Depression in Children: A Narrative Review

Tiffany Field

University of Miami/Miller School of Medicine and Fielding Graduate University, USA

*Corresponding author
Tiffany Field, University of Miami/Miller School of Medicine and Fielding Graduate University, USA.

ABSTRACT

The recent literature on depression in children has primarily focused on predictors/risk factors. The prevalence rates have been highly variable, ranging from a low of 3% in China to a high of 20-30% worldwide, a variability that may relate to age range differences being sampled or to different measures of depression (symptoms versus diagnoses). Negative effects of depression have included dysfunctional long-term memory, negative interactions, self-depreciation, loneliness, somatic symptoms, and suicidality. Predictors/risk factors have included maternal depression, childhood trauma, poor diet, excessive media exposure, physical inactivity, insufficient sleep, obesity, peer victimization and academic underachievement. A few buffers have been noted including authoritative parenting, cognitive reappraisal and effortful control. And interventions have included Cognitive Behavioral Therapy, exercise, and omega-3 fatty acids. Potential underlying mechanisms for depression in children include mothers' prenatal depression, smaller anterior hippocampal volume and dysfunction in the fronto-limbic circuit and reward-related regions associated with emotion appraisal and regulation as revealed by fMRIs. Although the data highlight the severity of depression in children, they have been primarily based on parent-report surveys that have yielded mixed results across samples.

Depression is one of the most common problems in children, ranging in severity from depressed affect to depressive symptoms to diagnosable disorders. This narrative review summarizes 43 papers that were derived from a search on PubMed and PsycINFO using the terms depression in children and the years 2023–2024. Exclusion criteria included case studies and non-English language papers. The publications can be categorized as prevalence data, negative effects of depression, predictors/risk factors for depression, buffers against depression, interventions, and potential underlying biological mechanisms. This review is accordingly divided into sections that correspond to those categories. Although some papers could be grouped in more than one category, 8 papers are focused on prevalence, 7 on negative effects of depression, 21 on predictors/risk factors, 3 on buffers, 4 on Interventions, 5 papers on potential mechanisms and 4 on methodological limitations of the recent literature.

Prevalence of Depression in Children

The prevalence of depression in children has varied widely across the world from a low of 3% in China to 6% in the U.S. to 14% in Japan and to 20-30% worldwide [1-4]. In the study on 3% in China (N = 72,107), the children ranged in age from 6 to 16 and the prevalence was as low as 3% and similar across gender (4% in females and 3% in males), but it was greater in adolescents than children (5% versus 3%) [1]. The inclusion of both children and adolescents in these samples is common in this recent literature, making it difficult to report the prevalence that is specific to children. The low prevalence in China, nonetheless, may relate to the inclusion of very young children who tend to be less frequently diagnosed with depression than older children. In another sample from China that was also focused on primary and high school students, the prevalence of depression was much greater at 13% [5]. The greater prevalence may relate to several comorbidities that were noted in this sample including 22% who experienced anxiety, 26% who reported transient suicidal ideation, 2% who had serious suicidal ideation and 1.5% who made suicide attempts.

In a study based on the National Survey of Children's Health in the U.S. (N=45,989 6-17-year-old youth), depression occurred in 6% of the youth [2]. Comorbidities also occurred in this sample including 14% who experienced anxiety and 12% who were diagnosed with ADHD. Heavy digital media use (four or more than four hours per day) was prevalent in 31% of the sample. The children who engaged in heavy media use had as great as a 99% greater odds of experiencing depression which was not surprising.

The greater prevalence in the sample from Tokyo (14%) may relate to its being exclusively older children (fifth grade students) (N=10,505, mean age=11 years) [3]. This research from Japan

focused on an unusual relationship between depression and child-specific material deprivation (defined as being deprived of more than five material items).

The worldwide prevalence of childhood depression has been notably higher at 20-30% [4]. However, this figure is based on the broader definition of both depressive symptoms and diagnosed depression disorder and the prevalence is also based on a broader sample of both children and adolescents. Both the broad definition of depression and the wide age range would be expected to inflate the prevalence rate.

The differences in prevalence rates across these samples likely relate to the different age ranges assessed, with older children and adolescents being more frequently diagnosed with depression. This age difference is illustrated by a large, longitudinal database (N=445,449) on Portuguese youth showing that the mean depression levels increased from middle childhood through adolescence before stabilizing in adulthood [6]. These data highlight the need for more longitudinal studies on prevalence data.

Negative Effects of Depression on Children
The recent literature suggests that depression has had several negative effects on children. These include impaired cognitive function, negative interactions, loneliness, lifestyle problems including poor diet, excessive screen time, inactivity, insufficient sleep as well as somatic symptoms and suicidality.

