

METHODS

PBICR-2024: Protocol and data resource profile of a national cross-sectional study on psychological and behavioral health among Chinese residents

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Abstract

Background: Comprehensive, standardized data on psychological and behavioral health among Chinese residents remain limited, constraining population-level research and the development of evidence-based health promotion strategies.

Objective: The 2024 Psychology and Behavior Investigation of Chinese Residents aimed to establish a large-scale, multi-center, nationally representative database to support research on physical and mental health among Chinese residents and inform health policy development.

Methods: This national cross-sectional survey was conducted from June to September 2024 using a three-stage stratified sampling strategy across 150 cities and 800 communities/villages in China. Of 38,793 distributed questionnaires, 35,861 valid responses were retained after excluding non-consenting, underage, non-Chinese, and insufficiently completed questionnaires, followed by logical

quality checks (response rate: 99.05%; qualification rate: 98.95%). Trained investigators administered standardized questionnaires through face-to-face interviews, covering sociodemographic characteristics, personal health status, family information, social environment, psychological scales, behavioral scales, and attitudes toward topical social issues. Multi-level quality control procedures were implemented throughout data collection.

Results: Data collection has been completed, yielding a nationally representative dataset with multidimensional information on psychological and behavioral characteristics across 150 cities. Detailed descriptions of sampling outcomes, response rates, and data quality metrics are presented in the full protocol.

Conclusion: The 2024 Psychology and Behavior Investigation of Chinese Residents provides a comprehensive, high-quality evidence base to inform post-pandemic health promotion strategies and policy development aimed at improving physical and mental health in China and globally.

Keywords: Data quality control; Data resource; Cross-sectional studies; Health behavior; Mental health

1. Introduction

Health emerges from the complex interaction between psychological states and behavioral practices.¹ Collectively, these factors determine health outcomes. However, amid China's ongoing development, the prevalence of mental health disorders is increasing², and detrimental behaviors may heighten susceptibility to such psychological conditions.

Mental health constitutes a fundamental dimension of human existence, profoundly shaping cognition, emotion, and behavior while underpinning our capacity for decision-making, relationship formation, and engagement with the world. Mental health disorders represent a substantial component of the global disease burden.³ Nevertheless, analyses of leading psychology journals indicate that samples from non-Western contexts constitute fewer than 5% of studied populations.⁴ This limitation impedes the accurate reflection of psychological phenomena within a diverse global context. China, as the world's largest developing nation and a significant non-Western society, remains markedly underrepresented.⁵ Prior investigations into mental health trends within China have typically yielded single-center findings^{6,7}, focused narrowly on isolated determinants^{8,9}, or have examined specific depression subgroups.^{10,11} Consequently, the absence of large-scale, multi-center research encompassing the general population has resulted in an incomplete understanding of the distribution of mental health conditions among Chinese residents.

Health behaviors encompass activities that prevent

disease, facilitate early detection of medical conditions, and promote well-being through risk mitigation.¹² Empirical evidence demonstrates that optimizing combinations of such behaviors can reduce all-cause mortality by 58% while extending healthy life expectancy.¹³ Nevertheless, the external validity of these findings remains limited by significant geographical sampling biases in existing research. For instance, a nationwide study of 900,000 individuals examined health behavior variations solely across China's seven broad administrative regions, failing to capture potential differences in less developed areas such as Northwest China.¹⁴ Consequently, the aggregation of behavioral characteristics at the regional level may obscure meaningful subregional variations, potentially leading to ecological fallacies when generalizing patterns to specific localities.

Several large-scale epidemiological initiatives have made important contributions to population health research in China. The China Mental Health Survey provided nationally representative estimates of mental disorder prevalence, but focused primarily on diagnostic categories rather than the broader spectrum of psychological well-being and health-related behaviors across the general adult population.¹⁵ The China Health and Retirement Longitudinal Study offers valuable longitudinal data on health and ageing, but its target population is restricted to adults aged 45 and above.¹⁶ The China Kadoorie Biobank (CKB) is a prospective cohort designed principally around biological and genetic risk factors for chronic disease, with more limited coverage of the multi-domain psychosocial and behavioral determinants of health across the adult

lifespan.¹⁷

However, none of these platforms was designed to simultaneously characterize the full breadth of psychological, behavioral, and social health dimensions across the general adult population at the geographic granularity and psychosocial depth required by contemporary health promotion research and policy planning. The 2024 Psychology and Behavior Investigation of Chinese Residents (PBICR-2024) is specifically designed to address this gap, integrating validated multi-domain psychosocial assessments, health behavior measures, and social determinants of health within a single, standardized, nationally coordinated survey framework.

The growing burden of mental health disorders and suboptimal health behaviors, coupled with significant limitations in current research methodologies regarding population coverage and the absence of a unified multi-domain psychosocial survey infrastructure targeting the general adult Chinese population, necessitates comprehensive nationwide studies. PBICR represents a timely initiative to address these evidence gaps. This large-scale, multi-center investigation will generate robust contemporary data on psychological well-being and health-related behaviors across China's general population. Furthermore, the study's findings will offer valuable evidence-based insights for health policymakers and researchers in China and for global public health research.

2. Methodology

2.1. Ethical considerations

Ethical approval for the PBICR-2024 was obtained from the Institutional Review Board of Shanghai Jiao Tong University for Human Research Protections (Approval No. H202402371). The PBICR-2024 study was also registered with the Chinese Clinical Trials Registry (ChiCTR2400085016), continuing the established registration framework following the 2024 integration of the National Health Security Information Platform into this registry. All procedures involving human participants were conducted in accordance with the ethical standards of the Declaration of Helsinki (2013 revision) and applicable institutional and national guidelines. The questionnaire explicitly outlined the study's objectives and ensured the preservation of anonymity, confidentiality, and the participants' right to decline participation. Written informed consent was obtained from all participants prior to enrolment.

2.2. Study overview

The PBICR-2024 involved a large-scale, multi-stage, cross-sectional survey conducted across 150 cities in China,

utilizing stratified and quota sampling techniques. Trained investigators administered standardized questionnaires through face-to-face interviews with eligible adult residents, covering psychological, behavioral, social, and health-related domains.

To ensure high standards of data quality, comprehensive quality control measures were put in place, including expert consultations, three rounds of pilot testing, hierarchical investigator training, and multi-level data validation. The collected data, which was systematically cleaned and verified, forms a robust national database aimed at guiding public health strategies and advancing research on mental and behavioral health in China.

2.3. Organizational framework

To ensure comprehensive quality control and efficient implementation of the PBICR-2024 survey project, a structured organizational framework has been established under a general manager system. The project team consists of five specialized groups: the expert committee, scale design group, training and coordination group, survey group, and quality control group, as illustrated in [Figure 1](#).

The expert committee, composed of interdisciplinary scholars, provides strategic guidance and scientific oversight for research design and field implementation. The scale design group focuses on the development, adaptation, and validation of psychological and behavioral assessment tools, ensuring their scientific reliability and cultural relevance. The training and coordination group oversees the training of investigators, manages ethical approvals, and ensures compliance with research protocols.

