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# Living Rapid Review Update 15: 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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# 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 April 1, 2021. This updated version includes evidence available up to April 12, 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 growing body of literature, we have further refined our eligibility criteria to focus on the most relevant evidence for decision making. In this update, studies meeting the following criteria have now been excluded:
    - Data collected prior to July 2020 (during or following first wave lockdown) when understanding of the disease, access to testing and availability of personal protective equipment was limited
    - Studies that only report the absolute number of cases or overall prevalence within a school/district without calculation of secondary attack rates (SAR) or discussion of transmission within the schools
    - Studies which describe the risk of COVID-19 or COVID-19 mortality between teachers, students or parents of children attending school vs. those not attending school, with no description of exposure within the school
- Tables have been reorganized to group similar single studies together. These have been categorized as: studies exploring within-school transmission; case reports or case series following school reopening; studies exploring association between mitigation measures and COVID-19; studies exploring the impact of school reopening on community transmission; and studies exploring COVID-19 transmission within summer camps.
- In this update, six new studies from the USA (n = 5) and Ireland were identified that explored COVID-19 transmission within schools; findings from these studies are consistent with previously included studies. SARs ranged from 0 to 11.2%.
- Two new case reports, both from private schools in the USA were identified, including one boarding school. Extensive mitigation measures including asymptomatic testing, resulted in no identified within-school transmission.
- Seven new studies from Germany (n = 2), Italy, Finland, Brazil, Canada and the USA explored the effect of school reopening on community rates. Similar to findings from previously included studies, there is little evidence to suggest that schools drive increases in community incidence when proper IPAC measures are in place.

## 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.
- Implementation of infection control measures is critically important to reducing transmission, especially when community transmission rates are high. 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 the combination of measures implemented. There is emerging evidence that wearing masks, maintaining at least 3ft of distance (especially amongst staff), restricting entry to the school to others, cancelling extracurriculars, outdoor instruction, and daily symptom screening reduce the number of cases within schools; inconsistent findings have been found for associations between ventilation and in-person student density. In several instances, hybrid or part-time in-person learning was associated with higher incidence than full-time in-person. The certainty of the evidence is low (GRADE) and findings may change as new data become available.
- While the number of cases amongst students and teachers mirror trends in the community, there is little high-quality evidence to suggest that re-opening schools contributes meaningfully to community transmission, particularly when community rates are low-moderate and effective IPAC measures are in place. The role of schools on the surrounding community in areas of high community transmission is less clear and not well studied. The certainty of the evidence is low (GRADE) and findings may change as new data become available.
- Data from overnight camps (summer 2020), 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. The certainty of the evidence is low (GRADE) and findings may change as new data become available.
- To date there are limited data on the impact of variants of concern (VOC) related to prevalence, SAR, and associations with IPAC measure implementation in school and daycare settings. It is possible that findings may change as more information becomes available about the impact of VOC on transmission in school and daycare settings.
- The studies included in this review do not provide evidence for the experiences of populations who live with social and structural inequities, such as Indigenous or racialized communities. Further research is required to ensure representation of these populations for decision making.

## 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.

- Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Not all included studies separate out cases between staff and students in this way.
- 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, particularly when strong infection prevention and control measures are in place.
- Studies that explore the impact of school re-opening or closing on rates of community-transmission are generally limited by reliance on simple correlations, and lack of adequate control for potential confounding factors, such as coinciding timing of implementation or relaxing of other public health measures such as limits on gatherings, opening/closing of stores and restaurants, and community mask mandates.
- 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.
- 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 April 12, 2021. This search builds upon the previous search conducted in the thirteenth version of this rapid review.

- Pubmed's curated COVID-19 literature hub: LitCovid
- TripDatabase
- 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 International prospective 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
- Alberta COVID-19 school status map
- Québec Situation in schools
- 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 daycares 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 (April 2021) to refine the focus of this review given the substantial body of evidence. Studies were excluded if:

- Data was collected prior to July 2020 (during or following first wave lockdown) when understanding of the disease, access to testing and availability of personal protective equipment was limited
- Only absolute number of cases or overall prevalence were reported within a school/district without calculation of secondary attack rates (SAR) or discussion of likelihood of transmission within the schools
- Studies which described the risk of COVID-19 or COVID-19 morality between teachers, students or parents of children attending school vs. those not attending school, or with no description of exposure within the school

| | 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 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, 15 new single studies, two new in-progress single studies, one new in-progress synthesis, and seven updates to single studies were identified. Updated eligibility criteria resulted in 39 previously included studies that were removed, for a total of 81 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<br>In-progress syntheses<br>Single studies<br>In-progress single studies | 6<br>6<br>63<br>6 | Low-Moderate |
| What infection prevention and control policies or procedures have been implemented in daycares and schools? | Policy documents | 7 | 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.

# Table 1: Single Studies, Within School Transmission

| Reference | Date Released | Study Design | Setting, Location | IPAC measures | Summary of Findings | Quality Rating: |
|---|---|---|---|---|---|---|
| **New evidence reported on May 6, 2021** | | | | | | |
| White, P., O'Sullivan, M.B., Murphy, N., Stapleton, J., Dillon, A., Brennan, A., … Sheahan, A. (2021). An investigation into the rates of transmission of SARS-CoV-2 during the first 6 weeks of the 2020–2021 academic year in primary and post-primary schools in Cork and Kerry, Ireland. *Irish Journal of Medical Science.* Epub ahead of print. | Apr 1, 2021 | Cohort | Primary, post-primary and special educational need schools, Cork and Kerry, Ireland | • Enhanced cleaning<br>• Hand hygiene<br>• Masks (staff, students aged >13)<br>• Physical distancing (1 m between students in classrooms)<br><br>*Dept of PH rapidly identifies school cases and close contacts; advises isolation, as necessary. | From Aug 27 – Oct 11, 2020:<br>• 62 school index cases identified:<br>  ○ 27 (43.5%) aged 4-12<br>  ○ 23 (37.1%) aged 13-18<br>  ○ 12 (19.4%) aged ≥19<br>• 20/485 close contacts tested positive, Secondary Attack Rate (SAR): 4.1%<br>  ○ 11 (3.1%) among student close contacts<br>  ○ 9 (6.9%) among staff close contacts<br>  ○ These 20 led to 16 additional positive cases outside of school | High |
| Dawson, P., Worrell, M.C., Malone, S., Tinker, S.C., Fritz, S., Maricque, B. … CDC COVID-19 Surge Laboratory Group. (2021). Pilot investigation of SARS-CoV-2 secondary transmission in kindergarten through grade 12 | Mar 26, 2021 | Quasi-experimental | K-12 schools, Springfield and St. Louis County, Missouri, USA | Both counties:<br>• Contact tracing<br>• Enhanced ventilation<br>• Hand hygiene<br>• Masks<br>• Physical distancing (desk spacing, physical barriers)<br>• Quarantine / isolation* | From Dec 7-18, 2020, transmission in two counties with different quarantine policies for close contacts were compared.<br><br>37 participants (65% students, 35% staff) with COVID-19 and 156 school-based close contacts (88% students, 12% staff) from 22 schools were interviewed.<br>• 42 student contacts continued in-person learning under modified quarantine: 30 interviewed, 21 tested, none were positive.<br>• 52 contacts did not meet criteria for modified quarantine due to unmasked | Moderate |

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| schools implementing mitigation strategies — St. Louis County and City of Springfield, Missouri, December 2020. *Morbidity and Mortality Weekly Report, 70*(12), 449-455. | | | | Springfield:<br>• Modified quarantine policy (e.g., close contacts who were masked during exposure could continue in-person learning) | exposure (60%), athletic activity contact (21%), or lunch/recess contact (13%). 2 tested positive.<br>• SAR: 2/102, 2%<br><br>In schools which implemented mitigation measures, COVID-19 incidence was lower than respective community rates (8/100,000 vs. 711/100,000 in St. Louis and 996/100,000 in Springfield). | |
| Cooper, D.M., Messaoudi, I., Aizik, S., Camplain, R.L., Lopez, N.V., Ardo, J. … & Boden-Albala, B. (2021). SARS-CoV-2 acquisition and immune pathogenesis among school-aged learners in four K-12 schools. *Preprint.* | Mar 26, 2021 | Cohort | 4 schools (2 K-6 and 1 K-8 public, 1 K-12 private), Orange County, USA | • Masks<br>• Physical distancing (≥ 6 ft)<br>• Predominately remote learning (3 public schools) | Two cycles of asymptomatic testing were conducted in early fall 2020 when community spread was low (3-4 cases/100,000) and mid-fall during a community surge (40 cases/100,000).<br><br>No positive cases were identified in the first cycle; 17/320 students (5.31%) and 6/99 staff (6.1%) tested positive in the second.<br><br>School A (public, 97% remote) had highest infection rate (9/70, 12.9%, p<0.01), the highest ratio of learner-to-local positivity, and highest number of students reporting COVID-19 symptoms (30%, p=0.04); school D (private, 80% in-person) had lowest infection rate (1/86, 1.2%).<br><br>No significant difference in positivity rate between remote vs. in-person learning. | High<br><br>***PREPRINT*** |
| Doyle, T., Kendrick, K., Troelstrup, T., Gumke, M., Edwards, J., Chapman, S., Propper, R., … Blackmore, C. (2021). COVID-19 | Mar 26, 2021 | Cohort | Primary and secondary schools, Florida, USA | • Masks (some districts)<br>• Remote learning options | From Aug 10 – Dec 21, 2020, 63,654 cases were reported in school-aged children in Florida (aged 5-17). In that period there were 2,809,553 registered students (2.3%). 45% attended in-person learning.<br><br>34,959 cases were school-related cases (index case had attended school):<br>• 72% students, 28% staff | Moderate |

