

Closing schools for SARS-CoV-2: a pragmatic rapid recommendation

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To cite: Bekkering G, Delvaux N, Vankrunkelsven P, et al. Closing schools for SARS-CoV-2: a pragmatic rapid recommendation. *BMJ Paediatrics Open* 2021;5:e000971. doi:10.1136/bmjpo-2020-000971

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bmjpo-2020-000971>).

Received 30 November 2020
Revised 13 January 2021
Accepted 13 January 2021

ABSTRACT

Background In Belgium, schools closed during the first lockdown in March 2020, with a partial reopening in May. They fully reopened in September. During the summer, infections started to increase in the general population, speeding up in September. Some measures were taken to limit social contacts but those were insufficient to mitigate the exponential rise of infections in October. Children were still receiving all lessons at school at that time and it was questioned whether this position was tenable. We systematically compared the benefits and harms of closing primary and secondary schools and developed a recommendation.

Methods A multidisciplinary panel, including school pupils and teachers, educational experts, clinicians and researchers, produced this recommendation in compliance with the standards for trustworthy rapid guidelines. The recommendation is based on data collected through national surveillance or studies from Belgium, and supported by a rapid literature review.

Results Closing schools during the first lockdown probably resulted in a large learning delay and possibly led to more cases of child abuse. We are uncertain about the effect on the infection rate, hospitalisations, transmission rates, mental health of children, teachers and parents. The panel concluded that the balance of benefits and harms of closing schools clearly shifts against closing schools. Detrimental effects are even worse for vulnerable children. This recommendation is affected by the local virus circulation.

Conclusion The guideline panel issues a strong recommendation against closing schools when the virus circulation is low to moderate, and a weak recommendation against closing schools when the virus circulation is high. It does not apply when the school system cannot function due to lack of teachers, too many children who are at home or a shortage of support services. As the results of international studies are consistent with Belgian study results, this recommendation may also be relevant internationally.

INTRODUCTION

Many governments closed schools as a means of containing the spread of the virus during the first wave of the SARS-CoV-2 pandemic.

What is known about the subject?

- In 2020, many governments closed schools temporarily as a way of controlling SARS-CoV-2 infections in their countries.
- Although closing schools may seem like a useful way of reducing infections in theory, several harms became clear during the first lockdown.

What this study adds?

- Our panel concluded that closing schools should be prevented as long as possible because we are much more certain of the harms than benefits.
- Closing schools probably results in a large learning delay, affecting disadvantaged children disproportionately.

The reasoning for this was based mainly on influenza outbreaks, where transmission of the virus is predominantly driven by children. It is unclear if school closures are effective in coronavirus outbreaks, where transmission dynamics appear to be different.¹

Belgium started its lockdown on 18 March 2020, when schools, shops, sports activities, restaurants and cafés were ordered to close. The measures were eased from 18 May onward, when schools partially reopened. Face masks were required from 18 May at schools (pupils above 12 years of age, teachers and other personnel involved) and from 7 July in places where people could not observe a distance of 1.5 m. In March 2020, testing for SARS-CoV-2 was available but limited to hospitalised patients and symptomatic healthcare personnel. From 4 May onward, symptomatic persons in the general population were also tested. Testing of high-risk contacts started on 12 June 2020.



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**Table 1** Characteristics of the panel

Number and role	Gender	Expertise
3 Pupils	Boy aged 14, 2 girls aged 15	All in secondary education
1 Parent	Female	Has 2 children in primary education
2 Teachers	Female Male	In secondary education In primary special education
2 School managers	Female Male	Director nursery education Director primary education
7 Clinicians	3 Male Female 2 Male Female	General practitioners Psychiatrist Paediatricians Physician in youth healthcare
8 Researchers	Female Male Male Female Male Male Female Male	Manager COVID laboratory Educationalist Immunovirologist Epidemiologist Biostatistician Philosopher of ethics Methodologist Methodologist

Besides limiting the contacts between children at school, the closures force parents to work at home and thus indirectly reduce parental work-related contacts. However, early on in the COVID-19 pandemic the adverse effects of school closures were reported.³ An evidence-based approach to these data is now needed. We aimed to develop a recommendation for schools weighing up the benefits and harms based on data from Belgium, supported by international literature.

