,[4] accounting for only 1.49% of the total number of physicians nationwide (4.287 million) [5]. The number of psychiatrists per 100,000 population is 3.64, which is still a significant gap compared to the 7.9 psychiatrists per 100,000 population in high - income countries[6]. In addition, the geographical distribution of mental health resources in China is also uneven. The number of open psychiatric beds, physicians, and nurses per unit area of land in the western region is about 4 times less than that in the central region and 7 - 11 times less than that in the eastern region[7].

Driven by both economic development and digital health technology, digital mental health services have provided an effective way to alleviate the shortage of mental health resources in China[8]. Internet hospitals, which are based on digital health technology, have brought new development opportunities for mental health services and provided innovative ways and tools. Internet hospitals are one-stop service platforms established on the basis of physical hospitals through Internet technology, mainly providing online follow-up visits for common diseases and chronic diseases, health consultation, electronic prescriptions, and drug delivery services[9]. According to the "Interim Measures for the Administration of Internet Hospitals," there are three types of Internet hospitals in China: Internet hospitals independently established by physical medical institutions, Internet hospitals established in cooperation with third-party institutions by physical medical institutions, and Internet hospitals independently established by enterprises[10].

Internet hospitals have developed rapidly in China. As of June 2024, the number of Internet medical users in China has reached 365 million, accounting for 33.2% of the total number of Internet users[11]. Since the Guangdong Provincial Second People's Hospital established the first Internet hospital in China on October 25, 2014[12], by September 12, 2024, according to the news release from the National Health Commission, the number of Internet hospitals in the country has reached 3,340, and the annual volume of Internet medical services provided exceeds 100 million visits[13]. This growth not only reflects the rapid expansion of Internet hospitals in terms of quantity but also

shows that Internet hospitals can serve as a supplement and innovation to traditional medical services, enabling patients to obtain more convenient and personalized medical services.[14]

Founded in 2015, Haoxingqing Internet Hospital focuses on medical and health services in the field of mental health and is a leading online mental health platform in China. The platform has more than 60,000 registered physicians, over 50,000 of whom are psychiatrists and psychologists, with services covering 80% of public hospitals nationwide. Leveraging an intelligent diagnostic and treatment system, AI-based emotion recognition, and VR-based therapeutic technologies, Haoxingqing Internet Hospital has achieved efficient and precise medical service delivery. In terms of technological and service innovation, Haoxingqing Internet Hospital not only optimizes diagnostic pathways and improves diagnostic efficiency using big data and artificial intelligence technologies but also provides patients with more personalized and immersive therapeutic experiences through advanced technologies such as AI facial emotion recognition and VR-based therapeutic systems[14]. Additionally, the platform actively participates in the national 5G + mental health pilot project[15] to promote the development of the mental health industry and has obtained the “Internet Hospital” license from the state. It has also been selected for the “Top 100 Future Medical” list for five consecutive years[16].

Objectives

Although previous studies have explored the development and effectiveness of Internet hospitals, most of them have mainly focused on aspects such as the accessibility of medical services and patient satisfaction. There are relatively few studies on the characteristics of physicians providing services, especially demographic characteristics (such as gender, age, and professional title) and their impact on medical service data. Therefore, the main objectives of this study are: 1. To describe the demographic characteristics of physicians registered on the Haoxingqing platform; 2. To describe the characteristics of medical service data on the Haoxingqing platform; 3. To explore whether the demographic characteristics of physicians have an impact on the medical service data of the Haoxingqing platform.

Method

Data Collection

We collected comprehensive data from the Haoxingqing Internet Hospital platform from January 2018 to June 2023. The dataset mainly includes demographic data of registered mental health professionals and medical service data generated during this period. The demographic characteristics are detailed to include gender distribution, average age, as well as the professional titles and number of hospitals involved. Medical service data includes the number of patients who established a

relationship with the doctors, the number of prescriptions issued, and the total number of consultations, which can be further classified into text-and-image consultations, telephone consultations, and video consultations. Table 1 lists the relevant data related to this study.

Table(1): The statistical measure designed in this study

	Type of variables	Value
Data	Demographic characteristics	
	Total registered mental healthcare professionals, N	11333
	Gender (M/F)	5659/5674
	Age, mean (SD)	43.81(9.69)
	Number of professional titles, n	16
	Number of hospitals, n	2532
	Medical service data	
	Volume of patients formed relations, (M/F) n	(1402366/953721)2356087
	Volume of prescriptions, (M/F) n	(907254/754806)1662060
	Total consultation, (M/F) n	(293720/245947)539667
	Volume of graphic consultation, (M/F) n	(246748/197689)302908
	Volume of telephone consultation, (M/F) n	(36909/35713)46650
	Volume of video consultation, (M/F) n	(10063/12545)16813

Screening and Processing

From January 2018 to June 2023, a total of 11,333 mental health practitioners registered on the Haoxingqing platform, spanning 16 professional fields, including psychological consultants, nurses, and pharmacists. To align with the study's focus on professional physicians within China's medical system, we implemented a rigorous screening process. First, we excluded 244 psychological consultants due to their lack of medical background and focus on counseling or psychotherapy. Second, 14 intern and assistant doctors were excluded as they lack independent prescription rights. Finally, 8 social workers, nurses, and pharmacists were excluded due to their distinct roles from clinical physicians. After screening, 11,067 physicians remained, including resident physicians, attending physicians, associate chief physicians, and chief physicians, all holding valid practicing certificates and central to medical service delivery. These data were used for demographic and medical service correlation analyses.

Data Preprocessing

This study divided the collected data into two major categories: doctors' demographic characteristics and medical service data.

Demographic characteristics: We summarized information on doctors' gender, age, practice region, professional title, and hospital level. Hospital levels were classified according to the "Hospital

Classification and Management Standards," categorizing the 2,532 hospitals included in the Haoxing platform into Level 1, Level 2, and Level 3. Hospitals that were not graded or were Internet hospitals were classified as "others."

Medical service data: We counted the number of patients for each doctor, the number of prescriptions, and the number of consultations conducted through three different consultation modes. Patients on the Haoxing platform can choose doctors to establish a doctor-patient relationship by directly following the doctors' personal homepages and select one of the following three consultation methods according to their needs:

Text-and-image consultation: A quick and convenient consultation through pictures and text, suitable for simple inquiries.

Telephone consultation: Communication via phone through the platform, providing more intuitive descriptions and answers to questions.

Video consultation: "Face-to-face" communication between patients and doctors through video calls, enhancing the intuitiveness and interactivity of communication.

In addition, we defined two variables:

Consultation Conversion Rate: The ratio of consultations to established doctor-patient relationships, reflecting the proportion of patient interactions that lead to consultations.

Prescription Conversion Rate: The ratio of prescriptions to consultations, indicating the proportion of consultations resulting in prescribed treatments.

Statistical Analysis

Descriptive statistical analyses, including bar charts, line charts, and pie charts, were generated using Microsoft Excel to visualize the distribution of physician characteristics and medical service data.

Core statistical analyses were performed using SPSS Statistics. Non-parametric tests were selected due to the non-normal distribution of patient volume and prescription data (Shapiro-Wilk test, $P < 0.05$). The Kruskal-Wallis H test was used to compare patient volume and prescription volume across the four professional title groups, while the Mann-Whitney U test assessed gender differences. The chi-square test examined the association between professional title and gender, as well as the impact of gender and professional title on consultation method selection. For multiple comparisons, Bonferroni correction was applied to control for Type I error. Statistical significance was set at $P < 0.05$.

Results

Demographic Distribution Characteristics of Physicians on the Platform

Figure 1 reveals the distribution of registered doctors on the Haoxingqing platform across different provinces in China. Guangdong Province tops the list with 918 registered doctors nationwide, followed closely by Shandong Province and Jiangsu Province, with 808 and 797 registered doctors respectively. In contrast, with the exception of Sichuan Province (634 registered doctors, ranking fifth), the number of registered doctors in the western region provinces is significantly lower than that in the coastal provinces of the eastern region.

