BMJ Open Changes in pharmaceutical retail market and regional inequality of community pharmacists accessibility in mainland China: a retrospective crosssectional study

Zhen Feng (1),¹ Yun Ye (10),² Hua Ye,¹ Zhijia Tang (10)¹

To cite: Feng Z, Ye Y, Ye H, *et al.* Changes in pharmaceutical retail market and regional inequality of community pharmacists accessibility in mainland China: a retrospective cross-sectional study. *BMJ Open* 2022;**12**:e063739. doi:10.1136/ bmjopen-2022-063739

Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/ bmjopen-2022-063739).

Received 12 April 2022 Accepted 28 October 2022

Check for updates

© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Department of Clinical Pharmacy and Pharmacy Administration, School of Pharmacy, Fudan University, Shanghai, China ²Division of Epidemiology, College of Public Health, The Ohio State University, Columbus, Ohio, USA

Correspondence to Dr Zhijia Tang; zjtang@fudan.edu.cn

ABSTRACT

Objectives To describe the development of pharmaceutical retail market and community pharmacists in mainland China and identify challenges from both government and business perspectives.

Design A retrospective cross-sectional study.

Setting Community pharmacies providing primary care in mainland China.

Participants Community pharmacies and community pharmacists in all 31 provincial units in mainland China registered in the National Medical Products Administration during 2014–2020. Number of community pharmacies ranged from 433 529 (2014) to 553 892 (2020). Number of community pharmacists ranged from 129 895 (2014) to 541 264 (2020).

Primary and secondary outcome measures Changes in pharmaceutical retail market and accessibility of community pharmacists over the study period. We also examined the qualification of pharmacists and regional differences.

Results During 2014–2020, the total number of retail companies and pharmacies increased by 47.6% and 27.4%, respectively. The national retail chain rate boosted from 39.4% to 56.5%, and average number of stores per company increased from 40.2 to 49.7. The number of community pharmacists rose by 316.7%. Regarding accessibility, number of pharmacy stores per 10 000 inhabitants increased from 3.2 to 3.9; the average number of pharmacists per store and per 10 000 residents rose from 0.30 to 0.98 and from 0.95 to 3.83. However, the proportion holding a postgraduate or bachelor's degree dropped to one-third. Pharmacy resources were unevenly distributed across the country. Correlations were observed between economic indicators and number of pharmacy stores and pharmacists (p<0.05).

Conclusions In general, the accessibility and centralisation of retail pharmacies in China have shown a steady growth with a sign of regional disparities. The availability of community pharmacists has increased significantly, although with an unreasonable composition of academic qualifications and a shortage of personnel. Further efforts are necessary to provide sufficient pharmacy resources for community settings and resolve regional disparities.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ We analysed nationwide data on pharmaceutical retail market and community pharmacist over a 7year period in mainland China.
- ⇒ We presented maps to visualise the regional disparities and employed Spearman's correlation to investigate the relationship between various economic indicators and the accessibility of pharmacy resources.
- $\Rightarrow\,$ We do not have data to describe the disparities within provinces.
- ⇒ In areas with limited resources, technicians and unlicensed personnel who serve as pharmacists are not captured in our data.

BACKGROUND

China's Medical Separation policy was implemented in most provinces in 2014. Since then, patients are no longer restricted to fill prescriptions in hospitals, which promotes the pharmaceutical retail industry to flourish.

Data from China Pharmaceutical Business Association (CPBA) show a steady increase in the sales of retail pharmacies in mainland China from 2014 to 2020.¹ In 2019, the retail pharmacy sales nationwide was ¥2366.7 billion, yielding a gross profit of ¥41.8 billion, an average gross profit margin of 8.5% and a net profit margin of 1.6%.¹ The total income of the 25 publicly listed companies in the pharmaceutical distribution industry was 1355.6 billion, which witnessed a yearon-year increase of 17.9% over 2018 and an average market value of ¥17.8 billion.¹ Additionally, the retail sales of drugs attributed to 1.37% of the total retail sales of consumer goods in 2020, which was similar to that in 2019 (1.43%).²³

As the pharmaceutical retail industry developed over the past few decades, people have higher expectations for what pharmacies



can offer. In addition, the increased sales of prescription drugs in retail setting under the Medical Separation policy also put forward higher requirements for pharmacy practitioners. They provide professional services in millions of retail pharmacies and are one of the pillars of the primary healthcare system. The superimposed effects promote the accessibility and rational use of medications, supporting public health. All of the three laws that constitute the current legislative framework for pharmaceutical retailing, namely (1) the Drug Administration Law of the People's Republic of China (2019), (2) the Regulations for Implementation of the Drug Administration Law (2002) and (3) the Measures for the Administration of Pharmaceutical Trade License (2004), require retail pharmacies (including chain pharmacies and independent pharmacies) to be equipped with licensed pharmacists (LPhs) to provide consumers with safe and effective medications. In 2016, the National Pharmaceutical Circulation Industry Development Plan promulgated by the Ministry of Commerce encouraged qualified retail pharmacies to undertake outpatient pharmacy services from medical institutions,⁴ which required LPhs to be sufficiently equipped to perform their duties.

