




Living Rapid Review Update 13: What is the specific role of daycares and schools in COVID-19 transmission?



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Please Note: An update of this review may be available. Access the most current version of this review by visiting the National Collaborating Centre for Methods and Tools COVID-19 Rapid Evidence Service at the above link.

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The authors declare they have no conflicts of interest to report.

Executive Summary

Background

As jurisdictions continue to implement and lift restrictions to slow the spread of coronavirus disease 2019 (COVID-19), they face major decisions about how and when to re-open and operate schools and daycares. While children are known to be effective vectors for other viruses, such as influenza, their role in the transmission of COVID-19 is much less clear.

This living rapid review was produced to support public health decision makers' response to the COVID-19 pandemic. This review seeks to identify, appraise, and summarize emerging research evidence to support evidence-informed decision making.

This review is based on the most recent research evidence available at the time of release. A previous version was completed on January 21, 2021. This updated version includes evidence available up to February 24, 2021.

In this living rapid review, we answer the question: **What is the specific role of daycares and schools in COVID-19 transmission?**

What Has Changed in This Version?

- Given the substantial body of evidence, the focus of this review has been refined, resulting in 22 studies included in the previous version that are now excluded (available [here](#)). This version no longer includes:
 - Studies with data collected prior to or during the first wave lockdown
 - Studies only reporting absolute number of cases within a school/district without calculation of secondary attack rates (SAR) or overall prevalence
- Surveillance data from three provincial Canadian databases no longer meet eligibility criteria but are presented separately (Table 6) for contextual reference.
- Three new studies explored transmission dynamics among students and adults; consistent with previous evidence, SARs were higher among adults compared to students:
 - One cohort study from Germany found low SAR from school-associated cases (1.34%; CI=1.16,1.54). SARs were higher when the index case was a teacher, and in daycare compared to a secondary school.
 - A study from Brussels found transmission events from children aged 10-19 to other age groups were fewer than those from adults.
 - In one cross-sectional study from England, attack rates were higher among staff (4.85%; 95% CI=4.55,5.17%) compared to students (1.08%; 95% CI=1.02,1.13%).
- Similarly, across seven new studies, low prevalence and incidence of infection were found among students and staff, with higher rates reported among adult cohorts. These rates were consistently lower than the general population in their respective communities. Among these, two studies noted that increased prevalence or in-school transmission were often associated with noncompliance in mask wearing.
- Nine new studies investigated relationships between school re-openings and school-associated infection rates:
 - Five studies reported on low infection (0.1-0.6%) or seroprevalence rates (1.3-11%) among children following partial or full re-opening of schools.

- Three studies reported increased rates among students and/or adults following school re-opening; it is unknown the specific factors driving increased transmission:
 - One study found higher rates among adults vs. children aged 0-19 (easing of physical distancing may have contributed to increased prevalence);
 - One study found that while rates increased among parents/teachers/teachers' partners, only a minor impact on overall transmission among this group was identified;
 - One study found that weekly growth infection rates increased by five percentage points particularly in counties where mask wearing was not mandatory (variability in IPAC measures across counties was indicated as a limitation).
- Findings from a cohort study in England among pre-, primary, and secondary school-aged children found a strong correlation between adult and school-aged children infection rates. National lockdown measures during which schools remained open coincided with rapid declines in infection rates among young adults, which was followed by all age groups of children a week later.
- One new study conducted random testing of over 3000 selected students and staff across kindergarten, primary schools, and nurseries in Germany during high levels of community transmission; only two positive identified tests were found (one student; one teacher). Of 36 contacts tested only one additional asymptomatic case was identified.
- Two new case reports were included:
 - A cluster of infections (n=9) was reported among 2600 students and 700 staff across one school district in the United States. Index cases included both staff (n=4) and students (n=1), in addition to unknown sources (n=5). Staff-to-student transmission was commonly reported. Lack of physical distancing and inadequate mask use were noted.
 - A study from Italy reported a case of a secondary student attending school resulted in nine contacts (36.6%) testing positive. Certain IPAC measures were not implemented (e.g., insufficient desk spacing, lack of hand sanitizer availability).

Key Points

- Although the data is consistent that children can both contract and transmit COVID-19, based on published reports to date following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings is low, when IPAC measures are in place and adhered to. The certainty of the evidence is moderate (GRADE), and findings may change as new data become available. The risk of transmission within secondary schools is less clear, and findings may be confounded by adherence to IPAC measures in place in the school setting and activities outside of the school settings.
- Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is low (GRADE), and findings may change as new data become available.
- Implementation of infection control measures is critically important to limiting spread as evidenced by outbreaks where limited or no measures were in place or measures were not adhered to. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control

measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.

Overview of Evidence and Knowledge Gaps

- Building upon earlier case reports, contact tracing and prevalence studies, there is a growing body of reports using national or regional surveillance data and comprehensive contact tracing and testing strategies to minimize the likelihood of underestimation of cases. While surveillance reports are identifying cases among staff and students and children in schools and daycares, these commonly include single cases or a small number of cases typically less than five.
- A growing number of studies have randomly selected schools/classes/individuals to undergo testing for active infection (via RT-PCR) or antibodies; consistent across studies, few additional cases are detected suggesting that widespread asymptomatic transmission is not commonly occurring in these settings.
- The use of more rigorous data collection (e.g., random testing, comprehensive contact tracing/testing) and enhanced reporting of surveillance data (e.g., index cases, secondary transmission, overall prevalence) in future studies can provide more robust data for interpretation and improve certainty of findings.
- Data from overnight camps, and settings where IPAC measures are not in place or adhered to show that widespread transmission from children is possible, and again highlights the importance of infection control measures. Most case reports of widespread transmission in these settings are from adolescents.
- Infection control measures were highly variable across jurisdictions scanned. It is important to note that there may be regional variations in policies in place above what are reported in national guidelines.

Methods

Research Question

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

Search

The following databases and sources were searched for evidence pertaining to the role of daycares and schools in the transmission of COVID-19 up to February 24, 2021:

- Pubmed's curated COVID-19 literature hub: [LitCovid](#)
- [Trip Medical Database](#)
- World Health Organization's [Global literature on coronavirus disease](#)
- [COVID-19 Evidence Alerts](#) from McMaster PLUS™
- [COVID-19 Living Overview of the Evidence \(L·OVE\)](#)
- [Prospero Registry of Systematic Reviews](#)
- NCCMT [COVID-19 Rapid Evidence Reviews](#)
- [MedRxiv preprint server](#)
- NCCDH [Equity-informed Responses to COVID-19](#)
- NCCEH [Environmental Health Resources for the COVID-19 Pandemic](#)
- NCCHPP [Public Health Ethics and COVID-19](#)
- NCCID [Disease Debrief](#)
- NCCIH [Updates on COVID-19](#)
- [Public Health Ontario](#)
- [Uncover \(USHER Network for COVID-19 Evidence Reviews\)](#)
- Centers for Disease Control and Prevention's [Morbidity and Mortality Weekly Report](#)
- [Government of Ontario](#)
- Ontario [COVID-19 cases in schools and child care centres database](#)
- Alberta [COVID-19 school status map](#).
- Québec [Situation in Schools](#)
- USA [COVID-19 School Response Dashboard](#)
- Newfoundland and Labrador Centre for Applied Health Research ([NLCHAR](#))
- National Institute for Public Health and the Environment ([RIVM](#))
- Health Information and Quality Authority ([HIQA](#))
- National Centre for Immunisation Research and Surveillance ([NCIRS](#))
- Institut national de santé du Québec ([INSPQ](#))
- [Don't Forget the Bubbles](#)

A copy of the search strategy is available at this [link](#).

Information on policies for child care and educational settings were retrieved from the scientific publications and governmental public health webpages for the jurisdictions included in research articles in this review.

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 were excluded.

Additional exclusion criteria were established (February 2021) to refine the focus of this review given the substantial body of evidence. Studies were excluded if:

- Data was collected prior to or during the first wave lockdown
- Only absolute number of cases were reported within a school/district without calculation of secondary attack rates (SAR) or overall prevalence.

	Inclusion Criteria	Exclusion Criteria
Population	Children and adolescents aged 1–18	Infants
Intervention	Exposure to or diagnosis of COVID-19	
Comparisons	-	
Outcomes	Confirmed or suspected case of COVID-19	
Setting	Schools, daycares, camps	Extra-curricular activities such as sports teams

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.

The identified syntheses relevant to this report had considerable overlap in the primary literature but varied in the data reported across reviews for the same primary studies. We chose to conduct a new synthesis rather than reporting the overlapping results of the identified syntheses in order to present the data most succinctly and clearly. The primary studies were used to extract study characteristics and key findings, and to appraise study quality.

Appraisal of Evidence Quality

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	Assessing the Methodological Quality of Systematic Reviews (AMSTAR) AMSTAR 1 Tool
Cohort	Joanna Briggs Institute (JBI) Checklist for Cohort Studies
Case Control	Joanna Briggs Institute (JBI) Checklist for Case Control Studies
Case Series	Joanna Briggs Institute (JBI) Checklist for Case Series
Case Report	Joanna Briggs Institute (JBI) Checklist for Case Reports
Prevalence	Joanna Briggs Institute (JBI) Checklist for Prevalence Studies
Cross-sectional	Joanna Briggs Institute (JBI) Checklist for Analytical Cross Sectional Studies
Quasi-experimental	Joanna Briggs Institute (JBI) Checklist for Quasi-Experimental Studies

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

The Grading of Recommendations, Assessment, Development and Evaluations ([GRADE](#)) approach was used to assess the certainty in the findings based on eight key domains.

In the GRADE approach to quality of evidence, **observational studies**, as included in this review, provide **low quality** evidence, and this assessment can be further reduced based on other domains:

- High risk of bias
- Inconsistency in effects
- Indirectness of interventions/outcomes
- Imprecision in effect estimate
- Publication bias

and can be upgraded based on:

- Large effect
- Dose-response relationship
- Accounting for confounding.

The overall certainty of the evidence for each outcome was determined taking in to account the characteristics of the available evidence (observational studies, some not peer-reviewed, unaccounted-for potential confounding factors, different tests and testing protocols, lack of valid comparison groups). A judgement of 'overall certainty is very low', means that the findings are very likely to change as more evidence accumulates.

Findings

Summary of Evidence Quality

In this update, 20 new single studies, four updates to previously included single studies, one new in-progress single study, one update to a previously included synthesis, and one new in-progress synthesis were identified. Updated eligibility criteria resulted in 22 studies that were no longer eligible, for a total of 89 publications addressing the research question.

In this version a search was undertaken for infection control policies in place in jurisdictions with published data included in this review.

Question	Evidence included		Overall certainty in evidence
What is known about the likelihood of transmission of COVID-19 among children and adults in daycare and schools and among children to their household members?	Syntheses In-progress syntheses Single studies In-progress single studies	13 4 68 4	Low-Moderate
What infection prevention and control policies or procedures have been implemented in daycares and schools?	Policy documents	13	Not applicable

Warning

Given the need to make emerging COVID-19 evidence quickly available, many emerging studies have not been peer reviewed. As such, we advise caution when using and interpreting the evidence included in this rapid review. We have provided a summary of overall certainty of the evidence to support the process of decision making. Where possible, make decisions using the highest quality evidence available.

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

Table 1: Single Studies

Reference	Date Released	Study Design	Setting, Location	IPAC measures	Summary of Findings	Quality Rating:
New evidence reported on March 19, 2021						
Vlachos, J., Hertegård, & Svaleryd, H.B. (2021). The effects of school closures on SARS-CoV-2 among parents and teachers. <i>Proceedings of the National Academy of Sciences of the United States of America</i> , 118(9), e2020834118.	Mar 2, 2021	Prevalence	Lower and upper-secondary schools, Sweden	<ul style="list-style-type: none"> School closure 	<p>Upper-secondary schools (aged 17-19) closed Mar 18, 2020; lower-secondary schools (aged 14-16) remained open until the end of school year, mid-Jun 2020.</p> <p>Exposure to open schools increased infection rates among:</p> <ul style="list-style-type: none"> Parents (OR=1.17, 95% CI=1.03,1.32) Secondary school teachers (OR=2.01, 95% CI=1.52,2.67) Secondary school teachers' partners (OR=1.29, 95% CI=1.00,1.67) <p>Keeping lower-secondary schools open had minor impact on overall transmission (i.e., rates among parents, partners). By one estimate, closing lower-secondary schools could have resulted in a 17% decrease in infections among only 4.5% of the Swedish population.</p>	High

