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Review: Mental health impacts of the COVID-19 pandemic on children and youth – a systematic review

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Background: The COVID-19 pandemic has posed an unprecedented threat to global mental health. Children and adolescents may be more susceptible to mental health impacts related to their vulnerable developmental stage, fear of infection, home confinement, suspension of regular school and extracurricular activities, physical distancing mandates, and larger scale threats such as global financial recessions and associated impacts. Our objective was to review existing evidence of the COVID-19 pandemic's global impact on the mental health of children and adolescents <19 years of age and to identify personal and contextual factors that may enhance risk or confer protection in relation to mental health outcomes. **Methods:** We conducted a search of peer-reviewed and preprint research published in English from January 1, 2020, to February 22, 2021. We included studies collecting primary data on COVID-19-related mental health impacts on children and adolescents. We graded the strength of included articles using the Oxford Centre for Evidence-Based Medicine rating scheme. **Results:** Our search and review yielded 116 articles presenting data on a total of 127,923 children and adolescents; 50,984 child and adolescent proxy reports (e.g., parents, healthcare practitioners); and >3,000 chart reviews. A high prevalence of COVID-19-related fear was noted among children and adolescents, as well as more depressive and anxious symptoms compared with prepandemic estimates. Older adolescents, girls, and children and adolescents living with neurodiversities and/or chronic physical conditions were more likely to experience negative mental health outcomes. Many studies reported mental health deterioration among children and adolescents due to COVID-19 pandemic control measures. Physical exercise, access to entertainment, positive familial relationships, and social support were associated with better mental health outcomes. **Conclusions:** This review highlights the urgent need for practitioners and policymakers to attend to and collaborate with children and adolescents, especially those in higher risk subgroups, to mitigate short- and long-term pandemic-associated mental health effects.

Key Practitioner Message

- Children and adolescents are at crucial phases of development, making them more susceptible to negative mental health impacts of the COVID-19 pandemic and response measures.
- In this review, children and adolescents were found to experience more depressive and anxious symptoms than reported prepandemic rates, specifically with high levels of fear and concern regarding the impact of COVID-19 on their lives.
- Factors associated with worse COVID-19 mental health outcomes were older adolescent age, female gender, neurodiversity, and the presence of chronic physical conditions.
- While this review captures emerging data, study designs that utilize validated measures and undertake longitudinal data capture will greatly improve understanding of impacts.
- Pandemic-associated negative impacts on child and adolescent mental health are clear and must be monitored and addressed as societal restrictions are lifted to mitigate short- and long-term impacts.

Keywords: Mental health; adolescence; anxiety; depression; resilience

Introduction

Pandemics and other large-scale emergencies have the potential to negatively affect mental health during the event and long after. In response to the COVID-19 pandemic, mitigation measures have interrupted in-person learning, social and community networks, recreational activities and access to health care, challenging access to important routines, social structures, resources, and supports. While these measures are necessary to prevent an escalating public health emergency, prolonged social isolation and home confinement may lead to immediate and long-term mental health and well-being challenges (Kaufman, Petkova, Bhui, & Schulze, 2020; Wang, Zhang, Zhao, Zhang, & Jiang, 2020). Short-term factors contributing to mental distress during the COVID-19 pandemic include concerns about SARS-CoV-2 infection and subsequent health impacts, social isolation, and worsening social determinants of mental health such as socioeconomic stressors resulting in stress and increased mental illness (Aknin et al., 2021). For instance, a longitudinal survey in the United Kingdom of over 50,000 individuals found that the proportion reporting clinically significant levels of mental distress rose from 19% in 2018 to 27% in April 2020, one month into the COVID-19 lockdown (Pierce et al., 2020).

Mental health impacts of disasters, such as depression, anxiety, post-traumatic stress disorder, substance use disorder, as well as domestic violence and child abuse, have been identified in settings such as the aftermath of the SARS epidemic, 9–11, Hurricane Katrina, and other humanitarian emergencies (Furr, Comer, Edmunds, & Kendall, 2010; Galea, Merchant, & Lurie, 2020; Purgato et al., 2019; Sprang & Silman, 2013; B. Tang, Liu, Liu, Xue, & Zhang, 2014; Tang, Deng, Glik, Dong, & Zhang, 2017; Tol et al., 2011). The cumulative effect of multiple risk factors and inadequate protective factors can reduce mental well-being and increase vulnerability to mental illness emergence (World Health Organization, 2014). Individuals at risk may experience new onset of mental illness, while those with pre-existing mental health conditions may experience symptomatic worsening, especially if mental health service access is impeded (Moreno et al., 2020). The unprecedented reach of COVID-19 pandemic impacts necessitates urgent population-level monitoring of mental health to optimize efforts for prevention and mitigation of its effects.

Pre-existing vulnerabilities, such as socioeconomic disadvantage, neurodiverse needs, or disability may increase risk of poor mental health outcomes during the COVID-19 pandemic. Organizational closures and physical distancing requirements have reduced social contact and support, compromising food security in some cases and secondary oversight of child and adolescent emotional and physical safety (Poole, Fleischhacker, & Bleich, 2021; Salt et al., 2021; Swedo et al., 2020). Students who rely on special education, lack digital access or tools, or live in unstable home settings risk falling behind their (peers) as schools move online. In the rapidly evolving context of the pandemic as well as literature and evidence-generation elucidating mental health impacts of the pandemic on children and adolescents, we seek to build on reviews capturing early pandemic impacts (Araújo, Veloso, Souza, Azevedo, & Tarro, 2020; Meherali et al., 2021; Nearchou, Flinn, Niland, Subramaniam, & Hennessy, 2020) and report on child and adolescent mental health impacts one year into the COVID-19 pandemic. Our systematic review aims to summarize population-level impacts of the COVID-19 pandemic on global child and adolescent mental health as captured in the year following its onset, contextual factors influencing impacts, as well as to identify protective factors that may mitigate these impacts.

Methods

Search strategy

In this review, we searched for peer-reviewed and preprint articles describing COVID-19-related mental health changes among children and adolescents (<19 years of age) made available in English from January 1, 2020, to February 22, 2021. We registered a protocol for this review (https://doi.org/10.17605/OSF.IO/B94AC) with the Open Science Framework (Snell & Samji, 2021). We searched nine electronic databases: MEDLINE, PsycINFO, Scopus, PubMed, EMBASE, Web of Science, medRxiv, PsyArxiv, and Cumulative Index of Nursing and Allied Health Literature (CINAHL). We used a predefined search strategy (Table S1) to extract articles from MEDLINE, PsycINFO, PubMed, and EMBASE. This strategy did not use available database fields to filter results by language. We modified these keywords and patterns as necessary to identify articles using search engines offered by CINAHL, Web of Science, medRxiv, PsyArxiv, and Scopus.

Selection criteria

We included studies which assessed stratified mental health outcomes for young people 0-18 years of age related to the COVID-19 pandemic. We defined mental health outcomes as broadly as possible, including studies which measured changes in the prevalence or symptoms of mental illness, overall mental health or well-being, mental health service utilization, and other emotional or behavioral characteristics. Mental health outcomes could be (a) quantitatively or qualitatively measured, and/or (b) derived from child and adolescent self-report or from caregivers, caretakers, teachers, or other adults reporting on the mental health of young people they supervise. Gray literature and non-English language articles were not eligible for inclusion and were thus removed during screening. Studies focusing exclusively on the direct or indirect effects of COVID-19 on physical health or on mental health service adaptation in response to the pandemic were excluded. Controlled trials exclusively assessing mental health interventions and secondary analyses of primary data such as reviews, editorials, and letters were also excluded. Figure 1 describes the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart of our literature search.

