

Professional characteristics, numbers, distribution and training of China's mental health workforce from 2000 to 2020: a scoping review

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Summary

Over the last 20 years, the numbers, types, distribution, and qualifications of mental health professionals in China have changed dramatically. However, there has been no systematic attempt to collect information about this transformation in the human resources available to provide mental health services—information that needs to be regularly updated to improve the country's coordination of these services. This scoping review compiles current details about China's mental health workforce and identifies critical gaps in available research and reporting. We reviewed all relevant studies and reports published between 1 January 2000 and 30 June 2021 in two English-language and four Chinese-language databases, the website of China's National Health Commission, and national and provincial health services yearbooks. In addition to summarising data from government yearbooks, we integrated relevant results from 82 peer-reviewed publications and two government reports. From 2000 to 2020, the number of psychiatrists in the country increased by 139%, and the number of psychiatric nurses increased by 340%. However, the much higher ratio of mental health professionals per 100,000 population and the better quality of training of mental health professionals in urban, eastern provinces compared to rural, western provinces has not changed. Progress has been made in standardising the training of psychiatrists, but there are no standardised training programs for psychiatric nurses, clinical psychologists, or psychiatric social workers. Future research needs to address several issues that limit the effectiveness of policies aimed at increasing the size, quality and equitable distribution of China's mental health workforce: 1) limited data available about the numbers and characteristics of professionals who provide mental health services, 2) absence of nationally standardised training programs for non-psychiatric medical professionals and non-medical personnel who provide essential monitoring and supportive care to persons with mental illnesses, and 3) failure to scientifically assess the outcomes of currently available training programs.

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Introduction

Background

A recent nationwide epidemiological study in China estimated that approximately 130 million individuals 18 or older experienced a mental disorder during the 12 months before the survey.¹ Medical professionals and social welfare professionals in various institutions in China provide treatment and social support services to individuals with mental disorders, either as their primary (i.e., full-time) responsibility or as a part of their

professional responsibilities. These professionals include psychiatrists, assistant psychiatrists, psychiatric nurses, general medicine clinicians, clinical psychologists, counselling psychologists, social workers, hotline operators, and other professionals.² [‘Assistant psychiatrists’ are medical personnel trained in technical secondary schools or junior colleges who obtain certification as assistant physicians and have prescriptive privileges under the guidance of accredited psychiatrists.] Analysing available information about the number, distribution, training, and characteristics of these professionals—China's mental health workforce—will identify limitations in current statistics and research about the human resources available to address the increasing burden of mental disorders in the country and help inform future improvements of China's mental health services.

Since launching the first National Mental Health Plan (2002–2010),³ national and regional work plans and

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mental health service system reforms have resulted in enormous changes in the mental health workforce. In 2004, China initiated the National Continuing Management and Intervention Program for Psychoses,⁴ which aimed to expand the focus of mental health services that were almost exclusively provided in speciality psychiatric hospitals to include comprehensive community-based mental health care for persons with severe mental disorders.^{5,6} Efforts to implement this transformation of the service delivery system revealed huge gaps in the human resources needed to provide community-based treatment and social welfare services to individuals with mental disorders. As one method to address the shortage of mental health professionals, China's 2015–2020 National Mental Health Work Plan proposed increasing the number of psychiatrists from 27,352 to 40,000 by 2020.⁷ The simultaneous implementation of three interrelated programs made it possible to achieve this ambitious goal by 2019: undergraduate medical programs majoring in psychiatry,⁸ national standardised training programs for psychiatrists,⁹ and a psychiatric licensing program for accredited physicians.¹⁰ In a related development, as part of the effort to expand and strengthen the national psychosocial service network and to improve the early identification, prevention, effective treatment, and rehabilitation of mental disorders, the national Healthy China Program (2019–2030) promulgated by the State Council in 2019¹¹ proposed substantial increases in the community-based and school-based mental health workforce.

Several researchers have reviewed the development and current status of China's mental health workforce.^{5,6,12–14} They consistently identify six fundamental problems:

- 1) the failure of general (non-specialized) medical professionals to provide basic mental health services;
- 2) the overall shortage of mental health professionals;
- 3) the narrow range of mental health professionals that are available (primarily limited to psychiatrists and psychiatric nurses with very few clinical psychologists or mental health social workers);
- 4) the uneven distribution of available mental health professionals between rural and urban areas and between well-developed eastern and underdeveloped western regions of the country;
- 5) the lack of coordination between hospital-based services and community-based services; and
- 6) challenges in the quality, training, and supervision of existing mental health professionals.

However, there has been no systematic attempt to integrate national and provincial information about these issues or to monitor recent trends in the numbers, qualifications, and responsibilities of these

professionals—information essential to improving the country's overall mental health services.

Objectives

We aimed to systematically map current research and other information about the human resources available to provide mental health services in China over the last 20 years and identify critical gaps in current knowledge. The specific research question addressed in the review was: What are the types, numbers, distribution, training, and qualifications of health care and social welfare professionals providing treatment and social welfare services to mentally ill individuals in China?

Methods

Protocol registration

The protocol was drafted based on the methods described in the checklist of the PRISMA extension for scoping reviews (PRISMA-ScR).¹⁵ The article search strategy, article selection criteria, and data items extracted from selected papers and documents were revised based on the findings of a pilot study. The final protocol was registered prospectively with the Open Science Framework on 4 August 2021 (<https://osf.io/nfp45>).

Eligibility criteria

We included studies and governmental reports that fulfilled the following four criteria:

- 1) Participants: studies or reports that provide information about a single type of professional or about multiple types of professionals (including, but not limited to, psychiatrists, psychiatric nurses, general physicians, counselling and clinical psychologists, and social workers) that provide treatment or social welfare services to persons with mental illnesses in a specified geographic region in China.
- 2) Intervention: any psychiatric or social welfare services provided to mentally ill individuals in hospitals, rehabilitation institutions, or communities by the Ministry of Health, the Ministry of Civil Affairs, the All-China Disabled Persons Federation, or other organisations in China OR any policies, strategies, or initiatives implemented to influence the characteristics, numbers, distribution and training of health professionals who provide mental health services in these institutions.
- 3) Outcomes: the study or report provides information on at least one of the following characteristics of the professionals considered. The number of one or more types of professional providers in the specified geographic region, the demographic characteristics of the providers, the training received by the providers, the types of services provided to the mentally ill by the providers, and the proportion of

the service providers' work effort focused on providing services to persons with mental illnesses.

4) Study design: no restriction

We excluded studies and reports not published in English or Chinese, those that only reported information about the mental health care system before 2000, and those only available as protocols or abstracts (i.e., with no full paper or report). Studies and reports that provided specific numbers of professionals but did not specify the geographic region in which the services were provided, and intervention studies that specified the number of participating clinicians but did not provide information about the total number of clinicians providing mental health services in a specific geographic location were also excluded.

Search strategy

A systematic search was conducted in two English-language databases (Web of Science, PubMed) and two Chinese-language databases (CNKI and Wanfang) for peer-reviewed publications. Grey literature searches for relevant policies and reports were conducted in 1) two databases (the National Science and Technology Library of China [<https://www.nstl.gov.cn/>] and the State Council Policy Document Database of China [<http://www.gov.cn/index.htm>]); 2) China Health Yearbooks for 2001 through 2021; 3) the website of the National Health Commission of the People's Republic of China (<http://www.nhc.gov.cn/>) that includes the China Health and Family Planning Yearbooks for 2001 through 2021; and 4) province-level health yearbooks for 2001 through 2021 identified on the websites of province-level Health Commissions. The reference lists of included papers and reports were reviewed to identify other potentially eligible studies and reports not identified in the electronic searches. Studies and reports published between 1 January 2000 and 30 June 2021 were included. The details of the search strategy are described in [Appendix S1](#) in the [Supplementary Materials](#). Details of the search results are shown in [Fig. 1](#).

Data extraction

The data extraction process followed recommendations provided in the framework developed by Arksey and O'Malley,¹⁶ Levac and colleagues,¹⁷ and the JBI guidance.¹⁸ The review team developed and pilot-tested a data-collection form for recording relevant information from included papers and reports. The preliminary data collection form is provided in the registered protocol. The eight reviewers independently extracted data from five eligible English-language papers and ten eligible Chinese-language documents and discussed differences in their results; based on these discussions, they finalised the data extraction form and the coding instructions for extracting the data from eligible papers and documents. The reviewers subsequently worked in pairs to

independently extract data from the remaining papers using the final data extraction form; reviewers discussed any discrepancies to arrive at a consensus decision.

Extracted information included data about the following:

- 1) characteristics of the study or report (first and corresponding author, institution of the first author, date of publication, time period report refers to, type of data, study design, geographic region(s) covered, etc.);
- 2) professional group(s) considered (psychiatrists, psychiatric nurses, general physicians, counselling and clinical psychologists, social workers, etc.);
- 3) type of institution the identified professionals are employed by (speciality hospital, general hospital, community clinic, social welfare agency, etc.);
- 4) number of active professionals providing mental health treatment or welfare services (the ratio of the providers to population, [if available] the ratio of psychiatric beds to population, etc.);
- 5) characteristics of professionals providing services (the demographic characteristics of the providers, the professional training or qualification received by the providers, the type and duration of mental health-related training, etc.).

Quality assessment

The majority of identified studies were cross-sectional observational studies, so the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)¹⁹ checklist (shown in [Supplementary Table S1](#)) was employed to assess the quality of the reports about the studies (the quality of narrative reviews and government reports was not evaluated). The specific STROBE items reported in each paper are shown in [Supplementary Table S2](#). The quality score for each paper was based on the proportion of items in the STROBE checklist reported in the paper. The STROBE includes 34 items, but three of the items are not relevant for cross-sectional studies about human resources, so the denominator used for these proportions was 31. Based on criteria used in previous research using the STROBE,²⁰ the quality of papers was classified based on the per cent score as follows: <20%, 'low quality'; 20–39.9%, 'low-to-moderate quality'; 40–59.9%, 'moderate-to-high quality', and ≥60%, 'high quality'. Two reviewers independently assessed each included report. Discrepancies between reviewers were solved through discussion; if a consensus could not be reached, the final determination was made by a senior reviewer. The quality scores for the eight cross-sectional studies reported in multiple papers are the mean per cent scores of all papers about each study.

Synthesis of results

For the data from official national and provincial yearbooks, we identified the numbers of different types of

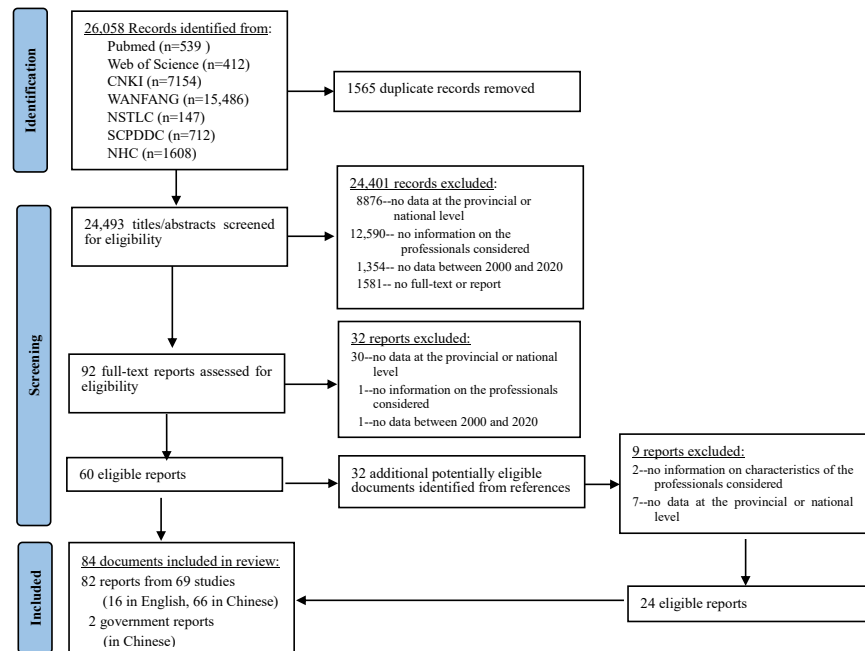


Fig. 1: PRISMA flowchart of the identification of documents included in the scoping review.

mental health professionals working nationally and in each province by year and then estimated the ratio of professionals per 100,000 population based on the national or provincial population in the corresponding year provided in census data of the National Bureau of Statistics (<http://www.stats.gov.cn/tjsj/pcsj/>). For years when there was missing data about the numbers of professionals, we assumed a linear trend in the numbers over the missing years and, based on this trend, estimated the numbers and rates for each of the missing years.

Data provided in the identified studies and reports were stratified by geographic region and professional discipline (i.e., physicians, nurses, and other medical professionals). All 31 province-level administrative areas in mainland China are categorised into seven geographic regions: Northeast China (Heilongjiang, Jilin, and Liaoning), North China (Hebei, Beijing, Tianjin, Inner Mongolia, and Shanxi), East China (Shandong, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, and Jiangxi), Central China (Henan, Hubei, and Hunan), South China (Guangdong, Guangxi, and Hainan), Northwest China (Qinghai, Xinjiang, Shaanxi, Gansu, and Ningxia), and Southwest China (Guizhou, Chongqing, Sichuan, Yunnan, and Tibet). Based on the data provided in the identified studies, we report the number, characteristics, and training of professionals providing mental health and welfare services to individuals with mental illnesses over time and across geographies. Other relevant information provided in the papers, such as the number of inpatient psychiatric beds

per psychiatrist and per psychiatric nurse, was also recorded and summarised.

When synthesising data across studies, the following operational definitions of key terms were used:

- *Psychiatrists* include both accredited psychiatrists and assistant psychiatrists in data provided in the peer-reviewed literature. However, the numbers of accredited and assistant psychiatrists are reported separately in China Health Yearbooks.
 - *Accredited Psychiatrists* There are three pathways to becoming an accredited psychiatrist. 1) The most common pathway includes individuals who have graduated from medical schools, passed the physicians' qualifying examination (typically after one year of internship) and registered psychiatry as their medical speciality. (The medical institutions employing physicians applying to be accredited in psychiatry must provide documentation verifying that the individual worked within the psychiatry department). They then need to work under the guidance of accredited psychiatrists for at least one year after passing the physician qualifying exam before taking the qualifying examination to become an accredited psychiatrist (usually during the second year of their residency training). Finally, they need to register in the government-run registry of medical professionals. They are considered *Trainee Psychiatrists* during residency training before taking the qualifying examination. 2) A second

certification method enables doctors registered as general physicians or with other specialities who wish to change their professional qualifications to include psychiatry. They must participate in a psychiatric licensing program and then pass the qualifying psychiatric examination to become accredited psychiatrists. 3) A third pathway to becoming an accredited psychiatrist is for 'assistant psychiatrists' (defined below) to participate in a residency training program and subsequently take an examination to become an accredited psychiatrist.

- *Assistant Psychiatrists* are individuals who received medical training from technical secondary schools or junior colleges (i.e., they do not have a bachelor's degree in medicine), passed the qualifying examinations for assistant physicians and registered psychiatry as their medical speciality. Assistant psychiatrists can write prescriptions only when supervised by an accredited psychiatrist. After two years of work experience as an assistant psychiatrist, those who received training from junior colleges can take the qualifying examinations for physicians and register psychiatry as their medical speciality to become accredited psychiatrists. However, those who received training from technical secondary schools must have five years of work experience before taking the qualifying examination to become accredited psychiatrists. Alternatively, assistant psychiatrists can also choose to do a residency as 'assistant physicians' (see below) to become general medical practitioners in primary care settings.
- *Assistant Physicians* are individuals who received medical training from technical secondary schools or junior colleges, passed the qualifying examinations for assistant physicians, and registered their discipline as 'assistant physician' (the speciality or discipline assistant physicians can register for depends on the department in which they work after they complete school). Assistant physicians can only prescribe medications when supervised by accredited physicians. They can either do a residency as an 'assistant physician' (to become general medical practitioners in primary care settings) or—after two or five years of work experience as assistant physicians—take the qualifying exam to become an accredited physician and subsequently do a residency in their chosen speciality.
- *Physicians in psychiatric speciality institutions* include all accredited physicians and assistant physicians working in these institutions, including accredited psychiatrists and assistant psychiatrists, as well as accredited physicians and assistant physicians working in other specialities at the psychiatric institutions. Some of these non-psychiatric specialists work in multi-speciality psychiatric institutions that were initially set up to provide mental health services exclusively; with the increased physical health demands of psychiatric patients and the need to generate revenue due to the relatively low reimbursement rates for psychiatric services, many psychiatric hospitals expanded to include non-psychiatric departments, such as general medicine, neurology, and neurosurgery.
- *Psychiatric Nurses* include both registered nurses and trainee nurses. Trainee nurses have graduated from nursing schools but have not yet become registered nurses; they usually carry out similar work as registered nurses but under the guidance of registered nurses. In some low-level medical institutions, the number of trainee nurses is large. However, the China Health Yearbooks only report the number of registered nurses; trainee nurses are included in the 'other types of medical professionals' category.
 - *Registered Nurses* include those who received nursing training from technical secondary schools or higher-level institutions, attained formal certification after completing the required work experience and passing the qualifying examination, have been registered as nurses in the government-run medical professionals' registry, and are engaged in nursing work in medical institutions.
- *Senior, intermediate and junior professional titles* are used in China to reflect medical professionals' technical level, ability and achievement. Medical professionals gain professional designations when they meet the requirements for each title, including having worked in the position for the required duration, passed the relevant examinations, and completed other speciality- and location-specific requirements. Qualified physicians who have not yet been accredited in their speciality (e.g., trainee psychiatrists) have no professional title. Psychiatrists assume the 'junior' professional title when first obtaining psychiatric certification. There are similar professional titles for other medical professionals, such as nurses, pharmacists, and medical technicians.
- *Medical institutions certified for mental health services* include three types of medical institutions that have staff members who are accredited psychiatrists: psychiatric speciality institutions, general hospitals, and primary health care settings. Once accredited psychiatrists work in an institution, the institution will be recognised as 'certified for mental health services' by the National Health Commission.
 - *Psychiatric speciality institutions* include psychiatric hospitals, psychiatric dispensaries, and drug rehabilitation centres.
 - *Psychiatric hospitals* are specialised hospitals that provide mental health services to both outpatients and inpatients. Some of these

hospitals may also include neurology, neurosurgery, and general internal medicine departments that offer inpatient and outpatient services.

