

Table 1. Study characteristics and main results

Author	Sample size by geographical area (n, %)	Sample characteristics (gender, age range etc)	Number of studies included	Pandemic exposure	Mental health outcomes	Results
(Bussières et al., 2021)	Japan (4738, 33.3%), Italy (2101, 14.8%), China (1410, 9.9%), UK (1234, 8.7%), Netherlands (650, 4.6%), South Korea (1236, 8.7%), Switzerland (200, 1.4%), USA (108, 0.8%), Israel (382, 2.7%), Spain (647, 4.6%), Singapore (336, 2.4%), Canada (87, 0.6%), Argentina (267, 1.9%), Turkey (61, 0.4%), Germany (752, 5.3%) Total: 14209	M&F; 5-13 years old (eligibility criteria)	28 (8 studies looked just at sleep, 20 studies on MH)	Quarantine COVID-19 effect on children's MH	Child Behavior Checklist (CBCL), Child Depression Inventory—Short Form (CDI-S), Depression Anxiety Stress Scale-21 (DASS-21), Korean Children and Youth Wellbeing Index (KCYWI), Pediatric Quality of Life Inventory (PedsQL), Revised Children's Anxiety and Depression Scale (RCADS), Screen for Child Anxiety Related Disorders (SCARED), Strength and Difficulties Questionnaire (SDQ), System of Evaluation of Children and Adolescent (SENA)	“COVID-19 lockdown measures were associated with negative general mental health outcomes among children ( $g = 0.28$ , $p < 0.001$ , and $k = 21$ ), but of small magnitude. Sleep habits were also changed during the pandemic, as sleep duration significantly increased in children ( $g = 0.32$ ; $p = 0.004$ , and $k = 9$ ). Moreover, results did not differ between children from the general population and those from clinical populations such as children with epilepsy, oncology, neurodevelopmental disorders, or obesity. Effect sizes were larger in European vs. Asian countries”.
(Chaabane et al., 2021)	Turkey (745, 75%), Italy (245 mothers, 25%, Japan (children under 20 - no specified sample size), USA (2 studies with no specified sample size) Total: 990	M&F, 2-20 years	5 (we only considered 5 out of 10 studies as the others looked at physical health or adult populations)	School closure, home quarantine, social restrictions,	Suicide rates (public statistics), loneliness (UCLA), child abuse (CPS reports), anxiety (STAI).	“The impact of school closures during the COVID-19 pandemic includes loss of access to school-based and critical services and resources particularly for children with disabilities and those living in poorer families. COVID-19 school closures were also associated with increased stress among children and emotional reactions (e.g., sadness, frustration, indiscipline)”

(Chai et al., 2021)	China (27,217, 100%)	M&F, 7-18 years, majority being mid and late adolescents	12	No specific exposure	Depression (DASS-21, DSRs, PHQ-9, CDI-S), Anxiety (SCARED, GAD-7), perceived stress (PSS-10), other mental health outcomes (SSS, SCSQ).	“The pooled prevalence of mental problems was 28% against the 17% of previous national surveys. For depression it was 22%, and for anxiety it was 25%. There was an increasing number of mental problems in CYP during the COVID-19 pandemic”
(Chawla et al., 2021)	Asia (1320338, 94.4%), Europe (36917, 2.6%), North America (32018, 2.3%), South America (5987, 0.4%), Africa (2500, 0.1%), Oceania (248, 0.01%) Total: 1398008	M&F, 0-28 years, majority adolescents, some parent reported studies	102	Mostly no specific exposure, some studies specifically assessed school closure, quarantine, adjustment, stressors, compliance and only child impact	Eating problems (Eating Behavior Questionnaire, CEDQ), Insomnia (ISI), Anxiety and Depression (SADS, CES-DC, GAD), quality of life (PedsQL), sleep (PSQI), social media use (BSMAS), emotion regulation (RESS), executive functions (BRIEF) etc.	“COVID-19 impacts the mental health of youth, particularly causing symptoms of anxiety and depression”
(Cunning & Hodes, 2022)	Denmark (101, 10.8%), Asia (838, 89.2%) Total: 939	M&F, 7-21 years, mainly adolescents	5 (1 American study excluded due to adult only sample)	No specific exposure	Obsessive-compulsive behaviours (CY-BOCS, CGI-S, CGI-I, OCI-CV), other mental health outcomes (Depression and Anxiety Scale for Children, Experiential Avoidance Questionnaire)	“The COVID-19 pandemic appears to have worsened obsessive-compulsive symptoms in young people”.
(de Moura Gabriel et al., 2022)	China (1217952, 94.2%), South Korea (55165, 4.2%), Brazil, Japan, Italy, Netherlands, USA, Saudi Arabia (<1%)	M&F; 0-19 years	20 (4 excluded due to being reviews, and one article not in English)	No specific exposure	PTSD; worry, stress, internalising behaviours, externalising behaviours, depression, anxiety	“The rapid spread of COVID-19 has significantly influenced the psychological state of children and adolescents. It is clear that poverty, hunger, housing insecurity, domestic violence, and sexual abuse, black children and adolescents, and homeless people living in favelas, especially older adolescents, need urgent mental health support. The physical restrictions of the COVID-19 pandemic and the social distancing measures have affected all domains of life. Anxiety, depression drug abuse, sleep and appetite disorders, as well as impaired social