Article screening and extraction

We used Covidence systematic review software (https://www.covidence.org/) to remove duplicate entries and coordinate article screening. In a two-stage process, a team of five coders first reviewed article abstracts and then full-text manuscripts for eligibility. Two coders completed a data extraction template for each article screened for inclusion. This template included fields for study location, period, design, target population and sample size, measurement tools, and mental health outcomes. When possible, coders extracted relevant outputs of quantitative analyses, including any reported effect sizes, descriptions of measurement uncertainty, and results of significance tests. Coders also assigned keywords to each study to identify common factors and outcomes, which included protective and resilience factors. Resilience was conceptualized as a process, rather than a trait or outcome, and defined as an individual's ability to cope with a crisis mentally or emotionally; to move forward in a positive manner despite adversity; or to adapt successfully to a pandemic that threatens their viability, function, or development (de Terte & Stephens, 2014; Southwick et al., 2014). We

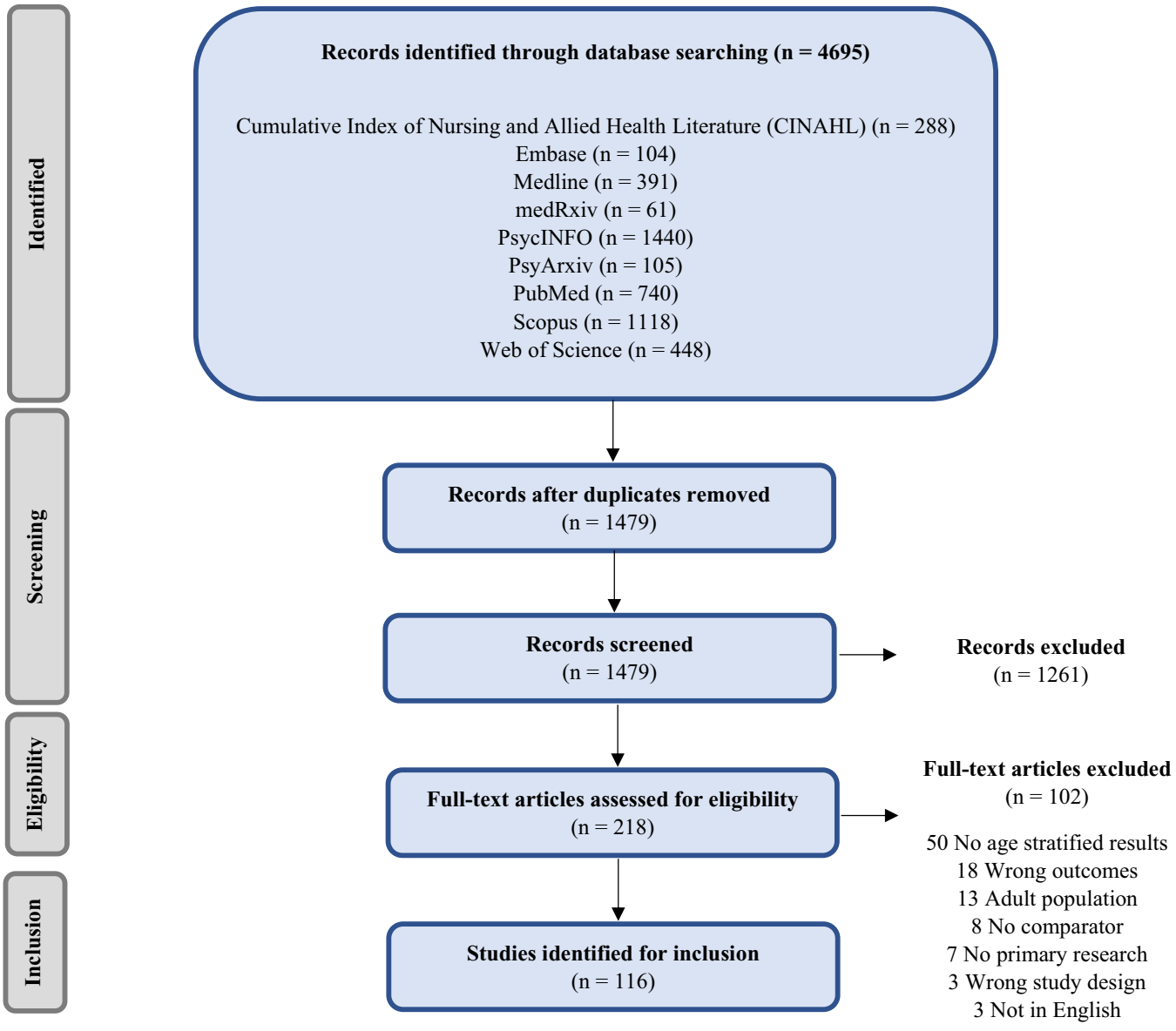

Figure 1. PRISMA flow diagram describing study selection process

assessed evidence quality using a rating scheme modified from the Oxford Centre for Evidence-Based Medicine ranging from one to five, with lower scores denoting higher-quality evidence (Centre for Evidence-Based Medicine, n.d.). We graded qualitative studies at '4' on this scale to denote that they collected cross-sectional data. We descriptively summarized results of data extraction considering high heterogeneity in study designs, populations, mental health outcomes, and measurement tools represented in included articles.

Results

Study design and quality

A total of 116 articles representing more than 127,923 children and adolescents met inclusion criteria and were included in the systematic review. Using the Oxford quality scoring system, four articles were given a rating of two (prospective cohort design) (Gassman-Pines, Ananat, & Fitz-Henley, 2020; Munasinghe et al., 2020; Shek, Zhao, Dou, Zhu, & Xiao, 2021; Xiang, Yamamoto, & Mizoue, 2020) and 24 were given a rating of three (case-control, retrospective cohort, and chart review designs) (Abawi et al., 2020; Ademhan Tural et al., 2020; Alonso-Martínez, Ramírez-Vélez, García-Alonso, Izquierdo, & García-Hermoso, 2021; Amorim et al., 2020; Bothara et al., 2021; Breaux et al., 2021; Chahal, Kirshenbaum, Miller, Ho, & Gotlib, 2021; Cheek, Craig, West, Lewena, & Hiscock, 2020; Chen, Chen, et al., 2020; Chen, She, et al., 2020; Conti et al., 2020; Diaz de Neira et al., 2020; Ezpeleta, Navarro, de la Osa, Trepat, & Penelo, 2020; Ferrando et al., 2020; Gotlib et al., 2020; Janssen et al., 2020; Jefsen, Rohde, Nørremark, & Østergaard, 2020; Leeb et al., 2020; Leff, Setzer, Cicero, & Auerbach, 2021; Magson et al., 2021; Rogers, Ha, & Ockey, 2021; Tanaka & Okamoto, 2021; Tromans et al., 2020; Zhang, Zhang, et al., 2020). The remaining 88 articles were given a rating of four, indicating cross-sectional or qualitative study design. A variety of standardized tools were used across studies to assess mental health, psychological and psychiatric diagnostic outcomes. The most commonly used tools included the Generalized Anxiety Disorder Scale (GAD-7) (15/116), the Strengths and Difficulties Questionnaire (SDQ) for

mental well-being (14/116), and the Patient Health Questionnaire (PHQ-9) (13/116), and the Centre for Epidemiologic Studies Depression Scale (CES-D) for depressive disorder (7/116).

Study populations

The 116 articles presented data on a total of 127,923 children, and adolescents; 50,984 child and adolescent proxy reports (i.e., parents, guardians, healthcare practitioners); and over 3,000 charts were reviewed across seven articles (although specific chart numbers reviewed were not reported in many studies frequently many did not specify the number of charts reviewed). The majority of studies described general population findings while a third of studies focused on specific population subgroups including those with neurodiverse conditions such as autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and obsessive-compulsive disorder (OCD) (Amorim et al., 2020; Asbury, Fox, Deniz, Code, & Toseeb, 2020; Breaux et al., 2021; Colizzi et al., 2020; Conte, Baglioni, Valente, Chiarotti, & Cardona, 2020; Conti et al., 2020; Evans et al., 2020; Graziola et al., 2020; Jefsen et al., 2020; Masi et al., 2021; Nonweiler, Rattray, Baulcomb, Happe, & Absoud, 2020; O'Sullivan et al., 2021; Patra, Patro, & Acharya, 2020; Paulauskaite et al., 2021; Sciberras et al., 2020; Secer & Ulas, 2020; Storch et al., 2021; Theis, Campbell, De Leeuw, Owen, & Schenke, 2021; Zhang, Shuai, et al., 2020). Other studies focused on specific populations such as children and youth with inflammatory bowel syndrome (IBS), chronic respiratory conditions, and neuromuscular disorders (Alshahrani et al., 2020), and LGBTQ-identifying adolescents (Fish et al., 2020).