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| in primary and secondary school settings during the first semester of school reopening – Florida, August – December 2020. *Morbidity and Mortality Weekly Report, 70*(12), 437-441. | | | | | • 0.9% of registered students contracted COVID-19 (25,094/2,809,553 students<<br>• 9,630 cases were identified amongst staff, no denominator given<br><br>86,832 close school setting contacts were identified; 37,548 (43%) were tested, 10,092 (27%) were positive; SAR: 11.6%<br><br>695 / 6800 (10.2%) of schools reported outbreaks, average of 6.3 cases/outbreak.<br>• 562 outbreaks had additional data:<br>  ○ 110 (20%) associated with activities outside of the classroom:<br>  ▪ Sports: (91)<br>  ▪ Social gatherings (12)<br>  ▪ Transportation to school (4)<br>  ○ Sports-related were larger than non-sports-related outbreaks (mean 6.0 vs. 4.1 cases, p<0.01)<br><br>Median incidence was 1280 per 100,000 students (range 394 – 3200 by county):<br>• Student incidence correlated with county incidences (p<0.001).<br>• Higher rates among students in:<br>  ○ Smaller districts (p<0.0001)<br>  ○ Districts without mandatory mask policies (p<0.01)<br>  ○ Districts with more full-time in-person students (p<0.0001) | |
| Gandini, S., Rainisio, M., Iannuzzo, M.L., Bellerba, F., Cecconi, F., & Scorrano, L. (2021). A cross-sectional and prospective cohort study of the role of schools in the | Mar 26, 2021 | Prevalence | Kindergarten, elementary, middle and high schools, Italy | • Ban on sports and music<br>• Frequent ventilation<br>• Hand hygiene<br>• Masks (staff, high school students)<br>• Negative test following exposure (some schools)<br>• Physical distancing (1m between seats) | From Sept 30, 2020 – Feb 28, 2021 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. | High |

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| SARS-CoV-2 second wave in Italy, *The Lancet Regional Health – Europe, 5,* 100092. | | | | • Reduced school hours<br>• Temperature check<br>Unidirectional flow of students | Active contact tracing occurred following case identification from Nov 23 – Dec 5, 2020; 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.<br><br>Teacher to teacher transmission (37%) was more common than student to teacher (10%) (p=0.007).<br><br>Incidence by school level (Nov 23-28):<br>• Kindergarten: 0.21% of children and 2.35% of teachers<br>• Elementary: 0.35% of children and 1.83% of teachers<br>• Middle: 0.45% of students and 1.60% of teachers<br><br>Increase in $R_O$ was not associated with staggered school reopening date but were linked to a national election. School closures in two regions did not lower $R_O$. | |
| Hershow, R.B., Wu, K., Lewis, N.M., Milne, A.T., Currie, D., Smith, A.R., … Chu, V.T. (2021). Low SARS-CoV-2 transmission in elementary schools — Salt Lake County, Utah, December 3, 2020–January 31, 2021. *Morbidity and Mortality Weekly Report, 70*(12), 442-448. | Mar 26, 2021 | Cross-sectional | K-6 schools, Salt Lake County, Utah, USA | • 6ft distance<br>• High mask use (86%)<br>• 81% in-person learning<br>• Plexiglass barriers for teachers<br>• Staggered mealtimes | From Dec 3-Jan 21, 2021, susceptible school contacts of 51 index cases (40 students, 11 staff) were contacted:<br>• Of 1041 close contacts, 735 (70.6%) were tested, 12 were positive (SAR: 1.6%)<br>• 5 of 12 positive cases were classified as school-associated<br>• Four of five events were deemed to be due to lapses in IPAC measures (<6ft distance during class (2) or lunch (2), and poor mask compliance (2).<br>• Tertiary transmission was detected in 3 households | Moderate |

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| Liu, D., Lin, G., Sun, X., Du, Y., Liu, H., & Qu, M. (2021). Different school reopening plans on coronavirus disease 2019 case growth rates in the school setting in the United States. *Journal of School Health, 91,* 370-375. | Mar 25, 2021 | Cohort | Public K-12 schools, USA | • Remote and hybrid learning options | From Aug 10 – Oct 14, 2020, data from 617 school districts in 48 states was crowdsourced:<br>• 13% remote<br>• 47% hybrid<br>• 40% in-person<br><br>1977 confirmed cases occurred:<br>• 277 remote; mean 3.4±6.7/district<br>• 748 hybrid; mean 2.6±.5.5/district<br>• 952 in-person; mean 3.8±10.7/district<br><br>Daily growth rates were calculated, adjusting for region, poverty level, state-level risk and metropolitan status:<br>• Remote, 1.1%; OR (vs. hybrid) =0.96, 95%CI=0.96,0.97)<br>• Hybrid, 4.9%<br>• In-person, 3.5%; OR (vs. hybrid) =0.99, 95%CI=0.98,0.99).<br>Hybrid learning resulted in the highest growth rate over time. | Moderate |
| Ladhani, S.N., Baawuah, F., Beckmann, J., Okike, I.O., Ahmad, S., Garstang, J. … Ramsay, M.E. (2021). SARS-CoV-2 infection and transmission in primary schools in England in June-December, 2020 (sKIDs): an active, prospective surveillance study. *Lancet Child & Adolescent Health.* Epub ahead of print. | Mar 16, 2021 | Cohort | Primary schools, England | • Physical distancing<br>• Reduced class sizes<br>• Cohorting (staff, students)<br><br>*Schools partially reopened Jun 1, after first national lockdown; summer half term from Jun to mid-Jul. Schools fully reopened Sep; fall term from Sep to mid-Dec. | In Jun – Jul, 2020 (i.e. summer half-term), 11,966 participants (6727 students, 4628 staff, 611 unknown) from 131 schools were tested weekly.<br><br>Estimated infection rates per week:<br>• 4.1/100,000 students (95%CI=0.1,22.8)<br>• 12.5/100,000 staff (95%CI=1.5,45.0)<br>• All household contacts tested negative<br><br>From Jun – Nov 2020, seroprevalence testing occurred three times: following partial reopening, at end of summer term, and following full reopening.<br><br>Round 1 (Jun 2020) seropositivity:<br>• Students: 11.2% (95% CI=7.9,15.1; 91/816)<br>• Staff: 15.1% (95% CI=11.9,18.9; 209/1381) | High |

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| | | | | | • Rates did not differ from community<br><br>Round 2 (Jul 2020):<br>• 73.7% participation<br>• None tested positive for COVID-19<br>• Seropositivity was 10.4% (95% CI=6.8,15.0); 56/540 students and 13.1% (95% CI=9.9,17.0); 117/890 staff<br><br>Round 3 (Nov 2020):<br>• 61.9% participation<br>• 1 staff tested positive (0.1%, 95% CI=0.0,0.6)<br>• Seropositivity was 8.6% (95% CI=5.8, 12.2) 33/384 students and 11.2% (95% CI=9.2,14.3); 103/90 staff<br><br>Seroconversion was associated with region, ethnicity; no differences were reported by sex, staff/students. | |
| **Previously reported evidence** | | | | | | |
| Willeit, P. Krause, R., Lamprecht, B., Berghold, A., Hanson, B., Stelzl, E., ... & Wagner, M. (2021). Prevalence of RT-qPCR-detected SARS-CoV-2 infection at schools: First results from the Austrian School-SARS-CoV-2 prospective cohort study. *The Lancet Regional Health – Europe, 5,* 100086. | Mar 23, 2021 | Cohort | Primary schools, Austria | Varied by region | From Sept 28 – Nov 16, 2020, a random sample of students (n=9465) and teachers (n=1269) in 245 schools took part in repeat RT-PCR testing every 3-5 weeks.<br><br>First testing Sep 28 – Oct 22, 2020, 7-day community incidence was 75 per 100,000. School prevalence was 0.39%.<br>• 209 (86%) schools had 0 cases<br>• 28 (11.5%) schools had 1 case<br>• 6 (2.5%) schools had 2 cases<br><br>Second testing Nov 10 – Nov 16, 2020, 7-day community incidence was 419 per 100,000. School prevalence 1.39%. Fewer schools were tested due to new school closure<br>• 52 (59.1%) schools had 0 cases<br>• 23 (26.1%) schools had 1 case<br>• 10 (11.4%) schools had 2 cases<br>• 4 (3.4%) schools had 3 cases. | High |

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| | | | | | In adjusted models, odds of a single case were associated with:<br>• Regional incidence: 2-fold higher incidence, OR: 1.64, 95% CI=1.38,1.96<br>• Social deprivation: high/very high vs. low/moderate, OR: 2.14, 95% CI=1.30,3.53<br>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 (unadjusted model). | |
| Ulyte, A., Radtke, T., Abela, I.A., Haile, S.R., Berger, C., Huber, M., ... Kriemler, S. (2021). Clustering and longitudinal change in SARS-CoV-2 seroprevalence in schoolchildren: prospective cohort study of 55 schools in Switzerland. *BMJ, 372,* n616. | Mar 17, 2021 | Cohort | Primary and secondary schools, Switzerland | • Hand hygiene<br>• Masks (students aged 12+)<br>• Physical distancing<br>• Regular surface cleaning[1] | 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%.<br><br>Overall seroprevalence was 2.4% (95% CI=1.4,3.6%) in summer and 4.5% (95% CI=3.2,6.0%) in late autumn. The proportion ever seropositive was 7.8% (95% CI=6.2,9.5%).<br><br>There were no differences by age or sex but did differ by district.<br><br>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).<br><br>7 classes (2.5%) in 5 schools had 3+ cases. Further investigation found probable teacher to student transmission in 1 cluster, and potential school transmission in 3 clusters. Household transmission was probable in the remaining 3 clusters. | Moderate |

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

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| 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. *Frontiers in Pediatrics, 9*, 645577. | Mar 16, 2021 | Prevalence | Primary and secondary schools, Switzerland | • Hand hygiene<br>• Masks (students aged 12+)<br>• Physical distancing<br>• Regular surface cleaning[2] | 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.<br><br>National incidence rates were ~4000-5000 per 100,000 per day.<br><br>Among the 641 children, 1 case was identified (0.2%) via RT-PCR. Among 66 teachers no cases were identified.<br><br>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. | High |
| Cordery, R., Reeves, L., Zhou, J., Rowan, A., Watber, P., Rosadas, C., … & Sriskandan, S. (2021). Transmission of SARS-CoV-2 by children attending school. Interim report on an observational, longitudinal sampling study of infected children, contacts, and the environment. *Preprint.* | Mar 9, 2021 | Cohort | Schools, United Kingdom | • 14-day whole class isolation (with single case detected)<br>• Enhanced cleaning<br>• Hand hygiene<br>• Masks (students, secondary schools)<br>• Physical distancing | From Oct – Dec 2020, longitudinal sampling was conducted for close contacts of 5 school-attending children with COVID-19 (aged 2–18).<br><br>No transmission to class or school contacts was identified and limited transmission in households (5/23 contacts (21.7%) positive; 1 child and 3 adults).<br><br>In one secondary school, 3 likely unrelated asymptomatic cases were identified. One student was infected with variant of concern B1.1.7; 7 other class members tested negative.<br><br>This is an interim report of a larger study; time frame, school participation rate, and sample size are limited. | Moderate<br><br>***PREPRINT*** |