Figure 2 further delineates the demographic characteristics of physicians registered on the Good Mood platform, with particular emphasis on the gender distribution across different professional title levels. Among the senior titles of chief physician and associate chief physician, the number of male physicians is slightly higher than that of female physicians. In contrast, in the middle and lower titles, such as resident physician and attending physician, the number of registered female physicians shows a slight predominance. Specifically, among attending physicians, there are 2117 female physicians compared to 2073 male physicians. In the resident physician title, the number of female physicians is 809, exceeding the 674 male physicians. The chi-square analysis results presented in Table 2 show a significant association between gender and professional title ($\chi^2=29.285$, $P<0.001$). Additionally, the data indicate that the platform has a higher number of attending physicians and associate chief physicians, who together account for 67.1% (7246/11067) of all registered physicians.

Table(2): Chi-square analysis results of the relationship between physician gender and professional title

category	Attending physician	Attending Physician	Associate Chief Physician	Chief Physician	χ^2	P
male	674(12.1%)	2073(37.1%)	1729(30.9%)	1116(20.0%)	29.285	<0.001
female	809(14.8%)	2117(38.7%)	1507(27.5%)	1042(19.0%)		

The age and title distribution of doctors presents an olive-shaped structure, with attending physicians and associate chief physicians forming the backbone of the platform. As shown in Figure 3, the age distribution of resident physicians and attending physicians shows a single peak, reaching the peak in the age groups of 25 - 34 years and 35 - 44 years, respectively. In contrast, the age distribution of associate chief physicians and chief physicians shows a bimodal pattern. Associate chief physicians reach peaks in the age groups of 35 - 44 years and 45 - 54 years, while chief physicians are primarily concentrated in the age groups of 45 - 54 years and 55 - 64 years.

Finally, Figure 4 displays the distribution of the levels of medical institutions to which the physicians on the platform belong. It can be observed that tertiary hospitals account for the highest proportion at 52%, followed by secondary hospitals at 35%, while primary hospitals and other non - graded

hospitals only account for 13%.

Characteristics of Medical Service Data

When analyzing the distribution of consultation volumes and methods on the Haoxingqing platform across different regions in China, as shown in Figure 5, Shandong Province ranks first with 71,916 consultations, accounting for 13.6% of the total consultations. Guangdong Province follows with 48,848 consultations (9.2%), and Jiangsu Province with 47,600 consultations (9.0%). Notably, among the 31 provinces included in the statistics, the sum of consultations from the top 15 provinces accounts for 81.9% of the national total (432,103/527,645). Furthermore, an analysis of the distribution of consultation methods across provinces reveals that text and image consultations dominate in all provinces, with an average share of 82.1%. However, in Beijing, phone and video consultations account for 40.6% of the total consultations, a relatively high proportion compared to other provinces.

Figure 6, utilizing the consultation conversion rate as defined by us, further delineates the consultation status across various provinces in China. The line chart within the figure reflects the consultation conversion of patients in each province, that is, the proportion of patients in each province who ultimately consult on the platform. It can be observed that, despite having the highest number of patients, Shandong Province and Jiangsu Province both have consultation conversion rates below the national average. In contrast, Beijing and Guangdong Province not only have a large number of patients but also rank high in consultation conversion rates. Additionally, some provinces with relatively fewer patients exhibit remarkable consultation conversion rates. For example, Hainan Province, ranking 30th in patient numbers, has the highest consultation conversion rate in the country; Yunnan Province, ranking 17th in patient numbers, has the second-highest consultation conversion rate nationwide.

Figure 7 illustrates the prescription conversion situation across different regions through the prescription conversion rate as defined by us. It can be observed that among the top five provinces in terms of consultation volume, only Guangdong Province has a prescription conversion rate above the national average. Additionally, in some provinces with a lower ranking in consultation volume, the prescription conversion rate is quite high. For example, Inner Mongolia ranks 27th in consultation volume but has the highest prescription conversion rate.

The Relationship Between Physicians' Demographic Data and Medical Service Data

Figure 8 presents the counts of patient numbers and prescription numbers for male and female physicians on the Haoxingqing platform, with male physicians having higher patient numbers and prescription numbers than female physicians. As shown in Table 3, further analysis using the Mann-

Whitney U test revealed the following:

Patient numbers: The median for male physicians was 29 (IQR 7, 114), and for female physicians, it was 29 (IQR 8, 106) ($Z=0.715$, $P=0.475$).

Prescription numbers: The median for male physicians was 19 (IQR 2, 108.75), and for female physicians, it was 20 (IQR 3, 105) ($Z=0.994$, $P=0.320$).

Since both P-values were greater than 0.05, no statistically significant differences were observed in patient numbers and prescription numbers between genders.

Table(3)The results of the Mann-Whitney U test on the relationship between physician gender and the number of prescriptions and patients.

Category	Male (N=5592)	Female (N=5475)	Z	P
Patient Count	29(7,114)	29(8,106)	0.715	0.475
Prescription Count	19(2,108.75)	20(3,105)	0.994	0.320

Figure 9 illustrates the distribution of the three consultation methods among male and female physicians. It can be observed that for both male and female physicians, text and image consultation had the highest proportion. However, female physicians had slightly higher proportions of video and telephone consultations compared to male physicians. According to the chi-square analysis results shown in Table 4, there were significant differences in the choice of consultation methods between patients of male and female physicians ($\chi^2=677.555$, $P < 0.001$). Specifically, among the patients of male physicians, text and image consultation accounted for the highest proportion at 83.7%, followed by telephone consultation at 12.9% and video consultation at 3.4%. Among the patients of female physicians, text and image consultation also accounted for the highest proportion at 81.2%, while telephone consultation and video consultation had relatively higher proportions, at 14.3% and 4.5%, respectively.

Table(4):The results of the chi-square analysis on the relationship between physician gender and consultation methods.

Category	Text and Image Consultations	Phone Consultations	Video Consultations	χ^2	P
Male	238684(83.7%) _a	36656(12.9%) _a	9823(3.4%) _a	677.555	<0.001
Female	196862(81.2%) _b	34712(14.3%) _b	10908(4.5%) _b		

The subscripts a and b are used to indicate significant differences between different groups. The same letter indicates no significant difference, while different letters indicate a significant difference.

Figure 10 Prescription and Consultation Numbers by Physician Title:

Patient Numbers: The median number of patients significantly increased with higher professional titles. As shown in Table(5), For resident physicians, the median and interquartile range (IQR) were 12 (4, 45); for attending physicians, 22 (6, 81); for associate chief physicians, 38.5 (9, 132); and for chief physicians, 61 (13, 216). The Kruskal-Wallis H test revealed a statistically significant effect of professional title on patient numbers ($H=565.10$, $P<0.001$).

Prescription Numbers: A similar trend was observed for prescription numbers. The median prescription numbers were 7 (2, 39) for resident physicians, 15 (2, 79) for attending physicians, 29 (4, 134) for associate chief physicians, and 41 (4, 203) for chief physicians. The differences were also statistically significant ($H=360.34$, $P<0.001$).

Table(5): Results of the Kruskal-Wallis H test examining the relationship between physician rank and patient volume, as well as prescription volume.

Category	Resident Physician	Attending Physician	Associate Chief Physician	Chief Physician	H
Patient Count	12(4,45) _a	22(6,81) _b	38.5(9,132) _c	60(13,216) _d	565.098
Prescription Count	7(2,39) _{a'}	15(2,79) _{b'}	29(4,134) _{c'}	40.5(4,203) _{d'}	360.338

The same letter indicates no significant difference, while different letters indicate a significant difference.

Figure 11 Distribution of Consultation Methods by Physician Title:

The data indicate that text and image consultation was the predominant method across all titles. However, the proportion of text and image consultation decreased with increasing professional title, while the proportions of telephone and video consultations increased. The chi-square analysis results ($\chi^2=4463.359$, $P<0.001$) further demonstrated significant differences in the distribution of consultation methods among physicians of different titles, as shown in Table 6. Pairwise comparisons revealed that, except for the lack of a statistically significant difference in the distribution of video consultation numbers between attending physicians and associate chief physicians, significant statistical differences were observed in the distribution of all three consultation methods among other titles.

Table(6): Results of the chi-square analysis examining the association between physician rank and consultation methods.