Impaired Cognitive Function
In a meta-analysis on 15 cross-sectional and one randomized controlled trial (N=13,567), children with depression experienced impaired cognitive function including inferior working memory and long-term memory as well as deficits in attention, executive function and language [7]. Surprisingly, the depressed children did not differ from children without depression on short-term memory or processing speed which are typically related to long-term memory and the other deficits that were reported.

Negative Interactions
In a study entitled "A dynamic systems analysis of dyadic flexibility and shared affect in preschoolers with and without major depressive disorder" (N=215 3–7-year-olds), a randomized controlled trial was conducted on parent-child interactions [8]. The children with major depressive disorder and their parents spent less time in shared positive contact and more time in neutral affect. This study, not unlike most studies in this recent literature, has the problem of unequal sample sizes in the depressed and non-depressed groups.

Self-deprecation and Loneliness
In a network analysis of depressive symptoms among school-age students (N=2514 Chinese grade school students in grades 4–11), depression was one of the most prevalent mental health problems [9]. Based on the Child Depression Inventory, self-hatred across stages was a central symptom. And loneliness was prominent in elementary and junior high school students. The network connectivity (close symptom associations) was stronger among elementary school students. This finding was not easily interpretable, although loneliness is typically more prevalent among elementary school students.

Similarly, in a study on central symptoms of children's depression in a different sample of Chinese students (N=2458 students with a mean age of 11), network analysis suggested again that the symptoms of self–hatred, loneliness, and self-deprecation were the most notable problems [10]. And no gender differences were noted in this sample. It is surprising that two different research groups from China with no overlapping research team members conducted the same network analysis of central symptoms and reported the same symptoms.

Poor Diet, Excessive Screen Time, Physical Inactivity and Insufficient Sleep
In still another study on Chinese students (6478 primary school students), logistic regression analyses suggested that poor diet, excessive screen time, physical inactivity and insufficient sleep led to a greater prevalence of depression [10]. Twelve per cent of the students had depression symptoms, and 49% greater odds of depression were noted for each additional risk factor. That depression contributed to these problem behaviors is not surprising, although depression contributed to different problems in the other samples of Chinese students including self-hatred and loneliness.

Somatic Symptoms
Somatic symptoms have also occurred in depressed elementary school children [11]. In this cross-cultural study on 1541 elementary school children 9-to-12-years-old, anxiety, depression and somatic symptoms scales were given. Depression and somatic symptoms were most prevalent in Jamaican children and least frequent in Colombian children. These cross-cultural differences are difficult to interpret, but, as might be expected, children with clinically significant depression also had higher Somatic Symptoms Scale scores.

Suicidality
Given that depression occurs in children, and depression often leads to suicidality, it's not surprising that suicidality also occurs in children. In a study on school-age children (N=161 6-to-12-year-old children presenting at an outpatient services clinic in the Midwest), as many as one in four children were reportedly experiencing suicidality [12]. Reports by different informants including clinicians, caregivers and youth were correlated. The strongest correlation was noted for youth and clinician reports and the weakest correlation was reported for caregivers and clinicians. The reports of suicidality by clinicians and youth, but not those by caregivers, were associated with youth-reported depression. The authors concluded that caregiver reports are insufficient for screening suicidality. This conclusion would be expected, however, because the school-age children were in an outpatient services clinic, suggesting that they were not communicating with their caregivers and needed clinicians.

Predictors/Risk Factors
Many risk factors have been identified for depression in children. They can be categorized as parental factors (9) such as maternal depression, peer factors (4) such as bullying and self-factors (8) such as media use.

Parental Risk Factors
Parental risk factors for depression in children include prenatal depression, postnatal depression, family history of depression,

childhood trauma, and emotional abuse. In a study on preterm versus term infants (N= 212), the prevalence of depression was 18% in the preterm infants and half that prevalence (9%) in the term infants (Yates at all, 2023). As hypothesized, the children who then experienced maternal postnatal depression had greater mental health problems including depression.

Research by another group involved assessments of children across the first five years [4]. Maternal depression measured across pregnancy and at 3, 6 and 24 months had negative effects on the infants and toddlers. These negative effects appeared on the Brief Infant and Toddler Social Emotional Assessment at two years and on the Strengths and Difficulties Questionnaire at five years.

