

# Research priorities on physical-mental comorbidity in children and adolescents: an international consensus



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eClinicalMedicine

2025;89: 103559

Published Online xxx

<https://doi.org/10.1016/j.eclinm.2025.103559>

1016/j.eclinm.2025.103559

## Summary

Physical-mental comorbidity in children and adolescents is an emerging global health concern, yet research remains fragmented and lacks a coordinated agenda. We conducted a global priority setting exercise using the Child Health and Nutrition Research Initiative method. A total of 134 research ideas were scored by 45 experts against five criteria: answerability, effectiveness, potential for paradigm shift, potential for translation and implementation, and impact on equity. The highest-ranked priorities focused on treatment strategies, early intervention, reducing disparities in care, and the role of schools and communities in supporting health. Comparative analyses revealed both shared and context-specific needs across income settings. This is the first global consensus on research priorities for child and adolescent physical-mental comorbidity and offers a strategic roadmap to guide future research and policy.

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**Keywords:** Physical-mental comorbidity; Child and adolescent health; Research prioritization; Global health

## Introduction

Childhood and adolescence are critical periods that lay the foundation for lifelong health, development, and wellbeing.<sup>1–4</sup> These formative years are marked by rapid physical, psychological, and social changes, creating unique opportunities for growth but also heightened vulnerability to adversity.<sup>4,5</sup> In recent decades, the global burden of physical health conditions among children has steadily increased.<sup>6–8</sup> Concurrently, mental disorders have emerged as a pressing global concern in this age group.<sup>9–12</sup> According to World Health Organization (WHO), one in seven individuals aged 10–19 years is affected by a mental disorder.<sup>13</sup> Importantly, the co-occurrence of physical and mental health conditions, commonly termed physical-mental comorbidity, is both prevalent and consequential.<sup>14</sup> Approximately 38.2% of children with chronic physical illnesses also meet diagnostic criteria for a mental disorder, while those with primary mental disorders face an elevated risk of developing health problems.<sup>15,16</sup> This bidirectional relationship can reinforce a circle of worsening health, impairing educational achievement, social engagement, and long-term wellbeing. The complexity and cumulative burden of physical-mental comorbidity underscore the urgent need for integrated, cross-sectoral approaches to prevention, care delivery, and policy reform.<sup>11,17,18</sup>

Despite its prevalence and consequences, physical-mental comorbidity in children and adolescents

remains under-recognized and poorly addressed in both research and health systems.<sup>19</sup> The complexity of these conditions poses substantial challenges to detection, treatment, and coordination of care across sectors.<sup>20,21</sup> In many low- and middle-income countries (LMICs), structural barriers such as limited resources, workforce shortages, and fragmented services further hinder effective responses.<sup>22,23</sup> Even in high-income countries (HICs), where service infrastructure is more developed, care often remains siloed, failing to reflect the interconnected nature of these comorbidities.<sup>24</sup> The COVID-19 pandemic has exacerbated these challenges, disrupting services, delaying diagnoses, and widening disparities in access, particularly for vulnerable pediatric populations.<sup>25,26</sup>

Research is central to informing more integrated and effective responses to complex health challenges.<sup>27</sup> Strategic prioritization is essential to ensure that research efforts are directed toward the most impactful, feasible, and equitable areas. Although interest in physical-mental comorbidity is growing, existing research efforts remain fragmented and poorly coordinated.<sup>19–21</sup> In the absence of a coherent global research agenda, funding and policy decisions may be inefficient or misaligned with the areas of greatest need.<sup>28,29</sup> This is especially relevant in LMICs, where health systems face competing demands and limited resources.<sup>30,31</sup> Research priorities may differ by income level, and development-specific guidance can help

ensure broader applicability and impact.<sup>32</sup> Yet most prior research prioritization exercises have focused on physical or mental health in isolation, neglecting their intersection.<sup>33,34</sup>

Addressing this gap requires global coordination, long-term planning, and inclusive approaches to priority setting. The Child Health and Nutrition Initiative (CHNRI) method is one of the most widely used and transparent frameworks for research prioritization in global health.<sup>35,36</sup> In this study, we applied the CHNRI approach to identify global research priorities on physical-mental comorbidity in children and adolescents. We also examined disparities in prioritized research ideas between HICs and LMICs.

## Methods

### Overview of study approach

This research prioritization exercise was coordinated by the International Society of Global Health (ISoGH). We applied the CHNRI method for setting research priorities, followed established methodological standards to ensure consistency with previous global exercises.<sup>37–39</sup> CHNRI is grounded in principles of crowdsourcing and expert consensus. It facilitates transparent, replicable, and inclusive decision-making by enabling independent scoring of research ideas against predefined criteria. By aggregating scores from multiple experts, the method reduces individual biases and reflects collective expert judgment. Originally developed for child health research, CHNRI has since been applied in over 200 prioritization exercises across diverse domains, including infectious diseases, non-communicable diseases, and health systems research.<sup>36,40,41</sup>

In the current study, the CHNRI method was used to identify and rank global research priorities related to physical-mental comorbidity in children and adolescents. This process comprised three steps (Fig. 1): (1) Formulation of research themes and prioritization criteria, (2) Generation and scoring of research ideas, and (3) Analysis and ranking of research priorities.

### Research theme and criteria formulation

A Management and Consultation Group (MCG), composed of four members, was established through ISoGH to lead the prioritization process. The research theme was defined as “global research priorities for physical-mental comorbidity in children and adolescents”. The geographic context was set globally to ensure broad applicability. Given target population was children and adolescents, short- and long-term timeframes were established. Following two rounds of MCG discussions, five distinct criteria commonly used in previous CHNRI exercises were adopted.<sup>36,37,42</sup> These were: Criterion 1—answerability: “Would you say that the proposed research would likely be feasible and successful in reaching the proposed endpoint?”;

Criterion 2—effectiveness: “Is this proposed research likely to lead to interventions that will effectively reduce the burden of physical-mental comorbidity in children and adolescents over time?”; Criterion 3—potential for paradigm shift: “Would you say that the proposed research is likely to result in a paradigm shift that could change and improve our current approaches to the problem of physical-mental comorbidity in children and adolescents?”; Criterion 4—potential for translation and implementation: “To the best of your knowledge and experience, would you say that the proposed research would likely be applicable across diverse linguistic regions, facilitate the implementation of novel insights, and be scalable for broader impact?”; and Criterion 5—impact on equity: “To the best of your knowledge and experience, would you say that the proposed research has the potential to contribute to improve equity among children and adolescents?”