METHODOLOGY

The guideline panel consisted of a multidisciplinary team, including pupils, teachers, school management boards, educational experts, parents, clinicians, researchers and guideline methodologists (table 1, online supplemental appendix 3). Recruitment of involved public (students, parent, teachers and management board) was pragmatic, for clinicians and researchers we identified seniors in their field of expertise. The panel met twice via web conferences.

The panel followed the BMJ Rapid Recommendations procedure for creating trustworthy recommendations³ using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.⁴ GRADE provides a systematic and transparent framework to develop evidence-based recommendations. It is based on a Population, Intervention, Comparator and

Box 1 PICO-structured question for our recommendation

Population: all those directly and indirectly involved in primary or secondary schools and anyone who can be infected with COVID.

Intervention: school closure (full or partial) with online lessons.
Comparator: keeping schools open—all children take lessons at school.

Outcomes: number of COVID infections (teachers, children aged 0–5, 6–12, 13–19, adults, elderly, grandparents); risk of transmitting virus to family; learning loss (short and long term); mental well-being of children, teachers and parents; child abuse and child neglect.

Outcome-structured research question with relevant outcomes, a systematic summary of the evidence and criteria for moving from evidence to recommendation or decision.⁵ Our aim was to assess whether we could use this for questions related to the COVID-19 pandemic.

Patient and public involvement

Eight individuals (three pupils, one parent, two teachers and two school managers) were full panel members and involved in all steps of our recommendation developmental process. These panel members identified important outcomes, and led the discussion on values and preferences of schoolchildren, practical issues and feasibility. All participated in the teleconferences and met all authorship criteria.

Importance of outcomes

The scope of the recommendation was discussed with the panel members. Subsequently, the importance of potentially relevant outcomes was individually rated by each panel member on a scale from 1 to 9 (7–9 critical, 4–6 important, 1–3 of limited importance), as recommended by the GRADE approach.⁶ For each outcome, the mean scores were calculated and outcomes that scored ≥ 7 were eligible to be selected for the recommendation. To ensure the outcome was considered important by several parties, we selected outcomes that were rated as important (score ≥ 7) by at least 50% of the panel (box 1).

Summary of evidence

For each outcome we searched for reliable data from Belgium, with a focus on Flanders, as many important factors are specific to a particular country, such as school system and implemented COVID-19 measures. We searched for data on the above-mentioned outcome measures during two time periods that were comparable in the best possible way. We considered other parallel COVID-19 measures, such as the closure of shops, restaurants, cafés, sports facilities, but also the testing strategy and wearing of face masks. Finally, we decided to compare data from the second half of May (when schools had been fully closed for 6 weeks) and the second half of September (when schools had been reopened fully since 1 September).

Data sources

We used national surveillance data for the number of COVID-19 cases and hospital admissions.^{7,8} The number of infections among grandparents was estimated using the number of cases among those aged 55–75 years. The centre that provides educational, medical and psychological support to schools and schoolchildren in Flanders (CLB—‘Centrum voor leerlingenbegeleiding’ [centre for schoolchild support]) provided the number of infections among teachers.⁹

Learning delay was assessed based on the result for a standardised test in the sixth grade (last year) of primary schools in Belgium over a 6-year period (2015–2020).¹⁰ These tests evaluated several subjects: mathematics, Dutch, science, social science and French. The mental health of children was assessed using the largest survey on COVID-19 performed by several Belgian universities.¹¹ We used the percentage of children reporting feeling well and the percentage of children who scored lower than 3 on the General Health Questionnaire-12 (GHQ-12, lower scores reflect better mental health). In addition, we examined data on chats with the CLB (CLBch@t), an online helpline for schoolchildren.¹² The number of chats about anxiety, depression or suicidal thoughts was used as indicators of poor mental health.

