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Original Research

Psychology and Behavior Investigation of Chinese Nurses (PBICN): Protocol for a Large-Scale, Multi-Center Prospective Cohort Study

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Abstract

Background: Nurses constitute the largest professional group in China's healthcare system; however, nurses face a substantial burden of mental health challenges and adverse behavioral outcomes. Systematic longitudinal data on the psychological and behavioral health of Chinese nurses remain limited, constraining the development of evidence-based policies and interventions. **Methods:** The Psychology and Behavior Investigation of Chinese Nurses (PBICN) is a large-scale, multicenter prospective cohort study with a target sample size of approximately 100,000 registered nurses. Registered nurses currently employed in primary, secondary, and tertiary hospitals were recruited through multistage stratified cluster sampling across all 33 provincial-level administrative divisions in China, using a stratified recruitment ratio of 1:6:10. Data were collected biennially through electronic questionnaires distributed via a dedicated WeChat Official Account. The questionnaire covers eight core domains: basic personal information, occupational details, personal health status, psychological dimensions, behavioral dimensions, workplace environment, health outcomes, and supplementary scales. Study implementation was guided by a multigroup organizational framework and a comprehensive, multistage quality control system. **Results:** This protocol provides a detailed description of the sampling design, quality control procedures, and outcome measures used in the study. A multistage quality control system governed every phase of study implementation, from participant recruitment to data management. The outcome measures cover psychological, behavioral, occupational, and health-related dimensions, supporting a comprehensive evaluation of the mental health and behavioral status of Chinese nurses. **Conclusion:** The PBICN establishes a large-scale, longitudinal database with broad geographic and hospital-level coverage to assess the psychological and behavioral health of Chinese nurses. These findings will support the early identification of health risks, inform nursing management policies, and contribute to the implementation of the Healthy China 2030 initiative. **Trial Registration:** Chinese Clinical Trial Registry, ChiCTR2500108696.

Keywords: nurses; mental health; health behavior; occupational stress; cohort study

1. Introduction

As the largest professional group in the health care system, nurses numbered 5.85 million by the end of 2024 and are the core force ensuring quality medical services and patient safety [1]. However, the mental health crisis among nurses worldwide has become a serious public health issue. During the COVID-19, the prevalence of mental illness among nurses was significantly higher than among other medical staff [2]. In China, the reporting rate of depressive symptoms among nurses is as high as 55.2%, and the reporting rate of anxiety symptoms is 39.3% [3]. China had only 4.16 registered nurses per 1000 people in 2024 [1], considerably lower than the 12.4 reported in the United States [4]. The relatively insufficient allocation of medical resources leads nurses in China to undertake more arduous tasks. In clinical practice, the long-term exposure of nurses to multiple occupational stressors, such as the risk of violence, continuous overtime work, frequent shifts, and an overloaded workload, is closely related to associated mental health problems: these stressors may not only increase the risk of suicidal ideation and self-injury, but also easily induce psychological disorders such as post-traumatic stress disorder, anxiety, and depression, and may be accompanied by adverse behavioral changes such as insomnia, eating disorders, and lack of exercise [5,6,7,8,9]. These psychological and behavioral problems not only seriously damage the physical and mental health of nurses, but also may weaken their clinical implementation ability and communication efficiency, and then pose a potential threat to patient safety and nursing quality. Ultimately, these problems may develop into a widespread crisis that threatens public health and safety.

However, significant shortcomings remain in current systematic research on the psychology and behavior of nurses in China. Existing domestic research generally suffers from small sample sizes and reliance on a single sampling method, which cannot comprehensively and objectively reflect the overall psychological and behavioral health status of nurses in China. Given the gradual, cumulative nature of mental and behavioral health changes, long-term, systematic longitudinal tracking is essential. Although a few scholars in China have attempted to initiate nurse cohort studies, a high-quality cohort research system focused on the psychology and behavior of nurses has not yet been established. For example, the nurse health cohort (TARGET) established by Shandong University is a multicenter prospective cohort study that assesses the impact of work-related stress, the working environment, and lifestyle factors on the health of Chinese nurses; however, the current coverage of this study remains limited, and the research subjects are currently limited to Shandong Province [10]. Meanwhile, the Nurses' Mental Health Study (NMHS), established by Central South University, is a multicenter prospective cohort study across hospitals nationwide that mainly focuses on psychological outcomes; however, the coverage of this study is also limited. Currently, only nurses from tertiary hospitals are included [11], which makes it difficult for Chinese academia to fully reveal the long-term evolution of the psychological and behavioral health of nurses and the key factors that influence this evolution. Therefore, China urgently needs a cohort study of the psychological and behavioral health of nurses.

In contrast, cohort studies on the health of nurses have become well established internationally. Indeed, the United States has launched a series of nurse health research (NHS)

projects since 1976, which have identified key associations between occupational exposure and chronic diseases, multifactorial health risks, and cross-generational effects on reproductive health. The Japanese Nurses' Health Study (JNHS) explored the mechanisms through which the group lifestyle of nurses affects the health of women [12]; Denmark, Sweden, South Korea, and other countries have also successively conducted large-sample, long-term follow-up cohort studies on the health of nurses [13,14,15,16]. These international studies have made important contributions to the health security of the global nursing community by tracking and analyzing health data for nurses over the long term. The psychological and behavioral characteristics of nurses in China and in international groups share professional commonalities but also differ due to local factors such as the medical system and the social and cultural environment, requiring targeted research to address their specific health needs.

Overall, conducting a cohort study of the psychology and behavior of nurses aligned with the national condition of China has irreplaceable practical significance. Indeed, this study will effectively fill the data gap in the field of long-term, dynamic tracking of the psychological behavior of nurses in China, and significantly improve early recognition and the precision of interventions for associated psychological problems. Conversely, the study can provide solid empirical support for nursing management policy-making and promote optimization of the nursing work system, scientific shift arrangements, and the improvement of organizational support mechanisms. Ultimately, by improving the working environment of nurses at the source and enhancing their sense of career fulfillment and willingness to continue practicing, this study will provide a strong guarantee for the in-depth implementation of the "healthy China" strategy.

