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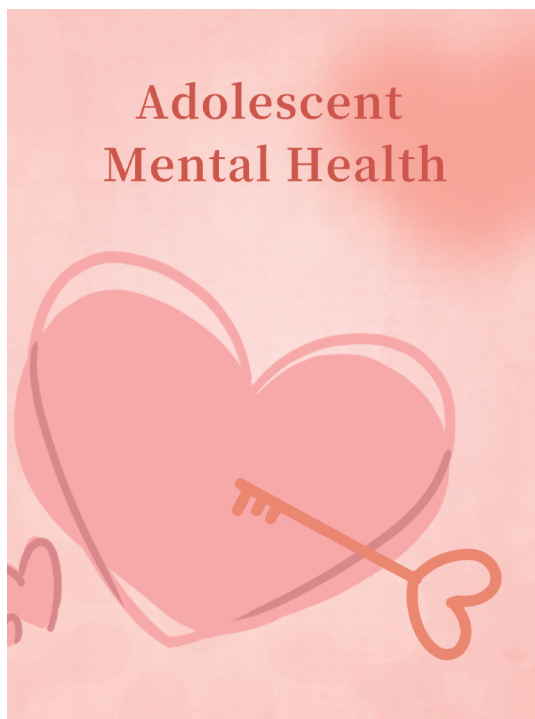
Adolescent Mental Health

ADOLESCENT MENTAL HEALTH ISSUE

China CDC Weekly

Foreword

Improving Child and Adolescent Mental Health Comprehensively in Challenging Times

Yi Song[1,#]

Mental health, an integral component of well-being, encompasses more than the mere absence of illness (*1*). Improving the mental health of the next generation is essential, as it not only affects their health in adolescence and adulthood but also enables them to thrive in various aspects of life, such as learning, working, forming relationships, and contributing to society (*2–3*). Currently, China faces growing concerns regarding mental health issues among children and adolescents (*4*). Recognizing the gravity of this situation, the government has implemented various policies, including the Special Action Plan for Comprehensively Strengthening and Improving the Mental Health Work of Students in the New Era (2023–2025) (*5*). However, regional disparities and the complex interplay of factors influencing youth mental development are posing challenges to the effective implementation of these policies, highlighting the need for more integrated and impactful interventions.

This special issue presents a series of articles examining the current status, influencing factors, latest policies, and interventions related to mental health issues among Chinese children and adolescents. These studies consider both positive psychology and psychopathology, providing a comprehensive perspective on mental well-being. Li et al. analyzed the mental well-being of Chinese adolescents aged 13 to 18 using nationwide data, identifying regional disparities and vulnerable populations and emphasizing the importance of targeted interventions to improve adolescent mental health (*6*). Zhou et al. employed socio-ecological systems and network structures to illustrate the relationships among multidimensional factors influencing adolescent depression, finding that parental awareness of emotional abuse iwas crucial for prevention (*7*). Yang et al. investigated the impact of gender and school grade on mental health symptoms and risky behaviors, highlighting the need for tailored interventions that address both gender- and grade-specific mental health challenges (*8*). Yuan et al. expound upon the background and significance of the Special Action Plan for Comprehensively Strengthening and Improving the Mental Health Work of Students in the New Era (2023–2025), including its main content, key points, highlights, and implementation. This analysis enhanced the international understanding of China's mental health work implementation strategies, particularly the potential of school hygiene work in the field (*9*). Jiang et al. explained the benefits of peer support among children and youth, providing an update on the progress and future applications of peer support for adolescent mental health in China (*10*). This special issue aims to provide a comprehensive review of the challenges faced by Chinese youth and offer potential solutions to improve their mental health.

Addressing these challenging times requires a multifaceted approach. While research has explored the prevalence and distribution of psychological issues like depression and anxiety among children and adolescents, a standardized method for comprehensively and conveniently measuring their overall mental health remains lacking. Furthermore, analytical methods that address the multidimensional impact of factors influencing child and adolescent mental health — across genetic, personal, peer, family, educational, environmental, and social levels — need development. Comprehensive interventions targeting these various determinants are also necessary. Ultimately, fostering positive mental health development for future generations requires a collaborative, society-wide effort.

Conflicts of interest: No conflicts of interest.

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Preplanned Studies

Mapping Adolescent Mental Well-Being — 30 PLADs, China, 2019

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Summary

What is already known about this topic?

High levels of mental well-being are linked to favorable life outcomes. Nonetheless, compared to the research on psychiatric disorders, the understanding of mental well-being among Chinese adolescents is still relatively underexplored.

What is added by this report?

This report fills a significant void in the literature concerning the mental well-being of Chinese adolescents by providing updated data. This information is critical for developing evidence-based interventions and strategies aimed at improving mental well-being and addressing mental health issues among adolescents.

What are the implications for public health practice?

Enhancing psychological support for vulnerable populations is essential to improve mental well-being among adolescents, reduce health disparities, and achieve global Sustainable Development Goals.

Adolescence represents a crucial phase in physical, emotional, and psychological development. Research indicates that most mental health disorders begin in early adolescence (1). Mental well-being is recognized as a positive aspect of mental health (2), with high levels of mental well-being linked to numerous beneficial outcomes, including reduced psychiatric disorders, increased life expectancy, and greater life satisfaction (3). Despite this, past research has predominantly focused on psychiatric disorders, with limited studies exploring the prevalence and determinants of mental well-being. Consequently, this study seeks to determine the prevalence of mental well-being among Chinese adolescents aged 13–18 years and to examine the factors influencing it through a comprehensive cross-sectional survey conducted across all 30 provincial-level administrative divisions (PLADs, not including Xizang Autonomous Region) nationwide. The goal is to improve adolescent mental well-being and identify vulnerable populations to reduce disease burden.

Data were sourced from the 2019 Chinese National Survey on Students' Constitution and Health (CNSSCH), which utilized a stratified cluster sampling method. To enhance representativeness, selection within each province was based on five criteria: regional gross domestic product (GDP), annual per capita income, per capita food consumption, population natural growth rate, and regional social welfare index. Provinces categorized their cities into three socioeconomic strata: upper, moderate, and low. One city from each stratum was randomly selected. Within these cities, middle and high schools were randomly chosen following established protocols, with sampling further differentiated by grade level. Classes were then randomly selected for survey participation. Data were gathered using a self-administered questionnaire focusing on adolescents aged 13 to 18 years. The study encompassed 30 PLADs, with a final sample of 99,788 participants after the exclusion of those with incomplete mental well-being scales.

The Warwick-Edinburgh Mental Well-being Scale (WEMWBS) was utilized to assess the mental well-being of adolescents, featuring a 14-item scale with each item scored between 1 and 5, yielding a total possible score range of 14 to 70. Higher scores are indicative of greater mental well-being. According to the classification based on the mean and standard deviation (SD) (4), scores below one SD from the mean (score <42) were considered indicative of low mental well-being, scores above one SD from the mean (score >63) suggested high mental well-being, and scores within these thresholds were categorized as moderate mental well-being. The reliability of the WEMWBS was confirmed with a Cronbach's alpha coefficient of 0.949. Exploratory factor analysis revealed a Kaiser-Meyer-Olkin (KMO) measure of 0.962. The KMO measure assesses the adequacy of sample size for factor analysis, with values closer to 1 indicating a more suitable sample for the analysis. The analysis identified a single underlying factor with an

eigenvalue exceeding 1, accounting for 60.349% of the total variance. Factor loadings for individual items ranged from 0.667 to 0.830.

Statistical analyses were performed using R (version 4.2.1, R Core Team, Vienna, Austria). Analysis of Variance (ANOVA) and χ^2 tests assessed differences in high and low mental well-being rates among adolescents with varied characteristics. Multinomial logistic regression identified factors influencing mental well-being. All tests were two-sided, using a significance threshold of P value<0.05.

Table 1 reports the characteristics of the participants included in this study. Overall, the mean (SD) score of mental well-being was 52.64 (11.26), with 20,957 adolescents (21.0%) classified as having high well-being, 64,471 (64.6%) as having moderate well-being, and 14,360 (14.4%) as having low well-being. A total of 50,877 adolescents aged 13 to 15 years (51.0%) and 48,911 adolescents aged 16 to 18 years (49.0%) were included in this study. The gender distribution comprised 50,176 males (50.3%) and 49,612 females (49.7%). Urban adolescents accounted for 50,386 (50.5%), while rural adolescents numbered 49,402 (49.5%).

Figure 1 illustrates the prevalence rates of high and low mental well-being among adolescents across various provinces in China. Jilin (39.6%), Heilongjiang (33.1%), and Shanghai (32.9%) report higher rates of high mental well-being, whereas Jiangxi (19.3%), Hainan (19.1%), and Anhui (18.9%) exhibit higher rates of low mental well-being.

The findings from the multinomial logistic regression, depicted in Figure 2, indicate that several factors are associated with lower mental well-being among adolescents. These factors include older age [odds ratio (OR)=0.80, 95% confidence interval (CI): 0.76, 0.83], female gender (OR=0.54, 95% CI: 0.51, 0.56), residing in rural areas (OR=0.86, 95% CI: 0.82, 0.91), and not being an only child (OR=0.64, 95% CI: 0.60, 0.67). Additionally, higher levels of parental education correlate positively with improved adolescent mental well-being. This relationship is particularly pronounced with maternal education, where increased education levels are directly linked to enhanced mental well-being in adolescents.

Additionally, compared to their counterparts in eastern provinces, adolescents in central and western provinces display reduced mental well-being, whereas those in northeastern provinces show enhanced levels. This pattern highlights the regional disparities in mental well-being among adolescents.

DISCUSSION

This study utilized a comprehensive, nationally representative dataset to examine regional disparities in the mental well-being of Chinese adolescents and to identify contributing factors. The findings indicate that the majority of Chinese adolescents display moderate to high mental well-being. However, despite this generally positive trend, consistent regional disparities highlight ongoing health inequalities among adolescents across different areas of China. These disparities may be attributed to variances in socioeconomic and environmental factors, including per capita gross domestic product, educational resources, and healthcare resources in different regions (5).

