

School closures during COVID-19: an overview of systematic reviews

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10.1136/bmjebm-2022-112085

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bmjebm-2022-112085>).

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► <http://dx.doi.org/10.1136/bmjebm-2023-112277>



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To cite: Hume S, Brown SR, Mahtani KR. *BMJ Evidence-Based Medicine* 2023;**28**:164–174.

Abstract

Objectives To assess the benefits and drawbacks of school closures and in-school mitigations during the COVID-19 pandemic.

Design Overview of systematic reviews (SRs).

Search methods We searched six databases and additional resources on 29 July 2022: MEDLINE, Embase, Google Scholar, Cochrane Library, COVID-END inventory of evidence synthesis, and Epistemonikos.

Eligibility criteria We selected SRs written in English that answered at least one of four specific questions concerning the efficacy and drawbacks of school closures. Their primary studies were conducted in primary and secondary schools, including pupils aged 5–18. Interventions included school closures or mitigations (such as mask usage) introduced in schools.

Data collection and analysis We used AMSTAR 2 to assess confidence in the included SRs, and GRADE was used to assess certainty of evidence. We performed a narrative synthesis of the results, prioritising higher-quality SRs, those which performed GRADE assessments and those with more unique primary studies. We also assessed the overlap between primary studies included in the SRs.

Main outcome measures Our framework for summarising outcome data was guided by the following questions: (1) What is the impact of school closures on COVID-19 transmission, morbidity or mortality in the community? (2) What is the impact of COVID-19 school closures on mental health (eg, anxiety), physical health (eg, obesity, domestic violence, sleep) and learning/achievement of primary and secondary pupils? (3) What is the impact of mitigations in schools on COVID-19 transmission, morbidity or mortality in the community? and (4) What is the impact of COVID-19 mitigations in schools on mental health, physical health and learning/achievement of primary and secondary pupils?

Results We identified 578 reports, 26 of which were included. One SR was of high confidence, 0 moderate, 10 low and 15 critically low confidence. We identified 132 unique primary studies on the effects of school closures on transmission/morbidity/mortality, 123 on learning, 164 on mental health, 22 on physical health, 16 on sleep, 7 on domestic violence and 69 on effects of in-school mitigations on transmission/morbidity/mortality.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ COVID-19 has caused millions of global deaths since the end of 2019, and has seen unprecedented levels of public health intervention, including school closures, to reduce its transmission. However, the effectiveness of school closures in reducing transmission is still not fully understood. Similarly, potential negative effects on children have not been fully characterised.

WHAT THIS STUDY ADDS

⇒ We performed an overview of systematic reviews to address these knowledge gaps. Evidence suggests a positive effect of school closures in reducing COVID-19 transmission, but also negative impacts. Children were reported to suffer reduced learning, increased anxiety and increased obesity. Our study's limitations include that the specific impacts of school closures are difficult to separate from other interventions introduced simultaneously, that we have reviewed a lack of data on Omicron variants, and that we were unable to perform meta-analysis.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This overview may inform pandemic planning policymakers when considering the benefits and harms of school closures during potential future waves of COVID-19.

Both school closures and in-school mitigations were associated with reduced COVID-19 transmission, morbidity and mortality in the community. School closures were also associated with reduced learning, increased anxiety and increased obesity in pupils. We found no SRs that assessed potential drawbacks of in-school mitigations on pupils. The certainty of evidence according to GRADE was mostly very low. **Conclusions** School closures during COVID-19 had both positive and negative impacts. We found a large number of SRs and primary studies.

However, confidence in the SRs was mostly low to very low, and the certainty of evidence was also mostly very low. We found no SRs assessing the potential drawbacks of in-school mitigations on children, which could be addressed moving forward. This overview provides evidence that could inform policy makers on school closures during future potential waves of COVID-19.

Introduction

COVID-19 has caused worldwide morbidity and mortality, requiring pharmaceutical and non-pharmaceutical interventions (NPIs) to control its spread.¹ These NPIs include mask-wearing, social distancing and school closures, all of which have been employed in most countries multiple times since the onset of the COVID-19 pandemic.²

SARS-CoV-2, the virus that causes COVID-19, is highly transmissible and mutable, and has produced a number of variants of concern. Most recent is Omicron and its subvariants, which are more immune-evasive and more transmissible than previous strains.^{3 4} These variants have caused worldwide records of COVID-19 infection, and induced further school closures.⁵ The likely emergence of new variants in the future, causing new periods of exponential growth, means that school closures may continue to be considered by governments around the world.

The aim of school closures is to reduce social contacts, to cut transmission chains in the community.² However, their effectiveness remains uncertain, and whether the positive impacts of school closures on transmission outweigh potential negative impacts on children remains unknown. Despite most countries shutting schools during the COVID-19 pandemic, closures were generally not part of pandemic planning,^{6 7} and it is unclear whether the potential negative impacts were fully considered by policymakers.

The number of systematic reviews (SRs) on COVID-19 school closures, which have addressed this topic from multiple angles—with varying quality, and with conclusions that are not always consistent—provides an opportunity for an evidence synthesis from a wider perspective. Given this, we decided that an overview of SRs was the best study type.

Methods

The protocol for this overview was registered in February 2022.⁸ We conducted the overview in line with Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (<https://prisma-statement.org/>), and with guidelines for reporting overviews.^{9–12}

Data sources

We searched MEDLINE via PubMed, Embase via Ovid, Google Scholar, the Cochrane Database of Systematic Reviews, COVID-END inventory of evidence synthesis, and Epistemonikos, on 29 July 2022. References of included SRs were also handsearched.

Search strategy

PubMed - COVID-19 [tiab] AND (school* [tiab] OR college* [tiab]). Filter by article type: systematic review or meta-analysis.

Embase - (COVID-19 AND (school* OR college*)).tw. Limit search to: systematic review or meta-analysis.

Google scholar - allintitle: "COVID-19" "systematic review" school OR schools OR college OR colleges.

Cochrane library - COVID-19 AND (school OR college). Limit search to Title Abstract Keyword, limit to Cochrane Reviews.

Epistemonikos - Filter by COVID-19 evidence, school congregate setting, systematic review.

COVID-END - Evidence about economic and social responses: Education section.

Inclusion and exclusion criteria

Only SRs (including rapid reviews) were included. Given the range of SRs published on this topic, whose results are not always consistent, we agreed that an overview of SRs was the best study design for a wide perspective on the topic. Only texts written in English were included, because we felt that we could not fairly review SRs written in other languages. Only SRs that answer at least one of the following four questions were included:

1. What is the impact of school closures (compared with no intervention) on COVID-19 transmission, morbidity or mortality of people in the community?
2. What is the impact of school closures (compared with no intervention or pre-COVID-19 levels) on mental health (eg, anxiety), physical health (eg, obesity, domestic violence, sleep) and learning/achievement of primary and secondary pupils (aged 5–18)?
3. What is the impact of mitigations in schools (compared with no intervention) on COVID-19 transmission, morbidity or mortality of people in the community?
4. What is the impact of mitigations in schools (compared with no intervention or pre-COVID-19 levels) on mental health, physical health and learning/achievement of primary and secondary pupils (aged 5–18)?

Definition of terms

School closures: Shutting of education institutions for 5–18 year olds, during the COVID-19 pandemic, resulting in students staying at home. In-school mitigations: Measures introduced to schools to reduce COVID-19 transmission, such as mask-wearing, social distancing and isolation of positive COVID-19 cases. Transmission: spreading of SARS-CoV-2 from human to human, usually measured by PCR positivity, R-value or secondary attack rate. Morbidity: COVID-19-induced hospitalisation. Mortality: COVID-19-induced death. Impact: Effect on transmission/morbidity/mortality or on students; for example, on mental health (eg, anxiety), physical health (eg, obesity) or learning and achievement (eg, test scores). SR: A study that searches more than one database to answer a defined question, includes at least two primary studies answering that question, and identifies itself as an SR/meta-analysis/rapid review in the title. The study must be a full journal article (and not, eg, a conference abstract or protocol).

Study selection

Our search found 578 studies (452 initially and 126 in the updated search), which were imported into Mendeley. A total of 242 duplicates were removed, and screening was performed using the Rayyan software.¹³ Articles were independently screened by two authors (SH and SRB), by title, abstract and full text, according to our inclusion and exclusion criteria, and 26 SRs were ultimately included in the overview (figure 1). Disagreements were resolved by discussion between all authors.

Data extraction

Two authors (SH and SRB) independently performed data extraction, according to a predefined data extraction table (online supplemental table 1). Data extracted were first author/year, main questions asked in the study, study type, study period, search strategy, number of included studies, quality appraisal tool used,

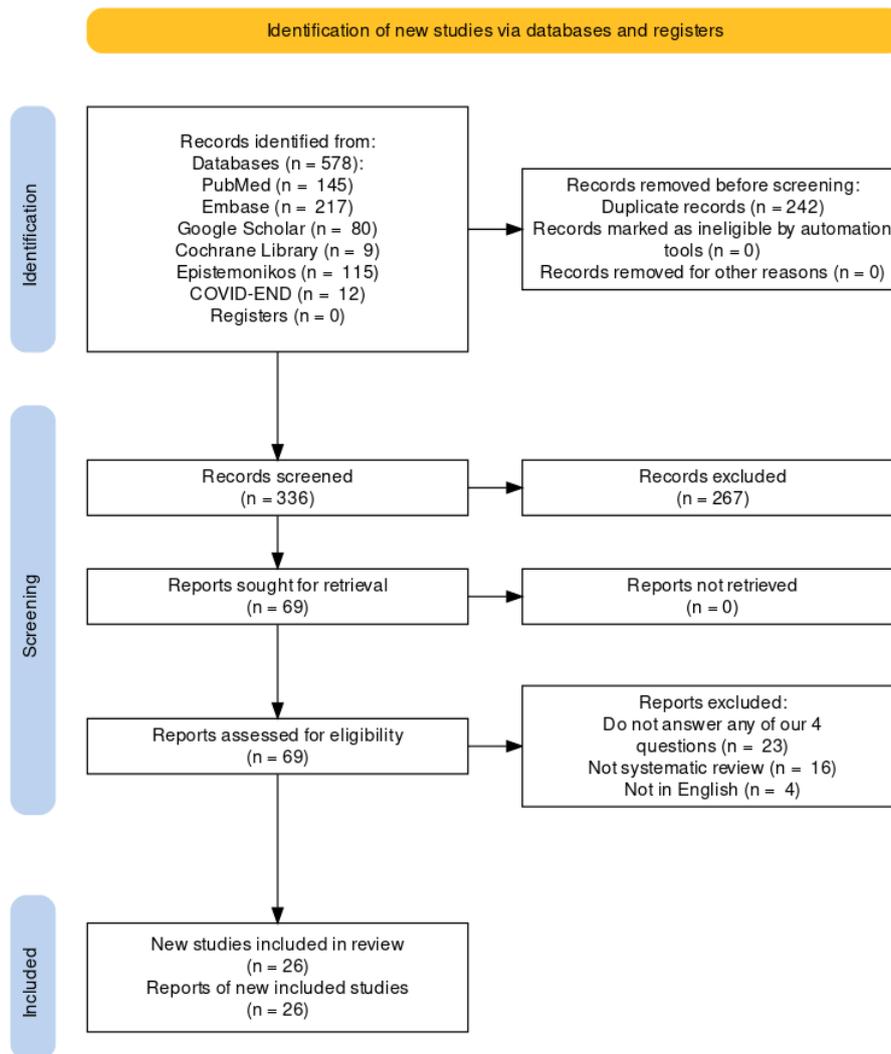


Figure 1 Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flow diagram. A full list of excluded studies is provided in online supplemental table 2.

authors' assessment on quality of included studies, main conclusions, funding/conflicts of interest, journal and which of our four posed questions the study addresses. Geographical areas covered in each SR, and the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) assessment performed by each SR, were later added.

Quality assessment

The AMSTAR 2 (A Measurement Tool to Assess systematic Reviews 2) tool was used, which contains 16 criteria to assess the quality of SRs¹⁴ (table 1).

Critical domains in the AMSTAR 2 tool are as follows. Item (2) Has the protocol been preregistered, and is the protocol comprehensive? Item (4) Is the literature search comprehensive? Item (7) Is a list of excluded studies provided, with exclusion reasons? Item (9) Is an appropriate risk of bias analysis performed? Item (11) Are the statistical analysis used in any meta-analysis appropriate? Item (13) Is the risk of bias considered when synthesising review results? Item (15) Is publication bias considered in studies that perform quantitative analysis?

SRs with 0 or 1 non-critical weakness were rated as high quality, studies with multiple non-critical weaknesses as medium,

SRs with 1 critical weakness as low and SRs with multiple critical weaknesses as critically low.¹⁴

Data synthesis

A narrative synthesis was performed. Each outcome was divided into independent sections in the Results section—for example, when assessing the impact of school closures on pupils, mental health was described in its own Results section. Within each Results section, SRs were described in order of quality (based on AMSTAR 2 assessments), with the highest quality SRs described first. SRs were then prioritised based on those that performed GRADE assessments (online supplemental table 1), and subsequently based on those that contained a higher proportion of unique primary studies (online supplemental table 3). Higher-quality SRs were given more weight in concluding each outcome. Data were drawn from SR authors' conclusions and results, and additional details, such as quantification from meta-analysis, were also added if available. Our findings were summarised in table 2.

GRADE assessments

For each outcome, GRADE assessments were used to assess the certainty of evidence.^{15 16} GRADE ratings from included SRs were

Table 1 AMSTAR 2 quality appraisal

Authors	PICO clear	Protocol registered*	Included study designs explained	Comprehensive search strategy*	Duplicate screening	Duplicate data extraction	Excluded studies listed*	Full description of included studies	RoB assessed*	Funding of included studies stated	Appropriate statistics (in MA)*	RoB considered (in MA)	RoB considered in interpretation*	Explanation of heterogeneity	Publication bias considered (in MA)*	Conflict of interest declared	Rating
Zhang <i>et al</i> , 2021 ³¹	+	-	+	Partial+	+	+	-	+	+	-	+	+	+	+	+	+	Critically low
NCCMT, 2021 ¹⁷	+	-	+	Partial+	-	-	+	+	+	-	N/A	N/A	-	-	N/A	+	Critically low
Walsh <i>et al</i> , 2021 ¹⁸	+	+	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Kourti <i>et al</i> , 2021 ⁴¹	+	+	+	Partial+	+	+	-	+	+	-	N/A	N/A	-	+	N/A	+	Critically low
Ayouni <i>et al</i> , 2021 ³⁰	+	Partial+	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Talib <i>et al</i> , 2021 ²¹	+	Partial+	+	Partial+	+	+	-	+	+	-	+	+	+	+	+	+	Low
Hammerstein <i>et al</i> , 2021 ²⁸	+	-	+	Partial+	+	-	-	+	+	-	N/A	N/A	-	+	N/A	+	Critically low
Muhammed, 2020 ²²	+	-	+	Partial+	-	-	-	-	-	-	N/A	N/A	-	+	N/A	-	Critically low
Bond <i>et al</i> , 2021 ³⁰	+	-	+	Partial+	+	-	+	+	+	-	N/A	N/A	+	+	N/A	+	Low
Sharma <i>et al</i> , 2021 ⁴⁰	+	Partial+	+	Partial+	+	+	-	+	+	-	+	+	-	+	+	+	Critically low
Krishnarane <i>et al</i> , 2022 ⁴²	+	Partial+	+	Partial+	+	+	+	+	+	+	N/A	N/A	+	+	N/A	+	High
Elharake <i>et al</i> , 2022 ³²	+	-	+	Partial+	+	+	-	+	-	-	N/A	N/A	-	-	N/A	+	Critically low
Meherali <i>et al</i> , 2021 ³³	+	Partial+	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Nussbaumer-Streit <i>et al</i> , 2020 ²³	+	Partial+	+	+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Samji <i>et al</i> , 2021 ³⁴	+	Partial+	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Viner <i>et al</i> , 2020 ²⁴	+	-	+	Partial+	+	-	-	-	-	-	N/A	N/A	-	+	N/A	+	Critically low
Viner <i>et al</i> , 2022 ³⁵	+	Partial+	+	+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Lehmann <i>et al</i> , 2022 ³⁶	+	-	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	-	Critically low
Panagouli <i>et al</i> , 2021 ²⁹	+	-	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Critically low
Mendez-Brito <i>et al</i> , 2021 ²⁵	+	-	+	Partial+	+	-	-	+	+	-	N/A	N/A	+	+	N/A	+	Critically low
Chaabane <i>et al</i> , 2021 ²⁶	+	Partial+	+	Partial+	+	+	-	+	+	-	N/A	N/A	+	+	N/A	+	Low
Chai <i>et al</i> , 2021 ³⁷	+	+	-	Partial+	-	-	-	+	+	-	+	+	+	+	+	+	Low
Suk <i>et al</i> , 2020 ²⁷	+	-	+	Partial+	+	+	-	+	-	-	N/A	N/A	-	+	N/A	-	Critically low
Vardavas <i>et al</i> , 2021 ⁴³	+	-	+	Partial+	+	+	-	+	-	-	N/A	N/A	-	+	N/A	+	Critically low
Chang <i>et al</i> , 2021 ³⁹	+	-	-	Partial+	+	+	-	+	+	-	+	+	+	+	+	+	Critically low
Caini <i>et al</i> , 2022 ³⁹	+	-	+	Partial+	-	+	-	+	+	-	+	+	+	+	+	+	Critically low

