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Systematic Review

# Psychological and behavior investigation of Chinese residents: Concepts, practices, and prospects☆

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ABSTRACT

To provide researchers with a comprehensive understanding of the Psychological and Behavior Investigation of Chinese Residents (PBICR), this paper introduces its background and features from four aspects. In terms of design concept, the PBICR focuses on various aspects of the mental health and health behaviors of the Chinese population, takes full account of timeliness and efficiency, adheres to the original intention of open data access and data sharing, and builds a high-quality database with large-sample, multi-center, repetitive, and a nationwide cross-sectional design to promote data mining and exchange and cooperation; in terms of survey implementation, the PBICR adopts a combination of population size-proportional, multi-stage sampling and quota sampling, and obtains data through face-to-face field surveys with strict quality control to ensure the representativeness and reliability of the samples. Regarding to the output, the PBICR's research content is rich and updated in line with international hotspots, which can satisfy the demand for research needs on diversified variables and data. Previous research results have had a significant impact in many fields such as public health, management, communication, and psychology. Looking ahead, the PBICR will gradually complete the construction of databases from the general database to sub-databases, pay attention to special populations and globally widespread areas, add perspectives on tracking surveys and biomedical data research, and have greater research potential to drive research on the mental and behavioral health of Chinese population through the overall layout of the multi-dimensional.

With the rapid development of China's economy, China is facing unprecedented challenges in terms of mental and behavioral health issues. Meanwhile, the rising prevalence of chronic non-communicable diseases means that the health behaviors of people in China deserve more attention from the academic community. Mental and behavioral health problems are also chronic issues and in public health agenda. The Psychological and Behavior Investigation of Chinese Residents(PBICR) was emerged in this context. The PBICR aims to establish a database that is grounded in classic research, focused on current affairs, and forward-looking databases for the future. This enables scholars in relevant fields to use reliable data to monitor changes in the mental health status and health behavior patterns of people in China. Since its inception in 2020, the PBICR has completed four rounds of data collection, with continuously improving data quality. To provide researchers with a more comprehensive understanding of this study, this paper will detail the design concepts of the database, explain how mental and health behavior data are collected, organized, and stored, and offer methods for data quality control. Finally, it will summarize the relevant findings obtained so far and provide prospects for the future.

## Design concept

### *Research content: individual psychology and behavior*

Mental health is defined as a state of well-being in which individuals can respond effectively to the stresses of life, realize their potential, work productively, and contribute to their community.[1] Common mental health issues include, but are not limited to, depression, anx-

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iety, stress and lonelines. The PBICR investigates the mental health status of people of China using well-established scales in its questionnaires. During repeated cross-sectional studies, it continuously monitors traditional mental health issues while exploring new mental health variables brought about by the times. In 2022, the prevalence of depression in China was approximately 10.6 %, the risk of anxiety was about 15.8 %, and the global prevalence of mental disorders was around 13 %.[2-3] In the same year, the PBICR found that the comorbidity rate of depression and anxiety in China was 11.72 %.[4] The government of China actively responds to the WHO's call and is committed to improving the accessibility of mental health services. In 2018, the government of China released the "National Social Psychological Service System Construction Pilot Work Plan," aiming to enhance the scientific nature of the mental service system and broaden its scope.[5] Commenced in 2020, the PBICR has focused on the mental health issues of people in China, hoping to expand research possibilities through database construction.

The physical and mental health of people in China, influenced by traditional culture and economic development, manifests in specific health behaviors. There are various definitions of health behavior internationally, and the WHO believes that human behavior impacts health outcomes.[6] Health behavior is a crucial means of disease prevention, while poor health behavior is one of the significant causes of disease occurrence.[7] The WHO has been dedicated to promoting health behaviors by issuing global health promotion guidelines and policy recommendations to guide member countries' actions. For instance, the "Global Action Plan for the Prevention and Control of Noncommunicable Diseases (NCDs)" emphasizes the importance of preventing and controlling noncommunicable diseases, including encouraging healthy eating, increasing physical activity, and reducing tobacco and alcohol consumption.[8] The Chinese government promotes nationwide health through the "Healthy China 2030 Plan," which includes promoting healthy lifestyles and controlling major health risk factors.[9] Research has demonstrated the significant impact of health behaviors on chronic non-communicable diseases, particularly in the aftermath of the COVID-19 pandemic.[10] Health behaviors are complex and diverse, and the PBICR provides a data platform for scholars to explore the health behaviors of people in China through a combination of self-developed questionnaires and well-established scales.