LPhs are professionals who have been trained in various disciplines related to pharmacy and passed the national qualification exam. The LPhs working in community settings (community pharmacists (CPs)) have the equivalent responsibilities to their hospital counterparts. In addition to their traditional dispensing and selling roles, they examine potential drug interactions, conduct drug utilisation reviews and patient counselling and assist physicians in chronic disease management in various ways, including screening, regimen adjustment and education for adherence and lifestyle changes. Their interventions have been found to improve clinical outcomes, increase patients' adherence, shorten hospitalisation and reduce health costs.^{5–7}

According to the National Medical Products Administration (NMPA, formerly the China Food and Drug Administration), the total number of LPhs increased perennially since 2014. In 2020, over 97% of LPhs were registered in nonmedical institutions, including pharmaceutical retail companies (91.1%), pharmaceutical wholesale companies (5.8%) and pharmaceutical manufacturers (0.7%).⁸ However, the gap between public demand and what the current pharmaceutical retail market can offer has not been studied yet, not to mention whether the gap varies across the country.

The objective of this study was to describe the change in mainland China's pharmaceutical retail market and the availability of pharmacy resources from 2014 to 2020, explore the reasons underlying the shift and discuss future steps towards a healthier market.

METHODS

Data collection and study design

All data were retrospectively extracted from the websites of the Chinese government and relevant industry associations–NMPA and CPBA, which covered seven fiscal years (2014–2020) and detailed breakdown statistics by province. Province-level population, gross domestic product (GDP) and disposable personal income (DPI) was downloaded from the National Bureau of Statistics website. This was a national cross-sectional study of all NMPAregistered retail pharmacies and CPs in 31 provincial units in mainland China.

Measurements

The primary measurements were changes in pharmaceutical retail market and accessibility of CPs over the study period. Secondary outcomes were the qualification of pharmacists and regional differences.

Data analysis

Descriptive statistics and comparative analysis were used to identify the overall scale, degree of centralisation and accessibility of retail pharmacies, the number and educational background of CPs and the regional differences between provinces. Spearman's correlation was employed to examine the correlation between economic indicators (ie, GDP per capita) and the accessibility of retail pharmacies and CPs. Regional-level maps were created to visualise the difference in availability of pharmacies and pharmacists across the country. Data were managed and analysed with Microsoft Excel 2016 and IBM SPSS Statistics for Windows, V.23.0. Maps were created with ArcMap 10.6.1. P value <0.05 was considered statistically significant.

Patient and public involvement

As our study is based on secondary data sources, there was no direct patient or public involvement in this research. No patients were evaluated in the study.

RESULTS

Growth of the pharmaceutical retail market and provincial inequality in mainland China

The overall scale of mainland China's pharmaceutical **g** retail market has presented a steady growth from 2014 to 2020 with an increment of 47.6% and 27.4% in the number of retail companies and pharmacy stores (including both chain pharmacies and independent pharmacies) (figures 1 and 2). The number of chain pharmacies has rocketed 82.5% in the meantime with a compound annual growth rate (CAGR) of 10.7%. In contrast, from 2014 to 2020, the number of independent pharmacies nationwide has fallen by 8.5%; national chain rate elevated from 39.4% to 56.5% and the average number of stores per company boosted from 40.2 to 49.7.

As of the end of 2020, Shandong had the highest number (756) of retail companies among 31 provinces and municipalities (online supplemental table S1). The three provinces with the most pharmacy stores were Guangdong (53 672), Sichuan (46 278) and Shandong (41 017), accounting for one-fourth of the national total (553 892). The ranking has not changed much since 2014.



6

Figure 1 Number of pharmaceutical retail companies and stores per company in mainland China (2014-2020).

Among the three, Sichuan had the most chain pharmacies (40 298). Guangdong had the most independently operated pharmacies (31 848) with the number being twice as much as Henan (15 805) in the second place. Tibet had the fewest retail companies (16), pharmacy stores (583) and chain pharmacies (99), whereas Shanghai had the fewest independent pharmacies (324). At the same time, the chain rate ranged from 17.0% (Tibet) to 92.1% (Shanghai) while the number of stores per company ranged from 6.2 (Tibet) to 120.4 (Hainan).

