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Living Rapid Review Update 18: What is the specific role of daycares and schools in COVID-19 transmission?

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Date: December 7, 2022

Suggested Citation:

National Collaborating Centre for Methods and Tools. (2022, December 7). *Living Rapid Review Update 18: What is the specific role of daycares and schools in COVID-19 transmission?* https://nccmt.ca/pdfs/res/schools-daycares

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.

The National Collaborating Centre for Methods and Tools (NCCMT) is hosted by McMaster University and funded by the Public Health Agency of Canada. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada. This review was supported by funding from nib Health. The funder had no role in collection or interpretation of data.

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

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Executive Summary

Background

As jurisdictions around the world responded to the evolving coronavirus disease 2019 (COVID-19) pandemic, they faced major decisions about how and when to re-open and operate schools and daycares. While children were known to be effective transmitters for other viruses, such as influenza, their role in the transmission of COVID-19 was much less clear.

This living rapid review was produced to support public health decision makers' response to the COVID-19 pandemic and to inform policies for future infectious disease threats. 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 August 12, 2021. This updated version includes evidence available up to October 17, 2022.

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?

- In this version, new eligibility criteria have been added to focus on the most relevant studies to the current context (December 2022). Given the growing body of high-quality evidence, case reports and case series of <5 schools have now been excluded. This resulted in 3 previously included studies being removed from this version. An archived version of Update 17 is available here, and a list of previously included but now excluded studies is available in Appendix 2.
- More data has been published in the context of more transmissible variants of concern (VOC). In updated ongoing cohort studies, while the number of cases identified in school settings and seroprevalence of previous infection has increased, secondary attack rates (SARs) remain low within school settings where infection prevention and control (IPAC) measures are in place.
- More studies have been published that evaluate the impact of specific IPAC measures on transmission within schools and daycares. Table 2 is now separated by measure investigated. Where more than three studies have reported data on the same measure, these have been included in the summary of findings table along with a GRADE statement on the certainty of the evidence.
- Regional variations in school openings and closures in response to community transmission has provided examples of natural experiments in which statistical analyses can be used to better understand the impact of school closures or re-openings on community incidence. These studies add to the previously reported evidence which suggest that school re-openings do not meaningfully increase community transmission, particularly with targeted IPAC measures in place.
- Whole-genome sequencing has been used in several studies to confirm that most school-identified cases originate from the community rather than school, even amongst cases that cluster within a given time period.

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 widespread 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 more variable, with findings suggesting that adherence to IPAC measures in place in the school setting and reducing activities outside of the school settings is critical in this age group. This trend appears to be consistent in the data collected with early VOC, while absolute case numbers are high, most infections originate from outside of school; less data are available with respect to Omicron than Alpha and Delta.
- Data suggest that facemasks may decrease the risk of transmission within school/daycares. The certainty of evidence is low (GRADE), and findings may change as new data become available. The level of adherence to mask wearing may be an important predictor of the magnitude of the risk reduction.
- Test-to-stay policies may not increase the risk of transmission within schools/daycares compared to policies requiring isolation of all close contacts in a school setting. The certainty of evidence is low (GRADE), and findings may change as new data become available.
- The impact of surveillance testing within schools is very uncertain (GRADE) and findings are likely to change as new data become available.
- Physical distancing policies may not increase the risk of transmission within schools/daycares. The certainty of evidence is low (GRADE), and findings may change as new data become available.
- Cohorting may make little to no difference in transmission within schools/daycares. The certainty of evidence is very low (GRADE), and findings are likely to change as new data become available.
- Part-time or hybrid learning (a combination of in-person and online learning) may make little to no difference in transmission within schools/daycares compared to full time in-person learning when other mitigation measures are controlled for. The certainty of evidence is low (GRADE), and findings may change as new data become available.
- Across studies, the number of cases amongst students and teachers mirror trends in the community. There is little evidence to suggest that widespread school closures meaningfully reduce community incidence, hospitalizations, or mortality, particularly when IPAC measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available.
- Three studies reported on transmission in camp settings with results consistent with findings from schools. While transmission can occur in camps, it may be mitigated by IPAC measures in place. SARs may be larger in overnight than day camps. The certainty of evidence is very low (GRADE) and findings may change as new data become available.
- 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

- Implementation of infection control measures is important to reducing risk of transmission, especially when community transmission rates are high. If reducing transmission is the top priority, implementation of infection control measures is the most effective way to achieve this. Data now illustrates the potential negative impacts on students' mental and social health and wellbeing. This raises the question of whether the benefits of reducing transmission through these measures is worth the harms being experienced by students particularly given the availability of vaccines and treatment for COVID-19. There is limited data currently on the impact of easing specific IPAC measures in schools within Canada.
- 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. The use of whole genome sequencing shows that in the context of widespread community transmission cases in schools are more likely to have originated from the community, even when they are temporally clustered within schools.
- 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 IPAC measures are in place.
- Studies that explore the impact of school re-opening or closing on rates of community-transmission are limited by their 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.

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 October 17, 2022. This search builds upon the previous search conducted in the 17th version of this rapid review.

- Medline
- Embase
- Global Health
- PsychInfo
- ERIC
- 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
- Institut national de santé du Québec (INSPQ)
- National Centre for Immunisation Research and Surveillance (NCIRS)
- National Institute for Public Health and the Environment (RIVM)
- Alberta COVID-19: Education and childcare
- COVID-19 School Response Dashboard
- Québec Situation in Québec
- Government of Ontario
- Ontario COVID-19 cases in schools and child care centres
- Newfoundland and Labrador Centre for Applied Health Research (NLCHAR)
- Health Information and Quality Authority (HIQA)
- Don't Forget the Bubbles

A copy of the full search strategy is available in Appendix 1.

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.

Additional exclusion criteria have been applied to this living review to refine its focus given the substantial body of evidence, and evolution of the COVID-19 pandemic.

Beginning in this version (December 2022), the following studies were excluded:

- Case reports or case series with less than 5 schools or daycares have been excluded.

Beginning August 2021, studies were excluded if:

- Data were collected prior to January 2021 when vaccines were not available, and VOCs were not prevalent in many countries

Beginning April 2021, the following studies were excluded:

- Studies that only report absolute number of cases or overall prevalence within a school or district without calculation of SAR or discussion of likelihood of transmission within the schools were ineligible for inclusion.
- Studies which described the risk of COVID-19 or COVID-19 mortality between teachers, students or parents of children attending school vs. those not attending school, or with no description of exposure within the school were ineligible.
- Predictive modelling studies using only estimated vs. collected data were not included.

	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.

Due to the large number of studies, studies are grouped into tables so similar studies can be reviewed together. These tables include 1) studies of transmission within schools and daycares; 2) studies exploring the relationship between IPAC measures and transmission in

schools and daycares; 3) studies of the impact of school in-person learning and community transmission; 4) studies of transmission within day and overnight camps; 5) in-progress single studies; 6) syntheses; 7) in-progress syntheses; and 8) Canadian surveillance data.

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
Cross-sectional	Joanna Briggs Institute (JBI) Checklist for Analytical Cross Sectional Studies
Prevalence	Joanna Briggs Institute (JBI) Checklist for Prevalence Studies
Quasi-experimental	Joanna Briggs Institute (JBI) Checklist for Quasi-Experimental Studies
Randomized Controlled Trial	Joanna Briggs Institute (JBI) Checklist for Randomized Controlled Trials

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 the Certainty of Evidence

In this update, 58 new single studies, seven new syntheses, two new in-progress single studies, two new in-progress syntheses, and one update to a synthesis were identified. 3 **previously included** studies were excluded based on new eligibility criteria, for a total of 100 publications addressing the research question.

A full list of studies that were previously included that are now excluded is available in Appendix 2.

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

Outcome	Studies included		Overall certainty in evidence (GRADE)	
	Study design	n		
COVID-19 transmission within schools/daycares (including number of cases, cases per population, and secondary attack rates (SARs))	Syntheses	8	⊕⊕⊕◯ Moderate[1]	COVID-19 transmission within schools/daycares is likely low compared to other settings, especially when IPAC measures are in place
	Observational	26		
Impact of combined IPAC measures on COVID-19 transmission within schools/daycares (including number of cases, cases per population, and SARs)	Syntheses	1	⊕⊕⊕◯ Moderate[1]	Combined IPAC measures are likely effective to mitigate transmission within schools and daycares.
	Observational	39		
Impact of **face masks** on COVID-19 transmission within schools/daycares (including number of cases, cases per population, and SARs) vs. no face masks	Syntheses	1	⊕⊕◯◯ Low[2]	Facemasks may decrease the risk of transmission within schools/daycares
	Observational	17		
Impact of **in-school surveillance testing** on COVID-19 transmission within schools/daycares (including number of cases, cases per population, and SARs) vs. no surveillance	Observational	8	⊕◯◯◯ Very Low[3]	It is very unclear whether surveillance testing reduces transmission in schools and daycares
Impact of **test-to-stay policies** on COVID-19 transmission within schools/daycares (including number of cases, cases per population, and SARs) vs. strict quarantine of close cases	Randomized controlled trial	1	⊕⊕◯◯ Low[2]	Test to stay policies may not increase the risk of transmission within school/daycares
	Observational	6		
Impact of **physical distancing** on COVID-19 transmission within schools/daycares (including number of cases, cases per population, and SARs) vs. no physical distancing policies	Observational	6	⊕⊕◯◯ Low[2]	Physical distancing may not decrease the risk of transmission within schools/daycares

Impact of **cohorting policies** on COVID-19 transmission within schools/daycares (including number of cases, cases per population, and SARs) vs. no cohorting	Observational	3	⊕◯◯◯ Very Low[3]	Cohorting may make little to no difference in transmission within schools/daycares
COVID-19 transmission in the community (change in number of cases, and cases per 100,000 before/after school re-opening)	Syntheses Observational	1 9	⊕⊕◯◯ Low[2]	Opening of schools/daycares may not meaningfully increase community incidence of COVID-19.
COVID-19 transmission within camps (including number of cases, cases per population, and SARs)	Observational	3	⊕◯◯◯ Very Low[4]	COVID-19 transmission within camps is very uncertain.

[1]In the GRADE approach to quality of evidence, **observational studies,** as included in this review, provide **low quality** evidence, and this assessment was upgraded to **moderate** based on the large effect observed.
[2]In the GRADE approach to quality of evidence, **observational studies,** as included in this review, provide **low quality** evidence. No additional up or downgrades were made.
[3]In the GRADE approach to quality of evidence, **observational studies,** as included in this review, provide **low quality** evidence, this assessment was downgraded due to inconsistency.
[4]In the GRADE approach to quality of evidence, **observational studies,** as included in this review, provide **low quality** evidence. This assessment was downgraded due to high risk of bias and inconsistency.

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 December 7, 2022						
Hargreaves, J.R., Langan, S.M., Oswald, W.E., Halliday, K.E., Sturgess, J., Phelan, J., ... COVID-19 Schools Infection Survey Study Group (2022). Epidemiology of SARS-CoV-2 infection among staff and students in a cohort of English primary and secondary schools during 2020-2021. *The Lancet regional health - Europe*, *21*, 100471.	Oct 21, 2022	Cohort	Primary and secondary schools, UK	• Enhanced ventilation • Cohorting (varied by setting) • Contact tracing • Hand hygiene • Masks • Physical distancing (varied by setting) • Quarantine policies • Regular surface cleaning • Testing	Serial RT-PCR and antibody testing were conducted in 7743 staff and 14,842 students in 91 randomly selected schools from Sept 2020-Jul 2021. Participation by school ranged from 12.9-48.8%. Infection and antibody prevalence were highly variable between schools. Infection prevalence was highest in Nov 2020 and lowest in July 2021, with higher vaccine coverage, although confidence intervals overlapped (data NR). From Nov 2020 to July 2021, antibody prevalence increased from 11.5% and 11.3% to 26.3% and 23.5% in primary and secondary school staff and 5.3-9.1% to 13.7-15.5% in students. Estimates of current infection prevalence in participants were lower than regional prevalence estimates by age group.	Moderate
Cordery, R., Reeves, L., Zhou, J., Rowan, A., Watber, P., Rosadas, C., ... Sriskandan, S. (2022). Transmission of SARS-CoV-2 by children to contacts in schools and households: a prospective	Aug 24, 2022	Prevalence	8 schools and daycares, London, UK	• Cohorting • Hand hygiene • Masks (students, except when seated in class) • Physical distancing • Quarantine policies • Symptomatic and asymptomatic contact screening (students, staff) • Testing	From Oct 2020 to July 2021, new cases where students had been in school within 48 hours were invited to participate; close contact testing was conducted for 4 weeks. Participation rate was low for out-of-school (median 8.8%, IQR: 5.25-10.0%) and in-school (median 22.5%, IQR 9.7-32.3%) contacts. • Secondary transmission detected in 1 of 8 classes; SAR = 1.5% • Household SAR = 28%	Moderate

cohort and environmental sampling study in London. *The Lancet Microbe*, S2666-5247(22)00124-0.					School environment was also tested following case detection; low levels of found contamination are consistent with low transmission frequency, possibly due to sufficient cleaning and ventilation.	
Stebbings, S., Rotevatn, T.A., Larsen, V.B., Surén, P., Elstrøm, P., Greve-Isdahl, M., … Astrup, E. (2022). Experience with open schools and preschools in periods of high community transmission of COVID-19 in Norway during the academic year of 2020/2021. *BMC public health*, *22*(1), 1454.	Jul 30, 2022	Prevalence	Preschools, schools, Norway	• Cohorting* • Enhanced cleaning • Hand hygiene • Hybrid learning* • Masks* • Physical distancing* • Quarantine policies • Symptomatic and asymptomatic contact screening (students, staff) • Testing *Contact-reducing measures adaptable to incidence level (e.g., three-level model).	Systematic surveillance of COVID-19 cases in 8311 schools from Sept 28, 2020-June 6, 2021. 1189 (41%) contained only a single case. 474 (28%) had insufficient information. Of Across 1203 outbreaks, 5032 students and 1498 staff identified. • 48% students only; 6% staff only Outbreaks were mostly small (median 3 cases; 2-72); 40 outbreaks (3%) included ≥20 cases	High
Campeau, L., Thistlethwaite, F., Yao, J.A., Hobbs, A.J., Shahriari, A., Vijh, R., … Zbar, A. (2022). Transmission dynamics of SARS-CoV-2 in British Columbia's largest school district during the second half of the 2020-2021 school year. *Canadian journal of public*	Jul 14, 2022	Prevalence	K-12 schools in one school district, Surrey, British Columbia, Canada	• Cohorting • Enhanced cleaning • Enhanced ventilation • Infrastructural adjustments (barriers erected) • Masks (grade 4 or over) • Physical distancing • Quarantine policies • Symptomatic and asymptomatic contact screening • Testing • Unidirectional flow of students	From Jan 4 – Jun 25, 2021, 2877 confirmed and probable student or staff cases were included; 83.4% of samples underwent whole-genome sequencing to confirm transmission links. • 262 cases (9.1%) confirmed in-school acquisition • 2142 (74.5%) confirmed out-of-school acquisition • 473 (16.4%) of cases unknown 126 clusters identified • Mean cluster size = 3 (SD: 5.3); median 2 (IQR: 1, 3) • Staff were more likely to have acquired in school vs. students (13.0% vs. 8.6%, p = 0.015)	High

