

Developing a Systematic Review-Informed Model for Identifying Mental Health Problems among Older Adults in China

Shengyu Ding¹, Xue Meng¹, Huifeng Zhang¹, Zihuan Xiong¹, Weilong Xiao^{1,2*}

¹School of Psychology, Zhejiang Normal University, Jinhua, China

²Zhejiang Philosophy and Social Science Laboratory for the Mental Health and Crisis Intervention of Children and Adolescents, Jinhua, China

Email: *weilong.xiao@zjnu.edu.cn, *xwl743@zjnu.edu.cn

How to cite this paper: Ding, S.Y., Meng, X., Zhang, H.F., Xiong, Z.H. and Xiao, W.L. (2026) Developing a Systematic Review-Informed Model for Identifying Mental Health Problems among Older Adults in China. *Journal of Biosciences and Medicines*, 14, 32-56.

<https://doi.org/10.4236/jbm.2026.149003>

Received: July 28, 2026

Accepted: August 30, 2026

Published: September 2, 2026

Copyright © 2026 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Older adults are particularly vulnerable to anxiety and depressive symptoms, including their co-occurrence, which often coexist with chronic illness, multimorbidity, disability, sleep disturbance, loneliness, and social isolation. In this review, “mental health problems” refers to elevated anxiety and/or depressive symptoms identified using validated screening instruments rather than formal psychiatric diagnoses. Although previous research has identified numerous correlates across sociodemographic, physical, psychological, family, social, and environmental domains, the evidence remains fragmented and lacks an integrative framework. This study systematically reviewed empirical research on anxiety and depression among older adults in Chinese mainland. Using narrative synthesis and variable mapping, we identified core factors associated with later-life mental health problems and incorporated representative international evidence for theoretical and cross-cultural support. We propose a risk accumulation-functional vulnerability-positive support model, in which risk accumulation represents the underlying stress context, functional vulnerability reflects aging-specific conditions that may increase susceptibility, and positive support represents resources that may protect mental health and provide intervention entry points. The model offers a theoretical basis for symptom screening, risk stratification, community service allocation, and targeted intervention among older adults.

Keywords

Older Adults, Mental Health, Systematic Review, Risk Accumulation, Functional Vulnerability, Positive Support

1. Introduction

As population aging accelerates, mental health in later life has become an increasingly important concern in public health, community governance, and research on healthy and active aging. The World Health Organization estimates that approximately 14.1% of people aged 70 years and older experience a mental health condition. Anxiety and depression are among the most common mental health problems in later life, yet they remain widely underrecognized and undertreated, with stigma often delaying help-seeking [1]. Mental health services for older adults should therefore extend beyond identifying individuals who meet clinical diagnostic criteria to the early detection of those who have not yet developed severe symptoms but are already exposed to multiple risks.

Later life involves continuous changes and readjustments in physical capacity, social roles, family relationships, and living environments. Role transitions after retirement, reduced income, bereavement, increasing chronic illness, mobility limitations, and growing care needs may all undermine psychological adaptation. The WHO identifies bereavement, financial difficulties, social isolation, chronic illness, functional decline, and inadequate support services as major threats to mental health in later life [1]. Studies of older adults in China have similarly shown that chronic diseases and multimorbidity are closely associated with depressive symptoms, with the number and type of conditions, as well as the resulting restrictions on daily life, jointly increasing psychological burden [2] [3].

Compared with mental health problems in younger populations, those occurring in later life are often more difficult to detect because of their concealed, comorbid, and multifaceted presentation. Symptoms such as fatigue, changes in sleep and appetite, and declines in attention or memory may be misattributed to normal aging, chronic illness, or medication side effects. Anxiety, depression, loneliness, sleep disturbance, chronic pain, and limitations in activities of daily living also frequently co-occur and reinforce one another. Physical impairment and reduced daily functioning are significantly associated with depressive symptoms, potentially because functional limitations reduce independence, social participation, and self-efficacy [4]. Cognitive frailty has also been consistently associated with subsequent depression, suggesting that physical and cognitive decline may constitute a vulnerability through which other risks are translated into psychological distress [5].

The present study uses anxiety and depression as the primary evidence base for developing a model to identify mental health problems among older adults. These conditions are not only among the most extensively studied and reliably measured psychological problems in later life but are also closely linked to loneliness, social isolation, sleep disturbance, chronic disease burden, physical decline, and cognitive frailty. Large-scale studies in China have associated anxiety and depression among older adults with gender, marital status, chronic illness, insomnia, lifestyle, and social participation [6] [7]. Longitudinal evidence further indicates that persistent loneliness and social isolation predict higher subsequent levels of depres-

sion [8]. Rather than merely comparing the prevalence of anxiety and depression, it is therefore necessary to identify recurring risk and protective factors and clarify how they jointly form an integrated risk structure.

Previous research has identified correlates of anxiety and depression across multiple domains. At the sociodemographic level, female gender, widowhood, lower education and income, living alone, and urban-rural inequalities in resources have been associated with poorer mental health. Physical and functional correlates include chronic illness, multimorbidity, pain, insomnia, frailty, limitations in activities of daily living, and cognitive decline [2] [4] [6]. At the psychological and social levels, loneliness, low life satisfaction, social isolation, and inadequate support may increase risk, whereas social participation, regular physical activity, family support, and community engagement may be protective. A national longitudinal study found that older adults who never participated in social activities were more likely to develop depressive symptoms, highlighting social participation as a potentially important target for intervention [9].

Despite this growing evidence base, existing research remains insufficient for precise risk identification. First, most studies focus on individual predictors and lack an overarching framework that integrates physical, psychological, familial, social, and environmental risks, making it difficult to explain the cumulative effects of multiple exposures. Second, chronic disease, frailty, disability, cognitive decline, and sleep disturbance are typically treated as general predictors, with limited attention to how they may amplify other risks by weakening self-care capacity, social participation, and coping resources. Third, protective factors such as family and social support, community services, physical activity, and psychological resilience have not been systematically incorporated into risk identification and stratified intervention. The WHO likewise emphasizes the importance of social connectedness, safe environments, health-promoting behaviors, and community services for mental health in later life [1]. An identification model should therefore address not only where risks originate but also which supportive resources can interrupt risk accumulation and provide feasible entry points for intervention.

To address these limitations, the present study systematically reviews and integrates evidence on anxiety and depression among older adults, with a primary focus on research conducted in China. It addresses four interrelated questions. First, across which domains are the factors repeatedly associated with anxiety and depression among older adults in China distributed, and do these factors form a coherent risk structure? Second, do functional factors such as chronic illness, frailty, disability, and cognitive decline exert only direct effects on mental health, or do they also amplify the influence of other risks? Third, how do positive resources—including family support, social support, community services, social participation, and psychological resilience—buffer accumulated risk? Fourth, how can fragmented evidence be translated into a theoretical identification framework that supports community-based screening, risk stratification, and intervention matching?

2. Literature Search and Evidence Synthesis Methods

This systematic review focused on anxiety and depressive symptoms as the primary mental health outcomes among older adults in Chinese mainland. Throughout this review, “mental health problems” refers to elevated anxiety and/or depressive symptoms identified using validated screening instruments or symptom scales, including co-occurring anxiety and depressive symptoms. The term does not denote a formal psychiatric diagnosis. Studies consisting exclusively of patients with confirmed clinical diagnoses were excluded, whereas studies conducted in community, institutional, hospital, or primary-care samples were eligible when symptom-based outcomes and associated factors were reported. The review was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 statement (PRISMA 2020). The reporting of information sources, search strategies, search dates, and record-management procedures was additionally guided by the PRISMA Search Extension (PRISMA-S) [10] [11].

2.1. Search Strategy

Chinese-language studies were searched in the China National Knowledge Infrastructure (CNKI), Wanfang Data, and VIP Database. English-language studies were searched in Web of Science, PubMed, PsycINFO, and Scopus. All databases were searched from inception to March 2026.

The Chinese databases were used to identify studies published in Chinese that examined older adults in Chinese mainland. The English-language databases were searched to identify studies of the same population that were published in English. Thus, the English-language search was intended to capture internationally published research on older adults in Chinese mainland rather than to extend the review to populations from other countries or regions.