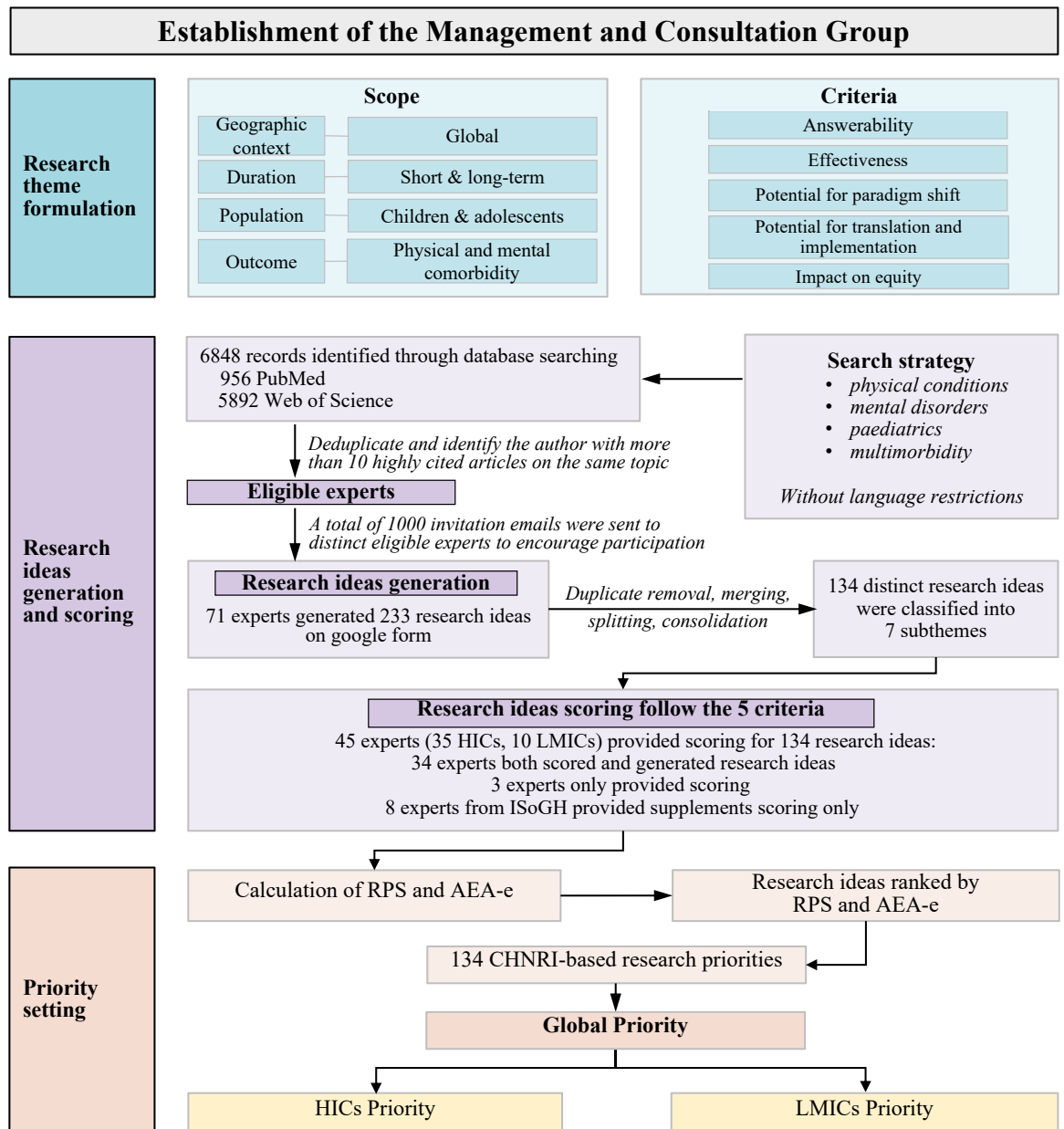
### Search strategy and selection criteria of experts

Expert input was sought to ensure the relevance of the study. Given the specialized nature of this research area, potential experts in child health were identified through a systematic literature search done on August 7, 2023, in two English bibliographic databases, namely PubMed and Web of Science. The search strategy was a combination of terms related to “physical conditions”, “mental disorders”, “pediatrics”, and “multimorbidity”, without language restrictions. The full search strategies are detailed in [Appendix p 3](#).

The search yielded 6848 records from two databases: 956 from PubMed and 5892 from Web of Science. In the Web of Science database, 943 experts were identified based on their authorship of more than 10 highly cited articles on the same topic ([Appendix p 4](#)). These experts were carefully compared and de-duplicated against authors indexed in PubMed to generate the final expert list. Emails were sent to eligible experts, inviting them to participate in the study. The invitations emphasized that participation was voluntary and based on the experts’ self-assessed knowledge in the field. Each email provided details about the study’s objectives and the context of their potential contributions.

### Research ideas generation and scoring

During the idea generation stage, we invited all participating experts to submit three to five research ideas in the field of physical-mental comorbidity in children and adolescents that they believed should be prioritized, based on their expertise and experience. Submissions were collected via an online Google Form. By January 21, 2024, approximately 1000 experts were invited to participate in the study via email. A total of 71 experts responded over a 12-week period, with the form closing on February 1, 2024. This process yielded 233 valid research ideas. Two MCG researchers independently reviewed and merged the ideas into 134 distinct



**Fig. 1: Flow chart of CHNRI exercise.** RPS, research priority score; AEA-e, average expert agreement score based on information theory; HICs, high-income countries; LMICs, low- and middle-income countries; LLMs, large language models; CHNRI, Child Health and Nutrition Research Initiative; ISOGH, International Society of Global Health.

ones by removing duplicates, ensuring clarity, and verifying relevance. Any disagreements were resolved through discussion until consensus was reached. After that, the MCG organized the research ideas into seven subthemes: Subtheme 1—Enhancing diagnostic and identification methods (22 ideas); Subtheme 2—Addressing socioeconomic, cultural, and environmental determinants (24 ideas); Subtheme 3—

Reducing trauma, violence, and adversity’s health impact (22 ideas); Subtheme 4—Advancing understanding of potential mechanisms (34 ideas); Subtheme 5—Developing effective treatment and management strategies (41 ideas); Subtheme 6—Promoting health behavior and lifestyle changes for prevention (22 ideas); Subtheme 7—Understanding and mitigating developmental and educational impacts (27 ideas). As some

ideas were listed under multiple subthemes, the total count exceeded 134.