- *Psychiatric dispensaries* are specialised public health institutions not affiliated with psychiatric hospitals that provide prevention, treatment, nursing, consultation, and other services for outpatients with psychiatric disorders.
 - *Drug rehabilitation centres* are inpatient facilities collaboratively managed by the Departments of Public Security, Justice, and Health, where individuals with substance use problems are housed for detoxification and rehabilitation.
- *Primary health care settings* that may be certified for mental health services (if they include staff members who are accredited psychiatrists) include community health centres in urban areas, township and village health centres in rural areas, private clinics, and health offices operated by other government institutions, schools, prisons or corporations.

Results

Data collected from annual national and provincial health yearbooks

We extracted official national data about psychiatrists and other medical professionals from the annual *China Health Yearbook* for 2001 through 2021. These yearbooks provide national data on the numbers of accredited and assistant psychiatrists for most years from 2000 through 2020; we compute the population ratios of accredited and assistant psychiatrists per 100,000 population based on annual estimates of the size of the national population. We estimate numbers and ratios in the years without data (2001, 2003, 2004, 2006, 2007, and 2008) by assuming linear changes between the years in which there are reported data ([Supplementary Table S3](#)).

The China Health Yearbook also provides data on the number of medical professionals working in three types of psychiatric speciality institutions: psychiatric hospitals, psychiatric dispensaries, and drug rehabilitation centres. Except for 2009, complete data are provided from 2002 through 2020; we estimate the 2009 numbers as the mean value between 2008 and 2010 ([Supplementary Table S4](#)).

Provincial-level data on the total number of medical professionals working in the three types of psychiatric speciality institutions from 2001 through 2021 were reported in provincial-level health yearbooks for 20 of the 31 provinces in mainland China. These data were located on the official websites of the provincial Health Commissions. (Shanxi also provided additional yearbooks for 2016–2021 on request). Beijing and Shanxi

reported data for all 21 years, but the data for the remaining 17 provinces were incomplete. Comparable data for 2008 in Shanghai was available from a scientific report (reference²¹). We estimated the numbers of professionals in years with missing data based on linear changes over time and computed the population ratios using annual estimates of each province's population ([Supplementary Table S5](#)). The ten provinces without any data included Jilin, Fujian, Guangdong, Hainan, Qingdao, Xinjiang, Gansu, Ningxia, Guizhou, and Tibet.

Medical professionals providing services to psychiatric patients in mainland China from 2002 to 2020

In China, medical professionals include physicians, assistant physicians, registered nurses, pharmacists, medical technicians, and other types of professional medical staff (including trainee physicians, nurses and medical technicians). The 'medical technician' category includes imaging technicians and medical laboratory technicians; clinical psychologists and rehabilitation professionals were not classified as medical professionals until 2022, when they were included as new categories of medical technicians in the official Occupational Classification of the People's Republic of China.²²

The China Health Yearbooks considered for this review (2001–2021) provide information on the national numbers of accredited physicians and assistant physicians and the speciality breakdowns of accredited physicians and assistant physicians (including accredited and assistant psychiatrists). As shown in [Fig. 2](#), the national ratio of all psychiatrists (including accredited and assistant psychiatrists) and accredited psychiatrists per 100,000 population more than doubled between 2002 and 2020 (from 1.51 to 3.19 and from 1.20 to 2.89, respectively).

The China Health Yearbooks also provided information on all medical professionals working in three types of psychiatric speciality institutions: psychiatric hospitals, psychiatric dispensaries, and drug rehabilitation centres. As shown in [Fig. 3](#), the national ratio of medical professionals working in these institutions per 100,000 population increased more than threefold from 2002 to 2020—from 4.19 to 13.26. The ratio of physicians (including psychiatrists and a small number of other types of physicians) working at these speciality psychiatric institutions per 100,000 population increased from 1.31 in 2002 to 3.26 in 2020, and the ratio of accredited physicians increased from 1.11 to 2.90. The ratio of registered nurses increased from 2.04 to 7.97. Almost all of these professionals worked in speciality psychiatric hospitals: as of 2020, speciality psychiatric hospitals, psychiatric dispensaries, and drug rehabilitation centres accounted for 97.2%, 2.1%, and 0.7%, respectively, of all speciality psychiatric

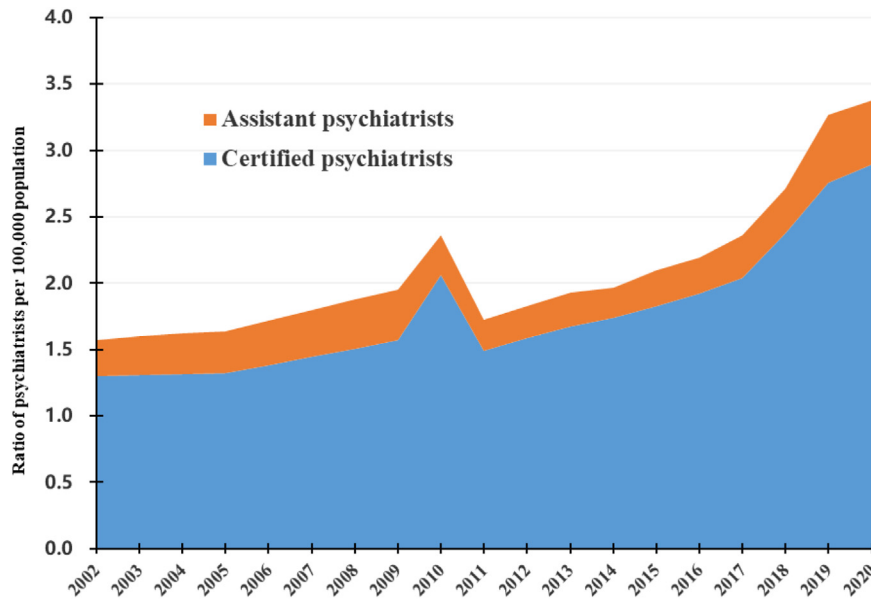


Fig. 2: Ratio (per 100,000 population) of accredited psychiatrists and assistant psychiatrists working in all types of institutions and clinics in China from 2002 to 2020 reported in annual China yearbooks.

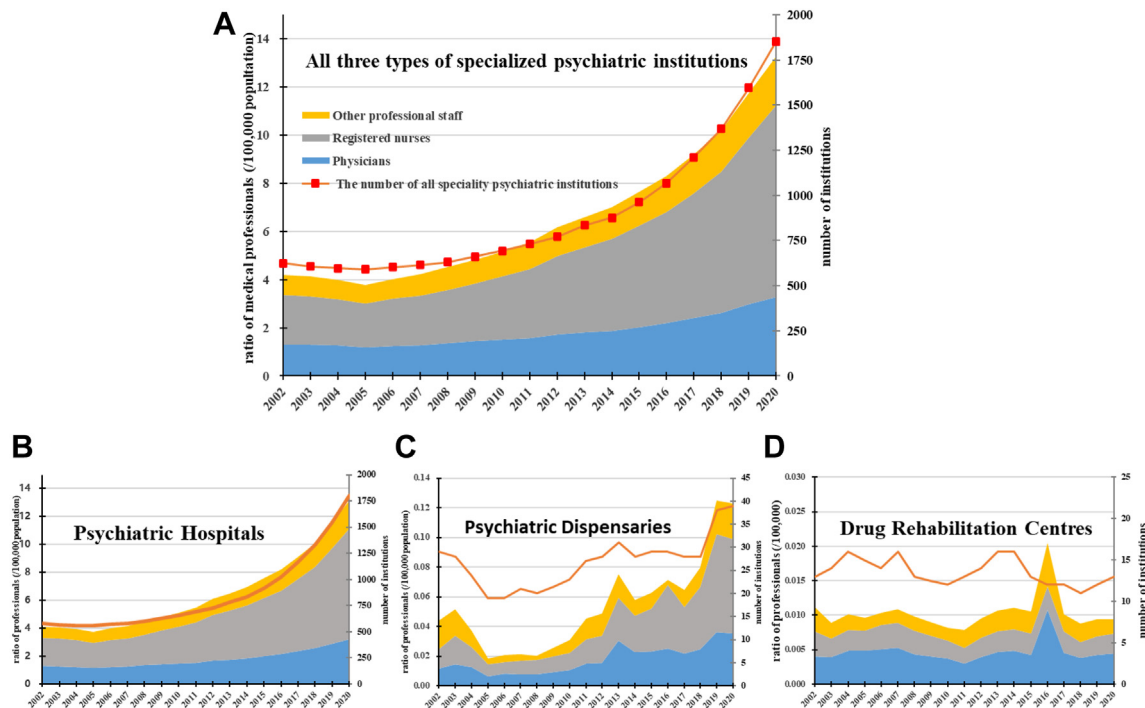


Fig. 3: Ratio (per 100,000 population) of different types of medical professionals* working in all three types of specialized psychiatric institutions (panel A), psychiatric hospitals (panel B), psychiatric dispensaries (panel C) and drug rehabilitation centres (panel C) in China from 2002 to 2020 as reported in annual China yearbooks. [* 'Physicians' include accredited physicians and assistant physicians; 'Other professional staff' include pharmacists, medical technicians, and trainee physicians, nurses and medical technicians.]

institutions in the country; and these three types of institutions accounted for 99.0%, 0.9% and 0.1%, respectively, of all medical professionals working at speciality psychiatric institutions in the country. From 2000 to 2020 the number of registered psychiatric hospitals increased by 374% (from 482 to 1801 hospitals), but there was relatively little change in the numbers of the other two types of speciality psychiatric institutions: from 2002 to 2020 the number of psychiatric dispensaries fluctuated between 19 and 39 centres and the number of drug rehabilitation centres fluctuated between 11 and 16 centres (Supplementary Table S4).

Fig. 4 shows the most recently reported population ratios of medical professionals working in the three types of speciality psychiatric institutions in 21 of China's 31 provinces. Ten provinces have never reported these data, and the available data for three other provinces (Shanghai, Jiangsu, and Shaanxi) are over a decade old. Among the provinces with reported data, the population ratios of medical professionals working in speciality psychiatric institutions were highest in Beijing (21.12), Sichuan (17.80), Zhejiang (16.62), and Liaoning (16.40); these ratios were lowest in Henan (7.92), Shaanxi (9.26), Anhui (9.27), and Inner Mongolia (9.62).

The province-level data on medical professionals working in speciality psychiatric institutions from 2000 to 2020 is provided in Supplementary Table S5.

Characteristics of reports identified in the systematic review of the literature

The main characteristics of the 69 studies and two government reports are shown in Table 1. Unlike the data available in the national and provincial yearbooks, the detailed data provided in the cross-sectional studies identified for this review (shown in Table 2) provide a much more nuanced picture of the characteristics of mental health providers and, importantly, intra-provincial regional differences in the numbers and population ratios of different types of mental health providers.

Number of studies

As shown in Fig. 1, a total of 26,058 records were identified in the electronic searches of peer-reviewed publications and grey literature; 60 of these documents met eligibility criteria. A review of the reference lists of eligible reports identified 24 additional eligible reports. The 84 eligible reports included 82 reports (16

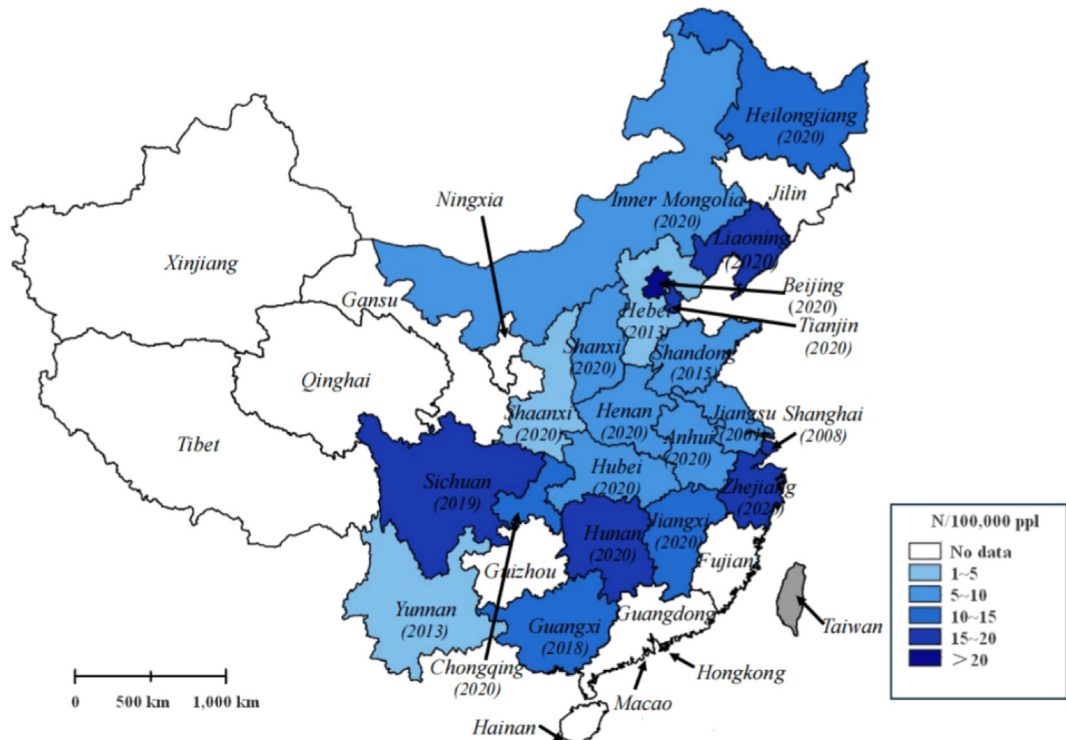


Fig. 4: Most recent report of ratios# (per 100,000 population) of medical professionals* working in specialized psychiatric institutions (i.e., psychiatric hospitals, psychiatric dispensaries and drug rehabilitation centres) in different provinces in China*. # Ratios were computed using data in provincial-level health statistical yearbooks and census data for each province, except for Shanghai (from Reference²³). * 'Medical professionals' include physicians, assistant physicians, registered nurses, pharmacists, medical technicians, and other types of professional medical staff (including trainee physicians, trainee nurses and trainee medical technicians).