Mental health and health behaviors are interrelated, a lack of mental health can affect individual behavioral decisions, while a lack of good health behaviors can weaken the physiological foundation of mental health. The two influence each other and jointly impact individuals' health outcomes. Following the steps of the Healthy China initiative, the PBICR hopes to provide a data foundation for more health policies through database construction.

### *Research design: cross-sectional study design*

The annual data collection of the PBICR is achieved through a cross-sectional study design. The reason the PBICR opts for a cross-sectional study design is that it allows for the collection of large amounts of data in a short period, making it highly effective for observing phenomena or variable relationships at a specific point in time. The design can be implemented with fewer resources and costs, without the need for long-term tracking of specific study subjects. Additionally, it enables the rapid acquisition of relevant data, which is beneficial for quickly grasping research data on current hot topics. However, compared to cohort studies, cross-sectional studies have some shortcomings. Firstly, cross-sectional studies cannot determine causal relationships; they can only describe the correlation between different variables and cannot prove the temporal sequence or causality. Secondly, cross-sectional studies cannot account for the dynamic characteristics of individual development and changes, lacking observation and analysis in the time dimension. Influenced by recall bias and selection bias, the authenticity of the data may be affected to some extent.

Many databases in China and abroad are currently built on cross-sectional study designs, such as the China Health and Nutrition Survey (CHNS) and the National Health and Nutrition Examination Survey (NHANES) in the United States. The PBICR focuses on traditional mental health and health behavior issues among people in China and on new mental health and health behavior issues arising from rapid changes in the times. Using a cross-sectional study design to collect data is economical, rapid, and effective. Although this approach inevitably has design defects, these can be partially mitigated through statistical methods, revealing data trends and changes and aiding in causal inference.

### *Research philosophy: data openness and sharing*

In the context of the digital age, data has become an important resource that can drive social progress and scientific development. With the increasing recognition of the importance of individual mental health and individual health behaviors in the public health field, establishing and sharing relevant databases has become a crucial step in supporting scientific research, disciplinary development, policy-making, and public education.

The joint construction of a database requires the collective wisdom of all parties involved. Expert consultation is a critical component, as the participation and guidance of experts can ensure the scientific validity and feasibility of the research design. On the other hand, professional investigators ensure the quality and reliability of the data. The sharing model of the PBICR database involves phased opening up. After the data are entered into the database, it is initially made available to scholars and students who play a significant role in its construction. Over time, the data is fully disclosed, allowing more researchers to freely access and use it. Fully open data only requires the source to be credited, with no additional usage conditions attached. The research team, experts, investigators, and other researchers who use the data can all benefit from data openness. Outputs based on the database can greatly support its further development. The research team and experts can provide more practical and research-aligned professional opinions for subsequent surveys based on previous data. Investigators, by utilizing the data, can not only produce scientific results but also further ensure data quality through practice.

The construction, openness, and sharing of the PBICR database aim to provide more academic resources and data support through interdisciplinary cooperation and resource integration, addressing the issue of insufficient data for young scholars. The PBICR hopes to break information silos through openness and sharing, further promoting communication and cooperation among government departments, the academic community, healthcare institutions, and the general public.

## Survey implementation

### *Organizational framework*

To ensure the smooth implementation of the project, the PBICR continuously adjusts and optimizes its research team. Since 2022, the PBICR project team has established a functional organizational framework, comprising an expert committee and four research working groups (investigator group, training coordination group, scale design group, and quality control group). These groups are responsible for project design and data management, recruitment and training of the survey team, introduction and registration of scales, and professional advancement and efficient implementation of the project.