Searches combined controlled vocabulary, where available, with free-text terms, and the search fields and syntax were adapted to the requirements of each database. The search terms were organized into three main concept groups. The first group described the target population and included terms such as “老年人”, “高龄老人”, “older adults”, “elderly”, and “aging”. The second group described the outcomes of interest and included “焦虑”, “抑郁”, “焦虑抑郁共病”, “anxiety”, “depression”, and related terms. The third group described potential correlates and included terms such as “风险因素”, “保护因素”, “社会支持”, “孤独”, “慢性病”, “衰弱”, “risk factors”, “associated factors”, “protective factors”, “social support”, and “frailty”. Terms within each concept group were combined using the Boolean operator “OR”, whereas the three concept groups were combined using “AND”.

All retrieved records were imported into Zotero and deduplicated before screening. The reference lists of included studies and relevant publications were also examined to identify potentially eligible studies not captured by the database searches. The design and reporting of the search strategy followed PRISMA-S rec-

ommendations to enhance the completeness, transparency, and reproducibility of the literature search [11].

2.2. Eligibility Criteria

Studies were eligible for inclusion when they met all of the following criteria. First, participants were adults aged 60 years or older residing in Chinese mainland. When a study included participants from Chinese mainland and other countries or regions, data for the Chinese mainland sample had to be reported separately or be independently extractable. Second, the study examined anxiety symptoms, depressive symptoms, or their co-occurrence using a reported screening instrument or symptom scale. Third, it reported the measurement instrument, prevalence or detection rate, or factors associated with either symptom outcome. Fourth, it was an empirical study employing a cross-sectional, longitudinal, cohort, or secondary-data design, or it reported eligible baseline data from an intervention study. Analyses based on large publicly available datasets were also eligible. Fifth, the article was published in Chinese or English.

Studies were excluded when they met any of the following criteria: 1) they were reviews, commentaries, conference abstracts, theoretical articles, or other nonempirical publications; 2) the participants were not older adults, or findings for older adults could not be separately extracted from a mixed-age sample; 3) the sample consisted exclusively of patients with a confirmed clinical diagnosis and therefore did not reflect mental health symptoms and associated factors in the broader older population; 4) the measurement instrument, classification criterion, or principal findings for anxiety or depression were insufficiently described; or 5) the study represented a duplicate publication of the same data or the full text could not be obtained. More details can be seen in **Figure 1**.

2.3. Study Selection and Quality Appraisal

Study selection proceeded through title and abstract screening, full-text eligibility assessment, methodological quality appraisal, and final inclusion. Two reviewers independently screened all records against the prespecified eligibility criteria and documented the reasons for excluding articles at the full-text stage. Disagreements were resolved through discussion and consensus; when consensus could not be reached, a third reviewer adjudicated. Independent screening by two reviewers was used to reduce the risk of missed studies and subjective selection bias [12].

Methodological quality was evaluated using design-specific Joanna Briggs Institute (JBI) critical appraisal checklists: the checklists for analytical cross-sectional studies and prevalence studies for the corresponding cross-sectional designs, the cohort-study checklist for longitudinal or prospective studies, the randomized controlled trial checklist for randomized intervention studies, and the quasi-experimental checklist for nonrandomized intervention designs or eligible baseline studies [13]. Each applicable item was rated “Yes”, “No”, “Unclear”, or “Not applicable”. Studies with affirmative ratings on fewer than 50% of applicable

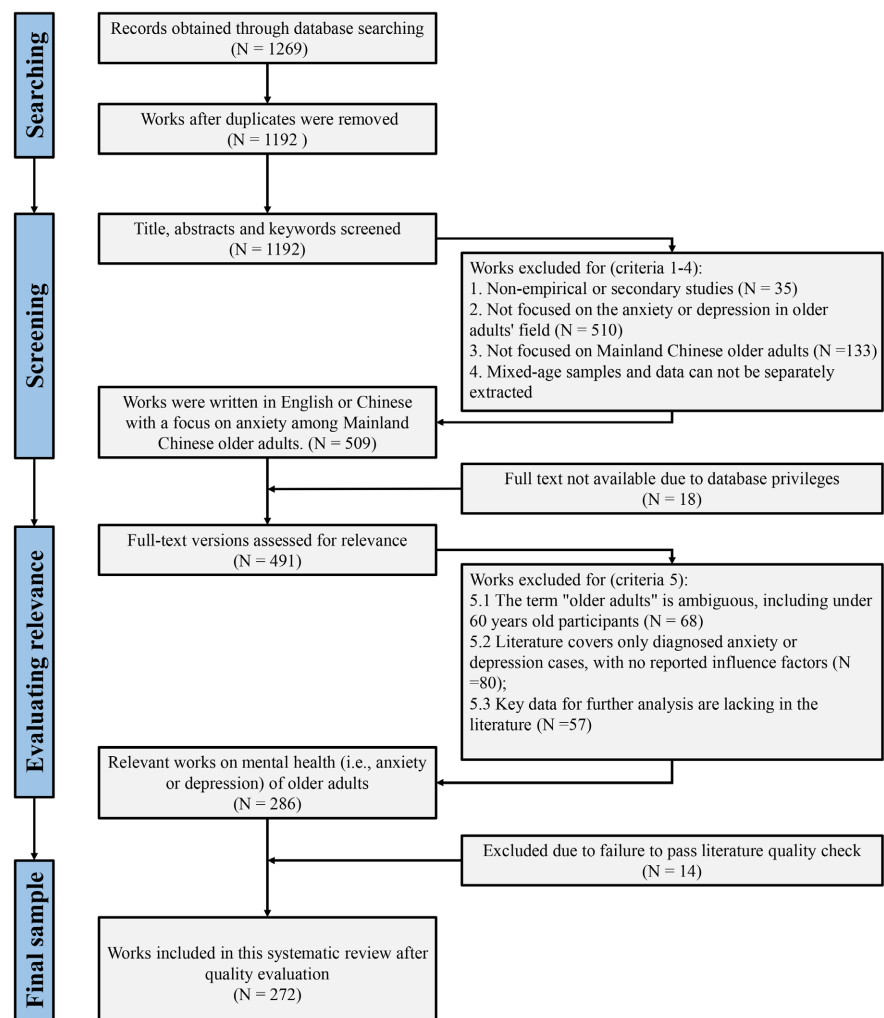


Figure 1. PRISMA flow diagram.

items were classified as low quality and failed appraisal; studies with 50% - 74% affirmative ratings were classified as moderate quality, and those with at least 75% were classified as high quality. Fourteen studies that failed the prespecified threshold were excluded. Among retained studies, appraisal results did not determine numerical weights, but high-quality, longitudinal, and representative studies received greater interpretive emphasis, whereas moderate-quality findings were described more cautiously.

The combined database searches yielded 1269 records. After 77 duplicates were removed, 1192 unique records underwent title, abstract, and keyword screening. At this stage, 683 records were excluded: 35 were nonempirical or secondary publications, 510 did not focus on anxiety or depression among older adults, 133 did not focus on older adults in Chinese mainland, and 5 included mixed-age samples for which findings concerning adults aged 60 years or older could not be separately extracted. This left 509 records. Eighteen full texts could not be obtained, and 491 reports underwent full-text assessment. A further 205 reports were excluded because the age criterion was ambiguous or mixed-age findings were not

extractable ($n = 68$), the sample was restricted to clinically diagnosed cases without eligible associated-factor analyses ($n = 80$), or key data were insufficient ($n = 57$). Of the 286 reports entering quality appraisal, 14 failed the prespecified quality criterion, resulting in 272 included reports. The anxiety-specific search subset yielded 393 records, 387 after duplicate removal, and 101 included reports; these 101 reports form part of, rather than an additional set beyond, the overall total of 272. The remaining 171 reports constituted the depression evidence set.