health, *113*(5), 653–664.					Staff were more likely to be primary case vs. student (OR: 2.62, 95% CI: 1.64, 4.21).	
Choi, A., Mâsse, L.C., Bardwell, S., Kayda, I., Zhao, Y., Xu, Y.X.Z., … Goldfarb, D.M. (2022). Symptomatic and Asymptomatic Transmission of SARS-CoV-2 in K-12 Schools, British Columbia, Canada April to June 2021. *Microbiology spectrum*, *10*(4), e0062222.	Jul 6, 2022	Prevalence	K-12 schools in one school district, Vancouver, British Columbia, Canada	• Cohorting (staff) • Enhanced cleaning • Enhanced ventilation • Hand hygiene • Individual protection devices • Infrastructural adjustments (barriers erected; staff only spaces) • Masks • Physical distancing • Quarantine policies • Staggering times (recess, class transitions) • Symptomatic and asymptomatic contact screening • Testing • Unidirectional flow of students	From Apr 12 – Jun 31 2021, 69 students (94%) and staff (6%) tested positive and 392 close contacts were identified (58% school, 30% household, 6% social, 6% other or mixed). • 48 secondary cases (SAR=12%) • 3/229 school contacts (SAR = 1.3%) • 43/117 household contacts (SAR = 36.8%) • 2/46 other/mixed (SAR = 4.3%) Of secondary cases, 67% of school cases (2/3) identified through asymptomatic testing.	Moderate
Van Heirstraeten, L., Ekinci, E., Smet, M., Berkell, M., Willen, L., Coppens, J., Spiessens, A., … Malhotra-Kumar, S. (2022). Detection of SARS-CoV-2 in young children attending day-care centres in Belgium, May 2020 to February 2022. *Euro*	May 27, 2022	Cohort	100 daycares, Belgium	• Not reported	Screening via RT-PCR within an ongoing cohort study took place in May-June 2020, Nov-May 2021, and Nov -Feb 2022. No positive tests occurred until the Delta/Omicron wave began;11 positive tests in 9 centers suggest transmission within daycares was low.	Moderate

surveillance, *27*(21), 2200380.						
Boutzoukas, A.E., Zimmerman, K.O., Benjamin, D.K., DeMuri, G.P., Kalu, I.C., Smith, M.J., … Butteris, S.M. (2022). Secondary Transmission of COVID-19 in K-12 Schools: Findings From 2 States. *Pediatrics*, *149*(12 Suppl 2), e2021054268K.	Feb 1, 2022	Quasi-experimental	K-12 schools, North Carolina and Wisconsin, USA	• Masks • Quarantine policies • Hand hygiene • Physical distancing (varied by setting)	Surveillance data from 1,102,039 students and staff from Mar 15 - Jun 25, 2021, were analyzed. 7865 primary infections and 386 secondary infections were detected. Ratio of school- to community-acquired infections was 0.05. Among 102 districts with appropriate data, estimated SAR was 0.7% (range 0% to 33%).	Moderate
Stange, M., Wuerfel, E., Peter, J.K., Seth-Smith, H., Roloff, T., Gsponer, S., … Egli, A. (2022). SARS-CoV-2 in schools: genome analysis shows that concurrent cases in the second and third wave were often unconnected. *Preprint.*	Jan 28, 2022	Cohort	Schools and daycares, Basel-City, Switzerland	• Masks (students aged 12 years and older) • Physical distancing • Testing	Whole-genome sequencing was conducted with 83 students, 35 staff, and 117 close contact samples from Oct 2020-May 2021 within ongoing cohort. Samples were eligible when >5 clustered cases were identified. 22 single cases and 55 clusters with 566 cases (range 2-63 cases per cluster) were identified. • 31 community-, 13 school-initiated (11 unknown) • 15 chains resulted in in-school transmission (vs. 29 out of school); 7/15 initiated by staff, 5 by students	High ***PREPRINT***
Blanchard, A.C., Desforges, M., Labbé, A.C., Nguyen, C.T., Petit, Y., Besner, D., … Quach, C. (2022). Evaluation of real-life use of Point-Of-Care	Jan 23, 2022	Cohort	Two secondary schools, Montreal, Quebec, Canada	• Cohorting • Masks • Physical distancing (3 ft between desks)	Staff and students tested weekly via rapid antigen detection tests and PCR. • Of 235 students who developed symptoms and tested on site, 10 had a positive rapid test and 12 had a positive PCR [prevalence=5.1% (95% CI 2.7-8.7)].	Low ***PREPRINT***

Rapid Antigen TEsting for SARS-CoV-2 in schools (EPOCRATES). *Preprint.*					• 64 staff were tested for symptoms 1 had a positive rapid test and PCR. • Additionally, 1 case was identified by PCR after a negative rapid test. • Of all participants, 76 PCR (gargle or nasal) positive cases were identified, including three cases in staff members. 20 out of the 35 classes included in the study returned on D8 after contact, if the gargle PCR was negative on D6 or D7. • 15 secondary cases within 10 classes were identified. • Only 7 false positive rapid antigen detection tests during the 5-month study (all in asymptomatic individuals) and the specificity of the rapid antigen detection tests remained excellent in all circumstances (99.8% and 100%).	
Heinsohn, T., Lange, B., Vanella, P., Rodiah, I., Glöckner, S., Joachim, A., ... Krause, G. (2022). Infection and transmission risks in schools and contribution to the COVID-19 pandemic in Germany–a retrospective observational study using nation-wide and regional health and education agency notification data. *Preprint.*	Jan 21, 2022	Cohort	Primary and secondary schools, Germany	• Masks • Testing *Varied by region and over time	National-level data were analyzed from Feb – Oct 2021, including 304,676 students and 32,992 teachers. • Infection risks ranged from 2-7.6% for the general population, 1.3-5.8% for students, 2.3-3.2% for teachers • Infection risk was lower for age <10 vs. 10-14 and 15-19 years • SAR ranged from 4.6-12.8% across counties • SAR increased in later periods with VOCs SAR rate was lower in school contacts (1.2%) vs. household contacts (23.2%) despite 2.2 times more contacts in schools than out	High ***PREPRINT***

Loss, J., Wurm, J., Varnaccia, G., Schienkiewitz, A., Iwanowski, H., Loer, A. … Jordan, S. (2022). Transmission of SARS-CoV-2 among children and staff in German daycare centres. *Epidemiology and infection*, *150*, e141.	Dec 27, 2021	Cohort	Daycares, Germany	• Enhanced cleaning • Enhanced ventilation • Masks (staff)	From Oct 2020-June 2021, 30 daycares with a positive case included (282 children, 91 staff, 45 household contacts). 74% of close contacts included. • 22/30 (73.3%) of daycares had only a single case • Overall SAR=9.6% (95% CI: 4.0, 21.3%) • SAR did not differ between adult (11.2%) and child (7.0%) index cases, p=0.706 • SAR appeared higher with Alpha variant (15.9% vs. 5.1%), but not statistically significant • SAR in households (53.3%, 95% CI: 35.4, 70.4%) higher than daycares (NR), p = <0.001	Moderate
Winje, B.A., Ofitserova, T.S., Brynildsrud, O.B., Greve-Isdahl, M., Bragstad, K., Rykkvin, R., … Brandal, L. T. (2021). Comprehensive Contact Tracing, Testing and Sequencing Show Limited Transmission of SARS-CoV-2 between Children in Schools in Norway, August 2020 to May 2021. *Microorganisms*, *9*(12), 2587.	Dec 14, 2021	Prevalence	Primary and secondary schools, Norway	• Cohorting* • Enhanced cleaning • Hand hygiene • Hybrid learning* • Masks* • Physical distancing* • Quarantine policies • Symptomatic and asymptomatic contact screening (students, staff) • Testing *Contact-reducing measures adaptable to incidence level (e.g., three-level model).	Close contacts of confirmed cases identified from two districts pre (Aug 2020-Feb 2021) and post-Alpha VoC (Mar-May 2021). • 43 positive cases, 559 child and 100 adult contacts (60.3% participation) • SAR = 1.4%, 95% CI: 0.62–2.80) • No difference before (1.4%, 95% CI: 0.50, 2.94) or during Alpha wave (1.7%, 95% CI: 0.21–5.99), p = 0.665. No difference between primary (1.0%, 95% CI: 0.27–2.53) and secondary (2.6%, 95% CI: 0.70–6.39) schools, p = 0.229.	High

Rotevatn, T.A., Larsen, B.V., Bjordal Johansen, T.K., Astrup, E., Surén, P., … Telle, K. (2022). Transmission of SARS-CoV-2 in Norwegian schools: A population-wide register-based cohort study on characteristics of the index case and secondary attack rates. *BMJ Medicine*, *1*(1).	Oct 7, 2021	Cohort	Primary and secondary schools, Norway	• Cohorting* • Enhanced cleaning • Hand hygiene • Hybrid learning* • Masks* • Physical distancing* • Quarantine policies • Symptomatic and asymptomatic contact screening (students, staff) • Testing *Contact reducing measures adaptable to incidence level (e.g., three-level model).	Population registry data were analyzed from Aug 2020-June 2021 including 640,295 students and 102,574 staff in 2641 schools. • 15,390 (2.4%) students and 2419 (2.4%) staff tested positive • 4,078 index cases included in analysis (79% students, 21% staff) • 2,230 (54.7%) single cases • 631 (15.5%) resulted in one additional case • 1217 (29.8%) clusters had multiple cases; clusters more common in larger schools, amongst students, and in secondary vs. primary schools SAR = 0.33% (95% CI: 0.32, 0.33%); SAR higher during VoC, no statistically significant difference.	Moderate
Zimmerman, K.O., Brookhart, M.A., Kalu, I.C., Boutzoukas, A.E., McGann, K.A., Smith, M.J., … ABC Science Collaborative (2021). Community SARS-CoV-2 Surge and Within-School Transmission. *Pediatrics*, *148*(4), e2021052686.	Oct 1, 2021	Prevalence	K-12 schools, 13 districts, North Carolina, USA	• Cohorting • Hand hygiene • Hybrid learning • Infrastructural adjustments (no locker room use) • Masks • One student per bus seat • Physical distancing • Symptom screening (varied by period in school year) • Symptomatic and asymptomatic contact screening • Temperature checking (varied by period in school year) • Unidirectional flow of students	Surveillance data were collected from 13 districts, including >100,000 staff and students during community surge (Oct 2020-Feb 2021) compared to pre-surge (Aug-Oct 2020). • Rate of primary infections in schools paralleled community rates before and during surge. • 209 school-acquired infections were identified, SAR <1%. • 75% of infections occurred in school sports	Moderate

Nelson, S. B., Dugdale, C. M., Bilinski, A., Cosar, D., Pollock, N. R., & Ciaranello, A. (2021). Prevalence and risk factors for in-school transmission of SARS-CoV-2 in Massachusetts K-12 public schools, 2020-2021. *Preprint.*	Sep 26, 2021	Prevalence	K-12 Public schools, Massachusetts, USA	• Masks • Symptomatic and asymptomatic contact screening • Testing	Data were collected from 70 schools from Aug 2020-June 2021. • 435 index cases, 1,771 school contacts identified • Of 1327 (75%) who were tested, 39 tested positive, 29 deemed possible or probably in-school transmission, SAR = 2.2% • Of school-related cases, 6 (20.7%) were staff-to-staff, 7 (24.1%) staff-to-student, 3 (10.3%) student-to-staff, and 13 (44.8%) student-to-student • SAR was higher for staff vs. student index cases (RR: 2.18, 95% CI 1.06-4.49; p=0.030), if exposure occurred at lunch (RR 5.74, 95% CI 2.11-15.63; p<0.001) • SAR did not differ by grade level.	Moderate ***PREPRINT***
Rowland, L. C., Hahn, J. B., Jelderks, T. L., Welch, N. M., & Ramirez, D. W. (2021). SARS-CoV-2 incidence and transmission in 48 K-12 Virginia public schools during community surge. *Journal of the Pediatric Infectious Diseases Society*, 10(11), 1018-1022.	Aug 26, 2021	Cohort	K-12 public schools, Virginia, USA	• Cohorting • Enhanced cleaning (surface disinfection) • Enhanced ventilation • Hand hygiene • Masks • Symptom screening • Physical barriers (e.g., isolation room, plexiglass for separation). • Physical distancing • School staff and nurses received training as part of prevention strategy.	School district data on positive school-related cases were collected from Sept-Jan 2021. Community surge occurred in Dec 2020. Among 20,681 students and 4,282 in-person staff, 820 positive cases were identified that entered a school building during a potentially infectious period. • 33 of 820 (4.0%) attributed to in-school transmission • 490/820 (59.8%) linked to household contacts • 221/820 (27.0%) could not be determined	Moderate

Previously reported evidence						
Aiano, F., McOwat, K., Obi, C., Powell, A.A., Flood, J., Bhardwaj, S., … Saliba, V. (2022). A cross-sectional national investigation of COVID-19 outbreaks in nurseries during rapid spread of the Alpha (B.1.1.7) variant of SARS-CoV-2 in England. *BMC public health*, *22*(1), 1845.	Oct 2, 2022	Prevalence	Daycares, England, UK (B.1.1.7)	• Cohorting • Physical distancing	From Nov 2, 2020 – Jan 31, 2021, 324/32,852 daycares reported an outbreak (0.98%). This study includes data from 173 daycares, reporting 1657 cases: 510 children (31%), 1147 staff (69%) (median 8 cases/outbreak, mode 2 cases/outbreak) Overall SAR was 9.1% (95% CI=8.65,9.48) • Child index case in 26% of outbreaks: SAR: 7.97% (95% CI=7.24,8.77) (Highest in those <1 and decreased with age) • Staff index case in 72% of outbreaks: SAR: 9.48% (95% CI=8.98,10.0) Staff to staff transmission was highest (SAR: 32.98, 95% CI=31.19,34.82), followed by child to staff (SAR: 26.28, 95% CI= 23.54,29.21) and lowest in child-to-child transmission (SAR: 3.55, 95% CI=3.01,4.19). SAR were higher in Jan 2021 when B.1.1.7 variants increased (compared to Nov 2020), suggesting variants may be more transmissible, although community rates also rose at the same time: • Children: SAR: 4.21% (95% CI=3.72,4.77) vs. 2.34% (95% CI=1.94,2.81) • Staff: SAR: 33.96% (95% CI=31.52,36.48) vs. 24.26% (95% CI=21.97,26.72)	Moderate
Ladhani, S.N., Ireland, G., Baawuah, F., Beckmann, J., Okike, I.O., Ahmad, S., … Ramsay, M.E. (2021). Emergence of SARS-CoV-2 Alpha (B.1.1.7) variant, infection rates, antibody	Nov 1, 2021	Cohort	Secondary schools, Derbyshire, West London, East London, Greater Manchester, Hertfordshire and Birmingham, England	• Masks (students, except when seated in class) • Widespread full closure in Mar 2020 partial reopening in Jun 2020, in-person Sep 2020 and closure Jan 5 - Mar 8, 2021	Point-prevalence testing occurred in 18 secondary schools at points: T1, Sept 22 – Oct 17, 2020, T2, Dec 3 – 17, 2020 and T3, Mar 23 – Apr 21, 2021. At T3, only 5.7% of students and 70.3% of staff attended in-person school part-time and 11.5% of students and 29.7% of staff attended full-time. 42.9% of staff and 1.3% of students reported being vaccinated.	Moderate

seroconversion and seroprevalence rates in secondary school students and staff: Active prospective surveillance, December 2020 to March 2021, England. *The Journal of infection*, *83*(5), 573–580.					• From T2-T3, 5.7% (62/1094) of students and 4.4% (35/792) of staff had RT-PCR confirmed infection (through study testing or national registry) • Seroprevalence increased from 11.0% at T1, to 13.3% at T2 and 20.9% at T3. • Using the N and S antibody test, at T3, seroprevalence was 36.3% (370/1018) in students and 31.9% (245/769) in staff Seroprevalence varied widely by region. Students who attended school in-person during at T3 had higher odds of seropositivity vs. those learning from home: **OR: 2.27 (95% CI=1.06,4.68)**	

Haag, L., Blankenburg, J., Unrath, M., Grabietz, J., Kahre, E., Galow, L., … Armann, J.P. (2021). Prevalence and Transmission of Severe Acute Respiratory Syndrome Coronavirus Type 2 in Childcare Facilities: A Longitudinal Study. *The Journal of pediatrics*, *237*, 136–142.	Oct 1, 2021	Cohort	14 Daycare facilities for children aged 1-6, Dresden, Saxony, Germany	• Masks (parents)	From Jul 15, 2020 – Jan 31, 2021, COVID-19 seropositivity of 318 children, 299 parents, and 233 staff from 14 daycares was monitored during periods of low and high community prevalence. No participants were seropositive at baseline.
					