<p>Oster, E. (2021, February 28). National COVID-19 school response dashboard.</p>	<p>Feb 28, 2021</p>	<p>Prevalence</p>	<p>Schools, United States</p>	<ul style="list-style-type: none"> Varied by county 	<p>From Aug 31, 2020 to Feb 28, 2021, 4,028,141 students learning in-person and 1,346,331 in-person staff included in the dashboard.</p> <p>Over a 2-week period (Feb 15 to Feb 28, 2021):</p> <ul style="list-style-type: none"> Daily case rate was 12 per 100,000 students, with an infection rate of 0.17%. Daily case rate was 17 per 100,000 staff, with an infection rate of 0.24% The community case rate in school-matched population was 26 per 100,000, positivity rate of 6.84%. <p>Case rates (per 100,000) by mitigation strategies include:</p> <p><u>Student Masking (mask vs. no mask)</u></p> <p>Community case rate <10:</p> <ul style="list-style-type: none"> Students: (4 vs. 7) Staff: (8 vs. 38) <p>Community case rate 10 to 20:</p> <ul style="list-style-type: none"> Students: (9 vs. 13) Staff: (15 vs. 42) <p>Community case rate >20:</p> <ul style="list-style-type: none"> Students: (34 vs. 27) Staff: (58 vs. 103) <p><u>No 3-foot distance vs 3-foot distance</u></p> <p>Community case rate <10:</p> <ul style="list-style-type: none"> Students: (5 vs. 5) Staff: (15 vs. 10) <p>Community case rate 10 to 20:</p> <ul style="list-style-type: none"> Students: (12 vs. 16) Staff: (35 vs 23) <p>Community case rate >20:</p> <ul style="list-style-type: none"> Students: (35 vs. 43) Staff: (80 vs. 82) 	<p>Low</p> <p>NOT PEER REVIEWED</p>
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					<p><u>Increased ventilation (vs. no)</u></p> <p>Community case rate <10:</p> <ul style="list-style-type: none"> • Students: (4 vs. 9) • Staff: (9 vs. 22) <p>Community case rate 10 to 20:</p> <ul style="list-style-type: none"> • Students: (17 vs. 11) • Staff: (23 vs. 29) <p>Community case rate >20:</p> <ul style="list-style-type: none"> • Students: (42 vs. 43) • Staff: (79 vs. 95) <p><u>In-person density</u></p> <p>Community case rate <10:</p> <ul style="list-style-type: none"> • Students: <ul style="list-style-type: none"> ○ Density <60%: 9 ○ Density 60-90%: 7 ○ Density >90%: 4 • Staff: <ul style="list-style-type: none"> ○ Remote: 7 ○ Density <60%: 13 ○ Density 60-90%: 17 ○ Density >90%: 17 <p>Community case rate 10 to 20:</p> <ul style="list-style-type: none"> • Students: <ul style="list-style-type: none"> ○ Density <60%: 21 ○ Density 60-90%: 10 ○ Density >90%: 7 • Staff: <ul style="list-style-type: none"> ○ Remote: 20 ○ Density <60%: 17 ○ Density 60-90%: 21 ○ Density >90%: 21 <p>Community case rate >20:</p> <ul style="list-style-type: none"> • Students: <ul style="list-style-type: none"> ○ Density <60%: 28 ○ Density 60-90%: 26 ○ Density >90%: 17 • Staff: <ul style="list-style-type: none"> ○ Remote: 75 ○ Density <60%: 40 ○ Density 60-90%: 52 ○ Density >90%: 45 	
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<p>Chernozhukov, V., Kasahara, H., Schrimpf, P. (2021). The association of opening K-12 schools and colleges with the spread of covid-19 in the united states: county-level panel data analysis. <i>Preprint.</i></p>	<p>Feb 23, 2021</p>	<p>Quasi-experimental</p>	<p>Primary and secondary schools, United States</p>	<ul style="list-style-type: none"> Masks (staff; not mandatory in all counties) 	<p>From Apr 1 - Dec 2, 2020, an increase in visits to schools and opening schools to in-person learning was associated with an increase in weekly growth rates of confirmed COVID-19 cases (by 5 (SE=2) percentage points), particularly in counties where staff mask wearing was not mandatory.</p>	<p>Moderate <i>PREPRINT</i></p>
<p>Schoeps, A., Hoffmann, D., Tamm, C., Vollmer, B., Haag, S., Kaffenberger, T., ... & Zanger, P. (2021). COVID-19 transmission in educational institutions August to December 2020 in Germany: a study of index cases and close contact cohorts. <i>Preprint.</i></p>	<p>Feb 20, 2021</p>	<p>Cohort</p>	<p>Schools and daycares, Rhineland-Palatinate, Germany</p>	<p>Secondary schools:</p> <ul style="list-style-type: none"> Enhanced cleaning Enhanced ventilation masks (in school buildings including classrooms after Nov 22) Personal hygiene Physical distancing (>1.5m) <p>Primary schools and daycares implemented the same measures as secondary schools, with the exception of physical distancing and wearing face masks.</p>	<p>From Aug - Dec 2020, 591 student, 157 teacher and 36 other school cases identified via local public health were followed.</p> <p>Among 14,591 close contacts, 441 index cases were identified; secondary attack rate (SAR) was 1.34% (95% CI=1.16,1.54%).</p> <p>Risk of transmission was more likely:</p> <ul style="list-style-type: none"> When index case was a teacher vs. student (RR: 2.38, 95% CI=1.73,3.26) In daycare vs. secondary schools (RR: 2.75, 95% CI=1.88,4.10) In older age groups (range of RRs reported) <p>SARs varied by characteristic of index case:</p> <ul style="list-style-type: none"> Higher when teacher vs. student (Incidence Rate Ratio (IRR): 3.17, 95% CI=1.79,5.59) Lower from asymptomatic vs. symptomatic cases (IRR: 0.47, 95% CI=0.25,0.89) Higher in daycare vs. secondary schools (IRR: 3.23, 95% CI=1.76, 5.91) 	<p>High <i>PREPRINT</i></p>

					<ul style="list-style-type: none"> Higher index cases >35 (range of IRRs reported) <p>Study limitations include:</p> <ul style="list-style-type: none"> Incomplete case identification and contact tracing due to testing outsourcing Transmission noted in this study was attributed to educational settings and did not acknowledge possible transmission outside these settings 	
<p>Ingelbeen, B., Peckeu, L., Laga, M., Hendrix, I., Neven, I., van der Sande, M.A.B., & van Kleef, E. (2021). Reducing contacts to stop SARS-CoV-2 transmission during the second pandemic wave in Brussels, Belgium, August to November 2020. <i>Eurosurveillance</i>, 26(7), 1-7.</p>	Feb 18, 2021	Quasi-experimental	Primary and secondary schools, Brussels, Belgium	Not reported	<p>Schools re-opened on Sep 1, 2020. Contacts, teleworking, and restaurant restrictions were loosened at this time, as well, then gradually reintroduced beginning Oct 6.</p> <p>Positive cases among children increased Aug-Sep (schools closed) with increasing testing rate (spearman rank correlation coefficient=0.74, $p<0.001$).</p> <p>From Sep 3 - Oct 7, 8.9% (67/755) of infections were from children (aged 10-19) to other age groups; 17.4% (131/755) from other age groups to children. The proportion of child cases among all diagnosed cases did not significantly change.</p> <p>Intragenerational transmission was highest (39.4%, 63/160) during extended autumn holidays and the closure of all non-essential services (Nov 2).</p>	Low

<p>Perramon, A., Soriano-Arandes, A., Pino, D., Lazcano, U., Andrés, C., Català, M., ... Soler-Palacin, P. (2021). Epidemiological dynamics of the incidence of COVID-19 in children and the relationship with the opening of schools in Catalonia (Spain). <i>Preprint</i>.</p>	<p>Feb 17, 2021</p>	<p>Quasi-experimental</p>	<p>Primary and secondary schools, Catalonia, Spain</p>	<ul style="list-style-type: none"> • Cohorting • Enhanced ventilation • Hand hygiene • Infographics • Masks (students aged 6+) • Mass screening campaigns • Screening/quarantining for whole cohort when positive case detected 	<p>From Sep 14, 2020 – Jan 31, 2021, 48,914 (of 942,881) children (aged <18) tested positive for COVID-19 (5.2%).</p> <p>Variant B.1.1.7 was first detected in Catalonia at end of December.</p> <p>Incidence for children aged <12 was lower than the general population; incidence for children aged 12-17 was at a similar or higher level. Higher incidence in children was associated with age.</p> <p>Incidence could have been affected by changes in active screening/testing. Daily tests and cases among children, compared with the general population, decreased when schools were closed ($p<0.001$). During first 11 weeks, positivity rate in children ($\leq 5\%$) was lower than general population; positivity rate increased when schools were closed for holidays ($p<0.001$) due to a decrease in screening/testing.</p> <p>Rate of cases in children was significantly lower than for adults during whole study period ($p<0.001$).</p>	<p>Low</p> <p><i>PREPRINT</i></p>
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<p>Gras-Le Guen, C., Cohen, R., Rozenberg, J., Launay, E., Levy-Bruhl, D., & Delacourt, C. (2021). Reopening schools in the context of increasing COVID-19 community transmission: The French experience. <i>Archives de Pédiatrie</i>. Epub ahead of print.</p>	<p>Feb 15, 2021</p>	<p>Quasi-experimental</p>	<p>Primary, middle and secondary schools, France</p>	<ul style="list-style-type: none"> • Hand hygiene • Masks (students aged ≥11, indoors, outdoors) • Physical distancing 	<p>From Sep - Oct 2020, the relative risk of a positive test and the incidence rate ratio were significantly lower in all child age groups, compared with adults.</p> <p>The positive risk ratio was:</p> <ul style="list-style-type: none"> • Ages 0-5: 0.46 (95% CI=0.44,0.49) • Ages 6-17: 0.69 (95% CI=0.68,0.70) <p>The incidence rate ratio was:</p> <ul style="list-style-type: none"> • Ages 0-5: 0.09 (95% CI=0.08,0.09) • Ages 6-10: 0.31 (95% CI=0.30,0.32) • Ages 11-14: 0.64 (95% CI=0.63,0.66) • Ages 15-17: 1.07 (95% CI=1.05,1.10) <p><1% of schools were closed during the study period.</p>	<p>Moderate</p>
<p>Thompson, D.A., Abbaszanjani, H., Fry, R., Marchant, E., Griffiths, L., Akbari, A., ... Lyons, R. (2021). Staff-pupil SARS-CoV-2 infection pathways in schools: a population level linked data approach. <i>Preprint</i>.</p>	<p>Feb 8, 2021</p>	<p>Cohort</p>	<p>Primary and secondary schools, Wales, United Kingdom</p>	<ul style="list-style-type: none"> • Cohorting (by grade) • Physical distancing • Quarantine policies (after exposures) 	<p>From Aug 1 - Dec 25, 2020, national testing data was linked to 69,462 students, 13,543 school staff and 69,326 close household contacts to determine likely route of transmission. 14.6% of staff or students were tested for COVID-19, 1.1% tested positive.</p> <ul style="list-style-type: none"> • Staff had higher odds of a positive COVID-19 test vs. students (OR 2.99, 95% CI=1.67, 5.37). • Staff in primary and special schools had higher odds of a positive COVID-19 test vs. middle and secondary schools. (OR not reported) <p>After adjusting for age, sex, housing type, school size:</p> <ul style="list-style-type: none"> • Household exposure was the strongest predictor of a positive COVID-19 test in both staff (OR: 39.86, 95% CI= 35.01,45.38) and students (OR: 9.39, 95% CI=8.94, 9.88). 	<p>Moderate</p> <p>PREPRINT</p>

					<ul style="list-style-type: none"> Number of student cases in the same year increased risk for students (OR 1.12, 95% CI=1.08, 1.15). Number of student cases in other grades decreased risk for students (OR: 0.92, 95% CI=0.89, 0.94) <p>Limitations include:</p> <ul style="list-style-type: none"> Variations in IPAC measures across schools Linked data originated from 2019; potential mismatching of current and older data 	
<p>Aiano, F, Mensah, A., McOwat, K., Obi, C., Vusirikala, A., Powell, A. ... Saliba, V. (2021). COVID-19 outbreaks following full reopening of primary and secondary schools in England: retrospective, cross-sectional national surveillance. <i>Preprint.</i></p>	Feb 5, 2021	Cross-sectional	Primary and secondary schools, England	<ul style="list-style-type: none"> Enhanced cleaning Enhanced ventilation Hand hygiene Masks (primary schools had discretion to recommend them to students and staff; secondary schools advised to wear in communal areas outside of classroom but not mandatory in classroom) Physical distancing 	<p>From Aug 31 - Oct 18, 2020, 969 outbreaks were reported; 450 in primary schools (3% of all primary schools) and 519 in secondary schools (15% of all secondary schools).</p> <p>Among 190 schools reporting an outbreak with completed survey data, 2,425 cases were reported.</p> <p>Attack rates were higher among secondary school students (1.20%, 95% CI=1.13,1.28%) compared to primary students (0.84%; 95% CI=0.75,0.94%).</p> <p>Attack rates were higher among staff (4.85%; 95% CI=4.55,5.17%) compared to students (1.08%; 95% CI=1.02,1.13%); particularly among primary staff (9.81%; 95% CI=8.90,10.82%) compared to secondary staff (3.97%; 95% CI=3.79,5.69%).</p> <p>Teaching staff were more likely to be the index case in primary (48%) versus secondary (32%) schools (p=0.027).</p>	Moderate <i>PREPRINT</i>

					<p>Larger outbreaks were found among secondary schools:</p> <ul style="list-style-type: none"> • Primary schools: 2-35 cases • Combined schools: 2-26 cases • Secondary schools: 2-100 cases 	
<p>Villani, A., Coltella, L., Ranno, S., Bianchi di Castelbianco, F., Murru, P.M., Mazzone, T. ... Concato, C. (2021). School in Italy: a safe place for children and adolescents. <i>Italian Journal of Pediatrics</i>, 47, 1-3.</p>	Feb 2, 2021	Prevalence	2 school complexes, Rome, Italy	<ul style="list-style-type: none"> • Administrative policies • Individual protection devices • Infrastructural adjustments • Enhanced cleaning • Symptoms screening (by parents, teachers) 	<p>From Sep - Oct 2020, 16 of 1251 (1.3%) participants (1083 students aged <6 – 18, 168 staff) tested positive for COVID-19 including 13 students and 3 staff.</p> <p>16 positive cases were across 14 different classrooms (1 preschool, 6 primary, 3 secondary, 6 upper secondary school).</p> <p>Positivity rates were lower than those detected in the community at this time.</p>	Moderate
<p>Smith-Norowitz, T.A., Hammerschlag, M.R., & Kohlhoff, S. (2021). Coronavirus Disease 2019 (COVID-19) infection rates in a private school in Brooklyn, New York. <i>Acta Paediatrica</i>. Epub ahead of print.</p>	Feb 1, 2021	Cohort	All girl's private school, New York City (NYC), United States	<ul style="list-style-type: none"> • Hand hygiene • Masks • Physical distancing • Plastic barriers erected around students' and teachers' desks 	<p>From Oct - Dec 2020, 2439 COVID-19 tests were performed in a reopened all girl's private school (aged 6–18).</p> <p>There were 3 positive cases (2 students, 1 staff), for an overall infection rate of 0.13% (vs. NYC public school rates of 0.28 – 0.30% during the same time).</p> <p>No asymptomatic infections were detected.</p>	Moderate