2.4. Data Extraction and Variable Coding

Data from the included studies were coded using a standardized extraction form that had been developed in advance, pilot-tested on a small subset of studies, and revised accordingly. The extracted information included authorship, year of publication, study location, sample size, participant age, gender composition, urban or rural setting, sampling source, study design, instruments used to assess anxiety or depression, statistical methods, principal associated factors, direction of association, and reported effect estimates. One reviewer extracted the data, and a second reviewer verified each item against the original publication. Disagreements were resolved through discussion or, when necessary, adjudication by a third reviewer. Standardized extraction and independent verification were used to reduce transcription errors and interpretive bias [12].

Variables were coded using a four-level structure comprising specific variable, variable domain, direction of association, and model dimension. First, specific variables reported in the original studies—such as chronic illness, living alone, loneliness, social support, psychological resilience, and sleep disturbance—were extracted. Second, these variables were grouped into broader domains, including sociodemographic characteristics, physical health, psychological resources, family and social relationships, living environment, and major life events. Third, the direction and statistical evidence of each variable's association with anxiety or depressive symptoms were recorded. Finally, each construct was assigned one primary model dimension according to its operational definition and principal theoretical role in the reported analysis, rather than according to its label alone.

The preliminary assignment rules were as follows. Risk accumulation included adverse socioeconomic, relational, environmental, and life-event exposures that represent stress burden or resource loss. Functional vulnerability included physical, cognitive, sensory, sleep-related, nutritional, and daily-functioning conditions that reduce autonomy, coping capacity, or access to support. Positive support included familial, social, community, behavioral, and psychological resources operationalized in a beneficial direction. Directionally opposite indicators were not double counted: loneliness and low social participation were coded as risk accumulation, whereas actual participation or social engagement was coded as positive support; sleep disturbance was coded as functional vulnerability, whereas a sleep-management intervention could be coded as positive support; and functional impairment was coded as functional vulnerability even when an environmental bar-

rier contributed to it. A study could contribute distinct variables to more than one dimension, but each construct-outcome estimate was counted once for a given outcome and time point. Secondary or cross-dimensional roles were discussed qualitatively rather than entered again in frequency summaries. Two reviewers independently coded and categorized the variables, and discrepancies were resolved by consensus.

2.5. Evidence Synthesis and Model Development

Because the included studies differed substantially in sampling sources, measurement instruments, variable definitions, and statistical indices, quantitative pooling of effect sizes was considered inappropriate. The evidence was therefore synthesized using narrative synthesis and variable mapping [14].

The synthesis involved four steps. First, factors repeatedly associated with anxiety or depression were identified across the included studies. Second, the consistency of the direction of associations was examined across mental health outcomes, study designs, and sample contexts. Third, factors common to anxiety and depression were identified by jointly considering methodological quality, replication across studies, sample representativeness, and theoretical plausibility. Fourth, the resulting factors were mapped onto three proposed dimensions—risk accumulation, functional vulnerability, and positive support—to generate an initial conceptual model.

Evidence strength was not determined solely by counting the number of statistically significant findings. Instead, the interpretation considered study design, sample size and representativeness, measurement quality, adjustment for potential confounders, magnitude and direction of associations, replication across independent samples, and consistency across studies. Evidence statements were classified as: 1) direct association evidence, when a factor was statistically associated with anxiety or depressive symptoms; 2) temporal or pathway evidence, when longitudinal ordering, mediation, moderation, or interaction was formally tested; or 3) a model-derived hypothesis, when an amplifying, buffering, or dynamic role was theoretically inferred but not directly tested. Greater interpretive weight was given to findings supported by methodologically stronger studies, longitudinal evidence, nationally or regionally representative samples, and repeated observations across different settings. Inconsistent or isolated findings were retained when theoretically relevant but were interpreted more cautiously.

Within the cited evidence base, longitudinal or prospective ordering was examined in studies of social participation, loneliness and social isolation, cognitive frailty, and psychosocial profiles [5] [8] [9] [15], whereas formal mediation or moderation was examined for perceived isolation, social capital, and coping or aging perceptions [16]–[18]. These studies support selected temporal or pathway propositions. However, the broader claims that functional vulnerability amplifies accumulated risk and that positive support buffers this amplification remain hypotheses requiring direct interaction tests and independent validation.

The conceptual model was developed iteratively from the synthesized evidence. Factors reflecting cumulative social, economic, interpersonal, environmental, or life-event exposures were classified under risk accumulation. Physical, cognitive, and functional conditions that could reduce independence, coping capacity, or participation and thereby intensify the effects of other risks were classified under functional vulnerability. Psychological, familial, social, behavioral, and community resources that could buffer risk or provide feasible targets for intervention were classified under positive support. These dimensions were then integrated in light of age-related changes in physical capacity, cognitive functioning, social roles, and support needs to construct a model for identifying mental health problems among older adults.

The eligibility assessment, quality appraisal, variable coding, and frequency summaries in this review were restricted to studies of older adults in Chinese mainland. To explain the potential mechanisms underlying the identified factors and assess whether findings from China were consistent with the broader international literature, selected international systematic reviews, meta-analyses, and longitudinal studies were additionally cited in the model-development and discussion sections. These international publications were not included in the number of studies reviewed, the methodological quality appraisal, or the frequency counts of coded variables. They were used solely to support theoretical interpretation and provide external corroboration.

3. Systematic Review Findings: Multidimensional Factors Associated with Mental Health among Older Adults in China

3.1. Characteristics of the Included Studies

A total of 272 study reports were included, comprising 101 reports in the anxiety evidence set and 171 reports in the depression evidence set. The studies were published between 2010 and 2025, with sample sizes ranging from 86 to 67,817 participants. Of the included studies, 173 employed cross-sectional designs (63.60%), 45 used longitudinal or prospective cohort designs (16.54%), 42 analyzed baseline data from intervention studies (15.44%), and 12 adopted other empirical designs (4.41%). Thus, the available evidence was predominantly cross-sectional. Regarding sample sources, 57 studies recruited community-dwelling older adults, 43 focused on residents of long-term care institutions, and 172 recruited participants from hospitals or primary healthcare settings.

Anxiety was most commonly assessed using the Generalized Anxiety Disorder scale, the Self-Rating Anxiety Scale, the anxiety subscale of the Hospital Anxiety and Depression Scale, and other screening instruments, with the Generalized Anxiety Disorder scale being used relatively frequently. Depression was primarily assessed using the Geriatric Depression Scale, the Center for Epidemiologic Studies Depression Scale, the Patient Health Questionnaire, and related instruments, among which the Geriatric Depression Scale was particularly common.

Variable mapping indicated that the factors examined in the included studies were distributed across several broad domains: sociodemographic characteristics, physical health and functional status, psychological resources, family and social relationships, living environments, and major life events. Multimorbidity, functional limitations, and sleep disturbances were reported in 67 studies; loneliness and low social support were examined in 55 studies; and social participation and family support were reported in 87 studies. Overall, multimorbidity, functional impairment, loneliness, and inadequate social support showed relatively consistent associations with anxiety or depression. In contrast, findings concerning age, urban-rural residence, marital status, and several lifestyle factors were less consistent, potentially because of differences in sample sources, measurement instruments, regional contexts, and adjustment for confounding variables.

3.2. Risk Accumulation

Risk accumulation encompassed socioeconomic disadvantages, loss of relational resources, subjective psychological distress, adverse living environments, and major life events. Studies of older adults in China repeatedly identified female gender, lower educational attainment, financial hardship, widowhood or unmarried status, living alone, and limited social resources as correlates of elevated anxiety, depression, or anxiety-depression comorbidity. Gender, marital status, economic circumstances, chronic illness, and lifestyle factors often jointly constituted the broader risk context in which mental health problems emerged [6] [19].

International evidence has produced similar findings. A systematic review and meta-analysis by Cole and Dendukuri [20] identified female gender, bereavement, sleep disturbance, and functional disability as important predictors of depression among community-dwelling older adults. A Dutch cohort study further suggested that the association between low income and depression may be stronger in later life than in younger age groups [21]. These findings indicate that sociodemographic characteristics are not merely descriptive variables but may also reflect prolonged resource deprivation and cumulative exposure to stress.