Eight studies contained results on child and adolescent populations accessing psychiatric services during the pandemic (Bothara et al., 2021; Cheek et al., 2020; Chen, She, et al., 2020; Diaz de Neira et al., 2020; Ferrando et al., 2020; Leeb et al., 2020; Leff et al., 2021; Tromans et al., 2020).

All of the data collection in the studies included in this review was undertaken between January and November 2020. By key phases in the progression of the pandemic, studies collected COVID-19-related data from January to February (20/116), March to May (91/116), June to August (25/116), and September to November (2/116). The greatest number of studies were conducted in Europe (39/116), followed in diminishing order by East Asia (28/116), North America (21/116), South Asia (7/116), Australasia (7/116), West Asia (6/116), South America (2/116), South-East Asia (2/116), Sub-Saharan Africa (1/116), and North Africa (1/116). Two studies involved multiple countries or were international in focus. Study period, sample size, gender distribution, population, mental health-related assessment tool, and location for each included study are further detailed in Table S2.

Age distribution

The majority of articles focused entirely on child and adolescent populations ≤18 years of age. However, 24 studies also included populations ≥18 years (Alamrawy, Fadl, & Khaled, 2021; Banati, Jones, & Youssef, 2020; Buzzi et al., 2020; Chahal et al., 2021; Chen, She, et al., 2020; Commodari & La Rosa, 2020; Conte et al., 2020; de Matos et al., 2020; Esposito et al., 2020; Ferrando et al., 2020; Fish et al., 2020; Fitzpatrick, Carson, & Weisz, 2020; Janssen et al., 2020; Matovu, Kabwama, Ssekamatte, Ssenkusu, & Wanyenze, 2021; Munasinghe et al., 2020; Murata et al., 2021; Qi, Liu, et al., 2020; Rauschenberg et al., 2020; Scott et al., 2021; Shek et al., 2021; Storch et al., 2021; Tanaka & Okamoto, 2021; Tromans et al., 2020; Zhou, Wang, et al., 2020). Thirteen studies targeted primary school populations (<12 years) (Alonso-Martínez et al., 2021; Chen, Chen, et al., 2020; de Avila et al., 2020; Dumas, Ellis, & Litt, 2020; Fontenelle-Tereshchuk, 2020; A. Gassman-Pines et al., 2020; Glynn, Davis, Luby, Baram, & Sandman, 2021; Lee, Ward, Chang, & Downing, 2021; Liu, Liu, & Liu, 2020; Romero, López-Romero, Domínguez-álvarez, Villar, & Gómez-Fraguela, 2020; Waller et al., 2021; Xie et al., 2020; Xue et al., 2021), 27 reported on middle and high school populations (aged 12–18) (Alamrawy et al., 2021; Breaux et al., 2021; Buzzi et al., 2020; Cao et al., 2021; Chi et al., 2021; Ellis, Dumas, & Forbes, 2020; Fish et al., 2020; Giannopoulou, Efstathiou, Triantafyllou, Korkoliakou, & Douzenis, 2021; Janssen et al., 2020; Kılınçel, Kılınçel, Muratdağı, Aydın, & Usta, 2020; Li et al., 2021; Liebana-Presa et al., 2020; Lu et al., 2020; Luthar, Ebbert, & Kumar, 2020; Magson et al., 2021; Masuyama, Shinkawa, & Kubo, 2020; Murata et al., 2021; Oosterhoff, Palmer, Wilson, & Shook, 2020; Pons et al., 2020; Qi, Liu, et al., 2020; Qi, Zhou, et al., 2020; Rauschenberg et al., 2020; Rogers et al., 2021; Scott et al., 2021; Secer & Ulas, 2020; Zhang, Ye, et al., 2020; Zhou, Yuan, et al., 2020; Zhou, Wang, et al., 2020), while 16 studies did not report the range or grades of their child and adolescent population (Abawi et al., 2020; Alivernini et al., 2021; Amorim et al., 2020; Amran, 2020; Colizzi et al., 2020; Ezpeleta et al., 2020; Graziola et al., 2020; O'Sullivan et al., 2021; Patra et al., 2020; Paulauskaite et al., 2021; Sama et al., 2021; Storch et al., 2021; Theis et al., 2021; Tromans et al., 2020; Yue, Zang, Le, & An, 2020; Zorcec, Jakovska, Micevska, Boskovska, & Cholakovska, 2020). The remaining 60 articles targeted a combination of children and adolescents in primary, middle, and/or high school.

Factors and outcomes

The following factors and outcomes emerged in our review and were used to categorize findings: mental health-related outcomes (depressive symptoms; self-harm, suicidal ideation, and suicide; anxiety symptoms; COVID-19-related fear, concern, and worry; general mental health; mental health service utilization; other mental health outcomes); demographic factors (age, gender); contextual factors (pandemic control measures; social connection; family relationships; technology use and media consumption; and population factors (neurodiverse children and adolescents; chronic physical conditions; additional resilience and protective factors)). We used frequency of reporting and strength of findings to organize the mental health-related outcomes section.

Mental health-related outcomes

COVID-19-related fear, concern, and worry. Thirty-five articles discussed COVID-19-related fear, concern, or stress in children and adolescents (Abawi et al., 2020; Abdulah, Abdulla, & Liamputtong, 2020; Adibelli & Sumen, 2020; Al Omari et al., 2020; Alshahrani et al., 2020; Anbarasu & Bhuvaneswari, 2020; Asbury et al.,

2020; Banati et al., 2020; Buzzi et al., 2020; Commodari & La Rosa, 2020; Dumas et al., 2020; Ellis et al., 2020; Evans et al., 2020; Guo et al., 2020; Idoiaga, Berasategi, Eiguren, & Picaza, 2020; Jefsen et al., 2020; Jiao et al., 2020; Kılınçel et al., 2020; Liebana-Presa et al., 2020; Lu et al., 2020; Masuyama et al., 2020; Matovu et al., 2021; McElroy et al., 2020; O'Sullivan et al., 2021; Qi, Liu, et al., 2020; Rauschenberg et al., 2020; Saurabh & Ranjan, 2020; Sciberras et al., 2020; Scott et al., 2021; Secer & Ulas, 2020; Shah, Kaul, Shah, & Maddipoti, 2021; Xie et al., 2020; Xue et al., 2021; Zhang, Zhang, et al., 2020; Zhou, Yuan, et al., 2020). The most reported COVID-19-related fear was fear of infection of either themselves or, more commonly, fear of infecting a vulnerable loved one (Abawi et al., 2020; Abdulah et al., 2020; Adibelli & Sumen, 2020; Alshahrani et al., 2020; Anbarasu & Bhuvaneswari, 2020; Asbury et al., 2020; Banati et al., 2020; Buzzi et al., 2020; Commodari & La Rosa, 2020; Dumas et al., 2020; Ellis et al., 2020; Evans et al., 2020; Guo et al., 2020; Idoiaga et al., 2020; Jefsen et al., 2020; Jiao et al., 2020; Kılınçel et al., 2020; Liebana-Presa et al., 2020; Lu et al., 2020; Masuyama et al., 2020; Matovu et al., 2021; McElroy et al., 2020; O'Sullivan et al., 2021; Qi, Zhou, et al., 2020; Rauschenberg et al., 2020; Saurabh & Ranjan, 2020; Sciberras et al., 2020; Scott et al., 2021; Secer & Ulas, 2020; Shah et al., 2021; Xie et al., 2020; Xue et al., 2021; Zhang, Zhang, et al., 2020; Zhou, Yuan, et al., 2020). An Indian study noted that 23% of children kept a daily count of deaths and hospitalizations from COVID-19 (Shah et al., 2021).

Other reported reasons for fear and concern during the COVID-19 pandemic included fear of not being able to cope with academic workload and worries about the impact of COVID-19 on the school year and future plans (Anbarasu & Bhuvaneswari, 2020; Ellis et al., 2020; Kılınçel et al., 2020; O'Sullivan et al., 2021; Scott et al., 2021). For example, a study in Canada showed that 73% of adolescents surveyed in April 2020 were 'very concerned' about the impact of COVID-19 on their school year (Ellis et al., 2020). Young people in two studies also reported fear of becoming socially isolated from their friends (Kılınçel et al., 2020; Scott et al., 2021).