Building on previous survey waves, the survey group in the 2024 project was organized through a newly established Provincial Investigators' Working Committee system. Each province has established its own working committee, composed of a secretary general, supported by multiple deputy secretaries general and secretaries. Through this structure, the survey group coordinates provincial teams and conducts face-to-face interviews in selected urban and rural areas. The quality control group plays a central role in monitoring all stages of the project, including pilot testing, data verification, and sampling procedures, to maintain the highest standards of data integrity.

2.4. Sampling design

To support broad national coverage and long-term data comparability, the PBICR-2024 implemented a three-stage sampling strategy that combines probability-based geographic selection with quota-based individual recruitment, supporting a growing annual sample size that now exceeds 40,000 participants.

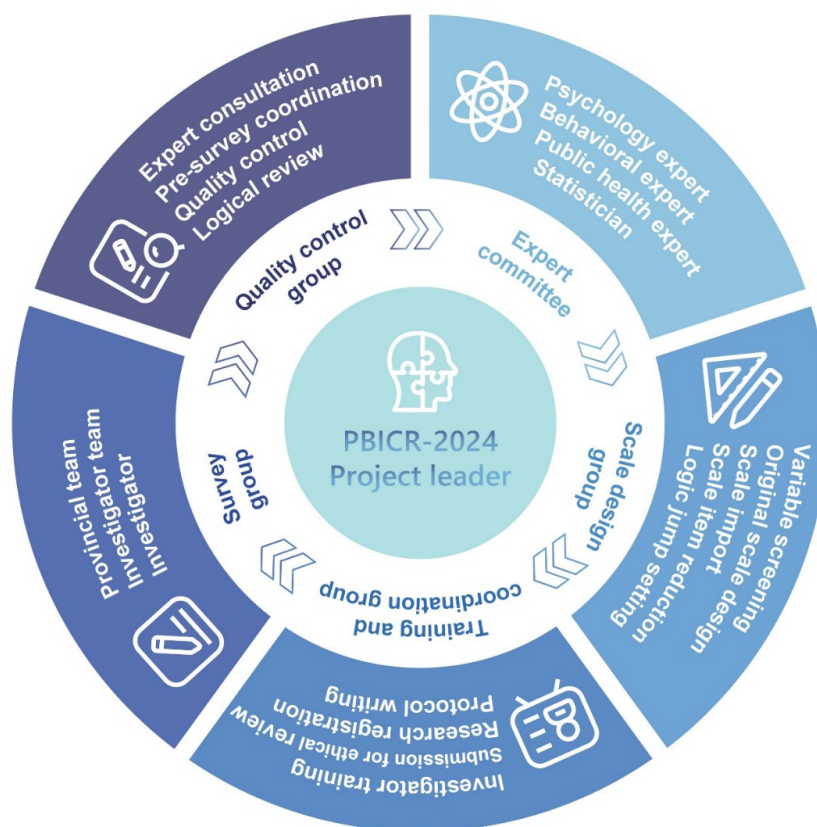


Figure 1. Organizational framework of the 2024 Psychology and Behavior Investigation of Chinese Residents (PBICR-2024) survey project

(a) Stages 1 and 2 (probability-based)

In the first stage, a total of 150 cities were selected. The four centrally administered municipalities (Beijing, Tianjin, Shanghai, and Chongqing) and the two Special Administrative Regions (Hong Kong and Macao) were included by design. The remaining 144 cities were drawn from 22 provinces and 5 autonomous regions using probability-proportional-to-size sampling, with 2–12 cities allocated per region according to population size. In the second stage, 800 communities were sampled from these cities, with a fixed 3:2 urban-to-rural ratio to reflect the residential composition of each region.

(b) Stage 3 (quota-based)

Within each selected community, individuals were recruited using quota sampling, with quotas set for gender (1:1) and for age groups, calibrated to the 2021 Seventh National Population Census of China, to maintain sociodemographic balance comparable to that of the

national population.

The provincial-level distribution of sampling sites is presented in [Figure 2](#). By combining probability-based geographic coverage at the city and community levels with demographically balanced individual recruitment, this multistage framework was designed to provide approximately national representativeness across China's diverse sociodemographic profile, while ensuring scientific rigor and comparability of the collected psychological and behavioral data. No post-stratification weighting, survey weights, or calibration to census distributions were applied in the present manuscript—users of the PBICR-2024 data resource are encouraged to apply such adjustments in downstream analyses where required.

2.5. Participant selection

The PBICR-2024 focuses on adult residents of China, with defined criteria to ensure data quality and population representativeness.

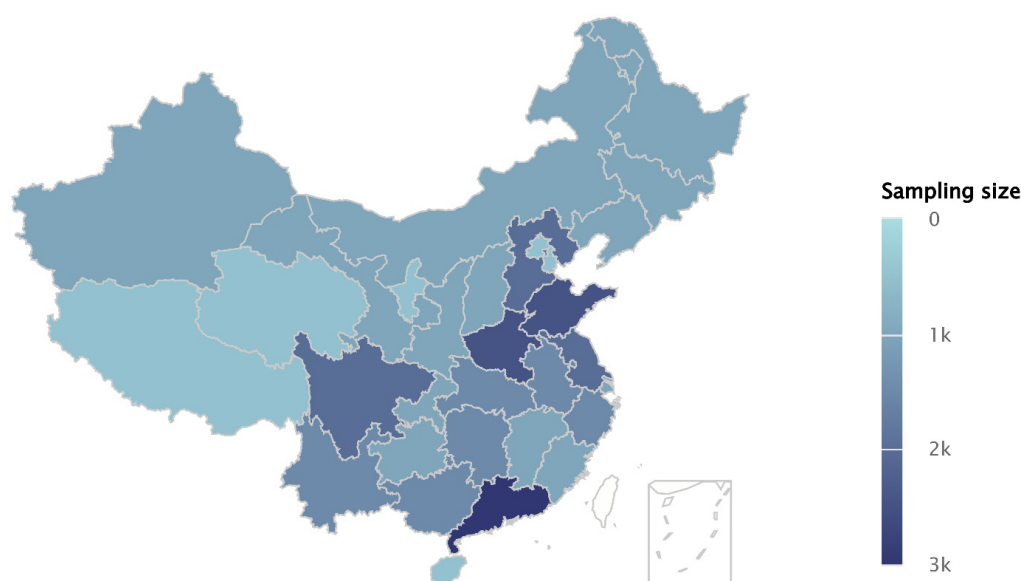


Figure 2. Provincial-level distribution of the 2024 Psychology and Behavior Investigation of Chinese Residents sampling sites

Inclusion criteria were:

- (i) Age ≥ 18 years.
- (ii) Chinese nationality.
- (iii) Usual residence in China (with absences from China not exceeding one month per year).
- (iv) Voluntary participation with written informed consent.
- (v) Ability to complete the questionnaire independently or with assistance from investigators.
- (vi) Ability to understand the content of questionnaire items.