Age, gender, urban versus rural background, only-child status, and parental education level are crucial determinants of adolescent mental well-being. Studies indicate that older adolescents generally have poorer mental well-being compared to their younger counterparts, a phenomenon also documented in the United Kingdom, where younger adolescents are observed to flourish more frequently (6). Moreover, male adolescents tend to have better mental well-being, potentially due to different cognitive developmental trajectories during puberty and lower susceptibility to body image dissatisfaction, which tends to affect females more (7). Consistent with existing literature, adolescents from rural areas exhibit lower mental well-being, a situation often exacerbated by the high incidence of left-behind children who suffer from insufficient parental care (8).

A significant observation from our study is that only children tend to exhibit better mental well-being, possibly due to the dilution of resources as the number of children in a family increases (9). This suggests that the relaxation of China's three-child policy could negatively affect the mental well-being of adolescents, underscoring the importance of heightened focus on adolescent mental health. Nevertheless, other studies suggest that having siblings may enhance mental well-being (10), which contradicts our findings. In light of China's shift from a one-child to a three-child policy, additional research is imperative to explore and elucidate these discrepancies. Moreover, the educational attainment of both parents was positively associated with the mental well-being of adolescents, indicating a dose-response relationship. This highlights the critical role of family background and parental education in fostering favorable mental health

TABLE 1. Descriptive characteristics of the participants included in the study.

Variable	Total	Mental well-being, No. (%) of participants			P value
		High mental well-being (N=20,957)	Moderate mental well-being (N=64,471)	Low mental well-being (N=14,360)	
Age groups, n (%)					<0.001
13–15 years	50,877	11,635 (22.9)	32,004 (62.9)	7,238 (14.2)	
16–18 years	48,911	9,322 (19.1)	32,467 (66.4)	7,122 (14.6)	
Sex, n (%)					<0.001
Male	50,176	12,228 (24.4)	31,861 (63.5)	6,087 (12.1)	
Female	49,612	8,729 (17.6)	32,610 (65.7)	8,273 (16.7)	
Areas, n (%)					<0.001
Urban	50,386	11,676 (23.2)	31,816 (63.1)	6,894 (13.7)	
Rural	49,402	9,281 (18.8)	32,655 (66.1)	7,466 (15.1)	
Only child, n (%)					<0.001
Yes	40,472	11,070 (27.4)	24,538 (60.6)	4,864 (12.0)	
No	55,856	9,033 (16.2)	37,822 (67.7)	9,001 (16.1)	
Missing	3,460	854 (24.7)	2,111 (61.0)	495 (14.3)	
Paternal education level, n (%)					<0.001
Junior high school and below	49,835	8,785 (17.6)	33,324 (66.9)	7,726 (15.5)	
Senior high school	23,075	4,991 (21.6)	14,978 (64.9)	3,106 (13.5)	
College, junior college and above	21,344	6,076 (28.5)	12,823 (60.1)	2,445 (11.5)	
Missing	5,534	1,105 (19.9)	3,346 (60.5)	1,083 (19.6)	
Maternal education level, n (%)					<0.001
Junior high school and below	53,754	9,511 (17.7)	35,874 (66.7)	8,369 (15.6)	
Senior high school	21,505	4,796 (22.3)	13,922 (64.7)	2,787 (13.0)	
College, junior college and above	18,766	5,525 (29.4)	11,161 (59.5)	2,080 (11.1)	
Missing	5,763	1,125 (19.5)	3,514 (61.0)	1,124 (19.5)	
Region of China, n (%)					<0.001
Eastern	35,576	9,160 (25.7)	21,740 (61.1)	4,676 (13.1)	
Central	18,848	2,958 (15.7)	12,823 (68)	3,067 (16.3)	
Western	36,003	5,712 (15.9)	24,623 (68.4)	5,668 (15.7)	
Northeastern	9,361	3,127 (33.4)	5,285 (56.5)	949 (10.1)	

outcomes in adolescents.

This study is subject to some limitations. First, the findings are based on self-reported data, which can introduce recall bias. Second, due to its cross-sectional design, this study cannot confirm causal relationships between variables. Finally, the analysis was limited to sociodemographic factors and did not consider other potential influences on mental well-being.

Our research provides a detailed examination and evaluation of the mental well-being of Chinese adolescents, filling a notable void in the available literature. By pinpointing crucial demographics and enacting specific preventive strategies, our findings are instrumental in achieving the United Nations Sustainable Development Goals (1). With an estimated 1.2 billion adolescents globally, prioritizing this group is essential for attaining Universal Health Coverage (1). Adolescent mental health is also a key focus of the "Healthy China Action Plan" (11), underscoring the necessity to address mental health concerns within this population. Our study emphasizes the need for region-specific interventions to improve the mental well-being of adolescents. There is a pressing need to enhance mental health support for adolescents in remote regions and among left-behind children. Actions required include expanding the workforce of mental health professionals, increasing the availability of mental health facilities, and providing adequate
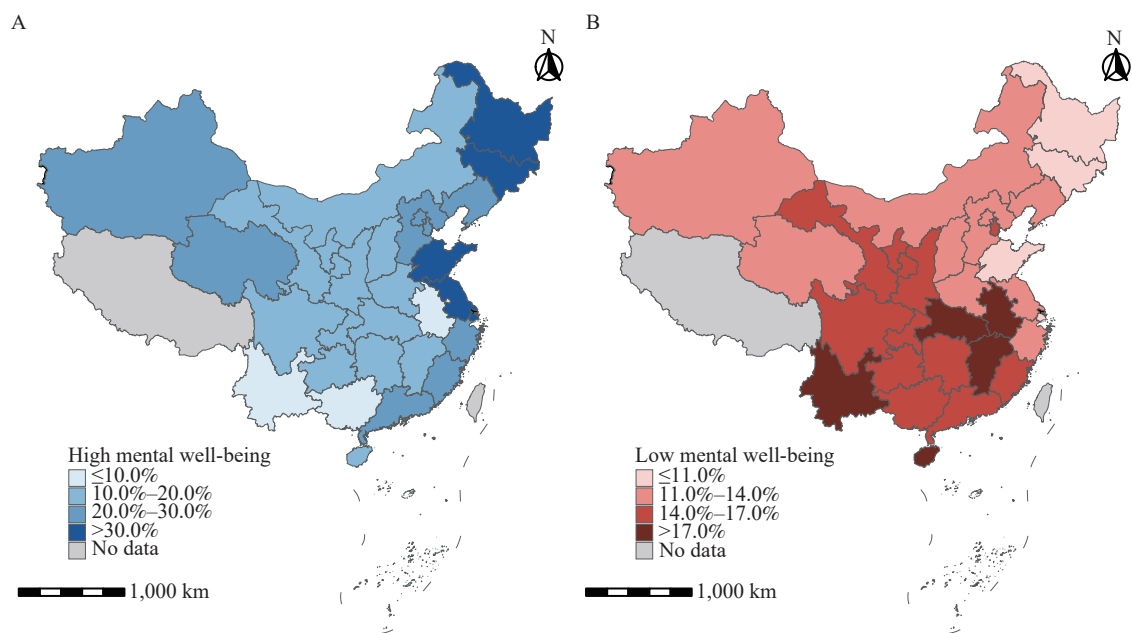
FIGURE 1. Mental well-being rates of adolescents aged 13–18 across provinces in China, 2019. (A) High mental well-being. (B) Low mental well-being.
Map approval number: GS 京 (2024)1369 号.

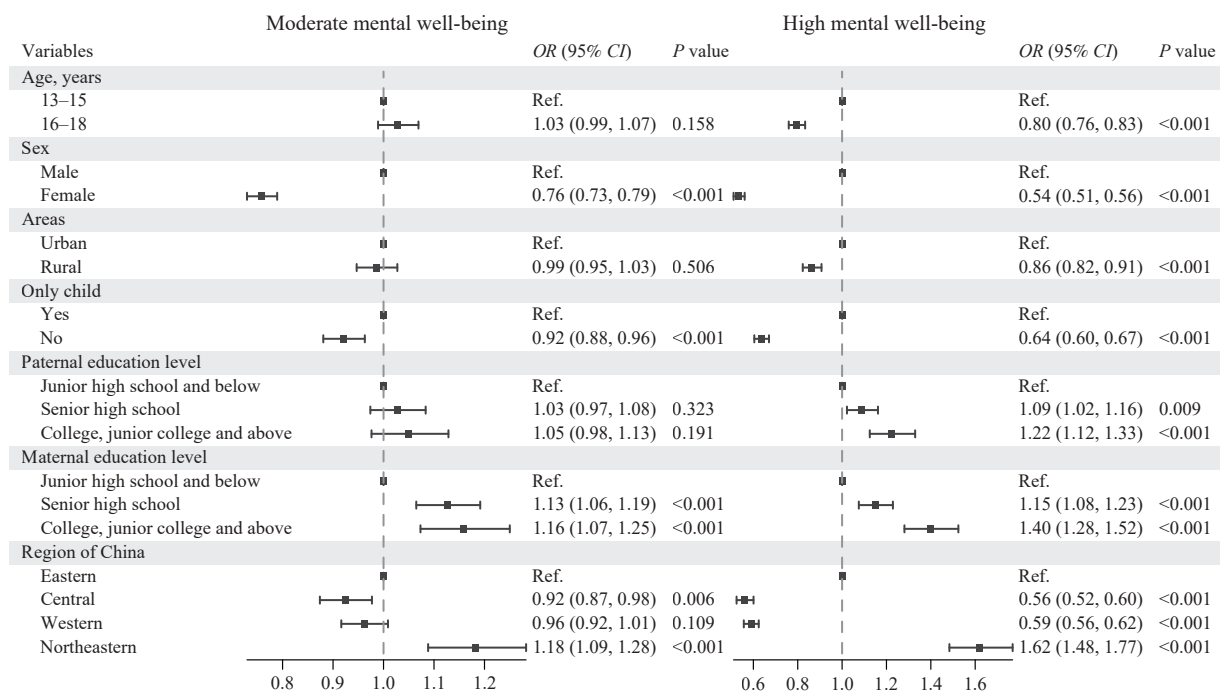|	Moderate mental well-being			High mental well-being		
Variables		OR (95% CI)	P value		OR (95% CI)	P value
Age, years						
13–15		Ref.			Ref.	
16–18		1.03 (0.99, 1.07)	0.158		0.80 (0.76, 0.83)	<0.001
Sex						
Male		Ref.			Ref.	
Female		0.76 (0.73, 0.79)	<0.001		0.54 (0.51, 0.56)	<0.001
Areas						
Urban		Ref.			Ref.	
Rural		0.99 (0.95, 1.03)	0.506		0.86 (0.82, 0.91)	<0.001
Only child						
Yes		Ref.			Ref.	
No		0.92 (0.88, 0.96)	<0.001		0.64 (0.60, 0.67)	<0.001
Paternal education level						
Junior high school and below		Ref.			Ref.	
Senior high school		1.03 (0.97, 1.08)	0.323		1.09 (1.02, 1.16)	0.009
College, junior college and above		1.05 (0.98, 1.13)	0.191		1.22 (1.12, 1.33)	<0.001
Maternal education level						
Junior high school and below		Ref.			Ref.	
Senior high school		1.13 (1.06, 1.19)	<0.001		1.15 (1.08, 1.23)	<0.001
College, junior college and above		1.16 (1.07, 1.25)	<0.001		1.40 (1.28, 1.52)	<0.001
Region of China						
Eastern		Ref.			Ref.	
Central		0.92 (0.87, 0.98)	0.006		0.56 (0.52, 0.60)	<0.001
Western		0.96 (0.92, 1.01)	0.109		0.59 (0.56, 0.62)	<0.001
Northeastern		1.18 (1.09, 1.28)	<0.001		1.62 (1.48, 1.77)	<0.001