Psychological factors such as loneliness, negative attitudes toward aging, health-related concerns, and low life satisfaction may represent proximal signals through which accumulated adversity is translated into psychological symptoms. Longitudinal research has shown that older adults experiencing persistent loneliness or sustained social isolation tend to maintain higher levels of depressive symptoms over time [8]. A longitudinal study of community-dwelling older adults in Shanghai similarly found that persistently high loneliness, social isolation, low social support, and low social capital—as well as transitions from favorable to adverse psychosocial conditions—were associated with more severe subsequent symptoms of depression, anxiety, and stress [15].

International longitudinal evidence further indicates that loneliness predicts depressive symptoms even after adjustment for age, income, marital status, and physical health [22]. Loneliness may also have reciprocal relationships with major

depression and generalized anxiety, although its predictive association with subsequent mental health problems appears to be comparatively stronger [23]. Loneliness may therefore function not only as a correlate of poor mental health but also as an early indicator that accumulated social and functional risks are beginning to manifest psychologically.

Deficits in family and social relationships constitute another major source of accumulated risk. The quality of spousal and parent-child relationships, frequency of contact with adult children, interaction with friends, neighborhood reciprocity, social capital, and participation in social activities have all shown direct associations with anxiety or depressive symptoms in later life. Chinese longitudinal studies further indicate that older adults with limited social participation are more likely to experience subsequent depressive symptoms than those who participate regularly in social activities [9]. Insufficient family and social support is therefore a plausible moderator of the psychological consequences of chronic illness, pain, and daily-life difficulties, but direct interaction tests of this buffering or amplifying proposition remain limited in the reviewed evidence [19].

International studies similarly suggest that reduced social connectedness may increase anxiety and depressive symptoms by heightening perceived social isolation [18]. Smaller social networks and greater loneliness have also been prospectively associated with anxiety and depression [23]. Importantly, objective social isolation and subjective loneliness are related but conceptually distinct. An older adult may maintain a relatively large number of social contacts yet remain psychologically vulnerable when those relationships lack emotional closeness, stability, or accessible support.

Residential and neighborhood conditions provide the external context in which risks accumulate. Poor housing, neighborhood disorder, transportation barriers, insufficient public activity spaces, and limited access to healthcare and long-term care services may adversely affect mental health by restricting physical activity, reducing social interaction, and weakening community belonging. Conversely, supportive neighborhood environments and higher community social capital may promote psychological well-being [17] [24].

An international systematic review and meta-analysis likewise found that neighborhood safety, social cohesion, service accessibility, walkability, and green space may be associated with depression in later life. However, these environmental effects may vary according to physical mobility, socioeconomic position, and urban-rural context [25]. Environmental disadvantage should therefore be understood not as an isolated exposure but as a contextual condition that may interact with individual functional capacity and access to social resources.

Major life events may trigger the transition from latent vulnerability to more overt psychological problems. Relevant events include bereavement, the loss of an only child, diagnosis of a serious illness, hospitalization or surgery, residential relocation, substantial financial loss, changes in caregiving relationships, and public health emergencies. Evidence from a nationally representative sample of Chinese

adults indicates that widowhood is associated with higher depressive symptoms and that this association may be mediated or moderated by coping styles and perceptions of aging [16].

International research has similarly identified bereavement as a relatively consistent risk factor for late-life depression [20]. The psychological consequences of widowhood may nevertheless differ according to gender, pre-bereavement marital quality, caregiving experiences, and regional welfare conditions [26]. The effects of major life events therefore depend not only on the events themselves but also on older adults' pre-existing risk burden, functional status, coping capacity, and available support.

3.3. Functional Vulnerability

Physical illness and functional decline represent the most age-specific group of factors associated with mental health problems in later life. The included studies examined chronic illness, multimorbidity, pain, sleep disturbance, frailty, sarcopenia, disability, limitations in activities of daily living, cognitive decline, visual and hearing impairment, malnutrition, and dependence on care.

Research among older adults in China consistently showed that multimorbidity, impaired daily functioning, and cognitive frailty were associated with elevated anxiety and depression. Analyses based on the China Health and Retirement Longitudinal Study indicated that multimorbidity was associated with an increased likelihood of depression [2]. Physical impairment and limitations in activities of daily living were also related to more severe depressive symptoms [4]. Prospective evidence further showed that older adults with cognitive frailty had a higher subsequent risk of depression than those with physical frailty or cognitive impairment alone [5].

International evidence supports a close relationship between physical and cognitive decline and mental health problems. A systematic review and meta-analysis by Soysal *et al.* [27] found a bidirectional association between depression and frailty: frailty predicted subsequent depression, whereas depression was also associated with the later development of frailty. A systematic review by Tan *et al.* [28] further showed that anxiety was more prevalent or severe among frail older adults than among their physically robust counterparts. Earlier meta-analytic evidence also identified disability, sleep disturbance, and chronic health problems as important predictors of late-life depression [20].

Functional limitations may provide a key pathway through which physical illness is translated into psychological distress. Chronic disease, pain, sleep disturbance, and sensory impairment may directly increase worry, fatigue, helplessness, and loss of control. They may also reduce independence, physical activity, social participation, and self-care, thereby weakening self-efficacy and coping capacity [4]. The latter sequence is theoretically plausible, but it should be treated as a pathway hypothesis unless mediation, moderation, or interaction is formally tested. The coexistence of physical frailty and cognitive decline may create a particularly pronounced state of vulnerability [5].

Sleep disturbance may occupy a similarly complex position. It can arise from illness, pain, medication use, caregiving burden, or emotional distress, while also exacerbating anxiety and depression through fatigue, impaired emotion regulation, and reduced cognitive efficiency. Functional conditions may therefore both directly contribute to mental health problems and increase sensitivity to social, economic, and environmental stressors.

On the basis of this evidence, chronic illness, multimorbidity, frailty, disability, cognitive decline, sleep disturbance, pain, malnutrition, sensory impairment, and care dependence were classified as indicators of functional vulnerability. Their direct associations with anxiety or depressive symptoms are better supported than the proposed amplification mechanism. The model therefore hypothesizes that these conditions may intensify the effects of other risks by reducing autonomy, social participation, coping capacity, and the ability to access and use supportive resources; this hypothesis requires direct interaction and longitudinal testing.

3.4. Positive Support

Positive support included family support, broader social support, interaction with friends and neighbors, community services, social participation, regular physical activity, health-promoting behaviors, psychological resilience, positive attitudes toward aging, subjective well-being, life satisfaction, and adaptive coping. Compared with relatively fixed or difficult-to-modify risk factors, these resources may both reduce the likelihood or persistence of mental health problems and provide feasible targets for intervention.

Family and social support can provide emotional companionship, practical care, financial assistance, health information, and early recognition of psychological crises. Lack of social participation and support has been associated with greater anxiety and depression, whereas stable social relationships and regular participation in social activities appear to be protective [9] [18] [19].

The protective value of a social network depends not only on its size but also on its emotional closeness, stability, reciprocity, and practical availability. Social and community activities may strengthen connectedness and reduce both objective isolation and subjective loneliness. Community health management, day-care programs, accessible medical services, and neighborhood mutual assistance may be especially important for older adults with functional limitations, for whom informal social participation is otherwise difficult.

Residential environments and community resources may also function as positive supports. Adequate housing, safe and accessible walking environments, public activity spaces, green areas, healthcare and long-term care services, and strong neighborhood social capital may promote physical activity, social interaction, and community belonging [17] [24]. However, the psychological benefits of neighborhood resources may vary according to physical functioning, socioeconomic status, and urban-rural context [25]. Environmental resources can produce meaningful protection only when older adults are able to access, use, and remain engaged with them.

Psychological resilience, positive attitudes toward aging, life satisfaction, subjective well-being, and adaptive coping constitute internal supportive resources. These factors may help older adults maintain a sense of control, hope, continuity, and meaning when facing illness, functional decline, or major life events. They may thereby reduce the likelihood that stress is translated into clinically relevant anxiety or depressive symptoms.

Positive support should therefore be conceptualized not only as a group of protective correlates but also as a set of actionable intervention resources. Potential strategies include psychological education, cognitive reframing, meaning-centered approaches, resilience enhancement, promotion of physical and social activity, strengthening of family relationships, and group- or community-based interventions.