					Period of low prevalence; 4 confirmed cases:
					• 1/154 (0.6%) staff
					• 1/196 (0.5%) parent
					• 2/232 (0.9%) children
					
					Period of high prevalence; 63 confirmed cases in 8 facilities:
					• 23/87 (12.3%) staff
					  ○ More administrative staff (20.8%) vs. childcare staff (8.1%), **p=0.034**
					• 25/236 (10.6%) parents
					• 15/222 (6.8%) children
					  ○ 4 clusters, range 2-3 children
					5/12 cases had no facility link
						Moderate

Ulyte, A., Radtke, T., Abela, I.A., Haile, S.R., Ammann, P., Berger, C., … Kriemler, S. (2021). Evolution of SARS-CoV-2 seroprevalence and clusters in school children from June 2020 to April 2021: prospective cohort study Ciao Corona. *Swiss medical weekly, 151*, w30092.	Jul 19, 2021	Cohort	Primary, middle and secondary schools, Zurich, Switzerland	• Cohorting • Contact tracing • Masks (gradual adoption starting with adults then upper and middle schools, masks for lower age children not mandated) • Physical distancing • Reduced common activities • Quarantine policies • School-wide screening with RT-PCR testing in cases of suspected outbreak starting Feb 2021 • Schools remained open for physical attendance from May 2020 to the end of the 2020/21 school year	In Jun/Jul, Oct/Nov 2020, Mar/Apr 2021 classes and schools were randomly selected to take part in seroprevalence testing. 2974 children from 275 classes in 55 schools enrolled. Median participation within each class was 50%. Seroprevalence increased from 1.5% (95% CI=0.6,2.6) in Jun – Jul to 6.6% (95% CI=4.0,8.9) in Oct – Nov and 16.4% (95% CI=12.1,19.5) in Mar-Apr 2021. Community daily incidence of positive cases peaked at 88/100,000 on Oct 28, 2020. There were no differences by sex but did differ by district and age. • Higher in middle school (aged 8-13, 19.5%) vs. upper level (age 12-17, 12.4%), **p=0.02** • No difference between lower (aged 7-19, 16%) and middle or upper. At least 1 seropositive child was detected in all 55 schools and in 184/275 (67%) classes, (range 0-15 per school, 0-13 per class). 14% of classes at clusters of 3+ cases; 25 were investigated further. Within-school transmission was likely in 12/25 (48%), improbable in 7/25 (28%) and undetermined in 6/25 (24%). Most PCR-positive cases were linked to a household source.	Moderate
Schenk, B., Hoehl, S., Rudych, O., Menger, D., Farmand, S., Wrobel, F. … Ciesek, S. (2021). Longitudinal testing for SARS-	Jul 3, 2021	Cohort	Daycare centers, Hesse, Germany	Not reported	SAFE KiDS 2: 577 children, 334 staff from 47 daycare centers were tested weekly for 4 weeks via RT-PCR in Jan – Feb 2021. 7-day community incidence 66.0 to 138.7 per 100,000 • 7/577 (1.21%) children tested positive • 1/334 (0.3%) staff tested positive	Low ***PREPRINT***

CoV-2 RNA in day care centers in Hesse, Germany, during increased local incidence and with VOC Alpha as dominant variant: Results of the SAFE KiDS 2 and SAFE KiDS 3 study. *Preprint.*					• Only 3/8 positive cases were confirmed via health dept testing • In 6/8 positive cases, other household members also tested positive • No in-school transmission was detected • No VOC detected SAFE KiDS 3: 756 chidren, 226 staff from 46 daycares centres tested weekly for 4 weeks via RT-PCR in May – Jun 2021. 7-day community incidence 4.7-124.6 per 100,000; alpha VOC prominent. No positive results were detected. Results suggest that daycare centers have a limited role in transmission even with high community incidence.	

Gettings, J.R., Gold, J.A.W., Kimball, A., Forsberg, K., Scott, C., Uehara, A. … Vallabhaneni, S. (2021). SARS-CoV-2 transmission in a Georgia school district — United States, December 2020–January 2021. *Clinical Infectious Diseases,* ciab332.	Apr 17, 2021	Prevalence	School district in metropolitan Atlanta, Georgia, USA	• Enhanced cleaning
				• Enhanced ventilation
				• Hand hygiene
				• Masks (except during sports)
				• Physical distancing (<3 ft. in elementary schools due to higher class sizes)
				• Plastic barriers around desks
					From Dec 1, 2020 – Jan 22, 2021, 98 school cases were identified; 86 included in analysis:
					• 33 (38.4%) staff; 53 (61.6%) students
					  ○ Of 1,119 close contacts, 68 of 688 tested were positive
					
					Secondary Attack Rate (SAR) among:
					• Students: 5.8% (95% CI=3.6,8.0)
					• Staff: 13.1% (95% CI=9.0,17.2)
					
					Higher SAR occurred in:
					• Indoor high impact sports: 23.8% (95% CI=12.7,33.3)
					• Staff interactions: 18.2% (95% CI=4.5,31.8)
					• Elementary classrooms: 9.5% (95% CI=6.5,12.5)
					  ○ Elementary teachers: 15.0 (95% CI=10.2,19.8)
					  ○ Symptomatic staff; 13.7% (95% CI=9.1,17.8)
					Lower SAR occurred in:
					• Asymptomatic students: 2.3% (95% CI=0.6,4.6)
						Moderate

					• Elementary students: 2.7% (95% CI=0.7,5.3) 69 samples were sequenced. No variants of concern were detected.	
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 SARS-CoV-2 second wave in Italy, *The Lancet Regional Health – Europe, 5,* 100092.	Mar 26, 2021	Prevalence	Kindergarten, elementary, middle and high schools, Italy	• Ban on sports and music • Enhanced ventilation • Hand hygiene • Masks (staff, high school students) • Negative test following exposure (some schools) • Physical distancing (1m between seats) • Reduced school hours • Temperature check • Unidirectional flow of students	From Sep 30, 2020 – Feb 28, 2021, incidence and positivity were lower amongst elementary and middle school students compared to 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. 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. Teacher to teacher transmission (37%) was more common than student to teacher (10%) **(p=0.007)**. Incidence by school level (Nov 23-28): • Kindergarten: 0.21% of children and 2.35% of teachers • Elementary: 0.35% of children and 1.83% of teachers • Middle: 0.45% of students and 1.60% of teachers 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.	High

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	• Masks • Hybrid learning (81% in-person) • Physical distancing (6 ft) • • Plexiglass barriers for teachers • Staggered mealtimes	From Dec 3 – Jan 21, 2021, susceptible school contacts of 51 index cases (40 students, 11 staff) were contacted: • Of 1041 close contacts, 735 (70.6%) were tested, 12 were positive (SAR: 1.6%) • 5 of 12 positive cases were classified as school-associated • 4 of 5 events were deemed to be due to lapses in IPAC measures (<6ft distance during class (2) or lunch (2), and poor mask compliance (2). • Tertiary transmission was detected in 3 households	Moderate
van Loon, W., Hommes, F., Theuring, S., von der Haar, A., Körner, J., Schmidt, M. … Mockenhaupt, F. P. (2021). Renewed absence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections in the day care context in Berlin, January 2021. *Clinical Infectious Diseases,* ciab199.	Mar 2, 2021	Cohort	Kindergarten, Metropolitan Berlin, Germany	Not reported	From Jan 17 – 23, 2021, children, families, and staff from 12 kindergarten programs were sampled: • 149 kindergarten children • 74 staff • 472 household members All tested negative for COVID-19. Community weekly incidence in the same time period was 110/100,000. Small sample size (n=12 centres) may not be representative of the >2600 kindergartens in Berlin.	Low

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	Case report	Elementary schools, Georgia, USA	• Masks (except while eating) • 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. 2600 students and 700 staff attended school during this time. 18/69 (26%) household contacts tested positive. Median cluster size (including household members) was 6 (range 3-16). Index patients were: • Staff (4 clusters) • Student (1 cluster) • Unknown (5 clusters) Probable transmission included: • Staff-to-student (8 clusters) • Student-to-student (4 clusters) • Student-to-staff (3 clusters) • Staff-to-staff (2 clusters; which was followed by staff-to-student transmission and resulted in 15/31 school-associated cases) 9 clusters involved lack of physical distancing, 5 inadequate student mask use.	Moderate

Table 2: Single Studies, Associations Between Mitigation Measures and Outcomes

Reference	Date Released	Study Design	Setting, Location	IPAC measures	Summary of Findings	Quality Rating:
Mask wearing (n = 17)						
New evidence reported on December 7, 2022						
Jarnig, G., Kerbl, R., & van Poppel, M.N.M. (2022). Effects of Wearing FFP2 Masks on SARS-CoV-2 Infection Rates in Classrooms. *International journal of environmental research and public health*, *19*(20), 13511.	Oct 19, 2022	Quasi-experimental	Secondary schools, Klagenfurt, Austria	Sep-Oct 2021 (low community incidence, delta) • Voluntary testing (rapid antigen) at school P2/P3 (high community incidence, delta/omicron): • Masks (FFP-2) • Physical distancing (1 m) • Quarantine policies (10 days) • Testing (3x week; 2 PCR, 1 rapid antigen) P4: Mar-Apr 2022 (low community incidence, omicron): • Testing (2 PCR, 1 rapid antigen)	Data were collected through Sep 2021 – Apr 2022, period 1 (Sep- Oct 2021), period 2 (Nov-Dec 2021), period 3 (Jan-Feb), period 4 (Mar-Apr) . Infection rates compared between students attending general school (facemasks used, n = 419) and sport development school (limited face mask use, n=195) Sport students more likely to be infected • P2: OR=1.97, 95%CI=1.19,3.26 • P3: OR=2.61, 95%CI=1.84,3.69 • P4: OR=1.45, 95%CI=1.02,2.06 Mean 7-day incidence higher in sport students in P1, P2, P3 (p<0.001), but higher in general students in P4 (after mitigation measures relaxed; p<0.001).	High
Chandra, A., & Høeg, T.B. (2022). Lack of correlation between school mask mandates and paediatric COVID-19 cases in a large cohort. *The journal of infection*, S0163-	Sep 29, 2022	Quasi-experimental	1832 counties, USA	• Not reported	Data were analyzed from 3 weeks prior to 9 weeks after school reopening (Aug-Nov 2021). In the first 2 weeks, and after 9-weeks, change in pediatric cases were not different between counties with and without mask mandates After 9-weeks, pediatric cases per 100,000 were 21.8 in counties without mask mandates vs. 24.3 in counties with mandates (p = 0.057)	Moderate

4453(22)00550-3. Epub ahead of print.					After adjusting for covariates, mask mandates are associated with an increase in 1.279 pediatric cases per 100 000, p = 0.058	
Coma, E., Català, M., Méndez-Boo, L., Alonso, S., Hermosilla, E., Alvarez-Lacalle, E., … Prats, C. (2022). Unravelling the role of the mandatory use of face covering masks for the control of SARS-CoV-2 in schools: a quasi-experimental study nested in a population-based cohort in Catalonia (Spain). *Archives of disease in childhood*. Epub ahead of print.	Aug 23, 2022	Quasi-experimental	Pre-schools and primary schools, Spain	• Cohorts • Masks (>6yo)	Using data from 1907 schools, 599,314 students from Sep-Dec 2021, data from preschool students (3-5y, no mask mandate) were compared to primary students (6-11y, mask mandate) • Cumulative incidence and reproductive rate lower in preschool vs. primary school over all time periods, p-value, NR) • Cumulative incidence higher for 6yo (masked) vs. 5yo (not masked), OR=1.15 (95% CI 1.08, 1.22) • Test positivity higher for 6yo (masked) vs. 5yo (not masked) = 7.98% (95% CI 7.69, 8.27) vs. 6.82% (95% CI 6.55, 7.10), p-value NR • No difference in SAR: IRR: 0.96 (95% CI 0.82, 1.11) or reproductive number, OR 0.96, 95% CI 0.87, 1.09) Findings suggest masks do not provide extra protection in this age group.	Moderate
Cowger, T.L., Clarke, J., Murray, E.J., Sánchez, S.M., Bassett, M.T., Ojikutu, B.O., … Hall, K.T. (2022). Impact of Lifting School Masking Requirements on Incidence of COVID-19 among Staff and Students in Greater-Boston	Aug 9, 2022	Quasi-experimental	School districts, Boston, USA	• Not reported	Data were collected from 72 districts in 2021-2022 school year with changing mask policies. Lifting masking requirements led to an increase of 44.9 cases per 1,000 students and staff (95% CI=32.6, 57.1) vs. districts that maintained mask policies over 15 weeks. Increased risk was higher for staff: 81.7 (95% CI= 59.3, 104.1) cases per 1,000 staff over 15 weeks (student data NR). Strength of the association between masks and case incidence stronger in areas of high community transmission (data NR).	High ***PREPRINT***

Area School Districts: A Difference-in-Differences Analysis. *Preprint.*						
Sood, N., Heick, S., Stevenson, J., Høeg, T. (2022). Association between School Mask Mandates and SARS-CoV-2 Student Infections: Evidence from a Natural Experiment of Neighboring K-12 Districts in North Dakota. *Preprint.*	Jul 1, 2022	Quasi-experimental	Two adjacent K-12 school districts, Fargo, North Dakota, USA	• Enhanced cleaning • Enhanced ventilation upgrades • Quarantine policies (symptomatic students)** • Voluntary testing **One district also required quarantine for close contacts	Data were analyzed in Fall 2021, comparing one district that mandated masks to one that did not. No difference between districts: IRR= 0.99; 95% CI= 0.92, 1.07. Both districts moved to optional masks in Winter 2022; no differences found: IRR 1.04; 95% CI: 0.92, 1.16.	Moderate ***PREPRINT***
Boutzoukas, A.E., Zimmerman, K.O., Inkelas, M., Brookhart, M.A., Benjamin, D.K., Butteris, S., … Benjamin, D.K. (2022). School Masking Policies and Secondary SARS-CoV-2 Transmission. *Pediatrics*, *149*(6), e2022056687.	May 20, 2022	Quasi experimental	K-12 schools, USA	• Symptomatic and asymptomatic contact screening • Physical distancing	Data were collected from Jul 26 - Dec 31, 2021. Risk of secondary transmission was higher when masks optional vs. mandated, RR: 7.5, 95% CI = 4.21, 13.42.	Moderate
Hughes, A.E., Medford, R.J., Perl, T.M., Basit, M.A., & Kapinos, K.A. (2022). District-Level Universal Masking Policies and	May 2, 2022	Quasi experimental	School districts, Texas, USA	• Not reported	Data were collected from 61 school districts, Aug-Oct 2021. Districts without mask mandates reported an additional 2 student cases per 1000 from weeks 2-6, or 37 cases per week (range: 28-42) (p-value NR). No difference was found after 7-8 weeks following school start.	Moderate

