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School of Nursing



Rapid Review: What is the specific role of daycares, primary schools in COVID-19 transmission?

Prepared for: Technical Advisory Committee (TAC); Public Health Agency of Canada (PHAC)

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Executive Summary

Background

As jurisdictions plan to lift restrictions implemented to slow the spread of COVID-19, they face major decisions in terms of when and how to re-open daycares and schools. While children are known to be effective vectors for other viruses, such as influenza, their role in the transmission of the novel coronavirus is much less clear.

This rapid review was produced to support the Public Health Agency of Canada's response to the coronavirus disease 2019 (COVID-19) pandemic. This review seeks to identify, appraise and summarize emerging research evidence to support evidence-informed decision making.

This rapid review is based on the most recent research evidence available at the time of release. This version includes evidence available up to May 7, 2020.

In this rapid evidence review, we provide the most recent research evidence to answer the question: **What is the specific role of daycares, primary schools in COVID-19 transmission?**

Key Points

- The effect of school closures to prevent the spread of COVID-19 is not known as it has not been possible to separate the effect of school closures from other physical distancing and quarantine measures. The quality of evidence is low, findings are consistent across reviews.
- Analysis of infection clusters in China prior to school closures revealed that for children who were infected, transmission was traced back to community and home settings rather than daycares or schools. The quality of this evidence is low, findings are consistent across reviews.
- Overall, low quality evidence suggests that children are not significant vectors for transmission. This evidence is based on limited case series and should be interpreted with caution.
- There is some evidence suggesting that transmission from children to caregivers is possible and the virus may be transmitted through fecal matter, although this evidence is low quality and further research is needed to confirm.

Overview of Evidence and Knowledge Gaps

- Overall, low quality evidence suggests that children are not significant vectors for transmission of COVID-19, but this is based on limited case series and should be interpreted with caution.
- The specific effect of school closures on limiting the spread of COVID-19 is not known.
- Evidence available on transmission by children is limited to low quality case series data.

Methods

Research Questions

What is the specific role of daycares, primary schools in COVID-19 transmission?

1. What is known about the likelihood of transmission of COVID-19 amongst children and adults in daycare and primary schools and to their household members?
2. What is known about likelihood of transmission of COVID-19 by infants, toddlers and school-aged children to others?

Search

On May 7, 2020, the following databases were searched for evidence pertaining to the role of children in the transmission of COVID-19. The databases searched were:

- Pubmed’s curated COVID-19 literature hub: [LitCovid](#)
- [Trip Medical Database](#)
- World Health Organization’s [Global literature on coronavirus disease](#)
- Joanna Briggs Institute [COVID-19 Special Collection](#)
- [COVID-19 Evidence Alerts](#) from McMaster PLUS™
- [Public Health +](#)
- [COVID-19 Living Overview of the Evidence \(L·OVE\)](#)
- Cochrane [Coronavirus \(COVID-19\) Special Collections](#)
- Oxford [COVID-19 Evidence Service](#)
- [Guidelines International Network \(GIN\)](#)
- Cochrane Rapid Reviews [Question Bank](#)
- [Prospero Registry of Systematic Reviews](#)
- NCCMT [COVID-19 Rapid Evidence Reviews](#)

A copy of the search strategy is available on request.

Study Selection Criteria

The search first included recent, high-quality syntheses. If no syntheses were found, single studies were included. English-language, peer-reviewed sources and sources published ahead-of-print before peer review were included. Grey literature and surveillance sources were excluded.

	Inclusion Criteria	Exclusion Criteria
Population	Children aged 0-12	Adolescents
Intervention	Exposure to or diagnosis of COVID-19	
Comparisons		
Outcomes	Transmission of COVID-19	

Data Extraction and Synthesis

Data on study design, setting, location, population characteristics, interventions or exposure and outcomes were extracted when reported. We synthesized the results narratively due to the variation in methodology and outcomes for the included studies.

We evaluated the quality of included evidence using critical appraisal tools as indicated by the study design below. Quality assessment was completed by one reviewer and verified by a second reviewer. Conflicts were resolved through discussion.

Study Design	Critical Appraisal Tool
Synthesis	Health Evidence™ Quality Appraisal Tool

Completed quality assessments for each included study are available on request.

Findings

Quality of Evidence

This document includes seven completed syntheses, and two in progress syntheses, for a total of nine publications included in this evidence review addressing two distinct questions. The quality of the evidence included in this review is as follows:

Question 1: What is known about the likelihood of transmission of COVID-19 amongst children and adults in daycare and primary schools and to their household members?