In 2014, the average retail pharmacy stores per 10000 inhabitants nationwide was 3.2 with the highest value (Hainan) being five times the lowest value (Tibet) (online supplemental table S2). In 2020, this number increased by 21.9% to 3.9, indicating a constant rise in availability of pharmacy services and, to some extent, access to medicine and healthcare. The highest data occurred in Heilongjiang while Tibet remained the lowest (6.7 vs 1.6 stores per 10000 residents).

Variation in accessibility and highest education attained of community pharmacists across the country

From 2014 to 2020, the number of CPs rose by 316.7% with a CAGR of 28.2% (figure 3). The growth rate was the highest in 2015, a 68.2% increase from 2014. The



mainland China (2014-2020).



Figure 3 Number of community pharmacists (CPs), their proportion among licensed pharmacists (LPhs) and staffing gap of CPs in mainland China (2014-2020).

includ percentage of LPhs who chose to work in the community also rose but to a lesser extent (13.1%). Since 2018, the trend has gradually flattened with an increase by <1% per ٥ year. As every retail pharmacy is required to equip with ğ LPhs by law, assuming all LPhs work in different pharuses rel macies, the staffing gap was 300000 in 2014. Despite the fast growth in the number of CPs, there was a shortfall of 12000 personnel in 2020 (figure 3).

Three provinces (Heilongjiang, Guizhou and Yunnan) witnessed an upsurge over 1000% in the number of CPs during this period (online supplemental table S3). In contrast, three municipalities (Beijing, Tianjin and × Shanghai) had an increase rate below 100%. In 2020, Shanghai had the highest number of CPs per pharmacy (1.6) while Guizhou had the lowest (0.4). Nationally, the average number of CPs per store boosted 3.3 times from 0.30 to 0.98 (figure 4). The estimated number of pharmacists per 10000 population increased from 0.95 in 2014 to 3.83 in 2020. Heilongjiang and Yunnan were the only ≥ two provinces with an increase >10 times (21.5 and 11.5, respectively).

Bu We found a weak to moderate correlation between the average DPI and the number of CPs in 2014 and 2020,



Figure 4 The availability of community pharmacists (CPs) in mainland China (2014-2020).

ätö

e

an

tra

respectively (ρ_1 =0.553, p_1 =0.001; ρ_2 =0.354, p_2 =0.047) (online supplemental table S3). No association was found between any of other parameters.

All LPhs in our study had at least a secondary degree in pharmaceutical science or related disciplines (eg, medicine, nursing, chemistry and biology). They all passed the National Pharmacist Licensure Examination, obtained the Licensed Pharmacist Certificate and registered with the provincial regulatory authority. In 2014, 2.4% of LPhs were postgraduates (including masters and doctors) and 35.6% were undergraduates.⁸ In 2020, the percentages dropped to 0.7% and 13.7%, respectively (figure 5, online supplemental table S4). Meanwhile, 85.6% of LPhs only completed high school (64.9%) or associate programmes (20.7%). Amid all provinces and municipalities, Beijing, Hainan and Henan had the highest proportion of LPhs holding a postgraduate, a bachelor's and an associate/ high school degree (2.9%; 30.7%; 91.2%), while Nei Mongol, Henan and Hainan had the lowest number (0.23%; 8.6%; 67.9%).¹

DISCUSSION

Following a steady growth from 2014, mainland China had >6000 drug retailers and over 550000 pharmacy stores in 2020. Number of pharmacy stores showed disparities across provinces, where Guangdong owned 92 times the number of stores that Tibet had as the end of 2020 (online supplemental table S1). This gap was even more pronounced in 2014 when the difference was as great as 169 times.⁸ On regional level, East China had the most pharmacy stores across all regions (figure 5, online supplemental table S4) and accounted for 36.1% of national sales in 2019.¹ As a traditionally economically developed region, East China has a good foundation for the development of the pharmaceutical industry.

Accessibility of pharmacy stores

The pharmaceutical market in China is expanding, bringing an almost inevitable inflation in the number of pharmacy stores. A strong correlation was observed between GDP per capita and the number of stores $(\rho=0.714, p=0.047)$. Globally, the median number of stores per 10000 residents was 2.85 in 2017.9 Only 3 out of the 31 provinces in mainland China was below the global median based on 2020 data: Beijing (2.3), Shanghai (1.6) and Tibet (1.6) (online supplemental table S2). Yet, oversupply can be fatal. Market size is considered unreasonable and unsustainable when the density of pharmacy stores is higher than 5 stores per 10000 residents.⁹ Across the country, Northeast China met that standard in 2020 (online supplemental table S4). Number of stores per 10000 residents was the highest there at 6.1, while the absolute number of stores there ranks second to last. The contradiction may be a result of massive loss of permanent residents due to economic recession in that region over the last few decades, and expanded infrastructure

investment from the central government despite underpopulation.