2. Methods

2.1 Study Overview

The Psychology and Behavior Investigation of Chinese Nurses (PBICN) launched a large-scale, multicenter prospective cohort study to comprehensively examine the mental health and health-related behaviors of registered nurses across China. By establishing a robust longitudinal follow-up framework with biennial data collection, the study meticulously characterized the current status and dynamic trajectories of psychological well-being and behavioral patterns among Chinese nurses. The study rigorously examined individual-level, workplace, and broader social determinants of these outcomes and elucidated the mechanisms linking psychosocial factors to behavioral health. This ambitious initiative aimed to establish a high-quality, reusable evidence base to optimize nursing management strategies and strengthen professional support systems. This protocol was developed in strict accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, with further details provided in **Supplementary Table 1**.

This research adhered rigorously to the ethical principles enshrined in the Declaration of Helsinki (2013 revision). Comprehensive ethical approval was obtained from the Ethics Committee of the Fourth Affiliated Hospital of Zhejiang University School of Medicine (Approval No.: K2025219). The study was prospectively registered with the Chinese Clinical Trial Registry (ChiCTR2500108696). Informed consent was obtained from each participant before data collection.

2.2 Organizational Framework

To ensure comprehensive quality control and efficient implementation of the PBICN survey project, the project operates under a structured organizational framework led by a general manager. The project team comprises five specialized groups: the Expert Committee, Scale Design Group, Training and Coordination Group, Survey Group, and Quality Control Group (Fig. 1). The Expert Committee, composed of interdisciplinary scholars, offers strategic direction and scientific oversight of the research design and field implementation. The Scale Design Group develops, adapts, and validates psychological and behavioral assessment tools to ensure their scientific rigor and cultural relevance. The Training and Coordination Group orchestrates investigator training, secures ethical approvals, and ensures compliance with research protocols. The Survey Group operates under a two-tier system. Provincial lead units function as regional management hubs, coordinating data collection and fulfilling provincial sampling quotas. Data collection units, including secondary and tertiary hospitals, serve as clinical implementation sites where trained investigators administer electronic questionnaires to eligible nurses. The Quality Control Group provides central oversight of quality, meticulously monitoring every stage of the project—from pilot testing and data verification to sampling procedures—to maintain the highest standards of data integrity.

2.3 Sampling Design

The PBICN implemented a multistage, stratified, cluster sampling strategy to achieve broad geographical and hospital-tier coverage across the diverse healthcare landscape in China. In the initial stage, 33 provincial-level administrative divisions were included, comprising 22 provinces, 5 autonomous regions, 4 centrally administered municipalities (Beijing, Shanghai, Tianjin, Chongqing), and 2 Special Administrative Regions (Hong Kong and Macao). Data from the Taiwan region of China were not included in this study. The target sample size for each province was estimated using proportional allocation based on the number of registered nurses reported in the 2023 National Health Statistics Yearbook. The study aimed to recruit approximately 100,000 registered nurses accord-