Take the 2023 Psychological and Behavior Investigation of Chinese Residents (hereinafter referred to as PBICR-2023) as an example, an

**Table 1**
Database overview of psychology and behavior investigation of Chinese residents, 2020–2023.

| Sample size | 2020<br>30 cities | 2021<br>120 cities | 2022<br>148 cities | 2023<br>150 cities |
|---|---|---|---|---|
| Pre-quota | About 3 100 | About 11 000 | About 31 000 | About 45 000 |
| Post-quota | – | – | About 22 000 | About 30 000 |
| Survey method | Non-face-to-face survey | Face-to-face survey | Face-to-face survey | Face-to-face survey |

expert committee, composed of invited experts from fields such as psychology, management, public health, and statistics, was formed to provide guiding suggestions and improvement advice for research design and survey implementation. The investigator working group, consisting of provincial leaders, survey teams, and investigators, was responsible for connecting with urban communities or rural areas for face-to-face field surveys. The scale design group, composed of members with professional backgrounds in psychology and statistics, ensured the rational and scientific selection of questionnaire variables, development, introduction, streamlining, and standardized translation of scales. The training coordination group determined the training content for investigators, submitted reviews to the ethics committee, and completed research registration, ensuring the project's legality and compliance. The quality control group played a key role in pre-survey, data logic check rule formulation, and sampling method selection, tracking the research process throughout. The five sub-teams each focus on their specialized functional areas and maintain stable cooperation. The PBICR project team has gradually developed into a research team with rich experience and a clear and mature structure.

*Sampling design*

As a recurrent national cross-sectional study, the PBICR aims to provide data across China, targeting individuals in all provinces, municipalities, autonomous regions, and special administrative regions of China. Over the past four years, the PBICR has expanded its survey scale, gradually covering more cities and increasing the sample size (Table 1). In recent years, PBICR's sample size has grown from 10,000 to 40,000, with a stable increase in the number of sampled cities. The survey areas now cover 22 provinces, 5 autonomous regions, 4 municipalities, and 2 special administrative regions, excluding Taiwan. To enhance sample representativeness and reduce survey costs, PBICR employs multi-stage sampling. The planned sample size each year exceeds the minimum required, with sample distribution in each province based on their respective population proportions.

Despite the varying annual sample sizes, the PBICR consistently adheres to a rigorous and standardized sampling procedure to ensure data quality and meet data usage needs. Using the PBICR-2023 as an example, the first stage involves equal probability sampling, where four municipalities (Beijing, Tianjin, Shanghai, and Chongqing) and two special administrative regions (Hong Kong and Macau) are directly included in the study. For the 22 provinces and 5 autonomous regions, a sampling frame is used to determine the number of cities to be sampled based on each province's or autonomous region's population base, and 2 to 12 cities are randomly selected using a random number table method. A total of 150 cities are sampled in the first stage. In the second stage, probability sampling is used to determine the number of communities to be sampled within the 150 selected cities, based on the population base of the primary administrative area where the city is located. A total of 800 communities are selected across all provinces, with a ratio of urban (3) to rural (2) communities, resulting in 10 to 60 communities per province. The third stage involves quota sampling of population within each selected community. The quota attributes are gender and age, with a gender ratio of 1:1 and an age distribution that aligns closely with China's "population pyramid" age proportions.

*Field survey*

The PBICR adopts scientific survey methods aimed at providing real, accurate, and comprehensive data. To facilitate direct communication between investigators and respondents, allowing for real-time adjustments based on actual situation, and to actively address and flexibly handle situations where respondents are not serious or are unable to complete the survey, thereby enhancing respondent motivation and response rates, the PBICR has employed one-on-one, face-to-face field surveys over the past three years. Additionally, to ensure data reliability and accuracy, meet the diverse needs of design principles and logical item skips, maintain the convenience and efficiency of data collection, and facilitate real-time data management and survey progress tracking, the PBICR has conducted field surveys using electronic questionnaires over the past four years. This method allows for the efficient distribution and collection of data, ensuring the integrity and usability of the survey results.