Child abuse was estimated based on the number of reports via three separate sources: child focus,^{13,14} and two different helplines.^{15,16} We compared data from March to August 2020 with the same months in 2019, and also the last 2 weeks in May and September 2020. Finally, we used the number of interventions for neglect at the centre for schoolchild support.¹⁴ We did not find data sources for other outcomes. See online supplemental appendix 2 for more details.

Literature

We performed a rapid literature review and searched for reviews on the effect of school closure on our selected outcomes. We searched PubMed, the Cochrane Database of Systematic Reviews and websites of organisations that collated COVID evidence (COVID-19 Scientific Advisory Group, WHO, European Centre for Disease Prevention and Control, Sciensano).

From evidence to recommendations

The panel discussed the evidence and formulated specific recommendations. They considered the balance of benefits, harms, practical issues relating to either closing schools or keeping them open (the intervention and comparison), the quality of evidence, values and preferences of schoolchildren, feasibility and acceptability, based on personal perception of participation, all with a different background and expertise. Formal methods were used to reach a consensus. Recommendations can be either strong or weak and in favour of or against a certain course of action.

RESULTS

Benefits

Comparing the number of COVID-19 cases (teachers, schoolchildren, adults, grandparents alike) and hospital admissions, all numbers were higher in September compared with May (table 2).

Certainty of evidence for these results was rated as very low (see online supplemental appendix 2); results were based on surveillance data, which were downgraded because of indirectness (the results are likely affected by the fact that in May additional corona measures were implemented and because the dynamic of the epidemic curve as well as the test strategy differed between the two time periods).

We found no Belgian data on transmission from teachers or schoolchildren to their families. Literature reviews concluded that the effect of school closure on number of infections was inconsistent.^{1,17}

Harms

A learning delay was found in students in the last year of primary school (table 3). This evidence was rated of moderate certainty; it was based on observational research but was upgraded. The study was performed well and sensitivity analyses confirmed that the results were robust. In addition, the observed effect was large considering that these children (last year) could go back to school before other years, that is, on 18 May 2020. It is therefore to be expected that the effects for other students may even be larger as they returned to schools later. This is called residual confounding.

Scores on well-being were higher in September compared with May. In addition, the number of chats about depression, anxiety and suicidal ideation was higher in May. The certainty of these results was downgraded because of indirectness (multiple corona interventions).

Data from several sources illustrated higher numbers of reports of child abuse in May compared with September and higher numbers in 2020 compared with 2019. The certainty of evidence was rated low because data were based on observational studies. Results were not downgraded because the effect was consistent in multiple data sources.

No data were found on the mental health of teachers and parents and long-term consequences of learning delay.

Results of reviews and studies showed that the closure of schools was associated with a learning loss, and that the lockdown increased violence and levels of stress among children and an increased use of health lines.^{18–22}

Values and preferences of schoolchildren

The panel judged that variability among schoolchildren probably exists. First, there are age differences between children in primary and secondary schools. Their age affects how they learn and the role of contact with peers. Second, the panel expects that there are differences in preferred learning environment between (secondary

**Table 2** Summary of benefits of closing schools. Results from Belgian studies and rapid review

Benefits	Schools closed	Schools open	Certainty of evidence (GRADE)	Conclusions of reviews
	Per 100000 for 14 days			
Number of infections among teachers	6	174	Very low	Typically only single or few (<5) infections among staff in schools. ¹
Number of infections among			Very low	Opening/closing schools has inconsistent results on community transmission levels. Reopening schools does not seem to be associated with increased infections in community. ¹⁷
0–5 years	7	22		Risk of infections in secondary schools is higher compared with primary schools. ³⁰
6–12 years	5	158		
13–18 years	9	331		
19–65 years	24	223		
65+ years	38	83		
Number of infections among grandparents	20	111	Very low	
Totals				
Number of hospitalisations due to COVID-19 infections	453	804	Very low	
Risk of transmission from child or teacher to household	No Belgian data			The risk of transmission from children (to household or community) is inconclusive. ¹

GRADE, Grading of Recommendations Assessment, Development and Evaluation.

school) children; some prefer to study at home while others prefer studying in a classroom setting. Some children function well with online schooling while others learn better in a physical schooling environment.