Market oversaturation leads to fierce price competition and potentially compromises the quality of services. Excessive competition may be detrimental to the rationality of market and is one of the key factors inducing stress and immorality of individual market participants.¹⁰ Too many pharmacies in a tiny community can cause the same problem, making it challenging for each business to attract consumers' attention. This is especially true in \neg highly concentrated markets such as urban or metropolitan areas where it takes a lot for a business to survive. Oversaturation of the market can eat up the pharmacy's profit on a service or transaction and sacrifice the revenues and gross profits of the company. These would cost the pharmacists on team their job or force them to accept reduced salaries and intensified workload. On the other side, too few choices on the market may bias consumers' side, too few choices on the market may bias consumers' choice towards inferior products and harm their interests, which should also be avoided.¹¹

To address this dilemma, some provinces and municipalities have announced regulations to restrict or encourage the opening of new stores based on local density of pharmacy stores. For example, the Shanghai Municipal government issued in 2001 that any two pharmacies must be at least 300 m apart to balance the distribution of resources in urban and suburban areas and prevent vicious competition among enterprises through $\overline{\mathbf{a}}$ restricting market entry.¹² This policy has been in effective for 20 years and was not cancelled until March 2021.¹² Correspondingly, the number of pharmacy stores in Shanghai was much lower than the national average (4076 vs 17 867) (online supplemental table S1). It may also explain why the accessibility of pharmacies in giant cities like Shanghai was relatively 'worse' than that in smaller cities (online supplemental table S2).

Centralisation of pharmaceutical retail market

The higher market access standards in recent years indicates a trend for integration of Chinese pharmaceutical retail market. Small retailers who do not have enough resources to upgrade their facilities and management systems to meet the latest policy requirements may be forced to withdraw from the market. Previous studies have revealed that one of the most common challenges for small business was how to obtain adequate funding from external sources, which otherwise would often led to bankruptcy.¹³¹⁴ Meanwhile, numerous new products on the market, thanks to the rapid development of the **3** biomedical industry, have also made it challenging for small businesses to keep up with. And for some novel techniques and professional software (eg, electronic prescribing), independent pharmacies have to pay more for installation, maintenance and transactions as they were unable to negotiate lower prices like large chain pharmacies.¹⁵ They also reported that it was difficult to find a supply to rely on, because they could not always order in bulk or in advance like large companies did.¹⁶





Figure 5 Spatial variation in the availability of (A) pharmacies and (B) community pharmacists (CPs) in mainland China in 2020. (A) The number of pharmacies in each region with the size of circles. Dark blue indicates higher number of pharmacies per 10000 inhabitants. In (B), the size of the pie charts indicates number of CPs and the light orange represent per cent of CPs with a bachelor's, master's or doctoral degree.

Undersized businesses are often more vulnerable to financial crises and have less efficient financial management behaviour, lower productivity and more conservative investment philosophy. Therefore, as the policy makers lifts the market access standards, the market will gradually tilt towards large companies that have more resources to guarantee and improve services, invest in new products and endure revenue losses. These changes would accelerate the consolidation of the pharmaceutical distribution sector and bring a continuous growth in chain rate.

Compared with independent pharmacies, chain pharmacies have been found to have 6% lower drug price and 6% higher drug quality, which may be partly explained by more restricted and comprehensive protocols on the practice of CPs in chain pharmacies.¹⁷ ¹⁸ Large chain pharmacies offered more structured training programme for CPs, aiming at knowledge and productivity, and communication and consultation skills.¹⁹ They were also more likely to provide well-recognised qualifications and better career development prospects.¹⁹ Additionally, in terms of supervision, the decentralised nature of independent pharmacies makes regulation implementation costly and logistically difficult. While in chain pharmacies, national-level regulatory measures can simply target the company's headquarters while the branches would be supervised by the company itself.²⁰ Reduction in the absolute number of pharmacies can suppress the repetitive, low-quality development of small and medium-sized enterprises, therefore promote market centralisation and industrial restructuring.

Compared with those working in chain pharmacies with relatively fixed wages, CPs in independent pharmacies face more direct economic incentives to sell a drug.²¹ Excessive profit maximising strategies adopted by pharmacies and CPs have been proven to lead to poor practices.²² Therefore, CPs in independent pharmacies are at higher risk of irrational drug use, such as selling unnecessary over-the-counter products, or deliberately omitting prescription review to sell more expensive products or controlled substances. In a fair and orderly market, individual business should be able to make profits. Therefore, CPs could have the margin to provide consumers with high-quality services and attention, rather than merely seeking to maximise the revenue from each customer and trying to survive an intensely competitive marketplace.^{22–24} The ultimate value of healthcare can be realised through putting efforts on establishing good relationships with consumers, developing care plans for drug treatment and following up on patient outcomes, instead of sacrificing service quality to the profit motive.