FIGURE 2. Multinomial logistic regression analysis of the factors influencing mental well-being among adolescents aged 13–18 in China, 2019.
Note: Low mental well-being is used as the reference group.
Abbreviation: Ref.=reference; OR=odds ratio; CI=confidence intervals.

psychological assessment tools to advance the development of adolescent mental health services. Furthermore, improving parental understanding of mental health, fostering a supportive family atmosphere, and early detection of mental health issues are vital for promoting the mental health development of adolescents. This is particularly critical in families with multiple children, where the risk of mental health

issues may be heightened. Acknowledging that the mental well-being of adolescents is integral to their overall life-long development, enhancing this aspect can substantially contribute to their comprehensive growth. In summary, our study highlights the critical need to place adolescent mental health at the forefront of public health initiatives to ensure their well-being throughout their lives.

Conflicts of interest: No conflicts of interest.

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Preplanned Studies

The Association Between Multidimensional Influencing Factors and Depressive Symptoms in Chinese Adolescents — Beijing Municipality, China, July 2022–April 2023

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Summary

What is already known about this topic?

Depression significantly impacts the mental health of Chinese adolescents. Identifying risk factors specific to adolescent depression is crucial for prioritizing intervention strategies.

What is added by this report?

Neuroticism and emotional abuse were associated with an increased risk of depressive symptoms, whereas a positive coping style was directly and strongly associated with a decreased risk.

What are the implications for public health practice?

Parental awareness of emotional abuse is critical in addressing adolescent depression. Future intervention strategies should aim to enhance individuals' positive coping mechanisms to improve mental health outcomes.

Depressive symptoms significantly affect the mental health of Chinese adolescents (*1*), with previous research indicating a prevalence rate of 24.3% (*2*). The presence of depressive symptoms in this demographic is particularly concerning due to its established association with several adverse outcomes. These include extensive and prolonged impairments in interpersonal relations, social interaction, educational achievement, and work performance (*3*). Moreover, depressive symptoms are linked to substance misuse and an increased risk of suicide (*4*). Although the precise causes of depression remain unclear, it is crucial to identify risk factors that are unique to adolescent depression to better prioritize intervention strategies. Bronfenbrenner's ecological systems theory emphasizes that both individual characteristics and various environmental levels influence child and adolescent development (*5*). Despite previous studies investigating individual factors of adolescent depression, there remains a deficiency in comprehensive models that

consider multidimensional influences and the interactions among different risk factors.

To thoroughly examine the factors influencing depressive symptoms in adolescents, identify the most significant ones, and delineate prevention targets, we conducted a cross-sectional study in eight secondary schools in Beijing. The study aimed to analyze the association between depressive symptoms and various factors such as personality, coping style, childhood abuse, school bullying, parent and peer attachment, and perceived stress among Chinese adolescents. Data collection occurred from July 7, 2022, to April 9, 2023, employing convenience sampling through a mix of online and field surveys. Rigorous data verification and quality control measures were implemented to ensure the integrity and accuracy of the data. Quality control personnel were assigned to verify the logic and completeness of the responses, achieving a questionnaire completion rate of 92.8% (1,671/1,800). The study protocol received approval from the Ethics Committee of Beijing Anding Hospital, and written informed consent was obtained from all participants and their parents.

We administered the 20-item Center for Epidemiologic Studies Depression Scale for Children (CES-DC), a self-report screening tool designed to assess depressive symptoms in adolescents. Scores exceeding 20 are indicative of depressive symptoms in the general population. On an individual level, personality and coping styles were evaluated. Personality was assessed using the Revised Eysenck Personality Questionnaire (EPQ-R), which measures four traits across 88 items: extraversion, neuroticism, psychoticism, and a lie scale, with higher scores suggesting a greater degree of the respective personality traits. Coping styles were assessed using the Simplified Coping Style Questionnaire (SCSQ), which consists of two dimensions: positive coping (12 items) and negative coping (8 items), where higher scores on each dimension indicate more pronounced coping strategies.

At the level of school and family environments, factors such as childhood abuse and neglect, parental and peer attachments, and peer victimization were considered. Childhood abuse and neglect were quantified using the Childhood Trauma Questionnaire-Short Form (CTQ-SF), which comprises 28 items across five dimensions: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Higher scores on each dimension denote a higher level of reported abuse or neglect. Parental and peer attachments were assessed using the Inventory of Parent and Peer Attachment (IPPA), which measures the quality of attachments to fathers and mothers separately, focusing on key aspects of attachment such as trust, communication, and alienation, with higher scores indicating a more secure parent-child relationship. Peer victimization was measured using the Multidimensional Peer-Victimization Scale (MPVS), where higher scores indicate greater victimization.

At the community and societal level, perceived stress was measured using the Chinese Perceived Stress Scale (CPSS) (6), where higher scores suggest increased perceived stress (Supplementary Table S1, available at https://weekly.chinacdc.cn/). All scales employed in this study demonstrate robust reliability and validity and are extensively utilized within our national context.

Descriptive data are presented as medians with interquartile ranges (IQR). The Wilcoxon rank test was employed for univariate analysis to evaluate differences between groups. Multiple linear regression analysis was then conducted to further investigate these factors and assess their collective impact. A network model was developed to estimate the relationships between depressive symptoms and associated factors using the R-package qgraph. In this model, nodes represent depressive symptoms and factors, while edges represent partial correlation coefficients between pairs of nodes. Thicker and more saturated edges indicate stronger correlations. Green edges signify positive partial correlations, and red edges indicate negative correlations. Statistical analyses were performed using SAS (version 9.4; SAS Institute, Cary, NC, US) and R Studio software (version 4.2.1; R Foundation for Statistical Computing, Vienna, Austria). All tests were two-sided and conducted at the 0.05 level of significance.

This study enrolled 1,800 adolescents, out of which 129 were excluded due to missing critical data, such as scores on the CES-DC scale. Consequently, the analysis incorporated 1,671 participants, consisting of 810 boys and 861 girls. The mean age of the adolescents was 14.14±1.62 years. Participants were almost evenly split between educational levels, with 861 (51.53%) attending junior high and 810 (48.47%) attending senior high school. The average CES-DC scale score was 14.88±10.48. Within the population, 444 individuals (26.57%) scored above 20 on the CES-DC scale, indicative of more significant depressive symptoms, whereas 1,227 (73.43%) scored 20 or below.

The results of the univariate analysis revealed significant distinctions in personality dimensions among adolescents with depressive symptoms. Specifically, these adolescents exhibited notably higher scores in neuroticism and psychoticism, and lower scores in extraversion and the lie dimension (P value <0.001). Furthermore, coping styles differed significantly; adolescents with depressive symptoms demonstrated lower scores in positive coping styles and higher scores in negative coping styles (P value <0.001). Environmental factors related to family and school also varied. Adolescents with depressive symptoms reported lower scores in parent-child attachment and higher scores in peer victimization and childhood abuse (P value <0.001). Additionally, at the mezzo level, the perceived stress among these adolescents was significantly elevated (P value <0.001) (Table 1). In the multiple linear regression analysis, which yielded an F-value of 92.32 and accounted for 61% of the variance (R^2=0.61, P value <0.001), the retained variables included extraversion, neuroticism, positive coping, negative coping, parent-child attachment, peer victimization, emotional abuse, emotional neglect, and perceived stress (Table 2). Gender-based stratification analyses were also conducted (Supplementary Table S2, available at https://weekly.chinacdc.cn/).

The network analysis revealed that among the factors influencing depressive symptoms, neuroticism (r=0.24), emotional abuse (r=0.22), and positive coping style (r=−0.23) exhibited the strongest and most direct correlations (P value <0.001). Stress demonstrated a positive correlation with neuroticism and a negative correlation with extraversion. The impact of stress on depressive symptoms appears to be predominantly mediated by personality traits, particularly neuroticism and extraversion, as shown in Figure 1.

TABLE 1. The score distribution of the influencing factors between depressive symptom groups in Chinese adolescents, median (*IQR*).