Exclusion criteria were:

- (i) Impaired consciousness or severe mental disorders.
- (ii) Cognitive impairment affecting questionnaire comprehension (based on self-report or community health records).
- (iii) Current participation in similar studies or previous participation in PBICR to avoid duplicate sampling and research fatigue.
- (iv) Refusal to participate in the study.

2.6. Questionnaire design

The PBICR-2024 questionnaire was systematically designed to comprehensively capture key variables related to the psychological and behavioral health status of the Chinese population. Informed by global research frontiers, national public health priorities, and expert consultations, the questionnaire underwent substantial expansion and optimization in 2024, ultimately comprising nine main sections: (i) basic personal information, (ii) personal

health status, (iii) household demographic information, (iv) social environment, (v) psychological dimension scales, (vi) behavioral dimension scales, (vii) additional scales, (viii) self-administered childhood experiences, and (x) attitudes toward topical social issues.

All scales included in the PBICR-2024 are supported by validated Chinese-language versions. For scales widely used in Chinese population research with an established prior Chinese validation, the validated version was adopted directly. For scales without a prior Chinese-population validation, the research team undertook a structured cross-cultural adaptation procedure prior to deployment, comprising forward translation and independent back-translation, expert panel review for semantic equivalence and cultural appropriateness, and pilot testing in a small sample of the target population. The source reference supporting the Chinese-language version of each scale is provided in [Table 1](#).

In addition to these scales, the questionnaire includes a set of items that are questionnaire-format measurements by design (non-psychometric items), for example, single-construct items capturing behavioral frequency, exposure recall, and other directly reported indicators ([Table 1](#)). As these items are not psychometric scales, formal reliability and validity testing was not applicable; the same translation and back-translation (where original source material was non-Chinese), expert panel review, and pilot testing procedures described above were nonetheless applied to ensure their linguistic and content adequacy prior to field deployment.

Table 1. Overview of the scales used in the questionnaire

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Quality of Life Scale	EQ-5D-5L ¹⁸	Other scale	≥18	All populations	5 dimensions: (i) Mobility, (ii) self-care, (iii) daily activities, (iv) pain or discomfort, and (v) anxiety or depression	5	Each of the five dimensions is rated on a five-level severity scale (1 = no problems to 5 = extreme/unable to). Health state profiles are converted to a utility index score using population-based value sets, anchored at 0 (dead) and 1 (full health); scores below 0 indicate health states considered worse than death
EQ Visual Analogue Scale	EQ-VAS ¹⁸	Other scale	≥18	All populations	Unidimensional: Self-assessment of health	1	A vertical visual analogue scale ranging from 0 (worst imaginable health) to 100 (best imaginable health), capturing self-rated overall health status
eHealth Literacy Scale	eHEALS ¹⁹⁻²²	Other scale	≥18	All populations	Unidimensional: Measures individual eHealth knowledge levels	8	1–5 (strongly disagree to strongly agree), with total scores ranging from 8 to 40. A higher total score indicates a higher level of eHealth literacy
Family Health Scale-Short Form	FHS-SF ^{23,24}	Other scale	≥18	All populations	4 dimensions: (i) Social and emotional health processes in the family; (ii) social approaches to health in the family; (iii) family health resources; and (iv) social support outside the family	10	1–5 (strongly disagree to strongly agree), with total scores ranging from 10 to 50, with higher scores indicating higher levels of family health
Health Literacy Scale—Short Form-4	HLS-SF4 ²⁵⁻²⁷	Other scale	≥18	All populations	3 dimensions: (i) Health care, (ii) disease prevention and (iii) health promotion	4	1–4 (very difficult to very easy), using a formula to calculate a standardized health literacy index ranging from 0 to 50, with higher indices representing higher level of health literacy
Short Cyberchondria Scale	SCS ²⁸	Other scale	≥18	All populations	Unidimensional: Assesses the process of becoming more anxious about one's health as a result of excessive internet searching	4	1–5 (totally disagree to totally agree), with total scores ranging from 4 to 20; higher scores indicate higher levels of cyber-skepticism
Social Isolation Indicators	SII ²⁹⁻³¹	Other scale	≥18	All populations	Frequency of visiting friends/family, weekly group activities, and living alone or not	3	0 (not living alone, visiting or being visited more often than or equal to once a month, participating in group activities once a week or more) or 1 (living alone, at intervals of several months or never visiting or being visited by friends, never participating in any group activities), with total scores ranging from 0 to 3, and social isolation status classified as social isolation (social isolation index ≥ 2) and non-social isolation (social isolation index < 2)

(Contd...)

Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Social Loneliness Indicators	SLI ^{30,32}	Other scale	≥18	All populations	Frequency of confiding in someone close to you, frequency of often feeling lonely	2	0 (no feelings of loneliness, speak their mind to someone close to them more often than once a month) or 1 (often feel lonely, speak their mind to friends every few months or never), with total scores ranging from 0 to 2. The loneliness status was split into 2 groups: loneliness (loneliness index of 2) and non-loneliness (loneliness index <2)
Social Connection Index	SCI ³³	Other scale	≥18	All populations	2 dimensions: (i) Functional (social isolation) and (ii) structural (social isolation)	5	Functional dimension: 1 (≥ once every 3 months) or 0 (rarely or never); structural dimension: 0 to 1 (no to yes), with total scores ranging from 0 to 5, with higher scores indicating higher levels of social connectedness
Social Frailty Index	SFI ³⁴⁻³⁶	Other scale	≥18	All populations	2 dimensions: (i) Social life and (ii) socio-economic deprivation	7	0 to 1 (no to yes), with total scores ranging from 0 to 7, 0 is no social debility, 1 is pre-social debility, and 2 to 7 is social debility
Pet-related behavior ^a	-	Questionnaire	≥18	All populations	Self-developed questionnaire: Type and number of pets owned, frequency of contact with pets, and degree to which pets are considered to be a family component	5	-
Big Five Inventory-10	BFI-10 ³⁷⁻³⁹	Psychological level scale	≥18	All populations	5 dimensions: (i) extroversion, (ii) agreeableness, (iii) rigor, (iv) neuroticism, and (v) openness	10	1 to 5 (totally disagree to totally agree), with total scores ranging from 10 to 50. Extraversion was scored as the sum of scores 1 and 6, agreeableness was scored as the sum of scores 2 and 7, discretion was scored as the sum of scores 3 and 8, neuroticism was scored as the sum of scores 4 and 9, and openness was scored as the sum of scores 5 and 10
Patient Health Questionnaire-9	PHQ-9 ⁴⁰⁻⁴²	Psychological level scale	≥18	All populations	Unidimensional: Assesses the patient's level of depression	9	Each item is scored from 0 to 3 (not at all to nearly every day), yielding a total score ranging from 0 to 27. Total scores are categorized into five severity levels: 0-4 (minimal), 5-9 (mild), 10-14 (moderate), 15-19 (moderately severe), and ≥20 (severe) depression. A score ≥10 is commonly used as a threshold for clinically significant depression
Generalized Anxiety Disorder-3	GAD-3 ^{43,44}	Psychological level scale	≥18	All populations	Unidimensional: Assesses the patient's level of anxiety	3	0 to 3 (not at all to almost daily), with total scores ranging from 0 to 9

(Cont'd...)

Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Perceived Stress Scale-4	PSS-4 ^{45,46}	Psychological level scale	≥18	All populations	2 dimensions: (i) Sense of loss of control and (ii) tension	4	0 to 4 (never to always), with total scores ranging from 0 to 16. The total score of the PSS is obtained by reversing the scores on the positive items and then summing across all the items, with a higher score indicating higher perceived stress
Perceived Social Support Scale-Short Form	PSSS-SF3 ⁴⁷⁻⁴⁹	Psychological level scale	≥18	All populations	3 dimensions: (i) Family support, (ii) friend support, and (iii) other support	3	1-7 (strongly disagree to strongly agree), with total scores ranging from 3 to 21; higher scores indicating greater perception of social support
New Generalized Self-Efficacy Scale-Short Form	NGSES-SF3 ⁵⁰⁻⁵²	Psychological level scale	≥18	All populations	3 dimensions: (i) Level or degree, (ii) intensity, and (iii) prevalence	3	1-5 (strongly disagree to strongly agree), with a total score ranging from 3 to 15, with higher scores indicating greater self-efficacy
Implicit Health Beliefs ^{53,54}	-	Psychological level scale	≥18	All populations	2 dimensions: (i) Progressive lay health theory and (ii) entity lay health theory	6	1-6 (strongly disagree to strongly agree). After reversing the scores for items 1-3, the average score is calculated as the score for the individual's fixed-type implicit health belief level; after reversing the scores for items 4-6, the average score is calculated as the score for the individual's gradual-type implicit health belief level
Narcissistic Admiration and Rivalry Scale	NARQS ^{55,56}	Psychological level scale	≥18	All populations	2 dimensions: (i) Admiration and (ii) competition		1-6 (strongly disagree to strongly agree), with a total score ranging from 6 to 36; higher scores indicate a greater sense of narcissistic competition
Attention-Deficit/Hyperactivity Disorder Self-Report Screening Scale	ASRS ⁵⁷	Psychological level scale	≥18	All populations	Unidimensional: Screening for adult attention-deficit/hyperactivity disorder		Response categories: never, rarely, sometimes, often and very often. For all questions, the "never" response option was scored as 0; the maximum score for each question varied from 6 for question 3, 5 for questions 1 and 2, 4 for question 5, 3 for question 6 and 2 for question 4, resulting in a score range of 0 out of 25. Higher scores indicate higher levels of attention deficit or hyperactivity disorder
Chinese Version of Copenhagen Burnout Inventory-7	C-CBI-7 ⁵⁸	Psychological level scale	≥18	All populations	2 dimensions: (i) Work exhaustion and (ii) work frustration	7	1-5 (rarely to often; strongly disagree to strongly agree), the total score is the average score for each question, with higher scores indicating higher levels of burnout
Rest Intolerance Scale	RIS ⁵⁹	Psychological level scale	≥18	All populations	4 dimensions: (i) Negative feelings, (ii) social comparison, (iii) obsessive thinking, and (iv) cognitive bias	8	1 to 5 (rarely to often; strongly disagree to strongly agree), with total scores ranging from 5 to 40. Higher scores indicate deeper shame felt at rest

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Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Maladaptive Daydreaming Scale	MDS-5 ^{60,61}	Psychological level scale	≥18	All populations	Unidimensional: Screening adults for maladaptive daydreaming	5	Scores ranged from 0% to 100%. The total score is calculated as an average. The best cut-off for the PMDS-5 is 42%
Bergen Social Media Addiction Scale	BSMAS ⁶²⁻⁶⁴	Psychological level scale	≥18	All populations	Unidimensional: Rating an individual's addiction to social media	6	1 to 5 (rarely to often), with total scores ranging from 6 to 30. Higher scores indicate greater risk of social media addiction. Threshold of 19 out of 30 points
Purpose-in-Life-1	PIL-1 ^{63,64}	Psychological level scale	≥18	All populations	Unidimensional: Assessing perceptions of the meaning of life	1	1-7; 1 indicates the lowest level and 7 the highest level of perceived importance of presence
Smoking behavior ^a	-	Behavior level scale	≥18	All populations	Self-developed questionnaire: Smoking status, years since quitting smoking, daily smoking frequency, age at smoking initiation, and duration of smoking	4	-
Drinking behavior ^a	-	Behavior level scale	≥18	All populations	Self-developed questionnaire: Alcohol consumption status, age at alcohol initiation, age at cessation of alcohol use, type of alcohol consumed, daily alcohol intake, daily alcohol intake prior to cessation, and anxiety related to alcohol cessation	7	-
The International Physical Activity Questionnaire-7	IPAQ-7 ^{65,66}	Behavior level scale	≥18	All populations	4 dimensions: (i) Participation in vigorous physical activity, (ii) participation in moderate-intensity physical activity, and (iii) walking versus (iv) sitting	7	(i) Walking MET = 3.3 × average daily walking time × weekly walking days (ii) Moderately strong MET = 4.0 × average time engaged in moderate intensity activity per day × days engaged in moderate intensity activity per week (iii) Strenuous activity MET = 8.0 × average time engaged in strenuous activity per day × days engaged in strenuous activity per week Therefore, basal metabolic time per week (minutes) = walking MET + moderately strong MET + strenuous activity MET

(Cont'd...)

Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Sleep Health Score	SHS ^{67,68}	Behavior level scale	≥18	All populations	5 dimensions: (i) Biological clock, (ii) sleep duration, (iii) insomnia, (iv) snoring, and (v) excessive daytime sleepiness	5	Temporal preference: Recoding participants who answered (1) and (2) as code 0 and participants who answered (3) and (4) as code 1. For insomnia symptoms, participants with answers (1), (2), and (3) were recoded as code 1 Snoring information: Participants with answer (2) were recoded to code 0 Daytime dozing: answers (0) and (1) were sometimes recoded as code 0 and answers (2) and (3) were recoded as code 1 For each sleep behavior, participants with a code of 0 were defined as a low risk factor with a score of 1. SHS were derived from the sum of the five sleep behaviors (ranging from 0 to 5), with higher scores representing healthier overall sleep characteristics. Based on the SHS, overall sleep characteristics were defined as “healthy overall sleep characteristics” (SHS >3), “intermediate overall sleep characteristics” (1 < SHS ≤3), and “poor overall sleep characteristics” (SHS ≤1)
							1–4 (very unstable to very stable), higher scores indicate greater stability in sleep duration
							0 to 1 (no to yes), whether working hours involve night shifts
Intimate Relationship Violence Scale	IRVS-5 ⁶⁹	Behavior level scale	≥18	Individuals with relationship or marriage experience	3 dimensions: (i) Sources of violence, (ii) physical violence, and (iii) mental violence	5	1 to 5 (never less than almost always), with total scores ranging from 5 to 25. For ease of practical implementation, surveys converted the receiver operating characteristic-derived thresholds (8.5 and 13.5) into the nearest interpretable integer-based ranges. Accordingly, scores from 5 to 8 indicate a low level of IPV, 9 to 13 represent a moderate level, and 14 to 15 correspond to a high level
							1 to 5 (strongly disagree to strongly agree), with a total score ranging from 4 to 20; higher scores indicate higher levels of family communication
							Human papillomavirus/flu/herpes zoster/hepatitis/none of the above
Family Communication Scale-4	FCS-4 ⁷⁰⁻⁷²	Behavior level scale	≥18	All populations	Unidimensional: Level of family communication	4	
Vaccination behavior ^a	–	Behavior level scale	≥18	All populations	Self-developed questionnaire	1	