Category	Image-Text Consultation	Phone Consultations	Video Consultations	χ^2	P
Resident Physician	29952(90.1%) _a	2685(8.1%) _a	604(1.8%) _a	4463.359	<0.001
Attending Physician	98012(84.8%) _b	13599(11.8%) _b	3946(3.4%) _b		

Associate Chief Physician	144027(84.3%) _c	21136(12.4) _c	5601(3.3%) _b
Chief Physician	163555(78.6%) _d	33948(16.3%) _d	10580(5.1%) _c

The same letter indicates no significant difference, while different letters indicate significant differences.

Discussion

Principal Findings

Registered doctors are mainly concentrated in the economically developed and densely populated provinces along China's eastern coast, and most of them come from secondary and tertiary medical institutions. In terms of gender and title distribution, the proportion of female doctors is slightly higher among those with lower titles (resident physicians and attending physicians), while male doctors dominate among those with higher titles (associate chief physicians and chief physicians). The distribution of doctors' ages and titles is olive-shaped, with fewer young resident physicians and senior chief physicians, and middle-aged attending physicians and associate chief physicians forming the backbone.

Medical service data shows that the consultation volume in economically developed provinces is significantly higher than in other regions, with text and image consultation being the main consultation method. Provinces with high numbers of patients and consultations do not necessarily have high consultation conversion rates and prescription conversion rates.

Doctors' gender has no significant impact on the distribution of patient numbers and prescription numbers, but it does significantly affect the distribution of consultation methods. Female doctors have a slightly higher proportion of telephone and video consultations than male doctors. Doctors' titles significantly affect the distribution of patient numbers, prescription numbers, and consultation methods. The higher the title, the higher the corresponding medical service data. Chief physicians have a significantly higher proportion of video and telephone consultations than other titles.

Geographical Distribution and Resource Allocation Imbalance in Online Mental Health Services

The rise of internet hospitals has brought new opportunities and challenges for the provision of mental health services. Patients can access online consultations through internet hospitals, breaking geographical barriers and conveniently selecting their preferred hospitals. This is particularly important for patients in regions with limited mental health service resources. They can directly choose to consult with mental health centers in economically developed areas to obtain higher

quality medical services. The significant differences in online medical service data more prominently reflect the inequality in medical resource distribution.

The top three provinces in terms of the number of registered physicians on the Haoxingqing platform are Guangdong, Shandong, and Jiangsu. These provinces also rank among the top three in terms of economic development in China, with eastern region provinces having a clear advantage in physician numbers. This finding is consistent with previous studies¹⁵[17]. Taking Guangdong Province as an example, it is a pioneer in the development of internet hospitals in China and places great emphasis on the construction of mental health service systems. The province has not only introduced policies to improve infrastructure, support talent cultivation and introduction¹⁶[18] but also actively explored the integration of internet medical services with mental health services. In 2018, Guangdong was the first province to allow medical institutions to use "internet hospital" as a secondary name, providing safe and appropriate medical services based on physical hospitals through internet technology. It also supported medical and health institutions and qualified third-party organizations in building internet information platforms to conduct remote medical services, health consultations, and health management services. By 2020, tertiary hospitals had fully launched "Internet Plus" medical services.¹⁷[19]

Furthermore, secondary and tertiary hospitals dominate on the Haoxingqing platform, which can be attributed to their high professional standards and patient trust. This online trend is closely related to the offline medical system in China. China implements a three-tier medical care system, where primary medical institutions, such as community health service centers, are mainly responsible for the initial diagnosis and treatment of common diseases and health management, undertaking the task of primary diagnosis at the grassroots level. Secondary medical institutions, namely county-level hospitals, receive referrals, handle complex diseases, and provide emergency and critical care as well as referrals. Tertiary medical institutions, including large general hospitals and specialized hospitals, are responsible for the diagnosis and treatment of difficult and critical cases, as well as scientific research and teaching.¹⁸ [20] However, for mental health services, China's tiered referral system for mental health services is not yet mature, and mental health centers are primarily located in economically developed cities. Mental health services in rural and community areas are relatively weak. For patients with mental illnesses, they tend to seek treatment at municipal specialized hospitals or the psychological departments of tertiary hospitals¹⁹[21]. This is also in line with the Chinese patient's medical seeking behavior: even for minor symptoms, they prefer to visit municipal or provincial hospitals.²⁰[12]

Although internet hospitals theoretically can break geographical barriers and achieve extensive

coverage of medical resources, the data show that their service networks are still deeply embedded in the traditional medical hierarchy. This phenomenon is consistent with the findings of Xie et al. (2021)21[22], who reported a significant "Matthew effect" in the distribution of medical resources in internet hospitals. High-quality medical resources are concentrated in core areas through policy bias and technological aggregation, forming a "digital siphon effect." Specifically, although patients in less developed areas can access high-end medical resources across regions, this model further strengthens the resource advantages of core areas and exacerbates regional medical resource inequality.

Analysis of Internet-based Mental Health Service Conversion Rates

When analyzing the conversion rates of internet-based mental health services across provinces, we observed that regions with more developed economies, such as Guangdong, Beijing, and Zhejiang, have relatively higher patient numbers. This may be attributed to the earlier development and more mature systems of internet-based medical services in these areas, as well as the higher acceptance of online consultation services among local residents, which in turn increases the consultation conversion rates in these regions. However, despite having a large number of patients, Shandong and Jiangsu provinces have consultation conversion rates below the national average, a finding that warrants attention.

Additionally, some provinces with relatively fewer patients, such as Hainan, have conversion rates exceeding 50%, despite ranking low in patient numbers (30/31). This indicates that the number of patients does not directly determine the consultation conversion rate. Further observations reveal that some provinces with high consultation volumes, such as Shandong, Jiangsu, and Beijing, have less than ideal prescription conversion rates. Although these provinces rank high in consultation numbers, their conversion rates are below average. In contrast, in less developed regions in the northwest, where patient numbers are low, prescription conversion rates are relatively high.

This phenomenon may be related to the following factors: In economically developed regions with abundant medical resources, although patient numbers and consultation volumes are high, some patients may still prefer traditional offline medical services, resulting in lower online platform conversion rates. In contrast, in less developed regions with limited medical resources, patients may rely more on online platforms to access medical services, which could be one reason for the higher conversion rates in these areas.

Gender Differences in Professional Title Distribution and Medical Service Data in Online Mental Health Services

Gender Barriers in Career Advancement

Despite the nearly equal gender ratio of registered physicians on this online platform, there is a significant difference in professional title distribution: female physicians are in the majority in lower and middle titles, while male physicians have a higher proportion in senior titles. This indicates that there may be barriers to career advancement and gender inequality for female physicians in the medical field. Studies have shown that this phenomenon may not only be related to the fact that women need to bear the burden of childbirth[23] and more family responsibilities[24] but also to the gender discrimination that female physicians face in the workplace[25], especially among female psychiatrists who face a higher proportion of gender discrimination in career advancement[26]. However, previous studies have also shown that even when factors such as childbirth, number of children, and output are controlled, gender differences in physician promotion still exist, indicating that the design of career development systems is more favorable to men[27].

Gender Preferences in Patient Consultation Methods: Female Physicians Focus More on In-depth Communication

Gender differences are also reflected in medical service data. Although the rank-sum test results show no significant statistical differences in prescription numbers and patient numbers based on physician gender, the chi-square analysis results reveal significant differences in the distribution of the three consultation methods between male and female physicians. Specifically, female physicians have higher proportions of telephone and video consultations. We speculate that this difference may be related to the differences in communication styles between male and female physicians. Female physicians are generally better at listening to patients' needs and feelings, tend to spend more time communicating with patients, and adopt a more patient-centered communication style[28]. This characteristic is particularly advantageous for patients with shorter offline outpatient consultation times, especially for consultations involving mental health-related issues, which often require more time to gain a deeper understanding of patients' inner states.

Professional Titles and Age Distribution: The Current Status of Career Advancement for Doctors

Characteristics of the distribution of titles and ages on the Haoxingqing platform: Young doctors (aged 25–34) are predominantly concentrated in lower-ranking positions such as resident physicians and attending physicians, while older doctors (aged 45–54) are more likely to hold higher-ranking positions such as associate chief physicians and chief physicians. This pattern is consistent with China's existing title promotion system, which stipulates the minimum years of service required for promotion to higher-level titles. For instance, physicians with a bachelor's degree must have at least 15 years of work experience to be eligible for promotion to chief physician[29].

