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# COVID-19 In Children With Brain-Based Developmental Disabilities

## A Two-Week Rapid Review

Date: 4/29/2020

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### For and in close collaboration with

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## Abbreviations

COVID-19	Coronavirus disease 2019 (illness)
CDC	Centers for Disease Control and Prevention
ICU	Intensive care unit
N/A	Not applicable
NR	Not reported
PECO	Population, Exposure, Comparator, and Outcomes
PROSPERO	International prospective register of systematic reviews
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2 (virus)
SPOR	Strategy for Patient-Oriented Research
WHO	World Health Organization

## Key Definitions

**Brain-based developmental disability:** According to the CDC, “developmental disabilities are a group of conditions due to an impairment in physical, learning, language, or behavior areas. These conditions begin during the developmental period, may impact day-to-day functioning, and usually last throughout a person’s lifetime.” (National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, 2019)

**Prevalence:** Number of cases that are affected by a disease.

**Pediatric:** Related to infants, children, and adolescents.



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## Summary

**Context:** In the last few months, COVID-19 has infected millions of people Worldwide, and as of the date of this publication, the pandemic continues. While studies continue to explore the epidemiology of the disease, information regarding children with brain-based disabilities, or those at-risk of developing such diseases, remains scarce. The CHILD-BRIGHT Network, an innovative pan-Canadian network aiming to improve life outcomes for children with brain-based developmental disabilities and their families, commissioned a rapid review to the SPOR Evidence Alliance, which we undertook.

**Objectives:** Our review aimed to answer the following three research questions: 1) are children with brain-based disabilities more likely to develop COVID-19? (2) are children with brain-based disabilities more likely to develop complications due to COVID-19? and (3) are children with brain-based disabilities more likely to have a poorer prognosis once they develop COVID-19?

**Methods:** We conducted a rapid review using search strategies iteratively developed and tested by an experienced medical information specialist in consultation with the review team and a panel of knowledge users. All searches were performed on April 18, 2020. We included studies with primary data regarding children aged between 0 and 18 years old with brain-based developmental disabilities, or who were at-risk of developing such disabilities, with confirmed or suspected COVID-19.

**Results:** Our search strategy identified 538 individual records, of which 4 were included in our review. Of the 80 pediatric patients reported in the included studies, a total of 7 children at-risk of developing brain-based disabilities with COVID-19 were included. Symptoms ranged in severity. However, generally, patients were discharged or saw improvements in their symptoms by the end of the study period. No deaths were reported.

**Discussion:** Our study highlights a knowledge gap regarding the impact of COVID-19 in children with brain-based disabilities. It appears as though this specific population has been overlooked. There is an urgent need to gather data regarding this population in order to inform policy-makers, decision-makers, as well as the families affected by brain-based disabilities.



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## Context

According to the World Health Organization, SARS-CoV-2 (COVID-19) has infected close to 3 million and caused the death of over 200 000 individuals worldwide, as of April 26th, 2020 (1). Certain individuals are said to be at increased risk of experiencing severe outcomes or poorer prognostics, including older adults (aged 65 years and older) and individuals with underlying conditions such as diabetes, severe obesity, or liver disease (2, 3). Prevalence of COVID-19 in children is low. Of the 23,082 cases reported in Canada (April 23rd, 2020), 1,055 (4.57%) were in patients aged 19 years old and under (4). Of those, 14 were hospitalized, and 2 were admitted to ICU, with no deaths being reported. Data gathered for the U.S. between February 12th, 2020 and April 2nd, 2020 indicated that of the 149,760 cases, 1.5% (2,572) were children, of which 13% had underlying conditions, 5.7% were hospitalized, and included 3 deaths (3). As of February 11th 2020, China had reported that of 44,672 confirmed cases in Mainland China, 965 (2.1%) were children, with 1 reported death (5). As of April 24rd, 2020, a total of 150,383 cases were reported in Germany, of which 2,476 (2%) were under 10 years old, and 6,209 (4%) were aged between 10-19 years old (6). Finally, as of March 12th, 2020, 7,755 cases were reported in the Republic of Korea, of which 480 (6.2%) were pediatric, with no deaths being reported (7).

Based on the current available evidence, children do not appear to be at higher risk of contracting COVID-19 than adults (8). However, children with comorbidities may be vulnerable to severe COVID-19 disease (9). Indeed, children with neurological and neuromuscular disease had an increased risk of respiratory failure when hospitalized with influenza(10). Symptom manifestation in children appears to be milder than in adults (11, 12). Further, incidence in individuals under 19 years of age has been quite low (9, 11, 13) and children could even be less susceptible to the COVID-19 disease (8). To the best of our knowledge, no review has searched for the impact of COVID-19 on children with brain-based disabilities infected with COVID-19.