To obtain the research ideas scores, the MCG sent invitation emails to the same pool of approximately 1000 experts. To ensure broader expertise, 126 ISoGH members with expertise in Maternal, Newborn, Child, and Adolescent Health and Global Mental Health were also invited. Experts were invited to systematically score ideas using the five pre-agreed priority setting criteria: answerability, effectiveness, potential for paradigm shift, potential for translation and implementation, and impact on equity.<sup>37</sup> Each idea was scored against these criteria using four response options: 0 (unlikely to meet the criterion); 1 (likely to meet the criterion); 0.5 (sufficient knowledge but uncertain about the judgment, although this practice was generally discouraged); or blank (if the expert felt inadequately informed to make a judgment).<sup>36</sup> The scoring was conducted without weighting or adjustments. By June 6, 2024, we received scoring responses for the 134 research ideas from 45 experts, including 34 who contributed to both idea generation and scoring and 11 who participated only in scoring. The process for experts identification and research ideas scoring is shown in [Appendix p 4](#).

### Statistics

To ensure objectivity and protect participant confidentiality, expert scores were anonymized and delinked from respondent characteristics before analysis. Each research idea was scored across five equally weighted criteria.

A standardized ranking of research priorities was established by assigning equal weights to each of the five evaluation criteria. For each criterion, an intermediate criterion-specific score (CSS) was derived by computing the average of the submitted scores (1, 0.5, or 0), with blank responses omitted from the denominator. Subsequently, the Research Priority Score (RPS) for each research idea was determined as the average of the five CSS values, spanning from 0 (lowest priority) to 1 (highest priority).

The average expert agreement (AEA-e) measures expert agreement on the priority of an issue. It incorporates entropy to quantify score inconsistency,<sup>43</sup> with higher entropy indicating greater disagreement and less consistency among expert scores. The AEA-e score ranges from 1/3 to 1, with values closer to 1 indicating higher consistency among expert scores. The formula for calculating AEA-e is as follows:

$$AEA-e = \frac{1}{n} \times \sum_{q=1}^n \left[ \exp \left( \sum_{i=1}^k p_i \times \log p_i \right) \right]_q$$

where  $p_i$  is the proportion of scores in category  $i$  (1, 0.5, or 0) for a given research idea,  $k = 3$  represents the number of distinct score categories,  $n = 5$  represents the total number of priority setting criteria,  $q$  represents

the index of the research idea, ranging from 1 to the total number of research ideas being evaluated.

To quantify uncertainty, we generated 95% confidence intervals (CIs) for both RPS and AEA-e using bootstrap with 1000 iterations. The association between RPS and AEA-e across the 134 ideas was examined using Spearman's rank correlation coefficient. To evaluate the consistency between the two scoring metrics, we also calculated the intraclass correlation coefficient (ICC) using a two-way mixed-effects model with average measures. Hierarchical clustering was used to explore patterns in scoring across research ideas and criteria. Subgroup analyses compared research prioritization between experts from HICs and LMICs, based on the World Bank classifications.<sup>44</sup>

All statistical analyses were conducted using Python version 3.7.1 (Python Software Foundation, Wilmington, DE, USA) and R version 4.4.2 (R Foundation for Statistical Computing, Vienna, Austria). A two-sided  $p$ -value of less than 0.050 was indicative of statistical significance.

### Ethics

Informed consent was obtained from all experts by replying to the invitation email. All procedures were approved by the Medical Ethics Committee of the School of Public Health, Zhejiang University (No. ZGL202404-9).

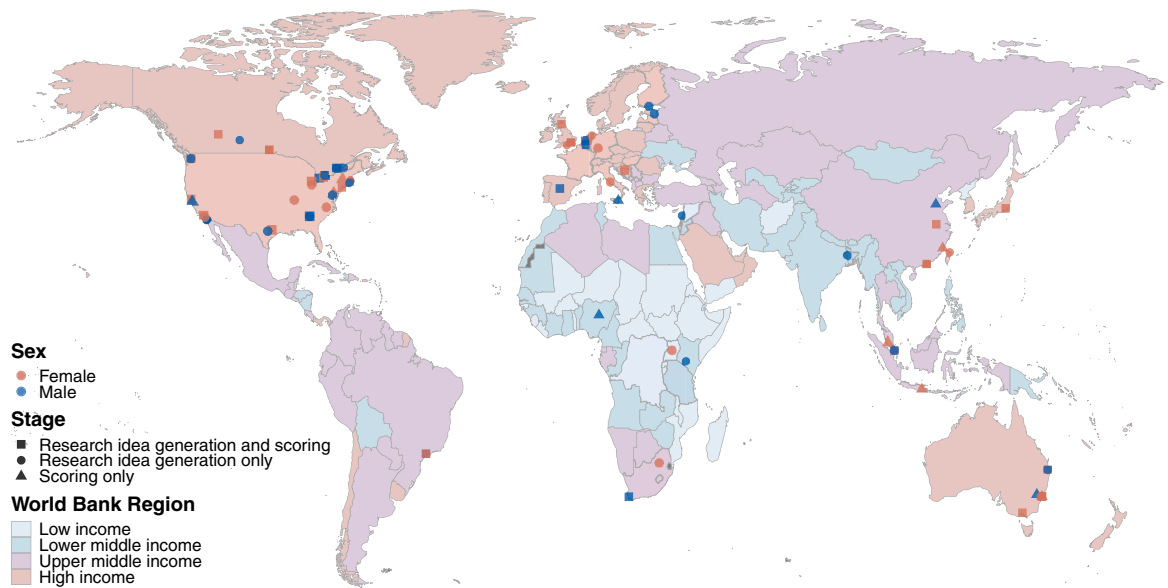
### Role of the funding source

This study was supported by National Natural Science Foundation of China (72474196). The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

### Results

A total of 82 experts from 25 countries contributed to the CHNRI prioritization exercise. Of these, 34 participated in both idea generation and scoring, 37 only proposed research ideas, and 11 only participated in scoring. The geographic distribution of participants is illustrated in [Fig. 2](#), with detailed demographic characteristics presented in [Appendix pp 5–11](#). Among the 45 experts who contributed to the scoring phase, 29 (64.44%) were female, 39 (86.67%) held doctoral-level qualifications and the majority were affiliated with institutions in HICs ( $n = 35$ , 77.78%) ([Appendix pp 12–13](#)).