						interactions, are the most common presentations”
(Đurđević et al., 2022)	Asia (n=10559, 20%), Europe n=26398, 50%), America (n=10560, 20%), Africa (n=2639, 5%), Oceania (n=2641, 5%) Total: 52797	M&F; 6-19 years, mostly adolescents	27	No specific exposure	Anxiety (STAIC, CAQ, HAD, SAS), depression (CDI, DASS-21, PHQ-9)	“Anxiety symptoms increased from 28.3% before the pandemic to 49.5% during confinement [General Anxiety Disorder (GAD)-7 ≥ 11] (McNemar test, p < 0.0001). More depressive symptomatology was found, as well as weight and sleep disturbances. Female teenagers were experiencing grater declines in mood disorders than male teenagers during the pandemic”
(Gul & Demirci, 2022)	China (n=5663, 45.9%), Taiwan (n=1046, 8.6%), Iran (n=1512, 12.4%), India (n=2248, 18.2%), USA (n=217, 1.7%), Canada (n=1630, 13.2%)	M&F; mostly adolescents	12	No specific exposure	Internet addiction (Internet Addiction Test, Internet Gaming Disorder Short Form), Substance use (cannabis, e-cigarettes, alcohol)	In general, it seems that the majority of the studies included in this systematic review report higher levels of internet and smartphone usage, which associate with lower levels of mental health and well-being. There was no significant difference in the prevalence of alcohol use before and after the pandemic, but cannabis use increased significantly.

(Imran et al., 2020)	Italy (5989, 80.4%), China (320, 3.1%), Italy and Spain (1143, 15.3%) Total: 7452	M&F, 3-18 years, majority being children	3 (Only 3 studies in this review were COVID-19 specific and therefore considered)	Quarantine, self-isolation, lock-down	Online survey based on DSM-5, cross cultural assessment of anxiety and depression. A survey with four sections: a) Socio Demographic of parents, b) parental perception of emotional effects of quarantine on children, c) parents' perception of family coexistence, d) children's routines: time of screen use, physical activity, and hours of sleep during quarantine compared to before COVID-19 12-item ad-hoc questionnaire including three areas (four questions for each domain: Regressive, Oppositional behaviours, and adaptation behaviours).	"This review suggests that quarantine is associated with far reaching and significant negative impact on psychological wellbeing of children and adolescents".
(Jones et al., 2021)	China (32266, 80.5%), Canada (2108, 5.3%), Japan (2022, 5.0%), Philippines (1879, 4.7%), USA (842, 2.1%), UK (698, 1.7%), Germany (159, 0.4%), Denmark (102, 0.3%) Total: 40076	M&F, 3-17 years (as per inclusion criteria)	16	Lockdown, social distancing, unsupportive parents, loss of identity, quarantine	MH outcomes - anxiety, depression, burdensomeness, belongingness, suicide rates, eating problems, loss of identity, maltreatment, PTSD, stress, OCD, alcohol/drug use, trauma related distress (No list of measures used but in results section states: 9 studies used standardised tools and 7 did not)	"Globally, adolescents of varying backgrounds experience higher rates of anxiety, depression, and stress due to the pandemic. Secondly, adolescents also have a higher frequency of using alcohol and cannabis during the COVID-19 pandemic".
(Layman et al., 2022)	Europe (n=320771, 66.7%), Asia (n=116441, 24.2%), North America (n=41362, 8.6%), South America and Australia (n=<2000, 0.5%)	Mostly late adolescents	49	No specific exposure but majority of studies conducted in 2020	Alcohol consumption (Youth risk behavior surveillance system, National Survey on Drug Use and Health, AUDIT), Tobacco Dependence, International Health Behavior in School-aged Children, GAIN short screener), cannabis and other drugs (Youth risk behavior surveillance system, GAIN short screener)	"The overall results of our review suggest that the prevalence of youth alcohol, cannabis, tobacco, and e-cigarette/vaping use has declined during the pandemic".