In still another study on maternal depressive symptom effects on child behavior from infancy to preschool (N=322 low income Mexican-American mothers), the mothers reported depressive symptoms and child behavior problems from year one to 4.5 years [13]. Bi-directional associations were noted between the mothers' depressive symptoms and the children's behavior problems as early as one year, and those remained stable across the four-year period. Bi-directionality of depressive symptoms in parents and depressive and/or behavior problems in children have been frequently reported. Both genetic predisposition and environmental factors have been suggested as potential underlying mechanisms.

In a multi-variable study on family factors associated with children's depressive symptoms, the School Health Promotion Study in Finland was used (N=32,181 parents and fourth and fifth grade students) [4]. The children's depression was associated with parents' depressed mood, but also with poor self–rated health, family interaction problems and life events. History of parental depression has not only been associated with child depression, but also with smaller anterior hippocampal volume in the children [14]. This relationship is consistent with the reports that long-term memory (related to hippocampal function) has been affected by depression [7].

Childhood trauma has also been significantly correlated with childhood depression in a sample of children with major depressive disorder as compared to a normal child sample(N=178) [9]. In this sample, altered brain activity moderated the relationship between childhood trauma and depression. This moderation effect of altered brain activity suggests that the childhood trauma involved physical trauma.

In a longitudinal study on Chinese children (N=3633, mean age =10), emotional abuse was related to depressive symptoms [15]. Latent growth curve modeling at six-month intervals suggested that emotional abuse led to depressive symptoms. That relationship was mediated by cognitive reappraisal. It's not surprising that both physical and emotional abuse would lead to depressive symptoms in children, just as they do in adolescents and adults.

Peer Risk Factors
Peer risk factors have included peer victimization and bullying. In a paper entitled "Transactional relations between peer victimization and depressive symptoms among youth at risk of developing depression", children with major depression disorder and children without major depression disorder (N.= 251

children 8-14 years old) were compared every six months for two years [16]. Peer relational victimization led to depression, especially in females.

A reciprocal relationship was also observed between peer victimization and depressive symptoms in a sample of Chinese children (N= 1205) [17]. In this study, the Chinese students completed surveys at four time points. Victimization and depression were related. Peer victimization led to depressive symptoms across adjacent waves. And, reciprocally, depression at time two led to victimization at time three. No gender, age or socioeconomic status differences were noted. The reciprocal relationship between depression and its predictor/risk variables is rarely studied, but, as in this longitudinal study, reciprocal relationships can be seen.

Bullying is also reputedly a prevalent worldwide problem at 10% [18]. Depression has been a mediator between bullying and self-cutting in a sample of Finnish students (N.= 3345). But confounding variables were younger age, being afraid of school, having fewer friends, being lonely and having negative relationships with family. Childhood bullying victimization has even been noted to lead to later depression in college-age students in a sample from seven countries, with 71% being female [19]. As for other problems like bullying, other variables have confounded the predictor variables/risk factors.

Self-Risk Factors
Several self–risk factors have been noted in this recent literature on depression In children. They include older age, greater BMI, less exercise, high or low empathy, academic under achievement, and comorbid obsessive-compulsive disorder.

In a study that assessed multiple self-risk factors (N=398,520), older age, being female, having siblings, greater BMI and less exercise as well as smoking and drinking, lower SES, and low popularity in school contributed to more depressive symptoms [20]. The degree to which these many variables contributed to depression in this study was not clear.

In a paper entitled "Developmental trajectory of bodyweight and youth at risk for major mood disorders" (N=394, 3 to 20-year-old youth), females with a family history of mood disorders were prone to weight gain [21]. This happened at puberty and predated mood disorder onset. In a meta- analysis on 22 studies (N=175,135), obese children were more frequently depressed [22]. The relationship between a psychological variable like depression and a physical variable like obesity needs more research. Clearly, they would be considered bi-directional or reciprocal variables.

In a rare experimental study in this literature, an eye tracking paradigm was used to assess attention bias to sad faces [23]. The results suggested that attention bias to sad faces correlated with depressive symptoms. In a similar study, sad and rejection words were presented [24]. While depressed children showed a bias toward sad words, "left behind children" not living with parents showed not only a bias toward sad words, but also toward rejection words. Attention to negative stimuli has frequently been associated with depression, but "left behind children" would be expected to experience many negative biases.

Empathy was highlighted in a study entitled "Association between children's empathy and depression" (N.= 1223, mean age=11) [1]. Those children with cognitive and positive empathy had less depression. Children with extremely high and extremely low empathy were more depressed. It is not clear why children with extremely high and low empathy were more depressed except that they may have been more emotionally vulnerable and had less emotional regulation.