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## Objectives

**This rapid review was commissioned by the Strategy for Patient-Oriented Research (SPOR) funded CHILD-BRIGHT Network**, an innovative pan-Canadian network that aims to improve life outcomes for children with brain-based developmental disabilities and their families (<https://www.child-bright.ca/>). Concerned with the potential impact of the novel coronavirus on children with brain-based developmental disabilities, they requested support from the SPOR Evidence Alliance to conduct a rapid review within a two-week period, on the topic. Thus, this review aimed to answer the following questions:

- 1) Are children with brain-based developmental disabilities more likely to develop COVID-19?
- 2) Are children with brain-based developmental disabilities more likely to develop complications due to COVID-19?
- 3) Are children with brain-based developmental disabilities more likely to have a poorer prognosis once they develop COVID-19?

**We engaged with a panel of knowledge users (patients, caregivers, clinicians, decision makers) and researchers from the CHILD-BRIGHT Network** throughout the review process, from question development, literature search, interpretation and writing of results, and dissemination of findings.



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## Methods

We conducted the rapid review based on the proposed methodology guide of the Cochrane Rapid Reviews Methods Group (14). We report our results based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (15).

### Literature Search

An experienced medical information specialist developed the search strategies through an iterative process in consultation with the review team and the panel of knowledge users. The MEDLINE strategy was peer reviewed by another senior information specialist prior to execution using the PRESS Checklist (16). Using the OVID platform, we searched Ovid MEDLINE®, including Epub Ahead of Print and In-Process & Other Non-Indexed Citations, Embase Classic+Embase, PsycINFO, Cochrane Database of Systematic Reviews and the Cochrane Central Register of Controlled Trials. We also searched CINAHL (Ebsco) and Web of Science. All searches were performed on April 18<sup>th</sup>, 2020.

We used a combination of controlled vocabulary and keywords (e.g., “Coronavirus Infections”, “Coronavirus”, “Child”) for the strategies and adjusted vocabulary and syntax across databases. We initially included vocabulary and keywords specific to brain-based developmental disabilities but removed them after piloting of that strategy yielded no citations to be included in the review. There were no language restrictions on any of the searches but when possible, animal-only records were removed from the results. We limited results to publication years 2019 to the present. Specific details regarding the strategies appear in Appendix 1.

From the included studies and the reviews identified from our searches, we reviewed reference lists for original studies and cross-referenced them with a list of articles provided by content experts from our knowledge users panel. Considering the fast pace





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at which information becomes available in the context of COVID-19, we developed a grey literature search strategy in consultation with our experienced medical information specialist, which consisted of preprint articles from SSRN and medRxiv (last consulted April 23<sup>rd</sup>, 2020), ongoing trials from the WHO International Clinical Trials Registry Platform (last consulted April 23<sup>rd</sup>, 2020), ongoing reviews from PROSPERO (last consulted April 23<sup>rd</sup>, 2020), and Government or Health organizations' websites and reports (consulted between April 17<sup>th</sup> to April 25<sup>th</sup>, 2020) (Appendix 2).

### Eligibility Criteria

We followed the PECO Framework in establishing eligibility criteria (17, 18) (Table 1). We considered any study with primary data that included children aged between 0 and 18 with a brain-based developmental disability or at-risk of developing such disability with confirmed or suspected COVID-19 (see Appendix 3 for full list).

**Table 1. PECO Inclusion Criteria**

<b>Population (P)</b>	Children (18 years and under) with brain-based developmental disabilities (e.g., cerebral palsy, autism, developmental delay, ADHD, severe impairments) or at-risk of developing brain-based disabilities (e.g., premature, congenital heart disease/defect).
<b>Exposition (E)</b>	COVID-19
<b>Comparator (C)</b>	Children with COVID-19 or none
<b>Outcomes (O)</b>	Any outcome



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## **Study Selection and Extraction**

Four reviewers individually performed screening for titles, abstracts and then full-text using pilot-tested standardized forms (25 and 5 citations respectively for each level of screening). We developed a standardized extraction form that included study (e.g., authors, country, study design, population) and cases (e.g., type of disability, age) characteristics, complications, and any outcome reported. Single reviewers extracted data which was then confirmed by a senior reviewer. We resolved discrepancies through discussion.

## **Risk of Bias Appraisal**

No risk of bias was performed due to the short turnaround timeline.

## **Synthesis**

We report data using a narrative approach which includes tables of study characteristics and detailed reporting of case characteristics, complications, and outcomes. Our data synthesis focused on providing a descriptive summary to inform knowledge users.