Stars indicate critical domains. SRs with 0 or 1 non-critical flaw score 'High', studies with multiple non-critical flaws score 'Medium', studies with 1 critical flaw score 'Low' and studies with multiple critical flaws score 'Critically low'. SRs are awarded a '+', '-' or '*' depending on whether they satisfy each condition. SRs are awarded a 'Partial+' in 'Protocol registered' if they register a protocol, but the protocol is not comprehensive, and a 'Partial+' in 'comprehensive search strategy' if, for example, authors search at least two databases, but no not scan included articles' bibliographies. Full details of the AMSTAR 2 appraisal tool are available at Shea *et al*.¹⁴

AMSTAR 2, A Measurement Tool to Assess systematic Reviews 2; MA, meta-analysis; NA, not applicable; PICO, Population, intervention, comparison, Outcome; RoB, risk of bias;

Table 2 Summary of findings

Question	Unique primary studies	Outcome	Result	Magnitude of effect	GRADE
1: What is the effect of school closures on community COVID-19 transmission, morbidity and mortality?	132	Transmission	Reduced: 6 SRs ^{20–23 25 27} (closures) Uncertain: 2 SRs ^{18 19} (closures) No effect: 2 SRs ^{17 18} (re-openings)	► Transmission from pupils less likely than from adults (OR 0.26, 95% CI (0.11 to 0.63)) ¹⁹ (Meta-analysis) ► Pupils may be less likely to be infected than adults (OR 0.6, 95% CI (0.25 to 1.47)) ¹⁹ (Meta-analysis)	Very low* ⊕○○○
		Hospitalisation	Reduced: 1 SR ²⁶	► 45% reduction in paediatric hospital admissions ²⁶	Very low† ⊕○○○
		Mortality	Reduced: 1 SR ²⁴	► 2%–4% reduction in deaths ²⁴	Very low‡ ⊕○○○
2: What is the effect of school closures on children's health?	123	Learning	Worse: 4 SRs ^{26 28–30}	► Learning loss of –0.005 to –0.05 SD, per week of closures ²⁸	Low ⊕⊕○○
		Mental health	Worse: 8 SRs ^{26 31–37}	► Prevalence of anxiety during COVID-19: 24% (95% CI (20% to 29%)) ³¹ (Meta-analysis) ► Anxiety in outbreak phase: 25% (95% CI (17% to 34%)) ³¹ (Meta-analysis) ► Anxiety in diffusion attenuation phase: 42% (95% CI (35% to 50%)) ³¹ (Meta-analysis) ► Prevalence of mental health problems during COVID-19: 28% (95% CI (22% to 34%)) ³⁷ (Meta-analysis)	Very low§ ⊕○○○
	22	Physical health	Worse: 3 SRs ^{26 35 39}	► BMI increased by 0.77 units (95% CI (0.33 to 1.2)) p=0.0006, obesity prevalence by 1.23-fold (95% CI (1.1 to 1.37)) p=0.0002, and bodyweight by 2.67 kg (95% CI (2.12 to 3.23)) p<0.00001 ³⁹ (Meta-analysis)	Very low¶ ⊕○○○
	16	Sleep	Worse: 2 SRs ^{35 40} No effect: 1 SR ²⁶	► 54% (95% CI (50% to 57%)) had sleep disturbance ⁴⁰ (Meta-analysis) ► 49% (95% CI (39% to 58%)) did not achieve recommended sleep quantities ⁴⁰ (Meta-analysis)	Very low** ⊕○○○
	7	Domestic violence	Increased: 1 SR ⁴¹ Uncertain: 1 SR ³⁵	► 67% reduction in reported cases of domestic violence involving children ⁴¹ ► 41% reduction in police reports for domestic violence involving children ⁴¹ ► Estimated increase in victims of violence against children: 11 488 186–18 381 098 in Africa, 3 577 839–5 724 542 in Asia, 2 921 466–4 674 345 in Latin America, 7 596 000–1 215 360 in Europe, 2 009 722–3 215 554 in North America, and 32 010–51 216 in Oceania ⁴¹	Very low†† ⊕○○○
3: What is the effect of in-school mitigations on community COVID-19 transmission, morbidity or mortality?	69	Transmission	Reduced: 3 SRs ^{17 42 43}	► Mask usage in schools associated with reduction in R in community by 0.011 (95% CI (0.008 to 0.0127)) ⁴²	Very low‡‡ ⊕○○○
		Hospitalisation	Reduced: 1 SR ⁴²	► Mask usage in schools associated with reduction in excess hospitalisation per 10 000 of population in teachers to 4.2 (95% CI (–47.39 to 48.09)) from 40.5 (95% CI (–46.95 to 146.64)) ⁴²	Very low§§ ⊕○○○
		Mortality	Reduced: 1 SR ⁴²	► Mask usage in schools associated with reduction in community mortality by ratio of 1.5 (95% CI (1.5 to 1.6)) ⁴²	Very low¶¶ ⊕○○○
4: What is the effect of in-school mitigations on children's health?	0	Children's health	0 SRs	Not available	–

Number of unique studies in individual SRs. For question 1 - ²⁰: 2, ²¹: 3, ²²: 5, ²³: 4, ²⁵: 15, ²⁷: 3, ²⁶: 1, ²⁴: 4, ¹⁷: 14, ¹⁸: 25, ¹⁹: 34. For question 2 (learning) - ²⁸: 1, ³⁰: 77, ²⁹: 29, ²⁶: 3. For question 2 (mental health) - ³¹: 7, ³²: 0, ³³: 3, ³⁴: 103, ³⁵: 15, ³⁶: 8, ²⁶: 1, ³⁷: 5. For question 2 (physical health) - ³⁵: 7, ²⁶: 2, ³⁹: 12. For question 2 (sleep) - ⁴⁰: 6, ³⁵: 6, ²⁶: 0. For question 2 (domestic violence) - ⁴¹: 4, ³⁵: 2. For question 3 - ¹⁷: 17, ⁴²: 38, ⁴³: 14.

Data from meta-analysis were prioritised to represent effect measures for each outcome, where available.

*Downgraded for risk of bias and inconsistency.
†Downgraded for imprecision.
‡Downgraded for imprecision and risk of bias.
§Downgraded for risk of bias.
¶Downgraded for risk of bias.
**Downgraded for inconsistency and imprecision.
††Downgraded for indirectness.
‡‡Downgraded for indirectness and imprecision.
§§Downgraded for risk of bias, indirectness and imprecision.
¶¶Downgraded for risk of bias, indirectness and imprecision.

BMI, body mass index; GRADE, Grading of Recommendations, Assessment, Development and Evaluations.

used if they were the only SR assessing that outcome, and if sufficient justification was given for the GRADE given. Otherwise, we performed GRADE assessments. All evidence was observational, and was therefore given a default GRADE of 'low' certainty. GRADE certainties were downgraded if the evidence had high risk of bias, imprecision, inconsistency or indirectness. Certainties

were upgraded if there was a large magnitude of effect, or if there was a dose response gradient.^{15 16}

Deviation from protocol

Due to resource limitations, we excluded SRs not written in English in the final version of the review. We also included a

fourth question in the final version of the overview not present in the protocol: what are the effects of COVID-19 mitigation strategies, implemented in schools, on transmission, morbidity or mortality? This was an important question to add, to enable us to weigh the positive impacts of mitigations in schools (on transmission) against potential negative impacts (eg, on pupils' learning or mental health). In the manuscript, we added more detail to the review questions from the protocol. This increased the clarity of the review questions, and did not change their focus.

Patient and public involvement

Patients and the public were not involved in the planning or completion of the project.

Results

Results of search strategy

Figure 1 shows the PRISMA flow diagram for our overview. The search was performed on 20 February 2022, and was updated on 29 July 2022. A total of 578 records were identified: 145 from PubMed, 217 from Embase, 80 from Google Scholar, 9 from Cochrane Library, 115 from Epistemonikos and 12 from COVID-END. A total of 242 of these records were excluded as duplicates. The remaining 336 records were screened, and 267 were excluded after reading titles or abstracts. The full texts of 69 articles were screened, and 43 were excluded (23 because they did not answer any of our 4 posed questions—see the Methods section, 16 because they are not SRs, and 4 because they are not written in English—3 are in Italian and 1 in German) (figure 1). No further studies were added after searching included SRs' references, because none fit the inclusion criteria.

This gave rise to 26 SRs to include in the review: 11 SRs assessing the impact of COVID-19 school closures on transmission, morbidity or mortality, 14 SRs assessing the impact of COVID-19 school closures on children, 3 SRs assessing the impact of COVID-19 in-school mitigations on transmission, morbidity or mortality, and 0 SRs assessing the impact of COVID-19 in-school mitigations on children. Online supplemental table 1 lists the main characteristics of the included studies. Online supplemental table 2 lists the 310 reports identified by our search strategy but excluded from the synthesis.

Quality assessment of included SRs

We used the AMSTAR 2 quality appraisal method¹⁴ to assess confidence in the included SRs. We assessed one of the included SRs to be high confidence, 0 medium, 10 low and 15 critically low confidence (table 1). SR quality was downgraded for a number of reasons. Fifteen SRs did not register a protocol, 4 did not perform screening in duplicate, 7 did not perform data extraction in duplicate, 23 did not list excluded studies, 2 did not include a full description of included studies, 5 did not assess risk of bias, 25 did not list the funding sources of included primary studies, 9 did not consider risk of bias in interpretation, 2 did not explain heterogeneity and 3 did not declare conflicts of interest (table 1).

Overlap

The relevant primary studies included in each SR, and their overlap, are shown in online supplemental table 3. The average number of unique primary studies in each group of SRs was as follows: 66% (range: 25%–100%, n=11 SRs) for school closures and COVID-19 transmission/morbidity/mortality, 89% (range: 69%–100%, n=4 SRs) for school closures and learning, 48% (range: 0%–89%, n=8 SRs) for school closures and mental health,

85% (range: 67%–100%, n=3 SRs) for school closures and physical health, 42% (range: 0%–67%, n=3 SRs) for school closures and sleep, 74% (range: 67%–80%, n=2 SRs) for school closures and domestic violence, and 100% (range: 100%–100%, n=3 SRs) for in-school mitigations and COVID-19 transmission/morbidity/mortality (online supplemental table 3). SRs with a higher proportion of unique primary studies were prioritised when synthesising results.

What is the impact of school closures on COVID-19 transmission, morbidity or mortality of people in the community?

Eleven SRs addressed the impact of school closures on COVID-19 transmission, morbidity or mortality.^{17–27} Six SRs reported a reduction in transmission on school closures,^{20–23 25 27} two SRs reported an uncertain effect on transmission of school closures^{18 19} and two SRs reported no effect on transmission of school reopenings.^{17 18} One SR reported a reduction in hospitalisations on school closures,²⁶ and one reported a reduction in mortality on school closures.²⁴ One SR reported the GRADE certainty for reduced transmission on school closures to be low,²³ one for no effect on transmission of re-opening schools to be low¹⁷ and one for reduced hospitalisation on school closures to be low²⁶ (table 2).

Low-quality SRs

Chaabane *et al* (Unique primary studies: 100%) reported that school closures may have reduced paediatric hospitalisations.²⁶ Nussbaumer-Streit *et al*'s SR (Unique: 67%) reported that adding school closures onto other measures, such as mandatory quarantine for infected students, may have reduced transmission over quarantine alone.²³ Walsh *et al* (Unique: 64%) reported uncertain findings on school closures: half of the included primary studies at lower risk of bias found reduced community COVID-19 transmission on closing schools, while the other half reported that school closures were associated with no change in transmission. This SR further reported that school reopening was mostly not associated with increased community transmission, when community transmission was low and in-school mitigations were in place.¹⁸

Talic *et al* (Unique: 60%) reported that school closures were largely effective. Primary studies included in this SR were inconsistent on the efficacy of school closures, although most supported reduced community COVID-19 transmission on school closure.²¹ Ayouni *et al*'s SR (Unique: 50%) reported that school closures were associated with reduced community transmission, but also that the specific effects of school closures were difficult to disaggregate, given the other NPIs introduced at the same time.²⁰

Critically low-quality SRs

The National Collaborating Centre for Methods and Tools (NCCMT) (Unique: 82%) reported little evidence that reopening schools increased transmission when mitigations, such as mask-usage, were in place.¹⁷ Caini *et al* (Unique: 87%) found that children may be less likely to transmit COVID-19 than adults, leading to limited transmission in schools.¹⁹ In meta-analyses of observational studies, Caini *et al* reported that onward transmission from school pupils was less likely than from adults (OR 0.26, 95% CI (0.11 to 0.63)) and school pupils may be less likely to be infected with COVID-19 (OR 0.60, 95% CI (0.25 to 1.47)).¹⁹

Viner *et al*²⁴ (Unique: 67%) is an SR from very early in the pandemic (the latest search was 19 March 2020), but predicted—from primary modelling studies—a very small beneficial effect of school closures on community COVID-19 mortality.²⁴ The Muhammed SR reported that school closures may have been effective in reducing COVID-19 transmission (Unique: 63%).

Effectiveness appeared to be dependent on infection levels in the community, and the time that closures were introduced: earlier interventions, when community levels remained relatively low, were reported to be more effective.²²

Mendez-Brito *et al*'s SR (Unique: 60%) concluded that school closures may be the most effective NPI, and were more effective when introduced earlier: 58% of included primary studies reported reduced transmission on school closure.²⁵ Finally, Suk *et al* included few unique studies (Unique: 25%), but reported that school children were rarely the index case for subsequent household transmission. Nevertheless, this SR reported that school closures may have reduced COVID-19 transmission.²⁷

Taken together, the evidence suggests that school closures may have reduced community COVID-19 transmission, morbidity and mortality. A limitation of these data is that only one of the SRs performed quantitative meta-analysis. In most of the SRs, most of the included primary studies were unique (online supplemental table 3). The quality of the evidence was variable, with all studies of low or critically low quality (table 1), although exclusion of the SRs with critically low quality does not change the overall conclusion. The GRADE certainty for the evidence in transmission, morbidity and mortality is all very low (table 2).

What is the impact of school closures on pupils' learning and achievement?

Four SRs assessed the impact of school closures on pupils' learning and achievement.^{26 28–30} Four SRs reported a decline in learning and achievement associated with school closures.^{26 28–30} One SR assessed the certainty of the evidence by GRADE, which was reported as low²⁶ (table 2).