3.5. Evidence Integration and Variable Mapping

The reviewed evidence indicates that elevated anxiety and depressive symptoms in later life are associated with factors from multiple domains rather than any single source (More details can be seen in [Table 1](#)). The strongest evidence concerns direct associations among socioeconomic disadvantage, relational and environmental adversity, physical and cognitive decline, supportive resources, and symptom burden. Claims about cumulative interaction, amplification, and buffering are less directly established and are therefore specified as hypotheses within the proposed model.

Table 1. Evidence mapping of factors associated with mental health problems in older adults.

Model dimension	Operational assignment rule	Representative variables	Evidence interpretation and proposed role
Risk accumulation	Adverse socioeconomic, relational, environmental, or life-event exposures that represent stress burden or resource loss.	Low income; living alone or empty-nest status; widowhood; social isolation; loneliness; low social participation; adverse living environments; major life events.	Primarily associated with higher anxiety or depressive symptoms. Cumulative and mutually reinforcing effects are plausible but require direct interaction or longitudinal tests.
Functional vulnerability	Aging-related physical, cognitive, sensory, sleep, nutritional, or daily-functioning conditions that reduce autonomy, coping, participation, or access to support.	Chronic illness; multimorbidity; frailty; disability; cognitive decline; sleep disturbance; pain; malnutrition; sensory impairment; care dependence.	Direct associations with higher symptom burden are supported. The proposed amplification of external risks is a model-derived hypothesis unless formally tested.
Positive support	Familial, social, community, behavioral, or psychological resources operationalized in a beneficial direction.	Family and social support; community services; social participation; physical activity; health-promoting behaviors; psychological resilience; positive attitudes toward aging; life satisfaction.	Generally associated with lower symptom burden and feasible intervention targets. A formal buffering role should be claimed only when moderation, mediation, or intervention evidence is available.

The dimensions are analytically distinct, and each construct received one primary assignment for frequency mapping. Overlapping constructs were handled according to operationalization and direction. Loneliness was coded as an adverse subjective social state under risk accumulation; social participation was coded as positive support when measured as actual engagement, but low or absent participation was coded as accumulated relational risk. Sleep disturbance and functional impairment were coded under functional vulnerability because they reflect reduced regulatory or daily-functioning capacity. Environmental barriers that contributed to impairment remained environmental risks, and interventions designed to improve sleep or functioning could be discussed as positive supports without recoding the original adverse construct. This rule prevented the same construct-outcome estimate from being counted twice while allowing secondary roles to be discussed conceptually.

Across the included evidence, multimorbidity, functional limitations, sleep disturbance, loneliness, and inadequate social support showed relatively consistent associations with anxiety or depression. In contrast, the effects of age, urban-rural residence, marital status, and some lifestyle factors varied across contexts. These inconsistencies may reflect differences in population characteristics, measurement methods, regional resources, model specification, and confounder adjustment rather than the complete absence of an association.

Considering the frequency with which variables were examined, the direction and consistency of their direct associations, study design, sample representativeness, methodological quality, and theoretical relevance, the identified factors were mapped onto three overarching dimensions: risk accumulation, functional vulnerability, and positive support. The three-dimensional structure provides the empirical basis for the model, whereas the proposed amplification, buffering, and transition processes constitute hypotheses for subsequent validation.

4. The Risk Accumulation-Functional Vulnerability-Positive Support Model for Identifying Mental Health Problems in Older Adults

Based on the systematic review of anxiety and depression among older adults in Chinese mainland, this study proposes a risk accumulation-functional vulnerability-positive support model for identifying mental health problems in later life (More details can be seen in **Figure 2**). Consistent with the review definition, “mental health problems” in this model refers to elevated anxiety and/or depressive symptoms, including their co-occurrence, rather than formal psychiatric diagnoses. The variables included in the model were primarily derived from the Chinese studies included in the review. International systematic reviews, meta-analyses, and longitudinal studies were used to clarify potential mechanisms and assess broader consistency; they were not included in review frequency counts and did not directly determine the model dimensions.

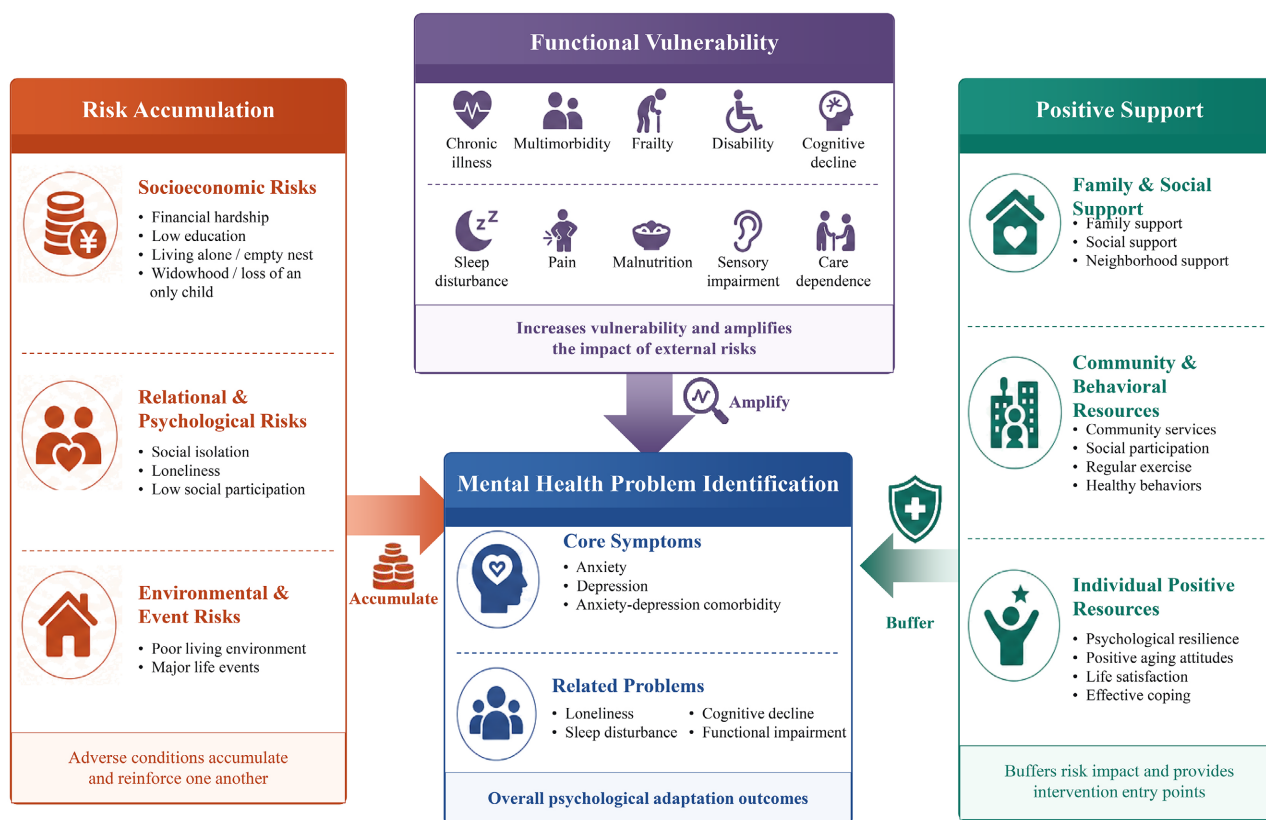


Figure 2. The risk accumulation-functional vulnerability-positive support model for identifying mental health problems.

The model proposes that later-life symptom burden reflects an integrative outcome associated with social and life-context risks, physical, cognitive, and functional vulnerability, and family, social, and community resources. Direct associations between these factors and anxiety or depressive symptoms are supported to varying degrees. By contrast, the propositions that risk accumulates synergistically, functional vulnerability amplifies external adversity, and positive support buffers these effects should be treated as testable mechanisms rather than established causal relations.