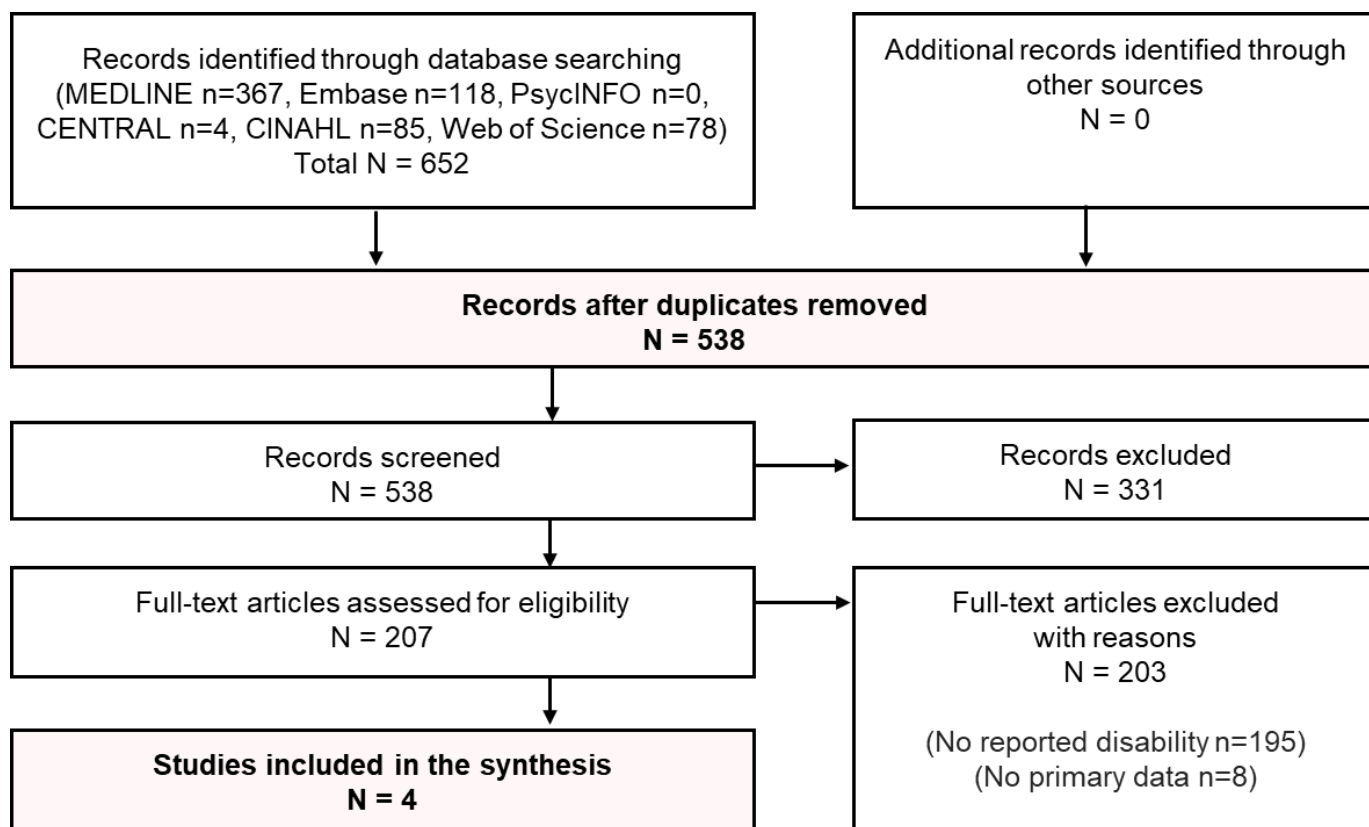
# Results

## Literature Search

Our search strategy identified 538 individual records. Following the screening of titles and abstracts, we excluded 331 records. After full-text screening, we excluded an additional 203 records resulting in a total of 4 records included in our review (19-22) (Figure 1).

Our grey literature search did not identify any ongoing trials or preprint articles of research regarding children with brain-based developmental disabilities.

**Figure 1. Study Flow Diagram**





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## Characteristics of Included Studies

Of the four included studies, one was a case report (19), one was a cohort study (20), one was a retrospective cross-sectional analysis (21), and one was a retrospective study of medical records (22) (Table 2). Three studies took place in Wuhan, Hubei province, China (20-22) and one in the U.S. (19). The four included studies reported on a total of 80 pediatric patients with 50 infected or suspected of being infected.

**Table 2. Description of included studies**

Author (year)	Country	Title	Study aims	Study design	Population
Paret (2020)	USA	SARS-CoV-2 infection (COVID-19) in febrile infants without respiratory distress	Reporting of two cases of COVID-19 in infants	Case report	Infants (n=2)
Zeng (2020)	China (Wuhan)	Neonatal early-onset infection with sars-cov-2 in 33 neonates born to mothers with COVID-19 in Wuhan, China	Examining neonatal early-onset infection with COVID-19 in 33 neonates born to mothers with COVID-19	Cohort study	Infants (n=33) Only 3 infected
Zheng (2020)	China (Wuhan)	Clinical characteristics of children with coronavirus disease 2019 in Hubei, China	Identifying clinical characteristics of children with COVID-19	Retrospective cross-sectional study	Children (n=25)
Xia (2020)	China (Wuhan)	Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults	Discussing characteristics of clinical, laboratory, and chest computed tomography in pediatric patients from adults with COVID-19	Retrospective study of medical records	Children (n=20)



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## Characteristics of Cases

We did not identify any study reporting on children with brain-based developmental disabilities, all included studies reported on COVID-19 infected children at-risk of developing a brain-based developmental disability. Two of the studies included preterm infants (19, 20) while the others included children with congenital heart disease or defect and epilepsy (21, 22).