Low-quality SRs

Chaabane *et al* (Unique: 100%) reported that students from lower socioeconomic backgrounds, and those with disabilities, may have fared worse with online learning, due to reduced access to the internet and technology at home.²⁶ Bond *et al*'s SR (Unique: 96%) reported that some students were less engaged, and attendance was reduced, for virtual teaching at home—potentially due to social isolation. Furthermore, it appeared that some pupils lacked the technical skills required for the virtual learning to be effective.³⁰

Critically low-quality SRs

Hammerstein *et al* (Unique: 91%) found loss of learning on closing schools, particularly affecting younger pupils and pupils from low socioeconomic backgrounds. The estimated learning loss was in the range of -0.005 to -0.05 SD per week of closures.²⁸ Similarly, Panagouli *et al* (Unique: 69%) reported that loss of learning on school closures was more severe in younger pupils and pupils with special educational needs (SEN). However, the SR also reported evidence that some students appeared to gain more from virtual learning than classical classroom teaching.²⁹

Together, these SRs suggest that learning loss occurred during school closures, and SEN students, as well as those from lower socioeconomic backgrounds, appeared to be most affected. It appears that some students engaged less with virtual teaching methods than in-person methods, and virtual teaching may have exacerbated inequalities. There was minimal overlap between primary studies included in the SRs (online supplemental table 3),

but the studies were of low or critically low quality (table 1), and the GRADE certainty for this evidence base is low (table 2).

What is the impact of school closures on pupils' mental health?

Eight SRs assessed the impact of school closures on pupils' mental health.^{26 31–37} Eight SRs reported a decline in mental health associated with school closures.^{26 31–37} One SR assessed the certainty of evidence using GRADE, which reported the evidence as low certainty²⁶ (table 2).

Low-quality SRs

Chaabane *et al* (Unique: 25%) reported increased anxiety and loneliness among students during school closures.²⁶ Samji *et al* (Unique: 89%) reported that female students were worse affected, as well as older students and pupils with neurodiversity. Nevertheless, effects on mental health could be mitigated, including if students exercised more at home or had better social support networks.³⁴

Viner *et al*³⁵ (Unique: 60%) reported increased anxiety and reduced well-being during school closures, but no change in suicide rate.³⁵ Chai *et al* performed a meta-analysis of cross-sectional studies (Unique: 42%), reporting that 28% (95% CI (22% to 34%)) of Chinese students experienced mental health problems during school closures for COVID-19 – compared with best estimates (in a different population) of 17.6% (95% CI (17.4% to 17.9%)) before the pandemic.^{37 38} Meherali *et al* (Unique: 23%) reported worse effects on mental health among female students, as well as among those who spent more time on social media—usage of which also appeared to increase during school closures.³³

Critically low-quality SRs

Lehmann *et al* (Unique: 80%) reported worsening behaviour and hyperactivity among students, and noted that students' mental health during school closures became worse if their parents were suffering from stress. Lehmann *et al* caveat that unequivocal conclusions were difficult to draw, since multiple NPIs were often introduced simultaneously.³⁶

Zhang *et al*'s meta-analysis of cross-sectional studies (Unique: 64%) reported that the prevalence of anxiety among Chinese students during the COVID-19 pandemic was 24% (95% CI (20% to 29%)). In subgroup analyses, Zhang *et al* reported that anxiety appeared to be worse in the diffusion attenuation phase of the pandemic (42%, 95% CI (35% to 50%)) than in the outbreak phase (25%, 95% CI (17% to 34%)).³¹ Although they did not include any primary studies unique from the above SRs, Elharake *et al* (Unique: 0%) also reported a decline in mental health during school closures, and reported that risk factors for this included low socioeconomic status, and having family members who work in healthcare.³²

Overall, these SRs suggest that COVID-19 school closures may have increased the prevalence of mental health problems—most notably anxiety—among children. A limitation of these data is that school closures were not applied as a solitary restriction; some effects on mental health may therefore also be effects of other restrictions, or from the wider context of the COVID-19 pandemic. There was moderate overlap between primary studies, and one SR (Elharake *et al*) presented zero unique primary studies (online supplemental table 3). The studies were of low or critically low quality (table 1), and the GRADE certainty for this evidence base is very low (table 2).

What is the impact of school closures on pupils' physical health?

Three SRs assessed the impact of school closures on pupils' physical health.^{26 35 39} Three SRs reported a decline in physical health associated with school closures.^{26 35 39} One SR assessed the certainty of evidence using GRADE, which reported low certainty in the evidence²⁶ (table 2).

Low-quality SRs

Chaabane *et al* (Unique: 67%) reported that school closures were associated with an increase in body mass index (BMI) and obesity, with predictions showing that longer closures would be associated with larger increases.²⁶ Similarly, Viner *et al*³⁵ (Unique: 88%) reported that school closures were associated with weight gain in children, as well as with reduced exercise, increased sedentary behaviour and increased unhealthy food consumption.³⁵

Critically low-quality SRs

Chang *et al*'s meta-analysis of non-randomised studies (Unique: 100%) reported that the average BMI of pupils increased by 0.77 points (95%CI (0.33 to 1.20) $p=0.0006$), rates of obesity increased by 1.23-fold (95%CI (1.10 to 1.37) $p=0.0002$), and the average increase in bodyweight was 2.67 kg (95%CI (2.12 to 3.23) $p<0.00001$) (noted by the authors to be a greater increase than normal average growth), following COVID-19 lockdowns.³⁹

Overall, these SRs suggest that school closures may have increased BMI and obesity among pupils—potentially due to reduced exercise coupled with a less healthy diet at home, where students did not have access to physical education teaching or healthy school meals. Given that school closures were not applied on their own, these changes may also reflect the wider context of the pandemic. There was little overlap between primary studies (online supplemental table 3), but the SRs were of low or critically low quality (table 1), and the GRADE certainty for this evidence base is very low (table 2).

What is the impact of school closures on pupils' sleep?

Three SRs assessed the impact of school closures on pupils' sleep.^{26 35 40} Two SRs reported a decline in sleep quality associated with school closures,^{35 40} and one SR reported no change to sleep quality associated with school closures²⁶ (table 2).

Low-quality SRs

Most of the 10 primary sleep studies included in the Viner *et al*³⁵ SR (Unique: 60%) reported reduced sleep quality during school closures, with many students developing new sleep problems and fewer students sleeping through the night.³⁵ Although they only included one primary study on sleep, which was not unique, Chaabane *et al* (Unique: 0%) concluded that sleep timing (but not sleep quality) was affected during school closures.²⁶

Critically low-quality SRs

Sharma *et al* (Unique: 67%) conducted a synthesis of nine primary studies and reported that, in general, students slept later and woke later during school closures. They also reported that some students had better sleep quality during school closures, but three-times this number experienced a decline in sleep quality.⁴⁰ Meta-analysis found that 54% of pupils (95%CI (50% to 57%)) had sleep disturbance, and 49% (95%CI (39% to 58%)) did not achieve recommended sleep quantities during the pandemic.⁴⁰

Although the quality of the SRs and their findings varied, there appears to be a trend to suggest that sleep quality reduced during school closures. This may be due to a mixture of increased anxiety and reduced physical activity. Nevertheless, there was some evidence that a subgroup of students reverted to a more natural sleeping routine, with many sleeping later and waking later. These changes could reflect school closures directly, but cannot be separated from the potential wider context of the COVID-19 pandemic. There was moderate overlap between primary studies, and one SR (Chaabane *et al*) presented zero unique primary studies (online supplemental table 3). The SRs were of low or critically low quality (table 1), and the GRADE certainty for this evidence base is very low (table 2).

What is the impact of school closures on domestic violence against children?

Two SRs assessed the impact of school closures on domestic violence against children.^{35 41} One SR reported a possible increase in domestic violence associated with school closures,⁴¹ and one SR reported an uncertain effect of school closures on domestic violence³⁵ (table 2).

Low-quality SRs

Viner *et al*³⁵ (Unique: 67%) described a consistent reduction in reports of child abuse during school closures, although no findings on incidence of abuse.³⁵

Critically low SRs

Kourti *et al* (Unique: 80%) described that, around the world, reported cases of domestic violence against children reduced during school closures. Despite this, some studies suggested increased incidence of abuse, including increased numbers of children presenting to healthcare centres with abusive head trauma. Kourti *et al* suggested that this may be due to co-quarantine of perpetrators and victims.⁴¹

Together, these SRs suggest that reported cases of domestic violence may have reduced during school closures, but actual cases may have increased. There was little overlap between the primary studies in the SRs (online supplemental table 3). However, the studies were of low or critically low quality (table 1), and the GRADE certainty for the evidence base is very low (table 2).

What is the impact of in-school mitigations on COVID-19, transmission, morbidity and mortality?

Three SRs addressed the effects of in-school mitigations on COVID-19 transmission, morbidity or mortality.^{17 42 43} Three SRs reported that in-school mitigations were associated with reduced transmission,^{17 42 43} one SR reported an association with reduced hospitalisations,⁴² and one SR reported an association with reduced mortality⁴² (table 2). One SR reported the GRADE certainty for reduction in transmission as low,¹⁷ and another reported the GRADE certainty for the reduction in transmission, morbidity and mortality as very low.⁴²

High-quality SRs

Krishnaratne *et al* (Unique: 100%) reported that in-school mitigations, such as mask-wearing and isolation of positive cases, appeared to be effective in reducing community COVID-19 transmission, hospitalisation and mortality.⁴²

Critically low-quality SRs

The NCCMT (Unique: 100%) found that mask-usage, social distancing, restricting school entrance to non-staff/non-students, stopping extracurricular activities, teaching outdoors and screening for symptoms of COVID-19, all appeared to reduce transmission in schools.¹⁷ Vardavas *et al* (Unique: 100%) also reported that the mitigations introduced in schools appeared effective in reducing transmission, with little transmission occurring in schools when these measures were in place.⁴³

Overall, these SRs suggest that the mitigations implemented in schools, such as mask usage, may be effective in reducing school and community transmission of COVID-19. There was no overlap between the primary studies included in the SRs (online supplemental table 3). One SR was high quality, but the others were of critically low quality (table 1); the conclusions of the high-quality study (Krishnaratne *et al*) were consistent with those of the other studies. The GRADE certainties for this evidence base—for the effect of in-school mitigations on transmission, morbidity and mortality—are all very low (table 2).

What is the impact of in-school mitigations during COVID-19 on children?

We found no SRs that addressed our fourth question: the effect of in-school mitigations on children (eg, on learning, physical or mental health).

Discussion

We performed an overview of 26 SRs to assess the positive and negative impacts of school closures, and in-school mitigations, during COVID-19. We found evidence that both school closures and in-school mitigations may have had a beneficial impact on reducing COVID-19 transmission in the community. However, the GRADE certainty was very low in both outcomes. We also found that school closures may have had negative impacts on children, including reduced learning, increased anxiety and increased rates of obesity. However, GRADE certainties were low or very low in these outcomes (table 2). Overall, confidence in the included SRs was generally low or critically low (table 1).

We observed some heterogeneity across the evidence base, particularly related to the impact of school closures on community transmission. A likely source of heterogeneity is that studies were performed in different countries, at different times of the pandemic, with different SARS-CoV-2 variants and different vaccination coverage (online supplemental table 1). Exclusion of the SRs with critically low quality does not change our overall conclusion that school closures were associated with reduced community COVID-19 transmission, suggesting that SR quality does not account for the heterogeneity.

There have not been any randomised controlled trials that have assessed the impact of school closures on COVID-19 transmission, which also likely contributes to the heterogeneity. For this reason, it is difficult to disaggregate the specific effect of each intervention, when multiple NPIs were introduced simultaneously. This also contributes to the low and very low GRADE certainties across individual outcomes, and means that recommendations to policy makers should be made with caution. Similarly, the quality of included SRs, measured by the AMSTAR 2 tool,¹⁴ is generally low or critically low, highlighting the need for high-quality SRs in the future.

A recent study looked to address the lack of randomised studies using a retrospective approach, by matching the closed

and open schools that were most similar in terms of potential confounding factors. This study, based in Japan, found that school closures were not associated with reduced community transmission of COVID-19.⁴⁴

A main reason to close schools is to protect the family of school children from household COVID-19 transmission. However, none of the included SRs accounted for household size or number of vulnerable family members when assessing the efficacy of school closures on morbidity and mortality in the community. This is a limitation of our study, and should be addressed moving forward.

Another limitation of our study is that none of the SRs we have reviewed feature the currently dominant Omicron subvariants. This could reduce the applicability of our study's findings with respect to the ongoing evolution of the pandemic, although it should be noted that the recent Omicron waves caused fewer deaths than previous waves.⁴⁵ Similarly, the original COVID-19 vaccines have retained their protection against severe disease from Omicron,⁴⁶ and vaccination considerably reduced COVID-19 fatality rates during Omicron waves.⁴⁷ Moving forward, this protection is increased further by a bivalent booster dose containing Omicron's Spike mRNA, which is now being used in booster programmes across the world.⁴⁸ Despite increased transmission of Omicron versus previous variants, including in schools,⁴⁹ the continued vaccination of children,⁵⁰ which was not widespread in previous waves, may compensate for the transmission advantage of Omicron.

Although we have reviewed a lack of Omicron data, a recent study, which looked at the efficacy of mask usage in schools during Omicron waves, found evidence consistent with our conclusions. This study assessed the effects of removing school mask rules in the US during February–June 2022, when Omicron variants were dominant.⁵¹ The study found that removal of mask rules in schools was associated with 44.9 extra COVID-19 cases per thousand students and staff (95% CI (32.6 to 57.1)), representing 29.4% of all COVID-19 cases during the study period, and highlighting the efficacy of masks in schools, including against Omicron.⁵¹

Although we were able to analyse most of our planned outcomes, we found no SRs that assessed the effect of in-school mitigations—such as masks and social distancing—on children's health and well-being. Given the importance of considering an intervention's negatives alongside its positives, this is an area that should receive additional research attention in the future.

A final limitation is that we were unable to perform quantitative meta-analysis due to a lack of amenable data, so we were limited to narrative synthesis.

In conclusion, our findings suggest that the benefits of school closures in reducing community transmission of COVID-19 should be considered in the context of the harms on children's education, health and well-being. This overview may inform future planning for school closures during pandemic outbreaks.

Acknowledgements The authors are grateful to Nia Roberts (University of Oxford), for advising on the search strategy. The host institutions and any associated sponsors had no role in study design, data collection, analysis, decision to publish or preparation of the manuscript. The views presented in this report are those of the authors solely.

Contributors KRM had the idea for the review as a project led by SH. SH performed searches. SH and SRB screened articles for inclusion. SH and SRB extracted data. SH wrote the article and prepared figures and tables, with comments from KRM. All

authors approved the final manuscript. SH is guarantor for the article.

Funding No project-specific funding. KRM has received funding from the NIHR SPCR Evidence Synthesis Working Group (project 390).

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information.