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Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Salt addition frequency ^a	–	Behavior level scale	≥18	All populations	Self-developed questionnaire	2	Frequency of additional salt added to food at meals
Self-Regulation of Eating Behavior Questionnaire	SREBQ ⁷³	Behavior level scale	≥18	All populations	Unidimensional: Assessing someone's ability to regulate their diet	5	1 to 5 (from less than always to always) for a total score of 5 to 25, with higher scores indicating greater self-regulation of eating behavior (with 3 reverse items)
Penn State Electronic Cigarettes Dependence Index	PSECDI ⁷⁴	Behavior level scale	≥18	Individuals who use e-cigarettes	Unidimensional: Assessing dependence on e-cigarettes	10	Number of times using e-cigarettes per day scored: 0–4 = 0, 5–9 = 1, 10–14 = 2, 15–19 = 3, 20–29 = 4, ≥30 = 5
							How many minutes after waking up to smoke the first cigarette: 0–5 = 5, 6–15 = 4, 16–30 = 3, 31–60 = 2, 61–120 = 1, ≥121 = 0
							Wake up at night wanting to use e-cigarette desire: Yes = 1, no = 0
							How many nights a week do you wake up and smoke an e-cigarette: 0–1 = 0, 2–3 = 1, ≥4 = 2
							Smoke e-cigarettes now because it is hard to quit: Yes = 1, no = 0
							Strong desire to smoke e-cigarettes: Yes = 1, no = 0
							Level of craving for e-cigarettes in the past week: None/light = 0, moderate = 1, very strong/extremely strong = 2
							Difficulty in not smoking in tobacco-controlled places: Yes = 1, no = 0
							Angry because you cannot smoke e-cigarettes: Yes = 1, no = 0
							Nervous, upset or anxious because you cannot smoke e-cigarettes: Yes = 1, no = 0
							Score 0–3 = no dependence; 4–8 = mild dependence; 9–12 = medium tolerance dependence; ≥13 = high dependence

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Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Self-Injurious Behavior Questionnaire ^a	-	Behavior level scale	≥18	Individuals who use e-cigarettes	Self-developed questionnaire:		
					Age of onset, duration, frequency, and severity of non-suicidal self-injurious behavior	-	-
Suicide Ideation Questionnaire ^a	-	Behavior level scale	≥18	Individuals who use e-cigarettes	Self-developed questionnaire:		
					Suicidal ideation, suicidal threats, and suicidal behavior	-	-
Antibiotic use behavior ^a	-	Behavior level scale	≥18	Individuals who use e-cigarettes	Self-developed questionnaire:		
					Knowledge of antibiotics (definition and effects), non-prescription antibiotic purchase behavior, antibiotic use for common cold, patterns of antibiotic use behavior, and perceptions of repeated use of the same antibiotic	6	-
Psychological abuse	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	2	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)
Emotional neglect	ACE ³¹	Childhood experience	≥18	All populations	Self-developed questionnaire	1	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)
Physical abuse	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	2	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)
Sexual abuse	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	4	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)
Substance abuse	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	3	0 to 1 point (no to yes)
Mental illness	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	2	0 to 1 point (no to yes)
Violence against mother or stepmother	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	4	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)

(Cont'd...)

Table 1. (Continued)

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Family offences	ACE-WHO ⁷⁵	Childhood experience	≥18	All populations	Self-developed questionnaire	1	0 to 1 point (no to yes)
Family environment	ACE ⁷⁶	Childhood experience	≥18	All populations	Self-developed questionnaire	2	0 to 1 point (no to yes). Selected objects (father, mother, brother, brother, sister, sister, none)
Community violence	ACE ⁷⁷	Childhood experience	≥18	All populations	Self-developed questionnaire	2	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)
Collective violence ^a	CE	Childhood experience	≥18	All populations	Self-developed questionnaire	2	0 to 1 point (usually, sometimes, rarely, never; scoring: 1 point for the first two options, 0 points for the last two options)
Economic environment	CE ^{78,79}	Childhood experience	≥18	All populations	Self-developed questionnaire	4	1–5 (strongly disagree to strongly agree), with a total score ranging from 4 to 20; higher scores indicate better childhood family economic circumstances
Socio-economic status	CE ^{78,79}	Childhood experience	≥18	All populations	Self-developed questionnaire	1	VAS slider bar (1 for bottom, 7 for top)
Healthy behavior—exercise ^a	CE	Childhood experience	≥18	All populations	Self-developed questionnaire	1	VAS slider bar (1 for bottom, 7 for top)
Health maintenance ^a	CE	Childhood experience	≥18	All populations	Self-developed questionnaire	1	VAS slider bar (1 for bottom, 7 for top)
Art contact	CE ⁸⁰	Childhood experience	≥18	All populations	Self-developed questionnaire	2	Type of artistic activity (music, art, dance, other artistic activity, no exposure to any artistic activity) in the first eighteen years of life VAS slider bar (1 for bottom, 7 for top)

Note: ^aQuestionnaire-format measurements by design rather than psychometric scales.
Abbreviations: MET: Metabolic equivalent of task; VAS: Visual analog scale.

Throughout the iterative design process, the PBICR retained approximately 30% of core variables shared with previous survey waves (Table 2), which provides a basis for exploratory, variable-level trend- or trajectory-oriented analyses, while flexibly adapting the questionnaire structure to reflect evolving research needs and policy contexts. The inclusion of forward-looking items—such as attitudes toward immersive technologies and artificial intelligence applications in healthcare—demonstrates the

survey's responsiveness to both domestic and international academic trends.