Detailed information was only available for three of the four studies (19-21) (Table 3). Symptoms for preterm infants ranged from a single fever to overall mild symptoms (19, 20), with one infant developing complications (fetal distress, neonatal respiratory distress syndrome, pneumonia, and suspected sepsis) and requiring resuscitation at birth (20). The preterm infant without complications was discharged in stable condition (19) whereas the infant developing complications saw its condition resolve on day 14 of life (20). Children with heart disease expressed symptoms including cough, dyspnea, fever, and diarrhea and required pediatric intensive care with invasive mechanical ventilation (21). Their symptoms were later partially or significantly alleviated (21).

The fourth study identified one patient with epilepsy (resulting from sequela of previous encephalitis) and two with a history of atrial septal defect surgery but no individual information was available (22). Overall, symptoms were mild, and eighteen of the 20 children were cured and discharged with an average stay of 12.9 days (8-20 days).



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**Table 3. Summary of cases**

Study	Sex	Age	Diagnostics	Symptoms	Complications	Outcomes
Paret (USA)	M	56 d	Preterm (35 weeks)	Fever was the only symptom	N/A	Patient discharged in stable condition
Zeng (China)	NR	0 d	Preterm (31 weeks)	Symptoms were overall mild	Fetal distress Neonatal respiratory distress syndrome Pneumonia Suspected sepsis  Resuscitation was required at birth	Neonatal respiratory distress syndrome and pneumonia resolved on day 14 of life
Zheng (China)	M	8 mo	Congenital heart disease (malnutrition and suspected hereditary metabolic disease)	Cough Dyspnea Fever	Pediatric intensive care was required with invasive mechanical ventilation	Partly alleviated
	M	12 mo	Congenital heart disease	Fever Diarrhea Dyspnea	Pediatric intensive care was required, with invasive mechanical ventilation	Significantly alleviated



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## Discussion

Prevalence of COVID-19 in children has been reported as being low. However, we were unable to find information regarding the prevalence of this coronavirus in children with brain-based developmental disabilities. We did not identify any study investigating the effects of COVID-19 in children with brain-based disabilities but did identify four studies discussing the coronavirus disease in children considered at-risk (preterm infants or children with some pre-existing conditions). Although some of the children in the included studies did develop complications, symptoms were reported as being partially or significantly alleviated or resolved, with most patients being discharged from the hospital and no deaths being reported. These results are in accordance with other studies on COVID-19 in children which reported that symptoms in the pediatric population appeared milder than in adults with the occurrence of death being very rare (12, 13, 23).

Our review highlights the lack of evidence regarding the effects of COVID-19 in children with brain-based disabilities and those with at-risk conditions. Indeed, it appears as though this specific population has been overlooked. The lack of data could be due to the low occurrence rates as well as the milder symptoms which have previously been reported in children (12, 13, 23). In addition, it is possible that due to their milder or absent symptoms, these cases simply do not get reported. However, clinical guidelines from the Centers for Disease Control and Prevention (CDC) clearly state that individuals of any age with underlying conditions, including congenital heart disease, may be at higher risk of developing moderate to severe symptoms from COVID-19 (2). Moreover, UNICEF warns that children with underlying conditions may be at greater risk of developing complications (24). More data, including the presence of brain-based disabilities and other at-risk conditions in children, is required to have a better understanding of the clinical impacts of COVID-19 on these populations. With that goal in mind, one ongoing review is currently examining comorbidities in the adult and pediatric populations (25).



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## Limitations

Our rapid review had certain limitations. Due to our study design, screenings and data extractions were performed by single reviewers. However, we did perform pilot-testing for each review form to optimize consistency between reviewers. Further, despite our best efforts to identify all relevant studies, it is possible that some were missed.

## Implication for Practice and Policy

Our rapid review has identified knowledge gaps in the literature regarding the effects of COVID-19 in children with brain-based disabilities, and those at-risk of developing such disabilities. Without data regarding high-risk populations, it is difficult for decision-makers to determine the best course of action for not only treatment, but reintegration with regards to the eventually alleviated confinement measures.