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Supplementary Table 1: Characteristics of included studies														
First author and year	Questions posed by review	Study type	Study period	Geographical areas covered	Search strategy	Number of included studies	Quality appraisal tool used	Authors' assessment on quality of included studies	Study conclusions	Did the SR perform GRADE assessments?	Conflicts of interest and study funders	Our AMSTAR 2 quality appraisal rating	Journal	Answers which of our posed questions? Effect of closures on transmission (1) or on pupils (2). Effect of mitigations on transmission (3) or pupils (4).
Zhang <i>et al.</i> , 2021	• What have been the impacts of COVID-19 school closures on mental health of Chinese students?	• Systematic review and meta-analysis	• Start of COVID-19 pandemic – November 2020	China	• Web of Science, PubMed, Medline, Embase, PsycInfo, Google Scholar, Wanfang, China National Knowledge Infrastructure, China Science and Technology Journal. • Searches of included articles' reference lists.	• 31 (11 relevant for our study)	• The Agency for Healthcare research and Quality (AHRQ) tool for cross-sectional studies	>7 points/11 considered high-quality Of the studies relevant to us: • 10/11: 1 study • 9/11: 3 studies • 8/11: 2 studies • 7/11: 2 studies • 6/11: 2 studies • 5/11: 1 study	• Anxiety increased among students during COVID-19. • Average prevalence of anxiety among students during COVID-19 was 24% (95% CI [20-29%]). • Prevalence of anxiety was 25% (95% CI [17-34%]) during the outbreak phase of COVID-19 transmission. • During diffusion attenuation, prevalence of anxiety was 42% (95% CI [35-50%]).	No	• No conflict of interest declared. • Funding: Fundamental Research Funds for Central Universities.	• Critically Low	• <i>Frontiers in Public Health</i>	• 2
NCCMT, 2021	• What is the contribution of schools to COVID-19 transmission?	• Living rapid systematic review	• Start of pandemic – July 22, 2021.	Europe, North America	• 27 databases and sources were searched, including LitCovid and MedRxiv.	• 49 (17 relevant for our study)	• For systematic reviews: Assessment of multiple systematic reviews (AMSTAR 1) • For other study types: Joanna Briggs Institute (JBI) critical appraisal tool. • Grading of Recommendations, Assessment, Development and Evaluations (GRADE) approach.	Quality ratings of the studies relevant to us: • High: 4 • Moderate: 9 • Low: 4	• Mitigation measures applied in schools, including mask-wearing, social distancing, and symptom screening, were effective in reducing transmission. • Re-opening schools did not appear to increase community transmission, especially with other mitigation measures in place.	Yes Low certainty	• No conflicts of interest to declare. • Funding: nib Health.	• Critically low	• <i>National Collaborating Centre for Methods and Tools</i>	• 1 • 3
Walsh <i>et al.</i> , 2021	• Do school closures or re-openings affect community COVID-19 transmission, morbidity, or mortality?	• Systematic review	• Start of pandemic – 7 January 2021	North America, Europe, South America, Asia, Worldwide	• PubMed, Web of Science, Scopus, CINAHL, WHO Global COVID-19 Research Database, ERIC, British Education Index and Australian Education Index, Google. • Experts asked.	• 40 (40 relevant for our study)	• Cochrane Risk of Bias in Non-randomised Studies of Interventions tool (ROBINS-I)	Risk of bias: • Low: 0 studies • Moderate, serious or critical in all studies	• Half of the lower-bias studies showed no effect of school closures on transmission, while the other half showed reduced transmission. • Most of the lower-bias studies showed no increase in transmission upon re-opening schools. • Studies reporting reduced transmission upon school closure were at higher risk of bias than studies reporting no change. • Studies reporting increased transmission upon school re-opening were more prone to bias than studies reporting no effect.	No	• No conflict of interest declared. • Funding: nothing from public, commercial, or not-for-profit sectors.	• Low	• <i>BMJ Open</i>	• 1
Kourti <i>et al.</i> , 2021	• What has been the impact of COVID-19 school closures on incidences and reporting of domestic violence?	• Systematic review	• Start of pandemic – July 2020	South America, Europe, North America, Africa, Australia, Worldwide	• DOAJ, ERIC, Google Scholar, ProQuest, PubMed, PsycNet, Scopus. • References of included studies searched.	• 32 (5 relevant for our study)	• Newcastle-Ottawa Scale (NOS) for cross-sectional and cohort studies.	For the studies relevant for us: Cross-sectional studies • 8/10 (high quality): 1 study • 6/10 (intermediate quality): 1 study • 4/10 (intermediate quality): 2 studies Cohort studies • Good quality: 1 study	• COVID-19 NPIs lead to reduced reports of violence towards children. • Despite this, cases of child abuse may have increased.	No	• No conflict of interest declared. • No funding.	• Critically low	• <i>Trauma, Violence & Abuse</i>	• 2
Ayouni <i>et al.</i> , 2021	• Which public health NPIs have been effective in reducing	• Systematic review	• Start of pandemic – 16 March, 2021.	Asia, Europe, North	• PubMed, Science Direct, MedRxiv.	• 18 (4 relevant for our study)	• Effective Public Health Practice Project (EPHPP) quality assessment tool.	Quality ratings • Good quality: 1 study	• Multiple NPIs, including school closures, appeared to reduce transmission of COVID-19.	Yes Mostly	• No conflict of interest declared.	• Low	• <i>BMC Public Health</i>	• 1

	the transmission of COVID-19?			America, Worldwide				For the studies that are relevant for us: • Strong: 0 studies • Moderate: 3 studies • Weak: 1 study		moderate level of evidence but low level of recommendation	• Funding: none.			
Talic et al., 2021	• How effective are public health measures, including school closures, in reducing the transmission of COVID-19?	• Systematic review and meta-analysis	• Start of pandemic – 7 June 2021.	Europe, Asia, North America, Africa, South America	• Medline, Embase, CINAHL, Global Health, Biosis, Joanna Briggs, WHO COVID-19 database.	• 72 (35 for individual interventions, 37 for multiple interventions) (5 relevant for our study)	• ROBINS-1 and Cochrane tool for assessing Risk Of Bias in randomised trials (ROB-2).	For the studies that are relevant for us: • Risk of bias low in: 0 • Moderate in: 5 • High in: 0	• Studies were not in complete agreement, although mostly agree that school closures reduced COVID-19 transmission.	No	• Conflicting interests declared. • No dedicated funding for the research.	• Low	• <i>The BMJ</i>	• 1
Hammerstein et al., 2021	• What has been the impact of COVID-19 school closures on student achievement?	• Systematic review	• March 1 2020 – April 30 2021.	Asia, Europe, Australia, North America	• Web of Science, PsycArXiv, EdArXiv, SocArXiv. • Included articles' reference lists searched.	• 11 (11 relevant for our study)	• ROBINS-1	Risk of bias: • 5 serious • 5 moderate • 1 low	• COVID-19 school closures reduced student achievement, including in Maths, Reading, and Science. • Younger students were affected more. • Students from lower socio-economic backgrounds were also affected more.	No	• Conflicting interests: none declared. • Funding: no information.	• Critically low	• <i>Frontiers in Psychology</i>	• 2
Muhammad, 2020	• What are the effects of school closures on transmission of COVID-19?	• Rapid systematic review	• 2019 – May 2020	Asia, North America, Europe	• PubMed, WHO Global Research Database on COVID-19, Medline, BMJ, Cochrane, Social Care online.	• 8 (8 relevant for our study)	• None performed.	• None performed.	• Although studies did not universally agree, most showed that school closures reduced COVID-19 transmission. • Earlier interventions appeared more effective. • It is difficult to measure the specific effect of school closures, since multiple NPIs were often introduced simultaneously.	No	• Conflicting interests: no information. • Funding: no information.	• Critically low	• <i>Kurdistan Journal of Applied Research</i>	• 1
Bond et al., 2021	• Which remote learning tools were employed during COVID-19 school closures, and what were their effects on children?	• Systematic review	• Start of pandemic – 5 May 2021	Asia, Europe, South America, North America, Australia, Africa	• Scopus, Web of Science, ERIC, Microsoft Academic Graph. • Manual searching.	• 81 (81 relevant for our study)	• Evidence for Policy and Practice Information (EPPI) Centre method.	Quality appraisal involved two questions: 1) Does the study answer posed questions? 2) Is the evidence trustworthy? All included studies answered research questions, and most were considered trustworthy.	• Some students' motivation to learn increased during remote learning, potentially due to increased independence. • Attendance at virtual sessions was lower than pre-pandemic sessions in person. • Poor engagement with online teaching, probably caused by social isolation. • Some students had less access to technology required for remote learning. • Some students' parents could not help with technological aspects.	No	• No conflict of interests declared. • Funding from ERSC.	• Low	• <i>The International Public Policy Observatory</i>	• 2
Sharma et al., 2021	• What effects do COVID-19 school closures have on school children's sleep?	• Systematic review and meta-analysis	• Start of pandemic – October 13, 2020.	Asia, Europe, North America	• Medline, Embase, Web of Science. • References of included studies also searched.	• 14 (9 relevant for our study)	• Joanna Briggs Institute (JBI) critical appraisal tool	Quality assessment: For the studies that are relevant for us: • 7/8: 5 studies • 6/8: 1 study • 5/8: 2 studies • 4/8: 1 study	• Some pupils slept better than before the pandemic, but three-times this many slept worse. • 54% (95% CI [50-57%]) of children experienced sleep difficulties during COVID-19. • 49% (95% CI [39-58%]) of children did not achieve recommended sleep amounts.	No	• No conflict of interest disclosed. • No funding.	• Critically Low	• <i>Sleep medicine</i>	• 2
Krishnarathne et al., 2022	• What were the effects of COVID-19 in-school mitigations on transmission, morbidity, and mortality?	• Rapid systematic review	• Medline, Embase, Cochrane central register of controlled trials, ERIC, Cochrane COVID-19 study register, WHO	North America, Asia, Europe	• Start of pandemic – August 2021.	• 38 (38 relevant for our study)	• ROBINS-1 for quasi-experimental/observational studies • Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) for observational screening studies	Mostly moderate or severe risk of bias	• Measures implemented in schools – including reducing class size, alternating attendance, mask-wearing, and case isolation - were effective in reducing community transmission and hospitalisation, but reduced the time spent in school.	Yes Very low certainty	• Conflicts of interest declared. • Funding: Ministry of Education and Research, Germany.	• High	• <i>Cochrane Database of Systematic Reviews</i>	• 3

	• What were the effects of in-school mitigations on social and mental health of school pupils?		COVID-19 global literature, Google.				• Bespoke tool for modelling studies • GRADE		• Little data was available on the impact of these measures on children (such as on pupils' mental health).					
Elharake et al., 2022	• What has been the mental health impact of COVID-19 school closures on pupils?	• Systematic review	• PubMed, Collabovid,	China	• January 2020 – July 2021	• 5 (5 relevant for out study)	• None performed.	• None performed.	• Anxiety, depression, and fatigue increased in school pupils during COVID-19 school closures. • This was worse for pupils from low socioeconomic backgrounds, and for those with healthcare workers as family members.	No	• No conflicts of interest disclosed. • Funding: Yale Institute for Global Health.	• Critically low	• <i>Child Psychiatry and Human Development</i>	• 2
Meherali et al., 2021	• What has been the mental health impact of COVID-19 and associated school closures on children and adolescents?	• Rapid systematic review	• MedLine, Embase, Web of Science Index Medicus, CINAHL, Lilacs, CENTRAL (Cochrane Library), eLINA (WHO), WHO COVID-19 databases, Google Scholar, MedRxiv, ChinaXiv. • References of included studies and published systematic reviews searched.	Africa, Australia, North America, Europe, Asia	• Start of the pandemic – unclear	• 18 (13 relevant for our study)	• Mixed- Method Appraisal Tool (MMAT)	• Overall assessment unclear	• Mental health and wellbeing concerns increased among school pupils during COVID-19 NPIs. • This included increased anxiety, depression, changes in sleep and appetite, and reduced social engagement. • Risk factors included female students and those who spent more time on social media.	No	• No conflict of interest disclosed. • Funding: Canadian Institutes of Health Research.	• Low	• <i>International Journal of environmental research and public health</i>	• 2
Nussbaumer-Streit et al., 2020	• How effective is quarantine of individuals who have had a COVID-19 contact – with and without other interventions such as school closures – against COVID-19 transmission?	• Rapid systematic review	• Cochrane COVID-19 Study Register, PubMed, Medline, WHO Global Index Medicus, Embase, CINAHL. • Reference lists of published systematic reviews searched.	North America, Asia, Europe	• Start of pandemic – 23 June 2020	• 51 (6 relevant for our study)	• For non-randomised studies of interventions: ROBINS-I • For non-randomised, non-controlled studies: Cochrane Childhood Cancer tool • For modelling studies: International Society for Pharmacoeconomics and Outcomes Research (ISPOR) tool	Of the studies relevant to us: • Observational studies with serious risk of bias: 1 study • Modelling studies with no-minor concerns: 3 studies • Modelling studies with moderate concerns: 1 study • Modelling studies with major concerns: 1 study	• The combination of school closures with mandatory quarantine was effective in reducing COVID-19 transmission, more-so than mandatory quarantine on its own.	Yes Mainly low certainty	• Conflict of interest declared. Funding: • Liverpool School of Tropical Medicine • University for Continuing Education Krems • Foreign, Commonwealth and Development Office	• Low	• <i>Cochrane Database of Systematic Reviews</i>	• 1
Samji et al., 2021	• What have been the mental health impacts of COVID-19 school closures on pupils?	• Systematic review	• Medline, PsycINFO, Scopus, PubMed, Embase, Web of Science, medRxiv, PsyArxiv, Cumulative index of Nursing and Allied Health Literature (CINAHL).	Europe, Asia, Africa, Australia, North America, South America	• January 1, 2020 – February 22, 2021.	• 116 (116 relevant for our study)	• Oxford Centre for Evidence-based Medicine tool.	A higher score indicates better quality evidence. • 1 rating: 0 articles • 2 rating: 4 articles • 3 rating: 24 articles • 4 rating: 88 articles • 5 rating: 0 articles	• COVID-19 school closures were associated with reduced mental health in pupils. • This was mitigated if pupils did more exercise or had better social support. • Risk factors for poorer mental health included increased age, female pupils, pupils with neurodiversity, and pupils with long-term health concerns.	No	• No conflicts of interest declared. • Funding: none.	• Low	• <i>The Association for Child and Adolescent Mental Health</i>	• 2
Viner et al., 2020	• What have been the effects of COVID-19 school closures on transmission, morbidity, and mortality?	• Rapid systematic review	• PubMed, WHO Global Research Database on COVID-19, MedRxiv.	Asia, UK	• Start of pandemic until March 19, 2020.	• 16 (6 relevant for our study)	• None performed.	• None performed.	• Although this study was from early in the pandemic (up to March 19, 2020), modelling studies revealed a small effect of school closures when compared to other NPIs. • Predictions that school closures would reduce COVID-19 mortality by 2-4%.	No	• No conflicting interests declared. • Funding: no information.	• Critically low	• <i>The Lancet Child and Adolescent Health</i>	• 1
Viner et al., 2022	• What is the effect of COVID-19 school closures on pupils' mental health and well-being?	• Systematic review	• PubMed, Psycinfo, Web of Science Social Citation Index, Australian	North America, Asia, Europe,	• Start of pandemic – September 1, 2020.	• 36 (36 relevant for our study)	• NOS-Cohort studies for cohort studies • Modified NOS for cross-sectional studies	Quality • High: 13 • Medium: 17 • Low: 6	• School closures were associated with negatively impacted mental health and well-being.	No	• No conflicting interests declared. • Funding: no information.	• Low	• <i>JAMA Pediatrics</i>	• 2