Variables	Total	CES-DC≤20	CES-DC>20	*Z*	*P* value
Age	14 (13–16)	13 (13–16)	15 (13–16)	3.29	0.001
Sex, *n* (%)				29.76	<0.001
Boy	810 (48.47)	644 (79.51)	166 (20.49)		
Girl	861 (51.53)	583 (67.71)	278 (32.29)		
Individual factors					
Personality					
Psychoticism	2 (1–4)	2 (1–3)	3 (2–5)	7.37	<0.001
Extraversion	15 (10–17)	15 (11–17)	13 (8–16)	−5.62	<0.001
Neuroticism	6 (2–14)	4 (1–9)	15 (8–19)	12.62	<0.001
Lie	16 (12–19)	16 (13–19)	14 (11–17)	−7.24	<0.001
Coping style					
Positive coping	23 (17–28)	24 (20–30)	18 (13–23)	−14.05	<0.001
Negative coping	11 (8–15)	10 (8–14)	13 (10–16)	7.59	<0.001
Family and school environment					
Parent-child attachment	77 (64–90)	81 (68–92)	66 (56–76)	−11.67	<0.001
Peer-victimization	4 (0–12)	2 (0–9)	10 (2–26)	8.94	<0.001
Childhood abuse					
Emotional abuse	6 (5–7)	5 (5–6)	8 (6–11)	17.33	<0.001
Physical abuse	5 (5–5)	5 (5–5)	5 (5–7)	11.53	<0.001
Sexual abuse	5 (5–5)	5 (5–5)	5 (5–5)	6.67	<0.001
Emotional neglect	8 (5–12)	6 (5–9)	12 (8–16)	15.26	<0.001
Physical neglect	6 (5–9)	5 (5–9)	8 (6–10)	11.40	<0.001
Total score	31 (26–39)	29 (26–34)	40 (33–48)	16.77	<0.001
Mezzo level					
Perceived stress	16 (11–20)	14 (9–18)	20 (16–24)	12.41	<0.001

Abbreviation: *IQR*=interquartile range; CES-DC=center for epidemiologic studies depression scale for children.

DISCUSSION

This study examines the impact of multi-dimensional factors on depressive symptoms in adolescents, guided by ecological systems theory and network structure analysis. Findings suggest that the most direct and potent influences on depressive symptoms occur at the individual level, particularly through traits such as neuroticism and positive coping styles. Furthermore, the relationship between stress and depressive symptoms appears to be primarily moderated by personality traits, notably neuroticism and extraversion.

Our findings indicate that high neuroticism is associated with an increased risk of depressive symptoms in adolescents, while extraversion appears to serve as a protective factor against depression. Furthermore, the network analysis revealed that neuroticism and extraversion inversely modulate the effects of perceived stress. Neuroticism, characterized by heightened negative emotionality and stress reactivity, may enhance stress appraisals and psychological distress, thereby increasing susceptibility to depressive symptoms (7). Conversely, extraversion, which is marked by sociability, assertiveness, and considerable emotional expressiveness, is typically linked with lower stress appraisals and reduced reactivity to stressful events, providing a protective effect against depressive symptoms (8). However, given that personality traits are stable and enduring, altering them to prevent depressive symptoms in adolescents is not a viable approach.

Our research has identified an additional individual factor, the positive coping style, which exerts a significant and direct impact on depressive symptoms among adolescents. A positive coping style entails

TABLE 2. Multiple linear regression analysis for the association between depressive symptoms and multi-dimensional influencing factors among Chinese adolescents.

Variables	Parameter estimation	Standard error	t	P value	VIF
Intercept	−1.91	3.33	−0.57	0.566	0
Age	0.72	0.19	3.80	<0.001	1.07
Extraversion	−0.28	0.07	−3.88	<0.001	1.23
Neuroticism	0.39	0.07	5.98	<0.001	2.22
Positive Coping	−0.30	0.05	−6.26	<0.001	1.46
Negative Coping	0.29	0.07	4.13	<0.001	1.39
Peer-Victimization	0.12	0.02	5.82	<0.001	1.19
Emotional Abuse	0.72	0.12	6.16	<0.001	1.48
Emotional Neglect	0.23	0.07	3.13	0.002	1.41
Perceived Stress	0.19	0.06	3.33	0.001	2.29

R^2=0.61, F=92.32, P value<0.001

Note: The assumptions required for linear regression were met.
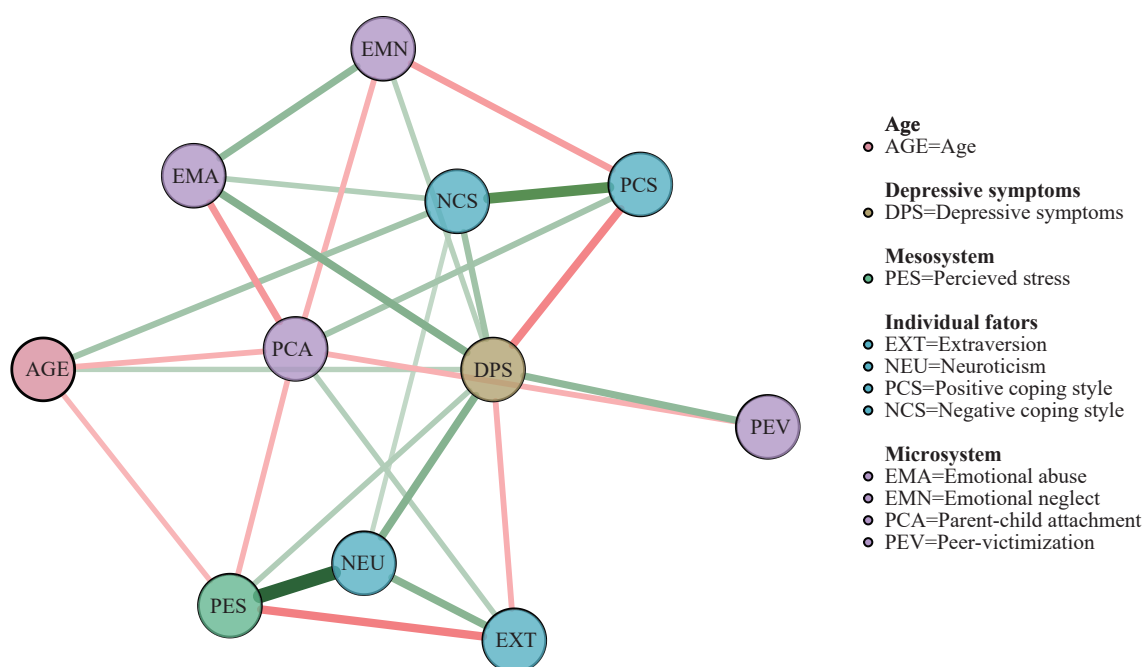Abbreviation: VIF=variance inflation factor.

FIGURE 1. Network structure of associations between multidimensional influencing factors and depressive symptoms in Chinese adolescents.
Note: Network structures were automatically generated using the "qgraph" package in R. These networks visually represent nodes (which include depressive symptoms and influential factors) and edges (representing pairwise partial correlations among items). In the network, green edges denote positive associations, and red edges denote negative connections. Additionally, the thickness of the lines corresponds to the strength of the associations.
Abbreviation: AGE=age; DPS=depressive symptoms; PES=perceived stress; EXT=extraversion; NEU=neuroticism; PCS= positive coping style; NCS=negative coping style; EMA=emotional abuse; EMN=emotional neglect; PCA=parent-child attachment; PEV=peer-victimization.

addressing problems in a direct and rational manner and approaching challenges with an optimistic attitude. This approach can facilitate a sense of accomplishment, thereby promoting psychological health and reducing the prevalence of depressive symptoms. Our findings align with previous research, which has reported that a positive coping style is a protective factor against depression (9). Conversely, a negative coping style, which is characterized by avoidance, withdrawal, and denial, is associated with an increased risk of depressive symptoms. Unlike inherent personality traits, a positive coping style can

be developed through education and cognitive behavioral therapy, making it a crucial target for intervention.

Consistent with prior research, our findings confirm that emotional abuse constitutes a particularly detrimental form of childhood maltreatment (10) for the development of depressive symptoms in adolescents. It is hypothesized that exposure to emotional abuse, characterized by statements such as "you are such a stupid child; you are worthless," can evoke feelings of assault, rejection, and degradation. Accordingly, affected individuals are more likely to develop negative self-perceptions and a pessimistic attributional style, which are known contributors to the onset of depression (11). However, emotional abuse has historically received less attention compared to other types of abuse, such as sexual and physical abuse. This oversight may be attributed to the chronic nature of the damage caused by emotional abuse, which is less immediately apparent and whose impacts are often underestimated. Consequently, there is a pressing need to allocate greater resources and focus toward the prevention of this form of abuse in children and adolescents.

This study is subject to some limitations. First, due to its cross-sectional design, it is impossible to establish causal relationships, and the estimations of network structure should be considered tentative and exploratory. The hypotheses generated by this study require further validation through prospective designs. Second, the sample was recruited exclusively from Beijing, which may limit the generalizability and representativeness of the findings. Future studies with larger, more nationally representative samples are needed to deepen the understanding of these results. Despite these limitations, this study is the first to depict the interrelationships among ecological systems theory-based multi-dimensional factors influencing adolescent depression using network structure. The findings provide valuable insights, offering clearer evidence for the development of more targeted interventions in the future.

In conclusion, a positive coping style has been identified as a critical protective factor against depressive symptoms in adolescents, while neuroticism and emotional abuse were notable risk factors. It is imperative to emphasize parental awareness regarding emotional abuse. Future intervention strategies should prioritize enhancing positive coping mechanisms and mitigating negative ones to bolster adolescents' mental health resilience.

Conflicts of interest: No conflicts of interest.

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SUPPLEMENTARY MATERIALS

SUPPLEMENTARY TABLE S1. Chinese perceived stress scale.