2.7. Survey administration

To ensure data authenticity, consistency, and field-level control, the PBICR-2024 continued to adopt a face-to-face, one-on-one field survey model using electronic questionnaires. In each province, trained investigators first contacted sampled community health centers or

Table 2. Core variables shared across survey waves (2020–2024)

Variable	2020	2021	2022	2023	2024
Quality of life	EQ-5D	EQ-5D	EQ-5D	EQ-5D	EQ-5D
	EQ-VAS	EQ-VAS	EQ-VAS	EQ-VAS	EQ-VAS
Self-efficacy	NGSES	NGSES	NGSES-SF	NGSES-SF	NGSES-SF
Health literacy	–	HLS-12	HLS-9	HLS-4	HLS-4
Family health	–	FHS-SF	FHS-SF	FHS-SF	FHS-SF
Depression	–	PHQ-9	PHQ-9	PHQ-9	PHQ-9
Anxiety	–	GAD-7	GAD-7	GAD-7	GAD-3
Pressure	–	Self-made (3 items)	PSS-4	PSS-4	PSS-4
Personality	–	BFI-10	BFI-10	BFI-10	BFI-10
Social support	–	PSSS	PSSS-SF	PSSS-SF	PSSS
Smoking	Self-made (3 items)	Self-made (1 items)	Self-made (9 items)	Self-made (4 items)	Self-made (4 items)
Nicotine dependence	–	FTND	–	FTND	PSECDI
Drinking	Self-made (1 item)	Self-made (5 items)	Self-made (7 items)	Self-made (7 items)	Self-made (7 items)
Physical activity	–	–	IPAQ-7	IPAQ-7	IPAQ-7
Sleep	–	–	B-PSQI	B-PSQI	SHS
Family communication	–	–	FCS	FCS-SF	FCS-SF

Abbreviations: BFI-10 = 10-item Big Five Inventory; B-PSQI = Brief Pittsburgh Sleep Quality Index; EQ-5D = EuroQol 5-Dimension questionnaire; EQ-VAS = EuroQol Visual Analogue Scale; FCS = Family Communication Scale; FCS-SF = Short Form of the Family Communication Scale; FHS-SF = Family Health Scale–Short Form; FTND = Fagerström Test for Nicotine Dependence; GAD-3 = 3-item Generalized Anxiety Disorder Scale; GAD-7 = 7-item Generalized Anxiety Disorder Scale; HLS-4 = 4-item Health Literacy Scale; HLS-9 = 9-item Health Literacy Scale; HLS-12 = 12-item Health Literacy Scale; IPAQ-7 = 7-item International Physical Activity Questionnaire; NGSES = New General Self-Efficacy Scale; NGSES-SF = Short Form of the New General Self-Efficacy Scale; PHQ-9 = 9-item Patient Health Questionnaire; PSECDI = Penn State Electronic Cigarette Dependence Index; PSS-4 = 4-item Perceived Stress Scale; PSSS = Perceived Social Support Scale; PSSS-SF = Short Form of the Perceived Social Support Scale; SHS = Sleep Health Score.

neighborhood committees that were willing to collaborate, establishing local data collection sites. Recruitment was carried out through posters and digital or printed announcements. Investigators verified the identity of potential participants and ensured that each individual met the inclusion and exclusion criteria before proceeding. The procedures are illustrated in Figure 3.

Electronic questionnaires were administered via the Wenjuanxing platform (<https://www.wjx.cn/>). Participants accessed the survey by scanning a QR code or clicking a designated link, with questionnaire IDs assigned and recorded by investigators. For participants with adequate cognitive ability but limited mobility, investigators conducted structured interviews and completed the questionnaire on their behalf. All completed questionnaires were automatically uploaded to a secure central server, enabling real-time data aggregation, centralized management, and quality monitoring.

2.8. Quality control

High-quality data remains the foundation of reliable research and evidence-based decision-making. Building upon four years of continuous refinement, the PBICR-2024 implemented a comprehensive, multi-stage quality control system, covering five key phases: (i) questionnaire design, (ii) pre-investigation, (iii) investigator training, (iv) questionnaire distribution, and (v) data retrieval and analysis. Each stage incorporated rigorous protocols to minimize bias, ensure consistency, and uphold the integrity of the data.

2.8.1. Questionnaire design

The questionnaire was developed following a thorough review of relevant literature and reference materials. From March to June 2024, three rounds of expert consultations were conducted with 48 senior specialists across diverse disciplines—including social medicine, behavioral epidemiology, psychology, health statistics, health education, health management, clinical medicine, pharmacy, nursing, humanities, sociology, journalism and communication, and philosophy. Experts were selected based on their academic qualifications and regional representativeness. Feedback from each consultation round was carefully reviewed and integrated, leading to iterative improvements in questionnaire structure, item wording, logical branching, and scale selection. The final version was confirmed after the pre-investigation phase.

2.8.2. Pre-investigation

Three rounds of pilot testing were conducted between May and June 2024, with sample sizes of 100, 100, and 200 participants, respectively. A quota sampling method

consistent with the formal survey was adopted to ensure representativeness. During each round, participant feedback was systematically collected and discussed by the research team to identify issues related to questionnaire clarity, item logic, and survey length. Revisions were made accordingly. Data from the pilot phase were used solely for refinement purposes and excluded from the final analysis. The quality control group established and implemented

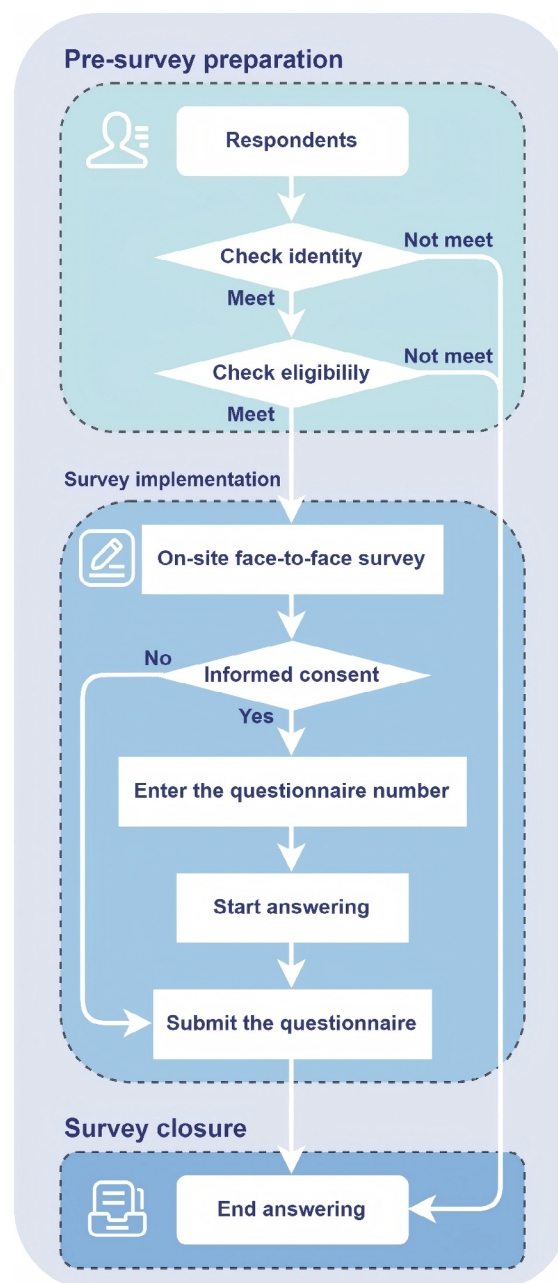


Figure 3. Field survey administration procedures in the 2024 Psychology and Behavior Investigation of Chinese Residents

the logic-checking protocols based on the finalized questionnaire.