(Ma et al., 2021)	China (21 studies, n=57746, 99.7%), Turkey (2 studies, n=181, 0.3%) Total: 57927	M&F, 0-18 years, mostly adolescents (7-18 years)	23	No specific exposure	Depression and Anxiety (DSRS-C, SCARED, DASS-21, PHQ9, SCAS). trauma (Impact of Events Scale – Revised), sleep (CSHQ).	“Early evidence highlights the high prevalence of mental health problems among children and adolescents during the COVID-19 pandemic, especially among female and adolescents. Studies investigating the mental health of children and adolescents from countries other than China are urgently needed”.
(Meherali et al., 2021)	China (n=15251, 79%), Italy (n=2064, 11%), Canada (n=1054, 5%), USA (n=683, 4%), India (n=252, 1%), Total: 19304	M&F, 6 -21 years, mostly adolescents	18 (5 excluded as not specific to COVID-19)	COVID-19 and past pandemics (e.g., Ebola, H1N1)	Anxiety and depression (BSI, DASS-21), PTSD, (PTSD-RI), loneliness (revised UCLA loneliness scale), general mental health (GHQ-12).	“This reviews sheds light on the significant impact of COVID-19 on the mental health of children and adolescents. The results are overwhelming and demonstrate that pandemics are precursors to mental health decline”.
(Nearchou et al., 2020)	China (n = 20373, 91%), Italy (n = 553, 2%), USA (n = 683, 3%), Turkey (n = 568, 3%), Poland (n=317, 1%) Total: 22494	M&F; 3-18 years mostly teenagers, (13-18 years)	12	No specific exposure	Depression and anxiety (CDI-S, DAS, PHQ-9, STAI, GAD-7), COVID-Related Measures (COVID-19 Stress Scale; Fear of COVID-19 Scale), OCD, (OCI), other mental health difficulties (diagnosis of ASD based on DSM-5 criteria questionnaire, ERS, INQ, MIL, PROMIS, SCL-90, SWLS).	“COVID-19 has an impact on youth mental health and is particularly associated with depression and anxiety in adolescent cohorts”.
(Nobari et al., 2021)	Germany (n = 2504, 79%), Croatia (n = 531, 17%), Netherlands (n = 40, 1%), Brazil (n = 44, 2%), Spain (n = 33, 1%) Total: 3177	M&F; 4-19-year-olds (majority 10-18 years)	6	No specific exposure	Health Related Quality of Life (HRQoL), Pediatric Quality of Life (PedsQL), Measure looking at Functional capacity, Limitation by physical aspect, General Health Status, Vitality, Social Aspects, Emotional Aspects, and Mental Health (SF-36)	“The COVID-19 pandemic could have significantly decreased the HRQoL of children and adolescents”.