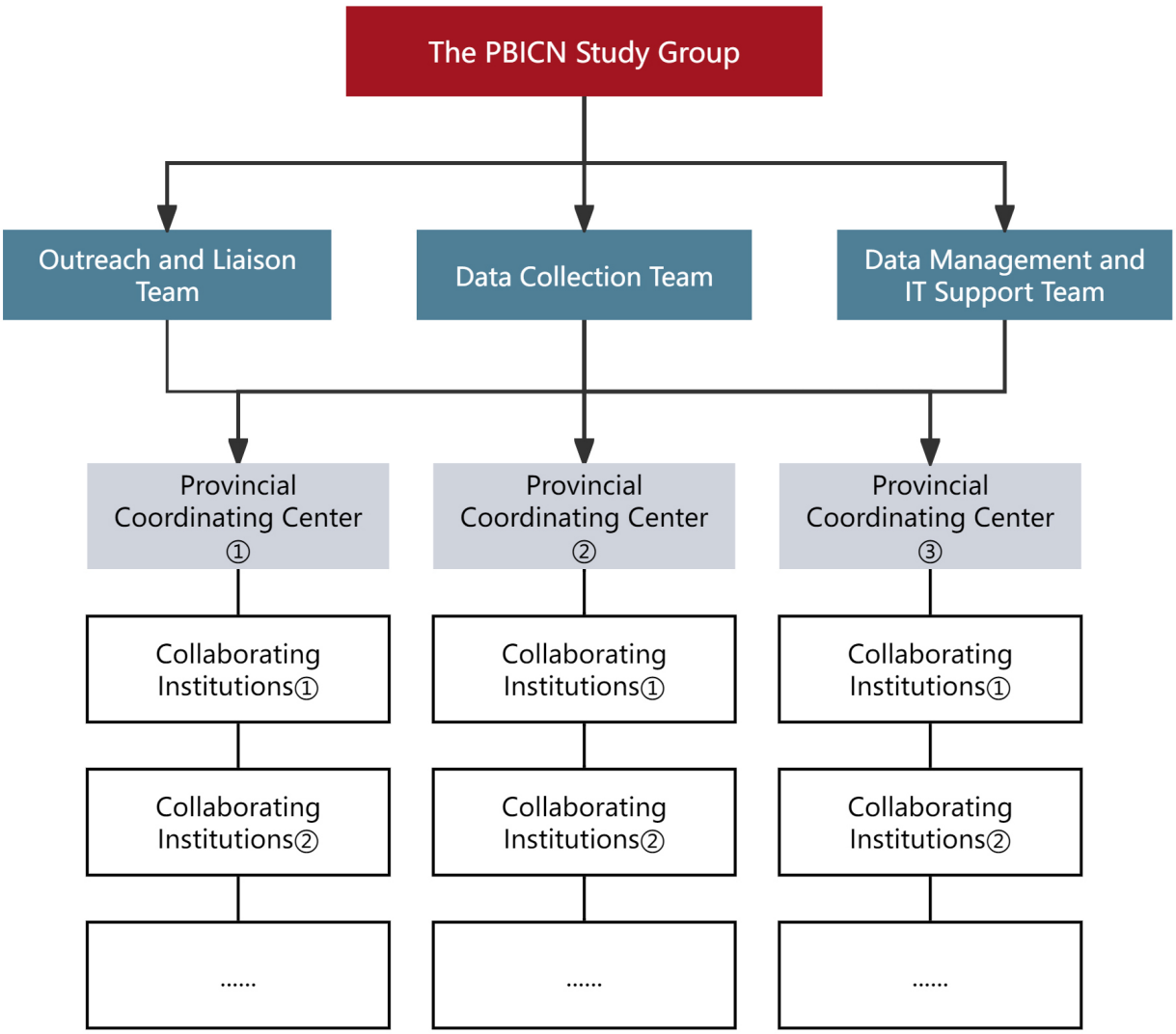


Fig. 1. The organizational framework for the Psychology and Behavior Investigation of Chinese Nurses (PBICN).

ing to the predefined provincial allocation plan. The detailed distribution of registered nurses, provincial proportions, planned sample sizes, and hospital-level allocation are provided in **Supplementary Table 2**. Subsequently, hospitals within each selected province were stratified by tier (primary, secondary, tertiary). The proportional allocation of nurse participants from primary, secondary, and tertiary hospitals was set at a 1:6:10 ratio, mirroring the national distribution of registered nurses across these hospital levels. Given the differences in nurse populations, hospital size, and the distribution of hospitals across provinces, the number of hospitals was not fixed a priori. Provincial lead units will organize hospitals into cluster-based data collection units based on provincial nurse quotas and hospital-level allocation requirements, and will invite all eligible nurses at each selected hospital to participate, with an anticipated response rate of approximately 80% per site. This approach provides broad coverage across geographic regions and hospital levels while allowing provincial implementation to reflect local hospital structures.

2.4 Participants

The PBICN targets registered nurses actively employed in Chinese hospitals and applies strict criteria to ensure data quality and broad coverage of the target nurse population. Inclusion criteria were as follows: (1) age ≥18 years; (2) a currently valid registered nurse license in China; (3) the ability to complete the online questionnaire independently or with investigator support, and voluntary participation in follow-up surveys. Exclusion criteria included: (1) intern or refresher nurses; (2) individuals on leave during the survey period; (3) less than one year of work experience; (4) unwillingness to cooperate with the study.

2.5 Questionnaire Design

The PBICN questionnaire was meticulously designed to capture key variables related to the psychological and behavioral health of Chinese nurses. Grounded in global research frontiers, occupational health priorities, and insights from multidisciplinary experts, the questionnaire includes

core sections covering basic personal information, occupational details, personal health status, psychological dimension scales, behavioral dimension scales, workplace environment measures, health outcome assessments, and supplementary scales.

To ensure scientific rigor and real-world relevance, the research team integrated validated instruments and contextually adapted items, informed by a rigorous literature review and consultations with experts in nursing, public health, psychology, psychiatry, nutrition, sports science, health education, and medical humanities. Key domains assess self-reported physical and mental health, work-related factors (workload), cognitive and emotional traits (depression), health behaviors (physical activity), and health outcomes (quality of life). Crucially, the questionnaire maintains substantial overlap with the Psychology and Behavior Investigation of Chinese Residents (PBICR) core variable set, enabling integrative analyses across both Chinese resident and nurse populations. A detailed overview of the PBICN questionnaire structure is presented in Table 1 [17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57].

Instrument selection was guided by relevance to the PBICN conceptual framework, prior validation in adult, Chinese, or nursing populations where available, a preference for validated short-form instruments, and complementarity across constructs to minimize redundancy.

2.6 Study Objectives and Outcome Framework

At the cohort-platform level, the PBICN does not prespecify a single primary outcome for all future analyses. The core outcome domains include psychological health, health behaviors, occupational health, health outcomes, and selected emerging topics. Potential exposure domains include individual, work-related and organizational, behavioral, family and social, and early-life or life-course factors. The same variable may serve as an outcome, exposure, mediator, or confounder, depending on the research question and causal framework. For each future study, a prespecified analysis plan will define the primary, secondary, and exploratory outcomes, exposure definitions, covariates, and statistical methods. The core domains will be assessed at baseline and again during the planned biennial data collection waves described in the "Study Overview" section.

After establishing the cohort, descriptive analyses will summarize participant characteristics, data completeness, and variable distributions. For longitudinal analyses, mixed-effects models or generalized estimating equations will be considered, as appropriate, to account for repeated measurements and clustering by hospital or province. Procedures for handling missing data and multiple testing should be prespecified in accordance with the research question and the analysis plan.

Approximately 40% of the questionnaire content was dynamically customizable at the provincial level, enabling local data collectors to add region-specific items to address local policy priorities or emerging challenges. This adaptable design accommodated evolving research needs while preserving core variables for robust longitudinal trend analysis.

2.7 Survey Administration

Each data collection unit actively recruited eligible nurses through hospital intranet announcements, targeted departmental briefings, and prominent poster advertisements. Nurses expressing initial interest underwent rigorous screening against predefined inclusion and exclusion criteria, conducted by meticulously trained investigators. Qualified candidates who provided written informed consent had the relevant contact information registered in a centralized database. This database securely captured essential details, such as name, mobile phone number, and affiliated hospital, to facilitate seamless longitudinal follow-up.

Participants who change hospitals but remain eligible for the study will continue to be followed through the electronic data collection system. Participants who leave nursing or retire will be recorded as occupational status transitions and may be treated as outcomes in relevant analyses. Routine follow-up will stop at the data collection wave in which the transition is reported. Loss to follow-up will refer to participants who do not complete a scheduled data collection wave and cannot be reached.