2.8.3. Investigator training

To ensure standardized and high-quality data collection, the PBICR-2024 implemented a “two-tier recruitment and hierarchical training” model. Provincial coordinators were first selected through online applications in June 2024, resume screening, and structured interviews, focusing on their competencies in research, management, communication, and decision-making. Each province, municipality, or autonomous region was assigned at least two coordinators, who then underwent systematic multi-week training covering project objectives, survey methodology, questionnaire content, and quality control procedures. Upon completion, these coordinators were responsible for recruiting and training local investigators using standardized curricula that included field survey techniques, ethical practices, and data quality assurance. Only those who passed formal assessments were qualified to conduct data collection activities.

2.8.4. Questionnaire distribution

Data collection was carried out face-to-face by trained investigators between June and September 2024, adhering

to strict standards. A unique coding system was used to label each questionnaire, enabling traceability of respondents, investigators, and coordinators. Questionnaires failing to meet coding requirements were excluded. Weekly online meetings were held every Friday evening via an online platform with provincial coordinators to review data quality, troubleshoot issues, and address inconsistencies in real time. Routine reminders and updates were provided before each day’s survey activity. Multi-level quality checks and centralized data management systems were implemented, with regular backups to safeguard against data loss.

2.8.5. Questionnaire retrieval and analysis

To ensure the integrity and scientific validity of the data, each questionnaire underwent independent logical checks by two professionally trained reviewers, following a standardized quality control protocol. The review focused on key dimensions such as time efficiency, internal consistency, completeness, duplication screening, and response pattern analysis. Further details are illustrated in Figure 4. When necessary, original records were revisited or investigators were contacted directly to verify data accuracy.

A dynamic review mechanism was established to update

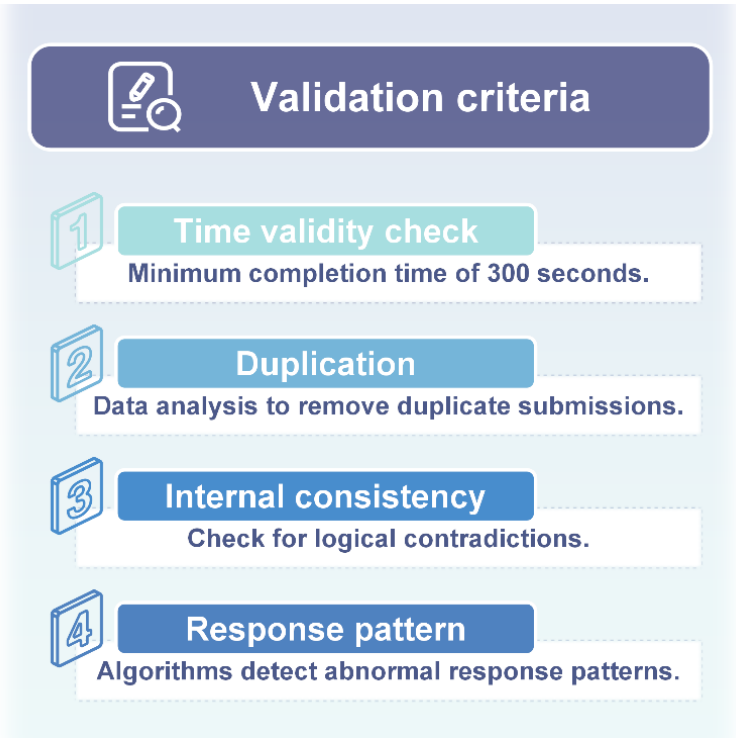


Figure 4. Questionnaire quality control and validation criteria in the 2024 Psychology and Behavior Investigation of Chinese Residents

screening rules in real time, ensuring continued data accuracy and scientific rigor throughout the entire process. Regarding item-level completeness, all questionnaire items were configured as mandatory within the Wenjuanxing platform, preventing submission without a response to each item. Unanswered items therefore reflect intentional skip logic based on preceding responses, constituting designed conditional non-responses rather than missing data. Data management and preliminary processing were conducted in Microsoft Excel.

In PBICR-2024, questionnaires were distributed at participating community health service centers and neighborhood committees to individuals who, after being approached and informed about the study, agreed to receive a questionnaire; refusals occurring prior to questionnaire distribution are not captured in this denominator. A total of 38,793 questionnaires were distributed under this protocol, of which 38,424 were returned, yielding a completion rate of 99.05% (38,424/38,793). After excluding respondents who did not provide informed consent on the questionnaire itself, underage participants, non-Chinese nationals, and responses completed in fewer than five minutes, 36,240 valid questionnaires were obtained. Of these, 35,861 passed all logical quality checks (qualification rate: 98.95% = 35,861/36,240) and constituted the final analytical sample.

3. Discussion

The PBICR-2024 establishes a large-scale, multi-center cross-sectional data infrastructure covering 35,861 Chinese participants across 150 cities. The survey captures physical health status, family circumstances, childhood experiences, and socioeconomic characteristics, while assessing mental health, perceived stress, self-regulation, substance use, dietary habits, sleep quality, social connections, and family communication. The resource is designed to support research and guide policy makers in improving population well-being.

Building on cross-sectional surveys conducted by the research team between 2021 and 2023^{81,82}, the PBICR-2024 retains approximately 30% of core variables shared with previous survey waves, providing a basis for exploratory trend and trajectory-oriented analyses. The incorporation of several internationally validated instruments, including the Sleep Health Score initially derived from the United Kingdom BioBank study⁶⁷ and subsequently applied to the CKB cohort study⁶⁸, is intended to enable cross-national comparison alongside domestic analyses.

The survey incorporates variables capturing significant contemporary social phenomena in China, including floating population identification, rest intolerance, and

sense of meaning in life. These items are intended to support future research on inter-regional economic, social, and cultural ties⁸³, psychological coping mechanisms in response to the demands of modern society⁵⁹, and the construction of life meaning in contemporary contexts⁸⁴. In response to China's evolving demographic policies, the study also incorporates attitudes toward egg freezing for single women⁸⁵ alongside investigations of palliative care⁸⁶, end-of-life education⁸⁷, and advance care directives, which together may provide future analyses with empirical material relevant to the social, ethical, and legal implications of these issues.