Increased feelings of fear and concern regarding COVID-19, measured via the 'Fear of COVID-19 Scale' and other COVID-19-specific questionnaires, were found to be cross-sectionally associated with higher levels of depressive and anxious symptoms, measured via separate questionnaires used to screen for those disorders (Chi et al., 2021; Lu et al., 2020), post-traumatic stress (Guo et al., 2020), lower emotional well-being (Adibelli & Sumen, 2020; Commodari & La Rosa, 2020), and insomnia (Chi et al., 2021). COVID-19-related cognitive preoccupation, worries, and anxiety were cross-sectionally associated with current use of mental health-related apps (Rauschenberg et al., 2020). In contrast, Qi, Liu, et al., (2020) observed that adolescents who were more concerned about COVID-19 experienced fewer anxious symptoms. The authors speculate that this relationship may be explained by a positive correlation between concern and knowledge of COVID-19, a factor which could protect against more severe fear and anxiety regarding the pandemic. In line with this hypothesis, Zhou, Zhang, et al., (2020) observed that those with more knowledge of the local COVID-19 epidemic and associated control measures reported fewer anxious symptoms.

Depressive symptoms

A majority of studies measured depressive symptoms as a mental health outcome. Of these, twenty-five articles identified a higher prevalence of depressive symptoms in children and adolescents during the pandemic compared to the prepandemic period (Abdulah et al., 2020; Breaux et al., 2021; Chen, Chen, et al., 2020; Crescentini et al., 2020; Duan et al., 2020; Ellis et al., 2020; Giannopoulou et al., 2021; Glynn et al., 2021; Gotlib et al., 2020; Janssen et al., 2020; Lee et al., 2021; Lu et al., 2020; Magson et al., 2021; Matovu et al., 2021; Oosterhoff et al., 2020; O'Sullivan et al., 2021; Rogers et al., 2021; Sama et al., 2021; Scott et al., 2021; Secer & Ulas, 2020; Xie et al., 2020; Zhang, Ye, et al., 2020; Zhang, Zhang, et al., 2020; Zhou, Yuan, et al., 2020; Zhou, Zhang, et al., 2020). In contrast, a small minority of studies detected a decrease in depressive symptoms (Ezpeleta et al., 2020; Tso et al., 2020; Xiang, Zhang, & Kuwahara, 2020). Ezpeleta et al., (2020) suggested that differences between parent and child self-report may have accounted for the decrease they observed among adolescents in Barcelona. On the other hand, Xiang, Zhang, et al., (2020) proposed that high ownership of digital devices, rapid implementation of remote learning, and a reduction in stresses experienced by some students at school may explain the decline in depressive symptoms they noted in a sample of 6- to 17-year-old students in Shanghai. Studies conducted at the height of the epidemic in China (January–May 2020) reported depression prevalence estimates ranging from 11% to 45% (Duan et al., 2020; Lu et al., 2020; Murata et al., 2021; Sama et al., 2021; Xie et al., 2020; Zhou, Zhang, et al., 2020), with one study of adolescents after extended lockdown reporting a prevalence of 64% (Zhou, Zhang, et al., 2020), compared with prepandemic estimates in similar populations ranging from 13% to 17% (Stewart & Sun, 2007; Xu et al., 2020).

Anxiety symptoms

The majority of studies measured anxiety symptoms in young people; among these, 17 found increased levels of anxiety symptoms in comparison with prepandemic estimates (Amorim et al., 2020; Asbury et al., 2020; Breaux et al., 2021; Chen, Chen, et al., 2020; Conti et al., 2020; Duan et al., 2020; Giannopoulou et al., 2021; Lee et al., 2021; Lu et al., 2020; Magson et al., 2021; Meherali et al., 2021; O'Sullivan et al., 2021; Ravens-Sieberer et al., 2021; Rogers et al., 2021; Sama et al., 2021; Xie et al., 2020; Zhang, Ye, et al., 2020; Zhou, Zhang, et al., 2020). No studies reported a decrease in anxiety symptoms; however, Zhang, Zhang, et al., 2020 reported no change in anxiety symptoms among middle and junior high school students in a longitudinal cohort comparing prepandemic (November 2020) and subsequent to school reopening (May 2020) surveys. Prevalence of anxiety in cross-sectional studies ranged from a low of 8% (China) (Yue et al., 2020) to as high as 74% (Egypt) (Alamrawy et al., 2021). Studies with lower estimates of anxiety (8%–25%) tended to only include younger children and adolescent populations (<12 years) (de Avila et al., 2020; Xie et al., 2020; Xue et al., 2021; Yue et al., 2020) and/or take place

approximately more than six weeks after the initial enactment of regional lockdown measures (Cao et al., 2021; Shitao Chen, Cheng, & Wu, 2020; Li et al., 2021; Ravens-Sieberer et al., 2021; Tang, Xiang, Cheung, & Xiang, 2021; Zhang, Ye, et al., 2020; Zhang, Zhang, et al., 2020). Mid-to-high estimates of anxiety (34%–74%) were more frequently observed in studies conducted within six weeks of the initial lockdown restrictions in the region (Giannopoulou et al., 2021; Qi, Zhou, et al., 2020; Yeasmin et al., 2020; Zhou, Wang, et al., 2020; Zhou, Zhang, et al., 2020) and/or in studies that focused on older adolescents (>15 years) (Chi et al., 2021; Giannopoulou et al., 2021; Lu et al., 2020), as well as during periods of high local COVID-19 case counts (Alamrawy et al., 2021).

General mental health

Eight cross-sectional studies assessed changes in children and adolescents' overall mental health related to the COVID-19 pandemic (Amran, 2020; Cusinato et al., 2020; Gadermann et al., 2021; Patra et al., 2020; Pons et al., 2020; Scott et al., 2021; Theis et al., 2021; Vallejo-Slocker, Fresneda, & Vallejo, 2020). Four articles noted that a majority of included children retrospectively reported that they had worse overall mental health than before the pandemic (Amran, 2020; Pons et al., 2020; Theis et al., 2021; Vallejo-Slocker et al., 2020), while participants in two studies described no or positive changes among most participants (Cusinato et al., 2020; Gadermann et al., 2021; Patra et al., 2020).

Self-harm, suicidal ideation, and suicide

Prevalence of suicidal ideation, suicide, and nonsuicidal self-injury (NSSI) during the COVID-19 pandemic was reported in eight articles (Banati et al., 2020; Ellis et al., 2020; Jefsen et al., 2020; Matovu et al., 2021; Murata et al., 2021; Tanaka & Okamoto, 2021; Theis et al., 2021; Zhang, Zhang, et al., 2020). Three studies examined the prevalence of NSSI during the pandemic (Jefsen et al., 2020; Theis et al., 2021; Zhang, Zhang, et al., 2020), with Zhang, Zhang, et al. (2020) observing a statistically significant increase in NSSI from 32% to 42% after the enactment of school closures in a cohort of Chinese students.

Six studies reported occurrence of pandemic-related suicidal ideation in children and adolescents (Banati et al., 2020; Ellis et al., 2020; Jefsen et al., 2020; Matovu et al., 2021; Murata et al., 2021; Zhang, Zhang, et al., 2020). Of the six studies, three reported increased estimates of suicidal ideation in comparison to prepandemic estimates (Ellis et al., 2020; Murata et al., 2021; Zhang, Zhang, et al., 2020). For example, in Canada, 18% of adolescents surveyed from April 4–6, 2020, reported having thoughts of ending their life, a notable increase from 2017 reports of 6% (Ellis et al., 2020). Similarly in the United States, rates of suicidal ideation in adolescents rose from 17% in 2017 to 37% during the pandemic (Murata et al., 2021). An increase in suicidal ideation among Chinese adolescents from 23% to 30% (Zhang, Zhang, et al., 2020) was also reported. Lastly, monthly suicide rates in Japan increased by 49% among children and adolescents during the second wave of the pandemic (July–October 2020) (Tanaka & Okamoto, 2021).