Electronic questionnaires have already been established online via a dedicated WeChat Official Account established by the research team. Participants can access the survey by scanning a QR code or clicking a designated hyperlink. Investigators will assign and record individual questionnaire IDs. All completed questionnaires will be uploaded directly to a secure central server, enabling real-time data aggregation, centralized management, and continuous quality monitoring.

2.8 Quality Control

High-quality data is essential to reliable research and evidence-based decision-making. Through continuous refinement, the PBICN has implemented a comprehensive, multistage quality control system encompassing five critical phases: questionnaire design, pre-investigation, investigator training, questionnaire dissemination, and data collection and analysis. Rigorous protocols govern each stage to minimize bias, ensure consistency, and preserve data integrity.

2.9 Questionnaire Development and Refinement

The questionnaire was meticulously developed through an extensive literature review and careful reference to established instruments. From September 2025 to May 2026, multiple rounds of expert consultations

Table 1. Overview of the scales used in the questionnaire.

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Adverse Childhood Experiences	ACE [17,18]	Psychological	18+	All populations	Seven dimensions: psychological abuse, physical abuse, sexual abuse, household substance abuse, household mental illness, violence against the mother, and household criminal behavior	11	Each item is scored as 0 (no) or 1 (yes). For each dimension, an affirmative response to any item within that dimension indicates that the experience is present. All items assess lifetime experiences.
Big Five Inventory-10	BFI-10 [19,20,21]	Psychological	18+	All populations	Five dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness	10	Each item is scored from 1 to 5 (1 = strongly disagree; 5 = strongly agree). Each dimension score is calculated by summing the two corresponding items and ranges from 2 to 10. Higher scores indicate stronger expression of the corresponding personality trait.
Perceived Stress Scale-4	PSS-4 [22,23]	Psychological	18+	All populations	Two dimensions: perceived loss of control and tension	4	Each item is scored from 1 to 5 (1 = never; 5 = always), yielding a total score ranging from 4 to 20. Higher scores indicate greater perceived stress, unpredictability, and loss of control.
New Generalized Self-Efficacy Scale-Short Form	NGSES-SF [24,25,26]	Psychological	18+	All populations	Three dimensions: level, intensity, and prevalence	3	Each item is scored from 1 to 5 (1 = strongly disagree; 5 = strongly agree), yielding a total score ranging from 3 to 15. Higher scores indicate greater self-efficacy.
Implicit Health Beliefs	IHB [27,28]	Psychological	18+	All populations	Two dimensions: incremental lay health theory and entity lay health theory	6	Each item is scored from 1 to 6 (1 = strongly disagree; 6 = strongly agree), yielding a total score ranging from 6 to 36. Higher scores indicate stronger incremental rather than entity-based health beliefs.
Body Image–Acceptance and Action Questionnaire–5	BI-AAQ-5 [29]	Psychological	18+	All populations	Unidimensional; assess psychological flexibility related to body image	5	Each item is scored from 1 to 7 (1 = never true; 7 = always true), yielding a total score ranging from 5 to 35. Higher scores indicate greater psychological flexibility related to body image.
Rest Intolerance Scale	RIS [30]	Psychological	18+	All populations	Four dimensions: negative feelings, social comparison, obsessive thinking, and cognitive bias	8	Each item is scored from 1 to 5 (1 = rarely/strongly disagree; 5 = often/strongly agree), yielding a total score ranging from 8 to 40. Higher scores indicate greater intolerance of rest.
Brief Resilience Scale	BRS [31]	Psychological	18+	All populations	Unidimensional; assesses the ability to recover from stress and adversity	6	Each item is scored from 1 to 6 (1 = strongly disagree; 6 = strongly agree), yielding a total score ranging from 6 to 36. Higher scores indicate greater resilience.

Table 1. Continued.

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
International Physical Activity Questionnaire-7	IPAQ-7 [32,33]	Behavioral	18+	All populations	Four dimensions: vigorous-intensity physical activity, moderate-intensity physical activity, walking, and sitting	7	Physical activity is expressed in MET-minutes/week: ① Walking MET-minutes/week = 3.3 × daily walking duration (min) × walking days/week; ② moderate-intensity activity MET-minutes/week = 4.0 × daily activity duration (min) × days/week; ③ vigorous-intensity activity MET-minutes/week = 8.0 × daily activity duration (min) × days/week. Total weekly MET-minutes = ① + ② + ③. Higher values indicate greater physical activity.
Intimate Relationship Violence Scale	IRVS [34]	Behavioral	18+	Individuals with relationship or marital experience	Three dimensions: sources of violence, physical violence, and psychological violence	5	Each item is scored from 1 to 5 (1 = never; 5 = almost always), yielding a total score ranging from 5 to 25. Higher scores indicate greater exposure to intimate relationship violence.
Sleep Rating Scale for Self-Report	SRSS [35]	Behavioral	18+	All populations	Unidimensional; assesses overall sleep quality and related problems	10	Each item is scored from 1 to 5, yielding a total score ranging from 10 to 50. Scores are categorized into four severity levels: 10–22 (normal), 23–29 (mild), 30–39 (moderate), and ≥40 (severe sleep problems). Higher scores indicate poorer sleep quality.
Family Health Scale-Short Form	FHS-SF [36,37]	Other	18+	All populations	Four dimensions: social and emotional health processes, social approaches to health, family health resources, and external social support	10	Each item is scored from 1 to 5 (1 = strongly disagree; 5 = strongly agree), yielding a total score ranging from 10 to 50. Higher scores indicate better family health.
Perceived Social Support Scale-Short Form	PSSS-SF [38,39]	Other	18+	All populations	Three dimensions: family support, support from friends, and support from significant others	3	Each item is scored from 1 to 7 (1 = strongly disagree; 7 = strongly agree), yielding a total score ranging from 3 to 21. Higher scores indicate greater perceived social support.
Maternal Empowerment	—	Other	18+	All populations	Self-developed questionnaire assessing women's empowerment in family decision-making, including decisions regarding household expenditure, use of personal income, and participation in family affairs	3	Items 1 and 2 are categorical, with response options including "mainly self", "mainly partner", "jointly decided", and "others". Item 3 is scored from 1 to 5 (1 = strongly disagree; 5 = strongly agree). A higher Item 3 score indicates greater perceived empowerment in family decision-making.