Using the PBICR-2023 as an example, each survey implementation strictly follows the survey process. First, in each province, investigators contact the local community health centers or neighborhood committees that have been selected and are willing to cooperate with the survey to establish local survey sites. Investigators recruit participants through various methods, including posting flyers and distributing paper or electronic recruitment notices. Second, investigators verify the identities of potential participants, ensuring they meet the inclusion criteria and do not meet any exclusion criteria. The information filled out by participants is automatically collected on a backend server. Third, investigators conduct one-on-one, face-to-face administration of the electronic questionnaires to the participants. Participants can access the questionnaire by scanning a QR code or clicking a link. Fourth, during the survey, participants provide informed consent. Investigators either input the questionnaire number or inform the participants of the questionnaire number. If a participant has the cognitive ability but is unable to complete the questionnaire, the investigator conducts a one-on-one interview and records the responses on behalf of the participant.

*Inclusion and exclusion criteria*

The PBICR targets people in China and has continually adjusted the inclusion and exclusion criteria of survey participants to better align with the research objectives. It is noteworthy that, considering the overall structure and the construction of sub-databases, the PBICR has made appropriate adjustments to the age criteria of study participants starting in 2023. The age criteria for the main PBICR database in 2023 have been adjusted from ≥12 years old to ≥18 years old. For the population under 18, based on the exploration of building a comprehensive database for the people in China from 2020 to 2022, the PBICR established a sub-database in 2023 targeting children aged 8 to 18 years as follows.

Inclusion criteria: (1)aged 12 years and older(age 18 years and older in the PBICR-2023 ); (2)citizen of China; (3)permanent resident of China(time spent abroad ≤1 month/pa); (4)able to complete the online questionnaire independently or with the help of an investigator; (5)able to understand the meaning of each item in the questionnaire. Exclusion criteria: (1)unconscious or with severe mental disorders; (2)with cogni-

**Table 2**
Core variables retained in the psychology and behavior investigation of Chinese residents, 2020–2023.

| Variables | Trajectory variables | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| Mental dimension variables | Depression | – | PHQ-9 | PHQ-9 | PHQ-9 |
| | Anxiety | – | GAD-7 | GAD-7 | GAD-7 |
| | Stress | – | Self-editing (3 entries) | PSS-4 | PSS-4 |
| | Big five personality | – | BFI-10 | BFI-10 | BFI-10 |
| | Social support | – | PSSS | PSSS-SF | PSSS-SF |
| Behavioral dimension variables | Physical activity | – | – | IPAQ-7 | IPAQ-7 |
| | Sleeping | – | – | B-PSQI | B-PSQI |
| | Smoking | Self-editing (3 entries) | Self-editing (1 entry) | Self-editing (9 entries) | Self-editing (4 entries) |
| | Tobacco dependence | | FTND | | FTND |
| | Alcohol consumption | Self-editing (1 entry) | Self-editing (5 entries) | Self-editing (7 entries) | Self-editing (7 entries) |
| | Family communication | | | FCS | FCS-SF |
| Other scales | Quality of Life | EQ-5D,EQ-VAS | EQ-5D,EQ-VAS | EQ-5D,EQ-VAS | EQ-5D,EQ-VAS |
| | Self-efficacy | NGSES | NGSES | NGSES-SF | NGSES-SF |
| | Health literacy | – | HLS-12 | HLS-9 | HLS-4 |
| | Family health | – | FHS-SF | FHS-SF | FHS-SF |

**Table 3**
Selected characteristic variables of psychology and behavior investigation of Chinese residents, 2020–2023.

| | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|
| Behavior | Proactive waste sorting<br>Work style<br>Physical examination behavior | Food intake for feeding infants<br>Home first aid essentials preparation | Light fasting behavior<br>Gardening activities<br>Cell phone use at bedtime<br>Drinking water, tea, and alcohol behavior<br>Exposure to third-hand smoke | Antibiotic use behavior<br>Art exposure<br>Unpaid housework<br>Chinese medicine use behavior<br>Problem diet screening |
| Current affair | Long-term job characteristics<br>Focusing on the body's cancer signs | Types of smart home<br>Support for low carbon living<br>Willingness to be vaccinated with secondary vaccines<br>Support for building smoke-free environments | Nearby high-polluting businesses<br>Acceptance of hospice care<br>Acceptance of legal egg donation<br>Acceptance of pharmacy clinic<br>Acceptance of gene therapy | Acceptance of teleconsultation<br>Acceptance of fecal donation<br>Number of infections with COVID-19<br>Acceptance of smart Aging system<br>Degree of anxiety over (re)reproduction |