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## Appendix 1. Search Strategies

2020 Apr 18

Ovid Multifile

Database: Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® <1946-Present>, Embase Classic+Embase <1947 to 2020 April 16>, APA PsycInfo <1806 to April Week 2 2020>

Search Strategy:

- 
- 1 Coronavirus/ (9006)
  - 2 Coronavirus Infections/ (6788)
  - 3 (COVID-19 or COVID19).mp. (7538)
  - 4 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).mp. (1621)
  - 5 Wuhan virus\*.mp. (12)
  - 6 2019-nCoV.mp. (1049)
  - 7 (nCoV or n-CoV).mp. (1098)
  - 8 HCoV-19.mp. (8)
  - 9 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2).mp. (2406)
  - 10 (novel coronavirus\* or novel corona virus\*).mp. (3086)
  - 11 ((coronavirus\* or corona virus\*) adj2 "2019").mp. (2881)
  - 12 ((coronavirus\* or corona virus\*) adj2 "19").mp. (533)
  - 13 (coronavirus 2 or corona virus 2).mp. (1942)
  - 14 (coronavirus\* or corona virus\*).ti. (16258)
  - 15 or/1-14 [COVID 19] (29699)
  - 16 exp Infant/ (2278037)
  - 17 exp Child/ (4879551)
  - 18 Adolescent/ (3645659)
  - 19 (baby or babies or infant? or infanc\* or neonat\* or newborn\* or preschool\* or pre-school\* or toddler?).tw,kf. (1924540)
  - 20 (adolescen\* or child\* or pre-adolescen\* or preteen\* or pre-teen\* or school-age\* or teen or teens or teenager? or youth\*).tw,kf. (4626733)
  - 21 exp Pediatrics/ (203872)
  - 22 p?ediatric\*.tw,kf. (943730)
  - 23 or/16-22 [INFANTS/CHILDREN/ADOLESCENTS] (9782583)
  - 24 15 and 23 [COVID-19 - INFANTS/CHILDREN/ADOLESCENTS] (2990)
  - 25 exp Animals/ not Humans/ (18169986)
  - 26 24 not 25 [ANIMAL-ONLY REMOVED] (2013)
  - 27 limit 26 to yr="2019-current" (658)
  - 28 27 use ppez [MEDLINE RECORDS] (386)
  - 29 Coronavirinae/ (3474)
  - 30 Coronavirus infection/ (7716)
  - 31 (COVID-19 or COVID19).mp. (7538)
  - 32 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).mp. (1621)



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- 33 Wuhan virus\*.mp. (12)
- 34 2019-nCoV.mp. (1049)
- 35 (nCoV or n-CoV).mp. (1098)
- 36 HCoV-19.mp. (8)
- 37 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2).mp. (2406)
- 38 (novel coronavirus\* or novel corona virus\*).mp. (3086)
- 39 ((coronavirus\* or corona virus\*) adj2 "2019").mp. (2881)
- 40 ((coronavirus\* or corona virus\*) adj2 "19").mp. (533)
- 41 (coronavirus 2 or corona virus 2).mp. (1942)
- 42 (coronavirus\* or corona virus\*).ti. (16258)
- 43 or/29-42 [COVID 19] (27586)
- 44 exp child/ (4879551)
- 45 exp adolescent/ (3645863)
- 46 juvenile/ (49134)
- 47 (baby or babies or infant? or infanc\* or neonat\* or newborn\* or preschool\* or pre-school\* or toddler?).tw,kw. (1906006)
- 48 (adolescen\* or child\* or pre-adolescen\* or preteen\* or pre-teen\* or school-age\* or teen or teens or teenager? or youth\*).tw,kw. (4632750)
- 49 exp pediatrics/ (203872)
- 50 p?ediatric\*.tw,kw. (969422)
- 51 or/44-50 [INFANTS/CHILDREN/ADOLESCENTS] (9624446)
- 52 43 and 51 [COVID-19 - INFANTS/CHILDREN/ADOLESCENTS] (2521)
- 53 exp animal/ or exp animal experimentation/ or exp animal model/ or exp animal experiment/ or nonhuman/ or exp vertebrate/ (52820606)
- 54 exp human/ or exp human experimentation/ or exp human experiment/ (40547950)
- 55 53 not 54 (12274383)
- 56 52 not 55 [ANIMAL-ONLY REMOVED] (1987)
- 57 limit 56 to yr="2019-current" (734)
- 58 57 use emczd [EMBASE RECORDS] (351)
- 59 (COVID-19 or COVID19).mp. (7538)
- 60 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).mp. (1621)
- 61 Wuhan virus\*.mp. (12)
- 62 2019-nCoV.mp. (1049)
- 63 (nCoV or n-CoV).mp. (1098)
- 64 HCoV-19.mp. (8)
- 65 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2).mp. (2406)
- 66 (novel coronavirus\* or novel corona virus\*).mp. (3086)
- 67 ((coronavirus\* or corona virus\*) adj2 "2019").mp. (2881)
- 68 ((coronavirus\* or corona virus\*) adj2 "19").mp. (533)
- 69 (coronavirus 2 or corona virus 2).mp. (1942)
- 70 (coronavirus\* or corona virus\*).ti. (16258)
- 71 or/59-70 [COVID 19] (23023)
- 72 (baby or babies or infant? or infanc\* or neonat\* or newborn\* or preschool\* or pre-school\* or toddler?).tw,id. (1874620)
- 73 (adolescen\* or child\* or pre-adolescen\* or preteen\* or pre-teen\* or school-age\* or teen or teens or teenager? or youth\*).tw,id. (4573083)
- 74 exp Pediatrics/ (203872)