			Education Index, British Education Index, Education Resources Information Centre, WHO Global Research Database on COVID-19, MedRxiv, PsyArXiv, Research Square, COVID-19 Living Evidence. • Reference lists of included studies also searched. • Experts in field consulted.	South America			• National Heart, Lung and Blood Institute (NHLBI) tool for pre-post studies		• School closures associated with reduced exercise, increased unhealthy eating, and increased obesity. • School closures led to no change in suicide rates. • Reduced reports of child abuse during school closures. • Increase in sleep difficulties during school closures.					
Lehmann et al., 2022	• What are the impacts of COVID-19 school closures on psychosocial outcomes in pupils?	• Systematic review	• Academic Search Ultimate, Bibliography of Asian Studies, CINAHL, ERIC, Medline, APA PsycArticles, APA PsycInfo, PSYINDEX, SocINDEX, Teacher Reference Center, PubMed, Web of Science, ProQuest, Google Scholar, The Lancet Psychiatry, BMC Public Health, Science Direct. • Experts consulted for additional papers. • Included papers' reference lists searched.	Europe, North America, Asia	• Start of pandemic – July 29 th 2021.	• 10 (10 relevant for our study)	• Downs and Black checklist	Quality • Good: 7 studies • Fair: 2 studies • Poor: 1 study	• COVID-19 school closures were associated with multiple psychosocial impacts on children, including anxiety, depression, hyperactivity, poor behaviour, and emotional issues. • Parental stress was a risk factor for poorer child mental health. • School closures often introduced alongside other measures, so difficult to identify specific effect of closures.	No	• Conflict of interests: no information. • Funding: no information.	• Critically Low	• <i>International Journal of Developmental Science</i>	• 2
Panagouli et al., 2021	• What is the effect of COVID-19 school closures on academic performance of school children?	• Systematic review	• PubMed, Google Scholar, ERIC, SCOPUS, DOAJ, PsycNet • Included papers' reference lists searched.	Asia, Europe, North America, Africa, Australia	• Start of pandemic – 18 July 2021	• 42 (42 relevant for our study)	• NOS for cross-sectional studies. • NOS for cohort studies.	Cross-sectional studies • All between 4 and 8 points (/10). Higher scores indicate better quality. Cohort studies • Mostly good quality.	• Some students had learning loss as a result of school closures. • Others preferred online classes from home. • Younger students and SEN students had worse learning loss.	No	• No conflicts of interest declared. • No funding received for the study.	• Critically Low	• <i>Children</i>	• 2
Mendez-Brito et al., 2021	• What is the effectiveness of NPIs, including school closures, against COVID-19?	• Systematic review	• Embase, Medline, MedRxiv	Europe, North America, Australia, Asia, Worldwide	• January 2020 – March 9, 2021	• 34 (25 relevant for our study)	• Risk of bias tool	Quality assessment: Of the studies relevant for us: • 17/18: 1 study • 16/18: 4 studies • 15/18: 5 studies • 14/18: 6 studies • 13/18: 7 studies • 12/18: 1 study • 11/18: 1 study	• School closures were the most effective measured (including workplace closing, business closing, and public event bans) at reducing COVID-19 transmission. • Introducing NPIs sooner increased effectiveness.	No	• No conflicts of interest declared. • No funding received for the study.	• Critically Low	• <i>Journal of Infection</i>	• 1
Chaabane et al., 2021	• What is the effect of COVID-19 school closures on pupils' health?	• Rapid systematic review	• PubMed, Embase, Google Scholar	North America, Europe, Asia	• 1 January – 2 September 2020	• 10 (10 relevant for our study)	• GRADE	• All studies observational and therefore low-level evidence.	• School closures reduced hospital admissions – including of children.	Yes Low certainty	• No conflicts of interest declared.	• Low	• <i>Children</i>	• 1 • 2

			<ul style="list-style-type: none"> Included articles' reference lists also searched. 						<ul style="list-style-type: none"> School closures prevented pupils from accessing food and disabled services in schools. School closures led to increased anxiety, loneliness, stress, hyperactivity, and reduced exercise. Sleep timing (not quality) was affected by school closures. School closures associated with increased children's BMI and obesity. Online learning was worse for students from lower socio-economic backgrounds. 		<ul style="list-style-type: none"> No funding received for the study. 			
Chai et al., 2021	<ul style="list-style-type: none"> What is the effect of COVID-19 and associated school closures on mental health of school pupils? 	<ul style="list-style-type: none"> Systematic review and meta-analysis 	<ul style="list-style-type: none"> PubMed, Web of Science, PsycINFO, Google Scholar, China National Knowledge Infrastructure (CNKI). References of included studies also searched. 	China	<ul style="list-style-type: none"> November 1 2019 – March 1 2021. 	<ul style="list-style-type: none"> 12 (12 relevant for our study) 	<ul style="list-style-type: none"> JBIC Critical Appraisal Checklist 	<ul style="list-style-type: none"> Quality assessment: 8/9: 7 studies 9/9: 4 studies 	<ul style="list-style-type: none"> Mental health problems among pupils increased during COVID-19 school closures. Prevalence of mental health problems among school pupils was 28% (95% CI [22-34%]) during COVID-19. 	No	<ul style="list-style-type: none"> No conflicts of interest declared. Funding: National Natural Science Foundation of China. 	<ul style="list-style-type: none"> Low 	<ul style="list-style-type: none"> Frontiers in Pediatrics 	<ul style="list-style-type: none"> 2
Suk et al., 2020	<ul style="list-style-type: none"> What is the effect of school closures on COVID-19 transmission? 	<ul style="list-style-type: none"> Systematic review 	<ul style="list-style-type: none"> Medline, Embase. Reference lists of included articles were also searched. 	Europe, North America, Asia, Australia	<ul style="list-style-type: none"> December 2019 – August 31, 2020. 	<ul style="list-style-type: none"> 22 (8 relevant for our study) 	<ul style="list-style-type: none"> None performed. 	<ul style="list-style-type: none"> None performed. 	<ul style="list-style-type: none"> School closures probably reduced COVID-19 transmission. School closures were more effective when introduced in a period of low community transmission. 	No	<ul style="list-style-type: none"> Conflicts of interest: no information. Funding: ECDC. 	<ul style="list-style-type: none"> Critically low 	<ul style="list-style-type: none"> medRxiv 	<ul style="list-style-type: none"> 1
Vardavas et al., 2021	<ul style="list-style-type: none"> What have been the effects of mitigations in schools on COVID-19 transmission, morbidity, and mortality? 	<ul style="list-style-type: none"> Systematic review 	<ul style="list-style-type: none"> Medline, Embase Reference lists of included articles were also searched. 	North America, Asia, Europe, Australia	<ul style="list-style-type: none"> December 2019 – April 1 2021. 	<ul style="list-style-type: none"> 15 (14 relevant for our study) 	<ul style="list-style-type: none"> None performed. 	<ul style="list-style-type: none"> None performed. 	<ul style="list-style-type: none"> NPIs implemented in schools reduced COVID-19 transmission. Little COVID-19 transmission occurred in schools when mitigations were also in place. 	No	<ul style="list-style-type: none"> Conflicts of interest: none declared. Funding: ECDC. 	<ul style="list-style-type: none"> Critically low 	<ul style="list-style-type: none"> medRxiv 	<ul style="list-style-type: none"> 3
Chang et al., 2021	<ul style="list-style-type: none"> What are the effects of COVID-19 school closures on BMI and obesity of pupils? 	<ul style="list-style-type: none"> Systematic review and meta-analysis 	<ul style="list-style-type: none"> Embase, Medline, Cochrane library, CINAHL. Manual searches in Google Scholar. 	Asia, Europe, North America, Africa	<ul style="list-style-type: none"> Start of pandemic – 9 October 2021. 	<ul style="list-style-type: none"> 12 (12 relevant for our study) 	<ul style="list-style-type: none"> NOS 	<ul style="list-style-type: none"> Quality assessment: 8/8: 4 studies 7/8: 7 studies 6/8: 1 study 	<ul style="list-style-type: none"> COVID-19 school closures were associated with an increase in pupils' bodyweight by 2.67 kg (95% CI [2.12-3.23], p<0.00001) on average. Pupils' BMI increased by 0.77 units (95% CI [0.33-1.20], p=0.0006) on average. Prevalence of obesity increased by 1.23-fold (95% CI [1.10-1.37], p=0.0002) on average. 	No	<ul style="list-style-type: none"> Conflicts of interest: none declared. Funding: Chi Mei Medical Center. 	<ul style="list-style-type: none"> Critically Low 	<ul style="list-style-type: none"> Nutrients 	<ul style="list-style-type: none"> 2
Caini et al., 2022	<ul style="list-style-type: none"> How much COVID-19 transmission occurs in schools? 	<ul style="list-style-type: none"> Systematic review and meta-analysis 	<ul style="list-style-type: none"> PubMed, Medline, Web of Science, SCI Expanded, Living Evidence on COVID database. 	Europe, Asia, North America	<ul style="list-style-type: none"> Start of pandemic – 15 May 2021. 	<ul style="list-style-type: none"> 43 (43 relevant for us) 	<ul style="list-style-type: none"> JBIC Critical Appraisal Tool 	<ul style="list-style-type: none"> Most high quality. 	<ul style="list-style-type: none"> Children were less likely to transmit COVID-19 than adults, and less likely to be infected themselves. Limited COVID-19 transmission occurred in schools. 	No	<ul style="list-style-type: none"> Conflicts of interest: none declared. Funding: EuCARE Project, Fondazione Invernizzi and Fondazione CARIPLO, Chance Project. 	<ul style="list-style-type: none"> Critically Low 	<ul style="list-style-type: none"> International Journal of Environmental Research and Public Health 	<ul style="list-style-type: none"> 1

Supplementary Table 1: Characteristics of included studies. We have only listed the questions and study conclusions that are relevant for our study.

Supplementary Table 2: List of excluded studies. Papers excluded as duplicates are not shown.

First author, year	Title	Reason for exclusion
Saulle <i>et al.</i> , 2021	Impact of social distancing for COVID-19 on youths' physical health: a systematic review of the literature	Not in English
Freiberg <i>et al.</i> , 2021	Impact of wearing face masks in public to prevent infectious diseases on the psychosocial development in children and adolescents: a systematic review	Not in English
Guarinoni <i>et al.</i> , 2020	School nurse in the restrain of pandemics and the re-opening school. An integrative review	Does not answer any of our 4 posed questions (see Methods)
Imtiaz Memon <i>et al.</i> , 2020	The effect of quarantine on the emotional well-being of kids: a systematic review	Not a systematic review
-	Integrative Medicine and Health Symposium Abstracts	Not a systematic review
Wei <i>et al.</i> , 2021	Reluctance towards digital image sharing and challenges for tele dermatology	Does not answer any of our 4 posed questions (see Methods)
Clare Vigilar <i>et al.</i> , 2021	The Impact of COVID-19 Virtual Schooling on Child and Adolescent Mental Health: Considerations for Force Readiness	Does not answer any of our 4 posed questions (see Methods)
Sheen <i>et al.</i> , 2020	Screen time in the context of COVID-19: the good, the bad, and the ugly	Not a systematic review
McGowan <i>et al.</i> , 2020	Challenges with managing children and adolescents with ADHD during the COVID-19 pandemic: a review of the literature	Not a systematic review
Sheen <i>et al.</i> , 2020	Impact of COVID-19-related school closures on children and adolescents worldwide: a literature review	Not a systematic review
Wu <i>et al.</i> , 2020	Medical education in the time of COVID-19: a literature review on e-learning	Does not answer any of our 4 posed questions (see Methods)
Gannon <i>et al.</i> , 2021	Impact of the COVID-19 Pandemic on Prescribing for Youth With Autism Spectrum Disorder: A Review of the Literature	Does not answer any of our 4 posed questions (see Methods)
Joshi <i>et al.</i> , 2021	A cost-benefit analysis of a flexible bronchoscope vis-a-vis life of a doctor in COVID-19 era	Does not answer any of our 4 posed questions (see Methods)
Smith <i>et al.</i> , 2021	A health and justice lab to address cancer related health disparities and social determinants of health in	Does not answer any of our 4 posed questions (see Methods)

	marginalized communities: The Cancer Health Justice Lab	
Dragioti <i>et al.</i> , 2021	A large-scale meta-analytic atlas of mental health problems prevalence during the COVID-19 early pandemic	Does not answer any of our 4 posed questions (see Methods)
Khatami <i>et al.</i> , 2020	A meta-analysis of accuracy and sensitivity of chest CT and RT-PCR in COVID-19 diagnosis.	Does not answer any of our 4 posed questions (see Methods)
Ezeonu <i>et al.</i> , 2021	A rapid review of the reopening of schools in this COVID-19 pandemic? How ready are we in Nigeria?	Does not answer any of our 4 posed questions (see Methods)
Pillay <i>et al.</i> , 2021	A review exploring convergence insufficiency in younger populations and e-devices in the digital era	Does not answer any of our 4 posed questions (see Methods)
Walsh <i>et al.</i> , 2021	A systematic review of current teleophthalmology services in New Zealand compared to the four comparable countries of the United Kingdom, Australia, United States of America (Usa) and Canada	Does not answer any of our 4 posed questions (see Methods)
Henry-Blake <i>et al.</i> , 2021	A systematic review of international guidelines regarding the role of radiography in the diagnosis of osteoarthritis	Does not answer any of our 4 posed questions (see Methods)
Byrne <i>et al.</i> , 2021	A systematic review of medical student willingness to volunteer and preparedness for pandemics and disasters	Does not answer any of our 4 posed questions (see Methods)
Zahedi <i>et al.</i> , 2021	A systematic review of screen-time literature to inform educational policy and practice during COVID-19.	Does not answer any of our 4 posed questions (see Methods)
Ashraf <i>et al.</i> , 2021	A Systematic Review of Systematic Reviews on Blended Learning: Trends, Gaps and Future Directions.	Does not answer any of our 4 posed questions (see Methods)
Nigam <i>et al.</i> , 2021	A Systematic Review on AI-based Proctoring Systems: Past, Present and Future.	Does not answer any of our 4 posed questions (see Methods)
Hutton <i>et al.</i> , 2021	A Systematic Scoping Review of the Impacts of Community Food Production Initiatives in Kenya, Cameroon, and South Africa.	Does not answer any of our 4 posed questions (see Methods)
Hempel <i>et al.</i> , 2021	Allocation of scarce resources in a pandemic: rapid systematic review update of strategies for policymakers	Does not answer any of our 4 posed questions (see Methods)
Wang <i>et al.</i> , 2021	Anxiety, depression, and stress prevalence among college students during the COVID-19 pandemic: A systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)

Asadzadeh <i>et al.</i> , 2021	Applications of Virtual and Augmented Reality in Infectious Disease Epidemics with a Focus on the COVID-19 Outbreak.	Does not answer any of our 4 posed questions (see Methods)
Chhibber <i>et al.</i> , 2021	Assessment of health equity consideration in masking/PPE policies to contain COVID-19 using PROGRESS-plus framework: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Pei <i>et al.</i> , 2021	Association of frailty status with adverse clinical outcomes in patients with COVID-19: Protocol for a systematic review and dose-response meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Ravindra <i>et al.</i> , 2022	Asymptomatic infection and transmission of COVID-19 among clusters: systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Tariku <i>et al.</i> , 2020	Available Evidence and Ongoing Hypothesis on Corona Virus (COVID-19) and Psychosis: Is Corona Virus and Psychosis Related? A Narrative Review.	Does not answer any of our 4 posed questions (see Methods)
Gracia-Ramos <i>et al.</i> , 2021	Can the SARS-CoV-2 infection trigger systemic lupus erythematosus? A case-based review	Does not answer any of our 4 posed questions (see Methods)
Ahmed <i>et al.</i> , 2021	Canadian Conference for the Advancement of Surgical Education (C-CASE) 2021: Post-Pandemic and Beyond Virtual Conference	Does not answer any of our 4 posed questions (see Methods)
van Hattum <i>et al.</i> , 2021	Cardiac abnormalities in athletes after SARS-CoV-2 infection: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Rodriguez-Gonzalez <i>et al.</i> , 2020	Cardiovascular impact of COVID-19 with a focus on children: A systematic review.	Does not answer any of our 4 posed questions (see Methods)
Ludvigsson <i>et al.</i> , 2021	Case report and systematic review suggest that children may experience similar long-term effects to adults after clinical COVID-19.	Does not answer any of our 4 posed questions (see Methods)
Lee <i>et al.</i> , 2021	Changes in undergraduate medical education due to COVID-19: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Gomez <i>et al.</i> , 2021	Child-Focused Mental Health Interventions for Disasters Recovery: A Rapid Review of Experiences to Inform Return-to-School Strategies After COVID-19	Does not answer any of our 4 posed questions (see Methods)
Ludvigsson <i>et al.</i> , 2020	Children are unlikely to be the main drivers of the COVID-19 pandemic - A systematic review	Does not answer any of our 4 posed questions (see Methods)