COVID-19 Incidence During the First 8 Weeks of School in Texas. *American journal of public health*, *112*(6), 871–875.					A statistically significant increase in staff cases was found in week 4 only: 0.5 staff cases per 1000 or 9 total excess staff cases (p = 0.04).	
Neuberger, F.S., Grgic, M., Buchholz, U., Maly-Motta, H., Fackler, S., Lehfeld, A.S., … Kuger, S. Delta and Omicron: Protective Measures and SARS-CoV-2 Infections in Day Care Centres in Germany in the 4th and 5th Wave of the Pandemic 2021/2022. *Preprint.*	Apr 12, 2022	Cohort	Daycares, Germany	• Cohorting • Enhanced ventilation • Physical distancing • School closure • Testing	From Aug 2020 - May 2021, data were collected from 8500 daycares. Mask wearing amongst staff associated with lower number of cases during omicron wave: • In children: IRR: 0.87, 95% CI: 0.80, .93 • In staff: IRR: 0.89, 95% CI: 0.82, 0.96 Mask wearing amongst staff associated with lower number of cases during delta wave: • IRR: 0.83, 95% CI: 0.70, 0.97 No statistical significance for students or staff during alpha wave, or students during delta wave (data NR).	Moderate ***PREPRINT***
Shah, M., Shah, M., & Hollingsworth, J.W. (2022). Relation of masking policy to COVID-19 positivity rate in Texas school districts. *Baylor University Medical Center Proceedings*, *35*(4), 466–467.	Apr 5, 2022	Quasi-experimental	Schools, Texas, USA	• Not reported	Data were collected through 2021–2022 school year. Student test positivity was lower with mask mandatory vs. optional policies (3.20± 0.39 vs 6.12 ± 0.85%, p = 0.004). There was no difference in staff test positivity between districts with mask mandatory vs. optional (9.30 ± 4.05 vs. 9.77 ±1.47%, p = 0.91).	Low

Donovan, C.V., Rose, C., Lewis, K.N., Vang, K., Stanley, N., Motley, M., … Cima, M. (2022). SARS-CoV-2 Incidence in K-12 School Districts with Mask-Required Versus Mask-Optional Policies - Arkansas, August-October 2021. *Morbidity and mortality weekly report*, *71*(10), 384–389.	Mar 11, 2022	Cohort	K-12 School districts, Arkansas, USA	• Cohorting	Data were collected from Aug- Oct 2021 in districts with full mask, partial mask and no mask policies. Incidence lower in full vs. no mask districts: IRR = 0.77, 95% CI= 0.66, 0.88). • Staff only: IRR = 0.76, 95% CI= 0.64, 0.90 • Students only: IRR = 0.77, 95% CI= 0.66, 0.89 No difference in partial vs. no mask districts • IRR = 0.88 ,95% CI= 0.77, 1.01 • Staff only: IRR=0.85 ,95% CI= 0.71, 1.02 • Students only: IRR= 0.89, 95% CI= 0.77, 1.03	Moderate
Heinsohn, T., Lange, B., Vanella, P., Rodiah, I., Glöckner, S., Joachim, A., … Krause, G. (2022). Infection and transmission risks in schools and contribution to the COVID-19 pandemic in Germany–a retrospective observational study using nation-wide and regional health and education agency notification data. *Preprint.*	Jan 21, 2022	Cohort	Primary and secondary schools, Germany	• Masks • Testing *Varied by region and over time	Data were collected from Mar 2020 - Oct 2021. Compared to no mask mandates, partial mask mandates decreased infections in students by -17.8 cases/100 000 per 14-days (95% CI: - 25.5, -10) but not teachers (RD: 9.9 cases/100 000 per 14 days (95% CI: - 5.2, 25.1)). Mandatory masks in all classes decreased infections in students by - 55.5 cases/100 000 per 14 days (95% CI: - 63.4, - 47.7) and teachers by - 55.6 cases/100 000 per 14 days (95% CI: - 71.6, - 39.6).	High ***PREPRINT***

Murray, T.S., Malik, A.A., Shafiq, M., Lee, A., Harris, C., Klotz, M., ... Gilliam, W. S. (2022). Association of Child Masking With COVID-19–Related Closures in US Childcare Programs. *JAMA network open*, *5*(1), e2141227.	Jan 4, 2022	Cohort	Daycares, USA	• Physical distancing • Screening	Data were collected from May 22 -June 8, 2020, and May 26- June 23, 2021. • Early adoption child masking was associated with lower risk of closure due to case (RR=0.87, 95%CI= 0.77,0.99). • Continued masking for 1 year was associated with lower risk of closure due to case (RR=0.86, 95%CI= 0.74,1.00).	Moderate
Sombetzki, M., Lücker, P., Ehmke, M., Bock, S., Littmann, M., Reisinger, E.C., ... & Kästner, A. (2021). Impact of Changes in Infection Control Measures on the Dynamics of COVID-19 Infections in Schools and Pre-schools. *Frontiers in Public Health*, 2069.	Dec 20, 2021	Cross-sectional	Schools and preschools, Germany	• Physical distancing • Testing	Data were collected from Aug 2020-May 2021. After adjustment for potential covariates, mandatory masking was associated with reduced risk of secondary cases • Staff: -0.941 cases (95% CI: -2.886, -0.996) • Children: −0.565 cases (95% CI: -0.944, -0.186)	High
Nelson, S.B., Dugdale, C.M., Bilinski, A., Cosar, D., Pollock, N.R., & Ciaranello, A. (2021). Prevalence and risk factors for in-school transmission of	Sep 26, 2021	Prevalence	K-12 Public schools, Massachusetts, USA	• Symptomatic and asymptomatic contact screening • Testing	Data were collected from all confirmed cases during 2020-21 school year, prior to delta VOC. Unadjusted SAR higher when index and close contacts were unmasked vs. masked (RR: 6.98, 95% CI=3.09, 15.77).	Moderate ***PREPRINT***

SARS-CoV-2 in Massachusetts K-12 public schools, 2020-2021. *Preprint*.						
Budzyn, S.E., Panaggio, M.J., Parks, S.E., Papazian, M., Magid, J., Eng, M., & Barrios, L. C. (2021). Pediatric COVID-19 cases in counties with and without school mask requirements—United States, July 1–September 4, 2021. *Morbidity and Mortality Weekly Report*, *70*(39), 1377.	Oct 1, 2021	Cohort	K-12 schools, USA	• Not reported	Data were collected from Jul –Sep 4, 2021, with schools opening in Aug. Counties with mask requirements had smaller increase in pediatric COVID-19 case rates after school start vs. counties without (-18.53 cases per 100 000 per day, p <0.01). Absolute difference in cases after adjusting for covariates = -1.31 cases per day, 95% CI: −1.51, −1.11.	Moderate
Jehn, M., Mac McCullough, J., Dale, A. P., Gue, M., Eller, B., Cullen, T., & Scott, S. E. (2021). Association between K–12 school mask policies and school-associated COVID-19 outbreaks—Maricopa and Pima Counties, Arizona, July–August 2021. *Morbidity and Mortality Weekly*	Oct 1, 2021	Cohort	K-12 schools, Arizona, USA	• Not reported	Data were collected from Jul - Aug 2021 Schools without mask mandates had increased odds of a school-related outbreak after adjusting for covariates, OR = 3.5, 95% CI = 1.8–6.9.	High

Report, *70*(39), 1372.						
Previously reported evidence						
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. *Science, 327*(6546), 1092-1097.	Apr 29, 2021	Cross-sectional	Schools, USA	• Cancelled extracurriculars • Closed common spaces (playgrounds, cafeterias) • Cohorting • Masks • Physical distancing (extra space, separators between desks) • Reduced class size • Restricted entry • Symptom screening *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). 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. Associations between IPAC measures and positive tests: • Student mask mandate: adjusted OR: 0.91 (95% CI=0.83,1.00) • Teacher mask mandate: adjusted OR: 0.91 (95% CI=0.83,1.00)	Moderate
Rapid testing (n = 8)						
New evidence reported on December 7, 2022						
Goldenfeld, M., Cohen, C., Gilboa, M., Pessach, I.M., Mehnick, B., Tal, I., … Regev-Yochay, G. (2022). Rapid Antigen Tests For Safe School Opening in the COVID-19 Pandemic	Jul 13, 2022	Quasi-experimental	Israel	• Quarantine policies • Testing	From Nov2020 - Apr 2021, 361 participants were included. 12.3% tested positive, initially. Fourteen additional cases were detected (3.5%), 12 of them from one single school in biweekly testing. 1691 school days were saved due to testing.	Moderate

Era. *The pediatric infectious disease journal*, *41*(8), e312–e317.						
Neuberger, F.S., Grgic, M., Buchholz, U., Maly-Motta, H., Fackler, S., Lehfeld, A.S., … Kuger, S. (2022) Delta and Omicron: Protective Measures and SARS-CoV-2 Infections in Day Care Centres in Germany in the 4th and 5th Wave of the Pandemic 2021/2022. *Preprint.*	Apr 12, 2022	Cohort	Daycares, Germany	• Cohorting • Masks • Enhanced ventilation • Physical distancing • School closure • Testing	From Aug 2020 - May 2021, data were collected from 8500 daycares. No association between staff or child testing and number of infections in staff or children (data NR). Child testing associated with lower number of parent cases during alpha and delta wave: • IRR alpha: 0.76, 95% CI: 0.60, 0.98 IRR delta: 0.78, 95% CI: 0.69, 0.89	Moderate ***PREPRINT***
Falk, A., Decoster, M., Wallace, Z., Falk, P., Steffen, S., Benda, A., & Høeg, T. B. (2022). COVID-19 Surveillance Testing in Secondary Schools: Findings and Barriers to Implementation. *Wisconsin Medical Journal*, *121*(1), 13–17.	Mar 31, 2022	Quasi experimental	Secondary schools, Wood County, Wisconsin, USA	• Masks • Physical distancing • Quarantine policies • Symptomatic and asymptomatic contact screening (parents, teachers) • Testing (weekly)	For 10 weeks, there were 1,578 surveillance tests performed. Percent positivity averaged 3.0% (0%-16.2% weekly) among students and 1.72% (0%-6.9% weekly) among staff. 2 cases of secondary transmission were suspected out of 163 individuals quarantined.	Moderate
Costa, S.F., Manuli, R.E., Oliveira, B.A.,	Mar 18, 2022	Quasi experimental	Public schools, Brazil	• Symptoms screening • Testing	From Sep 13 - Nov 17, 2021, 969 samples were tested.	Low ***PREPRINT***

Leal, F.E., Souza, E.C.B., Illi, A.P., ... Sabino, E.C. (2022). Online symptoms screening and testing of Covid-19 through RT-LAMP saliva of students and asymptomatic employees in a public school in Brazil. *Preprint*.					322 symptomatic patients were tested;40% were positive. No asymptomatic cases tested positive for COVID-19, and no cases of COVID-19 transmission occurred at the school.	
Heinsohn, T., Lange, B., Vanella, P., Rodiah, I., Glöckner, S., Joachim, A., ... Krause, G. (2022). Infection and transmission risks in schools and contribution to the COVID-19 pandemic in Germany–a retrospective observational study using nation-wide and regional health and education agency notification data. *Preprint.*	Jan 21, 2022	Cohort	Primary and secondary schools, Germany	• Masks • Testing *Varied by region and over time	Data were collected from Mar 2020 - Oct 2021. Compared to no testing, voluntary testing in schools increased detected infections in students by 45 cases/100 000 per 14-days (95% CI: 38.2, 51.9) and teachers by 17.8 cases/100 000 per 14 days (95% CI: 4.0, 41.6). Mandatory testing increased detected infections in students by 49.8 cases/100 000 per 14 days (95% CI: 41.2, 58.5) but not teachers (RD: 6.5 cases/100 000 per 14 days, 95% CI: -11.3, 24.3).	High ***PREPRINT***
Javier, F. (2021). Effectiveness of a 4x10 Surveillance Program to Detect and Prevent SARS-CoV-2	Oct 20, 2021	Quasi experimental	Public elementary schools, San Luis Potosi, Mexico	• At-home symptom screening • Cohorting • Enhanced cleaning	From May – Jul 2021, 178 students and staff (n=NR) were tested weekly following school re-opening at a time when community transmission was <5%:	Low ***PREPRINT***

Transmission in a Public Primary School in a Marginalized Community of San Luis Potosi, Mexico. *Preprint.*				• Entrance temperature and symptom checks • Hand hygiene • Hybrid learning • Masks (students, staff) Restricted school access	• Students tested every Monday for 2 weeks, pooled respiratory for the following 4 weeks, random testing for the last 2 weeks • Staff tested every Friday. During the study period 0/178 students or staff tested positive, despite a high positivity index present in the city (values NR).	
Farina, E., Eboli, I., Spadea, T., Saugo, C., Richiardi, L., Maule, M., … Bena, A. (2021). 'Scuola sicura': a school screening testing programme to prevent the spread of COVID-19 in students in Piedmont. *Epidemiologia e prevenzione*, *45*(6), 504–512.	Oct 4, 2021	Quasi experimental	Second and third grade, first secondary grade, Piedmont, Italy	• Quarantine policies • School closure • Symptomatic and asymptomatic contact screening	From Jan to Mar 2021, 114 positives cases were reported. 46 close contacts were tested, with 11 cases testing positive. Asymptomatic cases accounted for 26.5% of the total cases. Screening identified a quarter of the cases that occurred in the participating classes.	Moderate
Berke, E.M., Newman, L.M., Jemsby, S., Hyde, B., Bhalla, N., Sheils, N E., … Cangelosi, G.A. (2021). Pooling in a Pod: A Strategy for COVID-19 Testing to Facilitate a Safe Return to School. *Public health reports*, *136*(6), 663–670.	Sep 6, 2021	Quasi-experimental	Independent K-12 school, Washington DC	• Hybrid learning (1-12 only, K all in person) • Masks • Modified extracurriculars • Physical distancing • Symptom screening • "Facility optimization"	This project aimed to test the feasibility of 'pool in a pod' cohort-specific testing for early case detection and management. From Nov 30, 2020 – Apr 30, 2021, 863 students and 264 staff took part in twice a week testing (participation varied by week). Average pool size was 7.4 people. Over 34 testing sessions, there were 1733 negative and 4 positive pools. Outside confirmatory testing identified two positive cases; the rest were false positives. Weekly cost-per-person was $24.24. Return to in-person learning after initiating testing	Moderate

					procedures resulted in no increase in positive cases.	
Test to stay policy (n = 7)						
New evidence reported on December 7, 2022						
Campbell, M. M., Benjamin, D. K., Mann, T. K., Fist, A., Blakemore, A., Diaz, K. S., … Zimmerman, K. O. (2022). Test-to-Stay After SARS-CoV-2 Exposure: A Mitigation Strategy for Optionally Masked K-12 Schools. *Pediatrics*, *150*(5), e2022058200.	Oct 21, 2022	Quasi-experimental	K-12 schools, North Carolina, United States	• Masks (optional) • Test-to-stay program (which implements a protocol that involves rapidly testing asymptomatic students exposed to COVID-19, allowing them to remain in school if their tests were negative)	Test-to-stay policy implemented, data were collected from Nov 29, 2021 – Jan 28, 2022. 2463 participants from 9 school districts enrolled; 1675 (68%) included in analysis (i.e., positive test during study period or at least 1 negative test on or after day 5 of exposure). • 20/192 contacts tested-positive (tertiary attack rate (TAR): 10% (95%CI=6,19). • SAR ranged from 11-15% across schools, no transmission in administrative buildings. • Estimated 1 additional school case for every 21 avoided school exclusions • 934 school days missed vs. anticipated 8206 days without test to stay From Jan 3 – Jan 28, 2022 (omicron variant), 932 participants included in analysis. • 7/109 contacts tested positive (TAR: 6% (95%CI=3,13) • Estimated 1 additional school case for every 29 avoided school exclusions • 530 school days missed vs. anticipated 3660 days without TTS	Moderate
Lammie, S.L., Ford, L., Swanson, M., Guinn, A.S., Kamitani, E., van Zyl, A., … Neatherlin, J.C. (2022). Test-to-Stay Implementation in 4 Pre-K-12 School Districts. *Pediatrics*, *150*(4), e2022057362.	Sep 29, 2022	Quasi-experimental	PreK – 12 schools, Georgia, Illinois, Kentucky, and New Mexico, USA	• Cohorting (varied by region) • Enhanced cleaning • Enhanced ventilation • Hand hygiene • Masks • Physical distancing (varied by region) • Symptomatic and asymptomatic contact screening	Test-to-stay policy implemented, data were collected from Sept 13 - Nov 19, 2021. 374 cases and 2520 school-based contacts eligible for test-to stay. Proportion participating in program ranged from 22-79% across districts. • SAR ranged from: 2.2 to 11.1% across states • TAR ranged from 0% to 17.6% Test-to-stay preserved 976 to 4650 in-person learning days with minimal tertiary transmission in most schools.	Moderate