Authors	Study design	Region and time of study	Professional group(s) considered	Type of institution	Type of patients	Quality of report ^a
He et al., ²⁴ 2020	Cross-sectional study	Mainland China, 2019	child and adolescent psychiatrists	Training hospitals with nationally approved PhD and master's degree training base or post-graduation training base for child and adolescent psychiatry	Children and adolescents aged 0-18 years with mental disorders	51-6%
Xia et al., ²⁵ 2021	Cross-sectional study	Mainland China, 2019	psychiatrists; psychiatric nurses; clinical psychologists; social workers	Top-tier tertiary psychiatric hospitals	All psychiatric patients	54-8%
Wu and Pan, ²⁶ 2019	Narrative review	Mainland China, 2015-2019	child and adolescent psychiatrists	NM	Children and adolescents aged 0-18 years with mental disorders	xxx
National Health Commission, ²⁷ 2019	Government report	Mainland China, 2018	hotline workers	NM	All psychiatric patients	xxx
Li et al., ⁵ 2020	Narrative review	Mainland China, 2015-2018	psychiatrists	NM	All psychiatric patients	xxx
Jiang et al., ²⁸ 2018; Jiang et al., ²⁹ 2019; Zhou et al., ³⁰ 2019;	Cross-sectional study	Mainland China, 2017	psychiatrists; psychiatric nurses	Tertiary psychiatric hospitals in the capital city	All psychiatric patients	58-1% 77-4%
Zhao et al., ³¹ 2017	Narrative review	Mainland China, 2012-2017	psychiatrists; psychiatric nurses; clinical psychologists	NM	All psychiatric patients	xxx
Hu et al., ³² 2017	Narrative review	Mainland China, 2016	psychiatrists; clinical psychologists; counselling psychologists	NM	All psychiatric patients	xxx
Liang et al., ⁶ 2018	Narrative review	Mainland China, 2000-2016	psychiatrists; counselling psychologists; clinical psychologists; social workers	NM	All psychiatric patients	xxx
Shi et al., ¹⁴ 2019	Cross-sectional study	Mainland China, 2015	psychiatrists; registered nurses; clinical psychologists; counselling psychologists; rehabilitation therapists; social workers; public health physicians	Medical institutions accredited for mental health services	All psychiatric patients	45-2%
Wong et al., ³³ 2014	Narrative review	Mainland China, 2002-2012	psychiatrists; psychiatric nurses; social workers; clinical psychologists	NM	All psychiatric patients	xxx
Tang and Yu, ³³ 2011	Narrative review	Mainland China, 2007-2011	psychiatrists	Psychiatric residency training bases authorised by the Department of Health	All psychiatric patients	xxx
Li et al., ³⁴ 2013	Narrative review	Mainland China, 2004-2011	MMT providers ⁹	China's National MMT clinics	Drug users	xxx
Liu et al., ³⁵ 2013	Cross-sectional study	Mainland China, 2010	accredited physicians ⁸ ; registered nurses; other medical professionals ⁸	Psychiatric speciality institutions	All psychiatric patients	61-3%
Liu et al., ⁵ 2011	Narrative review	Mainland China, 2009	psychiatrists; psychiatric nurses; neighbourhood/village committee staff; case managers; policemen	All institutions within the National Continuing Management and Intervention Program for Psychoses	SMD patients in the National Continuing Management and Intervention Program for Psychoses	xxx
Yin et al., ²⁶ 2010	Narrative review	Mainland China, 2004-2009	MMT providers ⁸	China's National MMT clinics	Individuals with drug use disorders	xxx
Liu and Chen, ³⁷ 2002	Narrative review	Mainland China, 2002	all medical professionals	Psychiatric speciality institutions in China's Public Security System	Psychiatric patients, especially those considered a threat to society	xxx
Gao et al., ¹³ 2010	Cross-sectional study	Mainland China, NM	psychiatrists; psychiatric nurses; clinical psychologists; counselling psychologists working in industry, prisons, and schools	Clinical settings; educational settings; counselling centres operated by government, prisons or corporations	All psychiatric patients	35-5%
Zhu et al., ³⁸ 2002; Geng, ³⁹ 2007	Cross-sectional study	13 provinces, 2001	all medical professionals	Medical institutions accredited for mental health services	All psychiatric patients	22-6% 16-1%
Yan et al., ²⁰ 2021	Cross-sectional study	Anhui, 2018	psychiatrists	Medical institutions accredited for mental health services	All psychiatric patients	51-6%
Yan et al., ⁴¹ 2019	Cross-sectional study	Anhui, 2016-2018	psychiatrists; physicians provided short-term training in psychiatry	Medical institutions accredited for mental health services	All psychiatric patients	32-3%
Xu et al., ⁴⁰ 2018	Cross-sectional study	Anhui, 2015	psychiatrists	Medical institutions accredited for mental health services	All psychiatric patients	35-5%
Xu et al., ⁴⁰ 2021	Cross-sectional study	Beijing, 2019	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	48-4%
An et al., ⁴² 2013	Cross-sectional study	Beijing, 2009	psychiatrists; psychiatric nurses	General hospitals	All psychiatric patients	61-3%
Guan, ⁴⁵ 2011	Cross-sectional study	Beijing, 2009	psychiatrists; psychiatric nurses; clinical psychologists; rehabilitation therapists; social workers; pharmacists; medical technicians	Psychiatric speciality institutions	All psychiatric patients	64-5%
Jiang et al., ⁴⁶ 2005	Cross-sectional study	Beijing, 2001	psychiatrists; psychiatric nurses; other staff	General hospitals	All psychiatric patients	64-5%
Luo and Qiu, ⁴⁷ 2018	Cross-sectional study	Chongqing, 2017	psychiatric nurses	Psychiatric speciality institutions affiliated with Civil Affairs System	All psychiatric patients	45-2%
Wang, ³⁸ 2014	Narrative review	Chongqing, 2012	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	xxx
Lin et al., ²¹ 2012	Cross-sectional study	Fujian, 2007	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	38-7%
Zhao et al., ⁴⁹ 2017	Cross-sectional study	Gansu, 2014	psychiatrists; psychiatric nurses; clinical psychologists; counselling psychologists; rehabilitation therapists; social workers; other medical staff	Medical institutions accredited for mental health services	All psychiatric patients	45-2%
Xu et al., ⁵⁰ 2019	Cross-sectional study	Guangdong, 2014	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	48-4%
Li et al., ⁵¹ 2015	Cross-sectional study	Guangdong, 2013	psychiatrists; general physicians; social workers; rehabilitation therapists; clinical psychologists; other health workers ⁵	Medical institutions accredited for mental health services	All psychiatric patients	54-8%
Lin et al., ⁵² 2004; Lin et al., ⁵³ 2006	Cross-sectional study	Guangdong, 2001	psychiatrists; psychiatric nurses; medical technicians; pharmacists	Medical institutions accredited for mental health services	All psychiatric patients	41-9% 45-2%
Jiang et al., ⁵⁴ 2018	Cross-sectional study	Guangxi, 2015	psychiatrists; psychiatric nurses; clinical psychologists; counselling psychologists; social workers	Medical institutions accredited for mental health services	All psychiatric patients	54-8%
Wei et al., ⁵⁵ 2006	Cross-sectional study	Guangxi, 2004	psychiatrists; psychiatric nurses	Psychiatric speciality institutions	All psychiatric patients	35-5%
Liu et al., ⁵⁶ 2015	Cross-sectional study	Guizhou, 2014	psychiatrists; physicians; psychiatric nurses, pharmacists; medical technicians; counselling psychologists; rehabilitation therapists	Medical institutions accredited for mental health services	All psychiatric patients	51-6%
Luo and Tan, ⁵⁷ 2002	Cross-sectional study	Guizhou, 2000	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	41-9%
Zhang et al., ⁵⁸ 2017	Cross-sectional study	Guizhou, NM	physicians in charge of community SMD patients	Primary healthcare settings	SMD patients in the National Continuing Management and Intervention Program for Psychoses	54-8%
Chen et al., ⁵⁹ 2015	Cross-sectional study	Hainan, 2013	psychiatrists; psychiatric nurses; medical technicians	Medical institutions accredited for mental health services	All psychiatric patients	41-9%
Li et al., ⁶⁰ 2004	Cross-sectional study	Hebei, 2001	psychiatrists; psychiatric nurses; medical technicians	Psychiatric speciality institutions	All psychiatric patients	32-3%
Lan et al., ⁶¹ 2013	Cross-sectional study	Hubei, 2012	psychiatrists; psychiatric nurses	General hospitals	All psychiatric patients	67-7%
Tang et al., ⁶² 2014	Cross-sectional study	Hubei, 2008	psychiatrists; psychiatric nurses; clinical psychologists	Medical institutions accredited for mental health services	All psychiatric patients	54-8%

(Table 1 continues on next page)

(Continued from previous page)

Authors	Study design	Region and time of study	Professional group(s) considered	Type of institution	Type of patients	Quality of report ^e
Chen et al., ⁶³ 2004	Cross-sectional study	Hunan, 2002	all medical professionals	Medical institutions accredited for mental health services	All psychiatric patients	48-4%
Gao, ⁶⁴ 2019	Cross-sectional study	Inner Mongolia, 2017	psychiatrists; psychiatric nurses; medical technicians; clinical psychologists; counselling psychologists	Medical institutions accredited for mental health services	All psychiatric patients	51-6%
Xu et al., ⁶⁵ 2019; Xu et al., ⁶⁶ 2021	Cross-sectional study	Jiangxi, 2012-2018	psychiatrists; physicians provided short-term training in psychiatry	Medical institutions accredited for mental health services	All psychiatric patients	45-2% 29-0%
Zheng and Liu, ⁶⁷ 2018	Narrative review	Jilin, 2016-2018	physicians provided short-term training in psychiatry	Jilin Neuropsychiatric Hospital	All psychiatric patients	xxx
Meng, ⁶⁷ 2017	Cross-sectional study	Liaoning, 2015	psychiatrists; general physicians; psychiatric nurses; pharmacists; medical technicians; clinical psychologists; counselling psychologists; social workers	Medical institutions accredited for mental health services	All psychiatric patients	51-6%
Wang, ⁶⁸ 2013; Wang, ⁶⁹ 2014	Cross-sectional study	Liaoning, 2013	psychiatrists; psychiatric nurses; medical technicians	Medical institutions accredited for mental health services	All psychiatric patients	45-2% 45-2%
Gao, ⁶⁹ 2012	Cross-sectional study	Liaoning, 2009	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	45-2%
Chen et al., ⁷¹ 2011	Cross-sectional study	Liaoning, 2008	psychiatrists; psychiatric nurses; pharmacists; medical technicians	Psychiatric speciality institutions	All psychiatric patients	48-4%
Chen and Wang, ⁷² 2010	Cross-sectional study	Liaoning, 2008	psychiatrists; psychiatric nurses; pharmacists; medical technicians	General hospitals	All psychiatric patients	45-2%
Xinhua News Agency, ⁷³ 2019	Government report	Shandong, 2019	psychiatrists	Medical institutions accredited for mental health services	All psychiatric patients	xxx
Hu et al., ⁷⁴ 2017	Cross-sectional study	Shandong, 2015	psychiatrists; psychiatric nurses; rehabilitation therapists; counselling and clinical psychologists; social workers	Medical institutions providing mental health rehabilitation services	All psychiatric patients	45-2%
Wang, ⁷⁵ 2019	Cross-sectional study	Shandong, 2015	psychiatrists; psychiatric nurses; public health physicians; clinical psychologists; counselling psychologists; rehabilitation therapists; social workers	Medical institutions accredited for mental health services	All psychiatric patients	54-8%
Chen et al., ⁷⁶ 2021	Cross-sectional study	Shanghai, 2019	rehabilitation therapists	Community mental health rehabilitation institutions	Psychiatric patients in stable condition	58-1%
Chen et al., ⁷⁷ 2019	Cross-sectional study	Shanghai, 2017	community health professionals	Community health centres	All psychiatric patients	51-6%
Fang, ⁷⁸ 2018	Cross-sectional study	Shanghai, 2017	psychiatrists; psychiatric nurses	Psychiatric speciality institutions	All psychiatric patients	32-3%
Chen et al., ⁷⁹ 2015	Cross-sectional study	Shanghai, 2011-2013	psychiatrists	Public psychiatric speciality institutions	All psychiatric patients	48-4%
Li et al., ⁸⁰ 2014	Cross-sectional study	Shanghai, 2012	psychiatrists; psychiatric nurses	Psychiatric speciality institutions	All psychiatric patients	38-7%
Zhang and Wang, ⁸¹ 2010	Cross-sectional study	Shanghai, 2008	all medical professionals	NM	All psychiatric patients	22-6%
Zhang et al., ⁸¹ 2009	Cross-sectional study	Shanghai, 2007	all medical professionals	CDC	All psychiatric patients	48-4%
Guo and Wang, ⁸² 2005	Cross-sectional study	Shanghai, 2004	community health professionals	Community health centres	All psychiatric patients	45-2%
Wang, ⁸³ 2005	Cross-sectional study	Shanghai, 2003	counselling psychologists	Mental health counselling institutions	All psychiatric patients	22-6%
Yang et al., ⁸⁴ 2014	Cross-sectional study	Sichuan, 2014	psychiatrists	Medical institutions accredited for mental health services	All psychiatric patients	41-9%
Huang et al., ⁸⁵ 2009; Xiang et al., ⁸⁶ 2010	Cross-sectional study	Sichuan, 2007	psychiatrists; psychiatric nurses; rehabilitation therapists	Medical institutions accredited for mental health services	All psychiatric patients	41-9% 32-3%
Zhang et al., ⁸⁷ 2018	Cross-sectional study	Tianjin, 2015	psychiatrists; psychiatric nurses; clinical and counselling psychologists; public health physicians; rehabilitation therapists; social workers	Medical institutions accredited for mental health services	All psychiatric patients	48-4%
Du et al., ⁸⁸ 2010; Yang et al., ⁸⁹ 2010; Du and Zhang, ⁹⁰ 2014;	Cross-sectional study	Tianjin, 2006	psychiatrists; psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	58-1% 48-4% 54-8%
Zhang and Xu, ⁹¹ 2016; Zhang et al., ⁹² 2012a; Zhu et al., ⁹³ 2012; Zhang et al., ⁹⁴ 2012b; Zhang and Zhang, ⁹⁵ 2013; Fang and Tian, ⁹⁶ 2014	Cross-sectional study	Xinjiang, 2013	Psychiatric nurses	Medical institutions accredited for mental health services	All psychiatric patients	51-6% 32-3% 45-2% 48-4% 45-2%
Yang et al., ⁹⁷ 2015	Cross-sectional study	Yunnan, 2012	psychiatrists	Medical institutions accredited for mental health services	All psychiatric patients	41-9% 38-7%
Hu et al., ⁹⁸ 2018	Cross-sectional study	Zhejiang, 2017	psychiatrists; psychiatric nurses; clinical psychologists; rehabilitation therapists; social workers	Medical institutions accredited for mental health services	All psychiatric patients	41-9%

NM, Not specifically Mentioned; **MMT**, Methadone Maintenance Treatment; **CDC**, China's Centres for Disease Control and Prevention
SMD, severe mental disorders (including schizophrenia, schizoaffective disorder, paranoid psychosis, bipolar disorder, mental disorders caused by epilepsy, and mental disorders associated with mental retardation);
^a including physicians and pharmacists.
^b including accredited psychiatrists and other accredited physicians working in psychiatric speciality institutions.
^c including pharmacists and medical technicians.
^d including auxiliary staff, non-doctor/non-physician primary health care workers, health assistants, medical assistants, and professional and paraprofessional psychological counsellors
^e quality of reports was based on the proportion of the 31 STROBE items relevant for cross-sectional studies about human resources reported in the paper: the quality of papers was classified based on the per cent score as follows: <20%, 'low quality'; 20-39.9%, 'low-to-moderate quality'; 40-59.9%, 'moderate-to-high quality'; ≥60%, 'high quality'. Narrative reviews are coded 'xxx'. The quality score for the eight cross-sectional studies reported in multiple papers is based on the mean percentage score of all papers about the study.

Table 1: Characteristics of 69 studies and two government reports included in the review.

published in English and 66 in Chinese) that present results from 69 separate studies and two government reports (in Chinese).

Types of studies

The 69 studies identified in this review included 13 narrative reviews and 56 cross-sectional (i.e., observational) studies. Five of the cross-sectional studies were reported in two papers (with different data presented in the different papers), two studies were reported in three papers, and one study was reported

in five papers. All studies and reports provided information on human resources from 1996 to 2019, but two studies did not indicate the specific time period considered.^{13,58}

Geographic locations

Seventeen studies and one government report provided national-level data^{3,6,9,12-14,24-37}; and two of these studies also provided breakdowns of national data by 'provincial-level administrative region'.^{14,36} (This report considers the 31 provincial-level administrative regions in

mainland China, including 22 provinces, five autonomous regions, and four municipalities directly under the central government; hereafter, all these regions are referred to as ‘provinces.’) One study reported data on 13 provinces.^{38,39} The remaining 51 studies and one government report provided data on a single province: Guangdong (n = 3),^{50–53} Guangxi (n = 2),^{54,55} Tianjin (n = 2),^{88–90} Sichuan (n = 2),^{84–86} Xinjiang (n = 2),^{91–96} Chongqing (n = 2),^{47,48} Yunnan (n = 1),⁹⁷ Zhejiang (n = 1),⁹⁸ Inner Mongolia (n = 1),⁶⁴ Anhui (n = 3),^{40–42} Fujian (n = 1),²¹ Gansu (n = 1),⁴⁹ Guizhou (n = 3),^{56–58} Hainan (n = 1),⁵⁹ Hebei (n = 1),⁶⁰ Hubei (n = 2),^{61,62} Hunan (n = 1),⁶³ Jiangxi (n = 1),^{65,66} Jilin (n = 1),¹⁰ Liaoning (n = 5),^{68–72} Beijing (n = 4),^{43–46} Shandong (n = 3),^{73–75} and Shanghai (n = 9).^{23,76–83} No separate reports were available for eight of the 31 provinces: Heilongjiang, Shanxi, Jiangsu, Henan, Qinghai, Shaanxi, Ningxia, and Tibet.