(Oliveira et al., 2022)	China (31769, 89.1%), Canada (1054, 3.0%), Brazil (289, 0.8%), Spain (1508, 4.2%), Greece (67, 0.2%), India (252, 0.7%), Israel (351, 1.0%), Bangladesh (384, 1.1%), (1 USA study did not report sample size) Total: 35674	2 -18 years (1 study only included female participants)	19	Only one study is quarantine specific	Depression (DSRS-C, CDI, PHQ-9, RCADS, MFQ, CES-D), Anxiety (SCARED, SCAS, GAD-7), Stress (DASS-21), UCLA Loneliness scale, PTSD (IES-R), resilience (CYRM-12), child behaviour checklist (CBCL), Self-harming behaviour (NSSI).	“The proportion of emotional symptoms and behavior changes varied from 5.7% to 68.5%; anxiety 17.6% to 43.7%, depression 6.3% to 71.5%, and stress 7% to 25%. The prevalence of post-traumatic stress disorder (85.5%) and suicidal ideation (29.7% to 31.3%) were also evaluated”.
(Panchal et al., 2021)	Asia (n = 27,870, 51%), Europe (n = 25497, 46%), North America (n = 64, <1%), South America (n = 1320, 2%), Australia (n = 248, <1%) Total: 54999	M&F; under 19 years	61	No specific exposure	Depression and anxiety symptoms (GAD-7, PHQ-9), non-suicidal self-injury, suicide ideation, suicide plan, suicide attempt. PTSD symptoms, diagnosis of depression/anxiety/sleep disorders. Eating disorder symptoms. Symptoms of ADHD. Transdiagnostic: outcomes: hopelessness, irritation, use of social media, boredom, loneliness	“The COVID-19 lockdown has resulted in psychological distress and highlighted vulnerable groups such as those with mental health difficulties, and risk factors such as lack of routine and excessive COVID-19 media exposure”.
(Panda et al., 2021)	China (n = 12871, 57%), Italy (n = 6516, 29%), Italy and Spain (n = 1143, 5%), Hong Kong (n = 757, 3%), France (n = 533, 2%), India (n = 121, >1%), Brazil (n = 289, 1%), Bangladesh (n= 384, 2%). Total (children only): 22614	M&F; children up to 18 years, mostly adolescents (10-18 years)	12 (3 studies excluded because they included parents/caregivers in the sample)	Lockdown and quarantine (no specific exposure)	Depression, anxiety, irritability, fear, worsening of symptoms related to previous diagnoses (e.g., ADHD)	“Anxiety, depression, irritability, boredom, inattention, and fear of COVID-19 are predominant new-onset psychological problems in children during the COVID-19 pandemic and while confined in quarantine. Children with pre-existing behavioral problems like autism and ADHD have a high probability for worsening of their behavioral symptoms”
(Racine et al., 2020)	China (59844, 73.9%), USA (16397, 20.3%), Jordan (384, 0.5%), Ecuador (1550, 1.9%), Italy (721, 0.9%), Italy, Spain and Portugal (1024, 1.3%), Germany (1040, 1.3%) Total: 80879	4-18 years old (majority split male and female, one all-female study)	29 studies all looking at anxiety and depression	No specific exposure	Anxiety (GAD-7, SCARED), Depression (PHQ-9, DSRS-C), stress (DASS-21), CBCL, CDI, CAQ, Preschool feelings checklist, HADS, Wellbeing index, SMFQ, SCAS-P-8, SMFQ-P, CDI-SF, SAS, CES-DC, MHBQ, MFQ, CESD	“Pooled estimates obtained in the first year of the COVID-19 pandemic suggest that 1 in 4 youth globally are experiencing clinically elevated depression symptoms, while 1 in 5 youth are experiencing clinically elevated anxiety symptoms. These pooled estimates, which increased over time, are double of prepandemic estimates”.