<p>Falk, A., Benda, A., Falk, P., Steffen, S., Wallace, Z., & Høeg, T.B. (2021). COVID-19 cases and transmission in 17 K–12 schools – Wood County, Wisconsin, August 31–November 29, 2020. <i>Morbidity and Mortality Weekly Report</i>, 70, 136-140.</p>	<p>Jan 29, 2021</p>	<p>Prevalence</p>	<p>K-12 schools, rural Wisconsin, United States</p>	<ul style="list-style-type: none"> • Cohorting (11-20 students per group) • Masks (students, provided by a Foundation grant) • Physical distancing (indoor classes, lunch periods) • Quarantine policies (after exposures) 	<p>From Aug 31 - Nov 29, 2020, 191 positive cases were detected among 4876 students and 654 staff engaged in in-person learning from 17 rural schools.</p> <ul style="list-style-type: none"> • 7 students (3.7% of cases) were linked to in-school spread: <ul style="list-style-type: none"> ○ 5 elementary, 2 secondary schools ○ 3 in one class, 4 at separate schools • No in-school transmission reported between separate classroom cohorts • No known staff-to-staff or student-to-staff spread <p>COVID-19 incidence in these schools was lower than in the county, overall (3453 vs. 5466 per 100,000). (Weekly incidence of 34 – 1189 per 100,000 in the community; 7 – 40% positive COVID-19 tests.)</p> <p>Staff-reported rate of student mask wearing was high (>92%).</p> <p>A limitation of this study was the lack of infection screening to determine prevalence of asymptomatic spread.</p>	<p>High</p>
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<p>Gillespie, D.L., Meyers, L.A., Lachmann, M., Redd, S.C., & Zenilman, J.M. (2021). The experience of two independent schools with in-person learning during the COVID-19 pandemic. <i>Preprint.</i></p>	<p>Jan 29, 2021</p>	<p>Prevalence</p>	<p>2 independent K-12 schools, Southeast and Mid-Atlantic, United States</p>	<ul style="list-style-type: none"> • Cancelled extracurriculars and congregating activities • Enhanced cleaning (classroom disinfecting) • Enhanced ventilation • Masks • Periodic universal testing (following CDC's guidelines, similar to colleges/universities) • Physical distancing • Quarantine policies • Temperature checking 	<p>From Aug - Dec 2020, 2 schools were monitored for COVID-19 as they returned to in-person learning.</p> <p>School A:</p> <ul style="list-style-type: none"> • 112 confirmed cases (in 2299 students and staff, 4.9%) • 60 (54%) detected by universal test, 22 (20%) by contact tracing, 30 (27.8%) self-reported • 59 (54%) cases during 3-week period following school break • Largest outbreak (28 cases) traced to off-campus party <p>School B:</p> <ul style="list-style-type: none"> • 25 confirmed cases (in 1200 students and staff, 2.0%) • 21 (84%) detected by universal testing, 1 (4%) by contact tracing, 3 (12%) self-reported <p>Community incidence rates correlated with school infections:</p> <ul style="list-style-type: none"> • School A: $r=0.9$, $p<0.01$ • School B: $r=0.8$, $p<0.05$. <p>There was no correlation between community positivity rates and in-school introduction. In-school rates were consistently below community infection rates.</p> <p>9% of 69 introduced cases, in both schools, resulted in in-school transmission:</p> <ul style="list-style-type: none"> • 5 secondary infections from 45 introduced cases in school A • 1 secondary infection from 24 introduced cases in school B • Reproduction number consistently low (0.47 in school A, 0.05 in school B). 	<p>High</p> <p><i>PREPRINT</i></p>
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					<ul style="list-style-type: none"> 72% of in-school transmission (school A) associated with mask-wearing noncompliance <p>No evidence of staff-student transmission.</p> <p>A limitation of this study is that the testing protocol within schools changed over the study period based on resource availability; early cases may have gone undetected.</p>	
<p>Szépfalusi, Z., Schmidthaler, K., Sieber, J., Kopanja, S., Götzinger, F., Schoof, A. ... Frischer, T. (2021). Lessons from low seroprevalence of SARS-CoV-2 antibodies in schoolchildren: a cross-sectional study. <i>Pediatric Allergy and Immunology</i>. Epub ahead of print.</p>	Jan 29, 2021	Cross-sectional	Primary, middle, and upper grade schools, Vienna, Austria	Not reported.	<p>From May 18 - Jul 2, 2020 (coinciding with school re-openings), 2069 children (median age 13 years) were tested:</p> <ul style="list-style-type: none"> 2 (0.1%) tested positive 26 (1.3%) tested positive for specific antibodies (i.e., seroprevalence rate) <ul style="list-style-type: none"> 3 (11.5%) were aged 5-10; 18 (69.2%) were aged 11-14; 5 (19.2%) were aged 15-21 16 had self-reported contact with confirmed intergenerational cases (7 inside, 9 outside family), 10 were unknown <p>Child-to-child (including among sibling) transmission was rare; spread through intergenerational close contacts was more likely.</p>	High

<p>Theuring, S., Thielecke, M., van Loon, W., Hommes, F., Hülso, C., von der Haar, A. ... BECOSS Study Group. (2021). SARS-CoV-2 infection and transmission in school settings during the second wave in Berlin, Germany: a cross-sectional study. <i>Preprint.</i></p>	<p>Jan 29, 2021</p>	<p>Cross-sectional</p>	<p>Primary and secondary schools, Berlin, Germany</p>	<ul style="list-style-type: none"> • Cohorting • Enhanced ventilation (fresh air at least 3x day) • Hygiene commissioner (some schools) • Masks (outside and in classroom, some schools) • Signs about hand hygiene • Soap and water in restrooms 	<p>In Nov 2020, 1199 participants were tested (177 primary and 175 secondary school students from 24 classrooms, 142 staff, 625 household members).</p> <p>During this time, the 7-day incidence in Berlin was 185-210/100,000.</p> <p>9 students and 1 staff tested positive in 8 classrooms; 7 were asymptomatic.</p> <p>14 cases were found in 9 households; 3 households had a positive student in school. The attack rate in connected households was estimated at 1.1% (95% CI=0.3,2.9; 4/352). But there were no school-related secondary infections in affected classes at re-testing one week later.</p> <p>Infection prevalence:</p> <ul style="list-style-type: none"> • Students: 2.7% (95% CI=1.2,5.0; 9/338) • Staff: 0.7% (95% CI=0.0,3.9; 1/140) • Household members: 2.3% (95% CI=1.3,3.8; 16/611) <p>COVID-19 infection was present in 4.7%, 1.9%, and 1.0% of classes located in low-, medium-, and high-socioeconomic strata, respectively (high vs. low. OR=4.71, 95% CI=0.82, 48.18).</p> <p>Prevalence increased with inconsistent mask-wearing in school, walking to school, and case-contacts outside school.</p>	<p>High</p> <p><i>PREPRINT</i></p>
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<p>Hoch, M., Vogel, S., Kolberg, L., Dick, E., Fingerle, V., Eberle, U., ... von Both, U. (2021). Weekly SARS-CoV-2 sentinel in primary schools, kindergartens and nurseries, June to November 2020, Germany. <i>Preprint.</i></p>	<p>Jan 26, 2021</p>	<p>Prevalence</p>	<p>Primary schools, kindergarten and nurseries, Germany</p>	<p>All schools:</p> <ul style="list-style-type: none"> Cancelled common activities Hand hygiene Masks (staff, parents) Physical distancing Separate bathrooms and playground areas per cohort <p>Primary schools (in addition):</p> <ul style="list-style-type: none"> Masks (students, except when seated in class) Reduced class sizes 	<p>From Jun - Nov 2020, 2 of 3169 oropharyngeal swabs (weekly samples from randomly selected children (n=2149) and staff (n=1020)) tested positive (1 student, 1 staff in the same class). 36 close contacts were tested; 1 additional case (student) was identified.</p> <p>Incidence rate was 50/100,000 aged 1-11 and 150/100,000 general population at the time.</p>	<p>High <i>PREPRINT</i></p>
<p>Ladhani, S. (2021). Prospective active national surveillance of preschools and primary schools for SARS-CoV-2 infection and transmission in England, June 2020. <i>Preprint.</i></p>	<p>Jan 20, 2021</p>	<p>Cohort</p>	<p>Primary schools, England</p>	<ul style="list-style-type: none"> Cohorting Reduced class sizes 	<p>From Jun - Nov 2020, testing occurred at three time points: following partial reopening, at end of summer term, and following full reopening.</p> <p>Round 1 (Jun 2020):</p> <ul style="list-style-type: none"> 12,026 participants (6,441 students, 4,449 staff) in 131 schools Weekly infection rates: <ul style="list-style-type: none"> Students: 3.9/100,000 (95% CI=0.10, 21.8; 1/25,537) Staff: 11.4/100,000 (95% CI=1.4,41.2; 2/17,554) Seropositivity: <ul style="list-style-type: none"> Students: 11.1% (95% CI=9.2,13.5; 91/817) Staff: 15.1% (95% CI=13.3,17.1; 209/1381). Rates were not significantly different from each other and were similar to community rates. 	<p>High <i>PREPRINT</i></p>

					<p>Round 2 (Jul 2020):</p> <ul style="list-style-type: none"> • 73.7% participation • None tested positive for COVID-19 • Seropositivity was 10.4% (95% CI=8.0,13.2; 56/541 students) and 13.1% (95% CI=11.1,15.5; 117/890 staff) <p>Round 3 (Nov 2020):</p> <ul style="list-style-type: none"> • 61.9% participation • 1 staff tested positive (0.1%, 95% CI=0.0,0.6) • Seropositivity was 8.7% (95% CI=6.2, 12.1; 31/358 students) and 11.2% (95% CI=9.2,13.5; 96/858 staff) <p>Overall seroconversion rate was 3.7% (95% CI=2.8,4.8; 55/1,492); the overall incidence was 1.5 (95% CI=1.1,1.9) per 1,000 weeks of follow up.</p> <p>Seropositivity was associated with non-white ethnicity, region, history of COVID-19 symptoms, and having a health care worker in the household; school attendance, time spent in school, and staff-student contact in school were not.</p>	
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<p>Körner, R.W. & Weber, L.T. (2021). Prevalence of COVID-19 among children and adolescents while easing lockdown restrictions in Cologne, North Rhine-Westphalia, Germany. <i>Klinische Pädiatrie</i>. Epub ahead of print.</p>	<p>Jan 18, 2021</p>	<p>Prevalence</p>	<p>Schools and child care facilities, Germany</p>	<ul style="list-style-type: none"> Widespread full closure, with gradual reopening 	<p>Schools and daycares were fully closed on Mar 16, 2020; gradual, partial reopening occurred from Apr 23 - Jun 8, 2020 in one German state.</p> <p>Of 525 PCR-RT tests retrospectively analyzed among symptomatic children aged <18, only 3 (0.6%) tested positive.</p> <p>There was no significant rise in case numbers for 4 weeks after all schools had been fully reopened; the reopening of schools did not lead to an increase in the prevalence of COVID-19.</p> <p>Case numbers peaked at the beginning of Apr, declined through the first 2 opening periods, stabilized until the beginning of Jul.</p> <p>School reopening was not associated with infection, given the timing of symptom manifestation in affected children.</p> <p>Limitations of this study include the lack of serial testing, short observation period, and small cohort size (e.g., one city in one state).</p>	<p>Moderate</p>
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<p>Somekh, I., Shohat, T., Boker, L.K., Simões, E.A.F., & Somekh, E. (2021). Reopening schools and the dynamics of SARS-CoV-2 infections in Israel: A nationwide study. <i>Clinical Infectious Diseases</i>. Epub ahead of print.</p>	<p>Jan 18, 2021</p>	<p>Prevalence</p>	<p>Primary, secondary schools, Israel</p>	<ul style="list-style-type: none"> • Cohorting (during initial partial reopening) • Masks (students aged <7, classrooms, public areas) • Physical distancing (when completely reopened) • School closure, quarantine, and testing of all students and staff in the case of school outbreak • Symptomatic and asymptomatic contact screening (classmates, teachers) 	<p>Schools were fully closed on Mar 14, 2020 and, subsequently, partially (May 3, 2020) and completely (May 17, 2020) reopened; the academic year ended in Jun.</p> <p>Positivity and adjusted incidence rate ratios increased for most age groups (higher in adults than in children) following reopening.</p> <p>School reopening did not have a significant effect on COVID-19 infection rates among children.</p> <p>Positivity rate ratios 21-27 days following school re-opening relative to rate prior to opening:</p> <ul style="list-style-type: none"> • Children aged 0-9 years: RR=1.46 (95% CI=0.85,2.51) • Children aged 10-19 years: RR=0.93 (95% CI=0.65,1.34) • Adults aged 20-39: RR=3.37 (95% CI=2.51,4.53) • Adults aged 40-59: RR=4.72 (95% CI=3.26,6.83) <p>Easing of restrictions on social gatherings may have played a large contributory role to increases in prevalence following school openings.</p>	<p>High</p>
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<p>Mensah, A., Sinnathamby, M., Zaidi, A., Coughlan, L., Ismail, S.A., Ramsay, M.E., ... Ladhani, S.N. (2021). SARS-CoV-2 infections in children following the re-opening of schools and the impact of national lockdown during Autumn 2020: prospective, national observational cohort surveillance, England. <i>Preprint</i>.</p>	<p>Jan 11, 2021</p>	<p>Cohort</p>	<p>Pre-, primary, and secondary school-aged children, England</p>	<p>Not reported.</p>	<p>From Jul - Oct, 2020, there was a strong correlation ($p < 0.001$) in regional weekly COVID-19 infection rates between adults and children; the strongest correlation was for secondary school-aged children (aged 11-18).</p> <p>A week-long half-term school break (Oct 26, 2020) was associated with a small and temporary decline in infection rates.</p> <p>A national month-long lockdown (Nov 2020), during which schools remained open, was associated with rapid declines in infection rates first in young adults, followed by children across all age groups one week later. The trends were most noticeable in regions with moderate-to-high infection rates prior to lockdown.</p> <p>COVID-19 infection rates in school-aged children appear to be influenced by adult infection rates in the community.</p> <p>A limitation of this study is the analysis of data according to child's age, not whether he or she was attending school; it cannot comment on whether infection spread in or outside of school settings.</p>	<p>High <i>PREPRINT</i></p>
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Rytter, M.J.H., Nygaard, U., Mandic, I.N., Glenthøj, J.P., Schmidt, L.S., Cortes, D. ... Kristensen, K. (2021). Prevalence of SARS-CoV-2 antibodies in Danish children and adults . <i>The Pediatric Infectious Disease Journal</i> . Epub ahead of print.	Jan 7, 2021	Cross-sectional	Pediatric hospital departments, Denmark	Not reported	<p>From Jun 22 - Jul 3, 2020, antibodies were detected in 17 of 1033 (1.6%, 95% CI=1.0, 2.6) children (aged 0-17 years) visiting 8 pediatric hospital departments and 15 of 750 (2.0%, 95% CI=1.1, 3.3) adult blood donors. (The difference between children and adults was not significant.)</p> <p>At this time, there was low-grade transmission in the area, declining numbers of new cases and hospitalizations, and schools and daycares had reopened (Apr and May).</p> <p>23% of children had not returned to school when it reopened; the proportion of these children with detectable antibodies was similar to children attending school.</p>	Moderate
Previously reported evidence						
National Institute for Public Health and the Environment (RIVM). (2020, January 10). Children, school and COVID-19 .	Jan 10, 2021	Prevalence	Primary schools, child care facilities, Netherlands	<ul style="list-style-type: none"> Physical distancing (staff) Hand hygiene (recommended) 	Between Aug 31 2020 - Jan 10 2021, 9% of over 390,000 people working in education or child care tested positive. This is lower than the 14% positive of over 3.7 million adults tested in the general population at the same time.	Low NOT PEER REVIEWED
Gandini, S., Rainisio, M., Iannuzzo, M.L., Bellerba, F., Cecconi, F., & Scorrano, L. (2021). No evidence of association between schools and SARS-CoV-2 second wave in Italy . <i>Preprint</i> .	Jan 8, 2021	Prevalence	Kindergarten, elementary, middle and high schools, Italy	<ul style="list-style-type: none"> Ban on sports and music Frequent ventilation Hand hygiene Masks (staff, high school students) Negative test following exposure (some schools) Physical distancing (1 m between seats) reduced school hours 	<p>From Sept 12 - Nov 7, 2020 incidence and positivity were lower amongst elementary and middle school students; compared to the general population; incidence was higher in high school students in 3 of 19 regions. Incidence in teachers was no different from other occupations after adjusting for age.</p> <p>Active contact tracing occurred following case identification; mean number of tests per case ranged from 9-17. Clusters (2+ cases in 1 week) were found in 5-7% of schools with a case.</p>	High PREPRINT