Anxiety and depression constitute the primary entry points for identification, while the model also considers their comorbidity and closely related problems such as loneliness, sleep disturbance, cognitive decline, and functional impairment. Risk accumulation addresses the question of which adverse conditions are accumulating. Functional vulnerability concerns which aging-related conditions increase susceptibility and amplify risk. Positive support identifies which resources can buffer risk and serve as feasible intervention entry points. The framework extends the existing risk accumulation-positive support approach to psychological crisis identification by incorporating functional decline and its risk-amplifying role as a core feature of mental health in later life [29].

4.1. The Risk Accumulation Mechanism

Risk accumulation refers to the progressive clustering and mutual reinforcement

of adverse conditions across social, relational, psychological, and environmental domains. Key factors include financial hardship, living alone or in an empty-nest household, widowhood, loss of an only child, social isolation, loneliness, limited social participation, adverse living environments, and major life events. Female gender, bereavement, low income, sleep disturbance, functional limitations, and chronic illness frequently form the broader context of risk for late-life depression [20] [21]. Socioeconomic disadvantage, multimorbidity, and limited social participation are likewise closely associated with anxiety, depression, and their comorbidity among older adults in China [2] [6] [9].

Risk accumulation is not simply the additive effect of multiple risk variables. Financial hardship may limit healthcare access and social participation; chronic illness may reduce mobility and interpersonal contact; living alone may increase loneliness; and loneliness may worsen sleep and emotional functioning. Longitudinal studies show that loneliness, social isolation, and shrinking social networks precede or accompany later anxiety and depressive symptoms [8] [22] [23]. These findings support temporal ordering for selected factors, but synergistic accumulation across domains remains a hypothesis until additive and interactive risk models are directly compared.

Major life events may act as triggers within this cumulative process. Widowhood, serious illness, hospitalization, residential relocation, and caregiving changes can disrupt established routines and social structures. Formal mediation and moderation evidence indicates that coping strategies and perceptions of aging may help explain heterogeneity in the association between widowhood and depression [16]. Nevertheless, the broader triggering proposition should be tested prospectively by examining event timing, pre-existing risk burden, functional status, and available support.

4.2. The Proposed Amplifying Role of Functional Vulnerability

Functional vulnerability refers to reduced physical and psychological adaptive capacity resulting from aging, illness, and functional decline. It includes chronic illness, multimorbidity, frailty, disability, cognitive decline, sleep disturbance, pain, malnutrition, sensory impairment, and dependence on care. This dimension distinguishes the present model from more general frameworks for identifying psychological crises. Existing evidence indicates that multimorbidity, limitations in activities of daily living, and cognitive frailty are associated with a higher risk of depression [2] [4] [5].

Functional vulnerability may operate through both direct and amplifying pathways. Chronic illness, pain, insomnia, and mobility limitations show direct associations with anxiety or depressive symptoms and may increase worry, fatigue, helplessness, and perceived loss of control. Functional decline may also restrict mobility, physical activity, social participation, and self-care, making it more difficult to obtain or use external support. Prospective and meta-analytic evidence supports temporal and reciprocal links between frailty, cognitive frailty, anxiety,

and depression [5] [27] [28], but these studies do not by themselves establish that vulnerability statistically amplifies external risks.

Functional vulnerability is therefore treated as an independent model dimension with a testable amplifying hypothesis. Similar levels of financial hardship, bereavement, or social isolation may have different psychological consequences for older adults with preserved versus impaired functioning. This proposition requires direct tests of interaction, moderated mediation, and longitudinal change; until such evidence is available, the model should not be interpreted as demonstrating causal amplification.

4.3. The Proposed Buffering Role of Positive Support

Positive support refers to the system of resources that helps maintain mental health, buffer the effects of risk, and promote adaptive functioning. It includes family support, social support, community services, social participation, regular physical activity, health-promoting behaviors, psychological resilience, positive attitudes toward aging, and life satisfaction. Most reviewed evidence demonstrates direct protective associations; a buffering effect should be inferred only when a study formally tests interaction, mediation, moderation, or intervention-related change.

Three candidate pathways are proposed. First, family and social support may provide companionship, caregiving assistance, and practical help. Second, participation and community services may strengthen connectedness and reduce objective isolation and subjective loneliness. Formal mediation evidence shows that perceived isolation can link social disconnectedness with later anxiety and depressive symptoms [18], and social capital has been examined as a mediator between neighborhood environment and mental well-being [17]. Third, resilience, positive attitudes toward aging, life satisfaction, and adaptive coping may help preserve control, hope, and meaning. These findings support selected pathways but do not establish a universal buffering mechanism across all support variables.

The model hypothesizes that supportive resources may weaken links between risk accumulation, functional vulnerability, and symptom burden. Family care and community services may reduce the daily burden associated with functional limitations; social participation may interrupt the progression from living alone to loneliness; and adaptive coping may lessen the impact of major life events. These are intervention-relevant hypotheses, not established causal conclusions, and should be tested using interaction models, longitudinal mediation, and randomized or quasi-experimental designs.

4.4. Dynamic Transitions among the Three Dimensions

Risk accumulation, functional vulnerability, and positive support are expected to vary over time as diseases progress, physical and cognitive functioning changes, major life events occur, and supportive resources increase or decline. Longitudinal studies show that changes in loneliness, social isolation, social networks, and functional status are associated with subsequent anxiety or depressive symptoms [5]

[8] [23]. However, the reviewed studies did not directly validate transitions among the three proposed dimensions; the following stage-transition account is therefore conceptual and requires prospective testing.

Conceptually, older adults may be more likely to remain psychologically stable when cumulative risk is limited, functioning is relatively preserved, and support is available. As financial hardship, living alone, social isolation, and stressful life events cluster while support declines, loneliness, sleep disturbance, and mild anxiety or depressive symptoms may emerge. Additional functional losses or acute events may correspond to a higher-risk state, whereas stronger family support, timely community services, renewed participation, or improved functioning may correspond to movement toward lower risk. These proposed states and transitions should be empirically derived rather than assumed.

The model therefore recommends repeated, multidimensional risk assessment rather than reliance on a one-time symptom screen. Assessment may jointly consider current anxiety and depressive symptoms, cumulative risk exposure, functional vulnerability, supportive resources, and recent major life events. Such information may support risk stratification and referral decisions, but it does not constitute a clinical diagnosis and should not be used to assign deterministic risk stages before validation.

5. Applications, Theoretical Contributions, and Limitations

5.1. From Risk Identification to Stratified Intervention

The practical value of the risk accumulation-functional vulnerability-positive support model lies in organizing multidimensional information for stratified services. Symptom-based mental health identification in later life should not rely solely on one-time self-report screening. Instead, validated symptom measures may be considered alongside community health records, chronic disease management data, family caregiving information, social participation, and primary-care service records. This integrated assessment is intended for screening and service planning, not for replacing diagnostic evaluation by qualified professionals.

Such an approach requires collaboration among primary care physicians, mental health professionals, social workers, and family caregivers. In a review of 38 studies covering 13 integrated care models for older adults with depression and physical multimorbidity, Tops *et al.* [30] identified multidisciplinary teams, comprehensive assessment, individualized care plans, proactive follow-up, continuity of care, and cross-sector coordination as recurring components of effective service delivery. These findings support the development of information-sharing and coordinated care mechanisms for older adults at psychological risk.

On the basis of multisource data, provisional indices of risk accumulation, functional vulnerability, and positive support could be developed, while latent profile analysis could explore distinct combinations of risk and resources. Machine-learning methods such as random forests and XGBoost may estimate variable importance, nonlinear associations, and potential thresholds, with SHAP val-

ues improving interpretability. Using longitudinal data from 2331 middle-aged and older adults, Xia *et al.* [31] found that XGBoost performed relatively well in predicting depression two years later. Nevertheless, such models should be externally validated and used for symptom-risk prediction and service decision support rather than diagnosis or causal inference.

The ultimate purpose of the model is not to label or diagnose individuals but to match provisional risk profiles with proportionate support. Older adults with low and stable symptom risk may benefit from mental health education, community activities, and healthy-lifestyle guidance. Those experiencing loneliness, sleep problems, or mild anxiety or depressive symptoms may require social-connection programs, sleep management, group activities, and low-intensity psychological support [32]. Individuals with substantial cumulative risk, pronounced functional vulnerability, and inadequate support may need coordinated follow-up by primary care, social work, and mental health professionals. Severe, persistent, or co-occurring symptoms, particularly when accompanied by disability, cognitive decline, major life events, or extreme isolation, should prompt professional assessment and appropriate medical or mental health referral.