No.	Items	Scale measurement				
		Never	Almost never	Sometimes	Fairly often	Very often
1	In the last month, how often have you been upset because of something that happened unexpectedly					
2	In the last month, how often have you felt that you were unable to control the important things in your life					
3	In the last month, how often have you felt nervous and "stressed"					
4	In the last month, how often have you felt confident about your ability to handle your personal problems					
5	In the last month, how often have you felt that things were going your way					
6	In the last month, how often have you found that you could not cope with all the things that you had to do					
7	In the last month, how often have you been able to control irritations in your life					
8	In the last month, how often have you felt that you were in control of things					
9	In the last month, how often have you been angered because of things that were outside your control					
10	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them					

SUPPLEMENTARY TABLE S2. Multiple linear regression analysis for the association between depressive symptoms and multi-dimensional influencing factors among boys and girls.

Gender	Variables	Parameter estimation	Standard error	t	P value	VIF
Boys	Intercept	−0.59874	5.00557	−0.12	0.9049	0
	Age	0.64877	0.28248	2.30	0.0225	1.12710
	Extraversion	−0.37153	0.10462	−3.55	0.0005	1.32335
	Neuroticism	0.47863	0.09590	4.99	<0.0001	2.14730
	Positive coping	−0.29759	0.06445	−4.62	<0.0001	1.41458
	Negative coping	0.32764	0.10190	3.22	0.0015	1.39711
	Peer-victimization	0.03076	0.03564	0.86	0.3890	1.19437
	Emotional abuse	0.92251	0.18001	5.12	<0.0001	1.33073
	Emotional neglect	0.14420	0.09318	1.55	0.1230	1.28041
	Perceived stress	0.17119	0.09032	1.90	0.0592	2.35108
Girls	Intercept	−2.07750	4.27762	−0.49	0.6275	0
	Age	0.66544	0.24443	2.72	0.0068	1.04921
	Extraversion	−0.15205	0.09251	−1.64	0.1013	1.23781
	Neuroticism	0.25686	0.08213	3.13	0.0019	2.28974
	Positive coping	−0.33652	0.06761	−4.98	<0.0001	1.58220
	Negative coping	0.26141	0.08850	2.95	0.0034	1.38900
	Peer-victimization	0.15421	0.02311	6.67	<0.0001	1.19822
	Emotional abuse	0.56503	0.13808	4.09	<0.0001	1.58264
	Emotional neglect	0.38013	0.09814	3.87	0.0001	1.55632
	Perceived stress	0.26737	0.07203	3.71	0.0002	2.26777

Abbreviation: VIF=variance inflation factor.

Preplanned Studies

Exploring Multiple Perspectives on Psychological Health of Adolescents in Relation to Gender and School Grade — Jiangsu Province, China, 2022

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Summary

What is already known about this topic?

Mental health issues in Chinese children and adolescents have emerged as a substantial public health concern, causing distress and strain among families and society.

What is added by this report?

This study examines the effects of gender and school grade on mental health symptoms and risky behaviors among Chinese children and adolescents, with a particular focus on the role of family and school environments.

What are the implications for public health practice?

Caregivers and educators should enhance their awareness and skills in supporting the mental health of children. These findings offer critical insights for the early detection and intervention of mental health issues in Chinese children and adolescents.

The escalating mental health issues among children and adolescents stem from academic pressures, family dynamics, and societal transformations, considerably impacting their life quality, academic success, and future prospects (*1–2*). Effective promotion of mental health in these groups necessitates cooperative efforts from families and educational institutions. Yet, both caregivers and educators often lack the necessary understanding and strategies to address these issues (*3*). This study distinctively integrates perspectives from children, caregivers, and teachers, offering a comprehensive assessment of the mental health environment, an aspect frequently overlooked in prior studies. The prevalence of mental health problems and risky behaviors among students can differ according to grade level and cognitive development. Additionally, gender differences are evident as girls are more likely to report symptoms of anxiety and depression (*4*),

whereas boys tend to display increased aggression and disruptive behavior (*5*). Consequently, it is imperative to factor in both gender and educational level to forge a thorough comprehension of mental health challenges in this demographic. While variations in mental health conditions by sex and grade are recognized, this research furnishes detailed, empirical insights into these discrepancies, elucidating specific mental health difficulties and risky actions across different educational phases and between genders.

This study is part of the extensive, mixed longitudinal cohort study conducted in China, known as the "School-based Evaluation Advancing Response for Child Health (SEARCH)." In this setup, schools act as operational hubs, families play a critical supportive and informational role, and students are the primary focus. The current research employed a digital platform to examine the mental health of students in Jiangsu Province, tracking mental health statuses and developmental changes in a scalable and innovative manner. The study, a cross-sectional analysis conducted from September 2022 through February 2023, targeted students at various educational levels — primary, junior, and senior high school — along with their caregivers and teachers. Ethical approval was obtained from the ethics committee of the affiliated brain hospital of Nanjing Medical University (2022-KY095-02). Data collection occurred across three cities in Jiangsu, selecting three primary schools, four junior high schools, and three senior high schools per city. A stratified whole-group sampling method was utilized to monitor participants. The study aimed for a minimum of 450 children and adolescents aged 10–18, including their caregivers and teachers from each grade. Sample size calculation parameters included μ_α=1.96, μ_β=2.58, P_0=0.20, d=0.05, a design effect of 1.2, a predicted missing visit rate of 10%, and a required sample size of 6,930 participants. The study successfully achieved significant response rates, with

11,427 students, 8,839 caregivers, and 1,656 teachers participating. This broad inclusion of participants allows for comprehensive exploration of mental health development in children and adolescents, highlighting the impact of gender and educational level on mental health-related symptoms and risky behaviors.

The questionnaire was divided into two sections: the first section collected socio-demographic data such as gender, age, school grade, study status, and basic family details. The second section evaluated participants' mental health using the Depression, Anxiety and Stress Scale (DASS-21), Insomnia Severity Index (ISI), and Ottawa Self-Injury Inventory (OSI). Additionally, the Strengths and Difficulties Questionnaire (SDQ) was administered to identify emotional and behavioral issues among students, with assessments gathered through self-reports from students and reports from caregivers and teachers. The study also investigated various health risk behaviors in children and adolescents, focusing on indicators like smoking and alcohol consumption. Data analyses were conducted using SPSS software (version 27, IBM SPSS Inc., Chicago, USA), comprising descriptive analyses of participant demographics. Chi-square tests were used to compare demographic characteristics across genders and to analyze the distribution of mental health symptoms and health risk behaviors across academic periods, with a focus on gender differences. Internal consistency was evaluated using Cronbach's alpha to examine inter-rater agreement for SDQ scores, comparing results from self-reports, caregiver reports, and teacher reports across different genders and academic periods. Statistical significance was set at P values <0.05 (two-tailed).

The study involved 11,427 students, comprising 6,083 boys and 5,344 girls (Table 1). Analysis revealed that 23.02% of students displayed depressive symptoms, 33.70% experienced anxiety, and 16.79% exhibited signs of stress. Female students in both junior and senior high school demonstrated significantly higher incidences of depression, anxiety, stress, insomnia, suicidal behavior, self-harm, and suicidal ideation compared to their male counterparts (Table 2). Furthermore, the prevalence of depression, anxiety, stress, and insomnia increased progressively from primary school to junior high and then to senior high. Emotional-behavioral issues and prosocial behaviors showed higher consistency between self-reports and caregiver reports among girls than boys (Table 3). High congruence between self-reports and teacher reports for emotional symptoms, conduct

problems, hyperactivity, peer issues, and prosocial behaviors was more prevalent in primary school students compared to those in junior and senior high schools.

DISCUSSION

This comprehensive study adopts an innovative methodology to explore mental health status and developmental trajectories among children and adolescents, analyzing perspectives from the subjects themselves along with their caregivers and teachers. We observed significant gender-based discrepancies in mental health symptoms and behavioral patterns among participants. Additionally, the prevalence of these symptoms showed an increasing trend as students progressed from primary to junior and senior high school. Our findings underscore a potential gap in awareness of child and adolescent mental health issues among caregivers and teachers. These insights enhance our understanding of mental health dynamics in young populations and inform the development of targeted mental health policies.

Our findings concur with prior studies that indicate a higher incidence of internalizing symptoms among adolescent girls (6). Earlier research has also shown that there is no significant gender disparity in the prevalence of depression during childhood (7). Our study substantiates these findings, revealing that boys and girls display comparable mental health status during primary school years, with differences becoming more pronounced post-adolescence (8). As students advance academically, the educational system places increased demands on them, leading to elevated stress and mental health challenges. This study highlights the growing trend of mental health-related symptoms from primary to senior high school. It underscores the importance of early detection and intervention for mental health issues beginning in primary school to enhance student well-being and instill effective coping mechanisms.

Furthermore, the study reveals that the prevalence of risk behaviors linked to deteriorating mental health escalates with each academic level, with a notably higher incidence among boys compared to girls (9). Our research highlighted significant disparities in smoking and alcohol consumption among children and adolescents, with male adolescents more prone to these activities than females. Specifically, high school males displayed greater frequencies of smoking and alcohol use than their female counterparts, suggesting that

TABLE 1. Comparison of sociodemographic characteristics between boys and girls in children and adolescents.