Liu <i>et al.</i> , 2020	Children with COVID-19 behaving milder may challenge the public policies: a systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Gaythorpe <i>et al.</i> , 2021	Children's role in the COVID-19 pandemic: a systematic review of early surveillance data on susceptibility, severity, and transmissibility.	Does not answer any of our 4 posed questions (see Methods)
Di Cicco <i>et al.</i> , 2021	Chronic respiratory diseases other than asthma in children: the COVID-19 tsunami	Does not answer any of our 4 posed questions (see Methods)
	Clinical adaptations post COVID-19 in LMICs	Does not answer any of our 4 posed questions (see Methods)
Zhen-Dong <i>et al.</i> , 2020	Clinical and Transmission Dynamics Characteristics of 406 Children with Coronavirus Disease 2019 in China: A Review.	Does not answer any of our 4 posed questions (see Methods)
Abujafer <i>et al.</i> , 2020	Clinical features, diagnosis, complications, and treatment of multisystem inflammatory syndrome in children MIS-C during the COVID-19 pandemic: a systematic review	Does not answer any of our 4 posed questions (see Methods)
Iglesia <i>et al.</i> , 2021	College students' well-being during the COVID-19 pandemic: A systematic review of the literature	Does not answer any of our 4 posed questions (see Methods)
Preston <i>et al.</i> , 2022	Connectedness, Self-Esteem, and Prosocial Behaviors Protect Adolescent Mental Health Following Social Isolation: A Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Boyadzhieva <i>et al.</i> , 2020	Coronavirus disease 2019 (COVID-19) during pregnancy in patients with rheumatic diseases	Does not answer any of our 4 posed questions (see Methods)
Sanyaolu <i>et al.</i> , 2020	COVID 19 pandemicity: A global situation report as of June 9, 2020	Does not answer any of our 4 posed questions (see Methods)
Fardin <i>et al.</i> , 2020	Covid-19 and anxiety: A review of psychological impacts of infectious disease outbreaks	Does not answer any of our 4 posed questions (see Methods)
Tajbakhsh <i>et al.</i> , 2021	COVID-19 and cardiac injury: clinical manifestations, biomarkers, mechanisms, diagnosis, treatment, and follow up	Does not answer any of our 4 posed questions (see Methods)
Panakaje <i>et al.</i> , 2022	COVID-19 and its impact on educational environment in India	Does not answer any of our 4 posed questions (see Methods)
Rocha <i>et al.</i> , 2020	COVID-19 and patients with immune-mediated inflammatory diseases undergoing	Does not answer any of our 4 posed questions (see Methods)

	pharmacological treatments: A rapid living systematic review	
Boechat <i>et al.</i> , 2021	COVID-19 and pediatric asthma: Clinical and management challenges	Does not answer any of our 4 posed questions (see Methods)
Bansal <i>et al.</i> , 2021	COVID-19 and pregnancy: A scientometric assessment of global publications during 2020-21	Does not answer any of our 4 posed questions (see Methods)
Sameni <i>et al.</i> , 2020	COVID-19 and Skin Manifestations: An Overview of Case Reports/Case Series and Meta-Analysis of Prevalence Studies.	Does not answer any of our 4 posed questions (see Methods)
Nasiri <i>et al.</i> , 2020	COVID-19 Clinical Characteristics, and Sex-Specific Risk of Mortality: Systematic Review and Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Wijayanti <i>et al.</i> , 2020	Covid-19 in children and policy of the Indonesian government to begins new school year	Does not answer any of our 4 posed questions (see Methods)
Parilli-Troconis <i>et al.</i> , 2020	COVID-19 Infection and Its Influence in Otorhinolaryngology-Head and Neck Surgery	Does not answer any of our 4 posed questions (see Methods)
Desye <i>et al.</i> , 2021	COVID-19 Pandemic and Water, Sanitation, and Hygiene: Impacts, Challenges, and Mitigation Strategies	Does not answer any of our 4 posed questions (see Methods)
Ka Siu <i>et al.</i> , 2020	COVID-19 prevention and treatment information on the internet: a systematic analysis and quality assessment.	Does not answer any of our 4 posed questions (see Methods)
Beesoon <i>et al.</i> , 2020	COVID-19 Scientific Advisory Group Rapid Evidence Report	Does not answer any of our 4 posed questions (see Methods)
Ryan <i>et al.</i> , 2021	COVID-19, children and schools: overlooked and at risk	Not a systematic review
Siedlecki <i>et al.</i> , 2020	COVID-19: Ophthalmological Aspects of the SARS-CoV 2 Global Pandemic.	Does not answer any of our 4 posed questions (see Methods)
El Homossany <i>et al.</i> , 2021	COVID-19-related anxiety among dental students in two dental schools in Saudi Arabia	Does not answer any of our 4 posed questions (see Methods)
Noruzi <i>et al.</i> , 2022	Current and Future Perspectives on the COVID-19 Vaccine: A Scientometric Review	Does not answer any of our 4 posed questions (see Methods)
Caine <i>et al.</i> , 2020	Current views and understanding in an anaesthetic department surrounding power injection of intravenous contrast via central venous catheters for CT	Does not answer any of our 4 posed questions (see Methods)

Afifah <i>et al.</i> , 2021	DAMPAK PENDEMI COVID-19 TERHADAP PEMBELAJARAN DI SEKOLAH DASAR	Not a systematic review
Al-Ryalat <i>et al.</i> , 2021	Dedicated COVID-19 Resource Center in Radiology Journals: Its Citation Metrics and Altmetrics Impact	Does not answer any of our 4 posed questions (see Methods)
Guo <i>et al.</i> , 2021	Depression and Coping Styles of College Students in China During COVID-19 Pandemic: A Systemic Review and Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Jhala <i>et al.</i> , 2021	Development of a COVID-19 convalescent plasma curriculum amongst students: An initial pilot study	Does not answer any of our 4 posed questions (see Methods)
Vincent <i>et al.</i> , 2021	Development of a patient decision aid for COVID-19 vaccination with the Comirnaty vaccine	Does not answer any of our 4 posed questions (see Methods)
Moreira <i>et al.</i> , 2021	Diagnosis of SARS-Cov-2 Infection by RT-PCR Using Specimens Other Than Naso- and Oropharyngeal Swabs: A Systematic Review and Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Fujita-Rohwerder <i>et al.</i> , 2022	Diagnostic accuracy of rapid point-of-care tests for diagnosis of current SARS-CoV-2 infections in children: a systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Anglemyer <i>et al.</i> , 2020	Digital contact tracing technologies in epidemics: a rapid review.	Does not answer any of our 4 posed questions (see Methods)
Tudor Car <i>et al.</i> , 2021	Digital Health Training Programs for Medical Students: Scoping Review.	Does not answer any of our 4 posed questions (see Methods)
Ahmady <i>et al.</i> , 2021	Distance learning strategies in medical education during COVID-19: A systematic review.	Does not answer any of our 4 posed questions (see Methods)
Shimabuku <i>et al.</i> , 2020	Double burden of excess weight and anemia in Latin American children up to 2019	Does not answer any of our 4 posed questions (see Methods)
Patel <i>et al.</i> , 2020	Early epidemiological indicators, outcomes, and interventions of COVID-19 pandemic: A systematic review.	Does not answer any of our 4 posed questions (see Methods)
Oliveira <i>et al.</i> , 2021	Effectiveness of Mobile App-Based Psychological Interventions for College Students: A Systematic Review of the Literature.	Does not answer any of our 4 posed questions (see Methods)
Iezadi <i>et al.</i> , 2021	Effectiveness of non-pharmaceutical public health interventions against	Does not answer any of our 4 posed questions (see Methods)

	COVID-19: A systematic review and meta-analysis.	
Wilcha <i>et al.</i> , 2020	Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Adefalu <i>et al.</i> , 2021	Psychological Implications of Covid-19 Pandemic in College Students-A Systematic Review	Does not answer any of our 4 posed questions (see Methods)
Azab <i>et al.</i> , 2022	Egyptian neurosurgical publication productivity. A retrospective analysis from 2015 to 2020	Does not answer any of our 4 posed questions (see Methods)
Saha <i>et al.</i> , 2021	Epidemiological burden of parents being the index cases of COVID-19 infected children.	Does not answer any of our 4 posed questions (see Methods)
Martinoli <i>et al.</i> , 2021	Estimating SARS-CoV-2 Circulation in the School Setting: A Systematic Review and Meta-Analysis	Does not answer any of our 4 posed questions (see Methods)
Paterson <i>et al.</i> , 2021	Exploring the impact of COVID-19 on the movement behaviors of children and youth: A scoping review of evidence after the first year.	Not a systematic review
Danisi <i>et al.</i> , 2021	Exploring the impact of school closures on the mental health of children in grades K-12 in the United States during the COVID-19 pandemic	Not a systematic review
Regmi <i>et al.</i> , 2021	Factors Associated with the Implementation of Non-Pharmaceutical Interventions for Reducing Coronavirus Disease 2019 (COVID-19): A Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Carrion-Martinez <i>et al.</i> , 2021	Family and School Relationship during COVID-19 Pandemic: A Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Wang <i>et al.</i> , 2022	Fear of COVID-19 among college students: A Systematic Review and Meta-Analysis	Does not answer any of our 4 posed questions (see Methods)
Ishihara <i>et al.</i> , 2021	Flunking COVID-19 Out of Schools: A Systematic Review of Non-Pharmaceutical Interventions to Minimize Novel Coronavirus-2 in Educational Settings	Does not answer any of our 4 posed questions (see Methods)
Fligor <i>et al.</i> , 2020	Gastrointestinal Malignancies and the COVID-19 Pandemic: Evidence-Based Triage to Surgery.	Does not answer any of our 4 posed questions (see Methods)
Achmad <i>et al.</i> , 2021	Gingival Health and Oral Hygiene Measures among Junior High School Children during the Covid-19 Pandemic: A Systematic Review	Does not answer any of our 4 posed questions (see Methods)

Do Prado De-Carlo <i>et al.</i> , 2020	Guidelines for occupational therapy assistance in COVID-19 pandemic and post-pandemic perspectives	Does not answer any of our 4 posed questions (see Methods)
Kabiri <i>et al.</i> , 2021	Health-Related Physical Fitness and Activity in Homeschool: A Systematic Review With Implications for Return to Public School.	Does not answer any of our 4 posed questions (see Methods)
Sam <i>et al.</i> , 2020	High-stakes, remote-access, open-book examinations.	Does not answer any of our 4 posed questions (see Methods)
Besegato <i>et al.</i> , 2022	How can biophotonics help dentistry to avoid or minimize cross infection by SARS-CoV-2?	Does not answer any of our 4 posed questions (see Methods)
Wilcha <i>et al.</i> , 2020	How effective is virtual medical teaching during the COVID-19 crisis? A review of the advantages and disadvantages.	Does not answer any of our 4 posed questions (see Methods)
Richardson <i>et al.</i> , 2021	HPV vaccination in LMICs: A thematic analysis of attitudes and implementation strategies	Does not answer any of our 4 posed questions (see Methods)
Ebina-Shibuya <i>et al.</i> , 2021	Hydroxychloroquine and chloroquine for treatment of coronavirus disease 19 (COVID-19): a systematic review and meta-analysis of randomized and non-randomized controlled trials.	Does not answer any of our 4 posed questions (see Methods)
Wang <i>et al.</i> , 2020	Immunotherapy or other anti-cancer treatments and risk of exacerbation and mortality in cancer patients with COVID-19: a systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Portillo <i>et al.</i> , 2021	Impact of COVID-19 on Library Services in US Pharmacy Programs	Does not answer any of our 4 posed questions (see Methods)
Lopez-Valenciano <i>et al.</i> , 2020	Impact of COVID-19 Pandemic on University Students' Physical Activity Levels: An Early Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Rajmil <i>et al.</i> , 2021	Impact of lockdown and school closure on children's health and well-being during the first wave of COVID-19: A narrative review	Not a systematic review
Minozzi <i>et al.</i> , 2021	Impact of social distancing for covid-19 on the psychological well-being of youths: A systematic review of the literature	Not in English
Minozzi <i>et al.</i> , 2021	Impact of social distancing for Covid-19 on young people: Type and quality of the studies found through a systematic review of the literature	Not in English

Mao <i>et al.</i> , 2021	Impact of the COVID-19 pandemic on the mental health and learning of college and university students: A protocol of systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2021	Impact of the COVID-19 Pandemic on the Mental Health of College Students: A Systematic Review and Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Bakaloudi <i>et al.</i> , 2021	Impact of the first COVID-19 lockdown on body weight: A combined systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Spielberger <i>et al.</i> , 2021	Intra-Household and Close-Contact SARS-CoV-2 Transmission Among Children - a Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Mun <i>et al.</i> , 2021	Intraoperative aerosol viral transmission in minimally invasive surgery: a scoping review and impact on clinical guidelines and practice during the onset of the coronavirus disease 2019 (COVID-19) pandemic	Does not answer any of our 4 posed questions (see Methods)
Farumi <i>et al.</i> , 2020	Literature Review: Risk Factors Affecting College Student's Mental Disorder During Covid19 Pandemic	Does not answer any of our 4 posed questions (see Methods)
The National Collaborating Centre for Methods and Tools, 2021	Living Rapid Review Update 3 : What is known about the risk of transmission of COVID-19 within post-secondary institutions and the strategies to mitigate on-campus outbreaks ?	Does not answer any of our 4 posed questions (see Methods)
Hards <i>et al.</i> , 2021	Loneliness and mental health in children and adolescents with pre-existing mental health problems: A rapid systematic review.	Does not answer any of our 4 posed questions (see Methods)
Kaka <i>et al.</i> , 2021	Major Update: Remdesivir for Adults With COVID-19 : A Living Systematic Review and Meta-analysis for the American College of Physicians Practice Points.	Does not answer any of our 4 posed questions (see Methods)
Robinson <i>et al.</i> , 2020	Management of Canadian Pediatric Patients With Glomerular Diseases During the COVID-19 Pandemic: Recommendations From the Canadian Association of Pediatric Nephrologists COVID-19 Rapid Response Team	Does not answer any of our 4 posed questions (see Methods)
Krishnaratne <i>et al.</i> , 2020	Measures implemented in the school setting to contain the COVID-19 pandemic: a scoping review.	Not a systematic review

Okuyama <i>et al.</i> , 2021	Mental Health and Physical Activity among Children and Adolescents during the COVID-19 Pandemic.	Not a systematic review
Zapata-Ospina <i>et al.</i> , 2021	Mental health interventions for college and university students during the COVID-19 pandemic: a critical synthesis of the literature	Does not answer any of our 4 posed questions (see Methods)
Santabarbara <i>et al.</i> , 2021	Meta-Analysis of Prevalence of Depression in Dental Students during COVID-19 Pandemic.	Does not answer any of our 4 posed questions (see Methods)
Zhang <i>et al.</i> , 2021	Mindfulness-based interventions: An overall review	Does not answer any of our 4 posed questions (see Methods)
Fyfe-Johnson <i>et al.</i> , 2021	Nature contact and children's health: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Costa <i>et al.</i> , 2020	Olfactory and taste disorders in COVID-19: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Papa <i>et al.</i> , 2021	One year of anatomy teaching and learning in the outbreak: Has the Covid-19 pandemic marked the end of a century-old practice? A systematic review.	Does not answer any of our 4 posed questions (see Methods)
Camargo <i>et al.</i> , 2020	Online learning and COVID-19: a meta-synthesis analysis.	Does not answer any of our 4 posed questions (see Methods)
Pan <i>et al.</i> , 2021	Opening pandemic's box: supporting developing adolescents	Does not answer any of our 4 posed questions (see Methods)
Buja <i>et al.</i> , 2021	Opening Schools and Trends in SARS-CoV-2 Transmission in European Countries.	Not a systematic review
Jessop <i>et al.</i> , 2020	Personal protective equipment for surgeons during COVID-19 pandemic: systematic review of availability, usage and rationing.	Does not answer any of our 4 posed questions (see Methods)
Jefferson <i>et al.</i> , 2020	Physical interventions to interrupt or reduce the spread of respiratory viruses.	Does not answer any of our 4 posed questions (see Methods)
Kohler <i>et al.</i> , 2021	Playing games: A systematic review on teaching health professional students	Does not answer any of our 4 posed questions (see Methods)
O'Boyle <i>et al.</i> , 2020	PMD42 The IMPACT of COVID-19 on Telemedicine in Ophthalmology: A Literature Review	Does not answer any of our 4 posed questions (see Methods)
Van Hattum <i>et al.</i> , 2021	Post-COVID-19 peri-and myocardial manifestations are less common in athletes than in healthy non-athletes: Findings from a systematic review	Does not answer any of our 4 posed questions (see Methods)