Group-based arts interventions may provide another feasible pathway for translating the model into practice. The term group art therapy should be reserved for interventions delivered by professionally trained therapists according to explicit therapeutic goals, whereas broader programs involving music, dance, painting, crafts, drama, or creative writing are more appropriately described as group-based arts interventions. Such activities provide opportunities for emotional expression, shared participation, and social connection. Because social disengagement may exacerbate anxiety and depression through increased perceived isolation, strengthening group belonging and interpersonal interaction has a clear theoretical rationale [18].

A systematic review and meta-analysis of 39 controlled studies found that group-based arts interventions were associated with moderate reductions in anxiety and depressive symptoms among older adults [33]. The effect on depression remained after adjustment for publication bias and was larger in residential care settings than in community settings. Both professionally delivered art therapy and general participatory arts activities appeared beneficial, with no consistent evidence that music, dance, or visual arts was superior to the others. Group-based arts interventions may therefore simultaneously provide psychological support, social participation, and community engagement, making them especially suitable for older adults with emerging or moderately elevated risk. However, substantial heterogeneity and possible publication bias indicate the need for further randomized controlled trials examining intervention format, dosage, mechanisms, long-term effects, and differential effectiveness across risk profiles.

5.2. Theoretical Contributions, Practical Implications, and Limitations

The principal contribution of the proposed model is its extension of mental health

identification from symptom-based screening to an integrative assessment of risk accumulation, functional vulnerability, and positive support. Conventional screening can identify current anxiety or depressive symptoms but is less informative about the contexts in which symptoms arise or the resources that may support intervention. The present model therefore asks where associated risks originate, which aging-related conditions may increase susceptibility, and which resources may be actionable. These questions extend screening and service planning but do not convert correlational evidence into clinical diagnosis or causal explanation.

Theoretically, the model integrates factors previously examined separately across medicine, psychology, sociology, and public health. The risk accumulation dimension captures adverse financial, relational, environmental, and life-event exposures; the positive support dimension captures family relationships, social participation, community services, health-promoting behaviors, psychological resilience, and other adaptive resources. The primary extension is the inclusion of functional vulnerability as an independent age-specific dimension. The review supports direct associations between many functional conditions and anxiety or depressive symptoms. It does not yet establish that these conditions amplify external adversity or weaken protective resources; those cross-dimensional mechanisms are explicit hypotheses derived from the integrated framework.

Practically, the model may facilitate a shift from reactive treatment after symptom onset toward earlier identification, warning, and dynamic monitoring. It also supports movement from uniform service provision to stratified intervention and from an exclusive focus on individual symptoms to the simultaneous improvement of family relationships, community environments, and opportunities for social participation. Primary care and community practitioners could assess whether an older adult's principal difficulty involves excessive risk exposure, pronounced functional vulnerability, insufficient support, or a combination of these conditions, and then select appropriate pathways involving health management, family care, social support, psychological intervention, or medical referral. The framework may thus inform community screening, priority-population management, service allocation, and healthy-aging policy.

Several limitations should be acknowledged. First, the model was developed through narrative synthesis and theoretical integration and has not been validated in an independent sample. Its construct validity, predictive accuracy, classification thresholds, and added value beyond symptom screening remain uncertain. Second, the evidence base was predominantly cross-sectional. Direct associations are therefore better supported than causal claims about accumulation, amplification, buffering, or dynamic transitions; future studies should test these mechanisms using prospective interaction models, longitudinal mediation, and experimental or intervention designs. Third, substantial heterogeneity in samples, measures, variable definitions, and statistical methods limits conclusions about temporal ordering and effect magnitude. Fourth, anxiety and depressive symptoms were the primary outcomes, while suicide risk, sleep problems, cognitive impairment, and

quality of life were not fully incorporated as outcomes. Fifth, because the review focused on Chinese mainland, cross-cultural generalizability remains unknown.

Funding

This paper was supported by National Undergraduate Training Program on Innovation and Entrepreneurship (Number: 202610345073) to Shengyu Ding.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During manuscript preparation, the authors used ChatGPT Version 5.6 (OpenAI) solely for limited language editing of selected sentences in order to revise in order to improve clarity. No AI tool was used to generate research content, analyze data, interpret results, or prepare references; the ideas, argument, and intellectual contribution of the paper are entirely original. All AI-assisted suggestions were reviewed, revised where necessary, and approved by the authors, who take full responsibility for the final manuscript.

Author Contributions

Conceptualization: Weilong Xiao; methodology: Shengyu Ding, Xue Meng & Zihuan Xiong; software: Huifeng Zhang; validation: Huifeng Zhang; formal analysis: Shengyu Ding, Xue Meng & Zihuan Xiong; investigation, Zihuan Xiong; data curation, Shengyu Ding, Xue Meng, Huifeng Zhang & Zihuan Xiong; writing—original draft preparation: Shengyu Ding, Zihuan Xiong and Weilong Xiao; writing—review and editing, Weilong Xiao; visualization, Shengyu Ding and Zihuan Xiong; supervision, Weilong Xiao; funding acquisition: Shengyu Ding. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

References

- [1] World Health Organization (2025) Mental Health of Older Adults. <https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults>
- [2] Chao, G., Zhang, L., Zhan, Z. and Bao, Y. (2024) Effect of Multimorbidity on Depressive Status in Older Chinese Adults: Evidence from the China Health and Retirement Longitudinal Study (CHARLS). *BMJ Open*, **14**, e081776. <https://doi.org/10.1136/bmjopen-2023-081776>
- [3] Wang, Z., Yang, H., Guo, Z., Liu, B. and Geng, S. (2019) Socio-Demographic Characteristics and Co-Occurrence of Depressive Symptoms with Chronic Diseases among Older Adults in China: The China Longitudinal Ageing Social Survey. *BMC Psychiatry*, **19**, Article No. 310. <https://doi.org/10.1186/s12888-019-2305-2>
- [4] Yan, Y., Du, Y., Li, X., Ping, W. and Chang, Y. (2023) Physical Function, ADL, and Depressive Symptoms in Chinese Elderly: Evidence from the Charls. *Frontiers in Public Health*, **11**, Article 1017689. <https://doi.org/10.3389/fpubh.2023.1017689>