Mental health service utilization

Eight studies measured longitudinal changes during the COVID-19 pandemic in child and adolescent utilization of mental health services (Bothara et al., 2021; Cheek et al., 2020; Chen, She, et al., 2020; Diaz de Neira et al., 2020; Ferrando et al., 2020; Leeb et al., 2020; Leff et al., 2021; Tromans et al., 2020). Of the studies analyzing emergency department (ED) data, two studies noted an increase in pediatric mental health-related presentations (Cheek et al., 2020; Leeb et al., 2020) and four studies observed a decrease (Bothara et al., 2021; Diaz de Neira et al., 2020; Ferrando et al., 2020; Leff et al., 2021). Self-injurious behaviors were the most predominant reasons for consultation at an ER in Spain (Diaz de Neira et al., 2020), and rates of pediatric self-injurious behavior were found to increase at a tertiary ED during a lockdown period in New Zealand (Bothara et al., 2021).

In two studies in the United Kingdom, child and adolescent secondary referral rates to mental health services remained the same (Chen et al., 2020) or declined (Tromans et al., 2020). Diaz de Neira et al., (2020) found that hospitalization rates related to child and adolescent mental health diagnoses rose, but average length-of-stay fell compared to 2019 in an ED located in Madrid, Spain. Additionally, Ferrando et al., (2020) reported that pediatric ED presentations with substance use, mania, and psychosis had increased, and that presentations with suicide attempts, aggression/agitation, and among those with a previous psychiatric history had decreased.

Other mental health outcomes

Studies included in this review investigated additional outcomes related to mental health such as conduct problems and prosocial behaviors (Alonso-Martínez et al., 2021; Cusinato et al., 2020; Ezpeleta et al., 2020; Gassman-Pines et al., 2020; Luthar et al., 2020; Mallik & Radwan, 2021; Nonweiler et al., 2020; Romero et al., 2020; Spinelli, Lionetti, Pastore, & Fasolo, 2020; Tso et al., 2020; Wiguna et al., 2020), attention deficits and hyperactivity (Cusinato et al., 2020; Mallik & Radwan, 2021; Nonweiler et al., 2020; Ravens-Sieberer et al., 2021; Spinelli, Lionetti, Pastore, et al., 2020; Tso et al., 2020; Wiguna et al., 2020; Zhang, Shuai, et al., 2020), loneliness (Abdulah et al., 2020; Esposito et al., 2020; Rogers et al., 2021; Sciberras et al., 2020), anger (Patra et al., 2020; Sama et al., 2021), positive and negative affect (Janssen et al., 2020; Rogers et al., 2021), grief (Murata et al., 2021), somatic symptoms (Crescentini et al., 2020), eating problems (Alamrawy et al., 2021), and substance use (Dumas et al., 2020).

Demographic factors affecting child and adolescent mental health outcomes

Age

Overall, older children and adolescents exhibited more depressive symptoms (Ademhan Tural et al., 2020; Fitzpatrick et al., 2020; Ren, He, Bian, Shang, & Liu, 2021; Tang et al., 2021) and higher levels of stress, worry, concern, and fear related to COVID-19 (Buzzi et al., 2020; Commodari & La Rosa, 2020; Ellis et al., 2020; Liebana-Presa et al., 2020; Matovu et al., 2021; Tang et al., 2021; Xie et al., 2020) than younger children. In contrast, Xiang, Zhang, et al., (2020) longitudinally observed both

that all student participants experienced a decline in depressive symptoms from January to March 2020 and that middle school students experienced a more pronounced decrease than primary school students. The authors hypothesized that older students may have experienced a stronger drop in depressive symptoms due to postponement of middle school examinations. Romero et al., (2020) found that 3- to 6-year-old children experienced more hyperactivity and conduct problems related to COVID-19 than 7- to 12-year-old children. Additionally, Tso et al., (2020) observed that 6- to 12-year-old children experienced a stronger correlation between more screen time during the COVID-19 pandemic and worse mental and emotional well-being than 2- to 5-year-old children.

Gender

In most studies, girls reported higher levels of worry, concern, and fear regarding COVID-19 (Buzzi et al., 2020; Ellis et al., 2020; Gotlib et al., 2020; Liebana-Presa et al., 2020; Magson et al., 2021; Matovu et al., 2021; Xie et al., 2020), as well as more notable declines in general mental health during the pandemic based on retrospective self-report (Gotlib et al., 2020; Pons et al., 2020) compared with boys. Only one study found that girls experienced lower deterioration in general mental health compared to boys (Mallik & Radwan, 2021). However, girls exhibited equivalent changes in depressive symptoms related to the COVID-19 pandemic compared with boys (Ren et al., 2021; Xiang, Zhang, et al., 2020). Additionally, Scott et al., (2021) observed that gender diverse students described more mental health challenges related to the pandemic than either girls or boys.

Contextual- and population-level factors affecting child and adolescent mental health outcomes

Pandemic control measures

The effect of public health pandemic control guidelines on child and adolescent mental health was examined by numerous articles. Contact-restriction procedures such as physical and social distancing were the most frequently reported control measures. Many studies reported the occurrence of negative emotions or mental health deterioration due to COVID-19 pandemic control measures (Abdulah et al., 2020; Adibelli & Sumen, 2020; Alshahrani et al., 2020; Amran, 2020; Cacioppo et al., 2020; Esposito et al., 2020; Evans et al., 2020; Fitzpatrick et al., 2020; Gadermann et al., 2021; Giannopoulou et al., 2021; Glynn et al., 2021; Gotlib et al., 2020; Idoiaga et al., 2020; Magson et al., 2021; Mallik & Radwan, 2021; Masi et al., 2021; Munasinghe et al., 2020; O'Sullivan et al., 2021; Ravens-Sieberer et al., 2020, 2021; Ren et al., 2021; Rogers et al., 2021; Sama et al., 2021; Saurabh & Ranjan, 2020; Sciberras et al., 2020; Scott et al., 2021; Shah et al., 2021; Theis et al., 2021; Mi Xiang, Zhang, et al., 2020; Yeasmin et al., 2020; Zorcec et al., 2020). For instance, 71% of surveyed German youth reported feeling burdened by measures reducing social contact during the pandemic (Ravens-Sieberer et al., 2020). Specifically, children and adolescents were unhappy about lower levels of in-person interaction resulting in a sense that their relationships with others were deteriorating (Alshahrani et al., 2020; Amran, 2020; Cacioppo et al., 2020; Esposito et al., 2020; Ravens-Sieberer et al., 2021; Rogers et al., 2021; Scott et al., 2021; Shah et al., 2021), cancelation of in-person activities and events (Abdulah et al., 2020; Esposito et al., 2020; Evans et al., 2020; O'Sullivan et al., 2021; Scott et al., 2021; Shah et al., 2021), not enough time outside (Idoiaga et al., 2020; Rogers et al., 2021), and too much family time (Rogers et al., 2021; Yeasmin et al., 2020). However, more lenient COVID-19 pandemic control policies were also found to be cross-sectionally associated with greater internalizing and externalizing problems in children and adolescents (Fitzpatrick et al., 2020). Additionally, compliance with public health guidelines and beliefs that restrictions were appropriate were cross-sectionally correlated with a greater number of positive feelings since the pandemic began in one study (Commodari & La Rosa, 2020).

Some young people or their parents reported that, as a result of stay-at-home orders and increased time at home, children were found to fight more frequently with their siblings (Amran, 2020; Evans et al., 2020; Zorcec et al., 2020), to have more conflicts with parents (Amran, 2020; Evans et al., 2020; Gadermann et al., 2021; Ravens-Sieberer et al., 2020, 2021; Zorcec et al., 2020), and to lack a daily routine (O'Sullivan et al., 2021). However, participants in some studies also noted positive effects of the lockdown measures for young people such as increased family time (Gadermann et al., 2021; Sciberras et al., 2020) and more time to relax (Sciberras et al., 2020). Families and individuals that employed daily routines during lockdown were found to experience fewer adverse mental health outcomes (Glynn et al., 2021; O'Sullivan et al., 2021; Ren et al., 2021).