Zhu <i>et al.</i> , 2021	Post-secondary Student Mental Health During COVID-19: A Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Mosleh <i>et al.</i> , 2021	Potentials of Antitussive Traditional Persian Functional Foods for COVID-19 Therapy+	Does not answer any of our 4 posed questions (see Methods)
Payedimarri <i>et al.</i> , 2021	Prediction Models for Public Health Containment Measures on COVID-19 Using Artificial Intelligence and Machine Learning: A Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Citeroni <i>et al.</i> , 2021	Predictors of toxicity with hydroxychloroquine and chloroquine use: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Chang <i>et al.</i> , 2021	Prevalence of anxiety symptom and depressive symptom among college students during COVID-19 pandemic: A meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Silva <i>et al.</i> , 2021	Prevalence of anxiety, depression, and stress among teachers during the COVID-19 pandemic: A PRISMA-compliant systematic review.	Does not answer any of our 4 posed questions (see Methods)
Ozamiz-Etxebarria <i>et al.</i> , 2021	Prevalence of Anxiety, Depression, and Stress among Teachers during the COVID-19 Pandemic: A Rapid Systematic Review with Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Ghajarzadeh <i>et al.</i> , 2021	Prevalence of COVID-19 infection in patients with neuromyelitis optica spectrum disorder (NMOSD): A systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Huang <i>et al.</i> , 2022	Progress on Pharmaceutical Sciences/Pharmacy Postgraduate Education: a Bibliometric Perspective	Does not answer any of our 4 posed questions (see Methods)
Mao <i>et al.</i> , 2021	Protocol: Impact of the COVID-19 pandemic on the mental health and learning of college and university students: a protocol of systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Heideman <i>et al.</i> , 2021	Protocols for Managing Food Allergies in Elementary and Secondary Schools	Does not answer any of our 4 posed questions (see Methods)
Di Bidino <i>et al.</i> , 2020	PRS58 IMPACT of Sars-COV-2 on Provided Healthcare. Evidence from the Emergency Phase in Italy	Does not answer any of our 4 posed questions (see Methods)
Rogers <i>et al.</i> , 2020	Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with	Does not answer any of our 4 posed questions (see Methods)

	comparison to the COVID-19 pandemic.	
Adefalu <i>et al.</i> , 2021	Psychological Implications of Covid-19 Pandemic in College Students-A Systematic Review	Does not answer any of our 4 posed questions (see Methods)
Xu <i>et al.</i> , 2021	Psychological interventions of virtual gamification within academic intrinsic motivation: A systematic review.	Does not answer any of our 4 posed questions (see Methods)
Molleti <i>et al.</i> , 2021	Rapid Systematic Review of the Impact of School Closures on Child Mental Health amid the COVID-19 Pandemic	Not a systematic review
Dinnes <i>et al.</i> , 2021	Rapid, point-of-care antigen and molecular-based tests for diagnosis of SARS-CoV-2 infection	Does not answer any of our 4 posed questions (see Methods)
Wilt <i>et al.</i> , 2021	Remdesivir for Adults With COVID-19 : A Living Systematic Review for American College of Physicians Practice Points.	Does not answer any of our 4 posed questions (see Methods)
Hassib <i>et al.</i> , 2021	Renin-Angiotensin-Aldosterone System Inhibitors and COVID-19: A Meta-Analysis and Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Lo Moro <i>et al.</i> , 2020	Reopening Schools during the COVID-19 Pandemic: Overview and Rapid Systematic Review of Guidelines and Recommendations on Preventive Measures and the Management of Cases.	Does not answer any of our 4 posed questions (see Methods)
Melo-Oliveira <i>et al.</i> , 2021	Reported quality of life in countries with cases of COVID19: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Gao <i>et al.</i> , 2020	Research Collaboration and Outcome Measures of Interventional Clinical Trial Protocols for COVID-19 in China.	Does not answer any of our 4 posed questions (see Methods)
Karki <i>et al.</i> , 2021	Risk of infection and contribution to transmission of SARS-CoV-2 in school staff: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Irfan <i>et al.</i> , 2021	Risk of infection and transmission of SARS-CoV-2 among children and adolescents in households, communities and educational settings: A systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Ouma <i>et al.</i> , 2021	Role and utility of COVID-19 laboratory testing in low-income and middle-income countries: Protocol for rapid evidence synthesis	Does not answer any of our 4 posed questions (see Methods)

Rajmil <i>et al.</i> , 2020	Role of children in the transmission of the COVID-19 pandemic: A rapid scoping review	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2007	Role of ventilation in airborne transmission of infectious agents in the built environment - a multidisciplinary systematic review.	Does not answer any of our 4 posed questions (see Methods)
Grothe <i>et al.</i> , 2021	Rural access to pediatric gastroenterology care	Does not answer any of our 4 posed questions (see Methods)
Wenjing <i>et al.</i> , 2020	Safety and efficacy of convalescent plasma therapy in severely and critically ill patients with COVID-19: a systematic review with meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Martinoli <i>et al.</i> , 2021	SARS-CoV-2 circulation in the school setting: A systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Kumar <i>et al.</i> , 2021	SARS-CoV-2 detection in human milk: a systematic review	Does not answer any of our 4 posed questions (see Methods)
Lambelet <i>et al.</i> , 2020	SARS-CoV-2 in the context of past coronaviruses epidemics: Consideration for prenatal care	Does not answer any of our 4 posed questions (see Methods)
Xu <i>et al.</i> , 2021	SARS-CoV-2 transmission in schools: An updated living systematic review (version 2; November 2020).	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2022	School closures and reopenings during the COVID-19 pandemic: a scoping review protocol.	Not a systematic review
Alfano <i>et al.</i> , 2021	School openings and the COVID-19 outbreak in Italy. A provincial-level analysis using the synthetic control method	Not a systematic review
Lopes-Junior <i>et al.</i> , 2021	School reopening and risks accelerating the COVID-19 pandemic: A systematic review and meta-analysis protocol	Not a systematic review
Exner-Cortens <i>et al.</i> , 2021	School-Based Suicide Risk Assessment Using eHealth for Youth: Systematic Scoping Review.	Does not answer any of our 4 posed questions (see Methods)
Bond <i>et al.</i> , 2020	Schools and emergency remote education during the COVID-19 pandemic: A living rapid systematic review.	Does not answer any of our 4 posed questions (see Methods)
Sipiyaruk <i>et al.</i> , 2021	Serious Games and the COVID-19 Pandemic in Dental Education: An Integrative Review of the Literature	Does not answer any of our 4 posed questions (see Methods)
Thompson <i>et al.</i> , 2021	Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Setting-specific Transmission Rates: A	Does not answer any of our 4 posed questions (see Methods)

	Systematic Review and Meta-analysis.	
Lameiras-Fernandez <i>et al.</i> , 2021	Sex Education in the Spotlight: What Is Working? Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Hammond <i>et al.</i> , 2021	Should homes and workplaces purchase portable air filters to reduce the transmission of SARS-CoV-2 and other respiratory infections? A systematic review	Does not answer any of our 4 posed questions (see Methods)
Viola <i>et al.</i> , 2021	Social and environmental effects of the COVID-19 pandemic on children	Not a systematic review
Mousa <i>et al.</i> , 2021	Social contact patterns and implications for infectious disease transmission - a systematic review and meta-analysis of contact surveys.	Does not answer any of our 4 posed questions (see Methods)
Khosravizadeh <i>et al.</i> , 2021	Social distance capacity to control the COVID-19 pandemic: A systematic review on time series analysis.	Does not answer any of our 4 posed questions (see Methods)
-	Society for Acupuncture Research Pandemics, Pain, and Public Health: Roles and Relevance of Traditional East Asian Medicine	Does not answer any of our 4 posed questions (see Methods)
D'angelo <i>et al.</i> , 2021	Strategies to exiting the COVID-19 lockdown for workplace and school: A scoping review.	Does not answer any of our 4 posed questions (see Methods)
Xiao <i>et al.</i> , 2021	Suicide Prevention Among College Students Before and During the COVID-19 Pandemic: Protocol for a Systematic Review and Meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Younis <i>et al.</i> , 2021	Survey of Robotics in Education, Taxonomy, Applications, and Platforms during COVID-19	Does not answer any of our 4 posed questions (see Methods)
Lee <i>et al.</i> , 2021	Synchronous online learning during movement control order in higher education institutions: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Luo <i>et al.</i> , 2021	Systematic Review and Meta-Analysis of Fear of COVID-19.	Does not answer any of our 4 posed questions (see Methods)
Walsh <i>et al.</i> , 2022	Systematic review of current tele-ophthalmology services in New Zealand compared to the four comparable countries of the United Kingdom, Australia, United States of America and Canada	Does not answer any of our 4 posed questions (see Methods)

Byrne <i>et al.</i> , 2021	Systematic review of medical student willingness to volunteer and preparedness for pandemics and disasters.	Does not answer any of our 4 posed questions (see Methods)
Cachon-Zagalaz <i>et al.</i> , 2020	Systematic Review of the Literature About the Effects of the COVID-19 Pandemic on the Lives of School Children.	Does not answer any of our 4 posed questions (see Methods)
Oyetade <i>et al.</i> , 2020	Technology adoption in education: A systematic literature review	Does not answer any of our 4 posed questions (see Methods)
Bui <i>et al.</i> , 2021	Tele-monitoring in pediatric respiratory diseases	Does not answer any of our 4 posed questions (see Methods)
Dhillon <i>et al.</i> , 2021	The accuracy of saliva versus nasopharyngeal and/or oropharyngeal samples for the detection of SARS-CoV-2 in children. A rapid systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Ndreu <i>et al.</i> , 2021	The cold calling method: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Qaseem <i>et al.</i> , 2021	The development of living, rapid practice points: Summary of methods from the scientific medical policy committee of the american college of physicians	Does not answer any of our 4 posed questions (see Methods)
Veys <i>et al.</i> , 2021	The effect of hand hygiene promotion programs during epidemics and pandemics of respiratory droplet-transmissible infections on health outcomes: a rapid systematic review.	Does not answer any of our 4 posed questions (see Methods)
Rahayuwati <i>et al.</i> , 2021	The effectiveness of tele-education for health field university students as a learning method during a covid-19 pandemic: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Amate <i>et al.</i> , 2021	The effects of covid-19 in the learning process of primary school students: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Hu <i>et al.</i> , 2021	The effects of the measures against COVID-19 pandemic on physical activity among school-aged children and adolescents (6-17 years) in 2020: A protocol for systematic review.	Not a systematic review
Choudhuri <i>et al.</i> , 2021	The efficacy and safety of hydroxychloroquine (HCQ) in treatment of COVID19 -a systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)

Cozzi <i>et al.</i> , 2022	The first winter of social distancing improved most of the health indexes in a paediatric emergency department	Does not answer any of our 4 posed questions (see Methods)
Liyanage <i>et al.</i> , 2021	The impact of COVID-19 lockdown on dengue transmission in Sri Lanka; a natural experiment for understanding the influence of human mobility	Does not answer any of our 4 posed questions (see Methods)
Ding <i>et al.</i> , 2021	The impact of COVID-19 on college students' physical activity: A protocol for systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Ho <i>et al.</i> , 2020	The impact of death and dying on the personhood of medical students: a systematic scoping review.	Does not answer any of our 4 posed questions (see Methods)
Haddad <i>et al.</i> , 2021	The Impact of Social Media on College Mental Health During the COVID-19 Pandemic: a Multinational Review of the Existing Literature	Does not answer any of our 4 posed questions (see Methods)
Marchi <i>et al.</i> , 2021	The Impact of the COVID-19 Pandemic and Societal Infection Control Measures on Children and Adolescents' Mental Health: A Scoping Review	Not a systematic review
Smith <i>et al.</i> , 2020	The Impact of the COVID-19 Pandemic on Food Insecurity among US College Students, a Systematic Review	Does not answer any of our 4 posed questions (see Methods)
Araujo <i>et al.</i> , 2021	The potential impact of the COVID-19 pandemic on child growth and development: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Deng <i>et al.</i> , 2021	The prevalence of depressive symptoms, anxiety symptoms and sleep disturbance in higher education students during the COVID-19 pandemic: A systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Wiedenmann <i>et al.</i> , 2021	The role of children and adolescents in the sars-cov-2 pandemic: A rapid review	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2020	The role of children in the transmission of SARS-CoV2: updated rapid review.	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2020	The role of children in transmission of SARS-CoV-2: A rapid review.	Does not answer any of our 4 posed questions (see Methods)
Vaselli <i>et al.</i> , 2021	The seroprevalence of SARS-CoV-2 during the first wave in Europe 2020: A systematic review.	Does not answer any of our 4 posed questions (see Methods)

Petretto <i>et al.</i> , 2021	The use of distance learning and e-learning in students with learning disabilities: A review on the effects and some hint of analysis on the use during covid-19 outbreak	Does not answer any of our 4 posed questions (see Methods)
Dickey <i>et al.</i> , 2021	Toward the use of medical scent detection dogs for COVID-19 screening.	Does not answer any of our 4 posed questions (see Methods)
Wang <i>et al.</i> , 2020	Transmission and prevention of SARS-CoV-2	Does not answer any of our 4 posed questions (see Methods)
Viner <i>et al.</i> , 2021	Transmission of SARS-CoV-2 by children and young people in households and schools: a meta-analysis of population-based and contact-tracing studies.	Does not answer any of our 4 posed questions (see Methods)
Clyne <i>et al.</i> , 2022	Transmission of SARS-CoV-2 by children: a rapid review, 30 December 2019 to 10 August 2020.	Does not answer any of our 4 posed questions (see Methods)
Moon <i>et al.</i> , 2021	Transmission risks of respiratory infectious diseases in various confined spaces: A meta-analysis for future pandemics	Does not answer any of our 4 posed questions (see Methods)
Bhargava <i>et al.</i> , 2020	Universal health coverage and tuberculosis care in India in the times of Covid-19: Aligning Ayushman Bharat (National Health Assurance Scheme) to improve case detection, reduce deaths and catastrophic health expenditure	Does not answer any of our 4 posed questions (see Methods)
Viswanathan <i>et al.</i> , 2020	Universal screening for SARS-CoV-2 infection: a rapid review	Does not answer any of our 4 posed questions (see Methods)
Kotak <i>et al.</i> 2020	Use of Tocilizumab in COVID-19: A Systematic Review and Meta-Analysis of Current Evidence.	Does not answer any of our 4 posed questions (see Methods)
Lamb <i>et al.</i> , 2020	Use of Tracheostomy During the COVID-19 Pandemic: American College of Chest Physicians/American Association for Bronchology and Interventional Pulmonology/Association of Interventional Pulmonology Program Directors Expert Panel Report	Does not answer any of our 4 posed questions (see Methods)
Parsons <i>et al.</i> , 2020	'viral' virtual education: Constructing a virtual pediatric lab medicine elective for medical students and trainees	Does not answer any of our 4 posed questions (see Methods)
Perez <i>et al.</i> , 2021	Virtual implementations to away rotations in otolaryngology during COVID-19	Does not answer any of our 4 posed questions (see Methods)