The overall RPS for the 134 research ideas ranged from 0.333 (95% CI: 0.269–0.387) to 0.857 (95% CI: 0.809–0.895), with a median of 0.661. The AEA-e varied from 0.397 (95% CI: 0.370–0.426) to 0.579 (95% CI: 0.513–0.640), with a median of 0.429 ([Appendix pp 14–21](#)). There was a high level of concordance among experts in the ranking of research priorities (Spearman's rho 0.870;  $p < 0.0001$ ), indicating that higher-



**Fig. 2: The geographic distribution of participating experts.** Our study involved 82 participating experts. In the research idea generation phase, 71 experts submitted research ideas as requested via Google Form. A total of 45 experts participated in the scoring phase, of these, 34 were from the original 71 who had submitted ideas, 3 only scored, and the remaining 8 were additional scoring experts from ISOGH. ISOGH, International Society of Global Health.

priority ideas were generally associated with greater agreement among experts. In addition, an ICC of 0.705 further confirmed a high level of consistency in expert scoring (Appendix p 53). Hierarchical cluster analysis did not reveal any distinct clustering patterns in either overall RPS or criterion-specific scores (Appendix pp 54–71).

The top ten research priorities identified in this study primarily focused on developing effective treatment and management strategies for children and adolescents with physical-mental comorbidities (Table 1). Subtheme 5, “developing effective treatment and management strategies”, was the most prominent, appearing in six of the top ten priorities (ranked second, third, fourth, seventh, ninth, and tenth). This reflects the field’s strong emphasis on improving clinical outcomes, quality of life, and functional support for comorbid youth. Other highly ranked priorities addressed prevention, digital health, social determinants, and trauma-related risk factors.

The highest-ranked research priority focused on evaluating the influence of school-based physical activity policies and access to community recreational spaces on the physical and mental health of children and adolescents, particularly in disadvantaged communities (RPS 0.857 [95% CI: 0.809–0.895]; AEA-e 0.579 [95% CI: 0.513–0.640]). The second-ranked priority investigated disparities in the prevalence of, and access to care for, comorbid conditions among children and adolescents (RPS 0.822 [95% CI: 0.776–0.864]; AEA-e 0.501 [95% CI: 0.453–0.559]). These were followed by

priorities focused on identifying interventions to enhance quality of life (3rd, RPS 0.803 [95% CI: 0.750–0.848]; AEA-e 0.524 [95% CI: 0.476–0.579]), evaluating the impact of early physical health interventions on later mental health outcomes (4th, RPS 0.801 [95% CI: 0.749–0.854]; AEA-e 0.522 [95% CI: 0.474–0.576]), and exploring protective factors for children exposed to violence (5th, RPS 0.801 [95% CI: 0.750–0.848]; AEA-e 0.499 [95% CI: 0.447–0.553]).

The sixth and seventh priorities further highlighted the importance of early adversity and daily functioning. These included examining the role of child abuse and neglect in the development of comorbidity (6th, RPS 0.792 [95% CI: 0.737–0.842]; AEA-e 0.499 [95% CI: 0.450–0.548]) and developing strategies to support academic and occupational participation among affected youth (7th, RPS 0.791 [95% CI: 0.739–0.839]; AEA-e 0.479 [95% CI: 0.430–0.530]). Digital health was represented by the eighth-ranked priority, which assessed the effectiveness of digital interventions in promoting physical activity and mental wellbeing (RPS 0.787 [95% CI: 0.727–0.833]; AEA-e 0.527 [95% CI: 0.477–0.577]). Rounding out the top ten were priorities investigating whether mental health treatment can improve physical outcomes (9th, RPS 0.784 [95% CI: 0.724–0.831]; AEA-e 0.502 [95% CI: 0.451–0.555]) and developing responsive systems to monitor and address mental health needs in youth with physical health conditions (10th, RPS 0.773 [95% CI: 0.718–0.820]; AEA-e 0.490 [95% CI: 0.444–0.539]).

Analysis by country income level (Table 1; Appendix pp 27–34) revealed notable differences between HICs