A higher chain rate indicates a higher degree of centralisation in the retail market. The blanket chain rate in China was found to be 39.4% in 2014 and 56.5% in 2020, higher than the global average of 38% (ranged from a minimum of 3% in Belgium to a maximum of 99% in Colombia), and lower than that of the USA.^{9 25 26} In the USA, among $62\,145$ retail pharmacies as of 2019, over $39\,000$ (62.8%) were chain stores affiliated to large drug

companies or general retailers such as CVS, Walgreens and Walmart.^{25 26} With the continued tightening of market access and the saturation of the domestic market, it is foreseeable that the chain rate will further increase in China by means of higher degree of intensification and retail alliances.

Availability and staffing shortage of CPs

East and South China came top on the absolute number of CPs (online supplemental table S4). Similarly, this can **Protection** be explained by the higher level of economic develop-ment and higher living standards in these areas where **a** strong correlation between GDP per capita and the a strong correlation between GDP per capita and the a strong correlation between GDP per capita and the **by** number of CPs was observed (ρ =0.881, p=0.04). During 2014–2020, China witnessed a momentous rise (3.3 given by times) in the availability of CPs per store in response to an increasingly stringent regulatory framework. In 2015, **a** the NMPA issued the 'Notice on the Comprehensive Supervision and Implementation of the Newly Revised Good Supply Practice' that required the legal representative or the chairperson of new pharmaceutical retail companies must be a qualified pharmacist.²⁷ Meanwhile, **2** all pharmacy stores approved after 1 January 2016 must be equipped with pharmacists.²⁷ By the end of 2020, the all pharmacy stores approved after 1 January 2016 must absolute number of pharmacists nationwide almost hit 1 CP per store, but still has an obvious gap in some remote rural areas, especially in the Southwest where one store only had 0.64 CP. The lag between China and the world average (1.67 CP/store) was even greater.⁹ On average, 3.92 CPs were accessible to every 10000 Chinese residents (online supplemental table S4), much lower than the global median of 5.19, reported by the International Pharmaceutical Federation.²⁸ Likewise, the 2021 Global Health Observatory by WHO revealed that over 65% of its member states had fewer than 5 pharmacists per $10\,000$ population where China stood at 83th in the world.²⁹

Unlike their counterparts in North America, CPs in China are generally considered as salespersons rather than healthcare providers. Low wages, limited career 2 growth prospects and lack of appreciation drive people away from this profession. Doing a much more trivial job, CPs are living on a relatively fixed and modest salaries compared with those working in hospital settings and other aspects of pharmaceutical industry. Lack of incentives and appreciation obstruct their willingness to work in community services. Additional legal requirements in some jurisdictions also exacerbated the shortage in CPs. In 2018, pharmacy stores over 250 m² in Shanghai were required to have at least two CPs.³⁰ In Qingdao, Shandong Province, pharmacy stores selling 'special medical insurance medicines' must have two CPs.³¹ To become a designated pharmacy for 'special chronic disease drugs' in Kunming, Yunnan Province, two CPs must be appointed in the practising unit.³² Besides, retail pharmacies selling traditional Chinese medicines (TCMs) must be under the supervision of a specialised personnel (eg, a licensed TCM pharmacist).

In order to alleviate the shortage of CPs, local governments such as Ningxia Hui Autonomous Region, have issued special announcements allowing pharmacy technicians to temporarily assume CP's duties until 31 December 2025, giving the government time to strengthen infrastructure and find ways to attract and retain talents.33 Generally, granting financial and non-financial benefits (eg, unpaid leave, honorary awards or entertainment facilities and recognition of personal value) would be a feasible way to improve the profile of the profession. Multiregional pharmaceutical retail companies can reallocate employees and resources to reduce the disparities across the country. Higher salaries and a better promotion channel can also attract more workers. For Southwest China, the Great Western Development Strategy along with labour policies that encourage reemployment and regional autonomy may promote the quantity of CPs. For Northeast China, stronger retail alliances would reduce the total number of pharmacy stores and therefore increase the number of CPs per store. For sparsely populated areas, government agencies should consider promoting remote pharmacy service which can provide timely pharmaceutical care with a fraction of costs of a brick-and-mortar pharmacy. Allowing CPs to practice in multiple stores shall further alleviate personnel shortage.

Many countries suffer from shortage of pharmacy technicians, and the issue varies considerably between countries and regions. The difference may be related to population size and local needs.³⁴ A WHO survey showed that population density of pharmacists ranged from 0.02 pharmacists per 10 000 population in Somalia to 25.07 per 10 000 population in Malta.³⁵ So far, no internationally recognised minimum recommended density of pharmacists has been established. Pharmacists have been encouraged to serve rural communities through public health partnerships and government policies in multiple countries.^{34 36 37} However, to the best of our knowledge, very little research has been done on this topic.