Changes to school systems to facilitate physical distancing, such as the transition to online schooling during the early stages of the pandemic, were most commonly noted to contribute to an increasingly stressful environment for many children and adolescents (Shitao Chen, et al., 2020; Giannopoulou et al., 2021; Magson et al., 2021; O'Sullivan et al., 2021; Ravens-Sieberer et al., 2020, 2021; Rogers et al., 2021; J. Zhou, Yuan, et al., 2020). In one study, 65% of German middle and high school students found school and learning to be more exhausting during the pandemic (Ravens-Sieberer et al., 2020). However, several studies noted that some students had experienced improved mental health because school closures had alleviated usual school stress (Patra et al., 2020; Sciberras et al., 2020; Xiang, Zhang, et al., 2020).

Social connection

Multiple studies reported social isolation due to COVID-19 restrictions to be negatively associated with child and adolescent mental health outcomes. Many children felt they were missing out on usual daily activities and had lost relationships with peers, leading to increased anger, worry, helplessness, annoyance, post-traumatic stress symptoms, grief, depression, and loneliness (Abdulah et al., 2020; Cacioppo et al., 2020; Evans et al., 2020; Fish et al., 2020; Janssen et al., 2020; Murata et al., 2021; O'Sullivan et al., 2021; Ravens-Sieberer et al., 2020; Rogers et al., 2021; Saurabh & Ranjan, 2020; Scott et al., 2021; Shah et al., 2021), as well as lower levels of happiness and positive emotions (Munasinghe

et al., 2020). Similarly, one study found evidence of a cross-sectional dose–response relationship between increased isolation and psychological distress (Rauschenberg et al., 2020).

Many children found online learning to be difficult due to a lack of interaction with teachers, schoolmates, and friends (Esposito et al., 2020; Evans et al., 2020; Fontenelle-Tereshchuk, 2020; Ravens-Sieberer et al., 2020). Esposito et al., (2020) observed that younger children (aged 11-13) had greater negative mental health outcomes due to this change in routine and supports compared to older children (aged 14–19). Oosterhoff et al., (2020) additionally noted that those who were practicing physical distancing to avoid judgment or falling ill reported greater anxiety symptoms and those who practiced distancing because of friends' recommendations reported greater depressive symptoms.

In contrast, Esposito et al., (2020) noted that 25% of girl and 19% of boy adolescents surveyed stated that their relationships had improved throughout the pandemic. Moreover, some adolescents said they were able to rebuild their social habits and maintain contact with friends through increased online communication despite physically isolating at home (Buzzi et al., 2020; Janssen et al., 2020).

Family relationships

Family impacts related to the pandemic were frequently associated with mental health changes among young people during the pandemic. Children of parents who reported poorer current mental health or declining mental health in response to the pandemic exhibited more negative COVID-19-related mental health changes in four cross-sectional studies (Ademhan Tural et al., 2020; Evans et al., 2020; Romero et al., 2020; Spinelli, Lionetti, Pastore, et al., 2020). Similarly, higher parental worry about the threat posed by COVID-19 and its impact on their families was negatively correlated with child and adolescent mental health in three cross-sectional studies (Spinelli, Lionetti, Setti, et al., 2020; Spinelli, Lionetti, Pastore, et al., 2020; Waller et al., 2021). Spinelli, Lionetti, Setti, et al., 2020 noted that parents who described more parenting difficulties during the pandemic noted higher emotional negativity and more problems with emotional regulation among their children. In addition, Ademhan Tural et al., (2020) found that parents who placed greater pressure on their children to protect themselves from COVID-19 reported that their children had experienced a larger increase in depressive and anxious symptoms.

Additionally, family relationships emerged as a potential modifier of child and adolescent mental health changes during the pandemic. In several cases, parents and children reported that the pandemic had encouraged higher levels of family intimacy (Evans et al., 2020; Gadermann et al., 2021; Patra et al., 2020; Rogers et al., 2021; Xiang, Zhang, et al., 2020). Guo et al., (2020) found evidence that an interaction between adverse childhood experiences—including family abuse, neglect, and household dysfunction—and COVID-19 exposure was cross-sectionally associated with higher self-reported post-traumatic stress symptoms. Meanwhile, Shek et al., (2021) observed that stronger parent–child relationships before the pandemic was longitudinally associated with fewer post-traumatic stress symptoms related to COVID-19.

Technology use and media consumption

Recreational technology use such as checking social media, smartphone and Internet use, watching TV, and gaming during physical distancing and lockdown measures was reported in a large proportion of articles (Adibelli & Sumen, 2020; Amran, 2020; Chen, Chen, et al., 2020; Commodari & La Rosa, 2020; Duan et al., 2020; Evans et al., 2020; Fish et al., 2020; Fontenelle-Tereshchuk, 2020; Janssen et al., 2020; Jiao et al., 2020; Kılınçel et al., 2020; Li et al., 2021; Magson et al., 2021; Masi et al., 2021; Munasinghe et al., 2020; Murata et al., 2021; O'Sullivan et al., 2021; Patra et al., 2020; Ren et al., 2021; Sciberras et al., 2020; Shah et al., 2021; Tso et al., 2020), with one study reporting a doubling of time spent on smartphones and social media platforms during the pandemic (Chen, Chen, et al., 2020). Greater youth Internet, social media, gaming, and smartphone use exhibited significant positive cross-sectional correlations with anxiety (Duan et al., 2020; Li et al., 2021; O'Sullivan et al., 2021; Shah et al., 2021) and depression (Li et al., 2021; Murata et al., 2021; Ren et al., 2021; Shah et al., 2021) scores, as well as overall mental and psychological problems (Adibelli & Sumen, 2020; Magson et al., 2021; Murata et al., 2021; Sciberras et al., 2020) This negative correlation between technology use and mental health outcomes was found to be especially pronounced in younger age groups, even if usage was for learning purposes (Tso et al., 2020).

A study in China reported children at higher risk of anxiety and PTSD spent much more time on COVID-19 related media reports (Yue et al., 2020). Similarly, children and adolescents who consumed COVID-19 news and used social media the most during the pandemic experienced the highest levels of depression and stress (Ellis et al., 2020; Kılınçel et al., 2020; Yue et al., 2020). Conversely, use of social media to stay connected with friends and relatives was hypothesized to act as a buffer for feelings of loneliness, and may have even bolstered mental well-being during the pandemic (Janssen et al., 2020). Notably, LGBTQ-identifying adolescents highlighted the importance of online text-based platforms to allow for continued connection with peers and supportive individuals (i.e., staff from LGBTQ organizations, 'chosen family'), without fear of parents overhearing their conversations (Fish et al., 2020).

Neurodiverse children and adolescents

Nineteen studies described the experience of neurodiverse children and adolescents during the COVID-19 pandemic (Amorim et al., 2020; Asbury et al., 2020; Breaux et al., 2021; Colizzi et al., 2020; Conte et al., 2020; Conti et al., 2020; Evans et al., 2020; Graziola et al., 2020; Jefsen et al., 2020; Masi et al., 2021; Nonweiler et al., 2020; O'Sullivan et al., 2021; Patra et al., 2020; Paulauskaite et al., 2021; Sciberras et al., 2020; Secer & Ulas, 2020; Storch et al., 2021; Theis et al., 2021; Zhang, Shuai, et al., 2020).

Conditions included autism spectrum disorder (ASD) (Amorim et al., 2020; Asbury et al., 2020; Colizzi et al., 2020; Jefsen et al., 2020; Masi et al., 2021; Nonweiler et al., 2020; O'Sullivan et al., 2021), attention deficit disorder/attention deficit hyperactivity disorder

(ADD/ADHD) (Asbury et al., 2020; Breaux et al., 2021; Jefsen et al., 2020; Masi et al., 2021; Nonweiler et al., 2020; Sciberras et al., 2020; Zhang, Shuai, et al., 2020), obsessive-compulsive disorder (OCD) (Jefsen et al., 2020; Masi et al., 2021; Secer & Ulas, 2020; Storch et al., 2021), Tourette syndrome (Conte et al., 2020; Graziola et al., 2020; Masi et al., 2021), and other neurodiverse conditions (Conti et al., 2020; Evans et al., 2020; Masi et al., 2021; Patra et al., 2020; Paulauskaite et al., 2021; Theis et al., 2021).