Rank	Research idea	Subtheme	RPS (95% CI)	AEA-e (95% CI)
<b>Global</b>				
1	Examining the influence of school-based physical activity policies and community recreational resources on the physical and mental health of children and adolescents, focusing on disadvantaged communities.	Subtheme 6; Subtheme 2	0.857 (0.809, 0.895)	0.579 (0.513, 0.640)
2	Investigating disparities in prevalence and access to care for mental-physical comorbidity among children and adolescents.	Subtheme 2; Subtheme 5	0.822 (0.776, 0.864)	0.501 (0.453, 0.559)
3	Identifying potential interventions to enhance the quality of life for youth with physical and mental comorbidities.	Subtheme 5	0.803 (0.750, 0.848)	0.524 (0.476, 0.579)
4	Examining how early intervention in physical health conditions influences mental health development and severity in pediatric and adolescent populations.	Subtheme 5; Subtheme 7	0.801 (0.749, 0.854)	0.522 (0.474, 0.576)
5	Identifying factors that mitigate the effects of violence exposure on physical and mental comorbidity in children and adolescents.	Subtheme 3; Subtheme 6	0.801 (0.750, 0.848)	0.499 (0.447, 0.553)
6	Examining the role of child abuse and neglect in the development of physical and mental health comorbidities.	Subtheme 3; Subtheme 4	0.792 (0.737, 0.842)	0.499 (0.450, 0.548)
7	Developing strategies to support children and adolescents with physical-mental comorbidity in academic, occupational, and study settings.	Subtheme 5; Subtheme 7	0.791 (0.739, 0.839)	0.479 (0.430, 0.530)
8	Assessing the effectiveness of digital interventions in promoting physical activity and improving mental health outcomes in diverse pediatric and adolescent populations.	Subtheme 6	0.787 (0.727, 0.833)	0.527 (0.477, 0.577)
9	Investigating if mental health treatment enhances physical outcomes for children and adolescents with physical and mental comorbidities.	Subtheme 5	0.784 (0.724, 0.831)	0.502 (0.451, 0.555)
10	Developing strategies to monitor and respond to mental health needs in children and adolescents with physical health conditions.	Subtheme 5	0.773 (0.718, 0.820)	0.490 (0.444, 0.539)
<b>HICs</b>				
1	Examining the influence of school-based physical activity policies and community recreational resources on the physical and mental health of children and adolescents, focusing on disadvantaged communities.	Subtheme 2; Subtheme 6	0.827 (0.769, 0.873)	0.535 (0.474, 0.599)
2	Developing strategies to support children and adolescents with physical-mental comorbidity in academic, occupational, and study settings.	Subtheme 5; Subtheme 7	0.792 (0.731, 0.841)	0.467 (0.419, 0.525)
3	Investigating disparities in prevalence and access to care for mental-physical comorbidity among children and adolescents.	Subtheme 2; Subtheme 5	0.783 (0.723, 0.834)	0.467 (0.419, 0.522)
4	Assessing the effectiveness of digital interventions in promoting physical activity and improving mental health outcomes in diverse pediatric and adolescent populations.	Subtheme 6	0.763 (0.697, 0.817)	0.506 (0.452, 0.555)
5	Examining the role of child abuse and neglect in the development of physical and mental health comorbidities.	Subtheme 3; Subtheme 4	0.753 (0.693, 0.816)	0.472 (0.423, 0.530)
6	Identifying potential interventions to enhance the quality of life for youth with physical and mental comorbidities.	Subtheme 5	0.749 (0.681, 0.801)	0.478 (0.427, 0.536)
7	Examining how early intervention in physical health conditions influences mental health development and severity in pediatric and adolescent populations.	Subtheme 5; Subtheme 7	0.749 (0.680, 0.805)	0.473 (0.425, 0.525)
8	Investigating the roles of socio-economic and demographic disparities in the development of mental and physical conditions among young individuals.	Subtheme 2	0.747 (0.672, 0.805)	0.469 (0.419, 0.521)
9	Identifying factors that mitigate the effects of violence exposure on physical and mental comorbidity in children and adolescents.	Subtheme 3; Subtheme 6	0.746 (0.677, 0.800)	0.448 (0.405, 0.494)
10	Investigating if mental health treatment enhances physical outcomes for children and adolescents with physical and mental comorbidities.	Subtheme 5	0.737 (0.669, 0.791)	0.464 (0.421, 0.513)
<b>LMICs</b>				
1	Identifying interventions with cross-cutting benefits for physical and mental health and their comorbidities.	Subtheme 5	1.000 (1.000, 1.000)	1.000 (1.000, 1.000)
2	Identifying factors that mitigate the effects of violence exposure on physical and mental comorbidity in children and adolescents.	Subtheme 3; Subtheme 6	1.000 (1.000, 1.000)	1.000 (1.000, 1.000)
3	Exploring the perspectives of primary caregivers on the use of psychiatric medications for managing disruptive behavior in children with chronic physical conditions.	Subtheme 5	1.000 (1.000, 1.000)	1.000 (1.000, 1.000)
4	Developing strategies to monitor and respond to mental health needs in children and adolescents with physical health conditions.	Subtheme 5	0.990 (0.960, 1.000)	0.907 (0.722, 1.000)
5	Identifying potential interventions to enhance the quality of life for youth with physical and mental comorbidities.	Subtheme 5	0.990 (0.955, 1.000)	0.907 (0.693, 1.000)
6	Examining how early intervention in physical health conditions influences mental health development and severity in pediatric and adolescent populations.	Subtheme 5; Subtheme 7	0.980 (0.900, 1.000)	0.907 (0.722, 1.000)

(Table 1 continues on next page)

Rank	Research idea	Subtheme	RPS (95% CI)	AEA-e (95% CI)
(Continued from previous page)				
7	Determining if optimizing physical health reduces mental health symptoms and prevents mental health disorder onset.	Subtheme 5	0.970 (0.890, 1.000)	0.822 (0.578, 1.000)
8	Investigating attachment insecurity as a potential factor in the comorbidity between physical and mental health conditions in children and adolescents.	Subtheme 3; Subtheme 4	0.966 (0.909, 0.989)	0.780 (0.622, 0.897)
9	Investigating methods for enhancing the recognition, diagnosis, and evidence-based early intervention of mental, somatic, and genetic disorders in pediatric and adolescent populations with chronic physical conditions.	Subtheme 1; Subtheme 5	0.960 (0.890, 0.990)	0.767 (0.573, 0.907)
10	Examining the influence of school-based physical activity policies and community recreational resources on the physical and mental health of children and adolescents, focusing on disadvantaged communities.	Subtheme 2; Subtheme 6	0.960 (0.860, 1.000)	0.845 (0.653, 1.000)

Notes: RPS, research priority score; AEA-e, average expert agreement score based on information theory; HICs, high-income countries; LMICs, low- and middle-income countries; Subtheme 1, enhancing diagnostic and identification methods; Subtheme 2, addressing socioeconomic, cultural, and environmental determinants; Subtheme 3, reducing trauma, violence, and adversity's health impact; Subtheme 4, advancing understanding of potential mechanisms; Subtheme 5, developing effective treatment and management strategies; Subtheme 6, promoting health behavior and lifestyle changes for prevention; Subtheme 7, understanding and mitigating developmental and educational impacts.

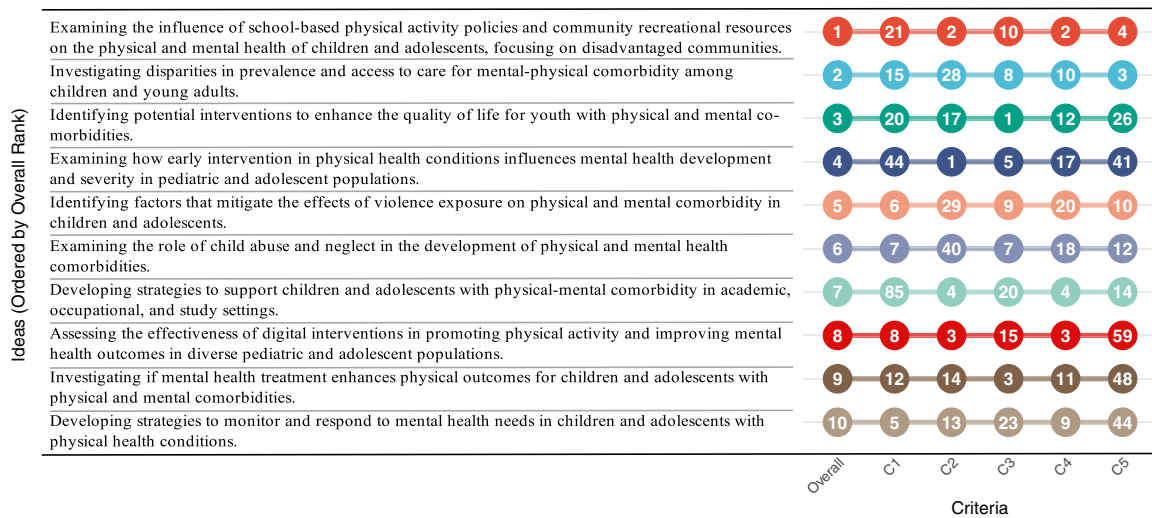
**Table 1: The ten highest-ranked research ideas, according to their RPS and AEA-e.**