Characteristics	Total (n=11,427)	Boys (n=6,083)	Girls (n=5,344)	P value χ² test
Age, n (%)				
10–12 years	4,101 (35.89)	2,192 (36.03)	1,909 (35.72)	0.909
13–15 years	4,221 (36.94)	2,238 (36.79)	1,983 (37.11)	
16–18 years	2,863 (25.05)	1,530 (25.15)	1,333 (24.94)	
Education level, n (%)				
Primary school stage	3,209 (28.10)	1,722 (28.31)	1,487 (27.83)	0.044
Junior high school stage	4,353 (38.10)	2,365 (38.88)	1,988 (37.20)	
Senior high school stage	3,865 (33.80)	1,996 (32.81)	1,869 (34.97)	
Economy of the region, n (%)				
Poor	3,800 (33.25)	2,141 (35.20)	2,039 (38.15)	0.002
Moderate	3,447 (30.17)	1,847 (30.36)	1,600 (29.94)	
High	4,180 (36.58)	2,095 (34.44)	1,705 (31.90)	
Serving as a student leader, n (%)				
No	5,452 (47.71)	3,190 (52.44)	2,262 (42.33)	<0.001
Yes	5,975 (52.29)	2,893 (47.56)	3,082 (57.67)	
Living with families, n (%)				
No	10,209 (89.34)	5,403 (88.82)	4,806 (89.93)	0.055
Yes	1,218 (10.66)	680 (11.18)	538 (10.07)	
Only-child status, n (%)				
No	7,081 (61.97)	3,447 (56.67)	3,634 (68.00)	<0.001
Yes	4,346 (38.03)	2,636 (43.33)	1,710 (32.00)	
Frequency of parental quarrels, n (%)				
Never	4,565 (39.95)	2,652 (43.60)	1,913 (35.80)	<0.001
Sometimes	6,386 (55.89)	3,200 (52.61)	3,186 (59.62)	
Often	476 (4.17)	231 (3.80)	245 (4.58)	
Educational level of father, n (%)				
L: Primary education level and below	547 (6.43)	258 (5.74)	289 (7.21)	0.020
M: Secondary education level	5,544 (65.21)	2,961 (65.89)	2,583 (64.45)	
H: University education level and above	2,411 (28.36)	1,275 (28.37)	1,136 (28.34)	
Educational level of mother, n (%)				
L: Primary education level and below	908 (10.68)	435 (9.68)	473 (11.80)	<0.001
M: Secondary education level	5,475 (64.40)	2,979 (66.29)	2,496 (62.28)	
H: University education level and above	2,119 (24.92)	1,080 (24.03)	1,039 (25.92)	

social, cultural norms, and gender roles may influence these behavioral patterns. Additionally, our findings showed a strong correlation between smoking, alcohol intake, and emotional and behavioral difficulties. Adolescents frequently involved in these behaviors were more likely to suffer from increased levels of depression, anxiety, and behavioral problems (10).

Our study reveals a closely aligned understanding of mental health concerns between girls and their caregivers, likely due to enhanced communication or increased emotional expressiveness among girls, which may facilitate caregivers' comprehension of their mental health experiences. However, the congruence between self-reports and teacher reports diminishes as students progress to higher educational levels. This decrease in consistency poses substantial challenges in effectively identifying and managing mental health issues during junior and senior high school. Additionally, the results concerning inter-rater agreement on SDQ scores across different genders and

TABLE 2. Prevalence of mental health-related symptoms and multiple risk behaviors by gender and school grade.

Characteristics	Primary school stage (n=3,209)			Junior high school stage (n=4,353)			Senior high school stage (n=3,865)			P value
	Boys (n=1,722)	Girls (n=1,487)	P value χ² test	Boys (n=2,365)	Girls (n=1,988)	P value χ² test	Boys (n=1,996)	Girls (n=1,869)	P value χ² test	
Depression, n (%)										
No	1,537 (89.26)	1,339 (90.05)	0.464	1,869 (79.03)	1,511 (76.01)	0.017	1,322 (66.23)	1,218 (65.17)	0.486	<0.001
Yes	185 (10.74)	148 (9.95)		496 (20.97)	477 (23.99)		674 (33.77)	651 (34.83)		
Anxiety, n (%)										
No	1,429 (82.98)	1,201 (80.77)	0.103	1,658 (70.11)	1,249 (62.83)	<0.001	1,119 (56.06)	919 (49.17)	<0.001	<0.001
Yes	293 (17.02)	286 (19.23)		707 (29.89)	739 (37.17)		877 (43.94)	950 (50.83)		
Stress, n (%)										
No	1,576 (91.52)	1,357 (91.26)	0.79	2,035 (86.05)	1,665 (83.75)	0.035	1,508 (75.55)	1,367 (73.14)	0.086	<0.001
Yes	146 (8.48)	130 (8.74)		330 (13.95)	323 (16.25)		488 (24.45)	502 (26.86)		
Insomnia, n (%)										
No	1,518 (88.15)	1,307 (87.9)	0.822	1,758 (74.33)	1,404 (70.62)	0.006	1,339 (67.08)	1,302 (69.66)	0.085	<0.001
Yes	204 (11.85)	180 (12.1)		607 (25.67)	584 (29.38)		657 (32.92)	567 (30.34)		
Suicidal behavior, n (%)										
No	1,667 (96.81)	1,424 (95.76)	0.118	2,245 (94.93)	1,769 (88.98)	<0.001	1,909 (95.64)	1,687 (90.26)	<0.001	<0.001
Yes	55 (3.19)	63 (4.24)		120 (5.07)	219 (11.02)		87 (4.36)	182 (9.74)		
Self-harm behavior, n (%)										
No	1,579 (91.70)	1,360 (91.46)	0.81	2,066 (87.36)	1,631 (82.04)	<0.001	1,772 (88.78)	1,566 (83.79)	<0.001	<0.001
Yes	143 (8.30)	127 (8.54)		299 (12.64)	357 (17.96)		224 (11.22)	303 (16.21)		
Suicidal ideation, n (%)										
No	1,636 (95.01)	1,387 (93.28)	0.036	2,166 (91.59)	1,671 (84.05)	<0.001	1,835 (91.93)	1,609 (86.09)	<0.001	<0.001
Yes	86 (4.99)	100 (6.72)		199 (8.41)	317 (15.95)		161 (8.07)	260 (13.91)		
Drink history, n (%)										
No	1,606 (93.26)	1,431 (96.23)	<0.001	1,922 (81.27)	1,717 (86.37)	<0.001	1,196 (59.92)	1,438 (76.94)	<0.001	<0.001
Yes	116 (6.74)	56 (3.77)		443 (18.73)	271 (13.63)		800 (40.08)	431 (23.06)		
Smoke history, n (%)										
No	1,672 (97.1)	1,475 (99.19)	<0.001	2,158 (91.25)	1,908 (95.98)	<0.001	1,669 (83.62)	1,744 (93.31)	<0.001	<0.001
Yes	50 (2.90)	12 (0.81)		207 (8.75)	80 (4.02)		327 (16.38)	125 (6.69)		

educational levels provide crucial insights into consistency among informants.

This study was subject to some limitations. First, the cross-sectional design of the study constrains our ability to determine causal relationships between gender, school grade, and symptoms related to mental health. Second, as the study sample consisted only of children and adolescents from China, this may restrict the applicability of the findings to other cultural or geographical contexts. Despite these limitations, the study offers important insights into the variations in mental health-related symptoms and health risk behaviors among children and adolescents based on gender and school grade.

Our study emphasizes the critical importance of early detection and intervention in addressing mental health issues from primary school onward. We have identified the need for intervention programs that are both gender- and grade-specific to effectively tackle these challenges. To improve the psychological well

TABLE 3. Inter-rater agreement for SDQ scores by gender and school grade.

SDQ scales	Self-report vs. caregiver-report ICC (95% CI)		Self-report vs. teacher-report ICC (95% CI)		Self-report vs. caregiver-report ICC (95% CI)			Self-report vs. teacher-report ICC (95% CI)		
	Boys (n=4,170)	Girls (n=4,664)	Boys (n=875)	Girls (n=781)	Primary (n=2,907)	Junior high (n=3,045)	Senior high (n=2,881)	Primary (n=317)	Junior high (n=934)	Senior high (n=405)
Emotional symptoms	0.202 (0.155, 0.246)	0.294 (0.250, 0.335)	−0.002 (−0.144, 0.123)	0.068 (−0.073, 0.19)	0.103 (0.036, 0.166)	0.352 (0.305, 0.397)	0.234 (0.176, 0.288)	0.023 (−0.218, 0.217)	0.074 (−0.053, 0.185)	−0.029 (−0.252, 0.153)
Conduct problems	0.253 (0.209, 0.295)	0.234 (0.186, 0.279)	−0.062 (−0.213, 0.070)	−0.080 (−0.243, 0.062)	0.209 (0.150, 0.265)	0.293 (0.241, 0.342)	0.212 (0.152, 0.267)	0.080 (−0.148, 0.262)	0.059 (−0.070, 0.172)	−0.085 (−0.320, 0.107)
Hyperactivity	0.252 (0.208, 0.294)	0.293 (0.249, 0.335)	0.010 (−0.130, 0.133)	0.063 (−0.078, 0.186)	0.296 (0.243, 0.345)	0.260 (0.206, 0.311)	0.308 (0.255, 0.356)	0.106 (−0.115, 0.283)	0.019 (−0.115, 0.138)	−0.014 (−0.233, 0.166)
Peer problems	0.323 (0.283, 0.361)	0.331 (0.289, 0.370)	0.024 (−0.115, 0.145)	0.062 (−0.08, 0.185)	0.305 (0.253, 0.354)	0.326 (0.277, 0.373)	0.340 (0.291, 0.387)	0.112 (−0.108, 0.288)	0.096 (−0.028, 0.205)	0.024 (−0.186, 0.197)
Prosocial behavior	0.180 (0.131, 0.226)	0.283 (0.238, 0.325)	0.083 (−0.047, 0.197)	0.101 (−0.035, 0.218)	0.297 (0.243, 0.346)	0.338 (0.289, 0.384)	0.224 (0.165, 0.278)	0.193 (−0.006, 0.353)	0.119 (−0.001, 0.225)	0.061 (−0.141, 0.228)
Total difficulties	0.318 (0.278, 0.356)	0.379 (0.340, 0.416)	0.000 (−0.142, 0.124)	−0.039 (−0.196, 0.097)	0.307 (0.255, 0.355)	0.269 (0.215, 0.319)	0.331 (0.280, 0.378)	0.129 (−0.086, 0.302)	−0.040 (−0.182, 0.085)	0.011 (−0.202, 0.187)

Note: Results of ICC are calculated using absolute agreement, two-way random-effects model. Interpretations of ICC values: values <0.20=poor agreement, values between 0.20 and 0.40=fair agreement, values between 0.40 and 0.60=moderate agreement, values between 0.60 and 0.80=strong agreement, values between 0.80 and 1.00=very strong agreement.
Abbreviation: ICC=intraclass correlation coefficients; 95% CI=95% confidence interval; SDQ=the strengths and difficulties questionnaire.

without of young learners, we recommend that schools establish dedicated psychological health service platforms. Enhancing these services can be achieved by training school nurses and integrating professional psychology educators into the school environment. Moreover, the formation of a collaborative "family-school-healthcare" model could be beneficial, making use of community resources to provide psychological education and support. Additionally, the development of a cloud-based provincial platform for psychological health interventions would connect educational institutions, families, and professional services, creating an extensive network of support for students.