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

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| National Centre for Immunisation Research and Surveillance. (2021, March 9). *COVID-19 in schools and early childhood education and care services – the Term 4 experience in NSW*. | Mar 9, 2021 | Cohort | Schools, daycares services, Australia | All schools:<br>• Cohorting<br>• Enhanced cleaning<br>• Hand hygiene<br>• Screening<br><br>Primary and secondary schools (in addition):<br>• Parents / carers not allowed on site, except for select purposes<br>• Physical distancing (staff)<br>Students must stay home if unwell, negative tests are required to return to school after showing symptoms[3] | From Sep 26 – Dec 18, 2020, 9 student and 1 staff index cases were identified from 3 secondary schools, 3 primary schools, and 4 daycares; infections were acquired via household and community non-household contacts).<br><br>Of 1113 close contacts (953 students, 160 staff), 1098 were tested; 13 secondary cases (12 students, 1 staff) occurred in 4 settings (2 primary schools, 2 daycares) for an overall SAR of 1.2%, with no transmission in secondary schools, 2.3% in primary schools, and 0.8% in daycares. | Moderate<br><br>***NOT PEER REVIEWED*** |
| Heudorf, U., Steul, K., Walczok, A., Gottschalk, R. (2021). Children and COVID-19-Data from mandatory reporting and results of contact person testing in daycare centers and schools in Frankfurt am Main, Germany, August-December 2020. *Monatsschr Kinderheilkd.* Epub ahead of print. | Mar 2, 2021 | Prevalence | Schools, daycares, Germany | Not reported | From Mar – Dec 31, 2020, 22,715 cases were reported (1717 in children ≤14).<br><br>274 index cases were identified in 143 daycares and 75 schools:<br>• Daycares:<br>○ 34% (56/164) of index cases were children<br>○ SAR from children:1.5% (22/1437)<br>○ SAR from adults: 11.2% (104/928)<br>○ 4.5% of adult (48/1062) and 2.5% of child (78/3065) contacts tested positive<br>• Schools:<br>○ 73.6% (81/110) of index cases were children<br>○ SAR from children: 2% (61/3006)<br>○ SAR from adults: 2.9% (16/549) | Moderate |

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

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| | | | | | ○ 0.9% of adult (8/897) and 2.5% of child (71/2891) contacts tested positive<br><br>Age-related incidence and SAR increased with increasing incidence in the general population. | |
| 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. *Preprint.* | Feb 20, 2021 | Cohort | Schools and daycares, Rhineland-Palatinate, Germany | Secondary schools:<br>• Enhanced cleaning<br>• Enhanced ventilation<br>• masks (in school buildings including classrooms after Nov 22)<br>• Personal hygiene<br>• Physical distancing (>1.5m)<br><br>Primary schools and daycares implemented the same measures as secondary schools, except for physical distancing and wearing face masks. | From Aug – Dec 2020, 591 student, 157 teacher and 36 other school cases were followed via local public health.<br><br>Among 14,591 close contacts, 441 index cases were identified; SAR was 1.34% (95% CI=1.16,1.54%).<br><br>Risk of transmission was more likely:<br>• When index case was a teacher vs. student (RR: 2.38, 95% CI=1.73,3.26)<br>• In daycare vs. secondary schools (RR: 2.75, 95% CI=1.88,4.10)<br>• In older age groups (range of RRs reported)<br>SARs varied by characteristic of index case:<br>• Higher when teacher vs. student (Incidence Rate Ratio (IRR): 3.17, 95% CI=1.79,5.59)<br>• Lower from asymptomatic vs. symptomatic cases (IRR: 0.47, 95% CI=0.25,0.89)<br>• Higher in daycare vs. secondary schools (IRR: 3.23, 95% CI=1.76, 5.91)<br>• Higher index cases >35 (range of IRRs reported)<br><br>Study limitations include:<br>• Incomplete case identification and contact tracing<br>• Transmission was attributed to educational settings and did not acknowledge possible transmission outside these settings | High<br><br>***PREPRINT*** |

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| 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. *Preprint.* | Feb 5, 2021 | Cross-sectional | Primary and secondary schools, England | • Enhanced cleaning<br>• Enhanced ventilation<br>• Hand hygiene<br>• 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)<br>• Physical distancing | From Aug 31 – Oct 18, 2020, 969 outbreaks were reported: 450 in primary schools (3% of all) and 519 in secondary schools (15% of all).<br><br>Among 190 schools reporting an outbreak with completed survey data, 2425 cases were reported.<br><br>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%).<br><br>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%).<br><br>Teaching staff were more likely to be the index case in primary (48%) versus secondary (32%) schools (p=0.027).<br><br>Larger outbreaks were found among secondary schools:<br>• Primary schools: 2-35 cases<br>• Combined schools: 2-26 cases<br>• Secondary schools: 2-100 cases | Moderate<br><br>***PREPRINT*** |
| Smith-Norowitz, T.A., Hammerschlag, M.R., & Kohlhoff, S. (2021). Coronavirus disease 2019 (COVID-19) infection rates in a private school in Brooklyn, New | Feb 1, 2021 | Cohort | All girl's private school, New York City (NYC), USA | • Hand hygiene<br>• Masks<br>• Physical distancing<br>• Plastic barriers erected around students' and teachers' desks | From Oct – Dec 2020, 2439 COVID-19 tests were performed in a reopened all girl's private school (aged 6–18).<br><br>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).<br><br>No asymptomatic infections were detected. | Moderate |

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| York. *Acta Paediatrica, 110*(5), 1569-1570. | | | | | | |
| 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. *Morbidity and Mortality Weekly Report, 70*, 136-140. | Jan 29, 2021 | Prevalence | K-12 schools, rural Wisconsin, USA | • Cohorting (11-20 students per group)<br>• Masks (students, provided by a Foundation grant)<br>• Physical distancing (indoor classes, lunch periods)<br>• Quarantine policies (after exposures) | 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.<br>• 7 students (3.7% of cases) were linked to in-school spread:<br>  ○ 5 elementary, 2 secondary<br>  ○ 3 in one class, 4 at separate schools<br>• No in-school transmission reported between classroom cohorts<br>• No known staff-to-staff or student-to-staff spread<br><br>COVID-19 incidence in 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% positivity rate).<br><br>Staff-reported rate of student mask wearing was high (>92%).<br><br>A limitation of this study was the lack of infection screening to determine prevalence of asymptomatic spread. | High |
| 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- | Jan 29, 2021 | Prevalence | 2 independent K-12 schools, Southeast and Mid-Atlantic, USA | • Cancelled extracurriculars and congregating activities<br>• Enhanced cleaning (classroom disinfecting)<br>• Enhanced ventilation<br>• Masks<br>• Periodic universal testing (following | From Aug – Dec 2020, 2 schools were monitored for COVID-19 as they returned to in-person learning.<br><br>School A:<br>• 112 confirmed cases (in 2299 students and staff, 4.9%)<br>• 60 (54%) detected by universal test, 22 (20%) by contact tracing, 30 (27.8%) self-reported<br>• 59 (54%) cases during 3-week period following school break | High<br><br>***PREPRINT*** |

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| 19 pandemic. *Preprint.* | | | | CDC's guidelines, similar to colleges/ universities)<br>• Physical distancing<br>• Quarantine policies<br>• Temperature checking | • Largest outbreak (28 cases) traced to off-campus party<br><br>School B:<br>• 25 confirmed cases (in 1200 students and staff, 2.0%)<br>• 21 (84%) detected by universal testing, 1 (4%) by contact tracing, 3 (12%) self-reported<br><br>Community incidence rates correlated with school infections:<br>• School A: r=0.9, p<0.01<br>• School B: r=0.8, p<0.05.<br>There was no correlation between positivity rates and in-school introduction. In-school rates were consistently below community rates.<br>9% of 69 introduced cases, in both schools, resulted in in-school transmission:<br>• 5 secondary infections from 45 introduced cases in school A<br>• 1 secondary infection from 24 introduced cases in school B<br>• Reproduction number consistently low (0.47 in school A, 0.05 in school B).<br>• 72% of in-school transmission (school A) associated with mask-wearing noncompliance<br><br>No evidence of staff-student transmission.<br><br>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. | |
| Theuring, S., Thielecke, M., van Loon, W., Hommes, F., | Jan 29, 2021 | Cross-sectional | Primary and secondary schools, Berlin, Germany | • Cohorting<br>• Enhanced ventilation (fresh air at least 3x day) | In Nov 2020, 1199 participants were tested (177 primary and 175 secondary school students from 24 classrooms, 142 staff, 625 household members). | High<br><br>***PREPRINT*** |

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| 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. *Preprint.* | | | | • Hygiene commissioner (some schools)<br>• Masks (outside and in classroom, some schools)<br>• Signs about hand hygiene<br>• Soap and water in restrooms | During this time, the 7-day incidence in Berlin was 185-210/100,000.<br><br>9 students and 1 staff tested positive in 8 classrooms; 7 were asymptomatic.<br><br>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. There were no school-related secondary infections in affected classes at re-testing one week later.<br><br>Infection prevalence:<br>• Students: 2.7% (95% CI=1.2,5.0; 9/338)<br>• Staff: 0.7% (95% CI=0.0,3.9; 1/140)<br>• Household members: 2.3% (95% CI=1.3,3.8; 16/611)<br><br>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).<br><br>Prevalence increased with inconsistent mask-wearing in school, walking to school, and case-contacts outside school. | |
| 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, | Jan 26, 2021 | Prevalence | Primary schools, kindergarten and nurseries, Germany | All schools:<br>• Cancelled common activities<br>• Hand hygiene<br>• Masks (staff, parents)<br>• Physical distancing<br>• Separate bathrooms and playground areas per cohort<br><br>Primary schools: | 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.<br><br>Incidence rate was 50/100,000 aged 1-11 and 150/100,000 general population at the time. | High<br><br>***PREPRINT*** |

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| Germany. *Preprint.* | | | | • Masks (students, except when seated in class)<br>• Reduced class sizes | | |
| 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. *Eurosurveillance, 26*(1), 1-6. | Jan 7, 2021 | Prevalence | Primary schools in 2 counties, Norway | • Hand hygiene<br>• Physical distancing<br>• Symptomatic children asked to stay home<br><br>(Masks *not* recommended.) | 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.<br><br>13 index cases and 319 child and 74 adult close contacts were identified, 292 (74%) agreed to participate.<br>• Of 234 child contacts tested, 2 cases (0.9%) were identified.<br>• Of 58 adult contacts, 1 case (1.7%) was identified | High |
| 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. *Clinical Infectious Diseases.* Epub ahead of print. | Jan 3, 2021 | Cohort | Daycare centres, Germany | • Masks (staff)<br>• 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.<br><br>7366 buccal mucosa swabs and 5907 anal swabs were analyzed.<br><br>No children tested positive for COVID-19; 2 staff (1 symptomatic, 1 asymptomatic) tested positive from 2 different day care centres. | Moderate |