The current title promotion system has significant issues. Chinese physicians generally express low overall satisfaction with the title promotion process. First, it relies excessively on administrative evaluation and lacks a scientific and systematic job evaluation system, resulting in evaluation content that lacks job specificity and scientific rigor. Second, the current salary system, which is primarily based on title, education level, and years of service, fails to adequately reflect the clinical capabilities and work performance of medical staff. Moreover, primary care physicians face promotion barriers due to the high demands for research and publications, which are not aligned with their clinical practice-oriented job nature[30]. Therefore, the reform of the title promotion system should balance clinical practice and research capabilities, establish tiered and categorized promotion criteria, and formulate differentiated requirements based on regional medical needs and hospital functional positioning. In particular, the promotion conditions for primary care physicians should be relaxed, and more support and development opportunities should be provided to promote the rational allocation of medical resources and coordinated development of the industry[31].

Impact of Professional Title on Medical Service Data

The study results show that professional title has a significant impact on medical service data. There are significant differences in prescription numbers, patient numbers, and consultation method choices. Specifically, physicians with higher professional titles have significantly higher patient numbers and prescription numbers than those with lower titles, and patients are more inclined to choose higher title physicians for video and telephone consultations. This finding is consistent with the results of Li et al.,[17] which may be because higher title physicians usually have richer clinical experience and higher professional technical levels, often undertaking more complex diagnostic and treatment tasks, and thus are more likely to gain patient trust, making patients more willing to choose the more expensive telephone and video consultation methods over text and image consultations.

Limitations

This study describes and analyzes the current status and characteristics of internet hospitals in China in providing mental health services, based on the overall features of practitioners and the platform's medical service data. However, some limitations remain. First, the data mainly involves the mental health service professionals registered on the platform, lacking data that can directly describe the platform's patient user information, such as disease diagnosis. Second, as far as we know, this study is the first cross-sectional study in China describing the application of internet hospitals in mental health services, so our results lack relevant literature for comparison. Third, our study mainly focused on medical service data and did not describe the satisfaction of platform users. Future research can collect and analyze patient feedback or other data to more comprehensively assess the

performance of internet hospitals dedicated to mental health services.

Conclusion

This study is based on the first cross-sectional data of domestic internet-based mental health services and has identified three major structural characteristics of online mental health services in China. First, there is an imbalance in the distribution of resources, with high-quality resources concentrated in the eastern developed regions and tertiary hospitals. Internet platforms have exacerbated the geographical concentration of resources, reflecting the continuation of the traditional medical resource allocation imbalance in the digital space. Second, there is an implicit gender barrier. Female doctors have a service efficiency in internet-based medical services comparable to that of male doctors, but their proportion of senior titles is low, indicating that career advancement is constrained by non-performance factors. Third, the service ecosystem is driven by professional titles. The professional title of a doctor is an important factor influencing patient decision-making and plays a significant role in service scale, pricing, and the choice of consultation methods, highlighting the consumption attribute of the authority symbol in internet-based medical services.

Conflicts of Interest

None declared

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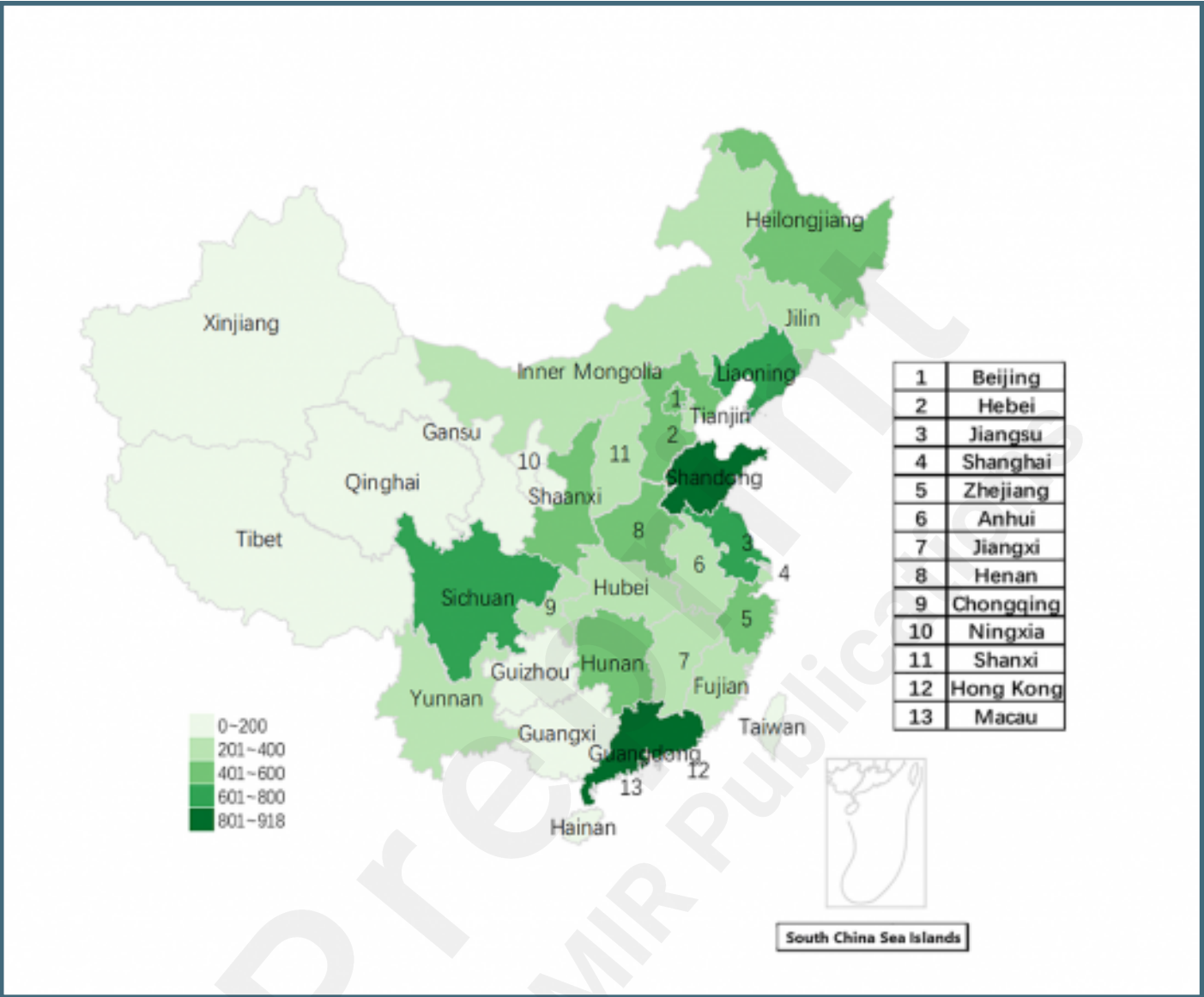
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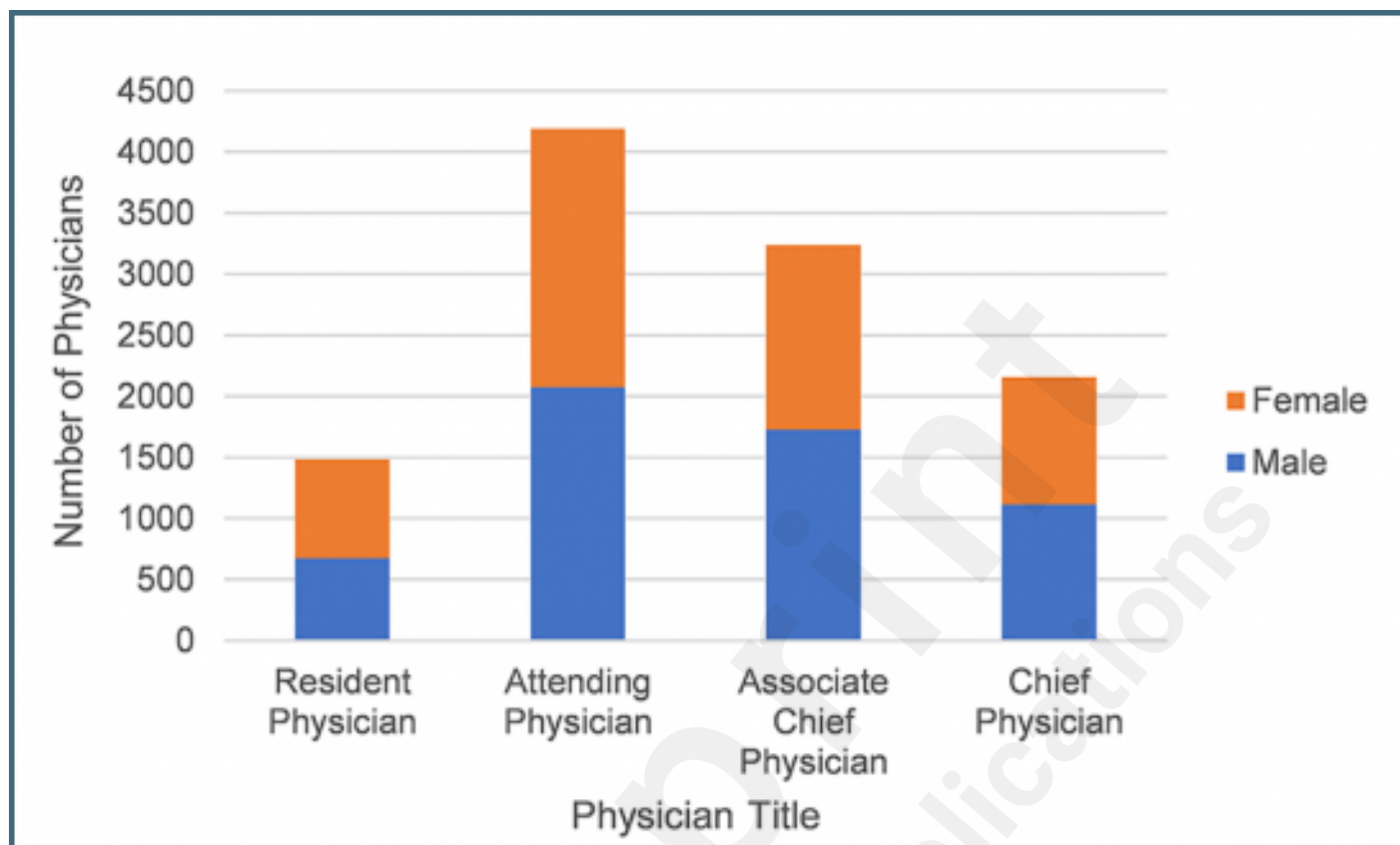
Supplementary Files