Neurodiverse populations reported more severe emotional and anxious symptoms during the pandemic compared with non-neurodiverse populations in both surveys (Amorim et al., 2020; Nonweiler et al., 2020) and qualitative data (O'Sullivan et al., 2021). In particular, increases in anxiety (Amorim et al., 2020; Asbury et al., 2020; Breaux et al., 2021; Conti et al., 2020; O'Sullivan et al., 2021; Sciberras et al., 2020; Secer & Ulas, 2020) and worsening symptoms (Asbury et al., 2020; Breaux et al., 2021; Colizzi et al., 2020; Conte et al., 2020; Conti et al., 2020; Graziola et al., 2020; Jefsen et al., 2020; Masi et al., 2021; Secer & Ulas, 2020; Zhang, Shuai, et al., 2020) were frequently observed across neurodevelopmental conditions. Participants in several studies cited disruptions to daily routines such as lack of access to schools, routine health care, and other specialized facilities as a contributing factor to the observed behavioral, emotional, and mental health changes (Amorim et al., 2020; Asbury et al., 2020; Conte et al., 2020; Masi et al., 2021; O'Sullivan et al., 2021; Sciberras et al., 2020; Theis et al., 2021).

Chronic physical conditions

Five studies presented results on children and adolescents with chronic physical health conditions including chronic respiratory conditions (Ademhan Tural et al., 2020; Zorcec et al., 2020), cancer (Alshahrani et al., 2020), inflammatory bowel syndrome (IBS) (Martinelli, Strisciuglio, Fedele, Miele, & Staiano, 2020), and other physical disabilities (Cacioppo et al., 2020). The majority of studies found a marked decrease in mental health during the pandemic (Ademhan Tural et al., 2020; Alshahrani et al., 2020; Cacioppo et al., 2020; Zorcec et al., 2020). In particular, children and adolescents with chronic respiratory diseases reported greater mental health deterioration than those without respiratory disease (Ademhan Tural et al., 2020), and children and adolescents with cancer were more likely to experience anxiety surrounding COVID-19 infection than general population estimates (Alshahrani et al., 2020).

Additional resilience and protective factors

Notably, coping methods were reported by children and adolescents, including activities such as engaging in hobbies (Banati et al., 2020; Commodari & La Rosa, 2020; Li et al., 2021; O'Sullivan et al., 2021; Shah et al., 2021), listening to music (Janssen et al., 2020; Shah et al., 2021), praying (Alamrawy et al., 2021), and maintaining a routine (O'Sullivan et al., 2021). In particular, higher levels of physical activity (Alonso-Martínez et al., 2021; Banati et al., 2020; Chi et al., 2021; Ellis et al., 2020; Jiao et al., 2020; Lee et al., 2021; Li et al., 2021; Lu et al., 2020; Munasinghe et al., 2020; O'Sullivan et al., 2021; Ren et al., 2021; Sciberras et al., 2020; Shah et al., 2021; Zhou, Yuan, et al., 2020) and time playing outside (Banati et al., 2020; Gadermann et al., 2021; Patra et al., 2020) were commonly correlated cross-sectionally with better mental health outcomes. Increasing knowledge and awareness of COVID-19 prevention and control measures were also cross-sectionally associated with reduced anxiety and depression, and overall better mental health (Alamrawy et al., 2021; Asbury et al., 2020; Xue et al., 2021; Zhou, Zhang, et al., 2020). Children and adolescents who looked to the future optimistically and confidently were also found to have a higher health-related quality of life (Ravens-Sieberer et al., 2020) associated with fewer depressive symptoms (Xie et al., 2020).

Discussion

This review identified studies describing mental health of children and adolescents during the first year of the COVID-19 pandemic. Cross-sectional design was used in 76% of the studies and almost a third focused on specific subgroups rather than general population samples. The greatest number of studies were undertaken in Europe, followed by East Asia and North America, which may reflect the geography of the pandemic's earliest studied impacts. Notably, fewer than 15% of all available studies used validated instruments, which can lead to challenges in interpreting the clinical relevance of mental health impacts and differentiation of adaptive symptoms and mental illness.

Most studies observed increases in the number of depressive and anxious symptoms reported by participants, as well as a worsening trend in general mental health, since before the pandemic. In general, government pandemic control policies that limited social interactions were associated with more depressive and anxious symptoms (Chen, Chen, et al., 2020; Duan et al., 2020; Ellis et al., 2020; Gotlib et al., 2020; Jiao et al., 2020; Oosterhoff et al., 2020; Secer & Ulas, 2020; Xie et al., 2020; Zhou, Zhang, et al., 2020). These symptoms were more common among older children and adolescents and girls, which parallels prepandemic distributions (Chen, Chen, et al., 2020; Gotlib et al., 2020; Jiao et al., 2020; Leff et al., 2021; McElroy et al., 2020; Ren et al., 2021; Spinelli, Lionetti, Setti, et al., 2020; Zhou, Zhang, et al., 2020). Neurodiverse children and adolescents and those with pre-existing mental illness have also experienced higher levels of psychological distress, depression, anxiety, and behavior problems since the start of the pandemic (Asbury et al., 2020; Breaux et al., 2021; Colizzi et al., 2020; O'Sullivan et al., 2021; Secer & Ulas, 2020; Zhang, Zhang, et al., 2020); similarly, those with chronic physical health conditions including chronic respiratory conditions (Ademhan Tural et al., 2020; Zorcec et al., 2020), cancer (Alshahrani et al., 2020) also experienced greater negative mental health impacts than those without those conditions. Preliminary findings suggest an increased prevalence of suicidal ideation, suicide, and nonsuicidal self-injury among children and adolescents during the pandemic (Ellis et al., 2020; Murata et al., 2021; Zhang, Zhang, et al., 2020). However, these findings should be interpreted with caution as it is important to consider the timing and context of studies (e.g., undertaken during lockdown vs. return to school setting) that can inform trends for these outcomes and others.

Factors associated with anxiety ranged from fear of oneself or loved ones contracting COVID-19, to concern about the economic and social repercussions of the pandemic (McElroy et al., 2020). A rise in anxiety symptoms was frequently matched to an increase in depressive symptoms, consistent with previous research on comorbid patterns of anxiety and depression (Hirschfield, 2001; Lamers et al., 2011). Furthermore, estimates of anxiety prevalence were higher in the periods shortly after enactment of regional lockdown measures (Cao et al., 2021; Chen, Cheng, et al., 2020; Li et al., 2021; Ravens-Sieberer et al., 2021; Tang et al., 2021; Zhang, Ye, et al., 2020; Zhang, Zhang, et al., 2020) than in estimates taken several months after (Giannopoulou et al., 2021; Qi et al., 2020; Yeasmin et al., 2020; Zhou, Wang, et al., 2020; Zhou, Zhang, et al., 2020) and may indicate gradual acclimation to lockdown restrictions by children and adolescents. Additionally, children and adolescents reported high rates of COVID-19-related fear, concern, and stress, suggesting that a preoccupation with the threat posed by COVID-19 may markedly impact young people's mental well-being (Buzzi et al., 2020; Ellis et al., 2020; Jiao et al., 2020; Masuyama et al., 2020; Saurabh & Ranjan, 2020; Xie et al., 2020).

Emerging evidence provides rationale for increased mental health concerns for children and adolescents during the pandemic. School closures and physical distancing may result in increased loneliness, which a review of 63 studies found was correlated with anxiety and depression (Loades et al., 2020). With increased time at home during lockdown, some children are exposed to spillover effects from stressful home environments, including family violence and parental substance use disorders, as adult family members experience adverse economic impacts, increased stress, reduced access to respite, and mental health concerns themselves (Ademhan Tural et al., 2020; Brown, Doom, Lechuga-Pena, Watamura, & Koppels, 2020; Cioffi & Leve, 2020; Evans et al., 2020; Romero et al., 2020; Maria Spinelli, Lionetti, Pastore, et al., 2020). Pandemic control measures such as restrictions on recreational spaces and activities may also limit options for physical activity, time spent outside the home, and respite care (Phillips et al., 2020; Tison et al., 2020; Wang et al., 2020). Lastly, excess Internet and social media use has been correlated with mental distress for children and adolescents (Chen, Chen, et al., 2020; Moore et al., 2020; Pietrobelli et al., 2020; Mi Xiang, Zhang, et al., 2020). These stressors add to concerns about the risk of SARS-CoV-2 infection and an uncertain future.