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| 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. *Public Health Management & Practice*, *27*(3), 229-232. | Dec 30, 2020 | Cohort | Private schools, Chicago, USA | • Hand hygiene<br>• Masks<br>• On site visits and leadership team to follow-up with implementation<br>• Physical distancing<br>• Quarantining of cohort with identification of a positive case<br>• Temperature and symptom checks<br><br>(No student or teacher test-based screening required.) | 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).<br><br>Mean community 7-day rolling average was 316 per 100,000, and average test positivity of 4.8%.<br><br>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. | Moderate |
| 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 | Primary schools:<br>• Enhanced cleaning<br>• Excluded students/staff with symptoms or recent contact<br>• Hand hygiene<br>• Physical distancing (staff, parents)<br>• Staggered start/end times<br><br>(<10% of schools implemented masks or distancing for students.)<br><br>Secondary schools:<br>• Cohorting<br>• Enhanced cleaning<br>• Masks (staff, students, common areas only) | 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.<br><br>In high-risk areas, % positivity was:<br>• Primary students 1.18%, 95% CI=0.71,1.83<br>• Primary staff: 1.13%, 95% CI=0.49,2.22<br>• Secondary students, 1.73%, 95% CI=1.17,2.43<br>• Secondary staff: 1.62%, 95% CI=1.12,2.27<br><br>In low-risk areas, % positivity was:<br>• Primary students: 0%<br>• Primary staff: 0%<br>• Secondary students: 1.12%, 95% CI=0.62,1.90<br>• Secondary staff: 1.18%, 95% CI=0.61, 2.05 | Moderate<br><br>***NOT PEER REVIEWED*** |

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| | | | | (<10% of schools implemented student masks in classrooms or teachers cohorted with a single class) | This study did not include students who were self-isolating due to symptoms or recent contact.<br><br>Noted differences between primary and secondary and between low and high-risk areas should be interpreted with caution due to overlapping confidence intervals. | |
| 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. *Eurosurveillance, 25*(49): pii=2001911. | Dec 10, 2020 | Cohort | Preschools, primary schools, middle schools, high schools, Italy | • Masks (staff, students aged 6+)[4]<br>• Physical distancing | From Sep 1 – Oct 15, 2020 after reopening of schools, across 41 classes in 36 schools [8 preschools (aged 0-5), 10 elementary (aged 6-10), 5 middle (aged 11-13), 13 high schools (aged 14-19)], 994 students and 204 teachers were tested following exposure to 48 primary cases (43 students, 5 staff).<br><br>38 secondary cases (3.82%) 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.<br><br>Most transmission appear to have been from infected family member or close contact. Only one middle school appears to have had transmission within the school, (index cases possibly teacher). | Moderate |
| Thielecke, M., Theuring, S., van Loon, W., Hommes, F., Mall, M.A., Rosen, A., … Mockenhaupt, F.P. (2020). SARS-CoV-2 infections in | Dec 9, 2020 | Cross-sectional | Kindergarten, Germany | • Cohorting<br>• Enhanced ventilation<br>• Masks (staff; 41.7% of settings)<br>• Physical distancing (staff, parents) | 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. | Moderate<br><br>***PREPRINT*** |

[4] Ministero dell'Istruzione. (2020, August 6). *Documento di indirizzo e orientamento per la riprena delle attivita in presenza dei servizi educative e delle scuole dell'infanzia.*

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| kindergartens and associated households at the start of the second wave in Berlin, Germany – a cross sectional study. *Preprint*. | | | | (Attendance with common cold symptoms was allowed in 75% of settings.) | Among those tested, 155 were children, 78 were staff and 487 were household members.<br><br>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. | |
| Russell, F.M., Ryan, K., Snow, K., Danchin, M., Mulholland, K., & Goldfeld, S. (2020). Methods to analyze DHHS data. In, *COVID-19 in Victorian Schools: An analysis of child-care and school outbreak data and evidence-based recommendations for opening schools and keeping them open* (pp. 31-52). Murdoch Children's Research Institute and The University of Melbourne. | Nov 9, 2020 | Prevalence | Schools, daycares, Victoria, Australia | • Enhanced cleaning<br>• Enhanced ventilation<br>• Hand hygiene<br>• Masks<br>• No singing / wind instruments<br>• No indoor sports<br>• Physical distancing<br><br>• *Strategies implemented according to areas' colour-coded risk scheme. | From Jan 25 – Aug 31, 2020, of 19,109 COVID-19 cases confirmed, 2673 (8.5%) were among children aged 0-18.<br><br>343 events (1635 cases) were associated with daycares and schools:<br>• 229 (67%) involved a single case<br>• 114* were outbreaks (≥2 cases from different households)<br>  ○ 90: ≤5 cases<br>  ○ 12: 6-10 cases<br>  ○ 26: >10 cases<br>  ○ 2: >50 cases<br>(*Of note, children may be associated with multiple outbreaks)<br><br>In schools (230 events), there were 337 secondary cases (incidence risk=33 cases per 100,000 students).<br><br>In daycares (113 events), there were 234 secondary cases (162 staff, 72 children).<br><br>Cases in schools and daycares were low when community transmission was low; cases peaked when community transmission was highest. | Moderate<br><br>***NOT PEER REVIEWED*** |
| National Centre for Immunisation Research and Surveillance. (2020, October 21). *COVID-19 in* | Oct 21, 2020 | Cohort | Daycare and schools, Australia | All schools:<br>• Cohorting<br>• Enhanced cleaning<br>• Hand hygiene<br>• Screening | From Jul 4 – Sep 25, 2020, 39 individuals (32 students and 7 staff members) from 34 educational settings (28 schools and 6 daycare services) were confirmed as primary COVID-19 cases (community acquired) who had an opportunity to | Moderate<br><br>***NOT PEER REVIEWED*** |

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| *schools and early childhood education and care services – the Term 3 experience in NSW*. | | | | Primary and secondary schools (in addition):<br>• Parents / carers not allowed on site, except for select purposes<br>• Physical distancing (staff)<br>• Students must stay home if unwell, negative tests are required to return to school after showing symptoms[5] | transmit the virus to others in their school or daycare setting.<br><br>3824 individuals (3439 students and 385 staff members) were identified as close contacts of the primary cases.<br><br>33 secondary cases (28 students and 5 staff members) occurred in 10 educational settings (5 high schools, 3 primary schools, 2 daycare centres).<br>• Outbreaks were identified in four high schools. SAR: 1.1%.<br>• There were no outbreaks within primary schools setting.<br>• There was one outbreak in a daycare<br><br>The overall SAR was 0.9% (33/3641) 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%. | |

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

# Table 2: Case Reports and Case Series Following School Reopening

| Reference | Date Released | Location, Setting | IPAC Measures | Summary of Findings | Quality Rating: |
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| **New evidence reported on May 6, 2021** | | | | | |
| Berke, E.M., Newman, L.M., Jemsby, S., Bhalla, N., Sheils, N.E., Oomman, N. … Cangelosi, G.A. (2021). Pooling-in-a-pod: A strategy for COVID-19 testing to facilitate safe return to school. *Preprint.* | Mar 26, 2021 | Independent K-12 school, Washington DC | • Daily symptom screening<br>• Masking<br>• Physical distancing<br>• Modified extracurriculars<br>• "Facility optimization"<br>• Hybrid learning (1-12 only, K all in person) | This project aimed to test the feasibility of 'pool in a pod' cohort-specific testing for early case detection and management.<br><br>From Nov 30, 2020-Mar 3, 2021, 815 students and 276 staff took part in twice a week testing (participation varied by week).<br><br>Over 15 testing sessions, there were 967 negative and 2 positive pools. Outside confirmatory testing identified a single positive case, the second was deemed to be a false positive.<br><br>Cost-per-program was $24.77. A number of students returned to in-person learning after initiating testing procedures with no increase in positive cases. | Moderate<br><br>***PREPRINT*** |
| Volpp, K.G., Kraut, B.H., Ghosh, S., & Neatherlin, J. (2021). Minimal SARS-CoV-2 transmission after implementation of a comprehensive mitigation strategy at a school – New Jersey, August 20 – November 27, 2020. *Morbidity and Mortality Weekly Report, 70*(11), 377-381. | Mar 19, 2021 | Secondary school with residential and commuter students, New Jersey, USA | • Pre-arrival and arrival quarantine<br>• Documented negative RT-PCR test before arrival<br>• Twice-weekly RT-PCR screening<br>• Rapid testing if self-reporting symptoms<br>• Isolation rooms<br>• School staff-led contact tracing and case management<br>• Signed agreement<br>• 6-ft distance<br>• Masking<br>• Hygiene<br>• Personal tracer device | From Aug 20-Nov 27, 2020 testing was conducted at a private boarding school.<br><br>8,955 tests were collected from 405 staff, and 12,494 tests from 775 students.<br>• 17 staff (0.18%) and 8 student (0.06%) specimens tested positive representing 4% of staff and 1% of students<br>• 31 close contacts were quarantined and tested; none tested positive<br><br>25 of 27 infections (93%) were likely due to off-campus contacts; source of infection could not be determined from 2 cases. | Moderate |

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| | | | • Take-out only cafeteria<br>• No visitors to dormitories<br>• HEPA-filters in classrooms, dining areas, bathrooms<br>• Inter-scholastic sports cancelled | | |
| **Previously reported evidence** | | | | | |
| 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, USA | • Masks (except while eating)<br>• Plastic dividers on desks (but students sat <3 ft apart) | 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.<br><br>18/69 (26%) household members of persons with school-associated cases tested positive.<br><br>Median cluster size (including household members) was 6 (range 3-16).<br><br>Index patients were:<br>• Staff (4 clusters)<br>• Student (1 cluster)<br>• Unknown (5 clusters)<br><br>Probable transmission included:<br>• Staff-to-student (8 clusters)<br>• Student-to-student (4 clusters)<br>• Student-to-staff (3 clusters)<br>• Staff-to-staff (2 clusters; which was followed by staff-to-student transmission and resulted in 15/31 school-associated cases)<br><br>9 clusters involved lack of physical distancing, 5 inadequate student mask use. | Moderate |