Figures

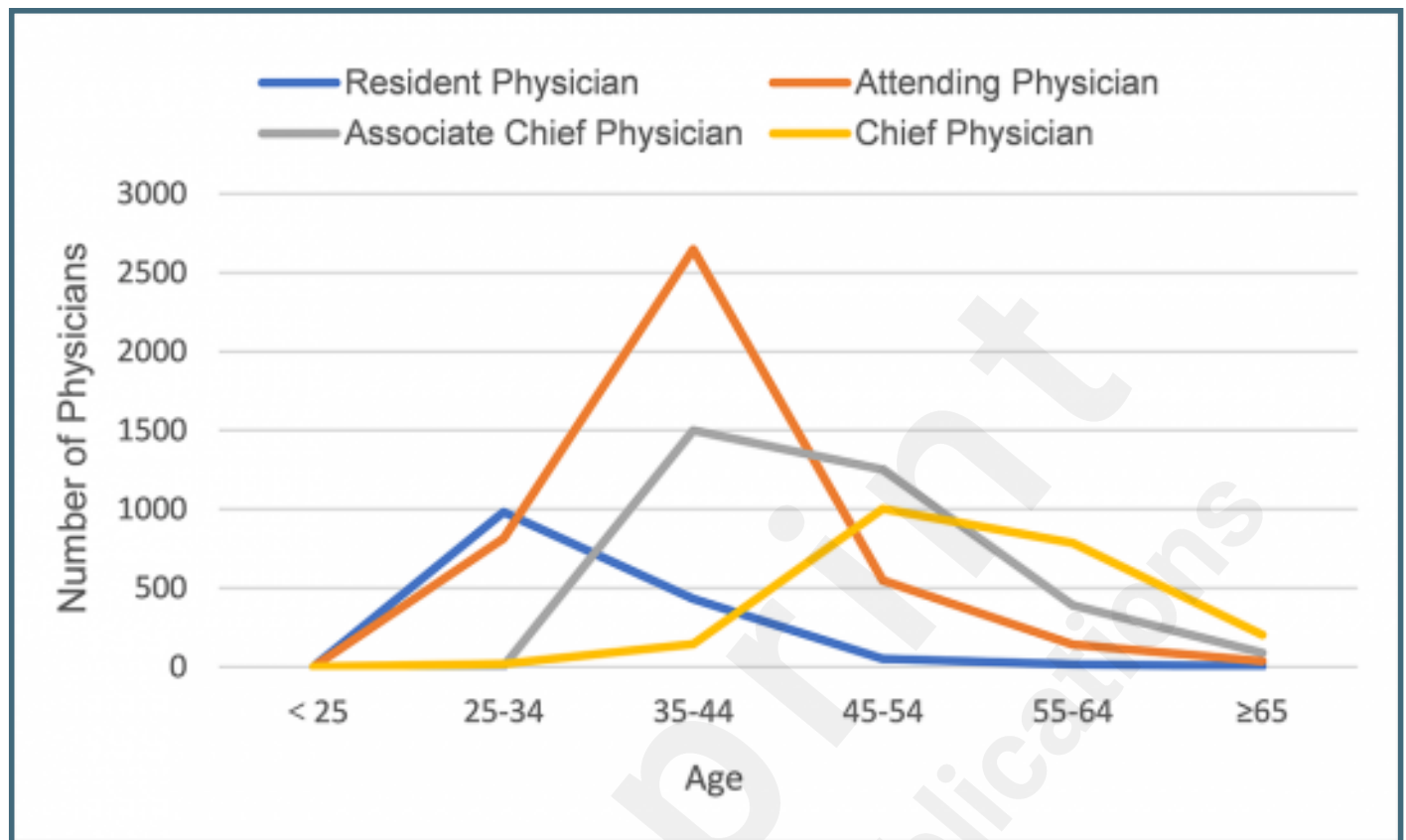
The geographical distribution of registered users on the Haoxingqing platform.