				<ul style="list-style-type: none"> • Temperature check • Unidirectional flow of students 	<p>Teacher to teacher transmission (38%) was more common than student to teacher (11%) (p=0.007).</p> <p>Incidence by school level:</p> <ul style="list-style-type: none"> • Kindergarten: 0.21% of children and 2.35% of teachers • Elementary: 0.35% of children and 1.83% of teachers • Middle: 0.45% of students and 1.60% of teachers <p>Increase in R values were not associated with staggered school reopening date but were linked to a national election. School closures in two regions did not lower R.</p>	
<p>Brandal, L.T., Ofitserova, T.S., Meijerink, H., Rykkvin, R., Lund, H.M., Hungnes, O., ... Winje, B.A. (2021). Minimal transmission of SARS-CoV-2 from paediatric COVID-19 cases in primary schools, Norway, August to November 2020. <i>Eurosurveillance</i>, 26(1), 1-6.</p>	Jan 7, 2021	Prevalence	Primary schools in 2 counties, Norway	<ul style="list-style-type: none"> • Hand hygiene • Physical distancing • Symptomatic children asked to stay home <p>(Masks <i>not</i> recommended.)</p>	<p>From Aug 28 - Nov 11, 2020, all close contacts of child cases identified in schools were asked to participate. 2 RT-PCR tests were administered, before and after a 10-day quarantine period.</p> <p>13 index cases and 319 child and 74 adult close contacts were identified, 292 (74%) agreed to participate.</p> <ul style="list-style-type: none"> • Of 234 child contacts tested, 2 cases (0.9%) were identified. • Of 58 adult contacts, 1 case (1.7%) was identified 	High

<p>Ludvigsson, J.F., Engerström, L., Nordenhäll, C., & Larsson, E. (2021). Open schools, COVID-19, and child and teacher morbidity in Sweden. <i>The New England Journal of Medicine</i>, 384, 669-671.</p>	<p>Jan 6, 2021</p>	<p>Prevalence</p>	<p>Schools, Sweden</p>	<ul style="list-style-type: none"> • Only primary schools open <p>(Masks <i>not</i> mandatory.)</p>	<p>From Mar 1 - Jun 20, 2020 while schools were open, a low incidence of ICU admission for COVID-19 occurred among children aged 1-16 and teachers.</p> <p>Compared to other occupations (excluding HCW) the risk of ICU admission for COVID-19 was lower for preschool (RR: 1.10, 95% CI=0.49,2.49) and school teachers (RR: 0.43, 95% CI=0.28,0.68) after adjusting for age.</p>	<p>Moderate</p>
<p>Willeit, P. Krause, R., Lamprecht, B., Berghold, A., Hanson, B., Stelzl, E., ... Wagner, M. (2021). Prevalence of RT-PCT-detected SARS-CoV-2 infection at schools: First results from the Austrian School-SARS-CoV-2 Study. <i>Preprint</i>.</p>	<p>Jan 6, 2021</p>	<p>Cohort</p>	<p>Primary schools, Austria</p>	<p>Varied by region</p>	<p>From Sept 29 - Oct 22, 2020, a random selection of students (n=9465) and teachers (n=1269) in 245 schools took part in repeat RT-PCT testing every 3-5 weeks.</p> <p>First testing, 7-day community incidence was 75 per 100,000. School prevalence was 0.39%.</p> <ul style="list-style-type: none"> • 209 (86%) schools had 0 cases • 28 (11.5%) schools had 1 case • 6 (2.5%) schools had 2 cases <p>Second testing, 7-day community incidence was 419 per 100,000. School prevalence 1.42%. Fewer schools were tested due to newly implemented school closure</p> <ul style="list-style-type: none"> • 52 (62.5%) schools had 0 cases • 23 (26.1%) schools had 1 case • 9 (10.2%) schools had 2 cases • 4 (4.5%) schools had 3 cases. <p>In adjusted models, odds of a single case were associated with:</p> <ul style="list-style-type: none"> • Regional incidence: two-fold higher incidence, OR: 1.66, 95% CI=1.38, 1.99 • Social deprivation: high/very high vs. low/moderate, OR: 2.05, 95% CI=1.23,3.42 	<p>High</p> <p><i>PREPRINT</i></p>

					There was no association between grade (1-4, 5-8), population density, students per class, teacher vs. students, sex, or age of teachers or students.	
Harris, D.N., Ziedan, E., & Hassig, S. (2021, January 4). The effects of school reopenings on COVID-19 hospitalizations . National Center for Research on Education Access and Choice.	Jan 4, 2021	Cohort	United States	Varied across jurisdictions	Compared to the 10 weeks prior to school reopening, in the first 6 weeks of opening, there was no increase in hospitalizations per 100,000 in counties with reopening of schools in-person or with hybrid learning. Analyses were adjusted for geographic and period-level factors. When analyses were stratified by baseline level of hospitalization, results were inconclusive at the highest rate of >44 per 100,000 per week. Thus, reopening schools may have an impact at this level due to higher rates of community transmission.	High NOT PEER REVIEWED
Hoehl, S., Kreutzer, E., Schenk, B., Westhaus, S., Foppa, I., Herrmann, I., ... Ciesek, S. (2021). Longitudinal testing for respiratory and gastrointestinal shedding of SARS-CoV-2 in day care centres in Hesse, Germany . <i>Clinical Infectious Diseases</i> . Epub ahead of print.	Jan 3, 2021	Cohort	Day care centres, Germany	<ul style="list-style-type: none"> • Masks (staff) • Screening (staff, students; runny nose permitted) 	From Jun 18 - Sep 10, 2020, 859 children (aged 3 months to 8 years) and 376 staff members from 50 randomly selected daycare centres participated in weekly screening for COVID-19 using buccal mucosa swab, anal swab, and RT-PCR. 7366 buccal mucosa swabs and 5907 anal swabs were analyzed. No children tested positive for COVID-19; 2 staff (1 symptomatic, 1 asymptomatic) tested positive from 2 different day care centres.	Moderate

<p>Fricchione, M.J., Seo, J.Y., & Arwady, M.A. (2020). Data-driven reopening of urban public education through Chicago's tracking of COVID-19 school transmission. <i>Public Health Management & Practice</i>. Epub ahead of print.</p>	<p>Dec 30, 2020</p>	<p>Cohort</p>	<p>Private schools, Chicago, United States</p>	<ul style="list-style-type: none"> • Hand hygiene • Masks • On site visits and leadership team to follow-up with implementation • Physical distancing • Quarantining of cohort with identification of a positive case • Temperature and symptom checks <p>(No student or teacher test-based screening required.)</p>	<p>From Aug 17 - Oct 4, 2020, 31 schools reported 59 COVID-19 cases (20 staff, 39 students); the median number of cases per school was 1 (range 1-8). 47 cases were school associated (case had been in the school during the infectious period).</p> <p>Mean community 7-day rolling average was 316 per 100,000, and average test positivity of 4.8%.</p> <p>The majority of multiple cases at a single school were siblings. Contact tracing identified 3 clusters; 2 involved only staff and 1 involved a student and a staff. 2 of 3 clusters were associated with nonadherence to physical distancing outside of school. 1 cluster was potentially transmitted in the classroom.</p>	<p>Moderate</p>
<p>Kriemler, S., Ulyte, A., Ammann, P., Peralta, G.P., Berger, C., Puhan, M.A., Radtke, T. (2020). Surveillance of acute SARS-CoV-2 infections in school children and point-prevalence during a time of high community transmission in Switzerland. <i>Preprint</i>.</p>	<p>Dec 26, 2020</p>	<p>Prevalence</p>	<p>Primary and secondary schools, Switzerland</p>	<ul style="list-style-type: none"> • Hand hygiene • Masks (students aged 12+) • Physical distancing • Regular surface cleaning¹ 	<p>From Dec 1 – 11, 2020 point-prevalence of asymptomatic COVID-19 infections in children aged 6-16 and teachers was assessed in 14 randomly selected schools in areas of high community transmission. Serial testing was completed 1 week via both RT-PCR and a rapid Ag test.</p> <p>National incidence rates were ~4000-5000 per 100,000 per day.</p> <p>Among the 641 children, 1 case was identified (0.2%) via RT-PCR. Among 66 teachers no cases were identified.</p> <p>7 children (1.1%) and 2 teachers (3.0%) tested positive using the rapid test; these results were negative when repeated, thus deemed false positives.</p>	<p>High</p> <p><i>PREPRINT</i></p>

¹ Federal Office of Public Health of the Swiss Confederation (2020, December 11). [Coronavirus: Precautionary measures](#).

<p>Ulyte, A., Radtke, T., Abela, I.A., Haile, S.R., Berger, C., Huber, M., ... Kriemler, S. (2020). Clustering and longitudinal change in SARS-CoV-2 seroprevalence in schoolchildren: prospective cohort study of 55 schools in Switzerland. <i>Preprint.</i></p>	<p>Dec 22, 2020</p>	<p>Cohort</p>	<p>Primary and secondary schools, Switzerland</p>	<ul style="list-style-type: none"> • Hand hygiene • Masks (students aged 12+) • Physical distancing • Regular surface cleaning² 	<p>In Jun/Jul and Oct/Nov 2020, classes and schools were randomly selected to take part in seroprevalence testing. 2831 children from 275 classes in 55 schools enrolled. Median participation within each class was 47%.</p> <p>Overall seroprevalence was 2.4% (95% CI=1.4, 3.6%) in summer and 4.5% (95% CI=3.2, 6.0%) in winter. The proportion ever seropositive was 7.8% (95% CI=6.2, 9.5%).</p> <p>There were no differences by age or sex, but prevalence did differ by district.</p> <p>At least 1 seropositive child was detected in 52 of 55 schools and in 125 of 275 classes (75 of 129 classes with ≥5 children and ≥50% of children tested).</p> <p>7 classes (2.5%) in 5 schools had 3+ cases. Further investigation confirmed teacher to student transmission in 1 cluster, and probable school transmission in 3 clusters. Household transmission was confirmed in the remaining 3 clusters.</p>	<p>Moderate</p> <p><i>PREPRINT</i></p>
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² Federal Office of Public Health of the Swiss Confederation (2020, December 11). [Coronavirus: Precautionary measures.](#)

<p>Hommes, F., van Loon, W., Thielecke, M., Abramovich, I., Lieber, S., Hammerich, R., ... Mockenhaupt, F.P. (2020). SARS-CoV-2 infection, risk perception, behaviour, and preventive measures at schools in Berlin, Germany, during the early post-lockdown phase: A cross-sectional study. <i>Preprint.</i></p>	<p>Dec 19, 2020</p>	<p>Cross-sectional</p>	<p>Primary and secondary schools, Germany</p>	<p>All schools had implemented some measures; highest rates were for:</p> <ul style="list-style-type: none"> • Documented absences • Hand hygiene • Information • Reduced class sizes <p>Poor adherence to physical distancing and masking.</p> <p>Primary schools adhered to more measures than secondary schools.</p>	<p>From Jun 11 - 19, 2020, 385 students and 150 staff from 12 primary and 12 secondary schools (randomly selected) were tested for COVID-19 infections and antibodies.</p> <p>One secondary student (0.2%) tested positive for COVID-19. 7 students (1.35%) had detectable antibodies; 3 were from the same secondary class.</p> <p>Among 535 participants (385 students, 150 staff), one teenager was identified as COVID-19 positive (0.2%), and 7 students exhibited specific IgG (1.3%).</p>	<p>Moderate <i>PREPRINT</i></p>
<p>Hobbs, C.V., Martin, L.M., Kim, S.S., Kirmse, B.M., Haynie, L., McGraw, S., ... Flannery, B. (2020). Factors associated with positive SARS-CoV-2 test results in outpatient health facilities and emergency departments among children and adolescents aged <18 years – Mississippi, September–November 2020. <i>Morbidity and Mortality Weekly</i></p>	<p>Dec 18, 2020</p>	<p>Case control</p>	<p>United States</p>	<p>Varied across jurisdictions</p>	<p>From Sept 1 - Nov 5, 2020, 397 symptomatic children aged <18 were tested for COVID-19 using RT-PCR. 154 tested positive and 243 tested negative.</p> <p>Cases were more likely to:</p> <ul style="list-style-type: none"> • Be a close contact of a confirmed case, adjusted OR: 3.2, 95% CI=2.0,5.0 • Attended a gathering with others outside of the household, adjusted OR: 2.4, 95% CI=1.1,5.5 • Participated in activities with other children, adjusted OR: 3.3, 95% CI=1.3,8.4 • Have had visitors, adjusted OR: 1.9, 95% CI=1.2,2.9 <p>Cases were no more likely to attend school, adjusted OR: 0.8, 95% CI=0.5,1.3.</p> <p>Of those who attended school, cases were less likely to report adherence to mask</p>	<p>High</p>

<i>Report, 69: 1925-1929.</i>					wearing by staff and students (adjusted OR: 0.4, 95% CI=0.2,0.8). Controls were more likely to be tested as a requirement for return to school or daycare (p=0.01).	
Children's Task and Finish Group. (2020, December 17). Update to 4th Nov 2020 paper on children, schools and transmission.	Dec 17, 2020	Cross-sectional	Primary and secondary schools, England	<p>Primary schools:</p> <ul style="list-style-type: none"> Enhanced cleaning excluded students/staff with symptoms or recent contact Hand hygiene Physical distancing (staff, parents) Staggered start/end times <p>(<10% of schools implemented masks or distancing for students.)</p> <p>Secondary schools:</p> <ul style="list-style-type: none"> Cohorting Enhanced cleaning Masks (staff, students, common areas only) <p>(<10% of schools implemented student masks in classrooms or teachers cohorted with a single class)</p>	<p>6253 students and 4841 staff from 42 primary and 63 secondary schools took part in point-prevalence testing. Enrollment rates were 17% for students and 55% for staff.</p> <p>In high-risk areas, % positivity was:</p> <ul style="list-style-type: none"> Primary students 1.18%, 95% CI=0.71,1.83 Primary staff: 1.13%, 95% CI=0.49,2.22 Secondary students, 1.73%, 95% CI=1.17,2.43 Secondary staff: 1.62%, 95% CI=1.12,2.27 <p>In low-risk areas, % positivity was:</p> <ul style="list-style-type: none"> Primary students: 0% Primary staff: 0% Secondary students: 1.12%, 95% CI=0.62,1.90 Secondary staff: 1.18%, 95% CI=0.61, 2.05 <p>This study did not include students who were self-isolating due to symptoms or recent contact.</p> <p>Noted differences between primary and secondary and between low and high-risk areas should be interpreted with caution due to overlapping confidence intervals.</p>	Moderate <i>NOT PEER REVIEWED</i>