Table 1. Continued.

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Fertility Intention	—	Other	18+	All populations	Self-developed questionnaire assessing fertility intentions, the ideal number of children, and reproductive decision-making	3	Item 1 is scored as 1 (yes), 2 (unsure), or 3 (no). Item 2 requires a numerical response indicating the ideal number of children. Item 3 is categorical, with response options including "mainly self", "jointly decided", "mainly partner", and "influenced by others". The items are analyzed separately rather than summed, thereby reflecting distinct aspects of fertility intention.
Workplace Violence Scale	WVS [40,41]	Occupational	18+	Nurses	Five dimensions: physical attacks, emotional abuse, threats, verbal harassment, and physical harassment	5	Each item is scored from 0 to 3 (0 = never; 1 = once; 2 = 2–3 times; 3 = ≥4 times), yielding a total score ranging from 0 to 15. Scores are categorized as 0 (no violence), 1–5 (low), 6–10 (moderate), and 11–15 (high). Higher scores indicate greater exposure to workplace violence.
Quantitative Workload Inventory	QWI [42]	Occupational	18+	All populations	Unidimensional; assesses perceived workload in terms of work pace and quantity	5	Each item is scored from 1 to 5 (1 = less than once a month or never; 5 = several times a day), yielding a total score ranging from 5 to 25. Higher scores indicate a greater perceived workload.
Nurse–Patient Relationship Scale in China	NPRS-C [43]	Occupational	18+	Registered nurses	Two dimensions: nurse–patient trust (four items) and patient-centered nursing (five items)	9	Each item is scored from 1 to 6 (1 = strongly disagree; 6 = strongly agree), yielding a total score ranging from 9 to 54. Higher scores indicate a better nurse–patient relationship.
Work–Family Conflict Scale	WAFCS [44]	Occupational	18+	Working parents with at least one child aged 2–12 years	Two dimensions: work-to-family conflict (WFC, five items) and family-to-work conflict (FWC; five items)	10	Each item is scored from 1 to 7 (1 = strongly disagree; 7 = strongly agree). The WFC and FWC subscale scores are calculated separately, with each ranging from 5 to 35. Higher scores indicate greater work–family conflict.
Chinese Version of Copenhagen Burnout Inventory-7	C-CBI-7 [45]	Occupational	18+	All populations	Two dimensions: work exhaustion and work frustration	7	Each item is scored from 1 to 5 (1 = rarely/strongly disagree; 5 = often/strongly agree). The total score is calculated as the mean of all items and ranges from 1 to 5. Higher scores indicate greater occupational burnout.
Job Satisfaction Scale	JSS-3 [46]	Occupational	18+	Registered nurses	Unidimensional; assesses overall job satisfaction	3	Each item is scored from 1 to 5 (1 = strongly disagree; 5 = strongly agree), yielding a total score ranging from 3 to 15. Higher scores indicate greater job satisfaction.

Table 1. Continued.

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Work Performance Scale	WPS [47]	Occupational	18+	Registered nurses	Two dimensions: task performance and relationship performance	11	Each item is scored from 1 to 5 (1 = completely inconsistent; 5 = completely consistent), yielding a total score ranging from 11 to 55. Higher scores indicate better work performance.
Patient Safety Measurement	—	Occupational	18+	Registered nurses	Self-developed questionnaire assessing patient safety performance and the occurrence of adverse events	2	Item 1 is scored from 1 to 5 (1 = very poor; 5 = excellent). Item 2 is scored as 0 (an adverse event occurred) or 1 (no adverse event occurred). Total scores range from 1 to 6, with higher scores indicating better patient safety.
Perceived Prejudice Questionnaire for Male Nursing Students [48]	—	Occupational	18+	Male nurses	Unidimensional; assesses perceived prejudice toward male nurses	6	Each item is scored from 1 to 4 (1 = strongly disagree; 4 = strongly agree), yielding a total score ranging from 6 to 24. Higher scores indicate greater perceived prejudice.
Turnover Intention	—	Occupational	18+	Registered nurses	Self-developed questionnaire assessing the intention to leave the current nursing position	2	Each item is scored from 1 to 5 (1 = strongly disagree; 5 = strongly agree), yielding a total score ranging from 2 to 10. Higher scores indicate a stronger intention to leave the current nursing position.
Sickness Presenteeism [49]	—	Occupational	18+	Registered nurses	Unidimensional; assesses attendance at work despite feeling the need to take sick leave	1	The item is scored from 1 to 4 (1 = never; 2 = once; 3 = 2–5 times; 4 = more than 5 times). Higher scores indicate more frequent sickness presenteeism.
EQ-5D-5L	EQ-5D-5L [50]	Health outcome	18+	All populations	Five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression	5	Each item is scored from 1 to 5, yielding a total score ranging from 5 to 25. Higher scores indicate better health-related quality of life.Each of the five dimensions is scored from 1 to 5 (1 = no problems; 5 = extreme/unable to), yielding a five-digit health state profile. These 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. Higher index scores indicate better health-related quality of life.
World Health Organization Five Well-Being Index	WHO-5 [51]	Health outcome	18+	All populations	Unidimensional; assesses subjective well-being and mental health status during the preceding two weeks	5	Each item is scored from 0 to 5 (0 = not present; 5 = constantly present), yielding a total score ranging from 0 to 25. Higher scores indicate greater psychological well-being.

Table 1. Continued.