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| Buonsenso, D. & Graglia, B. (2021). High rates of SARS-CoV-2 transmission in a high-school class. *Journal of Paediatrics and Child Health, 57*(2), 299-300. | Jan 15, 2021 | Secondary school, Italy | • Lunch at desk<br>• Masks (in class)<br>• Open windows (but no other ventilation system)<br><br>(Insufficient space to distance desks, class not divided into subgroups, and no hand sanitizer available.) | 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.<br><br>From Sep 17 – 28, 2020, 9 children (36.6%) tested positive.<br><br>Limitations of this report include lack of epidemiological assessment of the broader school and household members. | Moderate |
| 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. *Morbidity and Mortality Weekly Report 69*(34), 1170-1172. | Aug 28, 2020 | Daycare, Rhode Island, USA | • Cohorting<br>• Enhanced cleaning<br>• Hand hygiene<br>• masks (staff all times; students in common areas)<br>• Reduced class sizes<br>• Screening | Daycare programs re-opened on Jun 1, 2020; data presented on all possible daycare-associated COVID-19 cases to Jul 31, 2020.<br><br>52 positive/probable cases of 101 possible cases reported:<br>• 30 (58%) children (median age = 5 years)<br>• 22 (42%) adults (20 teachers, 2 parents)<br><br>Cases occurred in 29 (4.4%) of 666 re-opened daycare programs:<br>• 20 programs (69%) had a single case with no secondary transmission<br>• 5 programs (15%) had 2-5 cases with no secondary transmission<br>• 4 programs (0.6%) had possible secondary transmission<br><br>Among 4 programs with possible secondary transmission:<br>• Program #1: 5 children, 4 staff, 1 parent; 60 children and 21 staff quarantined<br>• Program #2: 3 confirmed cases; 26 students and 17 staff quarantined<br>• Program #3: 2 cases; appear un-linked but cannot confirm<br>• Program #4: 1 staff, 1 child; 37 students and 16 staff quarantined | Moderate |

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| | | | | 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). | |

# Table 3: Single Studies, Associations Between Mitigation Measures and Outcomes

| Reference | Date Released | Study Design | Setting, Location | IPAC measures | Summary of Findings | Quality Rating: |
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| **New evidence reported on May 6, 2021** | | | | | | |
| Oster, E. (2021, March 31). *National COVID-19 school response dashboard.* | Mar 31, 2021 | Prevalence | Schools, USA | • Varied by county | From Aug 31, 2020 – Apr 11, 2021, 7,079,530 students learning in-person and 1,607,582 in-person staff included in the dashboard.<br><br>From Mar 29 – Apr 11, 2021:<br>• Daily case rate = 14 per 100,000 students (0.20%).<br>• Daily case rate = 12 per 100,000 staff (0.17%)<br>• The community case rate in school-matched population was 23 per 100,000, positivity rate of 5.75%.<br><br>Case rates (per 100,000) by mitigation strategies include:<br><br><u>Student masking vs. no mask</u><br>Low/moderate community transmission (<50 total new cases per 100,000 persons in the past 7 days, or approx. <7 cases per day)<br>• Students: 3/5194 (0.06%) vs. 2/781 (0.25%)<br>• Staff: 7/5195 (0.13%) vs. 5/780 (0.64%)<br><br>Substantial community transmission (50-99 total new cases per 100,000 persons in the past 7 days, or ~7-14 cases per day)<br>• Students: 6/15,442(0.04%) vs. 5/3476 (0.14%)<br>• Staff: 9/15,432 (0.06%) vs. 7/3468 (0.20%)<br><br>High community transmission ≥100 total new cases or more per 100,000 persons in the past 7 days, or approx. >14 cases per day<br>• Students: 25/93,537 (0.03%) vs. 19/18,973 (6.6%)<br>• Staff: 33/93,338 (0.04%) vs 19/18,685 (0.10%) | Low<br><br>***NOT PEER REVIEWED*** |

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| | | | | | <u>6-feet student distancing vs. 3-feet vs. no distancing</u><br>Low/moderate community transmission<br>• Students: 8/3981 (0.09%) vs. 2/401 (0.7%) vs. 1/1433 (1.7%)<br>• Staff: 7/3979 (0.2%) vs. 3/402 (1.1%) vs. 5/1434 (2.9%)<br><br>Substantial community transmission<br>• Students: 7/10,403 (0.07%) vs. 5/1050 (0.48%) vs. 4/6040 (0.07%)<br>• Staff: 9/10,390 (0.09%) vs. 8/1050 (0.76%) vs. 7/6035 (0.12%)<br><br>High community transmission<br>• Students: 26/73,270 (0.04%) vs. 19/3373 (0.56%) vs. 16/18,952 (0.08%)<br>• Staff: 31/72,828 (0.04%) vs. 33/3373 (0.98%) vs. 27/18,907 (0.14%)<br><br><u>Increased ventilation vs. no ventilation</u><br>Low/moderate community transmission<br>• Students: 3/3906 (0.08%) vs. 2/1857 (1.1%)<br>• Staff: 3/3906 (0.08%) vs. 6/1857 (0.32%)<br><br>Substantial community transmission<br>• Students: 6/10,519 (0.06%) vs. 5/6932 (0.07%)<br>• Staff: 9/10,508 (0.09%) vs. 7/6925 (0.10%)<br><br>High community transmission<br>• Students: 25/65,804 (0.04%) vs. 22/29,567 (0.07%)<br>• Staff: 32/65,733 (0.05%) vs. 28/29,151 (0.10%)<br><br><u>In-person student density</u><br>Low/moderate community transmission<br>• Students:<br>  ○ Density <60%: 8/2802 (0.29%)<br>  ○ Density 60-90%: 4/4142 (0.10%)<br>  ○ Density >90%: 1/4884 (0.02%) | |

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| | | | | | • Staff:<br>  ○ Remote: 5/150(3.33%)<br>  ○ Density <60%: 11/2408 (0.46%)<br>  ○ Density 60-90%: 13/4140 (0.31%)<br>  ○ Density >90%: 7/4883 (0.14%)<br><br>Substantial community transmission<br>• Students:<br>  ○ Density <60%: 7/12,164 (0.06%)<br>  ○ Density 60-90%: 7/14,222 (0.05%)<br>  ○ Density >90%: 4/7872 (0.05%)<br>• Staff:<br>  ○ Remote: 14/276 (5.4%)<br>  ○ Density <60%: 11/11,211 (0.10%)<br>  ○ Density 60-90%: 14/14,212 (0.10%)<br>  ○ Density >90%: 12/7766 (0.15%)<br><br>High community transmission<br>• Students:<br>  ○ Density <60%: 25/61,555 (0.04%)<br>  ○ Density 60-90%: 22/61,503 (0.04%)<br>  ○ Density >90%: 15/31,311 (0.05%)<br>• Staff:<br>  ○ Remote: 45/1487 (3.0%)<br>  ○ Density <60%: 32/54,455 (0.06%)<br>  ○ Density 60-90%: 37/61,222 (0.06%)<br>  ○ Density >90%: 30/31,207 (0.10%) | |
| **Previously reported evidence** | | | | | | |
| van den Berg, P., Schechter-Perkins, E.M., Jack, R.S., Epshtein, I., Nelson, R., Oster,E., & Branch-Elliman, W. (2021). Effectiveness of three versus six feet of physical distancing for controlling spread of COVID-19 | Mar 10, 2021 | Cohort | 242 public schools, Massachusetts | • Cohorting<br>• Dedicated isolation space for symptomatic students<br>• Enhanced cleaning<br>• Enhanced ventilation<br>• Hand hygiene<br>• Masks (staff, students ≥ grade 2) | From Sep 24, 2020 – Jan 27, 2021, daily incidence in students and staff were compared in school physical distancing requirements of 3 vs. 6 feet. In total, 4226/537,336 (0.79%) students and 2382/99,390 (2.4%) staff tested positive.<br><br>Cases were similar in all districts:<br>• Staff IRR=0.989, 95% CI=0.73,1.33<br>• Student IRR=0.891, 95%CI=0.59,1.34<br><br>After adjusting for community incidence:<br>• Staff IRR: 1.02, 95% CI=0.75,1.37)<br>• Student IRR: 0.904, 95% CI=0.62,1.33 | Moderate |

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| among primary and secondary students and staff: A retrospective, state-wide cohort study. *Clinical Infectious Diseases.* Epub ahead of print. | | | | • Physical distancing (>3 vs. >6 feet)<br>• Symptom screening (staff, students) | | |
| Lessler, J., Grabowski, K., Grantz, K.H., Badillo-Goicoechea, E., Metcalf, J.E., Lupton-Smith, C. … & Stuart, E.A. (2021). Household COVID-19 risk and in-person schooling. *Preprint.* | Mar 1, 2021 | Cross-sectional | Schools, USA | • Cancelled extracurriculars<br>• Closed common spaces (playgrounds, cafeterias)<br>• Cohorting<br>• Masks<br>• Physical distancing (extra space, separators between desks)<br>• Reduced class size<br>• Restricted entry<br>• Symptom screening<br><br>*Substantial heterogeneity in number and type of IPAC measures mandated across states. | From Nov 24 – Dec 23, 2020 and Jan 11 – Feb 10, 2021, data on schooling behaviours and COVID-19 outcomes from 50 states were collected via an online survey (2,142,887 respondents, 284,789 reported living with at least one child in in-person schooling).<br><br>Compared to full-time in-person, part-time in-person was not associated with risk of COVID-19 outcomes once mitigation measures are accounted for.<br><br>For every additional IPAC measure implemented there was a decrease in odds of a positive test (adjusted OR=0.93, 95% CI=0.92,0.94); symptoms screening was associated with the greatest risk reduction. When 7 or more IPAC measures were implemented, risk largely disappeared (with a complete absence of risk with 10 or more IPAC measures). Among those reporting 7 or more mitigation measures, 80% reported student/teacher mask mandates, restricted entry, desk spacing and no supply sharing.<br><br>Associations between IPAC measures and positive tests varied; outdoor instruction, restricted entry, no extracurriculars, and daily symptom screening were associated with significant risk reductions:<br>• Student mask mandate: aOR=0.91, 95% CI=0.83,1.00 | Moderate<br><br>***PREPRINT*** |