Low academic achievement has also been a predictor of childhood depression. In the longitudinal study on Portuguese children already mentioned, the increasing depression levels from mid-childhood to adolescence before stabilizing in adulthood were most strongly predicted by academic achievement and learning disabilities as well as externalizing [6]. These results are not surprising given that academic achievement has been considered the strongest predictor of non-depression in children. This relationship needs more research to determine the specific aspects of academic achievement that predict depression in children.

In research on the comorbidity of depression and obsessive-compulsive disorder (OCD), the Patient Health Questionnaire for Adolescents was given to a group of youth with OCD plus major depressive disorder (N=124), and a group of youth with major depressive disorder without OCD (N=673) [25]. The comorbid group had more severe major depressive disorder and a greater prevalence of moderate to severe depression (75% versus 61%). The comorbid group also had more psychomotor retardation/agitation and less anhedonia because of behavioral activation. This study was, however, limited by being cross-sectional and self-reported with no standard diagnostic tool for OCD and a small sample size leading to low statistical power for the network analysis that was conducted.

Buffers of Depression in Children
A few buffers have been noted in this recent literature on depression in children. They include authoritative parenting, cognitive reappraisal, and effortful control. In a study that was conducted during the initial stage of the COVID-19 pandemic, the severity of depression and anxiety were noted to increase (N=106 4–8-year-old children) [26]. Greater pre-pandemic authoritative parenting led to less child depression. Authoritative parenting has been defined as child-centered and supportive which would understandably be related to less child depression.

In a study entitled "The role of emotion regulation strategies in the relationship between temperament and depression in adolescents" (N=535 8 to 12-year-old children), negativity was significantly related to depression symptoms [27]. Cognitive reappraisal, defined as considering more positive alternatives, mediated both the relationship between negativity and depressive symptoms and that between emotion regulation and depressive symptoms. In a very similar paper entitled "Effortful control moderated the relationship between negative emotionality and child anxiety and depressive symptoms severity", the relationship between negative emotionality and anxiety and depressive symptoms was weakened as effortful control (staying focused) increased [28]. These emotion regulation strategies could seemingly be included in intervention programs for children with depression.

Interventions for Depression in Children
Very few intervention studies have appeared in this recent literature on depression in children. They include Cognitive Behavioral Therapy, exercise, and omega-3 fatty acids.

In a longitudinal study on Cognitive Behavioral Therapy (N=220 6 to 18-year-olds) a follow-up assessment was conducted five years after the completion of the therapy [29]. Surprisingly, as great as a 57 to 70% decrease in depressive symptoms occurred. And improvement in life satisfaction was reported by 80% of the sample.

In the only qualitative study in this literature, themes of Cognitive Behavioral Therapy (CBT) were explored [30]. Five themes emerged including relationship with the clinician, useful cognitive behavioral therapy components, CBT's ability to accommodate different techniques, checking in, and the impact of major depression disorder on CBT.

Exercise was also an effective intervention for children with depression. In a meta-analysis of 35 randomized controlled trials (N=5393 participants), several forms of exercise were explored [31]. Aerobics had the greatest effect for 66% of the participants, group training for 63%, resistance exercise for 59% and aerobics plus resistance training for 58% of the participants. The greatest effect on reducing depressive symptoms occurred for 40 to 50-minute exercises that occurred three times per week for a 12-week period.

Inflammation is often involved in depressions. In a paper entitled "Pharmacological anti–inflammatory treatment and children and adolescents with depressive symptoms", a meta-analysis on 22 studies (N=1365 youth) was presented. Omega–3 fatty acids had the greatest anti-inflammatory effect on decreasing depression.

Potential Underlying Biological Mechanisms
Brain activity patterns based on fMRIs have been suggested as a potential underlying mechanism for depression in children. Reduced volume in the anterior hippocampus has also been suggested as a potential underlying mechanism.

In an fMRI study, neuroimaging was performed at 4.5 to 7.5 years and the Child Depression Inventory was given at 8.5 to 10.5 years [32]. Activation of the somatomotor area and the temporoparietal junction of the orbitofrontal cortex as well as the insula was associated with depressive symptoms. These areas have been implicated in speech/language, social cognition and information integration.

In a review entitled "Distinct functional patterns in child and adolescent bipolar and unipolar depression during emotional processing", 25 studies were included (N= 252 youth with bipolar and 311 with major depressive disorder) [33]. Distinct fMRI patterns were noted during negative processing. For those with bipolar depression, activity changes occurred in regions that were associated with emotion perception. Dysfunction for those with major depressive disorder occurred in the fronto-limbic circuit and reward-related regions associated with emotion appraisal and regulation.