		Total	Quality of Evidence
Syntheses	Completed	3	3 Low
	In Progress	0	-
Single Studies	Completed	0	-

Question 2: What is known about likelihood of transmission of COVID-19 by infants, toddlers and school-aged children to others?

		Total	Quality of Evidence
Syntheses	Completed	4	4 Low
	In Progress	2	-
Single Studies	Completed	0	-

Warning

Given the need to make emerging COVID-19 evidence quickly available, many emerging studies have not been peer reviewed. As such, the evidence included in this rapid review should be used and interpreted cautiously. We have provided a summary of the quality of the evidence as low, moderate or high to support the process of decision making, and where possible decisions should be made using the highest quality evidence available.

A number of mathematical modelling studies are emerging related to COVID-19. While these studies may provide important estimates, their ultimate usefulness depends on the quality of the data that is entered into the model. Given the constantly evolving nature and changing understanding of COVID-19 around the world, a high degree of caution is warranted when interpreting these studies, and when presented, include the range of confidence intervals rather than single effect estimates.

Question 1: What is known about the likelihood of transmission of COVID-19 amongst children and adults in daycare and primary schools and to their household members?

Table 1: Syntheses

Reference	Date Released	Description of included studies	Summary of Findings	Quality Rating: Synthesis	Quality Rating: Included Studies
Viner RM., Russell, SJ., Crocker, H., Packer, J., Ward, J., Stansfield, C., Mytton, O., Bonell, C., Booy, R. (2020). School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. <i>Lancet</i> , 4, 397-404.	Apr 6, 2020 (Search to Mar 19, 2020)	16 studies conducted on measures in response to the outbreak of SARS in 2003 and COVID-19 in 2019-20. <ul style="list-style-type: none"> • 12 reports on school closures in mainland China, Hong Kong, Taiwan and Singapore (including 5 preprint articles) • 3 modelling studies • 1 qualitative study 	<p>Preprint studies based on the COVID-19 pandemic noted that school closures were part of a broad range of quarantine and social distancing measures, and no data were available for the impact of school closures specifically.</p> <p>Published reports of school closures in Beijing during the 2003 SARS outbreak attributed very little prevention of transmission due to school closures, based on low transmission within schools prior to closures and low prevalence of SARS in children.</p> <p>Reports from Hong Kong during the 2003 SARS outbreak found that transmission in children occurred primarily within families and multi-residential buildings</p>	Moderate	Low
Fretheim, A. (2020). The role of children in the transmission of SARS-CoV-2-19 – a rapid review Oslo: Folkehelseinstituttet/ Norwegian Institute of Public Health.	Mar 23, 2020 (Search date unknown)	2 syntheses and 10 primary studies conducted to assess whether children can be infected by and transmit COVID-19 <ul style="list-style-type: none"> • 2 evidence summaries • 2 large national case series • 8 case and smaller case series reports 	Authors report that there was no evidence for the effect of school closures on transmission for the COVID-19 pandemic. Available reviews are based on outbreaks of influenza, which is of uncertain relevance to COVID-19	Low	Low

<p>Usher Institute. (2020). Summary: What is the evidence for transmission of SARS-COV-2 by children [or in schools]?</p>	<p>Apr 9, 2020 (Search completed April 8, 2020)</p>	<p>134 case studies and 28 reviews, however full citations for included studies are not provided.</p>	<p>Authors report that while children may be infected with COVID-19, outbreaks have been traced back to families and hospitalizations. There were no reported outbreaks in daycares or schools.</p>	<p>Low</p>	<p>Low</p>
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Question 2: What is known about the likelihood of transmission of COVID-19 by infants, toddlers and school-aged children to others?