Scale	Abbreviation	Level	Applicable age (years)	Target population	Dimension	Item	Score
Nordic Musculoskeletal Questionnaire	NMQ [52]	Health outcome	18+	Registered nurses	Unidimensional; assesses the frequency of musculoskeletal pain and related work absenteeism during the preceding year	10	Each response is scored as 0 (no) or 1 (yes) across 10 body regions (neck, shoulder, upper back, elbow, lower back, hand/wrist, hip/buttock, thigh, knee, and ankle/foot), and related absenteeism, yielding a total score ranging from 0 to 10. Higher scores indicate greater musculoskeletal discomfort and absenteeism.
Patient Health Questionnaire-9	PHQ-9 [53,54]	Health outcome	18+	All populations	Unidimensional; assesses the severity of depressive symptoms	9	Each item is scored from 0 to 3 (0 = not at all; 3 = nearly every day), yielding a total score ranging from 0 to 27. Scores are categorized as 0–4 (minimal), 5–9 (mild), 10–14 (moderate), 15–19 (moderately severe), or ≥20 (severe). A score ≥10 is commonly used as the threshold for clinically significant depressive symptoms.
Generalized Anxiety Disorder-3	GAD-3 [55,56]	Health outcome	18+	All populations	Unidimensional; assesses the severity of anxiety symptoms	3	Each item is scored from 0 to 3 (0 = not at all; 3 = nearly every day), yielding a total score ranging from 0 to 9. Higher scores indicate more severe anxiety symptoms.
Suboptimal Health Status Questionnaire-Short Form	SHSQ-SF [57]	Health outcome	18+	All populations	Unidimensional; assesses suboptimal health status	9	Each item is scored from 0 to 4 (Likert 5-point scale), yielding a total score ranging from 0 to 36. Scores are categorized as indicating optimal health (<11) or suboptimal health (≥11).

were held with senior specialists from diverse disciplines, including nursing science, public health, psychology, psychiatry, nutrition, sports science, health education, medical humanities, social medicine, and health statistics, to refine the study design and questionnaire content. Experts were selected based on academic qualifications and regional representativeness. Feedback from each round was systematically reviewed, resulting in iterative refinements to item wording, logical branching, and scale selection.

2.10 Pre-Investigation

Multiple rounds of pilot testing were conducted across multiple units with hundreds of participants between April and June 2026 to identify and address potential issues before formal data collection. Quota sampling, mirroring the formal survey, will reflect the planned sampling structure. During each pilot round, participant feedback will be systematically gathered and rigorously discussed by the research team to pinpoint concerns regarding questionnaire clarity, item logic, and survey length. Revisions will be implemented accordingly. Data from this pilot phase will be used exclusively for refinement and will be excluded from the final analysis. The quality control group will subsequently establish logic-checking protocols based on the finalized questionnaire.

In the pilot survey, 275 participants completed the questionnaire, and the median completion time was 30 minutes. Since all displayed items were mandatory, all participants submitted complete questionnaires, resulting in a 100% completion rate among pilot participants. Items not displayed because of predefined eligibility or branching logic did not apply to that participant and were not considered missing responses. Accordingly, the item nonresponse rate for displayed items was 0%. A formal review of questionnaire length will be initiated should the median pilot completion time exceed 30 minutes, the pilot completion rate fall below the prespecified 95% target, or repeated participant feedback indicate excessive length or redundancy. If further reduction is necessary, we will first remove or shorten non-core content, including redundant or less essential items, while retaining variables required for the primary study objectives and longitudinal comparability. If a validated scale needs to be shortened, we will preferentially use an established short form with prior validation evidence, preferably one validated in Chinese adult or nursing populations, rather than deleting items arbitrarily. Any substantial modification to the questionnaire will undergo an appropriate scientific and applicability review before formal implementation.

2.11 Investigator Training

To ensure standardized, high-quality data collection, the PBICN used a hierarchical training model. Quality control was implemented through a three-tier architecture: the first tier comprised the PBICN research team, responsible for establishing standards, monitoring the system, validating data, and conducting supervisory spot checks; the second tier included provincial lead units, responsible for managing sub-centers within their jurisdictions, monitoring progress, and reporting issues; the third tier encompassed sub-center data collection units, responsible for on-site data collection and follow-ups. Each data collection unit formed a dedicated working group, led by one to two site coordinators, to oversee survey operations at the respective hospital.

Before data collection, the research team implemented a two-level training program: Level One Training: The research team conducted centralized online training for all provincial leading units and sub-center leaders, and all sessions were fully recorded for archiving; Level Two Training: Provincial leading units conducted secondary training for sub-center research coordinators within their jurisdiction, tailored to local circumstances. These sessions covered study objectives, questionnaire administration procedures, ethical practices, participant screening, and informed consent protocols. Training culminated in a formal assessment; only individuals who passed were authorized to collect data. Investigators were required to strictly adhere to inclusion and exclusion criteria and obtain written informed consent from every participant. During data collection, the quality control group held weekly online meetings with each data collection unit to review electronic questionnaire completion, troubleshoot emerging challenges, and ensure sustained data quality.

2.12 Questionnaire Distribution

Data collection was conducted by trained investigators in strict adherence to rigorous standards. A unique coding system was used to label each questionnaire, and each participant was assigned a distinct identifier to ensure traceability. Completed questionnaires were automatically uploaded to a secure central server. The Quality Control Group and site coordinators met online weekly to review data completeness, resolve discrepancies, and address emerging issues in real time. Regular reminders helped increase participant response rates. The core evaluation indicators are as follows: (1) questionnaire completion rate >95%; (2) loss to follow-up rate <20%, with a minimum standard of 70%; (3) time to complete a single document >900 s.

2.13 Questionnaire Retrieval and Analysis

After each data collection wave, two independent reviewers will systematically verify all electronic records following a prespecified quality control protocol. Exclusion criteria for invalid questionnaires include: (1) excessive submissions from the same IP address in a single day (more than 500); (2) a completion time <900 seconds (15 minutes); (3) logical inconsistencies (*e.g.*, conflicting responses to branching items); (4) missing data >20% of core variables; (5) duplicate submissions from the same participant.