Professions considered

Most studies and one government report provided information on medical professionals (including psychiatrists, psychiatric nurses, physicians, pharmacologists, and medical technicians). Twenty-one studies provided information on other human resources available to provide treatment and social welfare services to mentally ill individuals, including clinical and counselling psychologists (n = 19 studies), social workers (n = 13), rehabilitation therapists (n = 10), hotline workers (n = 1), and one study that considered other personnel (including neighbourhood or village committee staff, case managers and police officers). [Prior to 2022, the ‘medical technician’ category only included laboratory technicians and imaging technicians, so clinical psychologists and rehabilitation therapists were not included in reports of ‘medical professionals’, though a few studies separately reported these professionals; the ‘medical technician’ category was officially expanded to include these two professions in 2022.²²]

Types of institutions

Eight studies did not specify the type of institution or clinic that employed the professionals considered in the report. Thirty-two studies and one government report considered all medical institutions qualified to provide mental health services (i.e., all public or private institutions or clinics that employ accredited psychiatrists, including general hospitals, psychiatric speciality institutions, primary health care settings, private clinics, and other medical and health institutions or clinics). One study considered mental health professionals working in clinical settings, educational settings, and counselling centres operated by the government, prisons or corporations.¹³ The remaining 28 studies and one government report focused on professionals working in specific types of institutions: psychiatric speciality

institutions (i.e., psychiatric hospitals, dispensaries and drug rehabilitation centres) (n = 12), general hospitals (n = 4), methadone maintenance treatment clinics (n = 2), institutions affiliated with the national community-based Management and Intervention Program for Psychoses (n = 1), training bases for psychiatrists (n = 3), mental health rehabilitation institutions (n = 2), mental health counselling institutions (n = 1), China’s Centres for Disease Control and Prevention (CDC) clinics (n = 1), primary health care settings (n = 1), and community health centres (n = 2).

Types of patients

Most studies reported the human resources available for all psychiatric patients, regardless of diagnosis. However, some studies focused on the human resources available for providing services to specific types of patients: children and adolescents (n = 2), persons with drug use disorders (n = 2), patients in the national community-based Management and Intervention Program for Psychoses (n = 2), community-dwelling psychiatric patients (n = 1), psychiatric patients in stable condition (n = 1), and psychiatric patients who threaten social security (n = 1).

Quality of information provided in identified reports of cross-sectional studies

The quality of the 69 reports about the 56 cross-sectional studies considered in this review was assessed based on the number and proportion of the 31 items included in the STROBE statement reported in each paper (see the last column of [Table 1](#)). Based on the cutoff per cent scores (described in the methods section), one paper was classed as ‘low quality’, 15 as ‘low-moderate quality’, 46 as ‘moderate to high quality’, and seven as ‘high quality’. The corresponding quality of the reports of the 56 studies (using the mean per cent score of reports for the studies that were reported in multiple papers) was as follows: reports of one study were classed as ‘low quality’, 13 as ‘low-moderate quality’, 36 as ‘moderate to high quality’, and six as ‘high quality’. The mean (SD) per cent score for the 69 papers was 46.5% (SD = 11.6%) (i.e., ‘moderate-high’ quality), and the mean (SD) per cent score for the 56 studies was 46.5% (SD = 10.6%) (i.e., ‘moderate-high’ quality).

As shown in [Supplementary Tables S1 and S2](#), three of the 31 STROBE items relevant for cross-sectional studies were not reported in any of the 69 papers: ‘describe the method of determining sample size’ (item 10); ‘explain how missing data were handled’ (item 12c); and ‘discuss the generalisability (external validity) of the study results’ (item 21). An additional nine items were reported in less than 20% of the papers (items 9, 11, 12b, 12d, 13b, 13c, 14b, and 16b). Only ten of the 31 items were reported in more than 80% of the papers (items 1b, 2, 3, 4, 5, 12a, 13a, 15, 18 and 20).

The number and characteristics of different professionals providing mental health services by region

Table 2 displays the numbers and characteristics of psychiatrists (including accredited psychiatrists and assistant psychiatrists), psychiatric nurses (including

registered nurses and trainee nurses) and other mental health professionals (including clinical and counselling psychologists, social workers, occupational therapists, or rehabilitation therapists) that provide mental health services in different regions of China as reported in the identified studies. Studies limited to a single type of

Region/Province (survey year)	Type of institution	Psychiatrists (accredited and assistant psychiatrists) N (number/100,000 population)	Psychiatric nurses N (number/100,000 population)	Other mental health providers N (number/100,000 population)	
MAINLAND CHINA (Nationwide studies)					
Nationwide	25 (2019)	Top-tier tertiary psychiatric hospitals in the provincial capital city N=5124 (0.37) Psychiatric beds per psychiatrist: 6.25 <u>Regional beds per psychiatrist:</u> Northeast China: 10.00 East China: 5.88 Central China: 5.88 West China: 5.88	N=10,921 (0.78) Psychiatric beds per nurse: 2.94 <u>Regional beds per nurse:</u> Northeast China: 3.57 East China: 2.86 Central China: 2.86 West China: 2.94	Clinical psychologists: N=1,005 (0.07) Psychiatric beds per psychologist: 0.03 Social workers: N=139 (0.01) Psychiatric beds per social worker: 0.004 Regional beds per psychologist / social worker: Northeast China: 0.01 / 0.005 East China: 0.02 / 0.004 Central China: 0.05 / 0.009 West China: 0.04 / 0.001	
	26 (2019)	not specified	Full-time child psychiatrists: N<500 (<0.04) Major cities (Beijing & Shanghai) have numbers similar to those in high-income countries, but many small and medium-sized cities have no specialist child psychiatry services	-	
	27 (2018)	not specified			Hotline operators: N=616
	28-30 (2017)	32 tertiary psychiatric hospitals in capital cities (3 in Beijing and 29 in provincial capitals)	N=3363 (0.24) <u>Regional distribution:</u> East China (41%); Central China (21%); West China (28%) Northeast China (10%) <u>Sex:</u> female (58%) <u>Age:</u> <29 (3%); 30-39 (55%); 40-49 (28%); 50-59 (13%); ≥60 (1%) <u>Education level:</u> doctorate (5%); master's (25%); bachelor's (65%); junior college or below (5%)	N=9907 (0.71) <u>Sex:</u> female (81.9%) <u>Age:</u> <27 (25.7%); 28-32 (27.7%); 33-40 (23.2%) ≥41 (23.4%) <u>Educational level:</u> bachelor's and above (57.0%); junior college or below (43.0%) <u>Professional title:</u> senior (5.3%); intermediate (29.8%); junior (25.8%)	
	12 (2016)	not specified	----	----	Clinical psychologists: 5,000 Counselling psychologists: 30,000-40,000
	14 (2015)	Medical institutions accredited for mental health services	N=30,122 (2.19) <u>Regional numbers and rates:</u> East China: N=14,656 (2.58) Central China: N=8612 (2.00) West China: N=6855 (1.85)	N=75,765 (5.51) <u>Regional numbers and rates:</u> East China: N=34,286 (6.03) Central China: N=22,371 (5.20) West China: N=19,108 (5.15)	Clinical psychologists: N=1615 (0.12) Counselling psychologists: N=3153 (0.23) Social workers: N=1500 (0.11) Rehabilitation therapists: N=1060 (0.08)
	6 (2015)	Medical institutions accredited for mental health services	Two-thirds of counties in China did not have psychiatrists (no numbers provided)	-	
	32 (2002, 2012)	not specified	Reports mental health workforce is clustered in urban regions in northeastern and eastern parts of the country (no numbers provided)	Reports mental health workforce is clustered in urban regions in northeastern and eastern parts of the country (no numbers provided)	
	35 (2010)	Psychiatric speciality institutions		N=35,337 (2.65) <u>Regional numbers:</u> North-East: N=3988 (3.63) East: N=13,078 (3.33) North: N=4502 (2.73) South: N=4062 (2.56) South-West: N=4541 (2.35) Central: N=3857 (1.78) North-West: N=1309 (1.35) <u>Sex:</u> female (87.3%) <u>Age:</u> <25 (13.3%); 25-44 (63.2%); ≥45 (23.4%) <u>Educational level:</u> bachelor's (10.6%); technical secondary school (43.9%); high school and below (45.5%) <u>Professional title:</u> senior (2.5%); intermediate (24.0%); junior (73.5%)	
	5 (2009)	All institutions within the National Continuing Management and Intervention Program for Psychoses	N=1643 (0.12)	N=1,491 (0.11)	Neighbourhood/village committee staff: N=20,375 (1.50) Case managers: N=9557 (0.70) Police officers: N=2714 (0.20)
NORTHEAST CHINA					
Heilongjiang	14 (2015)	Medical institutions accredited for mental health services	N=798 (2.26)	N=2446 (6.93)	
	38,39 (2001)	Medical institutions accredited for mental health services	943 (2.6) Psychiatric beds per psychiatrist: 7.06	1514 (4.09) Professional title: senior (1.1%); intermediate (34.5%); junior or below (64.5%) Psychiatric beds per nurse: 4.40	
Jilin	14 (2015)	Medical institutions accredited for mental health services	N=551 (2.11)	N=1675 (6.41)	
	38,39 (2001)	Medical institutions accredited for mental health services	719 (2.6) Psychiatric beds per psychiatrist: 6.21	2320 (8.50) Psychiatric beds per nurse: 1.92	
Liaoning	14 (2015)	Medical institutions accredited for mental health services	N=1531 (3.53)	N=3974 (9.16)	
	67 (2015)	Medical institutions accredited for mental health services	N=1575 (3.71) Educational level: master's and above (8.7%); bachelor's (56.1%); junior college (23.7%); technical secondary school and below (11.4%) Professional title: senior (23.1%); intermediate (39.8%); junior (37.2%) Numbers in 14 cities in the province: N=19*501 (1.47*6.91)	4425 (10.43) Educational level: master's and above (0.1%); bachelor's (39.7%); junior college (34.1%); technical secondary school and below (46.1%) Professional title: senior (2.1%); intermediate (27.6%); junior (63.5%); intern (6.8%) Numbers in 14 cities in the province: N=59*1,010 (4.57*18.31)	Clinical psychologists: N=164 (0.39) Counselling psychologists: N=530 (1.25) Social workers: N=55 (0.13)

(Table 2 continues on next page)

(Continued from previous page)

Region/Province Reference No. (survey year)	Type of institution	Psychiatrists (accredited and assistant psychiatrists) N (number/100,000 population)	Psychiatric nurses N (number/100,000 population)	Other mental health providers N (number/100,000 population)
Liaoning	68,69 (2013)	Medical institutions accredited for mental health services N=1509 (3.6) <u>Psychiatric beds per psychiatrist</u> 13.20 <u>Educational level:</u> master's (7.1%); bachelor's (54.4%); junior college and below (38.4%) <u>Numbers in 14 cities in the province:</u> N=15389 (1.2-5.7); 4.76-20.00 beds/psychiatrist	N=3451 (8.1) <u>Psychiatric beds per nurse:</u> 5.77 <u>Educational level:</u> master's (0.1%); bachelor's (17.8%); junior college and below (82.2%) <u>Numbers in 14 cities in the province:</u> N=30771 (0.9-22.3); 3.45-12.50 beds/nurse	
	70 (2009)	Medical institutions accredited for mental health services N=1063 (2.48) <u>Psychiatric beds per psychiatrist:</u> 12.01 <u>Educational level:</u> master's (8%); bachelor's (48.9%); junior college and below (43.1%) <u>Numbers in 14 cities in the province:</u> N=14265 (0.88-3.84) 5.00-25.00 beds/psychiatrist	N=2620 (6.11) <u>Psychiatric beds per nurse:</u> 4.87 <u>Educational level:</u> technical secondary school and below (72%) <u>Numbers in 14 cities in the province:</u> N=36555 (2.59-12.21) 1.89-10.00 beds/nurse	
	71 (2008)	Psychiatric speciality institutions N=1483 (3.44)	N=2541 (5.89)	
	72 (2008)	General hospitals N=118 (0.27)	N=90 (0.21)	
38,39 (2001)	Medical institutions accredited for mental health services N=1000 (2.4) <u>Psychiatric beds per psychiatrist:</u> 10.2	N=2373 (5.65) <u>Psychiatric beds per nurse:</u> 4.30		
NORTH CHINA				
Hebei	14 (2015)	Medical institutions accredited for mental health services N=1396 (1.90)	N=2615 (3.56)	
	38,39 (2001)	Medical institutions accredited for mental health services N=300 (0.5) <u>Professional title:</u> senior (14.0%); intermediate and below (86.0%) <u>Psychiatric beds per psychiatrist:</u> 18.3	N=1200 (1.85) <u>Psychiatric beds per nurse:</u> 4.58	
	60 (2001)	Psychiatric speciality institutions N=1497 (6.95) <u>Numbers in 16 districts:</u> N=17303 (1.27-25.70)	N=1450 (2.16) <u>Professional title:</u> senior (1.7%); intermediate (7.1%); junior (91.2%) <u>Psychiatric beds per nurse:</u> 4.49	
Beijing	43 (2019)	Medical institutions accredited for mental health services N=1219 (5.57)	N=3288 (15.26) <u>Numbers in 16 districts:</u> N=371170 (3.68-55.50)	
	14 (2015)	Medical institutions accredited for mental health services N=894 (5.09) <u>Educational level:</u> master's and above (16.7%); bachelor's (51.5%); junior college (25.3%); technical secondary school and below (6.5%) <u>Professional title:</u> senior (24.1%); intermediate (38.2%); junior (37.7%)	N=1522 (8.67) <u>Educational level:</u> master's and above (0.1%); bachelor's (8.1%); junior college (55.0%); technical secondary school and below (36.8%) <u>Professional title:</u> senior (1.6%); intermediate (21.5%); junior (76.9%)	<u>Clinical psychologists:</u> N=37 (0.21) <u>Social workers:</u> N=6 (0.03) <u>Rehabilitation therapists:</u> N=56 (0.32)
	44 (2009)	General hospitals N=1416 (10.9) <u>Professional title:</u> senior (12.6%); intermediate (23.2%); junior (64.2%) <u>Psychiatric beds per psychiatrist:</u> 3.79	N=192 (1.03)	
	38,39 (2001)	Medical institutions accredited for mental health services N=308	N=1450 (11.15) <u>Professional title:</u> senior (1.4%); intermediate (13.5%); junior (85.1%) <u>Psychiatric beds per nurse:</u> 3.70	
	46 (2001)	General hospitals N=539 (4.36) <u>Numbers in different districts:</u> 6 inner-city districts: N=311 (7.02) 4 outer-city districts: N=145 (6.10) New coastal district: N=23 (1.38) 5 Other districts: N=60 (1.55)	N=77	
	87 (2015)	Medical institutions accredited for mental health services N=501 (3.48)	N=1080 (8.74) <u>Numbers in different districts:</u> 6 intra-city districts: N=729 (16.46) 4 surrounding districts: N=246 (10.34) New coastal district: N=43 (2.58) 5 Other districts: N=62 (1.60)	<u>Clinical and counselling psychologists:</u> N=36 (0.29) 6 intra-city districts: N=27 (0.61) 4 surrounding districts: N=1 (0.04) New coastal district: N=6 (0.36) 5 Other districts: N=2 (0.05) <u>Social workers:</u> N=19 (0.15) 6 intra-city districts: N=14 (0.32) 4 surrounding districts: N=1 (0.04) New coastal district: N=0 (0.00) 5 Other districts: N=4 (0.10) <u>Rehabilitation therapists:</u> N=11 (0.09) 6 intra-city districts: N=4 (0.09) 4 surrounding districts: N=7 (0.29) New coastal district: N=0 (0.00) 5 Other districts: N=0 (0.00)
Tianjin	14 (2015)	Medical institutions accredited for mental health services N=561 (5.4) <u>Psychiatric beds per psychiatrist:</u> 8.8 <u>Numbers of beds/psychiatrists in different districts</u> 6 urban districts: N=292 (7.4), 10 beds/psychiatrist 6 other districts: N=165 (4.5), 10 beds/psychiatrist 3 coastal districts: N=46 (3.5); 2 beds/psychiatrist 3 counties: N=58 (3.3), 5 beds/psychiatrist	N=885 (8.5) <u>Psychiatric beds per nurse:</u> 4.8 <u>Numbers and beds/nurses in different districts</u> 6 urban districts: 649 (16.5), 3 beds/nurse 6 other districts: 194 (5.7), 10 beds/nurse 3 coastal districts: 14 (1.1), 5 beds/nurse 3 counties: 28 (1.6), 10 beds/nurse	
	88-90 (2006)	Medical institutions accredited for mental health services N=655 (2.65) <u>Psychiatric beds per psychiatrist</u> 7.14 <u>Educational level:</u> master's and above (7.79%); bachelor's (64.27%); junior college (15.26%); technical secondary school and below (12.66%) <u>Professional title:</u> senior (27.5%); intermediate (27.8%); junior (44.7%) <u>Numbers from 12 cities in the province:</u> N=2168 (0.86-5.86)	N=4267 (17.27) <u>Psychiatric beds per nurse</u> 1.11 <u>Educational level:</u> master's and above (2.32%); bachelor's (48.81%); junior college (34.14%); technical secondary school and below (22.94%) <u>Professional title:</u> senior (7.6%); intermediate (27.8%); junior (64.5%) <u>Numbers from 12 cities in the province:</u> N=91557 (1.64-58.75)	<u>Clinical psychologists:</u> N=71 (0.29) <u>Counselling psychologists:</u> N=159 (0.64)
Inner Mongolia	64 (2017)	Medical institutions accredited for mental health services N=570 (1.62)	N=1928 (5.48)	
	14 (2015)	Medical institutions accredited for mental health services N=570 (1.62)	N=1928 (5.48)	