(Samji et al., 2022)	The majority of the participants were Chinese (about 69%), followed by Italy, USA, UK, Australia, Spain, Germany, etc. Total: 127923	<19 years old (children and adolescents)	116	No specific exposure	COVID-19 related fear, concern, worry. Depression, General MH, Anxiety, Self-harm, suicidal ideation, suicide, MH service use, Other MH outcomes e.g., conduct problems	“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”.
(Sharma et al., 2021)	China (14160, 76.7%), Canada (1782, 9.7%), USA and Israel (1142, 6.2%), Italy (282, 1.5%), Israel (264, 1.4%), Spain (571, 3.1%), Brazil and Portugal (253, 1.4%), Total: 18454	6 months – 18 years old (2 studies included only female participants, 1 study up to 29 years old so extracted adolescents only sample size)	9	Lockdown	CSHQ, SDSC, Brief infant/child sleep questionnaire, Pittsburgh sleep quality index, Sleep disturbances scale for children, daily logs, interviews	“The prevalence of sleep problems in children and adolescents during the COVID-19 pandemic is alarming. Pre-school children had a trend towards relatively fewer sleep disturbances due to home confinement measures in comparison with pre-pandemic times. Sleep duration recommendations were not met in nearly half of healthy children”.
(Theberath et al., 2022)	China (47236, 74.0%), Germany (2412, 3.8%), Turkey (1763, 2.8%), Netherlands (90, 0.1%), Brazil (289, 0.5%), Belgium (2165, 3.4%), Egypt (2015, 3.2%), Indonesia (213, 0.3%), USA (4109, 6.4%), UK (659, 1.0%), Australia (467, 0.7%), Iraq (15, 0.02%), Israel (50, 0.08%), India (252, 0.4%), Japan (629, 1.0%), Canada (1316, 2.1%), Italy (148, 0.2%) Total: 63828	M&F; 4-19 years old  Some specific study groups included children with ADHD, OCD, and cystic fibrosis	35 (27 surveys and 8 interviews)	No specific exposure – 1 quarantine specific	Anxiety (GAD-7), loneliness, depression (PHQ-9), internet addiction, panic disorder, phobias, mood, Quality of life (PQoLS), Parental rearing behaviours (The Short Egna Minnen Beträffande Uppfostran), the Fear of COVID-19 Scale, Emotional Reactivity Scale, Experiential Avoidance Questionnaire, SDQ, RCADS, Scale for Interpersonal conflict, BSI, SAS, EAQ,	“The impact of the COVID-19 pandemic on mental health of children and adolescents is multifaceted and substantial. Survey studies regarding child and adolescent mental health amid COVID-19 indicated that anxiety, depression, loneliness, stress, and tension are the most observed symptoms”

(Viner et al., 2021)	China (n=45027, 52.9%), USA (n=29394, 34.6%), UK (n=5400, 6.3%), Canada (n=1316, 1.6%), Turkey (n=749, 0.8%), Brazil (n=289, 0.3%), Bangladesh (n=384, 0.5%), India (n=1065, 1.3%), Italy (n=476, 0.6%), Spain (n=860, 1.1%). Total: 84960	M&F; 0 – 24 years, mostly children and adolescents.	36	School closures whether isolated or as part of broader lockdown	Anxiety and depression (GAD-7, STAI, PHQ-9, HADS), Internalising and externalising behaviours (SDQ), Executive functions (BRIEF-P).	“In this systematic review of reports from the first wave of the COVID-19 pandemic, studies of short-term school closures as part of broader social lockdown reported adverse mental health symptoms and health behaviors among children and adolescents”.
(Windarwati et al., 2022)	China (1685819, 93.6%), Iceland (59701, 3.3%), Iran (22209, 1.23%), Jordan (384, 0.02%), Norway (2536, 0.14%), Greece (442, 0.02%), USA (2386, 0.13%), Kenya (2224, 0.12%), UK (55, 0.003%), Czech Republic (3440, 0.19%), Canada (2828, 0.16%), Brazil (94, 0.005%), Italy (2064, 0.11%), Sweden (1608, 0.09%), Vietnam (1534, 0.09%), Serbia (1108, 0.06%), Morocco (541, 0.03%), Turkey (549, 0.03%), Saudi Arabia (367, 0.02%), Georgia (761, 0.04%), Mexico (8033, 0.45%), Romania and Croatia (2105, 0.12%) Total: 1800788	M&F, 14-19 years old	40	No specific exposure	Anxiety, depression, psychological distress, sleep disorder, loneliness, psychosocial function, traumatic symptoms, other psychological symptoms, feeling worried, suicide risk	“Our study revealed that psychological stress, anxiety, and depression were the most common MH problems among high school seniors during the pandemic. Adolescent girls are 1.13 times more likely to feel stressed than boys. Likewise, with depression and anxiety, girls compared to boys experienced more depression and anxiety with a ratio of 50.7% versus 30.7% and 46.9% compared to 26.7%, respectively”.