				• Testing (test-to stay) • Symptoms screening (varied by region)		
Campbell, M.M., Benjamin, D.K., Mann, T., Fist, A., Kim, H., Edwards, L., … ABC Science Collaborative (2022). Test-to-Stay After Exposure to SARS-CoV-2 in K-12 Schools. *Pediatrics*, *149*(5), e2021056045.	May 1, 2022	Quasi experimental	K-12 Schools, North Carolina, United States	• Masks • Symptomatic and asymptomatic contact screening • Test-to-stay program,	Test-to-stay implemented through 6-week pilot project, Oct 2021. Of 3020 students exposed to a case, 367 participants (staff and students) enrolled in study. • SAR: 1.7% (95% CI: 0.6, 4.7) • No tertiary cases identified • 1628 school days saved	High
Schechter-Perkins, E.M., Doron, S., Johnston, R., Hay, J., Berlin, D., Ciaranello, A., … Branch-Elliman, W. (2022). A Test-to-Stay Modified Quarantine Program for COVID-19 in Schools. *Pediatrics*, *149*(5), e2021055727.	Apr 8, 2022	Quasi experimental	Public schools, Massachusetts, USA	• Quarantine policies (modified) • Symptoms screening • Testing	Test-to-stay program implemented for 2021-2022 school year; data reported Sept-Dec 2021. • 2943 positive cases identified • SAR: 2.9% (95% CI: 2.8, 3.0) • 516 possible tertiary cases/102 373 participants; TAR = 0.5% • Estimated 325,328 to 497,150 school days saved	High
Boutzoukas, A E., Zimmerman, K.O., Mann, T.K., Moorthy, G.S., Blakemore, A., McGann, K.A., … Kalu, I.C. (2022). A School-Based SARS-CoV-2 Testing Program:	Feb 1, 2022	Quasi experimental	24 K-12 schools, North Carolina, USA	• Quarantine policies • Testing	In-school testing program with shortened quarantine period implemented in April 2021; data compared for 1 month before and 2 months after. 12,251 learners in 24 schools participated. • Close contact testing increased by 24.0% (95% CI: 22.7, 45.3) • Risk of a positive test decreased by 25.1% (95% CI: -47.3, -2.9)	High

Testing Uptake and Quarantine Length After In-School Exposures. *Pediatrics*, *149*(12 Suppl 2), e2021054268J.					• Number of missed school days decreased by 1.5 per person (95% CI: -2, -1) • % Positivity decreased by 25.1%	
Nemoto, N., Dhillon, S., Fink, S., Holman, E.J., Cope, A.K., Dinh, T.H., … Neatherlin, J. C. (2021). Evaluation of Test to Stay Strategy on Secondary and Tertiary Transmission of SARS-CoV-2 in K-12 Schools - Lake County, Illinois, August 9-October 29, 2021. *Morbidity and mortality weekly report*, *70*(5152), 1778–1781.	Dec 31, 2021	Quasi experimental	Illinois, USA	• Masks • Physical distancing • Testing (for unvaccinated after exposure)	Test-to-stay policy implemented, data were collected from Aug 9 - Oct 29, 2021. 258 cases were identified in school with 1035 close contacts. 16 close contacts subsequently tested positive (SAR = 1.5%), and 9 tertiary cases were identified. Test-to-stay preserved 8152 days of in-person learning.	Moderate
Previously reported evidence						
Young, B.C., Eyre, D.W., Kendrick, S., White, C., Smith, S., Beveridge, G., … Peto, T.E.A. (2021). Daily testing for contacts of individuals with SARS-CoV-2 infection and attendance and	Oct 2, 2021	Cluster randomized controlled trial	Secondary schools and colleges, England, UK	• Contact tracing • Quarantine policies (isolation for cases and contacts) • Testing (daily rapid antigen)	From Apr 19 – Jun 27, 2021, 201 schools were randomly assigned to one of two conditions following identification of a school case: 10-days of home isolation (control) or continued attendance with voluntary daily rapid testing (intervention). RT-PCR confirmed cases were identified in both intervention (740 or 61.8/100,000 per week) and control (657 or 59.1/100,000 per week) groups. Using intention-to-treat analysis:	High

SARS-CoV-2 transmission in English secondary schools and colleges: an open-label, cluster-randomised trial. *The Lancet, 398*(10307), 1217–1229.					• Symptomatic RT-PCR confirmed infection (vs. control): adjusted Incidence Rate Ratio (aIRR): 0.96 (95% CI=0.75,1.22) • Any community RT-PCR confirmed infection (vs. control): IRR: 0.96 (95% CI=0.76,1.20) • % of asymptomatic contacts testing positive on study-related PCR test (vs. control): IRR: 0.73 (95% CI=0.33,1.61) • % of symptomatic contacts testing positive on routine community test: IRR: 1.21 (95% CI=0.82,1.79) Daily testing is non-inferior to self-isolation in infection control and is a safe alternative to home isolation for school-based exposure.	
Physical distancing (n = 6)						
New evidence reported on December 7, 2022						
Jonker, L., Linde, K.J., de Boer, A.R., Ding, E., Zhang, D., de Hoog, M.L A., … Bruijning-Verhagen, P. (2022). SARS-CoV-2 Incidence in Secondary Schools; the Role of National and School-Initiated COVID-19 Measures and Indoor Air Quality. *Preprint.*	Aug 31, 2022	Quasi-experimental	18 secondary schools, The Netherlands	National policy: Oct – Dec 2020 (pre-lockdown) • Full class-occupancy • Physical distancing (>1.5m, staff-staff, staff-student) Dec 2020 – Feb 2021 (national lockdown) • Masks (outside classrooms) • School closures • Testing Feb 2021 – Jun 2021 (post-lockdown):	From Oct 2020 – Jun 2021, school incidence was recorded and association between implementation of school mitigation measures and incidence was calculated. After adjusting for school characteristics and community incidence, there was no relationship between physical distancing and incidence in schools (IRR: 1.07; 95% CI: 0.98, 1.16).	High ***PREPRINT***

				• 50% class-occupancy (alternating in-person and online) • Physical distancing (student-student) • Testing Additional school-initiated measures: • Cohorting • Hand hygiene • Physical distancing • Student displacement reductions • Ventilation / air monitoring		
Donovan, C.V., Worrell, M.C., Steinberg, J., Montgomery, B.K., Young, R., Richardson, G., … Salzer, J. S. (2022). An Examination of SARS-CoV-2 Transmission Based on Classroom Distancing in Schools With Other Preventive Measures in Place-Missouri, January-March 2021. *Public health*	Jul 16, 2022	Cross-sectional	K-12 schools, Missouri, USA	• Masks • Physical distancing	From Mar – Apr 2021, 51 index cases and 1 probable case of symptomatic in-school transmission cases were identified. Among close contacts sitting within 3 ft of possibly infectious people, 1 probable transmission event/42 close contacts were identified: • Space between desks was 2.5 ft • Classroom had higher density (3.2 people/100 ft^2 • Longer exposure time (5 hrs. 45 minutes) Among close contacts sitting >3 ft away from a possibly infectious people, 0 transmission events/122 close contacts were identified.	Moderate

reports, *137*(5), 972–979.						
Callies, M., Kabouche, I., Desombere, I., Merckx, J., Roelants, M., Vermeulen, M., Duysburgh, E. (2022). Measures for infection prevention and control of SARS-CoV-2 in Belgian schools between December 2020 and June 2021: a prospective cohort study. *Preprint*.	Apr 12, 2022	Cohort	Schools, Belgium	• Enhanced cleaning • Enhanced ventilation • Masks • Physical distancing • School closures	From Dec 2020 - Jun 2021, 1285 students and 818 staff were included. No statistically significant difference was found for physical distancing: aRR 0.90, 95% CI 0.73, 1.12.	Moderate ***PREPRINT***
Boutzoukas, A.E., Zimmerman, K.O., Benjamin, D.K., DeMuri, G.P., Kalu, I.C., Smith, M.J., … Butteris, S.M. (2022). Secondary Transmission of COVID-19 in K-12 Schools: Findings From 2 States. *Pediatrics*, *149*(12 Suppl 2), e2021054268K.	Feb 1, 2022	Quasi-experimental	K-12 schools, North Carolina and Wisconsin, USA	• Hand hygiene • Masks • Physical distancing (varied by setting) • Quarantine policies •	Surveillance data from 1,102,039 students and staff from Mar 15 - Jun 25, 2021, were analyzed. Compared to schools that required 6 ft of physical distancing, risk of secondary transmission was higher with: • 3 feet: RR=1.15, 95% CI: 0.31, 4.24 • <3 feet: RR = 1.12, 95% CI: 0.28, 4.45	Moderate
Previously reported evidence						
Lessler, J., Grabowski, K., Grantz, K.H., Badillo-Goicoechea, E., Metcalf, J.E.,	Apr 29, 2021	Cross-sectional	Schools, USA	• Cancelled extracurriculars • Closed common spaces (playgrounds, cafeterias)	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).	Moderate

Lupton-Smith, C. … Stuart, E.A. (2021). Household COVID-19 risk and in-person schooling. *Science, 327*(6546), 1092-1097.				• Cohorting • Masks • Physical distancing (extra space, separators between desks) • Reduced class size • Restricted entry • Symptom screening *Substantial heterogeneity in number and type of IPAC measures mandated across states.	Associations between IPAC measures and positive tests varied: • Reduced class size: adjusted OR: 1.01 (95% CI=0.94,1.09) • Desk shields: **adjusted OR: 1.12 (95% CI=1.04,1.22)** • Extra desk space: adjusted OR: 0.96 (95% CI=0.89,1.04) • No sharing supplies: adjusted OR: 0.92 (95% CI=0.85,1.00)	
van den Berg, P., Schechter-Perkins, E.M., Jack, R.S., Epshtein, I., Nelson, R., Oster,E., & Branch-Elliman, W. (2021). Effectiveness of 3 versus 6 feet of physical distancing for controlling spread of coronavirus disease 2019 among primary and secondary students and staff: A retrospective, statewide cohort study. *Clinical Infectious Diseases,* ciab230.	Mar 10, 2021	Cohort	242 public schools, Massachusetts	• Cohorting • Enhanced cleaning • Enhanced ventilation • Hand hygiene • Masks (staff, students ≥ grade 2) • Physical distancing (>3 vs. >6 feet) • Quarantine policies (dedicated isolation space for symptomatic students) • Symptom screening (staff, students)	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. Cases were similar in all districts: • Staff IRR: 0.989 (95% CI=0.73,1.33) • Student IRR: 0.891 (95% CI=0.59,1.34) After adjusting for community incidence: • Staff IRR: 1.02 (95% CI=0.75,1.37) • Student IRR: 0.904 (95% CI=0.62,1.33)	Moderate
Cohorting (n = 3)						

New evidence reported on December 7, 2022						
Jonker, L., Linde, K.J., de Boer, A.R., Ding, E., Zhang, D., de Hoog, M.L A., … Bruijning-Verhagen, P. (2022). SARS-CoV-2 Incidence in Secondary Schools; the Role of National and School-Initiated COVID-19 Measures and Indoor Air Quality. *Preprint.*	Aug 31, 2022	Quasi-experimental	18 secondary schools, Holland, The Netherlands	National policy: Oct – Dec 2020 (pre-lockdown) • Full class-occupancy • Physical distancing (>1.5m, staff-staff, staff-student) Dec 2020 – Feb 2021 (national lockdown) • Masks (outside classrooms) • School closures • Testing Feb 2021 – Jun 2021 (post-lockdown): • 50% class-occupancy (alternating in-person and online) • Physical distancing (student-student) • Testing	From Oct 2020 – Jun 2021, school incidence was recorded and the association between implementation of school mitigation measures and incidence was calculated. There was no association between cohorting and incidence, IRR: 1.04, 95% CI 0.95, 1.13.	High ***PREPRINT***
Neuberger, F.S., Grgic, M., Buchholz, U., Maly-Motta, H., Fackler, S., Lehfeld, A.S., … Kuger, S. Delta and Omicron: Protective	Apr 12, 2022	Cohort	Daycares, Germany	• Cohorting • Enhanced ventilation • Masks • Physical distancing • School closure • Testing	From Aug 2020 - May 2021, data were collected from 8500 daycares. Indoor cohorting reduced number of staff infections during delta wave only, IRR: 0.85, 95% CI: 0.73, 0.97.	Moderate ***PREPRINT***

Measures and SARS-CoV-2 Infections in Day Care Centres in Germany in the 4th and 5th Wave of the Pandemic 2021/2022. *Preprint.*						
Previously reported evidence						
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. *Science, 327*(6546), 1092-1097.	Apr 29, 2021	Cross-sectional	Schools, USA	• Cancelled extracurriculars • Closed common spaces (playgrounds, cafeterias) • Cohorting • Masks • Physical distancing (extra space, separators between desks) • Reduced class size • Restricted entry • Symptom screening *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). Associations between IPAC measures and positive tests: • Same teacher all day: adjusted OR: 1.00 (95% CI=0.93,1.08) • Same students all day: adjusted OR: 0.93 (95% CI=0.86,1.00) • Restricted entry: **adjusted OR: 0.88 (95% CI=0.81,0.95)** • Closed cafeteria: adjusted OR: 1.03 (95% CI=0.95,1.11) • Closed playground: adjusted OR: 1.01 (95% CI=0.92,1.10) • No extracurriculars: **adjusted OR: 0.73 (95% CI=0.68,0.79)**	Moderate
Hybrid learning (n = 2)						
New evidence reported on December 7, 2022						
Wiens, K.E., Smith, C.P., Badillo-Goicoechea, E., Grantz, K.H., Grabowski, M.K.,	Apr 8, 2022	Cohort	USA	• Masks • Quarantine policies • Symptoms screening (by	From Jan 12 - Jun 12, 2021, 1,082,773 respondents living with school-aged children were included.	Moderate