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Region/Province Reference No. (survey year)	Type of institution	Psychiatrists (accredited and assistant psychiatrists) N (number/100,000 population)	Psychiatric nurses N (number/100,000 population)	Other mental health providers N (number/100,000 population)
Shanxi 14 (2015)	Medical institutions accredited for mental health services	N=690 (1.96)	N=1580 (4.49)	
EAST CHINA				
Shandong 73 (2019)	Medical institutions accredited for mental health services	N=2577 (2.55)		
	Medical institutions providing mental health rehabilitation services	N=166 (0.17)	N=278 (0.28)	Clinical and counselling psychologists: n=91 (0.09) Social workers: N=32 (0.03) Rehabilitation therapists: N=130 (0.13)
	Medical institutions accredited for mental health services	N=2210 (2.24)	N=5032 (5.10)	
Shandong 75 (2015)	Medical institutions accredited for mental health services	N=2212 (2.25); 140.09/10,000 km ² Numbers from 17 cities in the province: N=28~236 (0.85~3.95); 33.97~280.06/10,000 km ²	N=5201 (5.28); 3.29/10,000 km ² Numbers from 17 cities in the province: N=64~559 (1.34~9.88); 69.78~848.03/10,000 km ²	Clinical psychologists: n=92 (0.09) Counselling psychologists: 332 (0.34) Social workers: N=68 (0.07) Rehabilitation therapists: N=130 (0.13)
	Community mental health rehabilitation institutions			Rehabilitation therapists: N=260 (1.04) Sex: female (70.8%) Age: ≤30 (10.0%); 31~40 (25.8%); 41~50 (29.6%); ≥51 (34.6%) Educational level: bachelor's and above (18.9%); junior college (33.2%); technical secondary school (36.3%); junior high school and below (11.6%)
Shanghai 78 (2017)	Psychiatric speciality institutions	N=1081 (4.47) Educational level: doctorate (4%); master's degree (10%); bachelor's degree (58%); junior college and below (28%) Professional title: senior (21%); intermediate (44%); junior (35%)	N=2633 (10.88)	
	Medical institutions accredited for mental health services	N=1069 (4.35)	N=2404 (9.78)	
	Public psychiatric speciality institutions	2011: N=698 (2.96); 2012: N=710 (2.96); 2013: N=724 (2.96) Professional title 2011: senior (11.8%); intermediate (44.4%); junior or below (43.8%) 2012: senior (12.4%); intermediate (46.4%); junior or below (41.2%) 2013: senior (11.9%); intermediate (45.9%); junior or below (42.2%)		
	Psychiatric speciality institutions	N=1148 (5.00) Educational level: doctorate (4.2%); master's (10.1%); bachelor's (58.3%); junior college and below (27.4%) Professional title: senior (18.8%); intermediate (43.8%); junior (38.2%)	N=2,545 (11.00)	
	Mental health counselling institutions			Counselling psychologists: N=360 Full-time (28.9%) Age: ≤30 (11.67%); 31~59 (75.28%); ≥60 (13.06%) Educational level: doctorate (6.7%); master's (18.6%); bachelor's (50.6%); junior college (18.6%); technical secondary school (5.6%) Professional title: senior (61.1%); intermediate (33.6%); junior (5.3%) Mental health training: ≥6 months (35.8%); 3~6 months (15.3%); <3 months (48.8%)
Jiangsu 14 (2015)	Medical institutions accredited for mental health services	N=1838 (2.21)	N=4648 (5.59)	
Zhejiang 62 (2017)	Medical institutions accredited for mental health services	N=2580 (4.56) Educational level: bachelor's and above (82.0%); junior college and below (18.0%) Professional title: senior (24.5%); intermediate (34.3%); junior (41.5%) Numbers from 11 cities in the province: N=58.420 (2.76~7.19)	N=5125 (9.06) Educational level: bachelor's and above (50.3%); junior college and below (49.7%) Professional title: senior (5.9%); intermediate (25.4%); junior (68.7%) Numbers from 11 cities in the province: N=110.919 (5.56~16.43)	Clinical psychologists: N=85 (0.15) Numbers from 11 cities in the province: (0.03~0.34) Social workers: N=19 (0.03) Numbers from 11 cities in the province: (0.00~0.11) Rehabilitation therapists: N=118 (0.21) Numbers from 11 cities in the province: (0.02~1.10)
	Medical institutions accredited for mental health services	N=1796 (3.00)	N=3794 (6.34)	
Anhui 40 (2018)	Medical institutions accredited for mental health services	N=1336 (2.11) Educational level: master's and above (6.1%); bachelor's (72.0%); junior college and below (21.9%) Professional title: senior (18.7%); intermediate (36.4%); junior (44.8%) Numbers from 17 cities in the province: (0.93~4.36)		
	Medical institutions accredited for mental health services	2016: N=894 (1.92) 2018: N=1285 (2.10)		
	Medical institutions accredited for mental health services	N=878 (1.46)	N=2212 (3.68)	
Anhui 42 (2015)	Medical institutions accredited for mental health services	N=891 (1.46) Psychiatric beds per psychiatrist: 8.93 Numbers from 17 cities in the province: (0.45~6.37) Beds per psychiatrist: 5~33.75		
	Medical institutions accredited for mental health services	N=700 (1.0) Psychiatric beds per psychiatrist: 5.17 Professional title: senior (14.3%); intermediate (35.7%); junior (50.0%)	N=1200 (1.79) Psychiatric beds per nurse: 3.02	

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Region/Province Reference No. (survey year)	Type of institution	Psychiatrists (accredited and assistant psychiatrists) N (number/100,000 population)	Psychiatric nurses N (number/100,000 population)	Other mental health providers N (number/100,000 population)
Fujian	14 (2015)	Medical institutions accredited for mental health services N=721 (1.81)	N=2347 (5.89)	
	21 (2007)	Medical institutions accredited for mental health services Numbers from 9 cities in the province: 13*140 (0.40*3.42)	N=1011 (2.81) Numbers from 9 cities in the province: 15*342 (0.47*5.95)	
Jiangxi	65,66 (2012-2018)	Medical institutions accredited for mental health services 2012: N=774 (1.72) 2014: N=950 (2.1) 2016: N=1089 (2.4) 2018: N=1336 (2.87)		
	14 (2015)	Medical institutions accredited for mental health services N=879 (1.96)	N=2687 (5.99)	
CENTRAL CHINA				
Henan	14 (2015)	Medical institutions accredited for mental health services N=1843 (1.90)	N=4375 (4.51)	
	38,39 (2001)	Medical institutions accredited for mental health services N=780 (0.8) Psychiatric beds per psychiatrist: 7.29	N=1300 (1.3) Psychiatric beds per nurse: 4.37	
Hubei	14 (2015)	Medical institutions accredited for mental health services N=1392 (2.38)	N=3416 (5.84)	
	62 (2008)	Medical institutions accredited for mental health services N=1398 (2.44) Psychiatric beds per psychiatrist: 11.91 Numbers for 16 cities in the province N=9*437 (0.76*4.47) Psychiatric beds per psychiatrist: 9.27*26.67	N=3175 (5.55) Psychiatric beds per nurse: 5.25 Numbers for 16 cities in the province N=47*891 (2.61*9.11) Psychiatric beds per nurse: 3.82*9.05	Clinical psychologists: N=293 (0.51) Psychiatric beds per psychologist: 56.84 Numbers for 16 cities in the province N=0*69 (0*1.37) Psychiatric beds per psychologist: 0*240.00
Hunan	14 (2015)	Medical institutions accredited for mental health services N=1,429 (2.16)	N=3,539 (5.35)	
	38,39 (2001)	Medical institutions accredited for mental health services N=1000 (1.6) Psychiatric beds per psychiatrist: 6.50 Professional title: senior (14.0%); intermediate (40.0%); junior and below (46.0%)	N=2500 (3.88) Psychiatric beds per psychiatrist: 2.60 Professional title: senior (0.4%); intermediate (26.0%); junior and below (73.6%)	
SOUTH CHINA				
Guangdong	14 (2015)	Medical institutions accredited for mental health services N=2476 (2.12)	N=5711 (4.89)	
	50 (2014)	Medical institutions accredited for mental health services N=1936 (1.81) Regional distribution: Pearl River Delta: N=1156 (2.01) East Guangdong: N=289 (1.16) West Guangdong: N=403 (2.24) North Guangdong: N=88 (1.30)	N=4484 (4.18) Regional distribution: Pearl River Delta: N=2688 (4.67) East Guangdong: N=862 (3.45) West Guangdong: N=722 (4.02) North Guangdong: N=212 (3.14)	
	51 (2013)	Medical institutions accredited for mental health services N=1430 (1.27)	N=4098 (3.64)	Clinical psychologists: N=110 (0.10) Social workers: N=78 (0.07) Rehabilitation therapists: N=67 (0.06)
	52,53 (2001)	Medical institutions accredited for mental health services N=1236 (1.5) Psychiatric beds per psychiatrist: 8.01 Professional title: senior (13.1%); intermediate (28.1%); junior (58.8%) Number/100,000 in 21 cities in the province: 0.2*2.8	N=1909 (2.2) Psychiatric beds per nurse: 5.19 Professional title: senior (1.1%); intermediate (9.0%); junior (89.9%) Number/100,000 in 21 cities in the province: 1.0*5.2	
Guangxi	14 (2015)	Medical institutions accredited for mental health services N=741 (1.54)	N=2,232 (4.64)	
	54 (2015)	Medical institutions accredited for mental health services N=1265 (2.29) Psychiatric beds per psychiatrist: 11.11 Educational level: doctorate (0.2%); master's (3.2%); bachelor's (42.6%); junior college (35.8%); technical secondary school (18.2%) Professional title: senior (12.9%); intermediate (33.2%); junior and below (53.8%)	N=2826 (5.12) Educational level: bachelor's (12.8%); junior college (46.8%); technical secondary school (40.4%)	Clinical psychologists: N=26 (0.05) Social workers: N=45 (0.08) Rehabilitation therapists: N=50 (0.09)
	55 (2004)	Psychiatric speciality institutions N=630 (1.3) Psychiatric beds per psychiatrist: 7.69 Professional title: senior (5.6%); intermediate and below (94.4%)	N=1267 (2.6) Psychiatric beds per nurse: 3.85 Professional title: senior (0.6%); intermediate and below (99.4%)	
Hainan	14 (2015)	Medical institutions accredited for mental health services N=293 (3.10)	N=697 (7.38)	
	59 (2013)	Medical institutions accredited for mental health services N=138 (1.55) Educational level: master's and above (3.6%); bachelor's (68.8%); junior college (19.6%); technical secondary school and below (8.0%) Professional title: senior (28.2%); intermediate (25.4%); junior (31.2%); intern (15.2%)	N=351 (3.96) Educational level: bachelor's (4.6%); junior college (38.2%); technical secondary school and below (57.3%)	
38,39 (2001)	Medical institutions accredited for mental health services N=180 (3.4)			
NORTHWEST CHINA				
Qinghai	14 (2015)	Medical institutions accredited for mental health services N=51 (0.88)	N=74 (1.29)	
	38,39 (2001)	Medical institutions accredited for mental health services N=34 (0.7) Psychiatric beds per psychiatrist: 3.59	69 (1.33) Psychiatric beds per nurse: 1.77	