<p>Peaper, D.R., Murdzek, C., Oliveira, C., & Murray, T. (2020). Severe acute respiratory syndrome coronavirus 2 testing in children in a large regional US health system during the coronavirus disease 2019 pandemic. <i>The Pediatric Infectious Disease Journal</i>, 40(3), 175-181.</p>	<p>Dec 15, 2020</p>	<p>Cohort</p>	<p>All school-age children, Southern Connecticut, New York, Rhode Island, United States</p>	<p>Varied by state</p>	<p>Data for all tests completed from Mar 1-Sep 26, 2020 in those ≤ 18 years of age in a single health system were analyzed.</p> <p>Test positivity did not increase with school reopening (trend: 0.02% per week; 95% CI=-0.06%,0.09%) overall or by age group. High school (age 15-18) and middle school (age 11-14) consistently had higher rate than children <2, 2-5, and 6-10.</p>	<p>Moderate</p>
<p>Larosa, E., Djuric, O., Cassinadri, M., Cilloni, S., Bisaccia, E., Vicentini, M., ... Reggio Emilia Covid-19 Working Group. (2020). Secondary transmission of COVID-19 in preschool and school settings in northern Italy after their reopening in September 2020: a population-based study.</p>	<p>Dec 10, 2020</p>	<p>Cohort</p>	<p>Preschools, primary schools, middle schools, high schools, Italy</p>	<ul style="list-style-type: none"> • Masks (staff, students aged 6+)³ • Physical distancing 	<p>From Sep 1 - Oct 15, 2020 after the reopening of schools, across 41 classes in 36 different schools [8 preschools (aged 0-5 years), 10 elementary (aged 6-10 years), 5 middle (aged 11-13 years), 13 high schools (aged 14-19 years)], 994 students and 204 teachers were tested following the identification of 48 primary cases (43 students, 5 teachers).</p> <p>38 secondary cases (3.82% attack rate) were identified among students in 1 elementary school, 2 middle schools, and 6 high schools. The attack rate was higher in high and middle schools (6.6%) vs. elementary schools (0.38%). There were no secondary cases in preschools or among teachers.</p>	<p>Moderate</p>

³ Ministero dell'Istruzione. (2020, August 6). [Documento di indirizzo e orientamento per la ripresa delle attività in presenza dei servizi educativi e delle scuole dell'infanzia](#).

<i>Eurosurveillance</i> , 25(49): pii=2001911.					Most routes of transmission appear to have been from an infected family member or close contact. Only one middle school appears to have had transmission within the school, with the index cases possibly being teachers.	
Thielecke, M., Theuring, S., van Loon, W., Hommes, F., Mall, M.A., Rosen, A., ... Mockenhaupt, F.P. (2020). SARS-CoV-2 infections in kindergartens and associated households at the start of the second wave in Berlin, Germany – a cross sectional study. <i>Preprint.</i>	Dec 9, 2020	Cross-sectional	Kindergarten, Germany	<ul style="list-style-type: none"> • Cohorting • Enhanced ventilation • Masks (staff; 41.7% of settings) • Physical distancing (staff, parents) <p>(Attendance with common cold symptoms was allowed in 75% of settings.)</p>	<p>From Sep 28 - Oct 2, 2020, 720 individuals in 12 kindergarten programs in Berlin were tested for COVID-19 to assess prevalence of infection among this population.</p> <p>Among those tested, 155 were children, 78 were staff and 487 were household members.</p> <p>701 samples were collected for 98.1% of children, 100% of educators and 96.7% of household members. Of these none were positive. One educator showed positive for COVID-19 antibodies.</p>	Moderate <i>PREPRINT</i>
Ismail, S.A., Saliba, V., Lopez Bernal, J., Ramsay, M.E., & Ladhani, S.N. (2020). SARS-CoV-2 infection and transmission in educational settings: a prospective, cross-sectional analysis of infection clusters and outbreaks in England. <i>The Lancet Infectious</i>	Dec 8, 2020	Cross-sectional	Child care, primary, secondary, schools, England	<ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Enhanced ventilation • Hand hygiene • Masks (staff, students aged 12+) • Physical distancing (staff, "older" students) • Screening⁴ 	<p>From Jun 1 – Jul 17, 2020, Public Health England conducted enhanced surveillance including daily monitoring of school.</p> <p>Median attendance was 928,000 students per day (IQR 630,000-1,230,000) in a median of 57 600 settings</p> <p>177 cases were identified; 113 (64%) single cases, 9 (5%) coprimary cases (i.e., from the same household), and 55 (31%) outbreak-associated cases.</p> <p>Rates per 1000 settings per month:</p> <ul style="list-style-type: none"> • Early years: 1.1 (95% CI=0.75,1.4) • Primary: 6.5 (95% CI=5.3,7.9) • Secondary: 4.5 (95% CI=2.7,7.1) 	Moderate

⁴ Government of the United Kingdom. (2020, December 18). [Guidance for schools: coronavirus \(COVID-19\).](#)

<p><i>Diseases, 21(3), 344-353.</i></p>					<p>Rates per 100 000 students per day:</p> <ul style="list-style-type: none"> • Early years: 18 (CI=14,24) • Primary: 6.0 (CI=4.3,8.2) • Secondary: 6.8 (CI=2.7,14) • Staff: 27 (CI=23,32) <p>Outbreaks were small (median 2 cases [IQR 2-5]; 29 (53%) involved only one secondary. Number of secondary cases was lower when index case was a child (maximum 6 (median 1 [IQR 1-2]) vs. adult (maximum 12, median 1 [IQR 1-5]).</p> <p>For every case introduction, the risk of an outbreak occurring was:</p> <ul style="list-style-type: none"> • Early years: 40% (95% CI=25,57) • Primary: 26% (95% CI=18,36) • Secondary: 39% (95% CI=17,64) <p>Probable direction of transmission</p> <ul style="list-style-type: none"> • Staff-to-staff (n=26) • Staff-to-student (n=8) • Student-to-staff (n=16) • Student-to-student (n=5) <p>For every 5 cases per 100 000 in community incidence, the risk of an outbreak increased (RR: 1.72, 95% CI=1.28,2.30). No association was seen between outbreaks and regional population size or density.</p>	
<p>Rozhnova, G., van Dorp, C.H., Bruijning-Verhagen, P., Bootsma, M.C.J., van de Wijgert, J.H.H.M., Bonten, M.J.M., Kretzschmar, M.E. (2020). Model-</p>	<p>Dec 8, 2020</p>	<p>Cohort</p>	<p>Netherlands</p>	<ul style="list-style-type: none"> • Physical distancing (staff, secondary schools) • Symptomatic or exposed individuals advised to stay home⁵ 	<p>Despite high numbers of contacts for children of all ages, and in particular older children aged 10-20, closing schools had less impact on the reproductive number than physical distancing measures outside the school environment.</p> <p>The impact of measures reducing school-based contacts including closure, is</p>	<p>Moderate <i>PREPRINT</i></p>

⁵ National Institute for Public Health and the Environment (RIVM). (2020, January 10). [Children, school and COVID-19.](#)

<p>based evaluation of school- and non-school-related measures to control the COVID-19 pandemic. <i>Preprint.</i></p>					<p>dependent on the other opportunities to reduce non-school based contacts.</p> <p>In the context of continued high rates of transmission, if non-school based measures are exhausted or undesired the additional benefit of school-based measures may be considerable. The biggest impact on transmission would be by reducing contacts in secondary schools.</p>	
<p>Hoehl, S., Schenk, B., Rudych, O., Göttig, S., Foppa, I., Kohmer, N., ... Ciesek, S. (2020). At-home self-testing of teachers with a SARS-CoV-2 rapid antigen test to reduce potential transmissions in schools. <i>Preprint.</i></p>	Dec 7, 2020	Cohort	Primary and secondary schools, Germany	Not reported	<p>Of 10,836 rapid antigen tests conducted by 602 teachers (mean 18 tests per participant), 5 true positive (0.19%) and 16 false positive tests were recorded. Four false negative tests occurred in symptomatic cases.</p> <p>Among cases, 4 were symptomatic and 1 was pre-symptomatic. All cases were identified when local 7-day incidence was higher than 100 cases/100,000.</p>	Moderate PREPRINT
<p>Miron, O., Yu, K.H., Wilf-Miron, R., Kohane, I., & Davidovitch, N. (2020). COVID-19 infections following physical school reopening. <i>Archives of Disease in Childhood.</i> Epub ahead of print.</p>	Dec 7, 2020	Cohort	Primary and secondary schools, Florida, United States	Varied by country	<p>In counties with in-person learning incidence increased daily once schools re-opened. In elementary schools on day 4, the incidence was 11/100,000 (95%CI=9.9,12) and increased to 12.8 (95%CI=11.7,13.9), 1.2-fold by day 20. No trend was observed in counties that did not re-open.</p> <p>Among secondary schools with in-person learning incidence increased daily once schools re-opened. On day 1, the incidence was 16.1 (95%CI=14.4,17.9), and on day 20, it increased to 20.5 (95%CI=18.5,22.5),1.3 fold.</p> <p>No trend was observed in counties that did not re-open.</p>	Moderate

					The authors note that counties that offered remote learning also had public mask mandates, limits on public gatherings, and socioeconomic differences that may confound results.	
Manny, E., Carroll, A., Charlton, C., Robinson, J., Subbarao, P., Azad, M.B., ... Mandhane, P.J. (2020). Increased mask use and fewer gatherings associated with lower SARS-CoV-2 seropositivity among young school-age children. <i>Preprint.</i>	Dec 3, 2020	Cross-sectional	School-age children, Edmonton, Canada	Varied by region	<p>This analysis includes 565 children age 8-13 years old enrolled in a longitudinal study.</p> <p>Neither age, sex, school attendance or sport participation were associated with seropositivity.</p> <p>Mask wearing decreased odds of positivity, and large gatherings increased risk.</p>	High <i>PREPRINT</i>
Robert Koch Institute. (2020, Nov 30). Coronavirus Disease 2019 (COVID-19) Daily Situation Report of the Robert Koch Institute.	Nov 30, 2020	Prevalence	Child care, schools, after school care, other educational facilities, children's homes, camps , Germany	Varied by setting	Of 1,053,869 total cases in Germany from Jan-Nov 30, 30,460 (2.9%) were in those cared for or attending child care/school/camp settings and 14,120 (1.3%) were in staff employed in these settings. No information available on source of exposure or the total number of staff and students who attended during the time period. Prevalence was lower than other settings such as hospitals and clinical settings (3.6% of total), congregate living settings (5.4% of total). No data is given on the number of people employed in these settings.	Moderate <i>NOT PEER REVIEWED</i>

<p>Armann, J.P., Unrath, M., Kirsten, C., Lück, C., Dalpke, A.H., & Berner, R. (2020). SARS-CoV-2 IgG antibodies in adolescent students and their teachers in Saxony, Germany (SchoolCoviDD19) : Persistent low seroprevalence and transmission rates between May and October 2020. Preprint.</p>	<p>Nov 29, 2020</p>	<p>Cross-sectional</p>	<p>Schools, Germany</p>	<p>Not reported</p>	<p>After school reopening in May/Jun, 2020, out of 2045 individuals (1538 students grades 8-11; 503 teachers), seroprevalence was 0.6% (12/2045) including 11 seropositive students and 1 teacher.</p> <p>In Sep/Oct, out of 1779 individuals (1334 students; 445 teachers), seroprevalence was 0.7% (12/1779) including 11 seropositive students and 1 teacher.</p> <p>Seropositive individuals were detected in 7/13 schools, with 4 in one school as the max. Seroprevalence ranged from 0 to 2.2 per individual school.</p> <p>During the study period, SARS-CoV-2 infections per 100,000 in the community increased from 139 to 245.</p>	<p>Moderate <i>PREPRINT</i></p>
<p>Yoon, Y., Kim, K.R., Park, H., Kim, S.Y., & Kim, Y.J. (2020). Stepwise school opening online and off-line and an impact on the epidemiology of COVID-19 in the pediatric population. Journal of Korean Medical Sciences, 35(46): e414.</p>	<p>Nov 20, 2020</p>	<p>Prevalence</p>	<p>Kindergarten, primary and secondary schools, South Korea</p>	<ul style="list-style-type: none"> • Enhanced cleaning • Hand hygiene • Masks (staff, students, indoors) • Physical distancing • Plastic barriers (at lunch) • Reduced class sizes • Screening • Temperature check 	<p>Report of phased school opening for all grades from May 20 - Jun 8, 2020, data collected to Jul 11. Proportion of pediatric cases nationally remained constant (~7.0%).</p> <p>As of July 31, 44 children from 38 schools and kindergartens had confirmed COVID-19 cases. Additional testing of more than 13,000 students and staff found only one additional student case.</p> <p>29 of the 44 cases had an identifiable source, 23 of which were family members. Older children were more likely to have unknown source than younger children (52.4% vs. 17.4%, p=0.014). 80% of younger children were infected by a family member; the proportion of students infected by family members decreased with age (p<0.001).</p>	<p>Moderate</p>