… Lessler, J. (2022). In-person schooling and associated COVID-19 risk in the United States over spring semester 2021. *Science advances*, *8*(16), eabm9128.				parents, teachers)	No difference in odds of positive case between full and part-time learners after adjusting for school mitigation measures (data NR).	
Previously reported evidence						
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. *Science, 327*(6546), 1092-1097.	Apr 29, 2021	Cross-sectional	Schools, USA	• Cancelled extracurriculars • Closed common spaces (playgrounds, cafeterias) • Cohorting • Masks • Physical distancing (extra space, separators between desks) • Reduced class size • Restricted entry • Symptom screening *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). Compared to full-time in-person, part-time in-person was not associated with risk of COVID-19 outcomes once mitigation measures were accounted for: adjusted OR: 0.97 (95% CI=0.91,1.03)	Moderate
Ventilation (n = 2)						
New evidence reported on December 7, 2022						
Callies, M., Kabouche, I., Desombere, I., Merckx, J., Roelants, M.,	Apr 12, 2022	Cohort	Schools, Belgium	• Enhanced cleaning • Enhanced ventilation • Masks	From Dec 2020 - Jun 2021, 1285 students and 818 staff were included. No statistically significant difference was found for ventilation: aRR 0.96, 95% CI 0.76, 1.22.	Moderate ***PREPRINT***

Vermeulen, M., Duysburgh, E. (2022). Measures for infection prevention and control of SARS-CoV-2 in Belgian schools between December 2020 and June 2021: a prospective cohort study. *Preprint*.				• Physical distancing • School closures		
Neuberger, F.S., Grgic, M., Buchholz, U., Maly-Motta, H., Fackler, S., Lehfeld, A.S., … Kuger, S. Delta and Omicron: Protective Measures and SARS-CoV-2 Infections in Day Care Centres in Germany in the 4th and 5th Wave of the Pandemic 2021/2022. *Preprint.*	Apr 12, 2022	Cohort	Daycares, Germany	• Cohorting • Enhanced ventilation • Masks • Physical distancing • School closure • Testing	From Aug 2020 - May 2021, data were collected from 8500 daycares. Regular ventilation was not associated with staff or child cases during alpha, delta, or omicron waves.	Moderate ***PREPRINT***
Vaccination (n = 2)						
New evidence reported on December 7, 2022						
Thakkar, P.V., Zimmerman, K.O., Brookhart, M.A., Erickson, T.R., Benjamin, D.K., Kalu, I.C., & ABC Science Collaborative (2022). COVID-19	Apr 12, 2022	Cohort	Private school, North Carolina, USA	• Enhanced ventilation • Masks • Symptomatic and asymptomatic contact screening • Testing	From Aug-Nov 2021, 1128 students were included. Unvaccinated students had 8.2 (95% CI: 3.5–19.4) times the incidence of documented infection and 9.2 (95% CI: 3.4–25.1) times the incidence of symptomatic infection vs. unvaccinated student.	Low

Incidence Among Sixth Through Twelfth Grade Students by Vaccination Status. *Pediatrics*, *149*(5), e2022056230.					Unadjusted vaccine effectiveness was 87.8% (95% CI: 71.2%–94.8%) against documented infection and 89.1% (95% CI: 70.3%–96.0%) against symptomatic infection.	
Neuberger, F.S., Grgic, M., Buchholz, U., Maly-Motta, H., Fackler, S., Lehfeld, A.S., … Kuger, S. Delta and Omicron: Protective Measures and SARS-CoV-2 Infections in Day Care Centres in Germany in the 4th and 5th Wave of the Pandemic 2021/2022. *Preprint.*	Apr 12, 2022	Cohort	Daycares, Germany	• Cohorting • Enhanced ventilation • Masks • Physical distancing • School closure • Testing	From Aug 2020 - May 2021, data were collected from 8500 daycares. Daycares that reach staff vaccination quota had: • Higher odds of child infections during omicron wave, OR: 1.16, 95% CI: 1.02, 1.31 • Lower odds of staff infections during alpha (OR: 0.30, 95% CI: 0.16, 0.55) and delta (OR: 0.53, 95% CI: 0.37, 0.76) Staff vaccination had no impact on child infections during alpha or delta wave (data NR) or on staff infections during omicron wave (data NR).	Moderate ***PREPRINT***
Hand hygiene (n = 2)						
New evidence reported on December 7, 2022						
Jonker, L., Linde, K.J., de Boer, A.R., Ding, E., Zhang, D., de Hoog, M.L A., … Bruijning-Verhagen, P. (2022). SARS-CoV-2 Incidence in Secondary Schools; the Role of National and School-Initiated COVID-19 Measures and	Aug 31, 2022	Quasi-experimental	18 secondary schools, The Netherlands	National policy: Oct – Dec 2020 (pre-lockdown) • Full class-occupancy • Physical distancing (>1.5m, staff-staff, staff-student)	From Oct 2020 – Jun 2021, school incidence was recorded. Association between implementation of school mitigation measures and incidence calculated. No statistically significant difference was found for hand hygiene IRR: 0.95 (0.88-1.03).	High ***PREPRINT***

Indoor Air Quality. *Preprint.*				Dec 2020 – Feb 2021 (national lockdown) • Masks (outside classrooms) • School closures • Testing Feb 2021 – Jun 2021 (post-lockdown): • 50% class-occupancy (alternating in-person and online) • Physical distancing (student-student) • Testing		
Callies, M., Kabouche, I., Desombere, I., Merckx, J., Roelants, M., Vermeulen, M., Duysburgh, E. (2022). Measures for infection prevention and control of SARS-CoV-2 in Belgian schools between December 2020 and June 2021: a prospective cohort study. *Preprint*.	Apr 12, 2022	Cohort	Schools, Belgium	• Enhanced cleaning • Enhanced ventilation • Masks • Physical distancing • School closures	From Dec 2020 - June 2021, 1285 students and 818 staff were included. No statistically significant difference was found for hand hygiene: aRR 0.86, 95% CI 0.69, 1.07.	Moderate ***PREPRINT***
Modified Quarantine (n = 1)						
New evidence reported on December 7, 2022						
Dawson, P., Worrell, M.C.,	Oct 20, 2022	Cohort	Grade K-12, in 103 public	• Enhanced ventilation	Modified quarantine policy implemented (e.g., could attend if aged <18, only exposure was in	High

Malone, S., Fritz, S.A., McLaughlin, H.P., Montgomery, B.K., … Newland, J.G. (2022). Modifications to student quarantine policies in K-12 schools implementing multiple COVID-19 prevention strategies restores in-person education without increasing SARS-CoV-2 transmission risk, January-March 2021. *PloS one*, *17*(10), e0266292.			schools across 6 districts, Missouri, USA	• Masks • Physical distancing • Quarantine policies (standard vs. modified) • Remote learning • Testing	class, and did not have direct physical contact with person with COVID-19 without a mask). Data were collected from Jan – Mar 2021. 23 school-based transmission events occurred among 1636 close contacts (1%). There was no difference between schools with a modified vs. standard quarantine policy (hazard ratio=1.00, 95% CI=0.97, 1.03). Modified student quarantine policies were not associated with increased school incidence of COVID-19.	
Suite of IPAC measures (n = 3)						
New evidence reported on December 7, 2022						
Callies, M., Kabouche, I., Desombere, I., Merckx, J., Roelants, M., Vermeulen, M., Duysburgh, E. (2022). Measures for infection prevention and control of SARS-CoV-2 in Belgian schools between December 2020 and June 2021: a prospective	Apr 12, 2022	Cohort	Schools, Belgium	• Enhanced cleaning • Enhanced ventilation • Masks • Physical distancing • School closures	From Dec 2020 - Jun 2021, 1285 students and 818 staff were included. Implementation of IPAC measures was associated with decreased risk of cases: • aRR: 0.79 (95% CI: 0.64 – 0.98)	Moderate ***PREPRINT***

cohort study. *Preprint*.						
Auger, K.A., Hall, M., Bunte, S., Mussman, G., Amin, M., Sprigg, S., ... Kahn, R. S. (2022). A Successful Collaboration Between an Urban School District, a Health System, and a Public Health Department to Address COVID-19 While Returning Children to the Classroom. *Journal of community health*, *47*(3), 504–509.	Feb 26, 2022	Quasi experimental	Schools, Ohio, USA	• Hybrid learning schedule • Masks • Physical distancing • Quarantine policies (isolation room) • Symptomatic and asymptomatic contact screening • Testing	During the 2020-2021 school year, over 33,000 students were included. The collaborative learning system among the public school system, public health department, and a local children's hospital ensured that in-school COVID-19 transmission was rare (3.2% school-related transmission).	High
Previously reported evidence						
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. *Science, 327*(6546), 1092-1097.	Apr 29, 2021	Cross-sectional	Schools, USA	• Cancelled extracurriculars • Closed common spaces (playgrounds, cafeterias) • Cohorting • Masks • Physical distancing (extra space, separators between desks) • Reduced class size • Restricted entry • Symptoms screening	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). 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	Moderate

				*Substantial heterogeneity in number and type of IPAC measures mandated across states.	student/teacher mask mandates, restricted entry, desk spacing and no supply sharing. Associations between IPAC measures and positive tests varied; outdoor instruction, restricted entry, no extracurriculars, and daily symptom screening were associated with significant risk reductions: • Student mask mandate: adjusted OR: 0.91 (95% CI=0.83,1.00) • Teacher mask mandate: adjusted OR: 0.91 (95% CI=0.83,1.00) • Same teacher all day: adjusted OR: 1.00 (95% CI=0.93,1.08) • Same students all day: adjusted OR: 0.93 (95% CI=0.86,1.00) • Outdoor instruction: **adjusted OR: 0.88 (95% CI=0.80,0.98)** • Restricted entry: **adjusted OR: 0.88 (95% CI=0.81,0.95)** • Reduced class size: adjusted OR: 1.01 (95% CI=0.94,1.09) • Closed cafeteria: adjusted OR: 1.03 (95% CI=0.95,1.11) • Closed playground: adjusted OR: 1.01 (95% CI=0.92,1.10) • Desk shields: **adjusted OR: 1.12 (95% CI=1.04,1.22)** • Extra desk space: adjusted OR: 0.96 (95% CI=0.89,1.04) • No extracurriculars: **adjusted OR: 0.73 (95% CI=0.68,0.79)** • No sharing supplies: adjusted OR: 0.92 (95% CI=0.85,1.00) • Daily symptom screen: **adjusted OR: 0.78 (95% CI=0.73,0.84)** • Part-time in person: adjusted OR: 0.97 (95% CI=0.91,1.03)	

Table 3: Single Studies, Community-level Impact of School Reopening

Reference	Date Released	Study Design	Setting, Location	IPAC measures	Summary of Findings	Quality Rating:
New evidence reported on December 7, 2022						
Mueed, A., Ahmad, T., Abdullah, M., Sultan, F., Khan, A.A. (2022). Impact of school closures and reopening on COVID-19 caseload in 6 cities of Pakistan: An Interrupted Time Series Analysis. *PLoS Global Health 2*(9): e0000648.	Sep 19, 2022	Quasi-experimental	Schools, Lahore, Karachi, Islamabad, Quetta, Peshawar, and Muzaffarabad, Pakistan	NR	Interrupted time series analysis to compare daily new COVID-19 cases per 100,000 before and after Nov 26, 2020-Feb 1, 2021 school closure. Across regions, school closures were associated with a difference in rate of change of daily cases ranging from -0.39 (95% CI: -0.46, - 0.33) to +0.14 (95% CI: 0.04, 0.24). Across regions, school reopening was associated with a difference in rate of change of daily cases ranging from +0.01 (95% CI: 0.00, 0.01) to -0.93 (95% CI: 0.63, 1.23). Analyses did not account for other public health restrictions.	High
Fitzpatrick, T., Wilton, A., Cohen, E., Rosella, L., & Guttmann, A. (2022). School Reopening And COVID-19 In The Community: Evidence From A Natural Experiment In Ontario, Canada. *Health affairs*, *41*(6), 864–872.	Jun 1, 2022	Quasi-experimental	Schools, Ontario, Canada	• Cohorting • Masks • Testing	Data analysis following staggered school reopening in Mar 2021, adjusting for time since provincewide shutdown, holidays, and changes in other public health restrictions. Days after schools reopened, estimated % increase in community COVID-19 cases: • Day 11-15: 0.07 (95% CI: −0.07, 0.21) • Day 16-20: 0.08 (95% CI: −0.09, 0.25) • Day 21-25: 0.07 (95% CI: −0.13, 0.27) • Day 26-30: 0.13 (95% CI: −0.15, 0.41) School closures prevented an estimated 213 (95% CI: −256, 672) cases from Dec 26, 2020 – Feb 28, 2021, or 0.08% of fewer cases. • Larger increases in case growth rates were seen in elementary-age children	Moderate

Mueed, A., Aliani, R., Abdullah, M., Kazmi, T., Sultan, F., Khan, A. (2022). School closures help reduce the spread of COVID-19: a pre- and post-intervention analysis in Pakistan. *PLoS Global Public Health, 2*(4), e0000266.	April 20, 2022	Quasi-Experimental	Schools, Islamabad and Peshawar, Pakistan	• School closure • Testing	This study compared schools that fully vs. partially closed from Nov 2020-Jan 2021, and following reopening to Mar 2021. • Full vs. partial closure = -124.8 cases/day (95% CI: -190.2, -59.36) • Reopening (vs. closed) = +1.156 cases / day (95%CI: -69.1, 71.45) • Reopening (vs. partial closure) = -9.79 cases/day (95% CI: -60.1, 40.56) Regions that were fully closed had much higher community rates at baseline than those that were partially closed. Analysis did not account for other changes in other public health measures.	High
Rotevatn, T.A., Elstrøm, P., Greve-Isdahl, M., Surén, P., Johansen, T., & Astrup, E. (2022). School Closure Versus Targeted Control Measures for SARS-CoV-2 Infection. *Pediatrics*, *149*(5), e2021055071.	Apr 1, 2022	Quasi-experimental	Schools, Oslo, Norway	• Cohorting* • Enhanced cleaning • Hand hygiene • Hybrid learning* • Masks* • Physical distancing* • Quarantine policies • Symptomatic and asymptomatic contact screening (students, staff) • Testing *Contact reducing measures adaptable to incidence level (e.g., three-level model).	Interrupted time series analysis to compare trends in COVID-19 rates amongst children in school with targeted measures (grades 1-4) vs. online (grades 5-10) from Feb 15 – Apr 18, 2021. No differences were found between cases in grades 5-7 vs. 1-4 (0.66, 95% CI: −1.25, 2.58) or 8-10 vs. 1-4 (-0.63, 95% CI: −2.30 to 1.04).	Moderate