Academic qualification of CPs

Pharmacists with lower educational levels were increasingly occupying China's retail drug market.¹⁸ Regional disparity is also pronounced in the distribution of academic qualifications (online supplemental table S4). North China had the highest percentage of CPs holding a master's degree and above (1.1%), which may be the consequence of the concentration of educational resources around Beijing-Tianjin-Hebei Metropolitan Region, also known as the National Capital Region. Limited career growth prospects of the professional discourage those with higher education credentials from working as a pharmacist in a community environment. And the low expected financial returns and excessive costs to attain a higher academic degree do not help alleviate the problem. Although 44.4% of CPs in a survey in 2019 were unsatisfied with their academic degrees,³⁸ degrees are not highly valued in performance evaluation and promotion considerations in their company. In the majority of time,

sales were the most important metrics. Even the very few ones who successfully obtained higher degrees tended to leave the current position and work in other settings or take on management positions. Few of them remained on the frontline to provide pharmaceutical services to patients. About 39.0% of CPs admitted that lack of knowledge and skills negatively affected their work especially when they needed to provide comprehensive medication guidance.³⁸ The loss of high-level talents will unavoidably lead to a decline in the capacity and quality of community **_** medical services and exacerbate the imbalance resource allocation among different regions. The good news is that according to the NMPA, the minimum qualification for taking the pharmacist licensure exam has been raised to associate degrees from 2021. It is expected to increase the overall educational level of CPs in the future. Moreover, education programmes were found to improve the treatment behaviours of CPs.²² Compulsory continuing education courses can also improve the professional ability of CPs at a lower cost compared with attaining a higher degree. Other feasible methods include specific professional training on health literacy, communication skills, point-of-care testing, chronic disease management, emergency care and remote pharmacy operations and patient care.^{39 40}

Our study used data from government website to present the trajectory of the pharmaceutical retail industry and CP availability and qualification in mainland China over 7 years. In addition to national results, we also presented results on province level, where we found consistent geographic disparity favouring economically developed regions across most outcomes. To our knowledge, no published study has assessed the status a of pharmaceutical retail market in China in this way. We provided important insight for policy makers, professionals, enterprises and researchers using the latest data. Our data included the year 2020, when the COVID-19 hit the world and the pharmaceutical industry took on an extra lift. The trajectory of all our results showed a steady growth in the industry despite the global pandemic. However, we do realise that with province level data, all the results presented had an underlying assumption that the situation was consistent within each province, which was not the case. Disparities within province exist and we could not capture that using our data. Rural communities may suffer from even less access to pharmacy stores and CPs compared with those live in major cities. For some rural areas, technicians, or unlicensed pharmacists, are available to dispense medications and provide services **3** for local communities. However, no national data about them are available. Future studies should include them to capture the full picture of retail pharmacies and pharmacists in China.

CONCLUSIONS

Over the last few decades, the rapid development of China's biomedical industry and stricter legislations

Open access

have placed higher demands on both retail pharmacies and pharmacists, especially in terms of the core competitiveness of enterprises and provision of staffing and professional healthcare services. In general, from 2014 to 2020, the scale, accessibility and centralisation of retail pharmacies have shown a steady growth with a sign of regional disparity. The number and availability of CPs have increased significantly, although still with an unreasonable composition of academic qualifications and a shortage of personnel. In addition, the total number of retail companies, pharmacy stores and CPs, and the density of such infrastructure and services were unevenly distributed across the country. To create a healthy business environment and promote common development, further efforts should be made to help combat market oversaturation, reinforce degree of centralisation, improve the number, availability and average academic qualifications of pharmacists, and most importantly, resolve regional inequalities.

Contributors ZT and ZF performed a literature search and wrote the manuscript. HY and YY participated in data management and revised the manuscript. ZT is the guarantor who is responsible for the overall content. All authors read and approved the final manuscript.

Funding This research was supported by the start-up grant for ZT by Fudan University (no. JIF301001Y).

Map disclaimer The inclusion of any map (including the depiction of any boundaries therein), or of any geographic or locational reference, does not imply the expression of any opinion whatsoever on the part of BMJ concerning the legal status of any country, territory, jurisdiction or area or of its authorities. Any such expression remains solely that of the relevant source and is not endorsed by BMJ. Maps are provided without any warranty of any kind, either express or implied.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. All data relevant to the study are included in the article or uploaded as supplementary information.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/ licenses/by-nc/4.0/.