and LMICs, although several priorities were shared across contexts. In HICs, the highest-ranked priority was evaluating the impact of school-based physical activity policies and access to community recreational resources on the physical and mental health of children and adolescents, particularly in disadvantaged areas (RPS 0.827 [95% CI: 0.769–0.873]; AEA-e 0.535 [95% CI: 0.474–0.599]). This priority was also ranked first in the overall global results. Second was the development of strategies to support young people with co-occurring physical and mental health conditions in academic and occupational settings (RPS 0.792 [95% CI: 0.731–0.841]; AEA-e 0.467 [95% CI: 0.419–0.525]), which ranked seventh globally. Third was the investigation of disparities in prevalence and access to care for comorbid conditions (RPS 0.783 [95% CI: 0.723–0.834]; AEA-e 0.467 [95% CI: 0.419–0.522]), aligning closely with its global position (2nd). Other topics in the HIC top ten included digital interventions to promote physical activity (4th), the role of child abuse and neglect in the development of comorbidity (5th), and interventions to improve quality of life (6th). Priorities related to early intervention in physical illness (7th), socioeconomic disparities (8th), and protective factors for violence-exposed youth (9th) also featured. The tenth-ranked priority in HICs, investigating whether mental health treatment improves physical health outcomes, was ranked ninth overall.

In LMICs, the top three priorities all received the highest possible scores for both metrics (RPS 1.000 [95% CI: 1.000–1.000]; AEA-e 1.000 [95% CI: 1.000–1.000]), indicating strong consensus and perceived impact (Table 1; Appendix pp 40–47). The first was identifying interventions with cross-cutting benefits for both physical and mental health conditions, a priority that also ranked third in the global results. Second was identifying protective factors for children exposed to violence, which

held the fifth position globally. The third top-ranked priority, exploring caregiver perspectives on psychiatric medication use to manage disruptive behavior in children with chronic physical illness, was unique to LMICs and did not appear in the global top ten. The remaining LMIC priorities emphasized developing systems to monitor and respond to mental health needs (4th), followed by improving quality of life (5th), and early intervention in physical illness (6th). The seventh-ranked priority explored whether improvements in physical health could reduce mental health symptoms and prevent disorder onset, an idea less prominently featured in HICs. Attachment insecurity as a potential contributor to comorbidity appeared eighth, while the need to improve early diagnosis and intervention for complex conditions was ranked ninth. Completing the LMIC top ten was the priority concerning school-based physical activity policies, which was the highest-ranked item globally and in HICs.

The top ten research priorities globally did not rank consistently across the five evaluation criteria (Fig. 3). The highest-ranked priority, on school-based physical activity policies and access to recreational resources, scored highly in effectiveness (2nd), implementation (2nd), and equity (4th), but ranked lower in answerability (21st) and innovation (10th). The second-ranked priority, addressing disparities in prevalence and access to care, was rated highly for equity (3rd), innovation (8th), and implementation (10th), but lower in answerability (15th), and effectiveness (28th). The third-ranked priority, improving quality of life for youth with comorbidities, ranked first in innovation and performed moderately in implementation (12th), and effectiveness (17th), but was lower in answerability (20th), and equity (26th). The remaining priorities showed similar trade-offs: early intervention in physical illness (4th), ranked first in effectiveness but much lower in answerability (44th), and equity (41st); violence

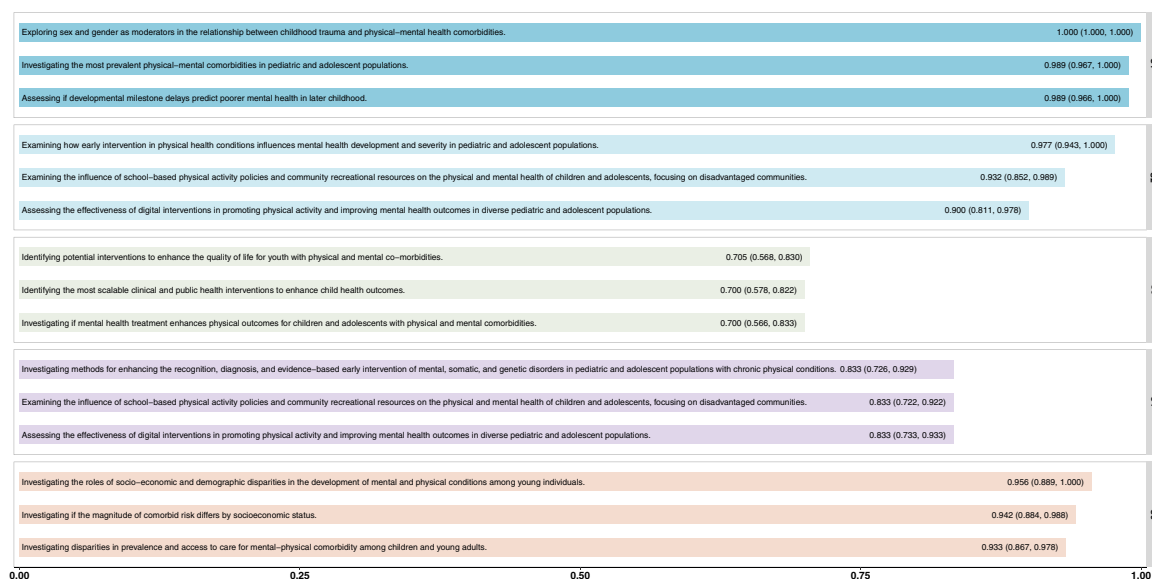


**Fig. 3: The ranking distribution of the top ten research priorities overall and across all criteria.** The numbers in the bubbles represent the rank of each idea in the overall ranking or across different criteria. C, criterion; C1, answerability; C2, effectiveness; C3, potential for paradigm shift; C4, potential for translation and implementation; C5, impact on equity.

and abuse-related priorities (5th and 6th) were strong in answerability and innovation but weaker in effectiveness and implementation; support in academic and occupational settings (7th) performed well in effectiveness and implementation but ranked lowest in answerability (85th); digital interventions (8th) scored highly across most criteria but poorly in equity (59th); and the final two priorities (9th and 10th) performed

well in answerability and implementation, moderate in effectiveness, mixed in innovation, and weak in equity. These variations highlight the diverse strengths and limitations across the top-ranked priorities.