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Region/Province Reference No. (survey year)	Type of institution	Psychiatrists (accredited and assistant psychiatrists) N (number/100,000 population)	Psychiatric nurses N (number/100,000 population)	Other mental health providers N (number/100,000 population)
Xinjiang	14 (2015)	Medical institutions accredited for mental health services N=475 (1.99)	N=1235 (5.18)	
	91 (2013)	Medical institutions accredited for mental health services N=870 Psychiatric beds per nurse: 4.08 Age: 18~29 (43.0%); 30~39 (30.1%); 40~49 (21.5%); ≥50 (5.4%) Educational level: bachelor's and above (5.3%); junior college (34.6%); technical secondary school and below (60.1%) Professional title: senior (2.8%); intermediate (19.2%); junior (68.7%); intern (9.3%)	N=870 Psychiatric beds per nurse: 4.08 Age: 18~29 (43.0%); 30~39 (30.1%); 40~49 (21.5%); ≥50 (5.4%) Educational level: bachelor's and above (5.3%); junior college (34.6%); technical secondary school and below (60.1%) Professional title: senior (2.8%); intermediate (19.2%); junior (68.7%); intern (9.3%)	
	92-96 (2010)	Medical institutions accredited for mental health services N=436 (2.0) Psychiatric beds per psychiatrist: 8.21 Educational level: master's (3.9%); bachelor's (51.6%); junior college (33.3%); technical secondary school (11.2%) Professional title: senior (12.8%); intermediate (35.1%); junior (41.7%); intern (10.4%) Number and rate in 14 cities in the province: 3~189 (0.30~9.22)	N=867 (3.98) Psychiatric beds per nurse: 4.13 Age: 18~29 (42.9%); 30~39 (30.1%); 40~49 (21.6%); ≥50 (5.4%) Educational level: master's (0.1%); bachelor's (4.2%); junior college (34.7%); technical secondary school and below (61.0%) Professional title: senior (2.8%); intermediate (19.3%); junior (68.9%); intern (9.1%)	
	38,39 (2001)	Medical institutions accredited for mental health services N=595 (3.1) Psychiatric beds per psychiatrist: 3.50 Professional title: senior (11.4%); intermediate and below (88.6%)	N=720 (3.74) Psychiatric beds per nurse: 2.89 Professional title: senior (0.4%); intermediate (26.0%); junior and below (73.6%)	
Shaanxi	14 (2015)	Medical institutions accredited for mental health services N=804 (2.09)	N=1715 (4.46)	
Gansu	14 (2015)	Medical institutions accredited for mental health services N=353 (1.40)	N=853 (3.38)	
	49 (2014)	Medical institutions accredited for mental health services N=320 (1.24) Psychiatric beds per psychiatrist: 11.49 Regional results: Northwest Gansu: N=107 (2.20) 5 cities in the region: (0.75~5.95) Central Gansu: N=278 (2.58) 5 cities in the region: (0.00~5.72) Southeast Gansu: N=400 (3.92) 4 cities in the region: (0.89~7.78)	N=785 (3.04) Psychiatric beds per nurse: 4.69	Clinical psychologists: N=26 (0.10) Social workers: N=2 (0.01) Rehabilitation therapists: N=9 (0.03)
Ningxia	14 (2015)	Medical institutions accredited for mental health services N=103 (1.51)	N=222 (3.25)	
SOUTHWEST CHINA				
Guizhou	14 (2015)	Medical institutions accredited for mental health services N=612 (1.65)	N=1405 (3.79)	
	56 (2014)	Medical institutions accredited for mental health services N=345 (0.94) Psychiatric beds per psychiatrist: 30.1	N=1112 (3.02) Psychiatric beds per nurse: 9.3	Counselling psychologists: N=51 (0.14) Rehabilitation therapists: N=7 (0.02)
	38,39 (2001)	Medical institutions accredited for mental health services N=217 (0.6) Psychiatric beds per psychiatrist: 9.90 Professional title: senior (17.5); intermediate (34.1%); junior and below (48.4%)	N=372 (1.06) Psychiatric beds per nurse: 5.77 Professional title: senior (0.0%); intermediate (70.4%); junior and below (29.6%)	
	57 (2000)	Medical institutions accredited for mental health services N=217 (0.61) Psychiatric beds per psychiatrist: 9.89 Educational level: bachelor's (35.0%); junior college (28.1%); technical secondary school and below (24.9%); other (12.0%)	N=372 (1.06) Psychiatric beds per nurse: 5.77 Educational level: junior college and above (70.4%); technical secondary school and below (29.6%)	
Chongqing	47 (2017)	Psychiatric specialty institutions affiliated with the Civil Affairs system N=327 (1.04) Psychiatric beds per nurse: 7.14 Age: <30 (45.0%); 30~39 (25.4%); 40~49 (15.2%); ≥50 (13.5%) Educational level: bachelor's degree and above (10.1%); junior college (51.7%); technical secondary school (25.1%); below (13.5%) Professional title: senior (4.0%); intermediate (13.5); junior (82.6%)	N=327 (1.04) Psychiatric beds per nurse: 7.14 Age: <30 (45.0%); 30~39 (25.4%); 40~49 (15.2%); ≥50 (13.5%) Educational level: bachelor's degree and above (10.1%); junior college (51.7%); technical secondary school (25.1%); below (13.5%) Professional title: senior (4.0%); intermediate (13.5); junior (82.6%)	
	14 (2015)	Medical institutions accredited for mental health services N=737 (2.40)	N=1906 (6.21)	
Sichuan	48 (2012)	Medical institutions accredited for mental health services N=319 (1.08) Educational level: bachelor's and above (37.6%); junior college and below (62.4%) Professional title: senior (17.8%); intermediate and below (82.2%)	1206 (4.10) Educational level: bachelor's and above (13.9%); junior college and below (86.1%) Professional title: senior (1.8%); intermediate and below (98.2%)	
	14 (2015)	Medical institutions accredited for mental health services N=1688 (2.06)	N=5844 (7.13)	
	84 (2014)	Medical institutions accredited for mental health services N=1756 (2.18) Number and rate in 21 cities in the province: 0~435 (0.00~4.11)		
	85,86 (2007)	Medical institutions accredited for mental health services N=1389 (1.62) Characteristics of psychiatrists AND psychiatric nurses: Age: <26 (16.6%); 26~35 (33.2%); 36~45 (28.7%); 46~55 (16.8%); >55 (4.7%) Educational level: master's and above (1.2%); bachelor's (13.8%); junior college (36.8%); technical secondary school (36.6%); below (6.5%) Professional title: senior (6.6%); intermediate (27.0%); junior (58.4%); intern (8.1%)	2084 (2.42) Characteristics of psychiatrists AND psychiatric nurses: Age: <26 (16.6%); 26~35 (33.2%); 36~45 (28.7%); 46~55 (16.8%); >55 (4.7%) Educational level: master's and above (1.2%); bachelor's (13.8%); junior college (36.8%); technical secondary school (36.6%); below (6.5%) Professional title: senior (6.6%); intermediate (27.0%); junior (58.4%); intern (8.1%)	Rehabilitation therapists: 32 (0.04) Age: <26 (25.0%); 26~35 (10.7%); 36~45 (39.3%); 46~55 (25.0%); >55 (0) Educational level: bachelor's (9.4%); junior college (46.9%); technical secondary school (37.5%); below (6.3%) Professional title: intermediate (32.0%); junior (24.0%); intern (44.0%)
Yunnan	14 (2015)	Medical institutions accredited for mental health services N=919 (1.97)	N=2322 (4.98)	
Tibet	97 (2012)	Medical institutions accredited for mental health services N=615 (1.34) Sex: female (40.8%) Age: <25 (1.3%); 25~50 (83.4%); >50 (15.0%) Educational level: master's and above (7.5%); bachelor's and junior college (80.3%); technical secondary school (12.2%) Professional title: senior (19.4%); intermediate (35.8%); junior (24.6%); intern (10.2%) Number/100,000 in 15 cities in the province: 6~181		
	38,39 (2001)	Medical institutions accredited for mental health services N=700 (1.6) Psychiatric beds per psychiatrist: 6.96 Professional title: senior (8.1%); intermediate (38.7%); junior and below (53.2%)	N=1110 (2.59) Psychiatric beds per nurse: 4.39 Professional title: senior (0.0%); intermediate (19.0%); junior and below (81.0%)	
14 (2015)	Medical institutions accredited for mental health services N=0 (0.00)		N=0 (0.00)	
6 (2010)	Medical institutions accredited for mental health services N=0 (0.00)			

MMT, Methadone Maintenance Treatment; CDC, China's Centres for Disease Control and Prevention

Table 2: Reported number and characteristics of mental health providers in different geographic regions of mainland China.

institution were not included in the following summaries; these summaries only include data from studies that considered professionals in all types of medical institutions qualified to provide mental health services.

Psychiatrists and psychiatric nurses

From 2002 to 2012, there was an uneven regional distribution of psychiatrists in mainland China, with most psychiatrists working in urban centres in the north-eastern and eastern parts of the country.³² In 2015, the number of psychiatrists (including accredited and assistant psychiatrists) per 100,000 population ranged from 1.85 (West China) to 2.58 (East China).¹⁴ In 2019, there were fewer than 500 full-time child and adolescent psychiatrists throughout mainland China, most of whom worked in major cities such as Beijing and Shanghai.²⁶ In 2009, 1643 psychiatrists and trainee psychiatrists working at regional psychiatric hospitals spent part of their work time providing services to community-dwelling individuals registered in the National Continuing Management and Intervention Program for Psychoses.⁵

The ratio of psychiatric nurses in mainland China was 5.51 per 100,000 population in 2015, ranging from 5.15 (West China) to 6.03 (East China).¹⁴ In 2009, 1491 psychiatric nurses participated in the National Continuing Management and Intervention Program for Psychoses, providing community-based services for persons with severe mental illnesses.⁵ [Note: in the remainder of this section, 'ratio' refers to the ratio of professionals per 100,000 population.]

Northeast China. [Heilongjiang, Jilin, and Liaoning] From 2001 to 2015, the ratio of psychiatrists *decreased* from 2.60 to 2.26 in Heilongjiang and from 2.60 to 2.11 in Jilin, while the ratio increased from 2.40 to 3.53 in Liaoning. The corresponding ratios for psychiatric nurses decreased from 8.50 to 6.41 in Jilin, while the ratio increased from 4.40 to 6.93 in Heilongjiang and from 5.65 to 9.16 in Liaoning.^{14,38,39}

More detailed information was available from Liaoning Province. The uneven regional distribution of psychiatrists and psychiatric nurses across 14 municipalities in Liaoning persisted over time^{67–70}; in 2009 the ratios of psychiatrists in these 14 municipalities ranged from 0.88 to 3.84 and that of psychiatric nurses from 2.59 to 12.21,⁷⁰ while in 2015, the ratios of psychiatrists ranged from 1.47 to 6.91 and that of psychiatric nurses from 4.57 to 18.31.⁶⁷ From 2009 to 2015, the proportion of psychiatrists with bachelor's degrees and above increased from 56.9% to 64.8%, while psychiatric nurses with a certificate from a technical secondary school and below *decreased* from 72.0% to 46.1%.^{67,70}

North China. [Hebei, Beijing, Tianjin, Inner Inner Mongolia, and Shanxi] The ratio of psychiatrists in 2001 in the five province-level administrative regions of

North China ranged from 0.50 in Hebei to 10.9 in Beijing (a twenty-fold difference), while the ratio of psychiatric nurses ranged from 1.85 in Hebei to 11.15 in Beijing (a six-fold difference).^{38,39} By 2015, the differential ratios between the five regions of North China had decreased somewhat: the ratio of psychiatrists ranged from 1.62 in Inner Mongolia to 5.57 in Beijing (a 3.4-fold difference), while the ratio of psychiatric nurses ranged from 3.56 in Hebei to 13.44 in Beijing (a 3.8-fold difference).¹⁴ [Beijing's burgeoning population partially explains the 49% drop in the ratio of psychiatrists in Beijing from 10.9 in 2001 to 5.57 in 2015.] Compared to the ratios in 2015, by 2017 the ratios of psychiatrists and psychiatric nurses in Inner Mongolia had increased to 2.65 and 17.27, respectively⁶⁴; and by 2019, the corresponding ratios in Beijing had increased to 6.95 and 15.26, respectively.⁴³

Differences between the districts within each province magnified the uneven distribution of psychiatrists and psychiatric nurses across the five provinces. For example, in 2015 the ratios of psychiatrists in the 16 districts of Tianjin ranged from 1.38 to 7.02, and the ratios of psychiatric nurses ranged from 1.60 to 16.46⁶⁷; in 2017 the corresponding ratios of psychiatrists in 12 cities in Inner Mongolia ranged from 0.86 to 5.86 and those of psychiatric nurses from 1.64 to 58.75⁶⁴; and in 2019 the ratios in of psychiatrists the 16 districts of Beijing ranged from 1.27 to 25.70 and those of psychiatric nurses from 3.68 to 55.50.⁴³

In 2009, the proportion of psychiatrists and psychiatric nurses in Beijing with bachelor's degrees and above was 68.2% and 8.2%, respectively⁴⁴; and in 2017 the proportion of psychiatrists and psychiatric nurses in Inner Mongolia with bachelor's degrees and above was in 72.1% and 51.1%, respectively.⁶⁴

East China. [Shandong, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, and Jiangxi] In 2015, there were 1.46 to 4.35 psychiatrists and 3.68 to 9.78 psychiatric nurses per 100,000 population among the seven province-level administrative regions in East China; Shanghai had the highest ratios of mental health professionals and Anhui had the lowest.¹⁴ In 2017 the ratios of psychiatrists and psychiatric nurses in Zhejiang were 4.56 and 9.06, respectively.⁹⁸ In 2018 the ratio of psychiatrists was 2.11 in Anhui⁴⁰ and 2.87 in Jiangxi.^{65,66} There was limited data available about the psychiatric workforce before 2015, but one report in 2001 from Anhui reported 1.0 psychiatrists per 100,000 population.^{38,39}

The uneven intra-provincial distribution of psychiatrists and psychiatric nurses was evident in several provinces in East China. For example, in 2007 the ratios of psychiatrists in nine municipalities in Fujian ranged from 0.40 to 3.42, and the ratios for psychiatric nurses ranged from 0.47 to 5.95²¹; in 2017 the corresponding ratios in 17 municipalities in Shandong ranged from

0.85 to 3.95 for psychiatrists and from 1.34 to 9.88 for psychiatric nurses⁷⁵; and the ratios in 11 municipalities in Zhejiang ranged from 2.76 to 7.19 for psychiatrists and from 5.56 to 16.43 for psychiatric nurses.⁹⁸ In 2018 the ratios of psychiatrists in 17 municipalities in Anhui ranged from 0.93 to 4.3.⁴⁰

In 2017 the proportions of psychiatrists and psychiatric nurses in Zhejiang with a bachelor's degree and above were 82.0% and 50.3%, respectively.⁹⁸ In 2018 the proportion of psychiatrists with a bachelor's degree or above in Anhui was 78.1%.⁴⁰

Central China. [Henan, Hubei, and Hunan] In 2001, the ratios of psychiatrists and psychiatric nurses in Henan were 0.8 and 1.3, respectively, while the corresponding ratios in Hunan were 1.6 and 3.9.^{38,39} In 2015, the ratios of psychiatrists in the three Central China provinces ranged from 1.90 to 2.38 and those of psychiatric nurses ranged from 4.51 to 5.84.¹⁴ Only one study reported the intra-provincial distribution of psychiatrists and psychiatric nurses: in 2008 the ratios in the 16 municipalities in Hubei ranged from 0.76 to 4.47 for psychiatrist and from 2.61 to 9.11 for psychiatric nurses.⁶²

South China. [Guangdong, Guangxi, and Hainan] In 2001, the ratios of psychiatrists and psychiatric nurses in Guangdong were 1.5 and 2.2, respectively,^{52,53} and the ratio of psychiatrists in Hainan was 3.4.^{38,39} In 2015, the ratios in the three South China provinces ranged from 1.54 to 3.10 for psychiatrists and from 4.64 to 7.38 for psychiatric nurses.¹⁴ Two studies in Guangdong Province compared intra-provincial ratios: in 2001 the ratios of psychiatrists and psychiatric nurses in 21 cities in the province ranged from 0.2 to 2.8 and from 0.1 to 5.2, respectively,^{38,39} while in 2014 the corresponding ratios in four districts in the province ranged from 1.30 to 2.24 and from 3.14 to 4.67, respectively.⁵⁰

In 2013, 72.4% of psychiatrists and 4.6% of psychiatric nurses in Hainan had bachelor's degrees and above⁵⁹; and in 2015, 46.0% of psychiatrists and none of the psychiatric nurses in Guangxi had bachelor's degrees or above.⁵⁴

Northwest China. [Qinghai, Xinjiang, Shaanxi, Gansu, and Ningxia] In Qinghai and Xinjiang, the ratios of psychiatrists in 2001 were 0.7 and 3.1, respectively, while the ratios of psychiatric nurses were 1.33 and 3.74, respectively.^{38,39} In 2015, the ratios of psychiatrists and psychiatric nurses in the five province-level regions of Northwest China ranged from 0.88 to 2.09 and from 1.29 to 5.18, respectively; the highest ratio of psychiatrists was reported in Shaanxi, and the highest ratio of psychiatric nurses was reported in Xinjiang, while the lowest ratios of psychiatrists and psychiatric nurses were reported in Qinghai.¹⁴ Two studies compared the intra-provincial distribution of psychiatrists and psychiatric nurses: in 2010 the ratios of psychiatrists and

psychiatric nurses in 14 cities in Xinjiang ranged from 0.30 to 9.22 and from 0.16 to 19.74, respectively^{92–96}; and in 2014 the corresponding ratios in 14 cities in Gansu ranged from 0.00 to 2.55 and from 0.00 to 7.78, respectively.⁴⁹ The educational level of psychiatrists and psychiatric nurses was only reported for Xinjiang: in 2010, 55.5% of psychiatrists and 4.3% of psychiatric nurses had bachelor's degrees or above^{92–96}; by 2013, 5.3% of psychiatric nurses had bachelor's degrees or above.⁹¹

Southwest China. [Guizhou, Chongqing, Sichuan, Yunnan, and Tibet] In Guizhou and Yunnan, the ratios of psychiatrists in 2001 were 0.6 and 1.6, respectively, while the ratios of psychiatric nurses were 1.06 and 2.59, respectively.^{38,39} In 2015, the ratios of psychiatrists and psychiatric nurses in the five provincial-level regions of Southwest China ranged from 0.00 to 2.40 and from 0.00 to 7.13, respectively; the highest ratio of psychiatrists was reported in Chongqing, and the highest ratio of psychiatric nurses was reported in Sichuan, while the lowest ratios of psychiatrists and psychiatric nurses were reported in Tibet.¹⁴ Only one study reported intra-provincial ratios: in 2014, the population ratios of psychiatrists in 14 cities in Sichuan ranged from 0.00 to 4.11. Three studies provided information about the level of training of psychiatrists and psychiatric nurses: in 2000, 35.0% of psychiatrists in Guizhou had a bachelor's degree or above⁵⁷; and in 2012, 87.8% of psychiatrists in Yunnan⁹⁷ and 13.9% of psychiatric nurses in Chongqing⁴⁸ had a bachelor's degree or above.

Other medical professionals

In addition to psychiatrists and psychiatric nurses, other professionals classified as 'medical professionals' in China who provide services to psychiatric patients include general physicians (who work in psychiatric speciality institutions providing medical services to psychiatric patients), pharmacists, imaging technicians, laboratory technicians, and public health physicians (who provide community follow-up in the National Continuing Management and Intervention Program for Psychoses). [Note: over the period covered by this review (1990–2021), national and provincial Health Yearbooks and research papers about the health workforce in China do not classify clinical psychologists, counselling psychologists, rehabilitation therapists, or social workers as 'medical professionals'—these types of professionals are discussed in subsequent sections.]