- [5] Wang, J., Zhu, A., Chen, J., Zeng, R., Wang, S., Chen, L., *et al.* (2024) Association between Cognitive Frailty and Depression: A Prospective Cohort Study of Adults Aged 45 Years and Older in China. *Clinical Interventions in Aging*, **19**, 2167-2178. <https://doi.org/10.2147/cia.s484352>
- [6] He, Z., Tan, W., Ma, H., Shuai, Y., Shan, Z., Zhai, J., *et al.* (2024) Prevalence and Factors Associated with Depression and Anxiety among Older Adults: A Large-Scale Cross-Sectional Study in China. *Journal of Affective Disorders*, **346**, 135-143. <https://doi.org/10.1016/j.jad.2023.11.022>
- [7] Peng, X., Zhang, S., You, L., Hu, W., Jin, S. and Wang, J. (2024) Prevalence and Correlates of Depression and Anxiety Symptoms among Older Adults in Shenzhen, China: A Cross-Sectional Population-Based Study. *BMJ Open*, **14**, e077078. <https://doi.org/10.1136/bmjopen-2023-077078>
- [8] Zhang, Y., Kuang, J., Xin, Z., Fang, J., Song, R., Yang, Y., *et al.* (2023) Loneliness, Social Isolation, Depression and Anxiety among the Elderly in Shanghai: Findings from a Longitudinal Study. *Archives of Gerontology and Geriatrics*, **110**, Article ID: 104980. <https://doi.org/10.1016/j.archger.2023.104980>
- [9] Du, M., Dai, W., Liu, J. and Tao, J. (2022) Less Social Participation Is Associated with a Higher Risk of Depressive Symptoms among Chinese Older Adults: A Community-Based Longitudinal Prospective Cohort Study. *Frontiers in Public Health*, **10**, Article 781771. <https://doi.org/10.3389/fpubh.2022.781771>
- [10] Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., *et al.* (2021) The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *BMJ*, **372**, n71. <https://doi.org/10.1136/bmj.n71>
- [11] Rethlefsen, M.L., Kirtley, S., Waffenschmidt, S., Ayala, A.P., Moher, D., Page, M.J., *et al.* (2021) PRISMA-S: An Extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews. *Systematic Reviews*, **10**, Article No. 39. <https://doi.org/10.1186/s13643-020-01542-z>
- [12] Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J. and Welch, V.A. (2024) Cochrane Handbook for Systematic Reviews of Interventions (Version 6.5). Cochrane.
- [13] Aromataris, E., Stern, C., Lockwood, C., Barker, T.H., Klugar, M., Jadotte, Y., *et al.* (2022) JBI Series Paper 2: Tailored Evidence Synthesis Approaches Are Required to Answer Diverse Questions: A Pragmatic Evidence Synthesis Toolkit from JBI. *Journal of Clinical Epidemiology*, **150**, 196-202. <https://doi.org/10.1016/j.jclinepi.2022.04.006>
- [14] Campbell, M., McKenzie, J.E., Sowden, A., Katikireddi, S.V., Brennan, S.E., Ellis, S., *et al.* (2020) Synthesis without Meta-Analysis (Swim) in Systematic Reviews: Reporting Guideline. *BMJ*, **368**, l6890. <https://doi.org/10.1136/bmj.l6890>
- [15] Kuang, J., Zhang, W., Zhang, H., Lin, N., Fang, J., Song, R., *et al.* (2024) Psychosocial Clusters and Their Associations with Depression, Anxiety and Stress among Older Adults in Shanghai Communities: Results from a Longitudinal Study. *Psychology Research and Behavior Management*, **17**, 2701-2716. <https://doi.org/10.2147/prbm.s464848>
- [16] Li, Y., Chan, W.C.H., Chen, H. and Ran, M. (2022) Widowhood and Depression among Chinese Older Adults: Examining Coping Styles and Perceptions of Aging as Mediators and Moderators. *Aging & Mental Health*, **26**, 1161-1169. <https://doi.org/10.1080/13607863.2021.1935455>
- [17] Lu, S., Guo, Y., Chui, C., Liu, Y., Chan, O.F., Chan, S.W., *et al.* (2022) Neighborhood Environment and Mental Well-Being among Chinese Older Adults: The Mediating Role of Social Capital. *Innovation in Aging*, **6**, igac070.

- <https://doi.org/10.1093/geroni/igac070>
- [18] Santini, Z.I., Jose, P.E., York Cornwell, E., Koyanagi, A., Nielsen, L., Hinrichsen, C., *et al.* (2020) Social Disconnectedness, Perceived Isolation, and Symptoms of Depression and Anxiety among Older Americans (NSHAP): A Longitudinal Mediation Analysis. *The Lancet Public Health*, **5**, e62-e70. [https://doi.org/10.1016/s2468-2667\(19\)30230-0](https://doi.org/10.1016/s2468-2667(19)30230-0)
 - [19] Lu, L., Shen, H., Tan, L., Huang, Q., Chen, Q., Liang, M., *et al.* (2023) Prevalence and Factors Associated with Anxiety and Depression among Community-Dwelling Older Adults in Hunan, China: A Cross-Sectional Study. *BMC Psychiatry*, **23**, Article No. 107. <https://doi.org/10.1186/s12888-023-04583-5>
 - [20] Cole, M.G. and Dendukuri, N. (2003) Risk Factors for Depression among Elderly Community Subjects: A Systematic Review and Meta-Analysis. *American Journal of Psychiatry*, **160**, 1147-1156. <https://doi.org/10.1176/appi.ajp.160.6.1147>
 - [21] Schaakxs, R., Comijs, H.C., van der Mast, R.C., Schoevers, R.A., Beekman, A.T.F. and Penninx, B.W.J.H. (2017) Risk Factors for Depression: Differential across Age? *The American Journal of Geriatric Psychiatry*, **25**, 966-977. <https://doi.org/10.1016/j.jagp.2017.04.004>
 - [22] Cacioppo, J.T., Hughes, M.E., Waite, L.J., Hawkley, L.C. and Thisted, R.A. (2006) Loneliness as a Specific Risk Factor for Depressive Symptoms: Cross-Sectional and Longitudinal Analyses. *Psychology and Aging*, **21**, 140-151. <https://doi.org/10.1037/0882-7974.21.1.140>
 - [23] Domènech-Abella, J., Mundó, J., Haro, J.M. and Rubio-Valera, M. (2019) Anxiety, Depression, Loneliness and Social Network in the Elderly: Longitudinal Associations from the Irish Longitudinal Study on Ageing (TILDA). *Journal of Affective Disorders*, **246**, 82-88. <https://doi.org/10.1016/j.jad.2018.12.043>
 - [24] Qiao, D., Wu, S., Xiang, L. and Zhang, N. (2024) Association of Residential Environment with Depression and Anxiety Symptoms among Older Adults in China: A Cross-Sectional Population-Based Study. *Building and Environment*, **257**, Article ID: 111535. <https://doi.org/10.1016/j.buildenv.2024.111535>
 - [25] Barnett, A., Zhang, C.J.P., Johnston, J.M. and Cerin, E. (2018) Relationships between the Neighborhood Environment and Depression in Older Adults: A Systematic Review and Meta-Analysis. *International Psychogeriatrics*, **30**, 1153-1176. <https://doi.org/10.1017/s104161021700271x>
 - [26] Schaan, B. (2013) Widowhood and Depression among Older Europeans—The Role of Gender, Caregiving, Marital Quality, and Regional Context. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, **68**, 431-442. <https://doi.org/10.1093/geronb/gbt015>
 - [27] Soysal, P., Veronese, N., Thompson, T., Kahl, K.G., Fernandes, B.S., Prina, A.M., *et al.* (2017) Relationship between Depression and Frailty in Older Adults: A Systematic Review and Meta-Analysis. *Ageing Research Reviews*, **36**, 78-87. <https://doi.org/10.1016/j.arr.2017.03.005>
 - [28] Tan, M., Bhanu, C. and Frost, R. (2023) The Association between Frailty and Anxiety: A Systematic Review. *International Journal of Geriatric Psychiatry*, **38**, e5918. <https://doi.org/10.1002/gps.5918>
 - [29] Sun, B., Wu, Y. and Sun, C. (2023) Construction and Application of a “Risk Accumulation-Positive Support” Model for Identifying Psychological Crises among Primary and Secondary School Students. *Jiangsu Education*, No. 43, 7-10. (In Chinese)
 - [30] Tops, L., Beerten, S.G., Vandenbulcke, M., Vermandere, M. and Deschodt, M. (2024)

Integrated Care Models for Older Adults with Depression and Physical Comorbidity: A Scoping Review. *International Journal of Integrated Care*, **24**, Article 1. <https://doi.org/10.5334/ijic.7576>

- [31] Xia, F., Ren, J., Liu, L., Cui, Y. and He, Y. (2025) A Machine Learning-Based Depression Risk Prediction Model for Healthy Middle-Aged and Older Adult People Based on Data from the China Health and Aging Tracking Study. *Frontiers in Public Health*, **13**, Article 1515094. <https://doi.org/10.3389/fpubh.2025.1515094>
- [32] Ciechanowski, P., Wagner, E., Schmalting, K., Schwartz, S., Williams, B., Diehr, P., *et al.* (2004) Community-Integrated Home-Based Depression Treatment in Older Adults: A Randomized Controlled Trial. *JAMA*, **291**, 1569-1577. <https://doi.org/10.1001/jama.291.13.1569>
- [33] Quinn, E.A., Millard, E. and Jones, J.M. (2025) Group Arts Interventions for Depression and Anxiety among Older Adults: A Systematic Review and Meta-Analysis. *Nature Mental Health*, **3**, 374-386. <https://doi.org/10.1038/s44220-024-00368-1>