Globally, the three highest-scoring research priorities under each evaluation criterion are listed in Fig. 4 and Appendix pp 22–26. For answerability, top-ranked priorities focused on sex and gender as moderators in



**Fig. 4: The three highest-ranked research ideas for each of the predefined priority-setting criterion.** C, criterion; RPS, research priority score; C1, answerability; C2, effectiveness; C3, potential for paradigm shift; C4, potential for translation and implementation; C5, impact on equity.

the relationship between childhood trauma and physical-mental health comorbidities, the prevalence of comorbid conditions in youth, and the predictive role of developmental milestone delays for later mental health. Under effectiveness, the highest priorities addressed early intervention in physical health to prevent mental health deterioration, the role of school-based and community physical activity resources, and the effectiveness of digital interventions on mental health outcomes. For potential for paradigm shift, leading priorities included improving quality of life for youth with comorbid conditions, identifying scalable clinical and public health interventions, and investigating whether mental health treatment enhances physical outcomes in children and adolescents with comorbidity. Under translation and implementation, three priorities received identical scores: enhancing recognition and early intervention for mental, somatic, and genetic disorders in chronic physical conditions; evaluation of school and community physical activity policies in disadvantaged communities; and digital strategies to promote health in diverse youth. For impact on equity, the top priorities focused on socioeconomic and demographic disparities in the development and treatment of comorbid conditions, differences in risk by socioeconomic status, and disparities in prevalence and access to care.

The top ten research ideas for each criterion, stratified by World Bank classifications, are shown in [Appendix \(pp 35–39 for HICs and pp 48–52 for LMICs\)](#).

## Discussion

This study identified key global research priorities in child and adolescent physical-mental comorbidity, with a strong emphasis on integrated care, early intervention, and health equity. Over half of the top-ranked priorities focused on treatment and management of co-occurring conditions, including the impact of school-based physical activity (ranked 1st), disparities in prevalence and access to care (2nd), and strategies to improve quality of life for affected youth (3rd). Other highly ranked areas included early intervention in physical illness (4th), exposure to violence and trauma (5th and 6th), support for academic and occupational functioning (7th), and the use of digital health interventions (8th). HICs prioritized school-based prevention, digital tools, and functional support, while LMICs focused on multi-benefit interventions, caregiver perspectives, and early detection systems. Priorities varied across scoring criteria, with implementation potential and impact on equity emerging as key drivers.

The top-ranked priorities identified in this study reflect longstanding challenges and emerging opportunities in global child and adolescent health. The highest-ranking item, evaluating the impact of school-based physical activity policies and access to

recreational spaces, aligns with a growing body of evidence linking physical activity to improved mental health outcomes in youth, particularly in disadvantaged communities.<sup>45–47</sup> Recent global guidelines from WHO and UNICEF have emphasized the importance of school and community environments in promoting both physical and mental wellbeing, making this a high-value area for policy-relevant research.<sup>48–50</sup> Similarly, the second-ranked priority, addressing disparities in prevalence and access to care, echoes persistent concerns about inequitable health outcomes across socioeconomic groups, consistent with global mental health research highlighting structural barriers to diagnosis and treatment.<sup>51–53</sup> Priorities focused on improving quality of life and functioning for children with comorbid conditions reflect a shift towards patient-centered and recovery-oriented frameworks, which are increasingly recognized in both clinical and public health domains. The high ranking of early intervention in physical illness further supports calls for integrated models of pediatric care that address both physical and mental health trajectories.<sup>54–56</sup> Priorities related to trauma, violence exposure, and digital tools also mirror global trends, including growing attention to adverse childhood experiences and the expanding role of digital health solutions in low-resource and remote settings.<sup>57,58</sup> Collectively, these priorities are well aligned with international agendas such as the WHO Mental Health Action Plan and the UN Sustainable Development Goals, particularly those targeting universal health coverage, health equity, and child development.<sup>59,60</sup>

Differences in research priorities between HICs and LMICs reflect varying health system capacities, contextual needs, and stages of service development. In HICs, top-ranked priorities centered on optimizing existing infrastructures and addressing equity within established systems. These included evaluating school-based physical activity policies and access to recreational spaces, supporting young people with comorbidities in academic and occupational settings, and addressing disparities in prevalence and access to care. Priorities related to digital interventions, childhood adversity, and socioeconomic inequalities also featured prominently, highlighting a focus on functional outcomes, prevention, and the refinement of integrated care pathways. In contrast, LMIC priorities emphasized foundational system-building and context-specific challenges. The highest-ranked items, developing cross-cutting interventions for physical and mental health, identifying protective factors for children exposed to violence, and exploring caregiver perspectives on psychiatric medication, reflect a strong emphasis on multisectoral integration, trauma-informed approaches, and culturally responsive care. These findings reflect and reinforce the goals of global initiatives such as WHO's Mental Health Gap Action

Programme, which promotes the integration of mental health into primary care and the expansion of services in LMICs.<sup>61</sup> Similarly, the WHO Global Mental Health Action Plan emphasizes scalable, affordable, and community-based approaches, alongside early detection and system-level monitoring.<sup>59</sup> The alignment between our LMIC-prioritized research areas and these international strategies suggests strong potential for policy relevance and practical implementation. While some priorities, such as improving quality of life and school-based activity promotion, were shared across contexts, their relative rankings suggest differences in perceived feasibility and urgency. These findings reinforce the importance of regionally responsive research investment strategies that align scientific opportunity with both local needs and global health frameworks.<sup>62–64</sup>