Twenty-four studies from different regions reported the total numbers and characteristics of all medical professionals (including psychiatrists, psychiatric nurses and other medical professionals) without stratifying the results by type of professional ([Supplementary Table S6](#)). One study in 2010 reported a national population ratio of medical professionals

working in the three types of psychiatric speciality institutions of 5.16 per 100,000 population; the corresponding values in 2010 for China's seven geographic regions ranged from 2.91 in Northwest China to 6.87 in Northeast China. There is little national information about the numbers and population ratios of medical professionals providing services to psychiatric patients who are not psychiatrists or psychiatric nurses. One national study that assessed all types of medical professionals working in institutions qualified to provide mental health services in 2015 reported that there were 0.06 public health physicians per 100,000 population providing mental health services.¹⁴ Ten studies provided provincial-level data on the population ratios of different types of medical professionals working in medical institutions qualified to provide mental health services in Liaoning (2013,^{68,69} 2015⁶⁷), Tianjin (2015⁸⁷), Inner Mongolia (2017⁶⁴), Guangdong (2001,^{52,53} 2013⁵¹), Hainan (2013⁵⁹), Guizhou (2014⁵⁶), Chongqing (2012⁴⁸), and Sichuan (2007^{85,86}). One study reported the population ratios of physicians and pharmacists working in China's National Methadone Maintenance Treatment (MMT) clinics in Yunnan from 2004 to 2011; the ratios rose sharply from 2004 to 2005 and then declined gradually after that.³⁴

Other types of professionals who provide mental health services in China

Several other professionals not officially classified as 'medical professionals' in China also provide services to individuals with mental illnesses, including clinical psychologists, counselling psychologists, rehabilitation therapists, social workers, and hotline operators. There has been controversy about the responsibilities and official occupational classification of clinical psychologists, counselling psychologists and rehabilitation therapists, so national and provincial health yearbooks and literature about the mental health workforce did not classify these professionals as 'medical professionals'. [However, based on the most recent Occupational Classification of the People's Republic of China released in 2022,²² in the future, clinical psychologists (but not counselling psychologists) and rehabilitation therapists will be classified as 'medical technicians' and, thus, 'medical professionals'.] Moreover, unlike the occupational classification in Western countries, social workers in China are classified as 'social work professionals', distinct from 'medical professionals'. The numbers, population ratios, and characteristics of these providers reported in the available literature are shown in the last column of [Table 2](#).

Clinical and counselling psychologists. In China, the national professional qualification programs for both clinical and counselling psychologists started in 2001. The qualifying requirements for clinical psychologists are much

more rigorous than counselling psychologists. Unlike counselling psychologists, clinical psychologists must work in medical institutions where they are permitted to provide psychotherapy to individuals with mental disorders. However, they are not allowed to diagnose mental disorders independently. In 2016, there were 5000 individuals accredited as clinical psychologists¹²; however, a national survey in 2015¹⁴ only identified 1615 clinical psychologists working in medical institutions, suggesting that less than half of the accredited clinical psychologists did relevant work. Getting certification as a counselling psychologist was much easier (reportedly too easy), so by 2016, their numbers rapidly increased to 897,000 (i.e., 180-fold the number of accredited clinical psychologists).¹² Similar to clinical psychologists, only 30–40% of the accredited counselling psychologists (30,000 to 40,000) are engaged in mental health-related work, but unlike clinical psychologists, most do not work in medical institutions.¹² Given concerns about the quality and short duration of the training of counselling psychologists, the national certification examination for counselling psychologists was terminated in 2017 and has not been reinstated (though some psychological associations continue to provide certification examinations that are not widely acknowledged). Twelve studies reported information on clinical or counselling psychologists at the provincial level; however, these studies were conducted in different institutions and over different time periods, so making meaningful comparisons between different provinces is impossible.

Rehabilitation therapists. Rehabilitation therapists are not professionally subclassified as physical or psychiatric rehabilitation therapists, so they are categorised based on their work location. That is, rehabilitation therapists working in psychiatric institutions are assumed to be psychiatric rehabilitation therapists. One national study in 2015 reported that 1060 (0.08/100,000) rehabilitation therapists worked in institutions qualified to provide mental health services.¹⁴ Ten studies reported relevant information at the provincial level. In 2014, the ratio of rehabilitation therapists in medical institutions qualified to provide mental health services per 100,000 population was 0.03 in Gansu⁴⁹ and 0.02 in Guizhou.⁵⁶ In 2015, the ratio was 0.09 in Guangxi,⁵⁴ 0.09 in Tianjin,⁸⁷ and 0.13 in Shandong.^{74,75} Apart from medical institutions, several psychiatric rehabilitation therapists work in community mental health rehabilitation institutions (usually affiliated with the Disabled Persons' Federation); a 2019 study in Shanghai identified 260 (1.04/100,000) rehabilitation therapists working in non-medical institutions.⁷⁶

Social workers. Social workers were first identified as a separate occupation in the 1990s. In 2006 the Ministry of Labor formally announced the "national professional

standards for social workers", and the annual national professional qualifying examination started in 2008. In the most recent Occupational Classification of the People's Republic of China, released in 2022, social workers are classified as 'social work professionals' (distinct from 'medical professionals'). However, there is still no separate certification for psychiatric social workers, so—like rehabilitation therapists—social workers employed in psychiatric institutions are assumed to be psychiatric social workers. Most psychiatric social workers are employed by social organisations and community mental health rehabilitation institutions (usually affiliated with the Disabled Persons' Federation), not by medical institutions. There is no reported information on the number of psychiatric social workers employed at these non-medical institutions. However, there is some information on social workers employed by medical institutions. The 2015 national study of the mental health workforce identified 1500 social workers employed in medical institutions qualified to provide mental health services.¹² Nine studies reported information on psychiatric social workers at the provincial level: in 2015, the number of social workers in medical institutions qualified to provide mental health services per 100,000 population was highest in Tianjin (0.15),⁸⁷ followed by Liaoning (0.13),⁶⁷ and lowest in Guangxi (0.08).⁵⁴

Others professionals. The number of hotline operators working at crisis intervention centres began to increase in 2000. By 2018, a government report estimated 616 hotline operators nationwide.²⁷ Before 2017, most hotline operators were trained as counselling psychologists, but since the 2017 termination of the national counselling psychologist certificate program, most crisis intervention centres have provided hotline operators with short-term, in-service training. A 2009 study reported the number of other types of human resources participating in the community-based National Continuing Management and Intervention Program for Psychoses, including 20,375 neighbourhood or village committee staff, 9557 case managers, and 2714 police officers.⁵

Mental health training of different medical professionals in mainland China from 2000 to 2020 Studies about the mental health training and qualification of different types of health professionals—including medical students, non-psychiatric physicians, psychiatrists, and other professionals—are listed³⁴ in Table 3.

Training for psychiatrists

Eight studies describe the training of psychiatrists in mainland China. Most clinical psychiatrists became psychiatrists after completing a postgraduate residency program after their undergraduate medical degree.

Some medical school graduates interested in psychiatry choose a non-clinical, research-oriented postgraduate program; these research psychiatrists are only accredited to do clinical psychiatry if they subsequently complete a clinical residency program. In 2014, a standardised psychiatry residency training program was promulgated nationwide and integrated with other clinical postgraduate medical programs; by 2015, 130 institutions nationwide were providing this standardised training program to psychiatric residents.^{9,12}

Starting in 2015, the National Family Planning and Health Commission implemented several programs to address the national shortage of psychiatrists. They promoted the development of 'undergraduate psychiatry major programs' (UPMPs) that provided degree courses for medical undergraduates majoring in psychiatry (i.e., during their undergraduate medical training).¹² The number of medical universities with UPMPs increased from four in 2014 to fifteen in 2016, and the number of students enrolled in the UPMPs increased from fewer than 400 in 2014 to 1132 in 2016.¹² (There is no up-to-date information available about the current number UPMPs or the number of students enrolled in these programs.)

Unlike most other countries, in China, non-psychiatrist physicians are not allowed to diagnose or treat mental disorders, so the pool of potential mental health providers is correspondingly smaller than in other countries. To help address this shortage, in 2015, the National Family Planning and Health Commission promoted training programs (based on a program piloted in Jiangxi Province in 2013^{65,66}) to license accredited physicians (i.e., medical school graduates) to provide psychiatric services.^{9,12} Under this program, general physicians already practising medicine receive training in psychiatry and can, after completing the training, formally register to expand the scope of their medical license to include providing psychiatric services. The program's target was to train 8500 physicians in the central and western provinces of China (locations with few accredited psychiatrists) by 2020; as of 2018, 4678 general physicians had completed the training,^{9,12} which usually consisted of one month of theoretical training, ten months of clinical practice, and one month of community practice.^{65,66} There is, however, no information available on the proportion of these trainees who provided mental health services after returning to their home institutions or, among those who do provide mental health services, the proportion of their work effort spent providing these services.

Another study reported on the training for Child and Adolescent Psychiatrists (CAPs)²⁴ in 28 of the 32 nationally approved training institutions for child and adolescent psychiatry. These training sites are clustered in more economically developed parts of the country: Beijing, Shanghai, Jiangsu, and Zhejiang. The clinicians who participated in the study (accounting for about 10% of all CAPs in the country) reported significant

Region	Reference Year(s)	Program Target population	Duration, content, and examination
TRAINING FOR ACCREDITED PSYCHIATRISTS			
Nationwide	(12) 2016	<ul style="list-style-type: none"> Undergraduate psychiatry major programs (UPMPs) Medical undergraduates majoring in psychiatry 	<ul style="list-style-type: none"> Degree course. Five years. The establishment of undergraduate psychiatry major programs (UPMPs) that provide a proportion of the students enrolled in medical school with mental health education comparable to undergraduate psychiatry education programs in developed countries. The Mental health-related course hours in the UPMP are three to six times higher than the standard undergraduate medical education programs in China.
	(33) 2007-2011	<ul style="list-style-type: none"> Psychiatric Residency Training Program Psychiatric residents 	<ul style="list-style-type: none"> Separate training course. One-year clinical rotations of basic clinical departments (4 months in neurology, 3 months in an emergency department, 2 months in a cardiovascular department and 2 months in a digestive department, and 1 month in an elective department) & national medical practitioner qualifications examination (enter the second stage only if pass the exam) Two-year psychiatric rotations (including 12 months in an intensive ward, 6 months in a mild and open ward, 3 months in an outpatient department and 3 months in an elective department) & national psychiatrists qualification exam (in prepared)
	(9, 12, 31) 2015-2018	<ul style="list-style-type: none"> Psychiatric Residency Training Program Graduates of undergraduate medical programs, having finished either a regular clinical medicine track or a dedicated psychiatry major track; research-type postgraduate medical students 	<ul style="list-style-type: none"> Separate training course. Two-phase clinical training as medical college students (Phase I is a resident training including rotation in the Cardiology Department, Emergency Department, Neurology Department and Psychiatry Department. Phase 2 is training only in the Psychiatry Department.) and passing the examinations of two training phases.
	(9, 12) 2015-2018	<ul style="list-style-type: none"> Psychiatrist licensing program for practising physicians Non-psychiatry physicians who would like to be trained to become psychiatrists in the central and western provinces 	<ul style="list-style-type: none"> Job-transfer training A one-year education program that includes 160 hours of coursework and over ten months of clinical rotations. The didactic components are divided into modules of psychiatry, clinical psychology, community mental health services, professional communication, and mental health rehabilitation.
Jilin	(10) 2016-2018	<ul style="list-style-type: none"> Psychiatrist licensing program for practising physicians Non-psychiatry physicians who would like to be trained to become psychiatrists in the central and western provinces 	<ul style="list-style-type: none"> Job-transfer training One-month theoretical training, 10-month clinical practice and one-month community practice; all students need to pass the theoretical training exam and clinical practice exam
Anhui	(41) 2016-2018	<ul style="list-style-type: none"> Psychiatrist licensing program for practising physicians Non-psychiatry physicians who would like to be trained to become psychiatrists in the central and western provinces 	<ul style="list-style-type: none"> Job-transfer training 12-month training: one-month theoretical training, 10-month clinical practice, and one-month community practice
Jiangxi	(65, 66) 2013-2015	<ul style="list-style-type: none"> Psychiatrist licensing program for practising physicians Non-psychiatry physicians who would like to be trained to become psychiatrists 	<ul style="list-style-type: none"> Job-transfer training 4-month full-time training, including one-month theoretical training and 3-month clinical practice; all students need to pass the theoretical training exam, clinical practice exam, and community practice exam
	(65, 66) 2016-2018	<ul style="list-style-type: none"> Psychiatrist licensing program for practising physicians Non-psychiatry physicians who would like to be trained to become psychiatrists 	<ul style="list-style-type: none"> Job-transfer training 12-month full-time training, including one-month theoretical training and 11-month clinical practice; all students need to pass the theoretical training exam, clinical practice exam, and community practice exam
TRAINING FOR CHILD AND ADOLESCENTS PSYCHIATRISTS (CAPs)			
Nationwide	(24) 2019	<ul style="list-style-type: none"> Current training of CAPs Not reported 	<ul style="list-style-type: none"> Degree course/post-graduation training The main forms of education and training for CAPs included: case studies of children and adolescents with mental disorders (33%), theoretical teaching (25%), rotary learning at the training hospitals with independent child and adolescent psychiatric wards and outpatient clinics (18%), related training of scientific research of children and adolescents with mental disorders (13%), and continuing education of adult psychiatric training (11%)
	(24) 2019	<ul style="list-style-type: none"> The Mental Health Training Course for Children of the Ministry of Health Not reported 	<ul style="list-style-type: none"> On-the-job training

(Table 3 continues on next page)

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Region	Reference Year(s)	Program Target population	Duration, content, and examination
TRAINING FOR THE NATIONAL METHADONE MAINTENANCE TREATMENT (MMT) PROVIDERS			
Nationwide	(34) 2005-2007	<ul style="list-style-type: none"> The National MMT Training MMT providers 	<ul style="list-style-type: none"> Separate training course An overview of MMT, diagnosis of heroin dependence, treatment of heroin dependence, behavioural and psychological characteristics of people dependent on heroin, overdose prevention, policy support for and administration of the MMT programme. pathology of opioid dependence, pharmacology of methadone, key points for MMT education and skills needed, and prevention of HIV infection
	(34) After 2008	<ul style="list-style-type: none"> The National MMT Training MMT providers 	<ul style="list-style-type: none"> Separate training course An overview of MMT, diagnosis of heroin dependence, treatment of heroin dependence, behavioural and psychological characteristics of people dependent on heroin, overdose prevention, policy support for and administration of MMT programme, pathology of opioid dependence, pharmacology of methadone, key points for MMT education and skills needed, prevention of HIV infection, counselling skills, motivational interviewing skills, management of poly-drug abuse, management of common mental health problems, reproductive health needs among female patients, methadone dosage, compliance and retention, the meaning of a positive urine test in an MMT patient, and prevention of hepatitis C virus infection.
	(36) 2004-2009	<ul style="list-style-type: none"> The National MMT Training MMT providers 	<ul style="list-style-type: none"> Separate training course Two specific training programs are provided to trainees. The first is a 10-day intensive training course covering addiction theory, clinical practice and administrative skills to deliver MMT services. The second is hands-on training provided on-site by clinical addiction experts who assist local staff for the first 7 days after a clinic has opened to supervise their provision of addiction treatment and data management.
TRAINING FOR CLINICIANS WHO PROVIDE SERVICES THROUGH THE NATIONAL CONTINUING MANAGEMENT AND INTERVENTION PROGRAM FOR PSYCHOSIS			
Nationwide	(5) 2006	<ul style="list-style-type: none"> The National Continuing Management and Intervention Program for Psychoses Psychiatrists, psychiatric nurses, community physicians, case managers, community workers, public security staff and family members 	<ul style="list-style-type: none"> Separate training course Two-level training model: guidance on project management, standardised treatment protocols, case management, information management, family education, and the training of police and neighbourhood committees.
	(5) 2007-2009	<ul style="list-style-type: none"> The National Continuing Management and Intervention Program for Psychoses Multi-skilled case workers 	<ul style="list-style-type: none"> Separate training course Tripartite training program; Developing understanding of the key principles of community-based mental health care in general and basic case management; providing practical skills in developing individualised service plans to maximise integration and continuity of care; exploring culturally appropriate ways to build partnerships with the patient, families and community; building skills to work in multidisciplinary teams; and providing opportunities to share ideas and plan for implementation.
	(6) 2000-2016	<ul style="list-style-type: none"> Certification in psychotherapy Not reported 	<ul style="list-style-type: none"> National provisions for qualifications and professional standards for counselling and clinical psychologists have not been accomplished. Many have only non-standard training courses with no supervised clinical experience
	(32) 2002-2012	<ul style="list-style-type: none"> Certification in psychotherapy Individuals who have no formal or systematic training and supervision in psychotherapy 	<ul style="list-style-type: none"> Training and accreditation programs are available through universities and their respective professional bodies. However, these programs do not always follow the standards developed in other countries. Fieldwork and practical training of psychotherapists usually fall short of the standards specified in other overseas institutions (e.g., hours of fieldwork practicum). Some teachers teaching fieldwork and practical training lack the necessary clinical training and experience. The current system accredits a clinical psychologist through public examination
	(31) 2012-2017	<ul style="list-style-type: none"> Certification in psychotherapy Clinical psychologists who work in hospital settings 	<ul style="list-style-type: none"> Medical professional and technical qualification examination system