Juutinen, A., Sarvikivi, E., Laukkanen-Nevala, P., & Helve, O. (2021). Closing lower secondary schools had no impact on COVID-19 incidence in 13-15-year-olds in Finland. *Epidemiology and infection*, *149*, e233.	Oct 26, 2021	Quasi experimental	Secondary schools, Finland	• Physical distancing • School closures • Testing	Data analyzed during regional lockdowns from Mar-Apr 2021. Amongst children aged 13-15: • No difference in trend between areas with restaurant closures only vs. restaurant & school closures: average weekly % change in cases overall: -16.4%, 95% CI: -22.4, -12.1 (difference between areas NR). Amongst children aged 7-12: • Average weekly % change in cases with restaurant closures: –29.1 (95% CI= -37.6, -19.6) vs. restaurant & school closures: –12.0 (95% CI= -15.5,-8.3 (statistical significance NR).	Low
Simetin, I.P., Svajda, M., Ivanko, P., Dimnjakovic, J., Belavic, A., Istvanovic, A., & Poljicanin, T. (2021). COVID-19 incidence, hospitalizations and mortality trends in Croatia and school closures. *Public health*, *198*, 164–170.	Aug 3, 2021	Quasi experimental	Schools, Croatia	• Cohorting • Hand hygiene • Masks (grade 4 and over) • Physical distancing • School closures/ hybrid learning • Staggered start/end times	National data on COVID-19 incidence, hospitalizations and mortality were analyzed from Feb 2020 – March 2021. • Statistically significant decreases in average % change in hospitalizations and mortality observed after school-closures due to holidays, but no significant increases following reopening (data not provided).	Moderate
Previously reported evidence						
Sebastiani, G. & Palù, G. (2021). COVID-19 Pandemic: Influence of Schools, Age Groups, and Virus Variants in Italy. *Viruses, 13*(7), 1269.	Jun 29, 2021	Quasi-experimental	Schools, Italy	Not reported	From Jan – Feb 2021, the incidence of COVID-19 in school aged children was compared in staggered school re-openings across the country. • Hospital ICU admissions consistently decreased over the course of Jan 2021 which coincided with a delay in school re-opening after the Christmas Break (values not provided) • The increased incidence of COVID-19 among those aged 0-9 in the first 10 days	Low

					of Jan 2021 is statistically significant **(p<0.001)** (data not provided). • Incidence peak occurred 14-days after return to remote schooling (data not provided)	
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): ○ Toronto: mandatory for elementary and secondary schools; encouraged for kindergarten. ○ Montreal: mandatory in common areas for elementary, and later, in classrooms for secondary schools. ○ Calgary: mandatory K-12, could be removed when seated in classrooms (cohorts, physically distanced) • Optional remote or hybrid learning	Levels of community transmission were low when schools reopened (Aug 25 – 31, 2020): • 11.3/100,000 Montreal • 10.0/100,000 Toronto • 26.7/100,000 Calgary 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). Levels of community transmission had risen by end of study period (Jan 6 – 12, 2021): • 356.9/100,000 Montreal • 165.9/100,000 Toronto • 153.5/100,000 Calgary 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. 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.	Low ***PREPRINT***
Perramon, A., Soriano-Arandes, A., Pino, D., Lazcano, U., Andrés, C., Català, M., …	Feb 17, 2021	Quasi-experimental	Primary and secondary schools, Catalonia, Spain	• Cohorting • Enhanced ventilation • Hand hygiene • Infographics	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 Dec.	Low ***PREPRINT***

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.*				• Masks (students aged ≥6) • Mass screening campaigns • Quarantine policies (cohort screening, quarantining with positive case)	Incidence for children waged <12 was lower than the general population; incidence for children aged 12-17 was similar or higher. Age was associated with higher incidence. Incidence 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 the first 11 weeks, positivity rate in children (≤5%) was lower than the general population; positivity rate increased when schools were closed for holidays **(p<0.001)** due to a decrease in screening/testing. Rate of cases in children was significantly lower than for adults during whole study period **(p<0.001)**.	

Table 4: Single studies, transmission within summer camps

Reference	Date Released		Location, Setting	IPAC Measures	Summary of Findings	Quality Rating:
New evidence reported on December 7, 2022						
Blaisdell, L., Rising, J., van Zyl, A., Finn, J., & Vergales, J. (2022). Testing and Nonpharmaceutical Interventions for Prevention of SARS-CoV-2 in 20 US Overnight Camps in Summer 2021. *Public health reports*, *137*(5), 1007–1012.	Jul 20, 2022	Cross-Sectional	20 summer camps, USA	• Cohorting • Enhanced cleaning • Masks • Quarantine policies • Symptoms screening • Testing	In summer of 2021, 20 camps with 9474 campers were surveyed. • 27 cases identified, 17 (63.0%) detected after arrival, 3 (7.4%) on arrival, 8 (29.6%) prior to arrival. Only 1 camp experienced on-campus transmission. Vaccination was high amongst staff (84.6%) and campers (76.2%).	Moderate
Van Naarden Braun, K., Drexler, M., Rozenfeld, R.A., Deener-Agus, E., Greenstein, R., Agus, M., … Nerwen, C. (2021). Multicomponent Strategies to Prevent SARS-CoV-2 Transmission - Nine Overnight Youth Summer Camps, United States, June-August 2021. *Morbidity and mortality weekly report*, *70*(40), 1420–1424.	Oct 8, 2021	Prevalence	Overnight camps, USA	• Cohorting • Hand hygiene • Masks • Physical distancing • Quarantine policies • Testing	From Jun - Aug 2021, 7173 campers and staff members attended 9 overnight camps. 9 cases and no secondary infections were detected. Vaccination rate was high (93% of those >12). Authors emphasize the importance of multiple prevention strategies.	High
Tonzel, J.L., & Sokol, T. (2021). COVID-19	Oct 8, 2021	Louisiana, USA	Day and overnight camps,	• Cohorting • Masks	From Jun – Jul 2021, 28 camp outbreaks, with 321 cases were investigated.	Low

Outbreaks at Youth Summer Camps - Louisiana, June-July 2021. *Morbidity and mortality weekly report*, *70*(40), 1425–1426.			Louisiana, USA	• Symptomatic and asymptomatic contact screening	• Mean outbreak size: 11.5 cases (range: 2–59) • 14 outbreaks (50%) occurred in day camps; mean outbreak size 9.3 cases (range: -21) • 14 (50%) occurred in overnight camps, mean outbreak size 13.6 cases (range 2-59) • 85.4% of cases were among campers, 14.6z% among staff • All staff cases occurred amongst the unvaccinated	

Table 5: In-progress Single Studies

Title	Anticipated Release Date	Setting	Description of Document
New evidence reported on December 7, 2022			
vanPoppel, M. (2022). Effect of physical education restrictions on SARS-CoV-2. Infections and clustering in class. A retrospective cohort study From September 2021 to April 2022. German Clinical Trials Register, DRKS00029061	Protocol registered May 27th 2022, release date not reported	Schools, Austria	This cohort study will evaluate the effect of physical education restrictions on SARS-CoV-2 transmission.
Euresist Network, Geie. (2022). School Studies Within the EuCARE Horizon Europe Research Project (EuCARE-SCHOOLS). Clinical Trials Registrar, NCT05396040.	Not reported	Students and school staff within 440 classes from two countries (Italy and Portugal)	This study will investigate whether regular screening with pooled saliva tests (Lolli-Method) is useful to support school opening and to reduce clusters and attack rates in schools, compared with the standard of care (SoC) regular surveillance based on symptoms and contact tracing by public health departments.
Previously reported evidence			
Sweeney-Reed, C. M., Wolff, D., Niggel, J., Kabesch, M., & Apfelbacher, C. (2021). Pool Testing as a Strategy for Prevention of SARS-CoV-2 Outbreaks in Schools: Protocol for a Feasibility Study. *JMIR research protocols*, *10*(5), e28673.	Not reported	Schools	This study will assess the feasibility of an infection monitoring program in schools in an effort to enable targeted quarantining in place of full school closures.
Universitätsmedizin Greifswald. (2021). *Analyzing the incidence of SARS-Cov-2 infected children and teenager in Western Pomerania. German Clinical Trials Register, DRKS00024635.*	Not reported	Not specified	This seroprevalence study will measure the infection rate of COVID-19 and temporal changes in COVID specific antibodies in children aged 6 months – 17 years.
Universitätsklinikum Heidelberg. (2021). *The Potential of home-based screening for SARS-CoV-2 when opening schools in Baden-Württemberg (COVID-19). German Clinical Trials Register, DRKS00024845.*	Not reported	School	This surveillance study will monitor the incidence and prevalence of COVID-19 in students and staff in a primary school using an at home rapid test with confirmation through PCR testing.
Chu, H. (2021). Reopening schools safely and educating youth (ROSEY) research study (ROSEY). *ClinicalTrials.gov, NCT04859699.*	Jun 2023	Schools	This pilot study includes a clustered randomized controlled trial (RCT) assessing the effectiveness of a testing program on student attendance in K-8. Incidence of COVID-19 will be compared between the control; students who receive weekly PCR testing and the intervention; students who receive weekly testing and risk mitigation communication materials to educate them on COVID-19 health and safety measures.

Newland, J. G. (2021). Assessing Testing Strategies for Safe Return to K-12 Schools in an Underserved Population. *ClinicalTrials.gov, NCT04875520.*	Mar 31, 2023	Schools	This clustered RCT will compare the incidence of school-based COVID-19 transmission between weekly student and staff surveillance testing vs. testing only symptomatic students and staff.
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.
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 schoolteachers over the period of 12 months.

Table 6: Syntheses

Reference	Date Released	Review Conclusions	Quality Rating
New evidence reported on December 7, 2022			
Dewan, M., Sharma, N., Panda, P.S., & Banerjee, P. (2022). School reopening: Back to classroom. A systematic review of strategies and their implementation during COVID-19 pandemic. *Journal of family medicine and primary care*, *11*(8), 4273–4279.	Aug 3, 2022 (Search completed up to Aug 2021)	This systematic review included 13 studies examining the effectiveness of school reopening measures at preventing COVID-19 transmission. Reopening schools resulted in a low risk of transmission; outbreaks were more likely among teachers and associated with community transmission. Effective measures included hand hygiene and mask wearing. Statistical significance N.R.	Low
Ferrari, S., Blázquez, T., Cardelli, R., Puglisi, G., Suárez, R., & Mazzarella, L. (2022). Ventilation strategies to reduce airborne transmission of viruses in classrooms: A systematic review of scientific literature. *Building and environment*, *222*, 109366.	Jul 2, 2022 (Search completed up to Dec 2021)	This systematic review included 30 studies examining air ventilation strategies (natural or mechanical) to reduce the risk of airborne transmission in schools. Natural ventilation systems: • Aeration strategies (n=7) likely to reduce the risk of contagion included open windows with cross ventilation, low-cost fans (up to 70% risk reduction), and airflow deflectors (up to 20% risk reduction). (Results based on mathematical models and simulations.) • Air purifiers (n=5) may remove more particles than ventilation systems bringing in outdoor air, but relative position (e.g., proximity to infected persons) may influence performance. Mechanical ventilation systems: • Ventilation procedures (n=8), such as using filters, combined with masking, may reduce cross infection, particularly in small-volume classrooms. (Results based on mathematical models and simulations.) • Air distribution systems (n=9), that ensure air mixing and dilution or removal of infected particles may reduce cross infection.	Low
Silverberg, S.L., Zhang, B.Y., Li, S., Burgert, C., Shulha, H.P., Kitchin, V., … Sadarangani, M. (2022). Child transmission of SARS-CoV-2: a systematic review and meta-analysis. *BMC pediatrics*, *22*(1), 172.	Apr 2, 2022 (Search completed Mar 31, 2021)	• This systematic review included 23 articles documenting transmission at a school or childcare centre. • Evidence of transmission in the school or childcare settings were limited. • General findings indicated that children were not major contributors of transmission (child-to-child secondary attack rate (SAR) in childcare and school settings was 7.1% and 2.0%; child-to-adult SAR, 31.7% and 11.7%); 48% of children confirmed infected with COVID-19 at school were adolescents in a secondary school environment.	Moderate

		• The study argued that reopening schools in the setting of adult vaccinations and in the absence of an ongoing community outbreak will not be risky in terms of virus transmission.	
Karki, S.J., Joachim, A., Heinsohn, T., & Lange, B. (2021). Risk of infection and contribution to transmission of SARS-CoV-2 in school staff: a systematic review. *BMJ open*, *11*(11), e052690.	Nov 3, 2021 (Search completed Jan 29, 2021)	This systematic review included 18 studies that discussed the risk of SARS-CoV-2 infection in staff and students, the transmission of SARS-CoV-2 in school settings and the seroprevalence of SARS-CoV-2 IgG antibodies in staff. During low incidence of infection: attack rates were low and similar among teachers and students. The risk of infection via seroprevalence studies ranged from 0-2%. During medium incidence: SARs in schools were higher, specifically for teachers (0% –6.6%). During high incidence (incidence >25/7 days/100 000, deaths per day >5/million population): the risk of infection following outbreaks in schools was higher among teachers (up to 16%), and the risk of infection via seroprevalence studies ranged from 1.7-28%. In the school setting, the transmission risk is higher among adults, and infectious children are less likely to infect teachers. In high-incidence settings, there is an increased risk of SARS-CoV-2 infection in school staff teaching face-to-face (RR:1.1–2). The risk of infections, as well as the risk of hospitalization, increased for teachers during school openings compared with school closure. While in low-incidence settings, there is little evidence for school staff to be at high risk of SARS-CoV-2 infection.	Moderate

Irfan, O., Li, J., Tang, K., Wang, Z., & Bhutta, Z.A. (2021). Risk of infection and transmission of SARS-CoV-2 among children and adolescents in households, communities and educational settings: A systematic review and meta-analysis. *Journal of global health*, *11*, 05013.	Jul 17, 2021 (Searches completed Apr 1, 2021)	This systematic review and meta-analysis included 90 studies (29 national and regional prevalence studies, 31 community or family cluster contact tracing (CTS), and 30 schools or daycare contact tracing)
		