tive dysfunctions (identified based on records from community health centers and self-reports of mental illnesses by the respondents); (3)currently participating in another study (to reduce the interference of duplicate samples and prevent research fatigue); (4)unwilling to participate in this study.

*Questionnaire design*

The PBICR questionnaire covers seven modules: individual basic information, individual health situation, basic family information, mental dimensional scales [e.g. The Patient Health Questionnaire (PHQ-9),Generalized Anxiety Disorder-7 (GAD-7), Perceived Stress Scale 4 (PSS-4) et.al], behavioral dimensional scales [e.g. International Physical Activity Questionnaire-7(IPAQ-7), Brief version of the Pittsburgh Sleep Quality Index (B-PSQI) et.al], other scales [EQ-5D,EQ-VAS, New General Self-efficacy Scale-short form(NGSES-SF) et.al], and current hot topics. To stay aligned with academic research trends worldwide, fit the research objectives, and accurately reflect the mental and behavior health status of people in China, the PBICR has continuously enriched and optimized the content of each module over the past four years through systematic reviews and expert consultations. The PBICR has developed, introduced, and refined scales to cover more mental and behavioral variables, meeting the research need for diverse variable and data while maintaining an appropriate questionnaire length for convenient administration. From 2020 to 2023, core variables have been updated and adjusted, while approximately 30 % of the variables have been retained for longitudinal analysis (Table 2). Each year, guided by relevant Chinese policies and considering the needs of cutting-edge international research, the PBICR rotates and enriches the questionnaire content with unique features (Table 3).

*Quality control*

High-quality data is the foundation for effective decision-making and reliable research. To effectively control bias, the PBICR's quality control procedures have undergone four years of exploration. Initially, in 2020, quality control only involved logic checks and data screening modules. Starting in 2021, the quality control process has been integrated throughout the entire logic check phase. The PBICR strictly adheres to scientific design principles and statistical requirements and has developed a mature quality control procedure for survey research.

During the questionnaire design phase, the expert committee evaluates the logical structure of the questionnaire, data validation rules, logic skip settings, and the appropriateness of scale selection. They conduct expert consultations and value discussions (the consulted experts all hold senior titles and represent diverse regions, with professional backgrounds including social medicine, health education, health statistics, health service management, behavioral epidemiology, psychology, humanistic medicine, communication, clinical medicine, pharmacy, nursing, sociology, philosophy, and other fields). The scale design group refines the questionnaire based on the feedback received.

During the pre-survey phase, three rounds of pre-surveys are conducted to identify issues related to the questionnaire design. The questionnaire is then refined based on team discussions. The sampling method for the pre-survey is quota sampling, with quota attributes identical to the requirements of the formal survey. Each pre-survey sample consists of 100 participants, and the questionnaires collected during the pre-survey phase are not included in the final research analysis. The

quality control team establishes logic check rules based on the final version of the questionnaire.

During the investigator training phase, the training coordination group develops a training program based on the finalized questionnaire version. Through three comprehensive training sessions, they address the questions of the investigator group, provide an overall understanding of the project, enhance investigators' survey skills, and standardize operating procedures. Additionally, provincial leaders, investigators, and the investigator team undergo training assessments. Only those who pass the assessments are permitted to begin the formal survey, ensuring the selection of high-quality provincial leaders, investigators, and investigator teams.

During the questionnaire distribution phase, investigators and their teams distribute the questionnaires according to survey standards and register and code the research subjects. The quality control team screens out unqualified questionnaires according to logic check rules and reminds investigators of important points before starting the survey each day. Weekly meetings are held on Sunday evenings where the overall research team communicates with the investigator group, summarizes and evaluates the questionnaires collected by each investigator and team, promptly identifies issues, and urges corrections.