In a study entitled "Polygenic risk for depression and anterior and posterior hippocampal volume in children and adolescents

(N=350), children with depression were likely to have a parent with a history of depression [14]. Depression was also associated with smaller anterior but not posterior hippocampal volume.

Methodological Limitations

Several methodological limitations can be noted for this recent literature on children with depression. They include sampling problems, selection of variables and data analysis. Many of the samples included a wide age range of both children and adolescents, making it difficult to determine the problems that are specific to depression in children and how those differ from depression problems in adolescents. Another difference related to the wide age range is the variable prevalence rates of the different ages with depression typically being more prevalent in older children and adolescents, likely because they can self-report when they are older.

In addition, most of the samples are not generalizable because they come from China which might not have a representative sample of depression in children. Further, the samples are confounded by virtue of depression being comorbid with other problems. For example, anxiety, which is often comorbid with depression, was not measured or entered as a covariate in these studies on depression in children, although anxiety has often been entered as a covariate in data analyses of studies on adult depression.

Still another problem is that these are cross-sectional samples, making it difficult to determine directionality or causality. And, the cross-sectional data were typically collected at a single time point, making them specific to that time and not cumulative. Further, the sampling for intervention studies was rarely conducted with a randomized controlled trial design, suggesting that the groups may have differed at baseline.

Regarding the variables, some studies were focused on a single predictor/risk variable while others involved multiple predictors. Multiple predictor variable studies often did not include regression analysis for determining the relative importance of the different variables. Reciprocal associations between variables were often reported, suggesting that the variables could be considered both predictors and outcomes.

The variables were derived from self–report measures by the parents/caregivers and by clinicians. Different variables were used for the mothers and children based on different questionnaires, making comparisons invalid. And, in at least a few databases, the different informants were inconsistent on their ratings. Caregivers and clinicians, for example, differentially rated the children [34]. The authors suggested that the caregiver reports were the least reliable and were not correlated with the children's ratings.

Further, variables that would seemingly be important for the literature on depression in children, because they have been significant in the literature on adult depression, for example, excessive internet use and inactivity were rarely mentioned and were not typically measured. And the most frequently measured variables were negatively biased including self–hatred, self-deprecation and loneliness [5,10].

Despite these methodological limitations, the recent literature has highlighted the severity of depression in children and the importance of early diagnosis. Identifying the numerous risk factors will help inform not only the diagnosis but the interventions that are needed for children experiencing depression.

Table 1: Prevalence of depression in children (and first authors)

Prevalence	First Author
3% in youth 6-16-years- old in China	Deng
6% in youth 6-17 -years -old in the U.S.	Uddin
13% in primary and high school students in China	Yu
14% in fifth grade students in Japan	Khin
20-30% in children and adolescents worldwide	Taja

Table 2: Negative effects of depression on children (and first authors)

Negative Effects	First Authors
Impaired cognitive function	Schumacher Deng
Negative interactions	Quinones-Camacho
Self-deprecation and loneliness	Li, Zhang
Excessive screen time and inactivity	Zhang
Somatic symmptoms	Gibson
Suicidality	Doyle

Table 3: Predictors/ Risk Factors for depression in children (and first authors)

Predictor/Risk Factor	First Author
Parental Risk Factors	
Prenatal depression	Yates
Prenatal and postnatal depression to 24 months	Korja
Maternal depression from 1 to 4.5 years	Curci
Parental depressed mood and family interaction problems	Tajla
Parental depression and smaller anterior hippocampal volume	Hurtado
Childhood trauma	Luo
Emotional abuse	Tian
Peer Risk Factors	
Relational victimization	Israel, Shen
Bullying	Hamal, Labella
Self-Risk Factors	
Older age, female, siblings, >BMI,<exercise,<SES,<popularity	Zhang
Weight gain	Adepalli
Obesity	Chen
Attentional bias to sad faces and words	Buhl, Peng
Extremely high and extremely low empathy	Cui
Low academic achievement	LoParo
Obsessive-compulsive disorder comorbidity	Strouphouer

Table 4: Buffers and interventions for depression in children (and first authors)

Buffers	First Authors
Authoritative parenting	Heaton
Cognitive reappraisal	Liu
Effortful control	Raines
Interventions	
Cognitive Behavioral Therapy	Walter, Ferguson
Exercise	Li
Omega-3 fatty acids	Vockel

Table 5: Potential underlying biological mechanisms (and first authors)

Mechanism	First Author
Activation of the somatomotor area and orbitofrontal cortex	Huang
Activation of the fronto-limbic circuit	Wu
Smaller anterior hippocampal volume	Hurtado

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