ORCID iDs

Zhen Feng http://orcid.org/0000-0003-4090-5966 Yun Ye http://orcid.org/0000-0001-5653-1773 Zhijia Tang http://orcid.org/0000-0001-8260-0082

REFERENCES

- Deng J, Wen Z. Annual Report on China's Pharmaceutical Distribution Industry [Chinese]. Beijing, China: Social Sciences Academic Press (China), 2020.
- 2 National Bureau of Statistics. Total retail sales of consumer goods increase by 4.6% in December 2020: National Bureau of Statistics, 2021. Available: http://www.stats.gov.cn/tjsj/zxfb/202101/ t20210118_1812428.html [Accessed 24 May 2021].
- 3 National Bureau of Statistics. Total retail sales of consumer goods increased by 8.0% in 2019: National Bureau of Statistics, 2020. Available: http://www.stats.gov.cn/tjsj/zxfb/202001/t20200117_ 1723391.html [Accessed 24 May 2021].
- 4 Ministry of Commerce. National Pharmaceutical Distribution Industry Development Plan (2016-2020) (Shang Zhi Fa (2016) No. 486) [Chinese], 2016. Available: http://www.mofcom.gov.cn/article/b/g/ 201703/20170302525095.shtml [Accessed 5 Jul 2021].
- 5 Hesso I, Gebara SN, Kayyali R. Impact of community pharmacists in COPD management: inhalation technique and medication adherence. *Respir Med* 2016;118:22–30.
- 6 Tsuyuki RT, Johnson JA, Teo KK, et al. A randomized trial of the effect of community pharmacist intervention on cholesterol risk management: the study of cardiovascular risk intervention by pharmacists (SCRIP). Arch Intern Med 2002;162:1149–55.
- 7 Newman TV, Hernandez I, Keyser D, et al. Optimizing the role of community pharmacists in managing the health of populations: barriers, facilitators, and policy recommendations. J Manag Care Spec Pharm 2019;25:995–1000.
- 8 Certification Center for Licensed Pharmacist of NMPA. 2014 National Licensed Pharmacist Registration Year-end Special Issue [Chinese] Beijing, China: Certification Center for Licensed Pharmacist of NMPA, 2015. Available: http://www.cqlp.org/info/link.aspx?id=2227& page=1 [Accessed 13 May 2021].
- 9 International Pharmaceutical Federation FIP. Pharmacy at a glance — 2015-2017 the Hague, the Netherlands: international pharmaceutical Federation, 2017. Available: https://www.fip.org/file/ 1348 [Accessed 13 May 2021].
- 10 Osenton T. The death of demand: finding growth in a saturated global economy. Upper Saddle River, New Jersey: FT Press, 2004.
- 11 Huck S, Zhou J. Consumer behavioural biases in competition: a survey: office of fair trading. *Munich Personal RePEc Archive* 2011.
- 12 Shanghai Municipal Health Commission. Reply to the proposal of No. 0585 representative of the Fifth Session of the 15th Municipal People's Congress [Chinese] Shanghai, China: Shanghai Municipal Health Commission, 2021. Available: http://wsjkw.sh.gov.cn/ rddbjydf/20210608/8076c5b8858043dcb8fa4cbec3aea749.html [Accessed 5 Jul 2021].
- 13 Ibe S, Moemena I, Alozie S. Financing options for small and medium enterprises (SMEs): exploring non-bank financial institutions as an alternative means of financing. *JEPER* 2015;2:28–37.
- 14 Wani KC. Strategies to sustain small businesses beyond 5 years. Walden University, 2018.
- 15 Lander L, Klepser DG, Cochran GL, et al. Barriers to electronic prescribing: Nebraska pharmacists' perspective. J Rural Health 2013;29:119–24.
- 16 Inal K. Supply chain problems forcing small businesses to change how they operate, 2021. Available: https://abcnews.go.com/ Business/supply-chain-problems-forcing-small-businesses-changeoperate/story?id=80713564 [Accessed 28 Oct 2021].
- 17 DBaW Y. The market for high-quality medicine: national Bureau of economic research, 2014. Available: http://www.nber.org/papers/ w20091 [Accessed 28 Oct 2021].
- 18 Gellad WF, Choudhry NK, Friedberg MW, et al. Variation in drug prices at pharmacies: are prices higher in poorer areas? *Health Serv Res* 2009;44:606–17.
- 19 Hemsley S. Structured training for community pharmacy staff. *The Pharmaceutical Journal*2016;296.
- 20 Miller R, Goodman C. Do chain pharmacies perform better than independent pharmacies? Evidence from a standardised patient study of the management of childhood diarrhoea and suspected tuberculosis in urban India. *BMJ Glob Health* 2017;2:e000457.
- 21 Frant H. High-Powered and Low-Powered incentives in the public sector. *Journal of Public Administration Research and Theory* 1996;6:365–81.
- 22 Miller R, Goodman C. Performance of retail pharmacies in low- and middle-income Asian settings: a systematic review. *Health Policy Plan* 2016;31:940–53.
- 23 Seeberg J. Connecting pills and people: an ethnography of the pharmaceutical nexus in Odisha, India. *Med Anthropol Q* 2012;26:182–200.