Discrepancies between reviewers will be resolved by consensus or referred to a third reviewer. The target is a 95% valid questionnaire retention rate, with verification of consistency between answers to reverse-scored and forward-scored questions; logical consistency checks of age and years of work experience; logical consistency checks of professional title and educational background; detection of anomalies in the internal consistency of key scales, such as selecting the same option for all questions. After meticulous data cleaning, de-identified data will be stored in a password-protected database with regular backups. The distribution of key demographic characteristics will be described to assess the composition of the recruited cohort.

Loss to follow-up will be handled using multiple imputation or inverse probability weighting, as appropriate; sensitivity analyses will be conducted to assess the potential influence of missing follow-up data.

2.14 Permission to View and Export Data

All questionnaires are automatically uploaded to the data collection system upon submission and immediately locked. Once the data is locked, no organization, including the research team, provincial leading units, or data collection units, may modify or delete the original data. Access permissions for data distribution are set at three levels to ensure data security and proper use: research teams can view, export, and analyze all raw data; provincial leading units receive system accounts assigned by the research teams and can view and export data for their province; exported files are for reference only and cannot be edited; data collection units do not directly access the system and receive data that has been exported and encrypted by the provincial leading units. Quality control procedures for the questionnaire are shown in Fig. 2.

3. Discussion

As the healthcare system in China continues to improve, its nursing workforce has grown rapidly and now accounts for approximately one-quarter of the global total of registered nurses [58]. However, nurses face a high risk of occupational injury and prevalent mental health issues, which not only constrain improvements in nursing care quality but also directly threaten the health of nurses [59,60,61]. Notably, existing cohort studies in China are often limited by small sample sizes and insufficient representativeness [49]. Therefore, establishing a large-scale national cohort on the psychology and behavior of nurses tailored to the Chinese context is imperative. Such a cohort is crucial for dynamically monitoring the physical and mental health of the nursing workforce, identifying key influencing factors, and providing evidence-based decision support to health authorities based on large-sample data. The variable design in this study is comprehensive, covering basic demographics, physical health status, mental health assessments, and health behavior monitoring, as well as workplace factors such as workload and job burnout. Moreover, given the notable regional disparities in China, locally relevant variables were included to address the unique structural needs of the Chinese nursing population.

Specifically, this study has three major strengths. First, in terms of study design, we adopted a multistage, stratified, cluster recruitment strategy with a three-tier allocation ratio of 1:6:10 to enhance geographic and hospital-level coverage. Second, for study implementation, we established a working system architecture involving the research team, provincial lead units, and data collection institutions to enforce rigorous quality control and management measures. Furthermore, five specialized working groups were formed, namely the quality control group, expert committee, scale design group, training and coordination group, and survey group, to facilitate the smooth progression and successful execution of the study. Finally, regarding study variable design, this study developed a comprehensive indicator system encompassing psychological, behavioral, and occupational dimensions. The inclusion of core variables enables comparisons across populations using databases such as the PBICR. In the mental health assessment section, in addition to conventional indicators, this study focuses specifically on two variables that have often been overlooked among nurses: rest-related shame and adverse childhood experiences (ACEs). Rooted in traditional Chinese cultural values, diligence is regarded as a virtue, often leading to intense moral anxiety and a cognitive bias about rest—the perception that resting equals idleness [62]. This sense of rest-related shame has been identified as a significant risk factor for anxiety, depression, and reduced subjective well-being, and represents a potential but underrecognized occupational health hazard for nurses [63]. Furthermore, childhood constitutes a critical window for personality formation. Adverse experiences during childhood not only increase the risk of mental disorders in adulthood [64] but may also exert transgenerational health impacts [65]. Conversely, positive early-life experiences can serve as important psychological buffers [66]. Accordingly, this study aimed to provide a robust scientific basis for developing precise psychological support interventions for nurses through multidimensional psychological assessment.

In the behavioral health dimension, this study focuses on indicators such as physical activity, dietary behaviors, intimate partner violence, and sleep health. Given the heavy workload and frequent shift work inherent in clinical nursing practice, nurses face substantial challenges to physical fitness and a high risk of circadian rhythm disruption. Existing evidence indicates that healthy dietary patterns and regular, moderate physical activity not only help maintain physiological and psychological homeostasis [1] but also improve sleep quality [4]. Therefore, this study aimed to clarify how these behavioral factors interact and to provide empirical evidence and practical guidance for developing targeted behavioral health interventions for nurses.