The study examined health concerns related to contemporary fast-paced lifestyles, including occupational health, e-cigarette dependence, antibiotic use, sleep quality, and pet ownership. Occupational health assessment enables researchers to examine the influence of work environment and occupational stress on health behaviors⁸⁸, including dietary habits, sleep quality, and exercise frequency, elucidating how occupational factors drive behavioral change in fast-paced lifestyles.⁸⁹ E-cigarette dependence may be examined as a behavioral correlate of lifestyle stress⁹⁰, and antibiotic use patterns may reveal important public health risks in the Chinese context.⁹¹ The Sleep Health Score enables cross-national comparisons with United Kingdom BioBank⁶⁷ and CKB studies.⁶⁸ Furthermore, the inclusion of pet ownership and human-animal interaction variables reflects the fact that interaction with animals has been demonstrated to reduce blood pressure, alleviate anxiety and depressive symptoms, and improve socialization⁹², which may inform future investigation of the role of animal companionship in individual mental health and emotional regulation amid modern lifestyle pressures.⁹³

The study emphasizes harm-related variables, including adverse and positive childhood experiences, self-injurious behaviors, and socialization-related variables. Childhood is crucial for personality development⁷⁵—adverse experiences are associated with a range of psychological issues in adulthood³¹, while positive early experiences contribute to long-term psychological resilience. Self-injurious behaviors—often manifestations of internal distress and underlying psychological issues⁹⁴—require comprehensive understanding for effective intervention. Social isolation²⁹ and loneliness³⁰ are linked to psychological distress, whereas positive social connections are known to enhance resilience and buffer against adverse mental health outcomes. The inclusion of these variables is intended to support future analyses that may inform prevention strategies in these domains.

To address emerging global health challenges, this

study included topics on climate change and mental health, examining the impact of extreme weather events⁹⁵ and awareness of individual carbon footprints.⁹⁶ The study further examined acceptance of emerging health technologies, including artificial intelligence and virtual reality applications, and assessed engagement with digital health interventions as a basis for future research into their public health utility.

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inference; although core variables are retained across waves, formal longitudinal cohort tracking of identical individuals is not implemented, limiting the strength of temporal conclusions. Additionally, the questionnaire structure has been adapted across waves to reflect evolving research priorities and policy contexts; while this flexibility supports responsiveness to emerging issues, it reduces direct cross-wave comparability for items that have been modified or replaced. Second, self-reported measures are subject to recall bias and social desirability effects, particularly for sensitive topics such as adverse childhood experiences and self-injurious behaviors. This risk may have been heightened by on-site data collection through community health service centers or neighborhood committees. Third, the third stage of recruitment relied on quota sampling within communities rather than within-community probability selection, and survey weights, post-stratification weighting, and calibration to census distributions were not applied in the present manuscript. While this design supports broad demographic balance, it does not constitute a fully probability-based national sample. Users of the PBICR-2024 data resource intending to generate inferential population-level estimates are therefore encouraged to apply sensitivity analyses to address this design feature. Although confidentiality, anonymization, trained investigators, and logical consistency checks were used to improve data quality, underreporting of sensitive information cannot be ruled out. Finally, the geographic coverage of the PBICR-2024 currently spans mainland China and the two Special Administrative Regions (Hong Kong and Macao); the present dataset does not include data from Taiwan, reflecting the operational scope of the current sampling framework. Future waves may seek to extend coverage where operationally feasible.

As a comprehensive multi-wave data resource, the PBICR-2024 is positioned to inform future research and policy in psychological and behavioral health. Several potential applications are highlighted below. First, the breadth of the survey may support population-level mental health surveillance that moves beyond diagnostic prevalence estimates toward multi-domain

assessments integrating psychological, behavioral, and social determinants across diverse subpopulations. Second, the dataset offers an opportunity to extend research on vulnerable and underserved groups, including floating populations, individuals with adverse childhood experiences, and those exhibiting self-injurious behaviors, who remain systematically underrepresented in existing Chinese health literature. Third, the resource may inform health promotion strategies addressing the intersection of occupational stress, lifestyle behaviors, and psychological well-being under fast-paced modern working conditions. Fourth, the inclusion of internationally validated instruments enables cross-national comparisons that may help situate Chinese population health findings within a broader global context. Finally, modules on reproductive health, end-of-life care, and digital health are expected to inform future evidence-based policymaking by providing empirical data on public attitudes across contemporary Chinese society.

4. Conclusion

The PBICR-2024 provides a large-scale, demographically calibrated dataset spanning psychological, behavioral, and social health domains across 150 cities in China. Underpinned by rigorous multi-level quality control and a three-stage stratified sampling design, this resource offers substantial potential for advancing population-based mental health and behavioral research in China and contributing to global comparative evidence. The findings of future studies drawing on this dataset are expected to inform evidence-based health promotion strategies and policy development at both national and international levels.

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Conflict of interest

Both Feng Jiang and Yibo Wu serve the Editorial Board of this journal, but were not in any way involved in the editorial and peer-review process conducted for this paper,

directly or indirectly. The authors declare no competing interests.

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Ethics approval and consent to participate

Ethical approval for PBICR-2024 was obtained from the Institutional Review Board of Shanghai Jiao Tong University for Human Research Protections (Approval No. H202402371). The PBICR-2024 study was also registered with the Chinese Clinical Trials Registry (ChiCTR2400085016), continuing the established registration framework following the 2024 integration of the National Health Security Information Platform into this registry. All procedures involving human participants were conducted in accordance with the ethical standards of the Declaration of Helsinki (2013 revision) and applicable institutional and national guidelines. The questionnaire explicitly outlined the study's objectives and ensured the preservation of anonymity, confidentiality, and participants' right to decline participation. Written informed consent was obtained from all participants prior to enrolment. Given the inclusion of sensitive mental health content, including modules on self-injurious behavior and suicidal ideation, a structured risk management protocol was implemented.

All participants received a written psychological support statement upon survey completion, which provided empathetic acknowledgement of potential distress and encouraged help-seeking where needed. In addition, investigators received specialized training prior to field deployment on appropriate responses to participants who disclosed or appeared distressed by sensitive items, including protocols for on-site verbal

support and immediate referral to the mental health department of the local community health service center. The full content of the written support statement and the relevant investigator training materials are provided in the supplementary materials.

Consent for publication

Written informed consent was obtained from all participants, including consent for the collection and use of personal contact information. All data have been de-identified prior to analysis, and no individually identifiable information is presented in this manuscript.

Availability of data

The PBICR project has been conducted as an annual multi-center, large-sample cross-sectional survey since 2020, with each wave identified by its survey year (e.g., PBICR-2024 denotes the 2024 wave). The datasets and supporting materials for the present manuscript are deposited at the Science Data Bank (ScienceDB) under the permanent identifier (<https://www.scidb.cn/anonymous/ZnVFYnky>). Publicly released materials comprise the PBICR-2024 core metrics dataset (PBICR_2024_Core_Data.xlsx), the corresponding codebook (PBICR_2024_Codebook.xlsx), and the Chinese and English versions of the 2024 questionnaire. The full PBICR-2024 variable set contains sensitive psychological and behavioral information and is available for non-commercial academic research upon reasonable request, subject to completion of the Data Usage Agreement (DUA). Historical materials and protocols from earlier waves (2020–2023) are available from the corresponding author upon reasonable request.

Further disclosure

ChatGPT was used solely to assist with English language polishing. No artificial intelligence-assisted tools were used to generate scientific ideas, analyze or interpret data, or draw conclusions. All outputs were critically reviewed and edited by the authors, who take full responsibility for the final manuscript.

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