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Comprehensively Strengthen and Improve Students' Mental Health System in the New Era

Wen Yuan[1]; Zhuojun Jiang[2]; Yunfei Liu[1]; Ziyue Chen[1]; Xiaohan Chu[2]; Yi Song[1,#]

The incidence of mental health issues among children and adolescents is on the rise, positioning it as a critical public health concern that could impact the future of humanity (1). To address this challenge, on April 27, 2023, 17 government bodies including the Ministry of Education launched the "Special Action Plan for Comprehensively Strengthening and Improving the Mental Health Work of Students in the New Era (2023–2025)" (hereinafter referred to as the Special Action Plan) (2), signaling a significant advancement in China's commitment to student mental health. The Special Action Plan delineates eight major initiatives, such as enhancing mental health education, standardizing mental health monitoring, and augmenting the support for psychological professionals. These coordinated efforts aim to establish an extensive, multi-layered mental health framework to enhance student well-being from various perspectives. As a holistic and strategically designed initiative, the policy holds substantial practical importance and serves an instrumental role in guiding advancements in this field.

BACKGROUND

Mental health issues profoundly impact children and adolescents' development. In 2019, the global count of individuals suffering from mental disorders was approximately 970 million, with prevalence rates for children aged 5–9 and adolescents aged 10–19 years estimated at 8% and 14%, respectively (3). A comprehensive psychiatric survey in China indicated that the prevalence of various mental disorders among children and adolescents aged 6–16 years was 17.5% [95% confidence interval (CI): 17.2, 18.0] (4). Globally, the 12-month prevalence of non-suicidal self-injury (NSSI) in this demographic was about 19.5% (5). High academic demands and psychological stress among students notably contribute to increasing mental health challenges such as depression and suicide, posing significant risks to adolescents' well-

being. A study involving 15,623 high school students in rural China revealed a 29.2% incidence of NSSI in the preceding year (6). These disorders also impose substantial economic burdens; in 2017, the total cost attributed to mental disorders in children and adolescents was estimated at 1.191 billion United States dollar (USD), with a direct cost of 565 million Chinese Yuan (CNY) (7). The mental health of children and adolescents in China is a critical public health issue with far-reaching implications for the nation's future (4,8). Accelerated social changes and evolving living conditions, compounded by the effects of the coronavirus disease 2019 (COVID-19) pandemic, have exacerbated these challenges. The implementation of the Special Action Plan is crucial as it not only tackles the current mental health issues but also aims to establish a robust, multi-tiered mental health support framework. It is essential for the government and societal sectors to proactively develop and enforce policies that address these emerging challenges.

METHODS

The Special Action Plan, initiated under the Chinese Ministry of Education and endorsed by 17 government departments, including the Health Commission, the Ministry of Science and Technology, the Ministry of Public Security, and the Ministry of Finance, is a crucial initiative critical in shaping both policy and practice. The development of the Special Action Plan progressed through four major phases: initial investigation and research, strategic plan drafting, thorough expert debate, and the iterative solicitation of feedback for continual improvement.

In an effort to thoroughly understand the contemporary status of student mental health within China, the Ministry of Education launched an extensive survey project in September 2021. This project, particularly focused on monitoring and surveillance of mental health quality within the

framework of national compulsory education (9), employed diverse methodologies including questionnaires and interviews. These questionnaires and interviews involved a broad array of stakeholders, such as students, parents, teachers, mental health educators, and school principals, thereby providing crucial insights. With data and feedback from these extensive surveys, the Ministry of Education refined the Plan's guiding ideologies, operational principles, goals, methods, and protective strategies, leading to the creation of the "Draft for Comments". Following this, the Ministry organized multiple symposiums to discuss student mental health, involving prominent experts for the thorough evaluation and further refinement of the draft. The Ministry also actively sought input from relevant governmental agencies including the Health Commission and the Ministry of Public Security. Through detailed research and the integration of various perspectives, the Special Action Plan was iteratively revised and enhanced, ultimately leading to a finalized version ready for distribution and execution.

RATIONALE AND EVIDENCE

In October 2016, the Communist Party of China (CPC) Central Committee along with the State Council released the "Outline of the Healthy China 2030 Plan". This plan underscored the urgent need to improve and standardize the mental health service system. Following this, 12 departments, including the National Health Commission and the Ministry of Education, jointly introduced the "Healthy China Action Plan for Children and Adolescents' Mental Health (2019–2022)". This initiative detailed six strategic actions aimed at bolstering mental health in children and adolescents, in accordance with the broader goals of the Healthy China Plan.

The Special Action Plan is designed to significantly enhance mental health initiatives for students in the contemporary era. It highlights the importance of cooperation among government bodies, educational institutions, families, and the community in building an extensive, layered mental health support network. This joint effort is intended to create an environment that promotes students' mental health literacy and contributes to the broader goal of social harmony and stability. The Special Action Plan adheres to an educational philosophy that places a high priority on health, advocating for the comprehensive development of students. It specifically delineates eight principal tasks and introduces twenty-two detailed measures, as

presented in Table 1, to effectively execute and fulfill its goals.

The Special Action Plan, situated within the principles of the contemporary era, emphasizes the critical importance of school health initiatives in bolstering student mental health. Building on foundational recommendations for child and adolescent mental health, the Special Action Plan underlines the essential role educational institutions — colleges, middle schools, and primary schools — play in the educational system. Key responsibilities highlighted include monitoring, early warning systems, psychological counseling, and intervention for students. The plan advocates for comprehensive school-based mental health education, which includes providing operation guides on common psychological issues to parents, principals, teachers, counselors, and other stakeholders, as well as implementing national mental health days for college and middle school students. It also recommends regular mental health classroom instruction and psychological assessments, suggesting that students at various educational levels undergo at least one mental health evaluation annually and that a mental health record be established for each student. Overall, the Special Action Plan offers detailed and systematic recommendations aimed at ensuring the provision of high-quality mental health services within schools.

The Special Action Plan introduces an innovative initiative by recommending the incorporation of psychological peer supporters into high school and college curricula. This represents the first time that the concept of peer support has been formally integrated into a national strategy. Peer support entails the deliberate use of the knowledge, skills, and experiences of children and adolescents organized to aid the development of others with similar experiences (10). Research has shown that adolescents spend nearly one-third of their leisure time interacting with peers (11), underscoring the significant influence that peer support can have on student development. The COVID-19 pandemic prompted countries, including China, to implement isolation measures that effectively contained the virus spread but also posed complex challenges to mental health. Studies have demonstrated a correlation between adolescents' social isolation during the pandemic and an increase in psychological problems such as social anxiety and depression (12). Recognizing the importance of peer support, various domestic and international organizations have launched programs targeting adolescent mental health,

TABLE 1. Eight tasks and specific measures of the Special Action Plan.

No.	Eight task	Specific measures
1	Multi-angle to promote mental health	1–5. All-rounded of morality, intelligence, physical, aesthetic and labor education to promote mental health simultaneously
2	Strengthen mental health education	6. Setting up mental health-related courses 7. Giving play to the role of classroom teaching 8. Carrying out all-round mental health education
3	Standardize mental health monitoring	9. Strengthening government-level mental health monitoring 10. Conducting mental health assessments in school
4	Improve psychological early warning intervention	11. Improving the early warning system 12. Optimizing cooperation mechanisms
5	Strengthen the psychological talent team	13. Improving the quality of talent training 14. Provision of mental health teachers 15. Open channels for teacher development
6	Support mental health research	16. Conducting scientific research 17. Promoting the application of results
7	Improve psychosocial services	18. Enhancing the capacity of social and psychological services 19. Strengthening family education guidance services 20. the protection of minors
8	Create a healthy environment	21. Carrying out science popularization and publicity in a standardized manner 22. Strengthening daily supervision and management

resulting in successful outcomes as evidenced by initiatives like the "Sources of Strength" project and the "I Support My Friends" campaign. As an emerging strategy for promoting well-being, peer or support is expected to play a vital role in the future development of adolescent mental health.

PRESENTATION

The primary aim of the Special Action Plan is to create a comprehensive "four-in-one" system for student mental health, which includes health education, monitoring, counseling, and intervention measures. This strategy intends to strengthen collaboration between schools, families, the broader community, and pertinent governmental departments. By 2025, the objective is to ensure that 95% of schools are equipped with either full-time or part-time professional mental health educators, and 60% of family education guidance service stations actively participate in mental health education initiatives.

The Special Action Plan prioritizes the psychological needs of Chinese students and emphasizes strengthening organizational leadership. Its objective is to enhance the students mental health working mechanism through interdepartmental collaboration, social engagement, and nationwide involvement. The plan details strategic initiatives for mental health development, ranging from comprehensive planning to detailed implementation. Further strengthening of the plan was achieved through the Ministry of Education's endorsement on November 6, 2023, via the "Notice on the Establishment of the National Student Mental Health Advisory Committee". This Committee is charged with significant duties including research, consultation, monitoring, evaluation, outreach, and guidance pertaining to the national mental health programs across universities and schools. At its inaugural plenary meeting on March 21, 2024, the Committee announced that China will develop a cohesive national system for student mental health monitoring and early warning. Its goal is to unequivocally enhance the mental health capabilities of students and advocate for mental health education in this new era and journey. These efforts aim to provide robust organizational support and ensure the effective execution of the Special Action Plan.

DISCUSSION

The Special Action Plan emphasizes the importance of enhanced coordination at the local level, advocating for comprehensive planning and the optimization of financial structures. It highlights the critical need to secure substantial funding for student mental health initiatives and encourages active support from social organizations. After a practical implementation phase, the plan proposes the creation of master and principal studios for student mental health education, aimed at nurturing and sharing effective practices. Additionally, educational and health management departments at all levels are urged to seamlessly incorporate the plan's principles into routine activities and school governance. By prioritizing student mental health, these departments are instrumental in promoting students' overall development.