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| | | | | | • Teacher mask mandate: aOR=0.91, 95% CI=0.83,1.00<br>• Same teacher all day: aOR=1.00, 95% CI=0.93,1.08<br>• Same students all day: aOR=0.93, 95% CI=0.86,1.00<br>• Outdoor instruction: aOR=0.88, 95% CI=0.80,0.98<br>• Restricted entry: aOR=0.88, 95% CI=0.81,0.95<br>• Reduced class size: aOR=1.01, 95% CI=0.94,1.09<br>• Closed cafeteria: aOR=1.03, 95% CI=0.95,1.11<br>• Closed playground: aOR=1.01, 95% CI=0.92,1.10<br>• Desk shields: aOR=1.12, 95% CI=1.04,1.22<br>• Extra desk space: aOR=0.96, 95% CI=0.89,1.04<br>• No extracurriculars: aOR=0.73, 95% CI=0.68,0.79<br>• No sharing supplies: aOR=0.92, 95% CI=0.85,1.00<br>• Daily symptom screen: aOR=0.78, 95% CI=0.73,0.84<br>• Part-time in person: aOR=0.97, 95% CI=0.91,1.03 | |
| 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. *Preprint*. | Dec 7, 2020 | Cohort | Primary and secondary schools, Germany | Not reported | 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.<br><br>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. | Moderate<br><br>***PREPRINT*** |

# Table 4: Single Studies, Community-level Impact of School Reopening

| Reference | Date Released | Study Design | Setting, Location | IPAC measures | Summary of Findings | Quality Rating: |
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| **New evidence reported on May 6, 2021** | | | | | | |
| Casini, L. & Roccetti, M. (2021). Reopening Italy's schools in September 2020: A Bayesian estimation of the change in the growth rate of new SARS-CoV-2 cases. *Preprint.* | Apr 9, 2021 | Quasi-experimental | Italy | Not reported | In 15/21 regions (71%), an estimated change in the growth rate of daily COVID-19 cases occurred an average of 16.66 days (95%CI=14.47,18.73) after schools reopened (Sep-Oct 2020). Of the other 6/21 regions: 2 presented a change >4 weeks after opening; 4 before or on day schools reopened.<br><br>Cases doubled an average of 47.50 days (95%CI=37.18,57.61) before this to an average of 7.72 days (95%CI=7.00,8.48) after.<br><br>While this analysis suggests an association between school reopening and community spread, no other confounding factors were considered; transmission within schools was also not studied. | Moderate<br><br>***PREPRINT*** |
| Haapanen, M., Renko, M., Artama, M., & Kuitunen, I. (2021). The impact of the lockdown and the re-opening of schools and day cares on the epidemiology of SARS-CoV-2 and other respiratory infections in children – A nationwide register study in Finland. *EClinicalMedicine, 34*, 100807. | Mar 30, 2021 | Cohort | School-aged children, Finland | School closures (as part of regional lockdown restrictions)<br><br>*Schools were closed from week 12-20; re-opened week 20 (May 14, 2020), closed again for summer vacation (week 23). Students returned to school in week 33.<br><br>• Masks (aged > 15) | This retrospective register study collected nationwide weekly incidences of positive COVID-19 findings in children (aged 0-19) from Jan – Aug, 2020, including 2 weeks following summer vacation<br>• Incidence dropped during summer vacation (0.3/100,000, 95%CI=0.1,0.8) in week 25; slowly increased (up to 2.5 / 100,000, 95%CI=1.7,3.5) by the time school resumed in week 33.<br>• Following school reopening, incidence reached 4.2/100,000 (95%CI=3.1,5.5).<br><br>A main limitation is the short reporting period (3 weeks before/after summer vacation). | High |

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| Lichand, G., Dória, C.A., Cossi, J., & Leal-Neto, O. (2021). Reopening schools in the pandemic did not increase COVID-19 incidence and mortality in Brazil. *Preprint.* | Mar 30, 2021 | Cohort | Primary, middle, and secondary schools, Sao Paulo State, Brazil | • Hand hygiene<br>• Limited attendance (35% capacity in severely affected regions)<br>• PPE (staff)<br><br>*131 / 645 municipalities reopened an estimated 1700 schools (~2 million students) for in-person activities from Oct-Dec 2020. | From Oct – Dec 2020, this study compared COVID-19 effective potential growth and deaths, 1) before and after returning to in-person learning in municipalities that reopened schools, and 2) between municipalities that reopened schools and those that did not.<br><br>Growth rates increased over time, with no difference in municipalities that did and did not reopen.<br><br>School reopening did not increase COVID-19 incidence or mortality, on average, up to 12 weeks after reopening. | Moderate<br><br>***PREPRINT*** |
| Bignami-van Assche, S., Boujija, Y., Fisman, D., & Sandberg, J. (2021). In-person schooling and COVID-19 transmission in Canada's three largest cities. *Preprint.* | Mar 23, 2021 | Case series | School-aged children, Montreal, Toronto, and Calgary, Canada | • Masks (varied):<br>○ Toronto: mandatory for elementary and secondary schools; encouraged for kindergarten.<br>○ Montreal: mandatory in common areas for elementary, and later, in classrooms for secondary schools.<br>○ Calgary: mandatory K-12, could be removed when seated | Levels of community transmission were low when schools reopened (Aug 25-31, 2020):<br>• 11.3/100,000 Montreal<br>• 10.0/100,000 Toronto<br>• 26.7/100,000 Calgary<br><br>Montreal and Toronto implemented IPAC measures (restaurant and recreation closures, gathering restrictions) in Oct 2020; by Dec, all 3 cities had implemented these and additional measures (work from home, business closures).<br><br>Levels of community transmission had risen by end of study period (Jan 6-12, 2021):<br>• 356.9/100,000 Montreal<br>• 165.9/100,000 Toronto<br>• 153.5/100,000 Calgary<br><br>In Toronto and Calgary, infection trends in 0-19 year olds paralleled adults; in Montreal, increased rates among adults were preceded by increases among 10-19 year olds, suggesting Montreal school IPAC measures were insufficient. | Low<br><br>***PREPRINT*** |

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| | | | | in classrooms (cohorts, physically distanced)<br>• Optional remote or hybrid learning | One week after schools closed for winter holiday break, weekly incidence declined among 0-19 year olds but continued to rise in other age groups. | |
| von Bismarck-Osten, C., Borusyak, K., & Schönberg, U. (2021). *The role of schools in transmission of the SARS-CoV-2 virus: Quasi-experimental evidence from Germany*. Centre for Research and Analysis of Migration (CReAM) & Department of Economics, University College London. | Mar 19, 2021 | Quasi-experimental | School-aged children, Germany | • Cohorting<br>• Enhanced cleaning<br>• Enhanced ventilation<br>• Masks (but not mandatory in classrooms)<br>• Physical distancing<br>Quarantine (cases, contacts) | From Jun 1 - Oct 28, 2020, neither staggered summer and fall breaks nor return to school at full capacity following breaks impacted the spread of COVID-19 among children or adults.<br><br>• 0.335 cases per day/100,000 children aged 5-14, and 0.026 cases per day/100,000 older adults 60+ were prevented in the first 3 weeks of the summer break. Community incidence was low (0.7/100,000) in all states.<br>• 1.279 cases per day/100,000 children aged 5-14, and 0.584 cases per day/100,000 older adults 60+ were prevented during the first week of the fall break. Community incidence was 3.141/100,000.<br><br>The number of child cases increased during the last 2 weeks of summer break and decreased in the first weeks after school re-opening. | Moderate<br><br>***NOT PEER REVIEWED*** |
| Goldhaber, D., Imberman, S.A., Hopkins, B., Brown, N., Harbatkin, E., & Kilbride, T. (2021). *To what extent does in-person schooling contribute to the spread of COVID-19? Evidence from Michigan and Washington*. National Bureau of Economic Research. | Feb 1, 2021 | Cohort | School-aged children, Michigan and Washington state, USA | • Optional remote or hybrid learning | Simple correlations show in-person learning is correlated with increased COVID-19 cases; but accounting for pre-existing cases and other covariates brings estimates close to zero, on average.<br><br>In Ordinary Least Squares (OLS) models, in-person or hybrid learning is not associated with increased spread when there are low or modest levels of pre-existing cases in the community; cases do increase with high levels of community transmission. (definition of high vs. low or modest levels not provided). | Moderate<br><br>***NOT PEER REVIEWED*** |

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| Isphording, I. E., Lipfert, M., & Pestel, N. (2021). *Does re-opening schools contribute to the spread of SARS-CoV-2? Evidence from staggered summer breaks in Germany*. Collaborative Research Center Transregio 224, University of Bonn & University of Mannheim. | Jan 29, 2021 | Quasi-experimental | School-aged children, Germany | • Cohorting<br>• Enhanced cleaning<br>• Enhanced ventilation<br>• Masks<br>• Physical distancing<br>• Quarantine (cases, contacts)<br>• Regular rapid testing (staff, students)<br>• Screening<br>• Sports, music cancelled<br><br>*Schools allowed to impose stricter measures. | From Jul 1 – Oct 12, 2020, there was no evidence that school re-openings, following staggered summer breaks, increased state community case numbers.<br><br>Confirmed cases were highest among those aged 15-59 (1.7/100,000), compared to children aged 5-14 (1.1/100,000). Case numbers in all age groups were higher after school re-opening compared with before.<br><br>Possible limitations of this study include only measuring 4 weeks after schools re-opened and low community spread at the time. | Moderate<br><br>***NOT PEER REVIEWED*** |
| **Previously reported evidence** | | | | | | |
| 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. *Preprint.* | Mar 16, 2021 | Quasi-experimental | Primary and secondary schools, USA | • Masks (staff; not mandatory in all counties) | 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. | Moderate<br><br>***PREPRINT*** |

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| Buja, A., Paganini, M., Cristofori, V., Baldovin, T., Fusinato, R., Bocucuzzo, G., ... & Parpinel, M. (2021). Opening schools and trends in SARS-CoV-2 transmission in European countries. *Preprint.* | Mar 1, 2021 | Quasi-experimental | Schools, Europe | Not reported | A significant increase in daily infections was found in 21/27 European countries from 20 days before to 45 days after schools reopened in 2020; most change points occurred 21 days (range 10-42 days) after reopening.<br><br>Importantly, follow-up period was short and other regional restrictions were loosened at the same time, thus causal relationship between school reopening and cases cannot be inferred. | Moderate<br><br>***PREPRINT*** |
| 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 full re-opening of schools and the impact of national lockdown: Prospective, national observational cohort surveillance, July-December 2020, England. *Journal of Infection*, *82,* 67-74. | Feb 24, 2021 | Cohort | Pre-, primary, and secondary school-aged children, England | Not reported | From Jul – Oct 2020, there was a strong correlation (r=0.1174-0.5832; 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).<br><br>Upon school re-opening (Aug 24, 2020), there was an increase in rates for secondary and primary but not preschool-aged children.<br><br>A week-long half-term break (Oct 26, 2020) was associated with a small and temporary decline in infection rates.<br><br>A national month-long lockdown (Nov 2020), with schools open, was associated with rapid declines in rates in young adults, followed by children in all age groups one week later. Trends were strongest in regions with high infection rates prior to lockdown.<br><br>COVID-19 infection rates in school-aged children appear to be influenced by adult infection rates in the community.<br><br>A limitation of this study is that analysis was completed according to child's age, not school attendance; it cannot comment on whether infection spread in or outside of school settings. | High |