<p>Mossong, J., Mombaerts, L., Veiber, L., Pastore, J., LeCoroller, G., Schnell, M., ... Wilmes, P. (2020). SARS-CoV-2 transmission in educational settings during an early summer epidemic wave in Luxembourg. <i>Preprint.</i></p>	<p>Oct 26, 2020</p>	<p>Cohort</p>	<p>Preschool, primary school, secondary school, Luxembourg</p>	<p>All schools:</p> <ul style="list-style-type: none"> Enhanced cleaning Enhanced ventilation (CO₂ detectors) Hand hygiene Masks (staff, students aged 6+, outside classroom) Physical distancing (staff) <p>Preschools (in addition):</p> <ul style="list-style-type: none"> Avoid using toys that cannot be properly cleaned⁶ <p>Primary and secondary schools (in addition):</p> <ul style="list-style-type: none"> Limited movements and reduced contacts outside classrooms Staggered breaks 	<p>From May 4 - Jul 25, 2020, there were 424 confirmed cases among students and teachers:</p> <ul style="list-style-type: none"> 176 pre- and primary school students (41.5%) 214 secondary school students (50.5%) 16 primary school teachers (3.8%) 18 secondary school teachers (4.3%) <p>Probable sources of transmission included:</p> <ul style="list-style-type: none"> Infected family member (42.5%) School (11.6%) Friend (3.8%) From another or multiple sources (4.2%) Unknown (37.5%) <p>Of 228 cases that attended school while infectious, 29 cases led to 49 secondary cases (school transmission).</p> <p>Of the 49 secondary cases:</p> <ul style="list-style-type: none"> 38 (78%) were student-to-student, same class 7 (14%) were teacher-to-student 3 (6%) were student-to-teacher 1 was teacher-to-teacher transmission. <p>The effective reproductive rate in schools was 0.27.</p> <p>Comparing Luxembourg's two waves (Mar - Apr and Jul), incidence was lower in school-age children (28 per 100,000) compared to adults (208 per 100,000; IRR=0.13, 95% CI=0.09, 0.19) in the first wave; there were no differences between groups in the second wave. Incidence was</p>	<p>Moderate <i>PREPRINT</i></p>
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⁶ Le Gouvernement du Grand-Duché de Luxembourg. (2021, January 12). [Questions and answers : Measures related to COVID-19 in schools and childcare facilities.](#)

					lower in students compared to teachers during the first wave (IRR=0.20, 95% CI=0.12, 0.34), but both teachers and students were affected during the second. Positivity rates were lower in children (5.1%) than in adults (10.9%) during the first wave, but were more similar (1.2% and 0.82%, respectively) in the second.	
Cooch, P., Watson, A., Olarte, A., Crawford, E., CLIAhub Consortium, DeRisi, J., ... Bardach, N. (2020). Supervised self-collected SARS-CoV-2 testing in indoor summer camps to inform school reopening. <i>Preprint.</i>	Oct 23, 2020	Cross-sectional	Camp, California, United States	<ul style="list-style-type: none"> • Cohorting • Masks (staff, except when eating) • Temperature check 	<p>163 participants (including 67 campers, 76 household contacts and 20 staff) self-collected nasal and saliva swabs at the beginning and end of 2 summer camps (between 3-5 weeks apart). No positive RT-PCR tests for the virus that causes COVID-19 were found at either timepoint.</p> <p>Seven participants (4%, 95% CI=1%,7%) tested positive for the virus that causes COVID-19 antibodies at one or more timepoints.</p> <p>It was not possible to determine whether any transmission occurred between participants in this study as no documented cases occurred during camps.</p>	High <i>PREPRINT</i>
National Centre for Immunisation Research and Surveillance. (2020, October 21). COVID-19 in schools and early childhood education and care services – the Term 3 experience in NSW.	Oct 21, 2020	Cohort	Child care and schools, Australia	<p>All schools:</p> <ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • Screening <p>Primary and secondary schools (in addition):</p> <ul style="list-style-type: none"> • Parents / carers not allowed on site, except for select purposes • Physical distancing (staff) • Students must stay home if unwell, 	<p>From Jul 4 - Sep 25, 2020, 39 individuals (32 students and 7 staff members) from 34 educational settings (28 schools and 6 child care services) were confirmed as primary COVID-19 cases (community acquired) who had an opportunity to transmit the virus to others in their school or child care setting.</p> <p>3824 individuals (3439 students and 385 staff members) were identified as close contacts of the primary cases.</p> <p>33 secondary cases (28 students and 5 staff members) occurred in 10 educational</p>	Moderate <i>NOT PEER REVIEWED</i>

				negative tests are required to return to school after showing symptoms ⁷	<p>settings (5 high schools, 3 primary schools, 2 child care centres).</p> <ul style="list-style-type: none"> • Outbreaks were identified in four high schools. The secondary attack rate in high schools was 1.1%. • There were no outbreaks within primary schools setting. • There was one outbreak in a child care <p>The overall secondary transmission rate was 0.9% (33/3,641) for all settings: 1.1% in high schools, 0.4% in primary schools and 0.7% in ECEC services. The highest rate of transmission in primary schools and ECEC services was among adults, at 6.6%.</p>	
Gilliam, W.S., Malik, A.A., Shafiq M., Klotz, M., Reyes, C., Humphries, J.E., ... Omer, S.B. (2020). COVID-19 transmission in US child care programs . <i>Pediatrics</i> , 147(1), e2020031971.	Oct 1, 2020	Cross-sectional	Child care, United States	<p>Varied by setting.</p> <p>Child care centres that were open reported high rates of infection mitigation strategies such as increased cleaning, cohorting and smaller group sizes.</p>	<p>Among 57,335 child care providers who participated in the study:</p> <ul style="list-style-type: none"> • 51.4% reported their child care facility closed near the start of the pandemic and remained closed. • 48.6% reported their child care facility did not close, closed but had reopened, or closed at a later date due to a confirmed or suspected case of COVID-19. <p>No association was found between exposure to child care and COVID-19 in both unmatched (OR=1.06; 95% CI=0.82,1.38, p=0.66) and matched (OR=0.94; 95% CI=0.73,1.21, p=0.64) analyses.</p> <p>Findings must also be interpreted in the context of community transmission rates.</p>	Moderate

⁷ New South Wales Government. (2020, December 8). [Advice for families](#).

<p>Ulyte, A., Radtke, T., Abela, I.R., Haile, S.R., Blankenberger, J., Jung, R., ... Kriemler, S. (2020). Variation in SARS-CoV-2 seroprevalence in school-children across districts, schools and classes. <i>Preprint.</i></p>	<p>Sep 18, 2020</p>	<p>Prevalence</p>	<p>Schools, Zurich, Switzerland</p>	<ul style="list-style-type: none"> • Hand hygiene • Masks (students, aged 12+) • Physical distancing • Regular surface cleaning⁸ 	<p>From Jun 16 – Jul 9, 2020, testing of 2585 children in 55 randomly selected schools found a seroprevalence rate of 2.8% (95% CI 1.6-4.1%). Participation rate was 45% (5% to 94% across classes).</p> <p>Seroprevalence rates were higher in younger children:</p> <ul style="list-style-type: none"> • Grades 1-2 = 3.8% (95% CI=1.9,6.1%) • Grades 4-5 = 2.5% (95% CI=1.1,4.2%) • Grades 7-8 = 1.5% (95% CI=0.5,3.0%) <p>Seroprevalence rates were similar in adults, however PCR confirmed cases were much higher for adults (0.24% vs. 0.03%).</p> <p>The number of classes with seropositive children was very small suggesting little evidence of major school transmission.</p> <p>Schools were closed between Mar 16 - May 10, 2020.</p>	<p>Moderate</p> <p><i>PREPRINT</i></p>
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⁸ Federal Office of Public Health of the Swiss Confederation (2020, December 11). [Coronavirus: Precautionary measures.](#) Update 13: March 19, 2021

<p>Macartney, K., Quinn, H.E., Pillsbury, A.J., Koirala, A., Deng, L., Winkler, N., ... Chant, K. (2020). Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study. <i>The Lancet Child & Adolescent Health</i>, 4(11), 807-816.</p>	<p>Aug 3, 2020</p>	<p>Cohort</p>	<p>Daycare, primary and secondary schools, New South Wales, Australia</p>	<p>All schools:</p> <ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • Screening <p>Primary and secondary schools (in addition):</p> <ul style="list-style-type: none"> • Parents / carers not allowed on site, except for select purposes • Physical distancing (staff) • Students must stay home if unwell, negative tests required to return to school after showing symptoms^{9,10} 	<p>From Jan 25 - Apr 10, 2020, all lab-confirmed COVID-19 cases in children or staff who attended school or daycare within 24h of symptom onset.</p> <p>15 adults, 12 children (8 secondary school, 1 primary school, 3 daycare) attended while infectious.</p> <p>Of 1448 close contacts identified, 43.7% had RT-PCR testing. Secondary transmission occurred in 4 of 25 settings.</p> <p>In schools, 5 secondary cases (3 children, 2 adults) were identified in 3 schools.</p> <p>No secondary transmission occurred in 9 of 10 daycares, however one outbreak was identified where 6 adults and 7 children were infected.</p> <p>Secondary attack rate of staff to staff was 4.4%, staff to child 1.5%, child to staff 1.0% and child to child 0.3%.</p>	<p>Moderate</p>
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⁹ New South Wales Government. (2020, March 16). [COVID-19 \(Coronavirus\) – Guidance for early childhood education and care services.](#)

¹⁰ New South Wales Government. (2020, December 8). [Advice for families.](#)

<p>National Centre for Immunisation Research and Surveillance. (2020, July 31). COVID-19 in schools and early childhood education and care services – the Term 2 experience in NSW.</p>	<p>Jul 31, 2020</p>	<p>Cohort</p>	<p>Daycare, primary and secondary schools, New South Wales, Australia</p>	<p>All schools:</p> <ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • Screening <p>Primary and secondary schools (in addition):</p> <ul style="list-style-type: none"> • Parents / carers not allowed on site, except for select purposes • Physical distancing (staff) • Students must stay home if unwell, negative tests required to return to school after showing symptoms^{11,12} 	<p>Surveillance data from Apr 10 - Jul 3, 2020 while all daycares were open, and schools were undergoing gradual reopening. Schools were fully reopened with face-to-face learning by May 25.</p> <p>Daycare:</p> <ul style="list-style-type: none"> • 1 child with confirmed COVID-19 had contact with 84 students and 18 staff in school • 82% of contacts were tested; none tested positive <p>Primary school:</p> <ul style="list-style-type: none"> • 1 child with confirmed COVID-19 had contact with 15 students and 4 adults in school • 57% of contacts were tested; none tested positive <p>Secondary school:</p> <ul style="list-style-type: none"> • 2 adolescents with confirmed COVID-19 had contact with a total of 165 students and 23 adults in school • 55% of contacts were tested; none tested positive 	<p>Moderate</p> <p><i>NOT PEER REVIEWED</i></p>
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¹¹ New South Wales Government. (2020, March 16). [COVID-19 \(Coronavirus\) – Guidance for early childhood education and care services.](#)

¹² New South Wales Government. (2020, December 8). [Advice for families.](#)

<p>Public Health Agency of Sweden. (2020, July 7). COVID-19 in schoolchildren: A comparison between Finland and Sweden.</p>	<p>Jul 7, 2020</p>	<p>Prevalence</p>	<p>Preschool, primary school, secondary schools, Sweden Finland</p>	<p>In Finland, all schools were closed in Mar 2020.</p> <p>In Sweden only secondary and post-secondary schools were closed.</p>	<p>As of Jun 14, 2020: In Finland, 584 out of 7110 (8.2%) reported cases of COVID-19 were among children aged 1-19. Age-specific rates were:</p> <ul style="list-style-type: none"> • 1-5 years: 36 per 100 000 • 6-15 years: 42 per 100 000 • 16-19 years: 98 per 100 000 <p>Primary school closures and reopening in Finland did not impact weekly number of reported COVID-19 cases.</p> <p>In Sweden, 1,124 out of 52,424 (2.1%) reported cases of COVID-19 were among children aged 1-19 years. Age-specific rates were:</p> <ul style="list-style-type: none"> • 1-5 years: 16 per 100 000 • 6-15 years: 30 per 100 000 • 16-19 years: 150 per 100 000 <p>No increased risk of infection was found amongst Swedish school or daycare staff:</p> <ul style="list-style-type: none"> • Daycare, Relative Risk (RR) = 0.9 (95% CI=0.7,1.1) • Primary school, RR = 1.1 (95% CI=0.9,1.3) • Secondary school, RR = 0.7 (95% CI=0.5,1.0) 	<p>Low</p> <p><i>NOT PEER REVIEWED</i></p>
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<p>Stage, H.B., Shingleton, J., Ghosh, S., Scarabel, F., Pellis, L., & Finnie, T. (2020). Shut and re-open: the role of schools in the spread of COVID-19 in Europe. <i>Preprint.</i></p>	<p>Jun 26, 2020</p>	<p>Cohort</p>	<p>Germany Denmark Norway Sweden</p>	<p>Varied by country</p>	<p>Timing of school closures coincided with a reduction in the growth rate of COVID-19 cases and hospitalizations compared to data models with no intervention. However, implementation of concurrent community interventions (e.g., travel restrictions, social distancing, banned gatherings) mean is it difficult to determine which interventions were most effective.</p> <p>Reopening of schools among younger student groups and those participating in exams did not result in a significant increase in rates of COVID-19.</p> <p>In countries with low community transmission of COVID-19, return of all students did not appear to increase transmission.</p> <p>The return of older students in a country of high community transmission levels appeared to increase transmission among students but not staff.</p>	<p>Moderate <i>PREPRINT</i></p>
<p>Folkhälsomyndigheten. (2020, May 27). Förekomst av covid-19 i olika yrkesgrupper.</p>	<p>May 27, 2020</p>	<p>Prevalence</p>	<p>Preschool, primary school, secondary schools, Sweden</p>	<p>(Masks <i>not</i> required.)</p> <p>Preschool: if a child becomes unwell, they must stay home for 48 hours after recovery¹³</p>	<p>National public health data and census data were used to determine the relative risk of COVID-19 infection for various occupations. For occupations working with children, such as primary and secondary school teachers, preschool teachers and nannies, the relative risk of COVID-19 infection was no different than other occupations.</p> <p>Notably, Sweden has not implemented nationwide lockdown measures.</p>	<p>Moderate <i>NOT PEER REVIEWED</i></p>

¹³ Public Health Agency of Sweden. (2020, December 21). [COVID-19](#).