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75 p?ediatric\*.tw,id. (928599)  
 76 limit 71 to (100 childhood <birth to age 12 yrs> or 120 neonatal <birth to age 1 mo> or 140 infancy <2 to 23 mo> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200 adolescence <age 13 to 17 yrs>) [Limit not valid in Ovid MEDLINE(R),Ovid MEDLINE(R) Daily Update,Ovid MEDLINE(R) In-Process,Ovid MEDLINE(R) Publisher,Embase; records were retained] (22978)  
 77 72 or 73 or 74 or 75 (6217215)  
 78 71 and 77 (1436)  
 79 76 or 78 [COVID-19 - INFANT/CHILD/ADOLESCENT POPULATION] (22980)  
 80 limit 79 to yr="2019-current" (10272)  
 81 80 use ppez,emczd (10272)  
 82 80 not 81 [PSYCINFO RECORDS] (0)  
 83 28 or 58 or 82 [ALL DATABASES] (737)  
 84 remove duplicates from 83 (485)  
 85 84 use ppez [MEDLINE UNIQUE RECORDS] (367)  
 86 84 use emczd [EMBASE UNIQUE RECORDS] (118)  
 87 84 not (85 or 86) [PSYCINFO UNIQUE RECORDS] (0)

\*\*\*\*\*

CINAHL

#	Query	Limiters/Expanders	Last Run Via	Results
S17	S9 AND S15	Limiters - Published Date: 20190101-20201231 Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	85
S16	S9 AND S15	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	392
S15	S10 OR S11 OR S12 OR S13 OR S14	Search modes - Boolean/Phrase	Interface - EBSCOhost Research	1,290,363



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			Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	
S14	TI p#ediatric* OR AB p#ediatric*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	141,058
S13	(MH "Pediatrics+")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	22,532
S12	TI ( adolescen* or child* or pre- adolescen* or preteen* or pre-teen* or school-age* or teen or teens or teenager# or youth* ) OR AB ( adolescen* or child* or pre- adolescen* or preteen* or pre-teen* or school-age* or teen or teens or teenager# or youth* )	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	638,958
S11	TI ( baby or babies or infant# or infanc* or neonat* or newborn* or preschool* or pre-school* or toddler# ) OR AB ( baby or babies or infant# or infanc* or neonat* or newborn* or preschool* or pre-school* or toddler# )	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database -	211,822



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			CINAHL Plus with Full Text	
S10	(MH "Child+") OR (MH "Minors (Legal)") OR (MH "Adolescence")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	1,030,685
S9	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	3,134
S8	T1 coronavirus* or (corona N0 virus*)	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	856
S7	TX ( (novel N0 coronavirus*) or ("novel corona" N0 virus*) ) OR TX ( (coronavirus* or (corona" N0 virus*)) N2 "2019" ) OR TX ( (coronavirus* or (corona" N0 virus*)) N2 "19" ) OR TX ( "coronavirus 2" or "corona virus 2" )	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	2,761
S6	TX "2019-nCoV" OR TX ( nCoV or "n-CoV" ) OR TX "HCoV-19" OR TX	Search modes - Boolean/Phrase	Interface - EBSCOhost	218



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	( "SARS-CoV-2" or "SARS-CoV2" or "SARSCoV-2" or SARSCoV2 )		Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	
S5	TX Wuhan N0 virus*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	3
S4	TX ( coronavirus* and (hubei or wuhan or beijing or shanghai) ) OR TX ( (corona N0 virus*) and (hubei or wuhan or beijing or shanghai) )	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	307
S3	TX "COVID-19" or COVID19	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	819
S2	(MH "Coronavirus Infections")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	981





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			Database - CINAHL Plus with Full Text	
S1	(MH "Coronavirus")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	302

## Cochrane

Database: EBM Reviews - Cochrane Central Register of Controlled Trials <March 2020>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to April 17, 2020>

Search Strategy:

- 
- 1 Coronavirus/ (2)
  - 2 Coronavirus Infections/ (47)
  - 3 (COVID-19 or COVID19).mp. (38)
  - 4 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).mp. (23)
  - 5 Wuhan virus\*.mp. (0)
  - 6 2019-nCoV.mp. (25)
  - 7 (nCoV or n-CoV).mp. (26)
  - 8 HCoV-19.mp. (0)
  - 9 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2).mp. (10)
  - 10 (novel coronavirus\* or novel corona virus\*).mp. (30)
  - 11 ((coronavirus\* or corona virus\*) adj2 "2019").mp. (25)
  - 12 ((coronavirus\* or corona virus\*) adj2 "19").mp. (6)
  - 13 (coronavirus 2 or corona virus 2).mp. (2)
  - 14 (coronavirus\* or corona virus\*).ti. (43)
  - 15 or/1-14 [COVID 19] (105)
  - 16 exp Infant/ (30812)
  - 17 exp Child/ (54451)
  - 18 Adolescent/ (102852)
  - 19 (baby or babies or infant? or infanc\* or neonat\* or newborn\* or preschool\* or pre-school\* or toddler?).ti,ab,kw. (69335)
  - 20 (adolescen\* or child\* or pre-adolescen\* or preteen\* or pre-teen\* or school-age\* or teen or teens or teenager? or youth\*).ti,ab,kw. (167037)
  - 21 exp Pediatrics/ (653)
  - 22 p?ediatric\*.ti,ab,kw. (34019)
  - 23 or/16-22 (292919)
  - 24 15 and 23 [COVID - PAEDIATRIC POPULATION] (13)