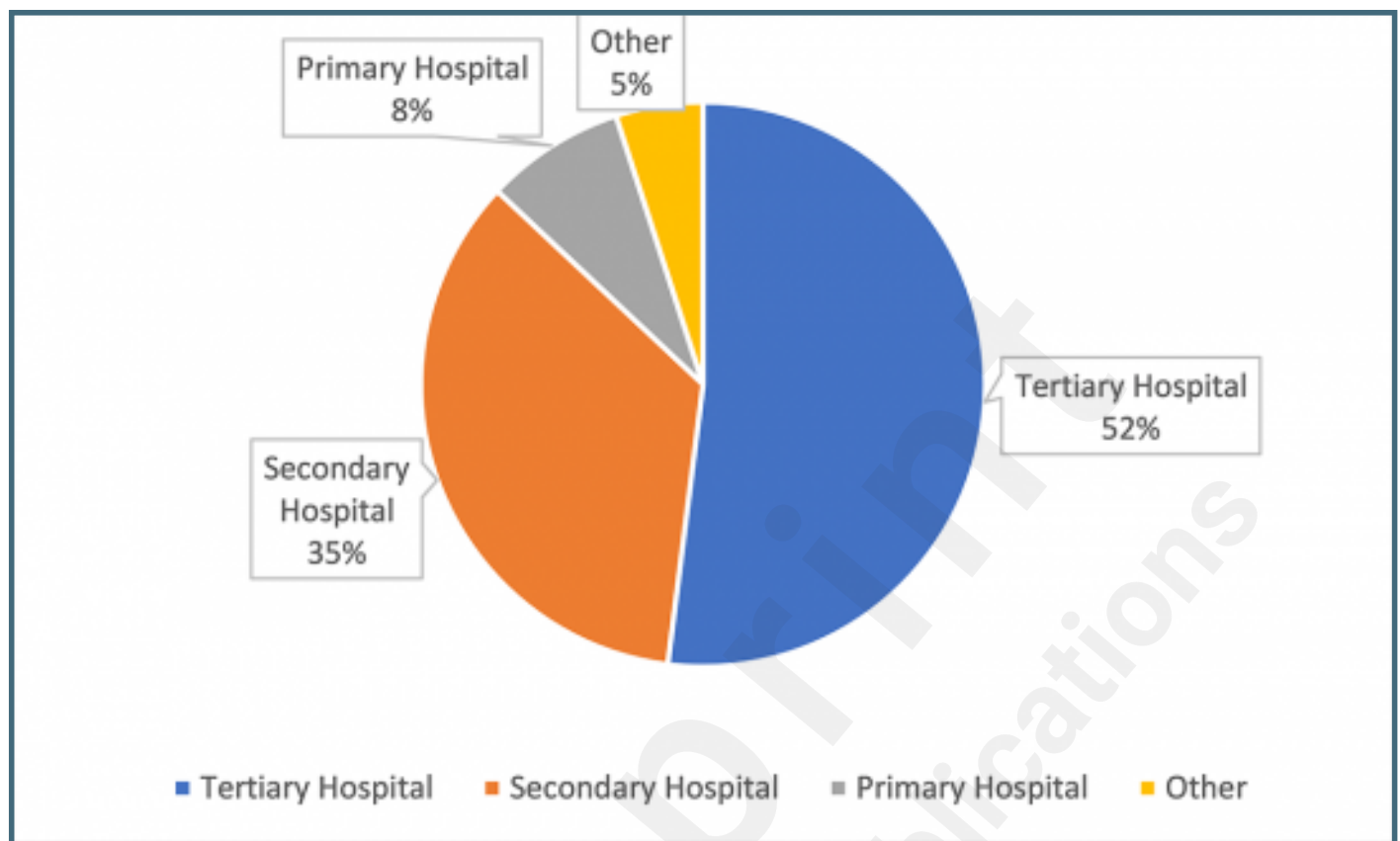
The distribution of doctors with different professional titles on the Haoxingqing platform.



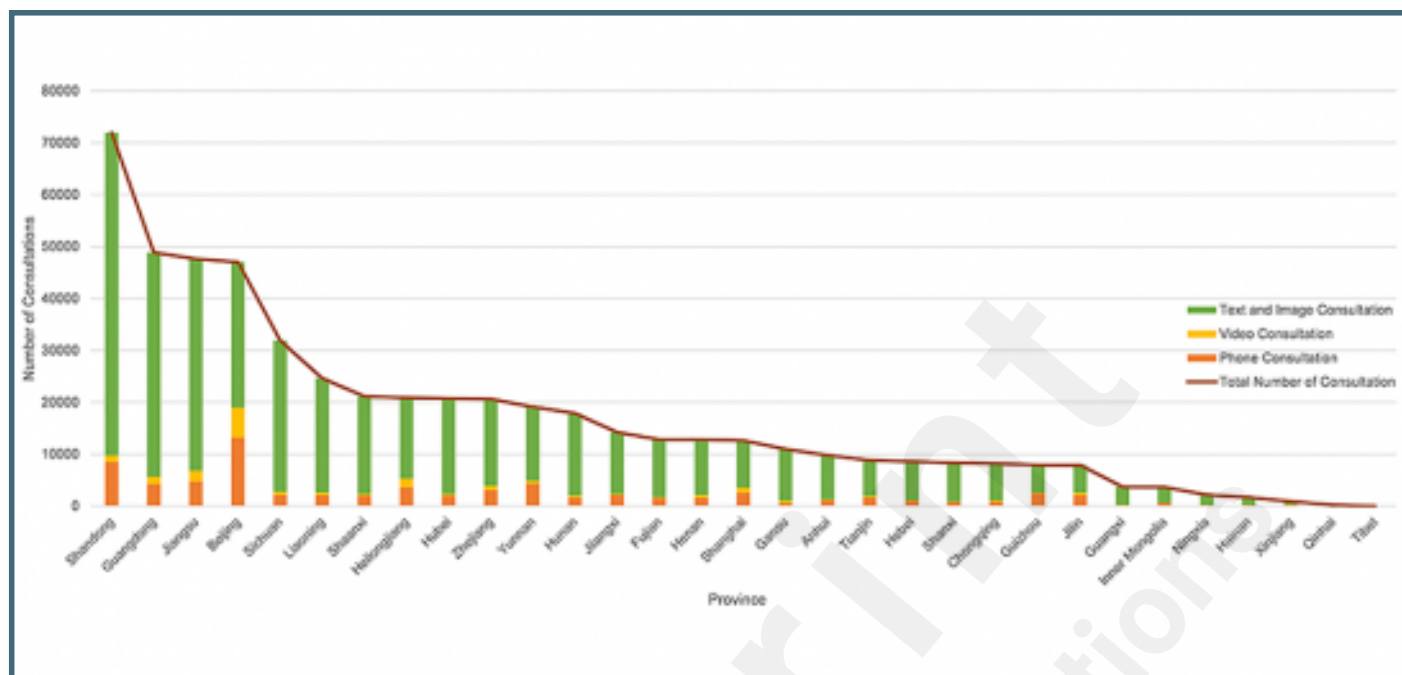
The age distribution of doctors with different professional titles.



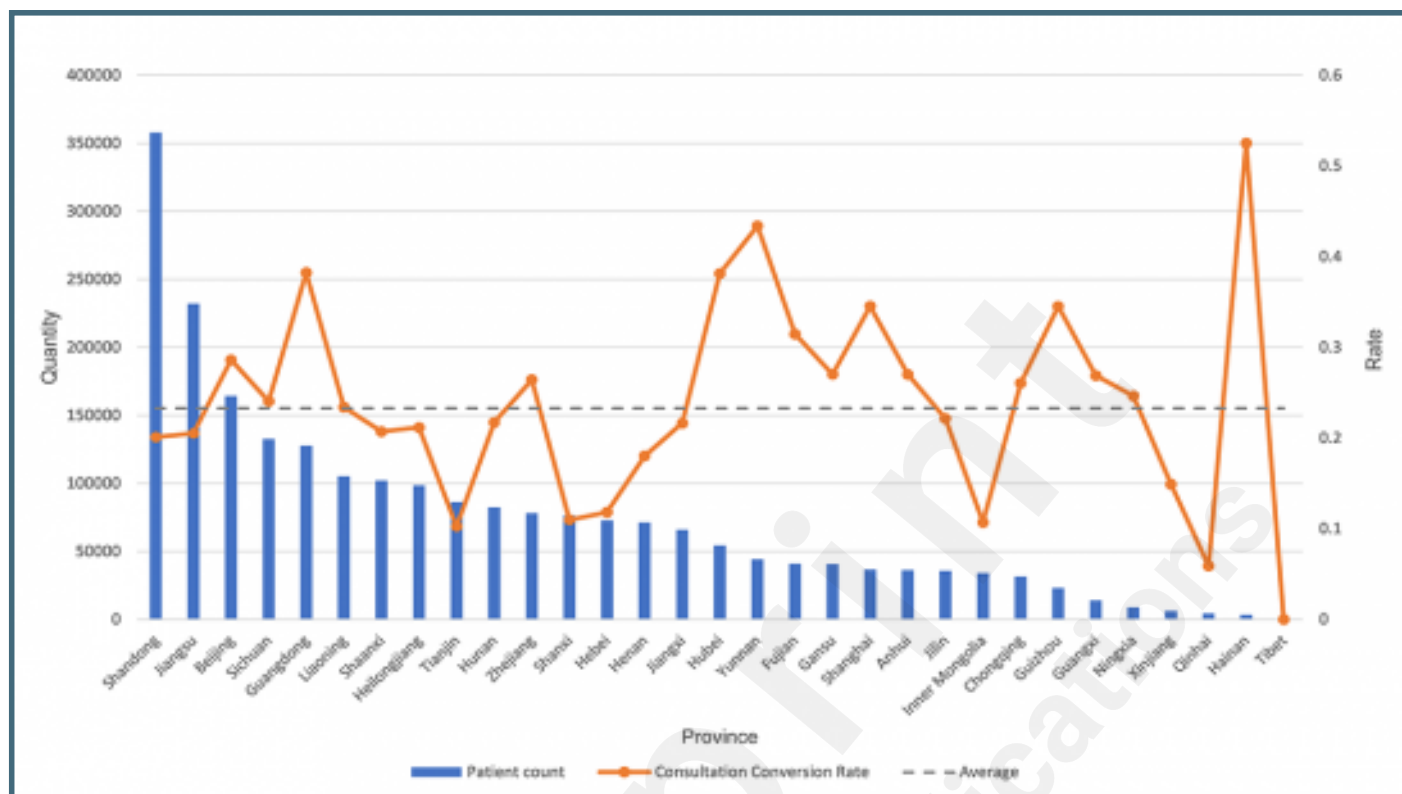
The distribution map of the hospital levels of Haoxingqing.