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| 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. *Eurosurveillance, 26*(7), 1-7. | Feb 18, 2021 | Quasi-experimental | Primary and secondary schools, Brussels, Belgium | Not reported | Schools re-opened on Sep 1, 2020. Contacts, teleworking, and restaurant restrictions were loosened at this time, then gradually reintroduced on Oct 6.<br><br>Positive cases among children increased Aug – Sep (schools closed) with increased testing rate (correlation =0.74, p<0.001).<br><br>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 cases did not change.<br><br>Intragenerational transmission was highest (39.4%, 63/160) during fall holidays and the closure of all non-essential services (Nov 2). | Low |
| 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). *Preprint.* | Feb 17, 2021 | Quasi-experimental | Primary and secondary schools, Catalonia, Spain | • Cohorting<br>• Enhanced ventilation<br>• Hand hygiene<br>• Infographics<br>• Masks (students aged ≥6)<br>• Mass screening campaigns<br>• Screening/ quarantining for whole cohort when positive case detected | From Sep 14, 2020 – Jan 31, 2021, 48,914 (of 942,881) children (aged <18) tested positive for COVID-19 (5.2%). Variant B.1.1.7 was first detected in Catalonia at end of December.<br><br>Incidence for aged <12 was lower than the general population; incidence for aged 12-17 was similar or higher. Age was associated with higher incidence.<br><br>Incidence may have been impacted 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 (≤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.<br><br>Rate of cases in children was significantly lower than for adults during whole study period (p<0.001). | Low<br><br>***PREPRINT*** |

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| 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. *Archives de Pédiatrie. 28*(3), 178-185. | Feb 15, 2021 | Quasi-experimental | Primary, middle, and secondary schools, France | • Hand hygiene<br>• Masks (students aged ≥11, indoors, outdoors)<br>• Physical distancing | From Sep – Oct 2020, the relative risk (RR) of a positive test and the IRR were significantly lower in all child age groups, compared with adults.<br>The positive RR was:<br>• Ages 0-5: 0.46 (95% CI=0.44,0.49)<br>• Ages 6-17: 0.69 (95% CI=0.68,0.70)<br><br>The IRR was:<br>• Ages 0-5: 0.09 (95% CI=0.08,0.09)<br>• Ages 6-10: 0.31 (95% CI=0.30,0.32)<br>• Ages 11-14: 0.64 (95% CI=0.63,0.66)<br>• Ages 15-17: 1.07 (95% CI=1.05,1.10)<br><br><1% of schools were closed during the study period. | Moderate |
| 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 | USA | Varied across jurisdictions | Compared to the 10 weeks prior to school reopening (Aug 2020), 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.<br><br>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<br><br>***NOT PEER REVIEWED*** |
| 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 | Dec 15, 2020 | Cohort | All school-age children, Southern Connecticut, New York, Rhode Island, USA | Varied by state | Data for all tests completed from Mar 1 –Sep 26, 2020 in those aged ≤ 18 in a single health system were analyzed.<br><br>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 11-4) consistently had higher rate than children aged <2, 2-5, and 6-10. | Moderate |

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| coronavirus disease 2019 pandemic. *The Pediatric Infectious Disease Journal*, *40*(3), 175-181. | | | | | | |
| Miron, O., Yu, K.H., Wilf-Miron, R., Kohane, I., & Davidovitch, N. (2020). COVID-19 infections following physical school reopening. *Archives of Disease in Childhood*. Epub ahead of print. | Dec 7, 2020 | Cohort | Primary and secondary schools, Florida, USA | Varied by country | In counties with in-person learning, incidence increased daily once schools re-opened (August 2020). 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.<br><br>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.<br><br>No trend was observed in counties that did not re-open.<br><br>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. | Moderate |

## Table 5: Studies specific to summer camps

| Reference | Date Released | Location, Setting | IPAC Measures | Summary of Findings | Quality Rating: |
|---|---|---|---|---|---|
| **Previously reported evidence** | | | | | |
| Jordan, I., Fernandez de Sevilla, M., Fumado, V., Bassat, Q., Bonet-Carne, E., Fortuny, C., ... & Gratacós, E. (2021). Transmission of SARS-CoV-2 infection among children in summer schools applying stringent control measures in Barcelona, Spain. *Clinical Infectious Diseases.* Epub ahead of print. | Mar 12, 2021 | Summer schools, Spain | • Cohorting<br>• Hand hygiene<br>• Mainly outdoor activities<br>• Masks (≥ 6 years) | From Jun 29 – Jul 31, 2020, 39 index cases were identified from 41 summer schools (2318 total children, 547 staff).<br><br>• Among 253 contacts identified from 30 child index cases (aged 3-15), 12 tested positive (4.7%).<br>• Among 9 adult index cases, 114 contacts identified, 3 tested positive (2.6%).<br><br>Overall SARs were 4.09%:<br>• From adult staff to:<br>  ○ Children, 0-12: 1.64% (1/61)<br>  ○ Children, 13-17: 11.76% (2/17)<br>  ○ Adult staff: 0% (0/36)<br>• From children aged 0-10 to:<br>  ○ Children, 0-12: 5.26% (8/152)<br>  ○ Children, 13-17: 0% (0/2)<br>  ○ Adult staff: 2.7% (1/37)<br>• From children aged 11-17 to:<br>  ○ Children, 0-12: 4% (1/25)<br>  ○ Children, 13-17: 6.9% (2/29)<br>  ○ Adult staff: 0% (0/8)<br><br>Schools with IPAC measures had lower transmission than general population (reproduction number 0.3 vs. 1.9).<br><br>Frequent hand washing was associated with a lower SAR (p=0.024). No significant associations were found between other IPAC measures and transmission (compulsory mask wearing indoors/outdoors, outdoor activities). | Moderate |

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| 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. *Morbidity and Mortality Weekly Report 69*(43): 1600-1604. | Oct 30, 2020 | Community/ Summer Camp Wisconsin, USA | • Masks (while travelling)<br>• Negative COVID-19 test (last 7 days or serology in last 3 months)<br>• Quarantine for 7 days, prior to attending | 127 students, 21 counsellors (aged 17-24) and 4 staff members from 21 states and 2 foreign countries attended camp from Jul 2 – Aug 11, 2020.<br><br>The index case (grade 9 student) developed COVID-19 symptoms on Jul 3 and tested positive on Jul 5.<br><br>Despite efforts to isolate close contacts, 116/152 (76%) of attendees had confirmed (n=78) or probable (n=38) COVID-19. This included:<br>• 100/127 students (79%)<br>• 15/21 counsellors (71%)<br>• 1 staff member (25%)<br><br>Excluding the 24 attendees who provided positive serologic results prior to camp, SAR: 91% (116/128). Note that no mitigation measures were in place following initial quarantine and negative test. | High |
| 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. *Preprint.* | Oct 23, 2020 | Day camp, K-8 California, USA | • Cohorting<br>• Masks (staff, except when eating)<br>• Temperature check | 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).<br>• No positive RT-PCR tests for the virus that causes COVID-19 were found at either timepoint.<br>• 7 participants (4%, 95% CI=1%,7%) had a positive serology test at either timepoint.<br><br>It was not possible to determine whether any transmission occurred between participants as no documented cases occurred during camps. | High<br><br>***PREPRINT*** |

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| 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. *Morbidity and Mortality Weekly Report 69*(35), 1216-1220. | Aug 26, 2020 | Overnight camps Maine, USA | • Cohorting<br>• Enhanced cleaning<br>• Hand hygiene<br>• Masks<br>• Maximal outdoor programming<br>• Physical distancing<br>• Prearrival quarantine<br>• Pre- and post-arrival testing and screening | 642 children and 380 staff members (aged 7-70) attended 4 overnight camps from Jun - Aug 2020.<br><br>12 attendees (11 children and 1 staff) were identified as having COVID-19 related signs or symptoms during daily screening checks. All tested negative.<br><br>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. | Moderate |
| 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. *Morbidity and Mortality Weekly Report 69*(31): 1023-1025. | Jul 31, 2020 | Overnight summer camp Georgia, USA | • Masks (staff)<br>• Negative test within 12 days of attending | 158 staff and counsellors took part in training Jun 17-20, 2020. 363 campers and 3 staff joined on Jun 21.<br><br>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.<br><br>Test results were available for 344 of 597 attendees.<br><br>Attack rate was highest amongst staff (56%) compared to youth (49%), and those in larger cabins (53%).<br><br>The authors note they cannot rule out multiple index cases due to high incidence of COVID-19 in Georgia. | Low |

## Table 6: In-progress Single Studies

| Title | Anticipated Release Date | Setting | Description of Document |
|---|---|---|---|
| **New evidence reported on May 6, 2021.** | | | |
| Zimmerman, K. (2021). *COVID-19 surveillance and exposure testing in school communities*. *ClinicalTrials.gov, NCT04831866.* | Apr 15, 2023 | Schools | This study will compare incidence of COVID-19 in schools performing weekly surveillance testing on 10-20% of students and 100% with schools performing exposure testing on students and staff after close contact with a confirmed COVID-19 case. |
| Kaiser, R. (2021). *SARS-CoV-2 surveillance in childcare facilities*. *German Clinical Trials Register, DRKS00023507.* | Not reported | Daycare | This study will assess the feasibility of testing children and staff at daycares for COVID-19 twice per week for two weeks. |
| **Previously reported evidence** | | | |
| Zimmerman, K. (2021). *Coronavirus-19 (COVID-19) and related outcomes in school aged children (ABC health outcomes in children)*. *ClinicalTrials.gov, 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). |
| 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*. *ClinicalTrials.gov, 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. |
| Mullane, M.J., Thomas, H.M., Epstein, M., Mandzufas, J., Mullan, N., Whelan, A. … & Gething, P. (2021). DETECT schools study protocol: A prospective observational cohort surveillance study investigating the impact of COVID-19 in western Australian schools. *Frontiers in Public Health, 9*, 636921. | Not reported | Schools | This prospective observational cohort surveillance study will measure the incidence, transmission, and impact of COVID-19 in 79 schools across Western Australia. |
| Universitätsklinikum Rostock. (2020). *Prospective Study initiated by University Hospital Rostock concerning COVID-19 in mothers, nursery and school teachers of children in Rostock*. *German Clinical Trials Register, DRKS00022504.* | N/A | Daycare, schools | This study will measure prevalence of COVID-19 and associated antibodies in mothers, daycare nurses and teachers, and school teachers over the period of 12 months. |