During the data processing phase, the quality control team checks and cleans the questionnaire data according to strict logic check rules. Based on the results of the seventh national census of China, the data is adjusted for gender (with a 1:1 gender ratio) and age (in line with the age distribution of China's "population pyramid").

## Research prospect

*Research subjects: from general to specific populations*

The PBICR is a investigation focuses on the mental health and health-related behaviors of people in China, aiming to continuously develop a database of mental and behavioral data for this population. Since the inception in 2020, the PBICR has targeted people in China. The number of sampled cities has increased from 30 to 150, and the sample size has grown from 3000 to 45,000, covering various age groups, including adolescents, middle-aged adults, and the elderly. Scholars can investigate the current status and trends of mental and behavioral patterns across different ages, educational levels, and regions in China based on the PBICR data. They can also explore the correlations between various mental and behavioral variables.[11-19] The large sample size and cross-sectional nature of the entire population enhance the generalizability of the research findings. Therefore, the research outcomes derived from the PBICR database are highly applicable and reliable across the general population.

While building a comprehensive database for the general population, the PBICR project team is also focusing on the health influencing factors of specific populations. The content design remains focused on mental health and health behaviors. The team is currently working on constructing sub-databases for special diseases and specific populations (Tables 4 and 5), with plans to build databases targeting children aged 8–18, pregnant and postpartum women, caregivers, patients with androgenic diseases, and patients with chronic diseases. Through overall planning and scientific design, the core variables of the sub-databases will be strictly comparable to those of the main database. The special population databases, as sub-databases, will be parallel to the main cross-sectional database of the general population. The construction approach is highly related, with a significant overlap in variable settings, facilitating the integration of main database data with sub-database data. This will allow for horizontal comparisons of mental and behavioral health differences between the general population and specific populations.

*Research design: from cross-sectional to longitudinal studies*

At the inception of the PBICR, a cross-sectional study design was adopted to ensure that the collected data was timely and better reflected the current state of population's mental health and health behaviors in each year. This design also aimed to provide preliminary clues and empirical evidence for analytical and experimental research.

The limitation of cross-sectional studies is difficulty in determining causal relationships. To better infer causality, the PBICR project team plans to maintain the cross-sectional study design of the general population database while adopting a cohort study design (Tables 4 and 5). The team aims to gradually build longitudinal databases for specific populations, such as pregnant and postpartum women, caregivers, and middle school students. Scholars in related fields will be able to longitudinally investigate the relationships between various factors and specific outcomes within these special populations. This approach allows for a thorough and direct analysis of the etiological roles of mental and behavioral health factors, providing more clues to uncover causal relationships between different exposure factors and outcomes. In addition to building cohort databases, the PBICR project team will also employ randomized controlled trials (RCTs). For instance, interventions will be applied to chronic disease patients using the Artificial Intelligence-based Health Education Accurately Linking System (AI-HEALS) .[20] RCTs help balance confounding factors, improve comparability between groups, and confirm the etiological roles of risk factors for mental and behavioral health in special populations through interventional research. This will provide evidence for clinical decision-making.

*Measurement tools: from questionnaire data to biomedical data*

To ensure scientific research design, facilitate the conceptualization of research objectives, maintain strict quality control, enable precise variable settings, and achieve stable and objective measurement indicators, the PBICR uses face-to-face questionnaire surveys to collect data. This method supports standardized data management and a logical sequence for unified data reception, considering various application scenarios in communities and the time required for survey implementation. Long-term survey practice has shown that using questionnaires as the measurement tool yields high-quality data.

Referencing methods and experiences from globally influential survey projects, the PBICR plans to incorporate multiple approaches such as interviews, physical examinations, and biomedical index collection in future surveys. This will include collecting objective data such as physical dimensions, biomarkers, and clinical diagnostic records to more accurately reflect the health status of people in China. Currently, some sub-databases have already started including biochemical indicators and clinical outcomes in their data collection. For example, the sub-database for pregnant and postpartum women includes prenatal screening biomarkers in the "Current Pregnancy Information" module and vital signs indicators such as postpartum hemorrhage in the "Current Delivery Information" module. In the future, the PBICR aims to collect comprehensive and diverse data through a variety of methods, building on the successful implementation of questionnaire surveys to enhance the diversity of data types.