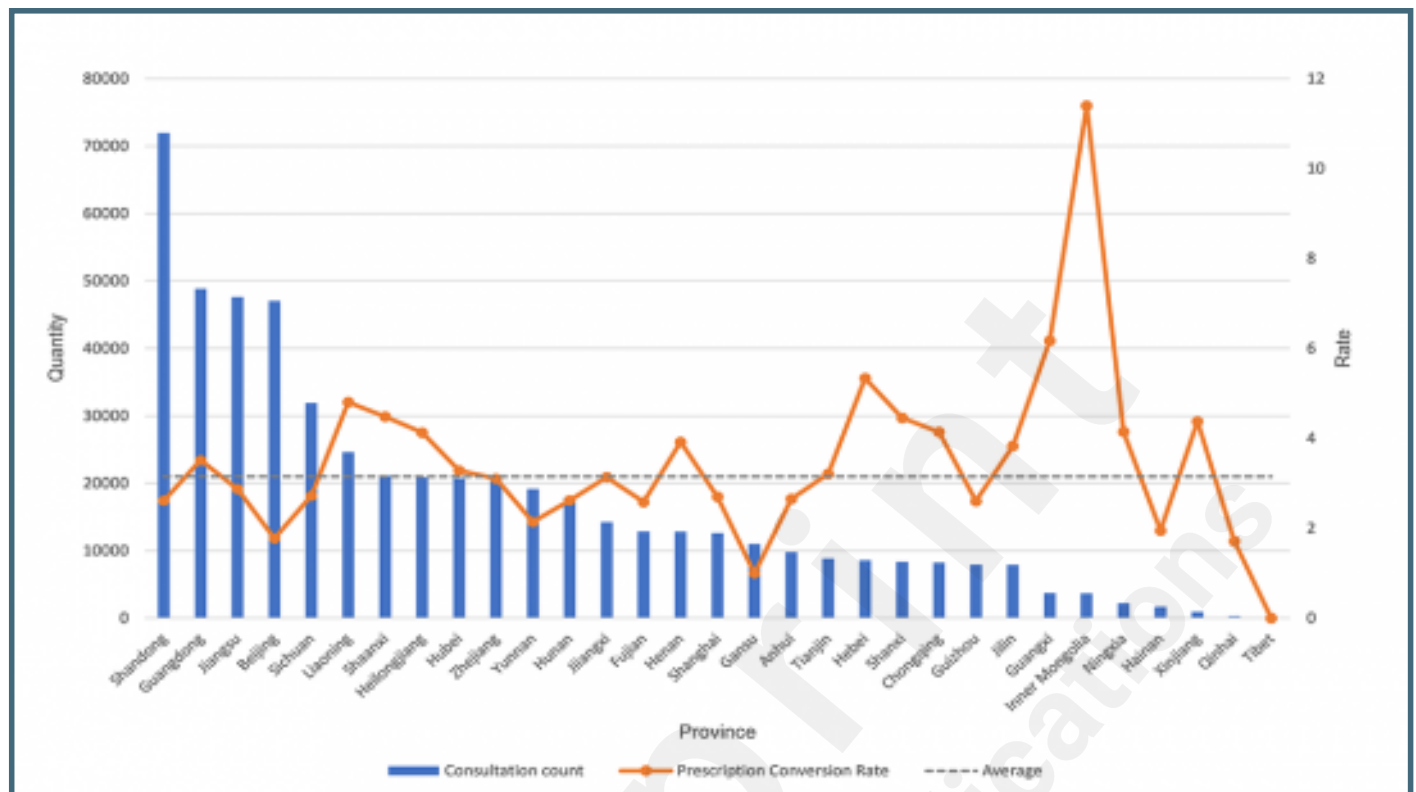
Distribution map of consultation methods in each province.



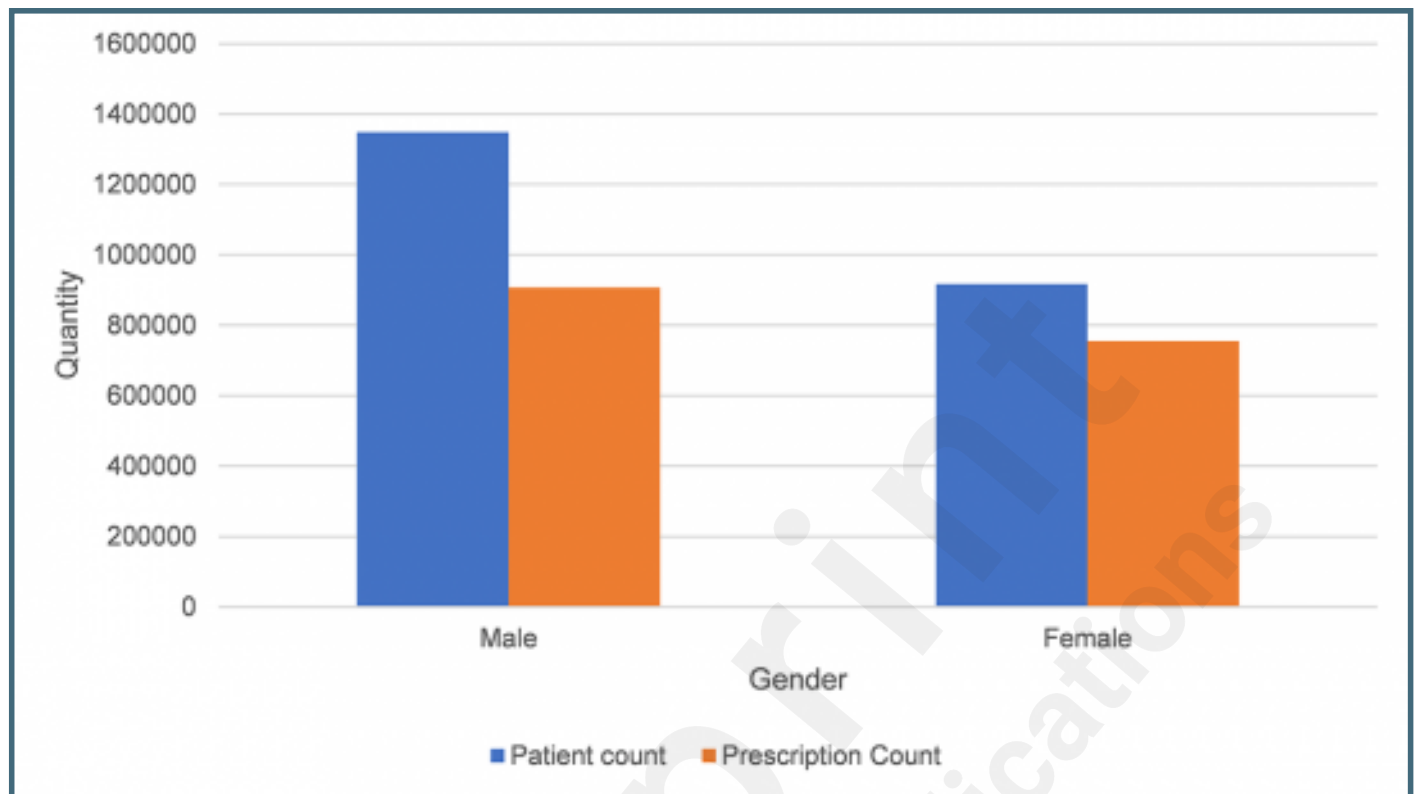
The number of patients and the consultation conversion rate in each province.