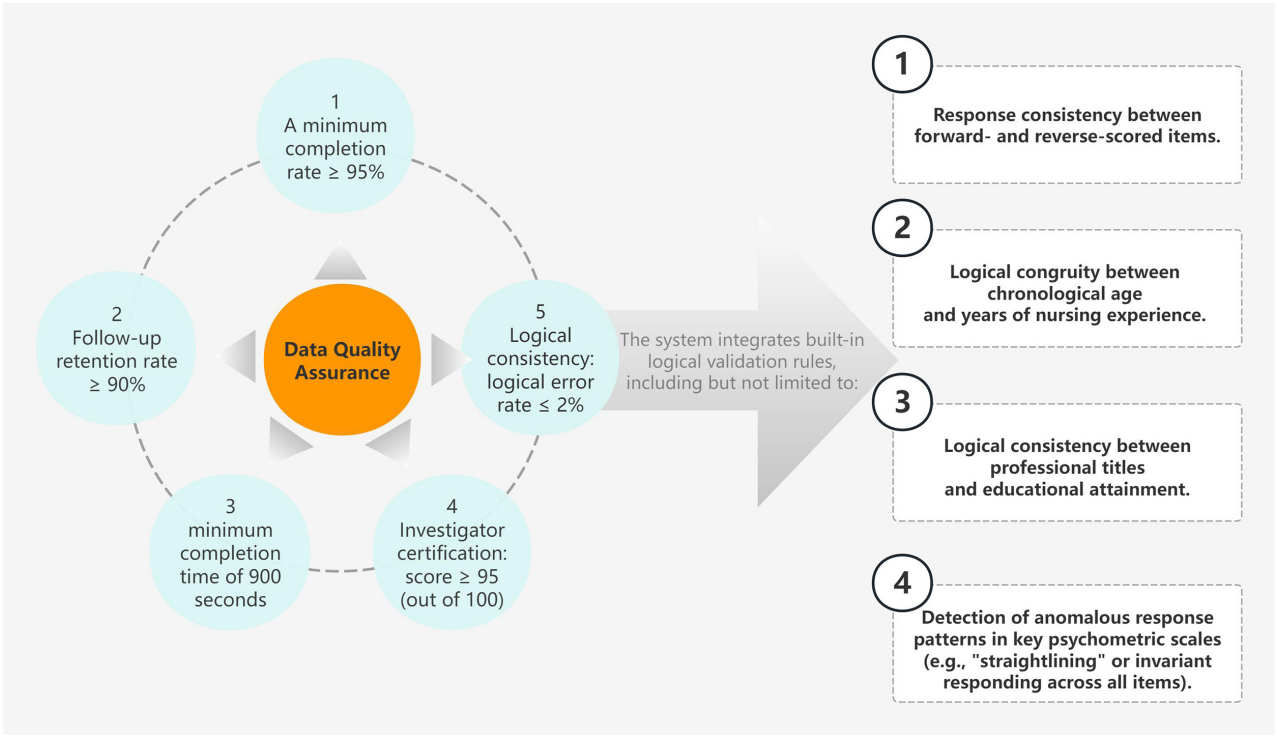


Fig. 2. Quality control procedures in the PBICN.

In the occupational health dimension, this study systematically examines multiple factors, including workplace violence, workload, nurse–patient relationships, work-related conflicts, implicit health beliefs, job burnout, job satisfaction, job performance, patient safety and quality of nursing care, perceived discrimination among male nurses, turnover intention, and presenteeism (covert absenteeism). Against the backdrop of current tensions in physician–patient and nurse–patient relationships, nurses, as front-line healthcare providers, are routinely exposed to high-intensity nursing procedures and face a substantial risk of workplace violence, with verbal violence being the most frequently reported type [67]. Such adverse events not only trigger psychological and behavioral problems, including anxiety, depression, and sleep disturbances, thereby impairing work efficiency and quality [68], but may also exacerbate job burnout and increase turnover rates [69]. Furthermore, due to the predominantly female composition of the nursing workforce, male nurses often encounter gender-based exclusion in certain specialized departments [70]. Coupled with the limited number of male peers in their work units, this may hinder their access to adequate emotional and instrumental support from colleagues [71]. Thus, by comprehensively investigating these variables, this study aimed to advance understanding of the complex interplay between the occupational environment of nurses and their physical and mental health. Ultimately, the findings are expected to provide a scientific basis for safeguarding the labor rights and interests of nurses, advancing nursing science, and informing relevant health policies.

Meanwhile, establishing a cohort with broad geographical and hospital-tier coverage across China on the psychological and behavioral health of nurses would serve two major purposes. First, it would facilitate dynamic tracking of the health trajectories and psychological and behavioral status of nurses in China, enable the early identification of health-related risk factors among nurses, and provide empirical evidence to inform targeted interventions and the development of relevant nursing policies. Second, developing a nurse cohort would constitute a key strategic step toward implementing the Healthy China 2030 initiative. It would provide evidence-based support for optimizing healthcare workforce allocation policies and improving the quality of healthcare services, thereby strengthening the resilience and promoting the high-quality development of the healthcare system.

This study has several notable strengths. First, the prospective cohort design, whose evidentiary strength is second only to that of randomized controlled trials, effectively enables the establishment of causal relationships between exposures and outcomes. Second, the research team has extensive experience developing large-scale national databases and has established robust quality control and privacy protection systems, ensuring compliance with data governance and use requirements.

Nevertheless, this study also has limitations. Although the sample was allocated based on the number of registered nurses in each province and proportional requirements were set for nurses from different hospital tiers, the study did not use probability sampling or predefine the

number of hospitals recruited from each province. The study relied on hospital announcements, online recruitment, and voluntary participation by nurses, which may introduce variability in hospital participation, self-selection bias, and non-response bias, particularly for mental health and occupational stress outcomes.

4. Conclusion

The PBICN will establish a large-scale, longitudinal database with broad geographic and hospital-level coverage to assess the psychological and behavioral health of Chinese nurses. The evidence generated by this cohort will support the early identification of health risks, inform nursing management policies, and contribute to the implementation of the Healthy China 2030 initiative.

Availability of Data and Materials

Data sharing is not applicable to this article, as it describes a study protocol without presenting any research data.

Author Contributions

HuW, YuZ, YqY, RM, YmZ, JyH, KS, XyL, and SeY designed the research study and developed the methodology. HuW, YuZ, and YqY drafted the manuscript. XF, XyY, CpX, NS, XlJ, CqD, ChZ, HxC, DhJ, HuH, DbH, ShJ, XlY, JC, YhS, YL, XqG, XyW, XmZ, ClW, DxZ, LlD, Ci, and PLC performed data collection and coordinated multi-center recruitment. YbW conceived and supervised the study, acquired funding, and critically revised the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision). Ethical approval was obtained from the Ethics Committee of the Fourth Affiliated Hospital of Zhejiang University School of Medicine (Approval No.: K2025219). Written informed consent was obtained from all participants prior to data collection.

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Conflicts of Interest

The corresponding author, Yibo Wu, is an editorial board member of Global Health and Hospital Management. Dr. Wu had no involvement in the peer review or editorial decision-making process for this article and had no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to Tian Gao. The other authors declare no competing interests.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.31083/GHHM53654.

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