*Research strategy: from quantitative to mixed methods research*

Quantitative research methods are data-based and use statistical tools to precisely express the objective relationships between phenomena. These methods are widely applied in various research fields, including social and natural sciences. Over the years, the PBICR has used quantitative research methods to collect and analyze data on the mental and behavior health of people in China. This approach has helped establish relationships between different variables, identify potential men-

**Table 4**
Overview of each database.

| Name of database | | Research design | Research strategy | Scope of survey | Data source | Data type | Target population |
|---|---|---|---|---|---|---|---|
| Master database | PBICR-2020 | Cross-sectional study | Quantitative research | China | Community | Questionnaire | Population ≥12 years old |
| | PBICR-2021 | Cross-sectional study | Quantitative research | China | Community | Questionnaire | Population ≥12 years old |
| | PBICR-2022 | Cross-sectional study | Quantitative research | China | Community | Questionnaire | Population ≥12 years old |
| | PBICR-2023 | Cross-sectional study | Quantitative research | China | Community | Questionnaire | Population ≥18 years old |
| | PBICR-2024 | Cross-sectional study | Mixed methods research | China | Community | Questionnaire, Interview | Population ≥18 years old |
| | PBIUR-2024 | Cross-sectional study | Quantitative research | UK | Community | Questionnaire | Population ≥18 years old |
| Sub-database | China National Maternal and Child Health Surveillance System | Cohort study | Quantitative research | China | Healthcare facilities | Questionnaire, Health Examination | Maternity |
| | National Survey on Children's Medication Literacy in China | Cross-sectional study | Quantitative research | China | Community | Questionnaire | Children aged 8–18 years old |
| | China Nurse Health Cohort Study | Cohort study | Quantitative research | China | Healthcare facilities | Questionnaire, Health Examination | Nursing staff |
| | National AI-HEALS Health Behavior Intervention Study | Randomized controlled trial | Mixed methods research | China | Hospital, community | Questionnaire, Health Examination, interview | Patients with various diseases |
| | Shandong Province Survey of Male Patients | Cross-sectional study | Mixed methods research | Shandong Province, China | Healthcare facilities | Questionnaire, interview | Patients with androgenic diseases |
| | Middle School Students' Mental Health Stigma Cohort | Cohort study | Mixed methods research | Shandong Province, China | School | Questionnaire, interview | Junior high school students |

**Table 5**
Design of each database and setting of some variables.

| Name of database | | Quality of life | Depression | Anxiety | Stress | Health literacy | Family health | Personality | Smoking | Smoking consumption | Sleeping | Self-efficacy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Master database | PBICR-2020 | √ | – | – | – | – | √ | – | √ | √ | – | √ |
| | PBICR-2021 | √ | √ | √ | √ | √ | √ | √ | √ | √ | – | √ |
| | PBICR-2022 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | PBICR-2023 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | PBICR-2024 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | PBIUR-2024 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Sub-database | China National Maternal and Child Health Surveillance System | √ | √ | √ | √ | √ | √ | √ | √ | – | √ | √ |
| | National Survey on Children's Medication Literacy in China | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | China Nurse Health Cohort Study | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | National AI-HEALS Health Behavior Intervention Study | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Shandong Province Survey of Male Patients | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Middle School Students' Mental Health Stigma Cohort | √ | √ | √ | √ | – | √ | – | – | – | √ | – |

tal health issues, assess healthy lifestyles, and provide clear, objective, and reliable quantitative results. These results facilitate comparative analyses, identification of differences, and replication across different studies.