Table 2: Case Reports and Case Series Following School Reopening

Reference	Date Released	Location, Setting	IPAC Measures	Summary of Findings	Quality Rating:
New evidence reported on March 19, 2021					
Gold, J.A.W., Gettings, J.R., Kimball, A., Franklin, R., Rivera, G., Morris, E., ... Georgia K-12 School COVID-19 Investigation Team. (2021). Clusters of SARS-CoV-2 infection among elementary school educators and students in one school district- Georgia, December 2020-January 2021. Morbidity and Mortality Weekly Report, 70(8), 289-292.	Feb 26, 2021	Elementary schools, Georgia, United States	<ul style="list-style-type: none"> Masks (except while eating) Plastic dividers on desks (but students sat <3 ft apart) 	<p>From Dec 1, 2020 – Jan 22, 2021, 9 clusters (of 3+ linked COVID-19 cases) involving 13 staff and 32 students at 6 schools were identified. 2,600 students and 700 staff attended school during this time.</p> <p>18/69 (26%) household members of persons with school-associated cases tested positive.</p> <p>Median cluster size (including household members) was 6 (range 3-16).</p> <p>Index patients were:</p> <ul style="list-style-type: none"> Staff (4 clusters) Student (1 cluster) Unknown (5 clusters) <p>Probable transmission included:</p> <ul style="list-style-type: none"> Staff-to-student (8 clusters) Student-to-student (4 clusters) Student-to-staff (3 clusters) Staff-to-staff (2 clusters; which was followed by staff-to-student transmission and resulted in 15/31 school-associated cases) <p>9 clusters involved lack of physical distancing, 5 inadequate student mask use.</p>	Moderate

<p>Buonsenso, D. & Graglia, B. (2021). High rates of SARS-CoV-2 transmission in a high-school class. <i>Journal of Paediatrics and Child Health</i>, 57(2), 299-300.</p>	<p>Jan 15, 2021</p>	<p>Secondary school, Italy</p>	<ul style="list-style-type: none"> • Lunch at desk • Masks (in class) • Open windows (but no other ventilation system) <p>(Insufficient space to distance desks, class not divided into subgroups, and no hand sanitizer available.)</p>	<p>On Sep 24, 2020, a 16-year-old secondary school student tested positive for COVID-19; one week before, 2 (of 26) classmates presented with flu-like symptoms and tested positive.</p> <p>From Sep 17 – 28, 2020, 9 children (36.6%) tested positive.</p> <p>Limitations of this report include lack of epidemiological assessment of the broader school and household members.</p>	<p>Moderate</p>
<p>Previously reported evidence</p>					
<p>Pray, I.W., Gibbons-Burgener, S.N., Rosenberg, A.Z., Cole, D., Borenstein, S., Bateman, A., ... Westergaard, R.P. (2020). COVID-19 outbreak at an overnight summer school retreat — Wisconsin, July–August 2020. <i>Morbidity and Mortality Weekly Report</i> 69(43): 1600-1604.</p>	<p>Oct 30, 2020</p>	<p>Community/ Summer Camp Wisconsin, United States</p>	<ul style="list-style-type: none"> • Masks (while travelling) • Negative COVID-19 test (last 7 days or serology in last 3 months) • Quarantine for 7 days, prior to attending 	<p>127 students, 21 counsellors (aged 17-24 years) and 4 staff members from 21 states and 2 foreign countries attended camp from Jul 2 - Aug 11, 2020.</p> <p>The index case (grade 9 student) developed COVID-19 symptoms on Jul 3 and tested positive on Jul 5.</p> <p>Despite efforts to isolate close contacts, 116/152 (76%) of attendees had confirmed (n=78) or probable (n=38) COVID-19. This included:</p> <ul style="list-style-type: none"> • 100/127 students (79%) • 15/21 counsellors (71%) • 1 staff member (25%) <p>Excluding the 24 attendees who provided positive serologic results prior to camp, the attack rate = 91% (116/128).</p>	<p>High</p>

<p>Okarska-Napierala, M., Mańdziuk, J., & Kuchar, E. (2020). SARS-CoV-2 cluster in Nursery, Poland. <i>Emerging Infectious Disease</i>, 27(1), 317-319.</p>	<p>Oct 9, 2020</p>	<p>Child care, Poland</p>	<ul style="list-style-type: none"> • Cohorting • Masks (staff) 	<p>Following lockdown, a child care facility reopened on May 18, 2020. The facility was closed on May 31 following a staff worker's contact with a symptomatic COVID-19 case (family member). The staff member tested positive on Jun 4. Subsequent testing of 2 initial case patients and 104 contacts found positive cases for:</p> <ul style="list-style-type: none"> • 4 nursery workers (1 who was also a parent of a child at the facility) • 3 children of staff • 8 children attending the facility • 3 siblings of those children • 8 parents • 1 grandparent <p>Overall positivity rate was 27%.</p>	<p>Low</p>
<p>Lopez, A.S., Hill, M., Antezano, J., Vilven, D., Rutner, T., Bogdanow, L., ... Tran, C.H. (2020). Transmission dynamic of COVID-19 outbreaks associated with child care facilities – Salt Lake City, Utah, April-July 2020. <i>Morbidity and Mortality Weekly Report</i> 69(37): 1319–1323.</p>	<p>Sep 11, 2020</p>	<p>Child care facilities and day camps for school-aged children Utah, United States</p>	<p>Facilities A and B:</p> <ul style="list-style-type: none"> • Enhanced cleaning • Masks (staff) • Temperature checks <p>Facility C:</p> <ul style="list-style-type: none"> • Home temperature and symptom screening 	<p>From Apr 1 - Jul 10, 2020 Salt Lake County, Utah identified 17 child care facilities with at least two confirmed COVID-19 cases; this report describes 3.</p> <p>Amongst 101 staff and children, 22 confirmed cases identified (10 staff, 12 children). Amongst 83 close contacts, 9 confirmed (2 adult, 7 pediatric) and 7 probable (2 adult, 5 pediatric) cases were identified.</p> <p>Facility attack rates ranged from 17%-100%. Overall attack rates ranged from 7%-36%.</p> <p><u>Facility A:</u> 12 staff and children, 15 close contacts, 2 confirmed adult cases, no transmission to/from children; index case staff</p> <p><u>Facility B:</u> 5 staff and children in setting all tested positive, of 28 close contacts 2 confirmed and 3 probable cases; likely transmission from children to household; index case staff</p> <p><u>Facility C:</u> 84 staff and children, 15 confirmed cases; 40 close contacts had 5 confirmed and 2 probable cases; likely transmission from children; index case unknown</p>	<p>High</p>

<p>Link-Gelles, R., DellaGrotta, A.L., Molina, C., Clyne, A., Campagna, K., Lanzieri, T.M., ... Bandy, U. (2020). Limited secondary transmission of SARS-CoV-2 in child care programs -Rhode Island, June 1-July 31, 2020. <i>Morbidity and Mortality Weekly Report</i> 69(34): 1170-1172.</p>	<p>Aug 28, 2020</p>	<p>Child care Rhode Island, United States</p>	<ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • masks (staff all times; students in common areas) • Reduced class sizes • Screening¹⁴ 	<p>Child care programs re-opened on Jun 1, 2020; data presented on all possible child care-associated COVID-19 cases to Jul 31, 2020.</p> <p>52 positive/probable cases of 101 possible cases reported:</p> <ul style="list-style-type: none"> • 30 (58%) children (median age = 5 years) • 22 (42%) adults (20 teachers, 2 parents) <p>Cases occurred in 29 (4.4%) of 666 re-opened child care programs:</p> <ul style="list-style-type: none"> • 20 programs (69%) had a single case with no secondary transmission • 5 programs (15%) had 2-5 cases with no secondary transmission • 4 programs (0.6%) had possible secondary transmission <p>Among 4 programs with possible secondary transmission:</p> <ul style="list-style-type: none"> • Program #1: 5 children, 4 staff, 1 parent; 60 children and 21 staff quarantined • Program #2: 3 confirmed cases; 26 students and 17 staff quarantined • Program #3: 2 cases; appear un-linked but cannot confirm • Program #4: 1 staff, 1 child; 37 students and 16 staff quarantined <p>In programs where secondary transmission likely took place, epidemiologic investigations identified lack of adherence to Department of Health guidelines (e.g., movement between groups/classrooms).</p>	<p>Moderate</p>
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¹⁴ Singapore Government Agency: Early Childhood Development Agency. (2020, May 28). [Letter to parents: COVID-safe ABCs – Back to school with our new ABCs: Let's stay safe together.](#)

<p>Blaisdell, L.L., Cohn, W., Pavell, J.R., Rubin, D.S. & Vergales, J.E. (2020). Preventing and mitigating SARS-CoV-2 transmission – four overnight camps, Maine, June-August 2020. <i>Morbidity and Mortality Weekly Report</i> 69(35), 1216-1220.</p>	<p>Aug 26, 2020</p>	<p>Overnight camps Maine, United States</p>	<ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • Masks • Maximal outdoor programming • Physical distancing • Prearrival quarantine • Pre- and post-arrival testing and screening 	<p>642 children and 380 staff members (aged 7-70 years) attended 4 overnight camps from Jun - Aug 2020.</p> <p>12 attendees (11 children and 1 staff) were identified as having COVID-19 related signs or symptoms during daily screening checks. All tested negative.</p> <p>Three asymptomatic attendees tested positive for the virus that causes COVID-19 after camp arrival (1 child, 2 staff). They were immediately isolated, and respective cohorts quarantined. No secondary transmission was identified.</p>	<p>Moderate</p>
<p>Szablewski, C.M., Chang, K.T., Brown, M.M., Chu, V.T., Yousaf, A.R., Anyalechi, N., ... Stewart, R.J. (2020). SARS-CoV-2 transmission and infection among attendees of an overnight camp. <i>Morbidity and Mortality Weekly Report</i> 69(31): 1023-1025.</p>	<p>Jul 31, 2020</p>	<p>Overnight summer camp Georgia, United States</p>	<ul style="list-style-type: none"> • Masks (staff) • Negative test within 12 days of attending 	<p>158 staff and counsellors took part in training Jun 17-20, 2020. 363 campers and 3 staff joined on Jun 21.</p> <p>On Jun 22 a staff member developed symptoms, on Jun 23 left the camp and on Jun 24 tested positive. The camp was closed that day.</p> <p>Test results were available for 344 of 597 attendees.</p> <p>Attack rate was highest amongst staff (56%) compared to youth (49%), and those in larger cabins (53%).</p> <p>The authors note they cannot rule out multiple index cases due to high incidence of COVID-19 in Georgia.</p>	<p>Low</p>

<p>Stein-Zamir, C., Abramson, N., Shoob, H., Libal, E., Bitan, M., Cardash, T., ... Miskin, I. (2020). A large COVID-19 outbreak in a high school 10 days after schools' reopening, Israel, May 2020. <i>Eurosurveillance</i> 25(29): pii=2001352.</p>	<p>Jul 23, 2020</p>	<p>Regional public school with 1,190 students age 12-18 years and 162 staff. Israel</p>	<p>(No physical distancing or masks. Children took school buses together and participated in extra-curricular activities (e.g., sports and dance classes).)</p>	<p>Within 10 days of schools reopening an outbreak among secondary school students was observed linked back to 2 independent index cases. The prevalence of confirmed cases was 13.1% among students and 16.4% among teachers.</p> <p>Cases were highest in grade 7 and grade 9. There was no report of the grade of index cases, or prevalence among close contacts.</p> <p>Prior to school reopening regional prevalence rate among those age 10-19 years was 19.8%. Following opening of schools, the prevalence increased to 40.9%.</p>	<p>Low</p>
<p>Yung, C.H., Kam, K., Nadua, K.D., Chong, C.Y., Tan, N.W.H., Li, J., ... Ng, K.C. (2020). Novel coronavirus 2019 transmission risk in educational settings. <i>Clinical Infectious Diseases</i>, 72(6), 1055-1058.</p>	<p>Jun 25, 2020</p>	<p>Preschool, secondary school Singapore</p>	<p>Secondary schools:</p> <ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • masks • Physical distancing (e.g., fixed seating, staggered travel) • Students and staff must stay home if unwell or if household members are unwell or on "home quarantine order" • Visual screening and temperature checks (2x day) 	<p>1 child with COVID-19 attended a preschool for children aged 3–6 (number of contacts not reported):</p> <ul style="list-style-type: none"> • 34 contacts developed symptoms and were tested; none tested positive <p>1 adolescent with COVID-19 attended a secondary school for students aged 12–15 (total number of contacts not reported):</p> <p>8 contacts developed symptoms and were tested; none tested positive</p>	<p>High</p>

Table 3: In-progress Single Studies

Title	Anticipated Release Date	Setting	Description of Document
New evidence reported on March 19, 2021			
Zimmerman, K. (2021). Coronavirus-19 (COVID-19) and related outcomes in school aged children (ABC health outcomes in children) . <i>ClinicalTrials.gov</i> , NCT04757831.	Feb 15, 2026	Schools	This study will measure the incidence of non-severe and severe COVID-19 disease including risk factors and outcomes, among children (aged ≤ 21).
Previously reported evidence			
Duysburgh, E. & Vermeulen, M. (2020). Prevalence and incidence of antibodies against SARS-CoV-2 in children measured for one year in Belgium: A sero-epidemiological prospective cohort study . <i>ClinicalTrials.gov</i> , NCT04613817.	Aug 31, 2021	Schools	This study will determine the seroprevalence and seroconversion of antibodies against the virus that causes COVID-19 in primary and secondary school-aged children at different time points.
Universitätsklinikum Rostock. (2020). Prospective Study initiated by University Hospital Rostock concerning COVID-19 in mothers, nursery and school teachers of children in Rostock . <i>German Clinical Trials Register</i> , DRKS00022504.	N/A	Child care, schools	This study will measure prevalence of COVID-19 and associated antibodies in mothers, child care nurses and teachers, and school teachers over the period of 12 months.
Charité. (2020). Berlin's testing strategy – Charité starts screening program for staff from childcare centers and school-based study .	N/A	School	Through this study, primary and secondary school children and staff will undergo testing at regular intervals over 12 months.