## Table 7: Syntheses

| Reference | Date Released | Review Conclusions | Quality Rating |
|---|---|---|---|
| **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. *Preprint*. | Mar 6, 2021 (Search completed Oct 12, 2020) | This review included 32 studies that explored the effect of school closures on community transmission of COVID-19. 11 studies explored the impact of school reopening. 3 studies explored the effect of school holidays. Most studies had serious to critical risk of bias. 15 were from peer-reviewed journals, 24 were pre-print articles and 1 was a conference abstract.<br><br>Studies of school closures with the lowest risk of bias found no conclusive evidence that school closures alone resulted in reduced transmission. Studies with serious to critical risk of bias found large protective effects in incidence and mortality rate.<br><br>Among studies of school reopening with the lowest risk of bias, 3 found no increase in transmission while 1 reported increase in transmission. Studies with serious to critical risk of bias found no association (3), mixed findings (2) or increased transmission (2).<br><br>Variability in the findings may reflect the methodology used and the importance of contextual factors (not studied) across geographic regions.<br><br>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. | Moderate<br><br>***PREPRINT*** |
| 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. *Journal of Global Health, 10*(2): 021104. | Dec 19, 2020 (Search completed Sep 14, 2020) | Five cohort studies found 18 secondary cases in 3345 contacts. The SAR were:<br>• Students: 0.15% (95% CI=0.00,0.93)<br>• Staff: 0.70% (95% CI=0.00,3.56)<br>• Overall: 0.08% (95% CI=0.00,0.86)<br><br>Six cross-sectional studies reported 639 COVID-19 cases from 6682 participants tested. The positivity rates were:<br>• Students: 8.74% (95% CI=2.34,18.53)<br>• Staff: 13.68% (95% CI=1.68,33.89)<br>• Overall: 8.00% (95% CI=2.17,16.95) | Moderate |

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| | | 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. | |
| 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. *Cochrane Database Systematic Reviews, 12*. | Dec 17, 2020 (Search completed Oct 8, 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.<br><br>Identified school-based measures included:<br>• 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)<br>• Structural/environmental (n=11; e.g., school yard division, furniture removal and distancing, improved ventilation and cleaning protocols)<br>• 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. *Preprint.* | Nov 9, 2020 (Search completed Aug 31, 2020) | There was limited to no evidence of secondary transmission among school contacts.<br><br>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<br><br>***PREPRINT*** |
| 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. *The Journal of Infectious Diseases, 223*(3), 362-369. | Oct 29, 2020 (Search completed Oct 5, 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.<br><br>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) | 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.<br><br>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<br><br>***NOT PEER REVIEWED*** |

## Table 8: In-progress Syntheses

| Title | Anticipated Release Date | Setting | Description of Document |
|---|---|---|---|
| **New evidence reported on May 6, 2021.** | | | |
| Viner, R. & Waddington, C. *Transmission of SARS-CoV-2 by children and young people: a systematic review of population studies.* PROSPERO, CRD42021222276. | April 30, 2021 | Home, school, community | This review will explore population-based surveillance studies to compare rates of COVID-19 transmission from children and young people to others. |
| **Previously reported evidence** | | | |
| Minozzi, S., Amato, L., Mitrova, Z., & Davoli, M. (2020). *COVID-19 among children and adolescents and impact of school closure on outbreaks control: an overview of systematic reviews*. *PROSPERO, CRD42020186291*. | Unknown; completed but not published | Home, school | 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. |
| Bhamani, S., Tabani, A., Ahmed, D., & Saleem, A. (2020). *A rapid systematic review on COVID transmission trends in children on schools reopening in lower middle income countries*. *PROSPERO, CRD42020204925.* | Jul 31, 2021 | Schools | This review will summarize virus transmission among children and outbreaks occurring after schools re-open in lower middle-income countries. |
| Karki, S.J., Lange, B., Heinsohn, T., & Joachim, A. (2021). *The risk of infection and contribution to transmission of SARS-CoV-2 in school staff - a systematic review*. *PROSPERO, CRD42021239225* | Apr 15, 2021 | Schools | This systematic review will summarize the risk and rate of COVID-19 transmission from staff working in schools, including secondary attack rates among students and the general population. |
| Lange, B., Ott, J., & Karki, S. J. (2021). *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*. | Mar 31, 2021 | Home, school | 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. |
| Chatterji, M., Kitamura, K., Muenig, P., Willson, G.E., De Leon Jr., R., & Allegrante, J.P. (2020). *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.* | Aug 29, 2020 | School and school-linked populations | 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. |

## Table 9: Canadian Surveillance Data

| Reference | Date Released | Study Design | Setting, Location | IPAC measures | Summary of Findings | Quality Rating: |
|---|---|---|---|---|---|---|
| **New evidence reported on May 6, 2021.** | | | | | | |
| Government of Ontario. (2021, April 30). *COVID-19 cases in schools and child care centres*. | Apr 30, 2021 | Prevalence | Primary, secondary schools, and daycares, Ontario, Canada | All schools:<br>• Cohorting<br>• Enhanced cleaning<br>• Masks, eye protection (staff)<br>• No non-essential visitors<br>• Record keeping<br>• Screening<br><br>Primary and secondary schools (in addition):<br>• Hand hygiene<br>• Student masks grades 1-12, in school (hallways, class), on school transportation, outdoors (when cannot distance)<br>• Physical distancing<br>• Scheduled remote learning days (grades 9-12)<br>• Staggered bell times (suggested)<br>• Targeted testing (voluntary, participating schools)[6]<br><br>Daycare centres (in addition): drop-off, pick-up protocols[7] | From Sep 5, 2020 – Apr 9, 2021, a total of 15,002 school-related cases were reported in publicly funded schools in Ontario:<br>• 11,315 student cases<br>• 2515 staff cases<br>• 1172 'other' cases (not identified)<br><br>As of April 9, 2021, schools moved to remote learning due to increasing COVID-19 cases in communities.<br><br>From Jun 12, 2020 – Apr 30, 2021, a total of 5702 cases occurred in those connected to daycare settings in Ontario:<br>• 3246 child cases<br>• 2456 staff/provider cases<br><br>As of Apr 30, 2021, 469 (8.88%) centres were currently reporting a case; 135 (2.56%) centres were closed.<br><br>Reported school and daycare centre closures are due to outbreaks or operational considerations (i.e., # of staff in isolation resulting in insufficient # of staff available to keep school or daycare centre open; regional closures in local public health unit areas not considered.<br><br>Transmission source unknown for cases, therefore unable to report the proportion of cases due to in-school transmission | Moderate<br><br>***NOT PEER REVIEWED*** |

[6] Government of Ontario. (2020, November 27). *Guide to reopening Ontario's schools*.

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

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| Government of Ontario. (2021, April 30). *COVID-19: asymptomatic targeted testing in schools*. | April 30, 2021 | Prevalence | Primary, secondary schools, Ontario, Canada | All schools:<br>• Cohorting<br>• Enhanced cleaning<br>• Masks, eye protection (staff)<br>• No non-essential visitors<br>• Record keeping<br>• Screening<br><br>Primary and secondary schools (in addition):<br>• Hand hygiene<br>• Student masks grades 1-12, in school (hallways, class), on school transportation, outdoors (when cannot distance)<br>• Physical distancing<br>• Scheduled remote learning days (grades 9-12)<br>• Staggered bell times (suggested)<br>• Targeted testing (voluntary, participating schools)[8] | From Feb 1, 2021 to April 30, 2021 56,183 rapid asymptomatic tests were conducted across 602 schools; a total of 411 additional cases were detected (0.73%).<br><br>The number of cases identified by school board ranged from 0 to 150, and percent positive tests per school board ranged from 0 to 2.6%. | Low<br><br>***NOT PEER REVIEWED*** |
| Government of Québec. (2021, April 23). *Daily numbers for the province – public and private school systems highlights*. | Apr 23, 2021 | Prevalence | Public and private school system, Québec | • Alternating in-person/remote attendance (secondary schools in red and orange zones)<br>• Cohorting<br>• Enhanced cleaning<br>• Masks (staff, students grades 5+; in red and orange zones, all students, except preschoolers)<br>• Physical distancing[9] | Data collected from 2740 public schools and 254 private schools including over 1,300,000 students and 226,000 staff.<br><br>Confirmed cumulative positive cases in the school system from start of school year to Dec 22, 2020:<br>• public: 14,929 students, 3558 staff<br>• private: 2443 students; 480 staff<br>• total: 17,372 students (~1.3% of all students), 4038 staff (~1.8% of all staff) | Low<br><br>***NOT PEER REVIEWED*** |

[8] Government of Ontario. (2020, November 27). *Guide to reopening Ontario's schools*.

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

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| | | | | | Confirmed currently active positive cases in the school system on Apr 29, 2021:<br>• public: 2440 students, 530 staff<br>• private: 409 students, 68 staff<br>• total: 2849 students (~0.22% of all students), 598 staff (~0.26% of all staff)<br><br>Confirmed variant cases since March 12 (daily change in parentheses)<br>• public: 73 (+13)<br>• private: 102 (+6)<br>• total: 175 (+19)<br><br>Number of schools that have had a positive case Jan 5 – Apr 29, 2021:<br>• 2448 (74.2%) | |
| Government of Alberta. (2021, April 23). *COVID-19 school status map*. | Apr 23, 2021 | Prevalence | Primary and secondary schools, Alberta | • Cohorting<br>• Enhanced cleaning<br>• Hand hygiene<br>• Masks (staff, students grade 4+, when physical distancing not possible)<br>• Physical distancing (staff, students)<br>• Screening<br>• Strict symptomatic stay-at-home policy[10] | School (251 total) status classification (no date reported):<br>• 135 outbreaks (10+ cases)<br>• 172 outbreaks (5-9 cases)<br>• 281 alerts (2-4 cases)<br>• 34 open (i.e., no status to report) | Moderate<br><br>***NOT PEER REVIEWED*** |

[10] Government of Alberta. (2021, January 19). *COVID-19 information: guidance for school re-entry - scenario 1*.

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