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- 25 limit 24 to yr="2019-current" (4)
- 26 25 use coch [DSR RECORDS] (0)
- 27 25 use cctr [CENTRAL RECORDS] (4)

\*\*\*\*\*

Web of Science

- # 7 78 #5 AND #4  
Refined by: PUBLICATION YEARS: ( 2020 OR 2019 )  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years
- # 6 552 #5 AND #4  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years
- # 5 2,820 TOPIC: (baby or babies or infant or infants or infanc\* or neonat\* or ,912 newborn\* or preschool\* or pre-school\* or toddler\*) OR TOPIC: (adolescen\* or child\* or pre-adolescen\* or preteen\* or pre-teen\* or school-age\* or teen or teens or teenager\* or youth\*)  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years
- # 4 8,001 #3 OR #2 OR #1  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years
- # 3 7,162 TITLE: (coronavirus\* or (corona W/0 virus\*))  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years
- # 2 523 TOPIC: (coronavirus\* NEAR/2 "2019") OR TOPIC: ((corona W/0 virus\*) NEAR/2 "2019") OR TOPIC: (coronavirus\* NEAR/2 "19") OR TOPIC: ((corona W/0 virus\*) NEAR/2 "19") OR TOPIC: ((novel W/0 coronavirus\*) or ("novel corona" W/0 virus\*)) OR TOPIC: ("coronavirus 2" or "corona virus 2")  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years
- # 1 1,234 TOPIC: ("COVID-19" or COVID19) OR TOPIC: (coronavirus\* and (hubei or wuhan or beijing or shanghai)) OR TOPIC: (Wuhan W/0 virus\*) OR TOPIC: ("2019-nCoV") OR TOPIC: (nCoV or "n-CoV") OR TOPIC: ("HCoV-19") OR TOPIC: ("SARS-CoV-2" or "SARS-CoV2" or "SARSCoV-2" or SARSCoV2)  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years



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## Appendix 2. Other Sources from the Grey Literature

**Total number of sources:** 18

Consulted between April 17th to April 25th, 2020

Note: Many of resources above drawn from CADTH's Grey Matters

<https://www.cadth.ca/resources/finding-evidence/grey-matters>

<p><b>Organization:</b> Health Canada  <b>Country:</b> Canada  <b>Description:</b> Epidemiological summary of COVID-19 cases in Canada  <b>Link:</b> <a href="https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html">https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html</a>  <b>Dates consulted:</b> 2020-04-17, 2020-04-23</p>
<p><b>Organization:</b> Canadian Agency for Drugs and Technologies in Health (CADTH)  <b>Country:</b> Canada  <b>Description:</b> Reports section  <b>Link:</b> <a href="https://www.cadth.ca/">https://www.cadth.ca/</a>  <b>Date consulted:</b> 2020-04-17</p>
<p><b>Organization:</b> Canadian Medical Association (CMA)  <b>Country:</b> Canada  <b>Description:</b> Clinical resources  <b>Link:</b> <a href="https://www.cma.ca/cma-update-coronavirus?_ga=2.90503450.1438667280.1587060765-763235055.1585752221">https://www.cma.ca/cma-update-coronavirus?_ga=2.90503450.1438667280.1587060765-763235055.1585752221</a>  <b>Date consulted:</b> 2020-04-17</p>
<p><b>Organization:</b> Health Clarity from Wolters Kluwer (global information services company)  <b>Country:</b> Multiple  <b>Description:</b> Covid-19 Resources &amp; Tools  <b>Link:</b> <a href="http://healthclarity.wolterskluwer.com/coronavirus-resources.html">http://healthclarity.wolterskluwer.com/coronavirus-resources.html</a>  <b>Date consulted:</b> 2020-04-17</p>
<p><b>Organization:</b> Canadian Pediatric Society  <b>Country:</b> Canada  <b>Description:</b> Covid-19 information and resources for paediatricians  <b>Link:</b> <a href="https://www.cps.ca/en/tools-outils/covid-19-information-and-resources-for-paediatricians">https://www.cps.ca/en/tools-outils/covid-19-information-and-resources-for-paediatricians</a>  <b>Date consulted:</b> 2020-04-17</p>
<p><b>Organization:</b> Evidence Aid (not-for-profit organisation)  <b>Country:</b> UK  <b>Description:</b> Covid-19 Evidence Collection</p>