Variability in how priorities ranked across evaluation criteria reflects the diverse dimensions that shape research value within the CHNRI framework. While some priorities, such as school-based physical activity policies or early intervention in physical illness, were rated highly for effectiveness and implementation, they ranked lower in answerability or innovation, suggesting mature areas of research with established feasibility but limited novelty. Conversely, priorities focused on improving quality of life for young people with comorbidities or reducing disparities in access to care scored more strongly for innovation and equity, but lower in answerability, pointing to challenges in study design and measurement. Other topics, including trauma-related interventions and digital health approaches, showed uneven profiles, often scoring well in answerability and innovation but lower in effectiveness and implementation, highlighting barriers to translation into practice. These patterns illustrate the importance of using multi-criteria evaluation not only to identify high-priority topics, but also to understand their differential strengths and limitations across domains.<sup>40,42</sup> A strong overall ranking may mask specific barriers to implementation or evidence generation, while lower-ranked topics may score consistently across criteria, indicating steady, cross-cutting value. Such insights are critical for funders and policymakers seeking to invest in research that is both impactful and actionable within varying system contexts.<sup>41,65–67</sup>

This study has several methodological strengths. The use of the CHNRI framework enabled a structured, transparent, and replicable process for identifying and ranking research priorities, consistent with established approaches in global health research. As the first international exercise focused specifically on child and adolescent physical-mental comorbidity, it provides a foundation for future work in a previously under-prioritized area. Inclusion of experts from both HICs and LMICs facilitated context-specific comparisons, and the absence of clustering in scoring patterns suggests a

diversity of views across criteria. High levels of agreement on top-ranked priorities support the internal consistency of the findings.

However, several limitations should be acknowledged. The expert panel was composed exclusively of researchers with expertise in child health and global health, which may have excluded relevant perspectives from policy, practice, or lived experience. The number of scorers ( $n = 45$ ) was in line with the recommended threshold for optimal score stability, and subgroup analyses by income setting were based on relatively small samples, especially for LMICs.<sup>42</sup> The low response rate may have introduced selection bias, limiting the diversity of perspectives. The availability of a 0.5 response option may have contributed to central tendency bias, potentially reducing variation between items. Future studies may benefit from broader stakeholder engagement, larger scoring panels, and periodic updates to reflect emerging evidence and shifts in global health priorities.

As one of the first international efforts to advancing global research agendas on child and adolescent physical-mental comorbidity, this study fills a critical gap in global health. The priorities, which focused on early intervention, coordinated care, equity, and cross-sector collaboration, are relevant across settings but need to be adapted to local systems and resources. The CHNRI method provides a transparent framework to guide funding and policy decisions by surfacing expert consensus on what is most needed and feasible. These priorities should inform national and regional research strategies and shape policies that bridge health, education, and social care sectors. For funders, the research agenda offer a clear direction to shift investments toward implementation research, systems strengthening, and context-specific solutions, especially in low- and middle-income countries where the burden of comorbidities is growing, and resources are limited. By aligning funding and research with real-world needs, this research agenda can support more inclusive, integrated, and sustainable improvements in child and adolescent health globally.

This study identifies key research priorities to support better understanding and response to physical-mental comorbidities in children and adolescents. The priorities emphasize the importance of earlier identification, more coordinated and youth-centered care, improved equity in access and outcomes, and stronger collaboration across sectors. They reflect both shared global concerns and context-specific differences, highlighting the need for adaptable research approaches relevant to diverse settings. By providing a clear direction for future work, these priorities can help guide research, funding, and policy efforts toward areas with the greatest potential to improve care and outcomes.

## Contributors

IR was the lead developer of the CHNRI method in 2005–2007. PS and YZ refined the CHNRI methods. IR and PS conceptualized and organized this exercise. DJ collated and cleaned the data. DJ and JZ accessed and verified the data. DJ and JZ wrote the first draft with inputs from PS and IR. Edimansyah Abdin, Tracie O. Affi, Laura Helena S.G. Andrade, Rebecca Bendayan, Emma E. Berkelbach van der Sprenkel, Ronny Bruffaerts, Ferrán Catalá-López, Ian Colman, Benjamin G. Druss, Laura Duncan, Nuša Farič, Erika Felix, Holly Foster, Shurong Lu, Hassan Mansour, Ruth Ann Marrie, Tanya Meade, Salima Meherali, Carles Muntaner, Yoko Nomura, Junko Okuyama, Susan J. Rees, Graham J. Reid, Janet U. Schneiderman, Dan J. Stein, Frederick W. Thielen, Wan Yee Winnie Tso, André Oliveira Werneck, Xiaoyan Wu contributed scores and provided important intellectual input on the drafted manuscript. All authors have read and approved the final version of the manuscript, and agreed to be accountable for all aspects of the work ensuring integrity and accuracy. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

## Data sharing statement

The data that support the findings of this study and code for this study can be requested from the corresponding author (PS, [peigesong@zju.edu.cn](mailto:peigesong@zju.edu.cn)).

## Editor note

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## Declaration of interests

Tracie O. Affi reported receiving grants from the Canadian Institutes of Health Research (CIHR), the Communications Research Centre Canada (CRC), and the Public Health Agency of Canada (PHAC), and royalties from Elsevier for a book, outside the submitted work. Ruth Ann Marrie reported serving as a co-investigator on studies funded by Biogen Idec and Roche Canada, outside the submitted work. Dan J. Stein reported receiving consultancy honoraria from Discovery Vitality, Kanna, L'Oréal, Lundbeck, Orion, Servier, Seaport Therapeutics, Takeda, and Wellcome outside the submitted work. No other disclosures were reported.

## Acknowledgements

We would like to express our sincere gratitude to the following experts for their valuable insights and contributions: Gregory Aarons, Rashed Alam, Anayochukwu Anyasodor, Lukoye Atwoli, Valerie Brandt, Robert C Bransfield, Oscar Bukstein, Louise Butler, Katrina Champion, Li-Chi Chiang, Annegret Dahlmann-Noor, Peter De Jonge, Jeffrey L Derevensky, Lisabeth DiLalla, Erin Dunn, Lawrence Eichenfield, Benjamin Goldstein, Erica Greenberg, Aleks Karnick, Giuseppe Lanza, Yazhen Li, Fadi Maalouf, Scovia Nalugo Mbalinda, Roger S. McIntyre, Lachlan McWilliams, Emily Mendenhall, Terrie E Moffitt, Suleiman Mshelia, Kwok Ng, Albertine J Oldehinkel, Chulwook Park, Siti Nurkamilia Ramdzan, Ulrike Ravens-Sieberer, Laura Richardson, Bushra Sabri, Norman Sartorius, Maria Luisa Scattoni, Roz Shafran, Cindy Sit, Mythily Subramaniam, Linda Theron, Supriyatiningih Wenang. This study was supported by the National Natural Science Foundation of China (72474196).

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.eclinm.2025.103559>.

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