		The overall risk of SARS-Cov-2 infection among children and adolescents in comparison to adults:
		• National (RR = 0.87, 95% CI = 0.71-1.060) and subnational (RR = 0.81, 95% CI = 0.66-1.01) for children
		  ○ When disaggregated by testing methods, children and adolescents showed a similarly lower risk of past infection in national (RR = 0.77, 95% CI = 0.62-0.96) studies, but it was nonsignificant in subnational studies.
		  ○ The risk of active infection was lower compared to adults but nonsignificant in both national and subnational studies.
		• In community/household contact-tracing studies OR = 0.62 (95% CI = 0.46-0.84) and heterogeneity, $I^2 = 0.91$
		  ○ When disaggregated by the schools' operational status, both children and adolescents were found to have a lower risk of infection than adults
			Moderate

		when schools were open or partially open, OR = 0.52 (95% CI = 0.33-0.83), but no significant difference during school closures. • Subgroup analysis of CTS with age-disaggregation showed a lower risk of secondary attack (OR= 0.57, 95% CI = 0.37-0.87) in children, whereas adolescents observed comparable risk (OR = 1.22, 95% CI = 0.74-2.04). • Children and adolescents appeared to have a lower, though statistically nonsignificant, risk of secondary attack in school settings. • In educational-settings, children attending daycare/preschools were observed to be at lower-risk (OR = 0.53, 95% CI = 0.38-0.72). Odds of infection among primary (OR = 0.85, 95% CI = 0.55-1.31) and high-schoolers (OR = 1.30, 95% CI = 0.71-2.38) were comparable to adults. Risk of contracting SARS-CoV-2 infection among children and adolescents in schools compared to community settings: • When the total number of children and adolescents tested and diagnosed with COVID-19 in the two settings were compared, children observed lower odds of infection (OR = 0.53, 95% CI = 0.38-0.75) in schools compared to community and households, which was consistently observed even with disaggregation by age; children (<10 years) (OR = 0.45, 95% = 0.39-0.51); adolescents and high-schoolers (OR = 0.63, 95% CI = 0.56-0.72).	
Vardavas, C., Nikitara, K., Mathioudakis, A.G., Hilton Boon, M., Phalkey, R., Leonardi-Bee, J., … Suk, J. E. (2022). Transmission of SARS-CoV-2 in educational settings in 2020: a review. *BMJ open*, *12*(4), e058308.	Oct 16, 2021 (Search completed by Apr 1, 2021)	This rapid review included 15 studies addressing child-to-child and/or child-to-adult transmission of SARS-CoV-2 in an educational setting Although there is evidence that children can be infected by and transmit SARS-CoV-2 in school settings, the SAR remains relatively low, when non-pharmaceutical interventions are implemented in parallel. Although the evidence was limited, there was an indication that younger children may have a lower SAR than adolescents.	Low
Viner, R., Waddington, C., Mytton, O., Booy, R., Cruz, J., Ward, J., … Melendez-Torres, G.J. (2021). Transmission of SARS-CoV-2 by children and young people in households and schools: A meta-analysis of population-based and contact-tracing studies. *The Journal of infection*, *84*(3), 361–382.	Dec 22, 2021 (Search completed Jul 28, 2021)	This systematic review and meta-analysis included 37 studies (19 population-based, 16 contact tracing and 2 that used both approaches) on transmission of COVID-19 from those aged 0-19 to other children and adults in school settings. The pooled SAR from child index cases in school studies (n=8) was 0.7% (95% CI=0.2,2.7), I^2=97.8%. Odds of transmission was not different from child vs. adult index cases in school settings, pooled OR: 0.27 (95% CI=0.06,1.28), I^2=87.97%. Pooled infection (PCR) prevalence across all studies was 0.4% (95% CI=0.2, 0.6), not significantly different by age.	Moderate

		Factors associated with higher school prevalence detected by RT-PCR included: • Current community 14-day incidence per 100,000, **OR: 1.003 (95% CI=1.001,1.004)** • Last month community incidence per 100,000, **OR: 1.003 (95% CI=1.001,1.006)** PCR prevalence was not associated with two-month prior community incidence, school attendance rate (i.e., % in face-to-face learning), or PCR source. Pooled seroprevalence across all studies was 4.8% (95% CI=2.4, 9.9), not significantly different by age. Factors associated with higher school seroprevalence included: • Last month community incidence per 100,000, **OR: 1.005 (95% CI=1.000,1.007)** • Two-month prior community incidence per 100,000 **OR: 1.005 (95% CI=1.002, 1.008)** School seroprevalence was not associated with current community incidence or school attendance rate.	
Previously reported evidence			
Caini, S., Martinoli, C., La Vecchia, C., Raimondi, S., Bellerba, F., D'Ecclesiis, O., ... Gandini, S. (2022). SARS-CoV-2 Circulation in the School Setting: A Systematic Review and Meta-Analysis. *International journal of environmental research and public health*, *19*(9), 5384.	Jul 19, 2021 (Search completed May 15, 2021)	This systematic review and meta-analysis included 41 studies that estimate COVID-19 prevalence and transmission in primary and secondary school settings. Studies that conducted random or longitudinal screening for infection (n = 21) identified 323 confirmed cases in >120,000 subjects; pooled mean percent positive was 0.44% (95% CI=0.13,0.92) with high heterogeneity across studies (I^2=97%). • Estimates differed significantly between cross-sectional (0.31%, 95% CI=0.05,0.81) and cohort studies (1.14%, 95% CI=0.01,4.19), **p=0.03.** • Children were no more likely to be positive than adults, pooled OR: 0.83 (95% CI=0.53,1.29). Seroprevalence studies (n = 9) identified 354 confirmed cases among 17,879 subjects; pooled mean seroprevalence was 3.9% (95% CI=1.15,8.19), I^2=100% • Estimates differed significantly between cross-sectional (1.49%, 95% CI=0.07 4.69) and cohort studies (10.31%, 95% CI=2.44,22.74), **p=0.005.** • Children were less likely to be seropositive than adults; **OR: 0.57, 95% CI=0.49,0.68)**, I^2=21%. Contact tracing studies (n = 15) included 747 index cases and 112,622 contacts; pooled mean SAR: 2.54 (95% CI=0.76,5.31), I^2=100%. • Child index cases had lower odds of transmitting to a secondary case vs. adults, pooled **OR: 0.26 (95% CI=0.11,0.63)**, I^2=44%.	Low

		• Child close contacts were no more likely to be positive than adult close contacts, pooled OR: 0.60 (95% CI=0.25,1.47), I^2=63%. Findings suggest that although infection does occur in schools, there is low COVID-19 circulation and limited child-to-adult or child-to-child transmission.	

European Centre for Disease Control and Prevention. (2021, July 8). *COVID-19 in children and the role of school settings in transmission - second update.*	July 8, 2021 (Search date NR)	This review explored the role of schools on the transmission of COVID-19 in Europe, and strategies to reduce risk. The number of studies included were not reported.
		
		Risk of infection in school settings:
		• When mitigation measures are in place, infection spread in schools is limited (moderate confidence); however, determining source of transmission is difficult.
		• Secondary infections in school settings are more likely to occur if the index case is a teacher than a student, other factors being equal (moderate confidence).
		• Staff and adults working within the school setting are not at an increased risk of severe COVID-19 compared to the general population (low confidence).
		• Authors conclude susceptibility and infectiousness of children, adolescents, and educational staff is higher with current community transmission compared to pre-VOC time points (data not provided to support this).
		
		Strategies to mitigate risk:
		• Implementing multiple physical distancing and hygiene measures can significantly reduce the possibility of transmission within schools (high confidence). These include:
		  ○ De-densification (classroom distancing, staggered arrival times, cancellation of certain indoor activities, especially among other students)
		  ○ Hygiene measures (handwashing, respiratory etiquette, cleaning, ventilation, and face masks for certain age groups)
		• Timely testing and isolation or quarantine of symptomatic cases is important. Rapid antigen tests should be considered.
			Low

Yuan, H., Reynolds, C., Ng, S., & Yang, W. (2022). Factors affecting the transmission of SARS-CoV-2 in school settings. *Influenza and other respiratory viruses*, *16*(4), 643–652.	Jul 16, 2022 (Search completed Jul 28, 2021)	This meta-analysis included 21 studies with 35 school clusters totaling 728 secondary cases among 21,600 contacts; mean SAR: 0.02 (IQR=0, 0.08). Compared to high school, lower-level schools were associated with lower odds to transmission, adjusting for other measures: • Preschool: **OR: 0.47 (95% CI = 0.23, 0.95)** • Mixed schools (primary and secondary): OR: 0.85 (95% CI = 0.62, 1.18) • Primary school: OR: 0.9 (95% CI = 0.76, 1.08) Factors associated with lower odds of transmission, adjusting for other measures: • Physical distancing or masking: **OR: 0.15 (95% CI = 0.08, 0.28**) • Mask wearing and physical distancing: **OR: 0.25 (95% CI = 0.19, 0.32)** • Population immunity rate (per 100 people): **OR: 0.57 (95% CI = 0.46, 0.71)**	Low

		Factors associated with higher odds of transmission, adjusting for other measures: • Surveilling all contacts vs. only symptomatic: **OR: 3.02 (95% CI = 2.13, 4.28)** • Intensity of community transmission: **OR: 1.11 (95% CI = 1.06, 1.16)** for each increase of 1 case/10,000 persons per week • Community death rate (per 100,000/week): **OR: 1.30 (95% CI = 1.15, 1.46)** • Humidity: **OR: 1.16 (95% CI = 1.11, 1.12)** • Higher national income: **OR: 1.02 (95% CI = 1.01, 1.03)** No association was found for average class size.	

Table 7: In-progress Syntheses

Title	Anticipated Release Date	Setting	Description of Document
New evidence reported on December 7, 2022			
Zheng, B., Zhang, J., Zhang, H. (2022). The SARS-CoV-2 Infection and Transmission in School Environments: A Meta-analysis. *PROSPERO, CRD42022349917.*	Oct 1, 2022	Staff and students in school environments including preschools, kindergarten, primary schools, middle schools, high schools	The aim of the study is to review available evidence on transmissibility COVID-19 in educational settings to provide recommendations for epidemic prevention and control.
Lopes-Júnior, L.C., Siqueira, P.C., & Maciel, E. (2021). School reopening and risks accelerating the COVID-19 pandemic: A systematic review and meta-analysis protocol. *PloS one*, *16*(11), e0260189.	Sep 30, 2021	Community, daycares, schools	This review and meta-analysis will summarize available evidence on school reopening and its impact on the transmission rate of COVID-19 among children, adolescents, and young adults.
Previously reported evidence			
Little, T., Reinhard, D., & White, S. K-12 non-pharmacological responses to influenza-like and Coronavirus illness outbreaks in US schools – A systematic review. *PROSPERO, CRD42021247217.*	Aug 31, 2021	Schools	This review will summarize available evidence as to the effectiveness of non-pharmaceutical interventions and/or prevention strategies employed by kindergarten to grade 12 schools on the transmission of COVID-19.
Milhomens, L.M., Domene, F.M., De Lucca Da Silva, J., de Araújo, Luquine Jr., C.D., B.C., Lopes Bezerra da Silva, L.A. … Barreto, J.O.M. (2021). SARS-CoV-2 infection in schools: rapid review. *PROSPERO, CRD42021257375.*	Jun 26, 2021	Schools	This rapid review will summarize differences in COVID-19 infection rates between students and staff in primary and secondary schools, post re-opening.
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 low- and middle-income countries.
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 interventions in reducing risks of COVID-19 and other lethal viruses among kindergarten to grade 12 school communities and in school-linked populations.

Table 8: Canadian Surveillance Data

Reference	Date Released	Study Design	Setting, Location	IPAC measures	Summary of Findings	Quality Rating:
Previously reported evidence						
Government of Alberta. (2021, July 30). *COVID-19: Education and child care*.	Jul 30, 2021	Prevalence	Primary and secondary schools, Alberta, Canada	• Cohorting • Enhanced cleaning • Hand hygiene • Masks (staff, students grade 4+, when physical distancing not possible) • Physical distancing (staff, students) • Screening • Strict symptomatic stay-at-home policy[1]	School (185 total) status classification as of Jun 30, 2021: • 30 outbreaks (10+ cases) • 21 outbreaks (5-9 cases) • 55 alerts (2-4 cases) • 79 open (i.e., no status to report)	Moderate ***NOT PEER REVIEWED***
Government of Ontario. (2021, July 28). *COVID_19 cases in child care centres*.	Jul 28, 2021	Prevalence	Licensed childcare centres and agencies, Ontario, Canada	All daycares: • Cohorting • Drop-off, pick-up protocols[2] • Enhanced cleaning • Masks, eye protection (staff) • No non-essential visitors • Record keeping • Screening	From Jun 12, 2020 - Jul 28, 2021, a total of 7568 cases occurred in those connected to daycare settings in Ontario: • 4540 child cases • 3028 staff/provider cases As of Jul 28, 2021, 28 (0.52%) centres were currently reporting a case; 3 (0.06%) centres were closed. Reported daycare closures are due to outbreaks or operational considerations (i.e., number of staff in isolation resulting in insufficient number of staff available to keep school or daycare centre open; regional closures in local public health unit areas not considered). Transmission source unknown for cases, therefore unable to report the proportion of cases due to in-daycare transmission.	High ***NOT PEER REVIEWED***

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

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

Government of Québec. (2021, July 26). *Daily numbers for the province – public and private school systems highlights*.	Jul 26, 2021	Prevalence	Public and private school system, Québec, Canada	• Alternating in-person/remote attendance (secondary schools in red and orange zones) • Cohorting • Enhanced cleaning • Masks (staff, students grades 5+; in red and orange zones, all students, except preschoolers) • Physical distancing[3]	Data from 2740 public schools, 254 private schools including over 1,300,000 students and 226,000 staff. Confirmed positive cases in the school from start of school in Sep - Dec 22, 2020: • Public: 14,929 students, 3558 staff • Private: 2443 students, 480 staff • Total: 17,372 students (~1.3% of all students), 4038 staff (~1.8% of all staff) Confirmed active cases in school system on Jun 7, 2021: • Public: 643 students, 58 staff • Private: 167 students, 8 staff • Total: 810 students (~0.06% of all students), 6 staff (~0.003% of all staff) Confirmed variant cases since Mar 12, 2021: • Public: 1097 • Private: 288 • Total: 13,855 Number of schools that have had a positive case Jan 5 – Apr 29, 2021: • 2576 (94%) At the close of the 2021 school year (Jun 23), there were a total of 3381 completed outbreaks in school environments (no additional data provided). As of Jul 26, 2021, childcare establishments reported 2 active outbreaks and 1300 completed outbreaks (no additional data provided).	Low ***NOT PEER REVIEWED***

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

Government of Ontario. (2021, July 20). *COVID-19 cases in schools and child care centres*.	Jul 5, 2021	Prevalence	Primary, secondary schools, and daycares, Ontario, Canada	All schools: • Cohorting • Enhanced cleaning • Masks, eye protection (staff) • No non-essential visitors • Record keeping • Screening Primary and secondary schools (in addition): • Hand hygiene • Masks (students, grades 1-12, in school (hallways, class), on school transportation, outdoors (when cannot distance)) • Physical distancing • Scheduled remote learning days (grades 9-12) • Staggered bell times (suggested) • Targeted testing (voluntary, participating schools)[4]	From Sep 5, 2020 – Jul 5, 2021, a total of 15,292 school-related cases were reported in publicly funded schools in Ontario: • 11,462 student cases • 2661 staff cases • 1169 'other' cases (not identified) As of Apr 9, 2021, schools moved to remote learning due to increasing COVID-19 cases in communities. From Apr 19 – Jun 30, 2021, there were 260 additional cases reported: • 120 student cases • 140 staff cases **Cases may be those not captured prior to April closure as well as students with special education needs who continued in-person learning and staff who support them.* Transmission source unknown for cases, therefore unable to report the proportion of cases due to in-school transmission.	Moderate ***NOT PEER REVIEWED***
Government of Ontario. (2021, July 9). *COVID-19: data for asymptomatic testing of students and school staff.*	Jul 9, 2021	Prevalence	Primary, secondary schools, Ontario, Canada	All schools: • Cohorting • Enhanced cleaning • Masks, eye protection (staff) • No non-essential visitors • Record keeping • Screening Primary and secondary schools (in addition): • Hand hygiene • Masks (students, grades 1-12, in school (hallways, class), on school	From Feb 1, 2021 - Apr 30, 2021, 64,526 rapid asymptomatic tests were conducted across 602 schools; a total of 411 additional cases were detected (0.73%). The number of cases identified by school board ranged from 0 to 151, and percent positive tests per school board ranged from 0 to 2.6%.	Low ***NOT PEER REVIEWED***

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

				transportation, outdoors (when cannot distance))s • Physical distancing • Scheduled remote learning days (grades 9-12) • Staggered bell times (suggested) • Targeted testing (voluntary, participating schools)[5]		

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

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