Table 4: Syntheses

Reference	Date Released	Included Studies Relevant to Transmission by Children in Daycares and Schools	Review Conclusions	Quality Rating
New evidence reported on March 19, 2021				
Xu, W., Li, X., Dozier, M., He, Y., Kirolos, A., Lang, Z., ... Theodoratou, E. (2020). What is the evidence for transmission of COVID-19 by children in schools? A living systematic review. <i>Journal of Global Health, 10</i> (2): 021104.	Dec 19, 2020 (Search completed Sep 14, 2020)	Danis, 2020 Heavey, 2020 Yung, 2020 NCIRS, 2020 Macartney, 2020 Torres, 2020 Armann, 2020 Desmet, 2020 Fontanet, 2020a Fontanet, 2020b Stein-Zamir, 2020	<p>Five cohort studies found 18 secondary cases in 3345 contacts. The infection attack rates were:</p> <ul style="list-style-type: none"> • Students: 0.15% (95% CI=0.00,0.93) • Staff: 0.70% (95% CI=0.00,3.56) • Overall: 0.08% (95% CI=0.00,0.86) <p>Six cross-sectional studies reported 639 COVID-19 cases from 6682 participants tested. The positivity rates were:</p> <ul style="list-style-type: none"> • Students: 8.74% (95% CI=2.34,18.53) • Staff: 13.68% (95% CI=1.68,33.89) • Overall: 8.00% (95% CI=2.17,16.95) <p>Quality of evidence (based on 5 cohort studies and 6 cross-sectional studies) was low but suggests that students have lower infection attack rates and positivity rates, compared to staff.</p>	Moderate
Previously reported evidence				
Walsh, S., Chowdhury, A., Russell, S., Braithwaite, V., Ward, J., Waddington, ... Mytton, O. (2021). Do school closures reduce community transmission of COVID-19? A systematic review or observational studies. <i>Preprint.</i>	Jan 4, 2021 (Search completed Oct 12, 2020)	Stein-Zamir, 2020 Auger, 2020 Courtemanche, 2020 Yehya, 2020 Juni, 2020 Wong, 2020	<p>This review included 10 studies that explored the effect of school closures on community transmission of COVID-19. One study explored the impact of school reopening. Most studies had serious to critical risk of bias.</p> <p>The studies with the lowest risk of bias found no conclusive evidence that school closures alone resulted in reduced transmission. Studies with high to critical risk of bias found protective effect of up to 62% relative reduction in incidence and mortality rate.</p> <p>Variability in the findings may reflect the methodology used and the importance of contextual factors (not studied) across geographic regions.</p>	Moderate PREPRINT

			The inability to properly adjust for other interventions, mostly introduced at the same time as school closures, may result in overestimation of the effects of school closures. Other limitations include an inability to distinguish between school type (primary, secondary) and direct vs. indirect (e.g., parents staying home, too) effects of school closures.	
Krishnaratne, S., Pfadenhauer, L.M., Coenen, M., Geffert, K., Jung-Sievers, C., Klinger, C., ... Burns, J. (2020). Measures implemented in the school setting to contain the COVID-19 pandemic: a rapid scoping review . <i>Cochrane Database Systematic Reviews</i> , 12.	Dec 17, 2020 (Search completed Oct 8, 2020)	Buonsenso, 2020 Curtius, 2020 Ehrhardt, 2020 Isphording, 2020 Macartney, 2020 NCIRS, 2020 Otte Im Kampe, 2020 Simonsen, 2020 Sparks, 2020 Stein-Zamir, 2020 Yoon, 2020	This rapid scoping review identified studies that reports on implementation of measures in schools but did not report on the effectiveness of these. The majority of included studies (n=31) were inferential modelling studies. 11 observational/quasi-experimental studies were included that are included in this rapid review. Identified school-based measures included: <ul style="list-style-type: none"> • Organizational (n=36; e.g., to make contacts safer (mask use, hand hygiene, respiratory etiquette, physical distancing, modified activities) and reduce opportunity for contacts (staggered arrivals, breaks, rotating attendance, cohorts, stay-at-home policies) • Structural/environmental (n=11; e.g., school yard division, furniture removal and distancing, improved ventilation and cleaning protocols) • Surveillance/response (n=19; e.g., testing, tracing, screening, quarantining) 	Moderate
Suk, J.E., Vardavas, C., Nikitara, K., Phalkey, R., Leonardi-Bee, J., Pharris, A., ... Semenza, J.C. (2020). The role of children in the transmission chain of SARS-CoV-2: a systematic review and update of current evidence . <i>Preprint</i> .	Nov 9, 2020 (Search completed Aug 31, 2020)	Heavey, 2020 Danis, 2020 Yung, 2020 Macartney, 2020 Stein-Zamir, 2020 Link-Gelles, 2020 Koo, 2020 Zhang, 2020 Bayham, 2020 Kim, 2020 Chin, 2020 Abdollahi, 2020 Prem, 2020 Auger, 2020	There was limited to no evidence of secondary transmission among school contacts. One outbreak following school re-opening was attributed to crowded classes, no masks, and the use of air conditioning. Conversely, another study showing limited transmission after re-opening attributed success to class distancing, use of masks for adults, daily screening, and disinfection.	Moderate <i>PREPRINT</i>

Goldstein, E., Lipsitch, M., & Cevik, M. (2020). On the effect of age on the transmission of SARS-CoV-2 in households, schools and the community . <i>The Journal of Infectious Diseases</i> , 223(3), 362-369.	Oct 29, 2020 (Search completed Oct 5, 2020)	Ehrhardt, 2020 Fontantet, 2020a Fontantet, 2020b Macartney, 2020 Stein-Zamir, 2020 Torres, 2020 Otte im Kampe 2020 Salt Lake County, 2020.	Some evidence that no/limited mitigation strategies (e.g., crowded classrooms) are associated with spread of the virus that causes COVID-19 in secondary schools. However, introduction of mitigation strategies may prevent outbreaks.	Low
Health Information and Quality Authority. (2020, August 21). Evidence summary for potential for children to contribute to transmission of SARS-CoV-2 .	Aug 21, 2020 (Search completed Aug 10, 2020)	Desmet, 2020 Dub, 2020 Fontanet, 2020a Heavey, 2020 Macartney, 2020 Stein-Zamir, 2020	Based on low certainty evidence, transmission from child-to-adult or child-to child does occur in household and education settings, but transmission rates for children are low. Three studies with nine cases and 1036 close contacts confirmed secondary transmission. Three studies with 74 confirmed cases across 66 facilities to over 13,000 close contacts identified 198 confirmed cases.	Low NOT PEER REVIEWED
Alberta Health Services. (2020, August 7). COVID-19 scientific advisory group rapid evidence report .	Aug 7, 2020 (Search completed Jun 10, 2020)	Number of studies not reported, included scientific evidence and news media reports	Exposed children in schools and daycares appear to be less infected than exposed adults in other settings. There is no evidence to suggest that transmission to teachers and staff is higher than community-based transmission. Transmission appears to be lower for younger children and may be higher for older children and teens in school settings; transmission can be limited if public health precautions are in place.	Moderate NOT PEER REVIEWED
Public Health England. (2020, July 28). Transmission of COVID-19 in school settings and interventions to reduce the transmission: a rapid review .	Jul 28, 2020 (Search completed Jun 18, 2020)	Danis, 2020 Fontanet, 2020a NCIRS, 2020	Transmission of COVID-19 within school settings is low, however additional research is needed to understand the role of schools in transmission of COVID-19.	Moderate NOT PEER REVIEWED
Rajmil, L. (2020). Role of children in the transmission of the COVID-19 pandemic: a rapid scoping review . <i>BMJ Paediatrics Open</i> , 4(1), e000722.	Jun 30, 2020 (Search completed May 28, 2020)	Heavey, 2020 NCIRS, 2020 RIVM, 2020	Children do not transmit the virus that causes COVID-19 more than adults. Many reported cases of transmission in children were traced to transmission within families.	Low

Institut national de sante publicé Québec. (2020, May 21). Revue rapide de la littérature scientifique - COVID-19 chez les enfants: facteurs de risque d'infections sévères et potentiel de transmission.	May 21, 2020 (Search completed May 15, 2020)	Danis, 2020 Fontanet, 2020a NCIRS, 2020	Children are susceptible to COVID-19 infection, but upon exposure to the COVID-19, they are less likely to be infected than adults. Transmission of COVID-19 by children is limited.	Low NOT PEER REVIEWED
Ludvigsson, J.F. (2020). Children are unlikely to be the main drivers of the COVID-19 pandemic – A systematic review. <i>Acta Paediatrica</i> 109(8), 1525-1530.	May 19, 2020 (Search completed May 11, 2020)	Danis, 2020 NCIRS, 2020	Children are unlikely to be key drivers of transmission. Opening daycares and schools is unlikely to affect mortality in adults.	Low
Brurberg, K.G. (2020). The role of children in the transmission of SARS-CoV-2-19 – 1st update - a rapid review Oslo: Folkehelseinstituttet/ Norwegian Institute of Public Health.	Apr 30, 2020 (Search completed Apr 22, 2020)	Fontanet, 2020a NCIRS, 2020 Viner, 2020	Children can transmit the virus that causes COVID-19 but are unlikely to be the main drivers of transmission. It is too early to make firm conclusions about the role of children in transmission.	Low NOT PEER REVIEWED
Viner, R.M., Russell, S.J., Croker, H., Packer, J., Ward, J., Stansfield, C., ... Booy, R. (2020). School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. <i>The Lancet Child & Adolescent Health</i> , 4(5), 397–404.	Apr 6, 2020 (Search completed Mar 19, 2020)	None included in Table 1. This review included studies from pandemics prior to COVID-19.	It is not possible to specifically evaluate the impact of school closures on infection prevention and control, as they were part of a broad range of quarantine and social distancing measures.	Low

Table 5: In-progress Syntheses

Title	Anticipated Release Date	Setting	Description of Document
New evidence reported on March 19, 2021			
<p>Lange, B., Ott, J., & Karki, S. J. (2021). <i>Evidence synthesis gaps in understanding disease burden of children, transmission parameters in schools and households and effects of measures implemented in schools during the COVID-19 pandemic – a rapid systematic review of systematic reviews. PROSPERO, CRD42021231866.</i></p>	<p>Mar 31, 2021</p>	<p>Home, school</p>	<p>This rapid review of systematic reviews will summarize evidence syntheses on the disease burden of COVID-19 in children, their role, and the role of schools in transmission, and the effects of mitigation measures.</p>
Previously reported evidence			
<p>Minozzi, S., Amato, L., Mitrova, Z., & Davoli, M. (2020). <i>COVID-19 among children and adolescents and impact of school closure on outbreaks control: an overview of systematic reviews. PROSPERO, CRD42020186291.</i></p>	<p>Unknown; completed but not published</p>	<p>Home, school</p>	<p>This review will summarize available evidence for the prevalence of infection and disease as well as the risk of transmission by children and adolescents. The review also seeks to assess the effect of school closures on controlling the spread of COVID-19.</p>
<p>Bhamani, S., Tabani, A., Ahmed, D., & Saleem, A. (2020). <i>A rapid systematic review on COVID transmission trends in children on schools reopening in lower middle income countries. PROSPERO, CRD42020204925.</i></p>	<p>July 31, 2021</p>	<p>Schools</p>	<p>This review will summarize virus transmission among children and outbreaks occurring after schools re-open in lower middle-income countries.</p>
<p>Chatterji, M., Kitamura, K., Muenig, P., Willson, G.E., De Leon Jr., R., & Allegrante, J.P. (2020). <i>The relative effectiveness of multilevel interventions in reducing risks of transmission of lethal viruses in Grade K-12 school communities and school linked populations: a systematic review and best-evidence synthesis. PROSPERO, CRD42020201930.</i></p>	<p>Aug 29, 2020</p>	<p>School and school-linked populations</p>	<p>This review will report on the relative efficacy of multilevel intervention in reducing risks of COVID-19 and other lethal viruses among kindergarten to grade 12 school communities and in school linked populations.</p>

Table 6: Canadian Surveillance Data

Reference	Date Released	Study Design	Setting, Location	IPAC measures	Summary of Findings	Quality Rating:
New evidence reported on March 19, 2021						
Government of Québec. (2021, March 5). Daily numbers for the province – public and private school systems highlights.	Mar 5, 2021	Prevalence	Public and private school system, Québec	<ul style="list-style-type: none"> • Alternating in-person/remote attendance (secondary schools in red and orange zones) • Cohorting • Enhanced cleaning • Masks (staff, students grades 5+; in red and orange zones, all students, except preschoolers) • Physical distancing¹⁵ 	<p>Data collected from 2740 public schools and 254 private schools including over 1,300,000 students and 226,000 staff.</p> <p>Confirmed currently active positive cases in the school system on Mar 5, 2021:</p> <ul style="list-style-type: none"> • public: 1233 students, 364 staff • private: 422 students, 69 staff • total: 1655 students (~0.13% of all students), 433 staff (~0.19% of all staff) <p>Confirmed cumulative positive cases in the school system from start of school year to Dec 22, 2020:</p> <ul style="list-style-type: none"> • public: 14,929 students, 3558 staff • private: 2443 students; 480 staff • total: 17,372 students (~1.3% of all students), 4038 staff (~1.8% of all staff) <p>Number of schools that have had a positive case, as of Mar 5, 2021:</p> <ul style="list-style-type: none"> • 1894 (63.3%) <p>No schools are currently closed due to COVID-19 because of annual school break (Mar 1-5).</p>	Low NOT PEER REVIEWED

¹⁵ Government of Québec. (2021, January 11). [Organization of educational activities in 2020-2021 \(COVID-19\).](#)

<p>Government of Ontario. (2021, March 4). COVID-19 cases in schools and child care centres.</p>	<p>Mar 4, 2021</p>	<p>Prevalence</p>	<p>Primary, secondary schools, and child care, Ontario, Canada</p>	<p>All schools:</p> <ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Masks, eye protection (staff) • No non-essential visitors • Record keeping • Screening <p>Primary and secondary schools (in addition):</p> <ul style="list-style-type: none"> • Hand hygiene • Masks (students grades 1-12, in school (hallways, class), on school transportation, outdoors (when physical distancing not possible)) • Physical distancing • Scheduled remote learning days (grades 9-12) • Staggered bell times (suggested) • Targeted testing (voluntary, participating schools)¹⁶ <p>Child care centres (in addition): drop-off, pick-up protocols¹⁷</p>	<p>From Sep 5, 2020 - Mar 4, 2021, a total of 9049 school-related cases were reported in publicly funded schools in Ontario:</p> <ul style="list-style-type: none"> • 6455 student cases • 1456 staff cases • 1138 'other' cases (not identified) <p>As of Mar 4, 2021, 683 (14.15%) schools were currently reporting a case; 26 (0.54%) schools were closed. (All schools have returned to in-person learning.)</p> <p>From Jun 12, 2020-Mar 4, 2021, a total of 2763 cases occurred in those connected to child care settings in Ontario:</p> <ul style="list-style-type: none"> • 1431 child cases • 1332 staff/provider cases <p>As of Mar 4, 2021, 153 (2.9%) centres were currently reporting a case; 36 (0.68%) centres were closed.</p> <p>Reported school and centre closures are due to outbreaks or operational considerations; regional closures in local public health unit areas are not considered.</p> <p>Transmission source unknown for cases, therefore unable to report the proportion of cases due to in-school transmission</p>	<p>Moderate</p> <p><i>NOT PEER REVIEWED</i></p>
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¹⁶ Government of Ontario. (2020, November 27). [Guide to reopening Ontario's schools.](#)

¹⁷ Government of Ontario. (2020, January 12). [COVID-19: Reopening child care centres.](#)

<p>Government of Alberta. (2021, January 18). COVID-19 school status map.</p>	<p>Jan 18, 2021</p>	<p>Prevalence</p>	<p>Primary and secondary schools, Alberta</p>	<ul style="list-style-type: none"> • Cohorting • Enhanced cleaning • Hand hygiene • Masks (staff, students grade 4+, when physical distancing not possible) • Physical distancing (staff, students) • Screening • Strict symptomatic stay-at-home policy¹⁸ 	<p>School (251 total) status classification (no date reported):</p> <ul style="list-style-type: none"> • 23 outbreak (10+ cases) • 44 outbreak (5-9 cases) • 107 alert (2-4 cases) • 77 open (i.e., no status to report) 	<p>Moderate</p> <p><i>NOT PEER REVIEWED</i></p>
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¹⁸ Government of Alberta. (2021, January 19). [COVID-19 information : guidance for school re-entry - scenario 1.](#)

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