Despite the likely need for greater mental support during lockdown, restriction measures may discourage and decrease support-seeking behaviors. In all six studies examining ED data, decreases in emergency mental health presentations were observed immediately after enforcement of national lockdown measures in four countries (Bothara et al., 2021; Cheek et al., 2020; Diaz de Neira et al., 2020; Ferrando et al., 2020; Leeb et al., 2020; Leff et al., 2021). Similar decreases in total ED presentations during lockdown periods have been observed in other populations (Hartnett et al., 2020; Jeffery et al., 2020), likely reflecting strong public adherence to national and international-level risk messaging to avoid public spaces and other high-transmission areas (Jeffery et al., 2020; Rosenbaum, 2020). However, delay of appropriate support and treatment for mental health concerns, particularly in the earlier stages of life, often exacerbates frequency and severity of mental health symptoms, ultimately resulting in poorer health outcomes and greater need for treatment later on (Kisely, Scott, Denney, & Simon, 2006; Malla et al., 2018; McGorry, Purcell, Goldstone, & Amminger, 2011). Indeed, pediatric mental health presentations to the ED steadily increased in the months following the initial lockdown period, surpassing prepandemic rates by October 2020 (Leeb et al., 2020), and suggests prolonged duration of lockdown procedures may result in continuous mental health deterioration for children and adolescents.

Notably, greater consumption of COVID-19-related news coverage during the pandemic was positively correlated with depressive and anxiety symptoms (Duan et al., 2020; Ellis et al., 2020; Zhou, Wang, et al., 2020). Conversely, children and adolescents who felt better informed about the COVID-19 pandemic and associated control measures were associated with fewer symptoms of depression and anxiety during the pandemic's early stages (Masuyama et al., 2020; Qi, Liu, et al., 2020; Zhou, Zhang, et al., 2020). This finding highlights that while traditional and social media may offer effective ways to share up-to-date news and communicate public health messaging, prolonged exposure may be detrimental for child and adolescent mental health.

Fostering positive mental well-being may have important impacts in promoting resilience and preventing poor mental health outcomes (Keyes, 2002). Physical exercise, access to entertainment, positive familial relationships, and social support were associated with better mental health outcomes in several studies (Buzzi et al., 2020; Duan et al., 2020; Gadermann et al., 2021; Jiao et al., 2020), suggesting they may contribute to mental health resilience during the pandemic. Notably, protective health behaviors for children and adolescents which have declined during the pandemic (Moore et al., 2020; Pietrobelli et al., 2020; Mi Xiang, Zhang, et al., 2020)—such as sufficient movement, routines, sleep, and nutrition—are favorably associated with social and emotional health for children and adolescents (Rollo, Antsygina, & Tremblay, 2020) and may be important targets for intervention. In particular, social support was associated with significantly fewer symptoms of depression, anxiety, and insomnia. Social connectedness is an important determinant of child and adolescent mental well-being (Jose, Ryan, & Pryor, 2012; Shochet, Dadds, Ham, & Montague, 2006). Children and adolescents need access to meaningful social support in the absence of usual opportunities for face-to-face interaction. Virtual resources connecting isolated peers and phased school restarts with controlled opportunities for in-person contact could mitigate effects of prolonged social isolation.

Directions for future research

Few studies have explored personal and contextual factors which may contribute to young people's mental resilience during the COVID-19 pandemic. Though the impact of socioeconomic disadvantage and race, key social determinants of mental health, did not emerge as key themes in our review due to a dearth of papers

addressing these subjects, both have been associated with poor mental health outcomes related to social marginalization (Priest et al., 2013; Reiss, 2013) and are important areas for future work. A better understanding of these factors, as well as parental mental health and reporting of dual perspectives (child self-report and parent report on child) which may diverge, would be illustrative. Better insight would enable universal, selective, and indicated prevention and treatment strategies to buffer children and adolescents against negative mental health outcomes not only in the context of the COVID-19 pandemic, but also during future crises. Given the pervasiveness of economic impacts due to the pandemic globally, a focus on universal prevention interventions for children and adolescents that targets social determinants of health (e.g., food security, secure and safe housing, access to education) is warranted (Purgato et al., 2020).

Research studies with longitudinal designs and with defined comparison groups are needed to investigate possible risk and protective factors, as well as other long-term mental health impacts on child and adolescent mental health. The current evidence base consists primarily of cross-sectional data; additional longitudinal findings will allow improved evaluation of causal relationships between pandemic pressures and mental health outcomes, as well as identify which groups continue to need mental health care and treatment or would benefit from prevention measures as pandemic conditions and associated control measures ease. Additionally, longitudinal data allow measurement of prolonged exposure to the threat of infection and concurrent efforts to contain the pandemic that may create 'allostatic load', accumulated physiological wear and tear resulting from repeated stress responses (Evans, Li, & Whipple, 2013). Similarly, 'sleeper effects', mental health ramifications that manifest after a specific developmental period of neurobiological maturation, may only become apparent after a period of time (Wade, Prime, & Browne, 2020). To investigate these potential long-term and dose–response relationships and identify subpopulations at increased risk now and in future, research with ongoing follow-up to assess mental health of children and adolescents during and after the pandemic is needed.

Standardized measurement tools and repositories of COVID-19-related research would facilitate comparison of the evidence on COVID-19's mental health impact. The studies reviewed in this paper did not employ consistent measurement tools to evaluate depression, anxiety, and other mental health outcomes. Methodological heterogeneity across studies precludes comparison to detect potential geographic and cultural influences. In order to enhance comparability of results, researchers should consider using one of the well-validated instruments which have recently emerged to measure COVID-19's mental health impacts, such as the Coronavirus Anxiety Scale (S. A. Lee, 2020), CoRonavIruS Health and Impact Survey (CRISIS) (Nikolaidis et al., 2020), or the Fear of COVID-19 Scale (Ahorsu et al., 2020). Additionally, growth of databases such as COVID-MINDS (Home, 2020) which aim to collate longitudinal mental health research related to COVID-19 will coordinate efforts to assess the global impact of the pandemic and potentially future crises.

Limitations

Given the dynamic nature of the COVID-19 pandemic, this review primarily captures studies undertaken during the first pandemic 'waves', without the ability to capture population-level mental recovery as the pandemic wanes in certain settings. Many studies were cross-sectional in design and undertaken during disparate pandemic conditions that could impact population mental health (e.g., full lockdowns vs. settings of minimal restrictions). Additionally, several studies which included individuals >18 years of age failed to separately report results for their child and adolescent samples, limiting efforts to disentangle adult mental health impacts from those on children and adolescents. Thus, the evidence concerning the COVID-19 pandemic's effects on child and adolescent mental health is relatively nascent. Moreover, heterogeneity of populations, pandemic conditions, mental health outcomes, and the tools used to assess impact in included studies precluded quantitative meta-analysis.

Conclusion

Mental health impacts of the COVID-19 pandemic on children and adolescents are significant and should be of tremendous concern to policymakers and practitioners globally. As the pandemic continues, innovative approaches that increase access to mental health services, as well as promote resilience and mental well-being such as maintaining social connection despite isolation and renewing social ties during the recovery phase may be explored. Similarly, increasing identification and supports for children, adolescents, and families experiencing disproportionate impacts as well as implementation of preventive measures more broadly may reduce long-term mental health sequelae in children and adolescents. Lastly, the pandemic may offer opportunities to identify prepandemic gaps in mental health service provision, adapt systems, and 'build it back better' (Moreno et al., 2020).

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Ethical information

No ethical approval was required for this review.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Table S1. Search strategy used for COVID-indexed databases.

Table S2. Characteristics of articles selected for review.

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