(Table 3 continues on next page)

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Region	Reference Year(s)	Program Target population	Duration, content, and examination
TRAINING AND QUALIFICATION FOR CLINICAL AND COUNSELLING PSYCHOLOGISTS			
Nationwide	(13) Not reported	<ul style="list-style-type: none"> Mental Health Counselling Training Program (MHCTP) certification (three levels) Eligibility criteria for counselling psychologists at each level <p><u>Level 3:</u></p> <p>(a) Holds bachelor's degree or higher in psychology, education or medicine;</p> <p>(b) Graduate of secondary technical school, major in psychology, education or medicine, and completion of 720 h of training approved by MHCTP; or</p> <p>(c) Holds bachelor's degree in any other discipline and has completed 720 h of level three training approved by MHCTP.</p> <p><u>Level 2:</u></p> <p>(a) Holds doctorate in psychology, education, or medical degree;</p> <p>(b) Holds master's degree in psychology, education, or medicine and has completed 520 h of level two training approved by MHCTP;</p> <p>(c) Level three psychological counsellors who have 3 years of practice in counselling or therapy and completed 520 hours of level two training approved by MHCTP; or</p> <p>(d) Professionals holding intermediate technical or advanced degrees in psychology, education or medicine, 3 years of practice in counselling or therapy and completion of 520 h of level two training approved by MHCTP.</p> <p><u>Level 1:</u></p> <p>(a) Holds doctorate or higher in psychology, education, or medicine, completion of 320 h of level one training approved by MHCTP, and 3 years of practice in counselling or therapy;</p> <p>(b) Level two psychological counsellors holding a master's degree, 3 years of practice in counselling or therapy, completion of 320 hours of level one training approved by MHCTP; or</p> <p>(c) Professionals with the title of Associate Professors or higher in psychology, education, or medicine, 3 years of practice in counselling or therapy, completion of 320 hours of level one training approved by MHCTP.</p>	<ul style="list-style-type: none"> National examination
	TRAINING FOR SOCIAL WORKERS		
Nationwide	(32) 2002-2012	<ul style="list-style-type: none"> Training for social workers Not reported 	<ul style="list-style-type: none"> Training and accreditation programs are available through universities and their respective professional bodies. However, these programs do not always follow the standards developed in other countries. Fieldwork and practical training of social workers usually fall short of the standards specified in overseas institutions (e.g., hours of fieldwork practicum). Moreover, some instructors who teach fieldwork and provide practical training lack clinical training and experience.
	(6) 2000-2016	<ul style="list-style-type: none"> Training for social workers Not reported 	<ul style="list-style-type: none"> Graduates do not typically receive mental health training

Table 3: Training and certification of mental health providers in mainland China.

limitations in the training program, primarily related to a lack of scientific support for the recommended interventions and limited supervised clinical experience during the program.

Training for the National Methadone Maintenance Treatment (MMT) providers

Two studies reported on training service providers in the national MMT program.^{34,36} Starting in 2008, the training materials for these providers included expanded mental health components.³⁴

The National Continuing Management and Intervention Program for Psychoses

The National Continuing Management and Intervention Program for Psychoses was initially a pilot program funded by 6.86 million Renminbi in December 2004 called the '686 Program'.⁵ The goals of the program were to 1) popularise knowledge about the prevention and management of severe mental disorders, 2) improve the coordination of community-based treatment for individuals with severe mental disorders, and 3) reduce the prevalence of violent or socially disruptive behaviour by individuals with severe mental disorders. In 2006 the pilot program was expanded to include an intervention component and renamed the National Continuing Management and Intervention Program for Psychoses. The scope of this program was then gradually increased until it covered all of China; it currently has more than six million enrollees with severe mental illness. The mental health workforce for this national community-based service network includes psychiatrists, psychiatric nurses, community physicians, case managers, community workers, public security staff, and family members. A two-level train-the-trainer model (national and provincial levels) for training service providers at the provincial level was adopted in 2006 and later changed to a three-level training model (national, provincial, and local levels) that trained provincial-level providers who subsequently trained local providers.³

Training and qualifications for other human resources

Four studies reported information on the training and qualification of psychologists in China.^{6,13,31,32} In 2001, the Ministry of Labor formally announced the 'National Professional Standards for Psychological Consultants' and instituted national examinations for certifying counselling and clinical psychologists.^{6,31,32} However, there were no standardised training programs for these two types of psychologists.^{6,32} Initially, only physicians were permitted to participate in the national examination for clinical psychologists, and there were no specific requirements for taking the national examination for counselling psychologists. The clinical responsibilities of these two types of psychologists remained unclear until the 2013 release of China's National Mental Health Law, which specified that counselling psychologists

were not allowed to do psychotherapy or to diagnose or treat mental disorders. The annual national examination for counselling psychologists was permanently cancelled in 2017, primarily due to the non-specific requirements for taking the examination, the lack of supervised clinical experience for trainees, and the low proportion of participants who subsequently provided mental health services. Subsequently, counselling psychologists were accredited by psychological associations (e.g., the Chinese Psychological Society and the Chinese Mental Health Association), which enforced specific training and clinical experience requirements. In 2015, clinical psychologists were formally classified as 'medical technicians', and the government lowered the threshold for admission to the national examination for clinical psychologists to include non-physician psychologists working in medical institutions. After completing this examination, accredited clinical psychologists could provide psychotherapy to (but not diagnose) individuals with mental disorders.

Reports about the training of social workers in China indicate that the amount and quality of training about mental health issues in the training courses for social workers are deficient.^{6,32}

Discussion

Summary of the evidence

This scoping review identified 69 studies and two government reports about the human resources for mental health in China from 1996 to 2019. Several types of professionals provide mental health services, including psychiatrists, psychiatric nurses, other medical professionals (including pharmacists, general physicians, medical technicians, and public health physicians), clinical and counselling psychologists, rehabilitation therapists, occupational therapists, social workers, and hotline operators. The community-based National Continuing Management and Intervention Program for Psychoses also uses non-professional personnel to provide services to mentally ill individuals, including staff from local, neighbourhood or village committees, police officers, and patients' family members.

The number of psychiatrists (including assistant psychiatrists) has increased from 18,846 (1.51/100,000 population) in 2002 to 44,943 (3.19/100,000) in 2020, an increase of 139% (i.e., an average annual increase of 7.3%). Over the same timeframe, the number of all medical professionals working in psychiatric speciality institutions, which remain the primary institutions where mental health professionals work, increased from 52,428 (4.19/100,000) in 2002 to 187,078 (13.26/100,000) in 2020, an increase of 257% (i.e., an average annual increase of 13.5%). Among these medical professionals working in psychiatric speciality institutions, the number of registered nurses increased by 340%, from 25,572 (1.11/100,000) in 2002 to 112,463

(2.90/100,000) in 2020, an average annual increase of 17.9%.

Despite these dramatic increases in the per capita number of medical professionals working in psychiatric institutions, the uneven distribution of these personnel between provinces and within provinces remains a serious, unresolved problem. China's overall per capita numbers of psychiatrists and psychiatric nurses exceed the level for upper-middle-income countries reported in the recent World Mental Health Report,⁹⁹ but the numbers in some regions of the country are lower than those reported for lower-middle-income countries.¹⁰⁰ As is true for other medical professionals in China, medical professionals working in psychiatric institutions are clustered in major cities such as Beijing and Shanghai and China's Eastern and Northeastern provinces. Mental health personnel are limited in small-to mid-size cities in China's Central and Western provinces and effectively absent in Tibet and many rural communities. Specialised mental health providers for children and adolescents are scarce in mainland China; there are no full-time child and adolescent psychiatrists in most small-to mid-sized cities.

Compared to other countries, graduates from medical schools in China (about 880,000 per year) are not qualified or licensed to provide psychiatric services. This failure to train and accredit general physicians in psychiatry severely reduces the potential providers of mental health services for persons with common mental disorders such as depression and anxiety—services primarily provided by general physicians in other countries. Three programs have been initiated to try and bridge this gap: 1) the Undergraduate Psychiatry Major Programs (UPMPs) that provide additional psychiatric training to a small proportion of medical undergraduates who are then qualified to provide psychiatric services after graduation; 2) the Psychiatrist Licensing Program for Accredited Physicians that provides targeted psychiatric training to currently practising general physicians who are then licensed to provide mental health services; and 3) the National Continuing Management and Intervention Program for Psychoses that engages public health workers and cadres in neighbourhood committees to coordinate and monitor community-based services for persons with severe mental illnesses. However, the short duration and the variable content and quality of the training provided by these programs in different parts of the country seriously limit the volume and quality of the mental health services the graduates of these programs provide. The duration and content of these training programs need to be standardised (as has been done for the training programs of psychiatric residents). Moreover, it is essential to establish routine monitoring of the quality and outcomes of the programs to ensure that they are achieving their stated objective—increasing the

numbers and quality of mental health providers. In addition to promoting the national promulgation of standardised training programs, other scale-up solutions should be considered. For example, evidence-based e-health services could help reduce regional inequality in mental health human resources by providing a platform for providing remote care.

There are no standardized national or provincial training programs for psychiatric nurses, so much of their training is provided as in-service training after being hired to work at a psychiatric institution.

In 2016, nearly 5000 clinical psychologists and 30,000–40,000 counselling psychologists were engaged in mental health-related work. Despite establishing national certification examinations for clinical psychologists and counselling psychologists in 2001, no standardised requirements exist for enrolling and training these professionals (which is part of the reason the national exam for counselling psychologists was terminated in 2017). In 2018, 616 hotline operators were providing psychological crisis services nationwide, but there was no standardized training program for hotline operators. The studies and government reports identified in this review provided no information on the nationwide numbers or training methods of social workers, rehabilitation therapists, or occupational therapists.

Two programs recommended by the recent World Mental Health Report⁹⁹ could potentially be implemented in China to help deal with the shortage of professional mental health providers and move from a hospital-based mental health delivery system to a community-based delivery system. Evidence-based psychological interventions provided by non-specialist counsellors have proven highly effective for individuals with depression and anxiety¹⁰¹; standardised non-specialist counselling training programs in China could—if managed and monitored well—provide the workforce needed to implement these interventions for persons with common mental disorders seen in primary care settings. Peer support services involving individuals with mental illnesses using their own experiences to help one another have also been found to be effective for clinical and personal recovery from mental disorders⁹⁹; these types of programs are only just starting in China, but they could potentially be scaled up—particularly in under-resourced communities—to provide an additional layer of support for persons suffering from mental disorders.

Limitations in the available literature

This scoping review identified several gaps and methodological limitations in the available literature. Our formal assessment of the quality of the reports included in the review categorised one-quarter of the reports as either 'low quality' or 'low-to-moderate quality'. These reports often lacked detailed descriptions of the setting,

participants, and data sources and provided incomplete statistical analysis of the results. Variability in the methods and quality of the reports between provinces and over time make it difficult to be confident about reported changes over time or differences between different regions. However, it is reasonable to assume that single studies (or multiple studies by the same research team) that cover multiple provinces or multiple locations in a single province use similar methods, so the large intra-provincial differences in the mental health workforce and inter-provincial differences reported in multi-province studies are presumed to be real differences.

Three significant gaps in the literature made it challenging to construct a comprehensive picture of the human resources available for delivering mental health services in China.

First, the available reports did not cover all time periods and did not provide any data from several parts of the country. Identified reports provided workforce data for periods between 1996 and 2019, but almost all of the reports were about time periods before 2017; only 17 reports provided data for 2017 or later. Moreover, the data available from studies and yearbooks only covered specific years in a limited number of locations, making it impossible to provide systematic comparisons between regions or over time. For example, data on all medical personnel in Hebei Province provided in the provincial-level health yearbooks covered 2000 to 2013, while data from Chongqing Province yearbooks covered 2015 to 2020. Unfortunately, no relevant data were available from the yearbooks of 11 of mainland China's 31 province-level administrative regions. The most comprehensive inter-provincial data were provided from a single multi-province study conducted in 2015.¹⁴ The utility of such multi-province studies for providing comparable data that can be used to identify regional differences in the numbers, types, and quality of mental health providers is much greater than that provided by multiple province-specific studies that use different methods of data collection (and, thus, are much less comparable).

Second, most studies focused on psychiatrists and psychiatric nurses working in speciality psychiatric institutions; minimal data is available on other types of professionals or professionals working in other types of institutions that provide services to mentally ill individuals. Traditionally, China's mental health service system has been dominated by speciality psychiatric hospitals, but there has been a gradual (perhaps too gradual) transition to providing more mental health services in community-based general hospitals, health clinics and rehabilitation centres.⁵ This trend accelerated after the 2004 launch of the community-based National Continuing Management and Intervention Program for Psychoses.^{6,32} This expansion in the range of services provided and in the locations where services are provided has been associated with increased diversity in the

range of professionals that provide services to individuals with mental illnesses. Most available studies do not consider the wide range of institutions that provide mental health services or the wide range of professionals that provide mental health services. For example, an increasing number of non-government organizations and private clinicians are providing mental health services, including psychological counselling, rehabilitation work, peer support, and suicide prevention,² but the numbers and characteristics of mental health providers in these organisations and private clinics remain unknown. Promoting this transition of mental health services from speciality psychiatric hospitals to a diverse range of other types of community-based services will require up-to-date data about the number of such institutions and, importantly, the numbers and types of mental health providers working in such centres. Future studies about mental health service providers must be expanded to include alternative types of institutions and the full range of professionals that provide full-time or part-time services to individuals with mental illnesses.

Third, few studies reported the educational levels and qualifications of the identified mental health providers. The limited number of studies that did provide this information often provided contradictory data, possibly because they used different data-collection methods or covered different periods.^{13,14} Moreover, studies that provided information about training programs (primarily about the training of psychiatrists) did not include information about the evaluation of the programs or about the degree to which the programs achieved their stated objectives. China's National Mental Health Law specifically states that both the number and quality of mental health providers need to be increased. Improving the coverage and quality of mental health services will require collecting regularly updated data on the training of all types of current mental health providers and rigorous assessment of the effectiveness of training programs aimed at improving the quality of services provided by both current and future mental health service providers.

Conclusions

In the past 20 years, there has been a remarkable increase in the number of mental health providers in China, especially psychiatrists and psychiatric nurses. However, the inequitable regional distribution of these professionals has increased over time, with most clustered in major cities and in Northeast and East China. Unlike most countries, graduates from 5-year and 8-year undergraduate clinical medical programs are not qualified or licensed to provide mental health services, severely limiting the potential number of mental health providers. Several undergraduate and postgraduate training programs aimed at increasing the number of psychiatrists have been launched, but the duration and

content of the programs have yet to be standardised, so it is uncertain whether or not they will achieve their stated objectives. Unlike the training for psychiatrists, there are no national (or provincial) standardized training programs for psychiatric nurses. As China tries to move the focus of mental health services from speciality psychiatric hospitals to general hospitals, community clinics, and other service centres, psychologists, counsellors, social workers, occupational therapists, and other professionals are an increasingly important part of the mental health workforce, but there are no standardised training programs for these professionals and the data available on the numbers and training of these professions is minimal or, in many parts of the country, absent. Future studies about the human resources for mental health services in China need to include multiple provinces (ideally, all 31 provinces), the full range of institutions that provide mental health services (not limited to speciality psychiatric institutions), the full range of professionals and non-professionals that provide services to individuals with mental illnesses, and an assessment of the training needs of the identified providers. Moreover, studies about training programs for mental health providers need to use rigorous methods to evaluate the fidelity of the implementation of the programs, the process outcomes (e.g., number of enrollees and graduates) and, most importantly, the long-term outcomes of the programs—that is, whether or not they achieve the stated objective of improving the coverage and quality of mental health services in the county.

Contributors

MS, HZ, and YL conducted the literature search. MS, HZ, YL, XY, and WY assessed the study quality. MS, HZ, JW, JX, JZ, YL, YG, and WY conducted the data extraction and cross-checked the extracted data. MS made the figures and tables and wrote the first draft. MB, MRP, and LZ contributed extensively to data interpretation and discussion. All authors contributed to the study design, data analysis, data interpretation, manuscript write-up, and revision.

Editor note

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Declaration of interests

The authors declare no conflict of interest.

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Appendix A. Supplementary data

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