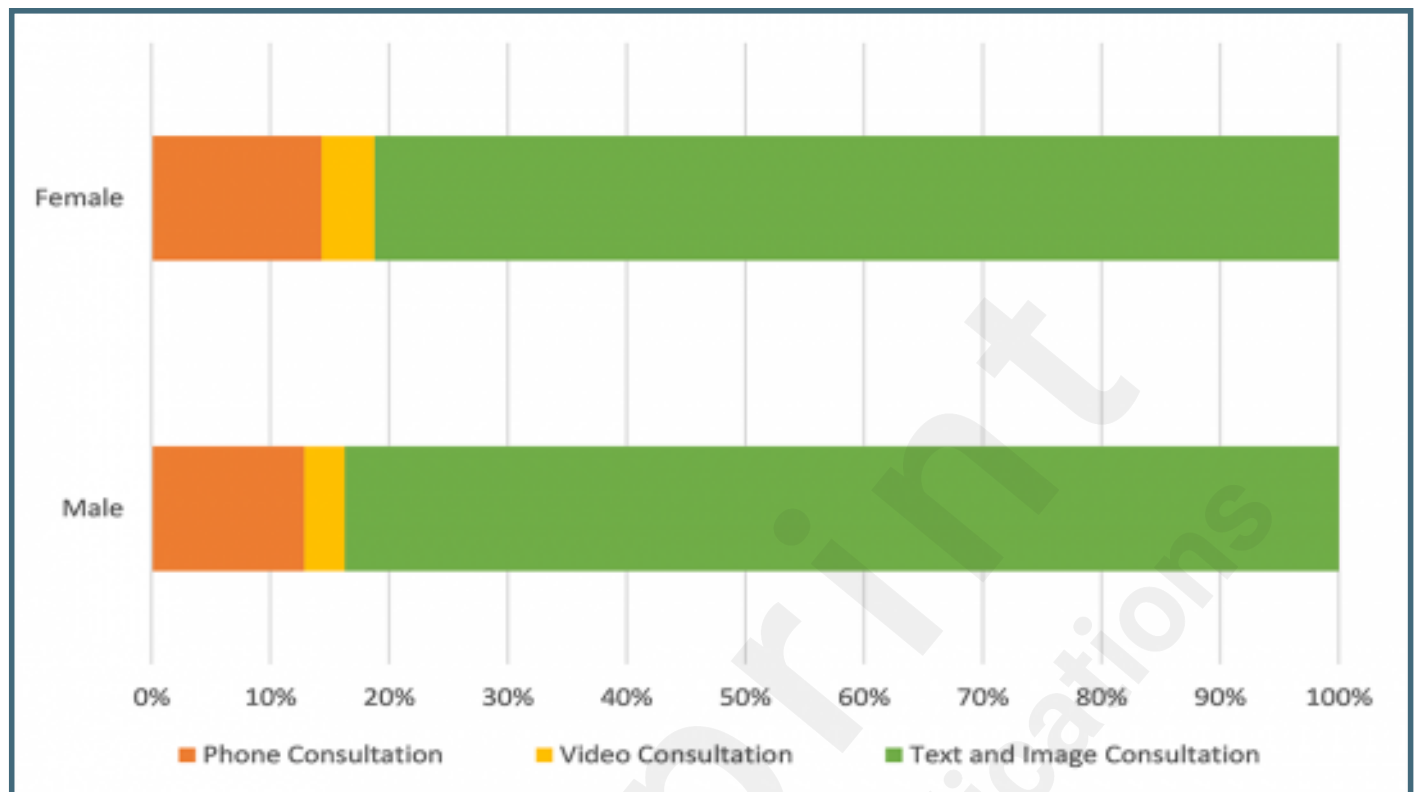
The number of consultations and the prescription conversion rate in each province.



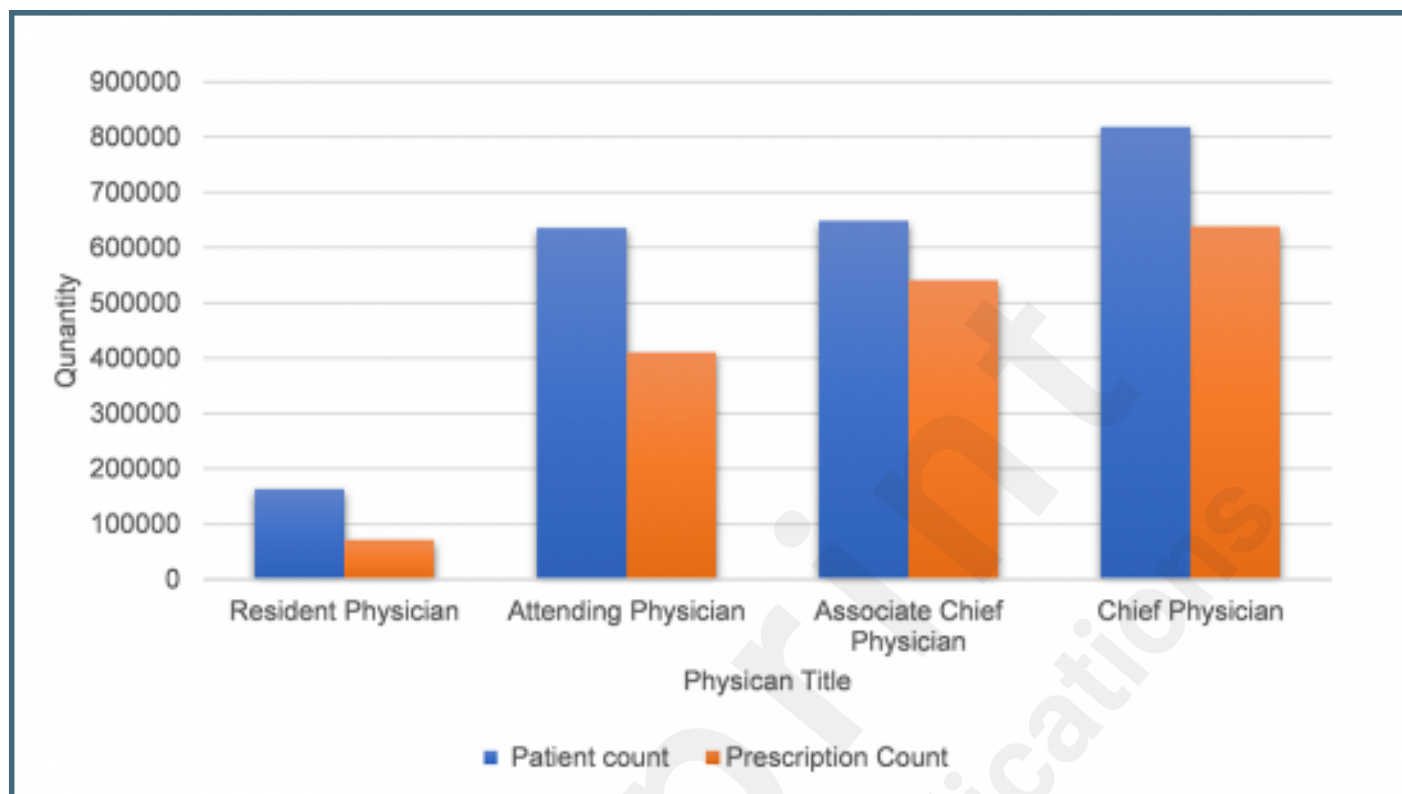
Distribution of patient volume and prescription volume by gender.



Distribution of consultation methods for male and female doctors.



Distribution of patient volume and prescription volume for doctors with different professional titles.



Distribution of consultation methods among doctors with different professional titles.