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The Role of Peer Support in Promoting Mental Health of Chinese Adolescents

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The concept of peer support has been utilized to foster emotional support, skill development, and positive social interactions among peers. Various forms of peer support include group activities, mentoring programs, peer counseling, and other structured interventions designed to enhance communication and collaboration among young individuals. These strategies promote empathy and understanding, thereby improving mental health outcomes, reducing social isolation and stigma, and boosting overall well-being. Furthermore, peer support empowers young individuals by equipping them with necessary tools and resources to actively manage their mental health symptoms.

BACKGROUND

The Concept of Peer Support for Adolescent Mental Health

The importance of mental health in children and adolescents cannot be overstated, given its potential for reversibility and its tendency to present in clusters. Peer support is critically important in addressing the mental health needs of adolescents, as supported by current data and evidence.

Peer support among adolescents, initially introduced in the 1970s in the United States as an innovative method to enhance mental health and well-being, has expanded globally. This approach gained traction in Canada and Australia during the 1980s and is now employed in numerous countries, including the United Kingdom (UK), Italy, Spain, Finland, Japan, New Zealand, Saudi Arabia, Norway, the Netherlands, and South Africa (1). In 2005, Street and Herts articulated a comprehensive definition of peer support as "using the knowledge, skills, and experience of children and young people in a planned and structured way to understand, support, inform, and help develop the skills, understanding, confidence, and self-awareness of other children and young people with whom they have something in common" (2).

Application and Advantages of Peer Support in Adolescent Mental Health

The concept of "peer support" encompasses various activities, and its benefits for children and adolescents are extensively recognized, particularly in academic environments. While traditionally centered on academic assistance within educational frameworks, the scope of peer support has shown wide-ranging positive impacts. For instance, in the UK, peer tutoring is advocated by the Education Endowment Foundation (EEF) Teaching and Learning Toolkit (3).

The available evidence supporting peer support programs aimed at enhancing mental health and well-being among children and adolescents remains limited. However, a meta-analysis conducted by Podmore et al. (4) identified the characteristics of successful mentoring and peer support programs that support well-being in these groups, and help prevent emotional and behavioral challenges. Research by James (5) found that peer leaders not only embraced healthier coping attitudes and norms but also established stronger connections with adults. They were four times more likely to refer peers to adults after participating in a peer support program. Additionally, James (5) highlighted that increased willingness to seek help and improved protective factors positively influence the school environment, consequently reducing the risk of suicide. During the coronavirus disease 2019 (COVID-19) pandemic, Pavarini et al. (6) observed that peer support training led to noteworthy benefits for young individuals, including improved capabilities in aiding others, better mental health and well-being, and enhanced agency, marked by increased self-efficacy and civic engagement. These findings underscore the potential of peer support programs to foster positive mental health outcomes among youths, especially during crisis periods.

International Experiences

Numerous international organizations have

introduced peer support programs targeting adolescent mental health, which have demonstrated a variety of beneficial effects. The "Source of Strength" program, for example, leverages peer social networks to foster healthy norms and cultures aimed at preventing suicide, violence, bullying, and substance abuse (7). This initiative thrives on principles of diversity, inclusivity, and collaboration, involving both adult counselors and youth peer leaders in efforts to cultivate positive social norms and cultural transformations.

Another initiative, "I Support My Friends," (8) is aimed at equipping children and adolescents aged nine and above with the skills and knowledge necessary to provide support based on the principles of psychological first aid (PFA) (9). This program emphasizes the importance of observing, listening, and connecting or referring individuals to more specialized support when necessary.

These international examples offer valuable insights for projects in China. Additionally, it is crucial to explore ways to implement peer support initiatives for adolescent mental health that are tailored to the specific conditions of China.

PEER SUPPORT ON MENTAL HEALTH FOR ADOLESCENTS IN CHINA

A Brief Overview of the Peer Support Process for Mental Health

The mental health issues among children and adolescents in China are increasingly recognized. Although numerous studies have focused on mental health within higher educational institutions, research on peer support for adolescent mental subdivisions remains insufficient.

In China, the initiation of peer support for mental health primarily originated within colleges and universities. Dong Xue et al. (10) noted that Tianjin University was the first to propose and implement a crisis intervention rapid response mechanism centered on peer support in 2004. Following this, other educational entities progressively developed peer education programs. Over time, these frameworks have evolved and have been incorporated into various educational institutions across China.

Recent Advances in Adolescent Mental Health Peer Support in China

Recent progress has been made in the domain of adolescent mental health peer support in China, guided by the National Health Commission and United Nations International Children's Emergency Fund and implemented by the National Center for Mental Health. The Adolescent Mental Health Development Project seeks to amalgamate international experiences to enhance technical support for adolescent mental health, with substantial contributions from Peking University in research and content development.

The objectives of the project are to develop essential peer support technologies, training programs, and organizational management processes customized for China's specific context. The aim is to bolster the knowledge and skills of peer supporters by creating an extensive peer support network. This network will encompass several mediums such as student associations, radio stations, social media platforms, youth centers, and homes. These platforms will play a crucial role in raising mental health awareness among adolescents, promoting engagement with and use of mental health services both in and outside school settings.

The peer support initiative seeks to extend its coverage to 100 schools across 10 provincial-level administrative divisions (PLADs) in China. Within these regions, both adolescent and adult peer supporters will be recruited to develop a peer support network. Objectives include training at least 1,000 adolescent peer supporters in pilot schools and ensuring that a minimum of 80% of these schools implement a peer support system for adolescent mental health.

Characteristics of Peer Support for Adolescent Mental Health

Peer support for adolescent mental health presents unique aspects distinct from other age groups. Critical characteristics to consider include: First, case studies should be rooted in the typical issues and situations faced by adolescents, redesigned with their input to maintain authenticity and relevance. Second, educational methods should focus on fostering inspiration, interaction, and independent thought. Third, a diverse range of activities should be implemented to enhance mental health within schools. Paramount to these efforts is the commitment to adhering to child and adolescent protection principles, thereby ensuring their safety.

Adolescent Mental Health Peer Support Toolkits

This new strategy for adolescent mental health peer support emphasizes the roles of both adolescent peer supporters and their adult counterparts. It includes resources specifically designed for the Chinese context, such as a Theory and Implementation Guide, a Work Manual for Adolescent Mental Health Peer Supporters, and a Work Manual for Adult Supporters. Critical skills for adolescent peer supporters — observing, listening, and linking — are highlighted. These skills, essential for conducting advocacy activities on campus, will be developed under the guidance of adult supporters, as illustrated in Figure 1.

DISCUSSION

Currently, the primary challenges encountered in peer support work for adolescent mental health include a limited understanding and recognition of the peer support concept within societal contexts. Additionally, there is a deficiency of holistic technical strategies and authoritative institutions to back this concept. Moreover, the effective implementation of peer support programs for adolescents necessitates collaboration across multiple sectors, particularly health and education.

Strengthening certain aspects can significantly improve adolescent mental health. It is crucial to acknowledge that peer support is beneficial not only for the recipients but also for the providers. Engaging in peer support allows adolescents to reinforce their knowledge and fosters a heightened sense of responsibility and personal growth. Overall, peer support offers valuable benefits to educational environments and positively influences the lives of young people.

The future of adolescent mental health peer support, both internationally and domestically, appears promising. As societal focus on the well-being of youth intensifies, there is an anticipated increase in demand for innovative methods to meet their mental health requirements. Adolescent mental health peer support offers a distinctive avenue for young individuals to engage with peers who share similar experiences and provide meaningful support and guidance.

Adolescent mental health is essential for overall human health and crucial for enhancing population quality. Consequently, fostering a supportive social environment that prioritizes adolescent mental health is imperative. Advancing key technologies to enhance adolescents' mental well-being and maximizing the benefits of peer support represent promising future directions.

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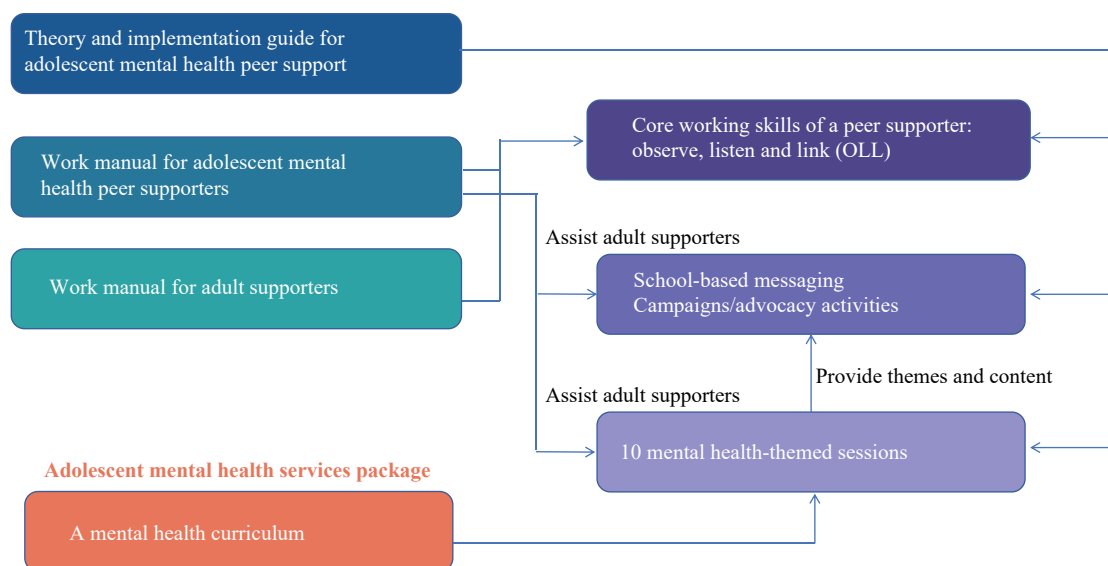

FIGURE 1. Adolescent mental health peer support toolkits.

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