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<p><b>Link:</b> <a href="https://www.evidenceaid.org/coronavirus-covid-19-evidence-collection/">https://www.evidenceaid.org/coronavirus-covid-19-evidence-collection/</a>  <b>Date consulted:</b> 2020-04-17</p>
<p><b>Organization:</b> World Health Organization  <b>Country:</b> Multiple  <b>Description:</b> Global literature on coronavirus disease  <b>Link:</b> <a href="https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/">https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/</a>  <b>Date consulted:</b> 2020-04-17</p>
<p><b>Organization:</b> National Institute for Health and Care Excellence (NICE)  <b>Country:</b> UK  <b>Description:</b> Coronavirus (COVID-19) Rapid guidelines and evidence summaries  <b>Link:</b> <a href="https://www.nice.org.uk/covid-19">https://www.nice.org.uk/covid-19</a> and <a href="https://www.nice.org.uk/guidance/published">https://www.nice.org.uk/guidance/published</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> National Institute for Health Research (NIHR)  <b>Country:</b> UK  <b>Description:</b> Innovation Observatory  <b>Link:</b> <a href="http://www.io.nihr.ac.uk/report/">http://www.io.nihr.ac.uk/report/</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> National Health Service (NHS) England  <b>Country:</b> England  <b>Description:</b> Coronavirus guidance for clinicians and NHS manager  <b>Link:</b> <a href="https://www.england.nhs.uk/coronavirus/">https://www.england.nhs.uk/coronavirus/</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> International Resource for Infection Control (NRIC)  <b>Country:</b> UK  <b>Description:</b> Resources section  <b>Link:</b> <a href="https://www.nric.org.uk/resources">https://www.nric.org.uk/resources</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> Centre for Evidence-Based Medicine (CEBM)  <b>Country:</b> UK  <b>Description:</b> Oxford COVID-19 Evidence Service  <b>Link:</b> <a href="https://www.cebm.net/covid-19-evidence-service/">https://www.cebm.net/covid-19-evidence-service/</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> Centers for Disease Control and Prevention (CDC)  <b>Country:</b> US  <b>Description:</b> COVID-19 Guidance Documents and MMWR report on Covid-19 in children  <b>Link:</b> <a href="https://www.cdc.gov/coronavirus/2019-ncov/communication/guidance-list.html">https://www.cdc.gov/coronavirus/2019-ncov/communication/guidance-list.html</a> and <a href="https://www.cdc.gov/mmwr/volumes/69/wr/mm6914e4.htm">https://www.cdc.gov/mmwr/volumes/69/wr/mm6914e4.htm</a> and <a href="https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/groups-at-higher-risk.html">https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/groups-at-higher-risk.html</a>  <b>Date consulted:</b> 2020-04-22, 2020-04-24, 2020-04-25</p>
<p><b>Organization:</b> Publons (commercial website for academics)</p>



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<p><b>Country:</b> Multiple  <b>Description:</b> COVID19 related publications  <b>Link:</b> <a href="https://publons.com/publon/covid-19/?sort_by=date">https://publons.com/publon/covid-19/?sort_by=date</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> China Centers for Disease Control and Prevention (CCDC)  <b>Country:</b> China  <b>Description:</b> The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) in China, 2020  <b>Link:</b> <a href="http://weekly.chinacdc.cn/en/article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51">http://weekly.chinacdc.cn/en/article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51</a>  <b>Date consulted:</b> 2020-04-22, 2020-04-25</p>
<p><b>Organization:</b> Robert Koch Institute  <b>Country:</b> Germany  <b>Description:</b> Covid-19 Daily Situation Report  <b>Link:</b> <a href="https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/Geamt.html">https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/Geamt.html</a>  <b>Date consulted:</b> 2020-04-24, 2020-04-25</p>
<p><b>Organization:</b> Korea Centers for Disease Control and Prevention (KCDC)  <b>Country:</b> Republic of Korea  <b>Description:</b> Press Release section  <b>Link:</b> <a href="https://www.cdc.go.kr/board/board.es?mid=a30402000000&amp;bid=0030">https://www.cdc.go.kr/board/board.es?mid=a30402000000&amp;bid=0030</a>  <b>Date consulted:</b> 2020-04-22</p>
<p><b>Organization:</b> Google and Goggle Scholar Search Engines  <b>Country:</b> Multiple  <b>Description:</b> -  <b>Link:</b> -  <b>Date consulted:</b> 2020-04-22</p>



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## Appendix 3. Included Medical Conditions

1. Attention deficit disorder; attention deficit hyperactivity disorder
2. Autism; Autistic spectrum disorder
3. Cerebral palsy
4. Childhood/developmental disability; neurodevelopmental disability
5. Congenital heart defect/disease
6. Developmental delay; global delay
7. Fetal alcohol spectrum disorder
8. Intellectual disability; Down syndrome; trisomy 21
9. Learning disability
10. Neonatal abstinence syndrome (opioid)
11. Neonatal encephalopathy
12. Neonatal intensive care unit survivors / graduates
13. Perinatal/neonatal asphyxia
14. Preterm, premature
15. Small for gestational age
16. Specific language impairment