- 24 Kotwani A, Wattal C, Joshi PC, et al. Irrational use of antibiotics and role of the pharmacist: an insight from a qualitative study in New Delhi, India. J Clin Pharm Ther 2012;37:308–12.
- 25 U.S. national pharmacy market summary: OneKey by IQVIA, 2019. Available: https://www.onekeydata.com/reports/most-powerfulpharmacies [Accessed 11 May 2021].
- 26 2018 U.S. Pharmacy Study: J.D. Power & Associates, 2018. Available: https://www.jdpower.com/business/press-releases/2018us-pharmacy-study [Accessed 11 May 2021].
- 27 China Food and Drug Administration. Notice on the Comprehensive Supervision and Implementation of the Newly Revised GSP (Shi Yao Jian Ban Yao Hua Jian (2020) No. 176) [Chinese], 2015. Available: https://www.cfdi.org.cn/resource/news/7272.html [Accessed 5 Jul 2021].
- 28 Federation IP. Community pharmacy at a glance 2021 Regulation, scope of practice, remuneration and distribution of medicines through community pharmacies and other outlets. The Hague, The Netherlands: International Pharmaceutical Federation, 2021.
- 29 World Health Organization. Global health Observatory (GHO): World Health organization. Available: https://www.who.int/data/gho/ data/indicators/indicator-details/GHO/pharmacists-(per-10-000population) [Accessed 10 Aug 2021].
- 30 Shanghai Drug Administration. Shanghai Pharmaceutical Retail Enterprises Licensing and Acceptance Implementation Rules (Hu Yao Jian Gui (2019) No. 1) [Chinese], 2019. Available: http://yiji.sh.gov.cn/ gfxwj/20191212/0003-52932.html [Accessed 5 Jul 2021].
- 31 Qingdao Municipal Medical Insurance Bureau. Notice on issues related to further strengthening the agreement management of special pharmacies for social medical insurance (Qing Yi Bao Gui (2019) No. 6) [Chinese], 2017. Available: http://ybj.qingdao.gov.cn/ n28356081/n32570956/n32570969/210208162038387373.html [Accessed 5 Jul 2021].
- 32 Kunming Human Resources and Social Security Bureau, Health and Family Planning Commission, and Food and Drug Administration. Notice on the Pilot Work Plan for Expansion of "Special Chronic Disease" Benefits of Basic Medical Insurance in Kunming City to

Retail Pharmacies (Kun Ren She Tong (2018) No. 213) [Chinese], 2018. Available: https://www.sohu.com/a/275642835_100194432 [Accessed 5 Jul 2021].

- 33 Ningxia Medical Products Administration. Notice on issues related to the management of the deployment and use of licensed pharmacists in retail pharmacies (Ning Yao Jian Fa (2020) No. 71) [Chinese]: Ningxia Medical Products Administration, 2020. Available: http:// nxyjj.nx.gov.cn/gzwj_37845/ypltjdglc/202012/t20201218_2470269. html [Accessed 5 Jul 2021].
- 34 International Pharmaceutical Federation FIP. Global pharmacy workforce and migration report, 2022. Available: https://www.fip. org/files/fip/HR/final%20report/Part1.pdf#:~:text=1.1%20Global% 20Overview%3A%20Pharmacists%20density%20The%20data% 20collected,200%20the%20pharmacists%20per%20100% 2C000population%20in%20some%20countries [Accessed 28 Aug 2022].
- 35 Bates I, John C, Bruno A, *et al.* An analysis of the global pharmacy workforce capacity. *Hum Resour Health* 2016;14:61.
- 36 Nuffer W, Trujillo T, Harmon C, et al. Engaging with In-need rural patient populations through public health partnerships. *Innov Pharm* 2018;9. doi:10.24926/iip.v9i2.1055. [Epub ahead of print: 23 08 2018].
- 37 Hays CA, Taylor SM, Glass BD. The rural pharmacy practice landscape: challenges and motivators. *J Multidiscip Healthc* 2020;13:227–34.
- 38 Tang Z, Lhamu P, Ye H, et al. Current perceptions and improvement approaches of pharmaceutical care capacity of community pharmacists: a quantitative analysis based on survey data at Chinese chain pharmacies. Int J Environ Res Public Health 2020;17:7482.
- 39 Ilardo ML, Speciale A. The community pharmacist: perceived barriers and patient-centered care communication. Int J Environ Res Public Health 2020;17:536.
- 40 Goode J-V, Owen J, Page A, et al. Community-Based pharmacy practice innovation and the role of the community-based pharmacist practitioner in the United States. *Pharmacy* 2019;7:106.