Table 2: Syntheses

Reference	Date Released	Description of included studies	Summary of Findings	Quality Rating: Synthesis	Quality Rating: Included Studies
Zhen-Dong, Y., Gao-Jun, Z., Run-Ming, ., Zhi-Sheng, L., Zong-Qi, D., Xiong, X., Guo-Wei, S. (2020). Clinical and Transmission Dynamics Characteristics of 406 Children With Coronavirus Disease 2019 in China: A Review . <i>Journal of Infection. Preprint</i> .	Apr 28, 2020 (Search to Apr 3, 2020)	406 case reports of children up to 16 years of age diagnosed with COVID-19	<p>Among the included case reports, nearly half of cases were asymptomatic or had only mild symptoms.</p> <p>Evidence from stool samples indicated that children had higher rates of fecal virus RNA (81.8%) than adults (53.4%), suggesting that further investigation of fecal-oral transmission by children may be warranted.</p>	Moderate	Low
Health Information and Quality Authority. (2020). Evidence summary for spread of COVID19 by children .	Apr 1, 2020 (Search completed Mar 19, 2020)	<p>3 studies investigating transmission of COVID-19 by children in China</p> <ul style="list-style-type: none"> • 1 case report • 1 larger case series • 1 modelling 	Overall, evidence was inconclusive. A family case reports demonstrate confirmed transmission from children to caregivers. Analysis of a larger case series reported no confirmed transmission from cases aged 15 years or younger.	Moderate	Low-moderate
Fretheim, A. (2020). The role of children in the transmission of SARS-CoV-2-19 – a rapid review [Barns rolle i spredning av SARS-CoV-19 (Covid-19) – en hurtigoversikt] Oslo: Folkehelseinstituttet/ Norwegian Institute of Public Health.	Mar 23, 2020 (Search date unknown)	<p>2 syntheses and 10 primary studies conducted to assess whether children can be infected by and transmit COVID-19</p> <ul style="list-style-type: none"> • 2 evidence summaries • 2 large national case series • 8 case and smaller case series reports 	<p>Case reports indicate that children are susceptible to COVID-19 infection. The overall prevalence of COVID-19 is unknown, due to lack of comprehensive testing.</p> <p>The majority of children with COVID-19 and no underlying medical conditions are asymptomatic or experience mild to moderate symptoms.</p>	Low	Low

			According to tracing of infection routes in case studies, infected children are not a significant vector for transmission, but this data is very limited.		
Usher Institute. (2020). Summary: What is the evidence for transmission of SARS-COV-2 by children [or in schools]?	Apr 9, 2020 (Search completed Apr 8, 2020)	134 case studies and 28 reviews, however full citations for included studies are not provided.	Some evidence indicates the virus in child fecal matter, but further investigation is necessary to confirm whether this is a viable route of transmission.	Low	Low

Table 3: In-progress Syntheses

Title	Anticipated Release Date	Setting	Description of document
Chan, M., Bhuiyan, M., Islam, S., Hassan, Z., Satter, S., Haider, N., Homair, H. (2020) Epidemiology of COVID-19 in children aged <5 years: a systematic review and meta-analysis. PROSPERO 2020 CRD 42020181936.	Jul 31, 2020	Home	This review will summarize COVID-19 epidemiology in children <5 years, including answering the question "is there any secondary/household transmission from pediatric COVID-19 cases?"
Medeiros, G., Azevedo, K., Oliveira Segundo, VH., Santos, G., Nayana Mata, A., Nunes, AC., Davidson Pimenta, I., Bezerra, I., Braga, L., Carneiro Capucho, H., et al. (2020) The control and prevention of COVID-19 transmission in children: a systematic review. PROSPERO 2020 CRD42020179263	Nov 1, 2020	Home, Community	This review will summarize the role of children in COVID-19 transmission

References

- Chan, M., Bhuiyan, M., Islam, S., Hassan, Z., Satter, S., Haider, N., Homair, H. (2020) [Epidemiology of COVID-19 in children aged <5 years: a systematic review and meta-analysis. PROSPERO 2020 CRD 42020181936.](#)
- Fretheim. (2020). [The role of children in the transmission of SARS-CoV-2-19 – a rapid review \[Barns rolle i spredning av SARS-CoV-19 \(Covid-19\) – en hurtigoversikt\]](#) Oslo: Folkehelseinstituttet/Norwegian Institute of Public Health.
- Health Information and Quality Authority. (2020). [Evidence summary for spread of COVID19 by children.](#) Norwegian Institute of Public Health.
- Medeiros, G., Azevedo, K., Oliveira Segundo, VH., Santos, G., Nayana Mata, A., Nunes, AC., Davidson Pimenta, I., Bezerra, I., Braga, L., Carneiro Capucho, H., et al. (2020) [The control and prevention of COVID-19 transmission in children: a systematic review. PROSPERO 2020 CRD42020179263](#)
- Viner et al. (2020). [School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review.](#) *Lancet*, 4, 397-404.
- Usher Institute. (2020). [Summary: What is the evidence for transmission of SARS-COV-2 by children \[or in schools\]?](#)
- Yang et al. (2020). [Clinical and Transmission Dynamics Characteristics of 406 Children With Coronavirus Disease 2019 in China: A Review.](#) *Journal of Infection. Preprint.*