Xu <i>et al.</i> , 2022	Virtual mindfulness interventions to promote well-being in adults: A mixed-methods systematic review.	Does not answer any of our 4 posed questions (see Methods)
Chen <i>et al.</i> , 2020	Visual analysis of coronavirus disease 2019 (COVID-19) studies based on bibliometrics	Does not answer any of our 4 posed questions (see Methods)
Nenna <i>et al.</i> , 2021	Weighing policymaking: A narrative review of school closures as COVID-19 pandemic-mitigation strategies	Not a systematic review
Xu <i>et al.</i> , 2020	What is the evidence for transmission of COVID-19 by children in schools? A living systematic review.	Does not answer any of our 4 posed questions (see Methods)
Goodwin <i>et al.</i> , 2021	Which factors influence the extent of indoor transmission of SARS-CoV-2? A rapid evidence review.	Does not answer any of our 4 posed questions (see Methods)
Caroppo <i>et al.</i> , 2021	Will nothing be the same again?: Changes in lifestyle during COVID-19 pandemic and consequences on mental health	Does not answer any of our 4 posed questions (see Methods)
Morgan <i>et al.</i> , 2022	Women healthcare workers' experiences during COVID-19 and other crises: A scoping review.	Does not answer any of our 4 posed questions (see Methods)
Ilesanmi <i>et al.</i> , 2021	A scope review on the global impact of COVID-19 lockdown on adolescents' health.	Not a systematic review
Kaddoura <i>et al.</i> , 2022	A systematic review on machine learning models for online learning and examination systems.	Does not answer any of our 4 posed questions (see Methods)
Trivandrum Anandapadmanabhan <i>et al.</i> , 2022	Effect of COVID-19 on Dental Education: A Review.	Does not answer any of our 4 posed questions (see Methods)
Walsh <i>et al.</i> , 2022	Effectiveness of rapid antigen testing for screening of asymptomatic individuals to limit the transmission of SARS-CoV-2: A rapid review.	Does not answer any of our 4 posed questions (see Methods)
Shankar <i>et al.</i> , 2022	Mental health of students of biomedical sciences during the COVID-19 pandemic: a scoping review.	Does not answer any of our 4 posed questions (see Methods)
Radwanski <i>et al.</i> , 2022	Neurosurgical Education for Medical Students: A Scoping Review.	Does not answer any of our 4 posed questions (see Methods)
Gunawan <i>et al.</i> , 2022	School Reopening during COVID-19 Pandemic: Is It Safe? A Systematic Review	Not a systematic review
Palacios <i>et al.</i> , 2022	Measuring Quality Standards for a Consultation-Liaison Psychiatry Service in a Chilean Teaching Hospital	Does not answer any of our 4 posed questions (see Methods)

Martin Delawalla <i>et al.</i> , 2022	The Impact of the COVID-19 Pandemic on Adolescent Social Media Use, Substance Use, and Depressive Symptoms: A Scoping Review	Not a systematic review
Windarwati <i>et al.</i> , 2022	A narrative review into the impact of COVID-19 pandemic on senior high school adolescent mental health	Not a systematic review
Simkeviciute <i>et al.</i> , 2021	A Novel Case Study Approach to Undergraduate Research in Post-COVID Times - Mayhem in May	Does not answer any of our 4 posed questions (see Methods)
Kruger <i>et al.</i> , 2022	Acute Cough in Adult Patients	Does not answer any of our 4 posed questions (see Methods)
Savage <i>et al.</i> , 2022	Advances in Clinical Cardiology 2021: A Summary of Key Clinical Trials	Does not answer any of our 4 posed questions (see Methods)
Furlong <i>et al.</i> , 2021	An evidence-based synthesis of instructional reading and spelling procedures using telepractice: A rapid review in the context of COVID-19	Does not answer any of our 4 posed questions (see Methods)
Djurdejevic <i>et al.</i> , 2022	Anxiety and depressive symptomatology among children and adolescents exposed to the COVID-19 pandemic - A systematic review	Does not answer any of our 4 posed questions (see Methods)
Al-Halabi <i>et al.</i> , 2020	Assessment of paediatric dental guidelines and caries management alternatives in the post COVID-19 period. A critical review and clinical recommendations	Does not answer any of our 4 posed questions (see Methods)
Geng <i>et al.</i> , 2022	Attitudes of COVID-19 vaccination among college students: A systematic review and meta-analysis of willingness, associated determinants, and reasons for hesitancy	Does not answer any of our 4 posed questions (see Methods)
-	BASHH 2022 Abstracts	Not a systematic review
Ziade <i>et al.</i> , 2021	Best practice guidelines for telehealth in rheumatology: An initiative by the arab league of associations for rheumatology	Does not answer any of our 4 posed questions (see Methods)
Fleury <i>et al.</i> , 2022	Canadian Northern and Indigenous health policy responses to the first wave of COVID-19	Does not answer any of our 4 posed questions (see Methods)
Silverberg <i>et al.</i> , 2022	Child transmission of SARS-CoV-2: a systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)

Abbasi <i>et al.</i> , 2021	Clinical Characteristics and Histopathology of Corona Virus Disease 2020	Does not answer any of our 4 posed questions (see Methods)
Koszalinski <i>et al.</i> , 2022	Communication challenges in social isolation, subjective cognitive decline, and mental health status in older adults: A scoping review (2019-2021)	Does not answer any of our 4 posed questions (see Methods)
Musa <i>et al.</i> , 2022	COVID-19 and screen-based sedentary behaviour: Systematic review of digital screen time and metabolic syndrome in adolescents	Does not answer any of our 4 posed questions (see Methods)
Grover <i>et al.</i> , 2022	COVID-19 and Substance Use: A Scientometric Assessment of Global Publications During 2020 and 2021	Does not answer any of our 4 posed questions (see Methods)
Khan <i>et al.</i> , 2020	COVID-19: A Worldwide, Zoonotic, Pandemic Outbreak	Does not answer any of our 4 posed questions (see Methods)
Courtney <i>et al.</i> , 2022	COVID-19-Driven Improvements and Innovations in Pharmacy Education: A Scoping Review	Does not answer any of our 4 posed questions (see Methods)
Chen <i>et al.</i> , 2022	Depressive Symptoms Among Children and Adolescents in China During the Coronavirus Disease-19 Epidemic: A Systematic Review and Meta-Analysis	Does not answer any of our 4 posed questions (see Methods)
Palo <i>et al.</i> , 2022	Effective interventions to ensure MCH (Maternal and Child Health) services during pandemic related health emergencies (Zika, Ebola, and COVID-19): A systematic review	Does not answer any of our 4 posed questions (see Methods)
Sun <i>et al.</i> , 2022	Effectiveness of different types and levels of social distancing measures: a scoping review of global evidence from earlier stage of COVID-19 pandemic	Not a systematic review
Caruso <i>et al.</i> , 2021	Efficacy and Benefits of Augmented and Virtual Reality Based Learning during COVID-19	Does not answer any of our 4 posed questions (see Methods)
Ostor <i>et al.</i> , 2021	Efficacy and safety of risankizumab for active psoriatic arthritis: 24-week integrated results from 2 phase 3, randomized, double-blind clinical trials for csdmard-ir and bio-ir patients	Does not answer any of our 4 posed questions (see Methods)
Su <i>et al.</i> , 2022	Enhancement of Online Education to the Teaching Paradigm: Taking Academic Medical Postgraduate Cultivation as an Example	Does not answer any of our 4 posed questions (see Methods)

Allaq <i>et al.</i> , 2021	EPIDEMIOLOGICAL STUDIES OF THE NOVEL CORONAVIRUS (COVID-19) IN LIBYA	Does not answer any of our 4 posed questions (see Methods)
Rahman <i>et al.</i> , 2021	Estimating the Impact of the Pandemic on Children's Physical Health: A Scoping Review	Not a systematic review
Howes <i>et al.</i> , 2022	Factors influencing the delivery of telerehabilitation for stroke: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Hossain <i>et al.</i> , 2022	Global burden of mental health problems among children and adolescents during COVID-19 pandemic: A systematic umbrella review	Not a systematic review
Sriharan <i>et al.</i> , 2020	HEALTHCARE SUPERHEROES NEED RESCUE DURING PANDEMICS	Does not answer any of our 4 posed questions (see Methods)
Kumar <i>et al.</i> , 2022	Impact of COVID-19 on Gender Equality, Sexual and Reproductive Health Rights of Adolescent Girls and Young Women: A Narrative Review	Does not answer any of our 4 posed questions (see Methods)
Sakti <i>et al.</i> , 2022	Impact of COVID-19 on School Populations and Associated Factors: A Systematic Review	Does not answer any of our 4 posed questions (see Methods)
Valenzuela <i>et al.</i> 2022	Impact of COVID-19 Pandemic on Sleep of Undergraduate Students: A Systematic Literature Review	Does not answer any of our 4 posed questions (see Methods)
Laing <i>et al.</i> , 2021	Is undergraduate nursing education sufficient for patient's nutrition care in today's pandemics? Assessing the nutrition knowledge of nursing students: An integrative review	Does not answer any of our 4 posed questions (see Methods)
Juneau <i>et al.</i> , 2022	Lessons from past pandemics: a systematic review of evidence-based, cost-effective interventions to suppress COVID-19	Does not answer any of our 4 posed questions (see Methods)
Kaka <i>et al.</i> , 2022	Major Update 2: Remdesivir for Adults With COVID-19: A Living Systematic Review and Meta-analysis for the American College of Physicians Practice Points	Does not answer any of our 4 posed questions (see Methods)
Bestetti <i>et al.</i> , 2022	Nonpharmaceutical public health interventions to curb the COVID-19 pandemic: a narrative review	Not a systematic review
Ali <i>et al.</i> , 2022	PCR80 Informing a Conceptual Framework for a Patient-Centered Value Assessment of Emerging Therapies for Mild/Moderate COVID-19	Does not answer any of our 4 posed questions (see Methods)

Burridge <i>et al.</i> , 2022	Predictive and retrospective modelling of airborne infection risk using monitored carbon dioxide	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2022	Prevalence and associated factors of depression and anxiety symptoms among college students: a systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Makwana <i>et al.</i> , 2022	Prevalence of depression among Indian medical students in COVID-19 pandemic - A meta-analysis	Does not answer any of our 4 posed questions (see Methods)
-	Proceedings of the New Zealand Society for the Study of Diabetes Annual Scientific Meeting	Does not answer any of our 4 posed questions (see Methods)
-	Psychiatry Update 2021 Spring Abstract	Does not answer any of our 4 posed questions (see Methods)
Dinnes <i>et al.</i> , 2022	Rapid, point-of-care antigen tests for diagnosis of SARS-CoV-2 infection	Does not answer any of our 4 posed questions (see Methods)
Robbins <i>et al.</i> , 2021	Rheumatology continuing professional development for primary care providers: A systematic review	Does not answer any of our 4 posed questions (see Methods)
Dadashi <i>et al.</i> , 2022	SARS-CoV-2 and HIV co-infection; clinical features, diagnosis, and treatment strategies: A systematic review and meta-analysis	Does not answer any of our 4 posed questions (see Methods)
Balachandren <i>et al.</i> , 2022	SARS-CoV-2 infection in the first trimester and the risk of early miscarriage: A UK population-based prospective cohort study of 3041 pregnancies conceived during the pandemic	Does not answer any of our 4 posed questions (see Methods)
Albaker <i>et al.</i> , 2022	Strengthening medical education during the post-COVID-19 era for building an effective healthcare workforce: A narrative review	Does not answer any of our 4 posed questions (see Methods)
Macleod <i>et al.</i> , 2020	Surgery during COVID-19 crisis conditions: can we protect our ethical integrity against the odds?	Does not answer any of our 4 posed questions (see Methods)
Babidge <i>et al.</i> , 2020	Surgery triage during the COVID-19 pandemic	Does not answer any of our 4 posed questions (see Methods)
Alharbi <i>et al.</i> , 2022	Synergism of CD28 Immune Molecule in Late Immunosuppressive Phase of COVID-19: Effectiveness in Vaccinated Individuals	Does not answer any of our 4 posed questions (see Methods)
Jawad <i>et al.</i> , 2022	The Impact of the COVID-19 pandemic on a regional Cleft Lip and Palate Surgery Service in the United	Does not answer any of our 4 posed questions (see Methods)

	Kingdom; A review of case-load prioritisation and lessons learned	
Banholzer <i>et al.</i> , 2022	The methodologies to assess the effects of non-pharmaceutical interventions during COVID-19: a systematic review	Does not answer any of our 4 posed questions (see Methods)
Sasidharanpillai <i>et al.</i> , 2022	The Short-Term Impact Of COVID-19 Pandemic on Cervical Cancer Screening: A Systematic Review and Meta-Analysis	Does not answer any of our 4 posed questions (see Methods)
Kratzer <i>et al.</i> , 2022	Unintended consequences of measures implemented in the school setting to contain the COVID-19 pandemic: a scoping review	Not a systematic review
Poague <i>et al.</i> , 2022	Water, Sanitation and Hygiene in Schools in Low-and Middle-Income Countries: A Systematic Review and Implications for the COVID-19 Pandemic	Does not answer any of our 4 posed questions (see Methods)
Pizarro <i>et al.</i> , 2022	Workplace interventions to reduce the risk of SARS-CoV-2 infection outside of healthcare settings	Does not answer any of our 4 posed questions (see Methods)
Moula <i>et al.</i> , 2022	A Systematic Review of Arts-Based Interventions Delivered to Children and Young People in Nature or Outdoor Spaces: Impact on Nature Connectedness, Health and Wellbeing.	Does not answer any of our 4 posed questions (see Methods)
Panda <i>et al.</i> , 2022	Clinical Outcome of Neonates Born to SARS-CoV-2 Positive Mothers in India: A Systematic Review and Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Sutton <i>et al.</i> , 2022	Comparing reactogenicity of COVID-19 vaccines: a systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Levy <i>et al.</i> , 2022	Consequences of Social Distancing Measures During the COVID-19 Pandemic First Wave on the Epidemiology of Children Admitted to Pediatric Emergency Departments and Pediatric Intensive Care Units: A Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Mayra <i>et al.</i> , 2022	COVID-19 and health in children and adolescents in the US: A narrative systematic review.	Does not answer any of our 4 posed questions (see Methods)
Ma <i>et al.</i> , 2022	COVID-19 pandemic-related anxiety, stress, and depression among teachers: A systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)

Alemayehu <i>et al.</i> , 2022	Covid-19 Vaccine Acceptance and Determinant Factors among General Public in East Africa: A Systematic Review and Meta-Analysis.	Does not answer any of our 4 posed questions (see Methods)
Saito <i>et al.</i> , 2022	Evaluation of postgraduate rural medical training programs and implications for rural workforce development: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Parveen <i>et al.</i> , 2022	Identifying the Leadership Challenges of K-12 Public Schools During COVID-19 Disruption: A Systematic Literature Review.	Does not answer any of our 4 posed questions (see Methods)
Renson <i>et al.</i> , 2022	Interventions on Socioeconomic and Racial Inequities in Respiratory Pandemics: a Rapid Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Li <i>et al.</i> , 2022	Knowledge, attitudes, and practices towards COVID-19 among college students in China: A systematic review and meta-analysis.	Does not answer any of our 4 posed questions (see Methods)
Oliveira <i>et al.</i> , 2022	Mental health effects prevalence in children and adolescents during the COVID-19 pandemic: A systematic review.	Does not answer any of our 4 posed questions (see Methods)
Gozdzielewska <i>et al.</i> , 2022	The effectiveness of hand hygiene interventions for preventing community transmission or acquisition of novel coronavirus or influenza infections: a systematic review.	Does not answer any of our 4 posed questions (see Methods)
Codispoti <i>et al.</i> , 2022	The Role of Access and Cost-Effectiveness in Managing Asthma: A Systematic Review.	Does not answer any of our 4 posed questions (see Methods)
Drumheller <i>et al.</i> , 2022	Unprecedented times and uncertain connections: A systematic review examining sleep problems and screentime during the COVID-19 pandemic.	Does not answer any of our 4 posed questions (see Methods)