However, while quantitative research methods are well-established, they can lack insight and flexibility, often failing to fully consider the respondents' perspectives. Mixed methods research combines the strengths of both qualitative and quantitative methods, balancing the advantages and disadvantages of each. This methodology provides a more comprehensive and multi-dimensional portrayal of participants, helping researchers form a holistic and detailed understanding of phenomena. In recent years, mixed methods research has gained widespread attention. Considering the appropriateness of research questions and methods, as well as the fit between researchers and methods, the PBICR project team plans to apply mixed methods research in the 2024 Psychological and Behavior Investigation of Chinese Residents (PBICR-2024) and the national AI-HEALS health behavior intervention study. Using an explanatory sequential design, this approach will provide contextual, experiential, and background details (qualitative information) to complement and explain the instrumental data (quantitative information). This dual perspective will validate, supplement, and interpret complex changes and their underlying causes, answering research questions related to mental and behavioral health more completely, reasonably, and comprehensively, thereby broadening the research insight.

*Research scope: from the people in China to global population*

As China's population structure continues to change and urbanization accelerates, people's lifestyles, work stress, and social environments have undergone significant transformations. These shifts have had substantial impacts on individuals' mental health and health-related behaviors. The PBICR emerged in response to these changes, and the research outcomes based on the mental and behavioral health data of the people

in China have enriched practical research in the field of mental health. These outcomes have provided strong scientific evidence for promoting the "Healthy China" strategy.

In today's globalized world, the COVID-19 pandemic has underscored the need for global collaboration and joint efforts in public health systems. Mental health and health-related behaviors are crucial topics in public health that require continuous exploration. The WHO emphasizes that universal mental health service coverage requires joint action from all countries. The PBICR project team plans to collaborate with UK scholars who is launching the Psychological and Behavior Investigation of UK Residents (PBIUR). The collaborative initiative aims to provide empirical cross-regional evidence for implementing promotion and prevention strategies in the mental health field, supporting the "Mental Health Action Plan 2013–2020″ adopted by the World Health Assembly.

In the future, the PBICR will keep pace with current trends and focus on a global population. The team will seek to collaborate with multiple countries to build an international database for studying the current state of mental and behavioral health. The variable settings will facilitate cross-regional research integration, allowing for multidimensional comparative analyses of individual characteristics, mental health, social networks, and other factors across different regions, economic levels, and cultural backgrounds. This approach will assess the impact of mental changes and health behaviors on individual and group health, promoting the standardized construction, joint research, and sustainable development of global databases in the health field from the perspective of mental and behavioral health. The PBICR provides comprehensive data on the mental and behavioral health of people in China through a large-scale, multi-center, and national cross-sectional database. This resource is crucial for policymakers to understand mental health issues and behaviors across different demographics, guiding targeted public health policies and interventions while improving basic healthcare and general practice services. The database is continuously updated to align with international research trends, supporting extensive research in fields like public health, management, communication, and psychology. Future plans include enhancing database structure to focus on specific populations and global health issues, aiming to advance customized healthcare strategies and overall medical service development.

This study has limitations despite the PBICR's use of population proportional, multi-stage, and quota sampling methods, which can still introduce bias. For example, disparities in questionnaire distribution and collection across populations or regions limit the generalizability of data to each province or specific population. Additionally, the PBICR's national cross-sectional design aims for broad applicability throughout China but varies in enumerator performance across provinces. Strong performance yields locally comparable data to national standards, while weaker performance may skew local data representation. Moving forward, the PBICR aims to dynamically improve enumerator consistency and quality control to ensure provincial data better reflects local realities.

## Competing interests

The authors declare that they have no competing interests.

## Declarations

Not applicable.

## Authors' contributions

Conceptualization, W.Y.; Methodology, W.Y., F.S., L.D. and S.X.; Data curation,F.S. and L.D.; Formal analysis, not applicable; Funding acquisition, not applicable; Project administration, not applicable; Resources, not applicable; Supervision, W.Y., F.S. and L.D.; Validation, W.Y. and S.X; Writing—original draft, F.S. and L.D.; Writing—review and editing, W.Y., F.S. and L.D. All authors have read and agreed to the published version of the manuscript.

## Ethics approval and consent to participate

Not applicable.

## Consent for publication

Not applicable.

## Availability of data and materials

Not applicable.

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