Practical issues

The closure of schools means that schools need to provide online education. It is unclear if this type of education is developed to the best of the schools' ability. Closed schools also mean that children need to be cared for at home. This creates stress for parents, even more so when they have to work from home.

Keeping schools open requires that all basic COVID-19 measures are implemented in the school environment, such as the wearing of face masks, keeping distance (including during lunch breaks and also for teachers) and washing hands. Schools make people cluster, and mixing clusters must be prevented as much as possible (in their class/year, before and after school, travelling to and from school, during breaks).

Feasibility/acceptability

School management reported that they increasingly have to deal with many teachers and children who are absent due to sickness or quarantine. Therefore, this recommendation does not apply when the school system can

no longer function due to an excessive number of people being sick or in quarantine.

Panel members noted polarisation between people being afraid of becoming infected or infecting relatives and those who wanted to carry on as usual. Polarisation occurred among schoolchildren, teachers, parents and between these groups. For example, some parents may be afraid to send their children to school.

Recommendation

The panel recommends against closing schools as long as possible (see Infographic in online supplemental appendix 1, **figures 1–3**). The recommendation is strong because the certainty of evidence of harms outweighs the certainty of evidence for the advantages. This means that the panel expects that keeping schools open is beneficial for almost all students, and even more so for disadvantaged or vulnerable children.

However, in the event of a major spread of the virus, and an increased risk that clusters of cases spread in schools, the recommendation becomes weak and schools may close, locally, partially and/or for a limited amount of time. The recommendation does not apply when the school system can no longer function due to a lack of personnel or schoolchildren as a result of illness or quarantine.

Table 3 Summary of harms of closing schools. Results from Belgian studies and rapid review

Harms	Schools closed	Schools open	Certainty of evidence (GRADE)	Conclusions of reviews
	Per 100 000 for 14 days			
Learning delay (short and long term)	Loss of 6 months		Moderate	Dutch children had a learning loss of one-fifth of a school year. ¹⁸ A learning delay may cause long-term consequences, estimated on the basis of a study that evaluated long-term effects of a school strike in 1990 in Wallonia. ¹⁹
Mental health of children	May	September	Very low	
% children feeling well	57	82		
% children <3 GHQ-12	45	55		
Mean number of chats about anxiety, depression, suicidal thoughts		-43%		
Child abuse (mean number of reports)			Low	The pandemic seems to increase the number of contacts to helplines significantly. The number of contacts related to violence is inconsistent. ²¹
2020 vs 2019 (March–August)	+80%			
May versus September 2020	+54%			
Neglect (number of interventions due to neglect)	-32%		Very low	The lockdown seems to increase the number of incidents of violence against women, children and adolescents. ²²
2020 vs 2019				
Mental health of parents	No Belgian data			
Mental health of teachers	No Belgian data			

GHQ-12, General Health Questionnaire-12; GRADE, Grading of Recommendations Assessment, Development and Evaluation.

DISCUSSION

Evidence from Belgian studies suggests that the closure of schools has a negative impact on children. School closure in the spring of 2020 probably resulted in a learning delay of about 6 months across students.¹⁰ Learning delay is serious as it may have long-term consequences, such as significant loss of future income.²³ The panel also argued that learning delay disproportionately affects disadvantaged children. This was confirmed in the study of Maldonado and De Witte,¹⁰ showing that inequality within, but also between, schools increased substantially. In addition, school closure may lead to increased child abuse. For children at risk of violence, school may be a safe haven.

Because schools are a crucial part of children's lives, the decision to close schools should not be taken lightly. The recommendation is strong because the certainty of evidence about the possible harms outweighs the certainty of evidence about the benefits. Although our panel decided to make a weak recommendation in case of high virus spread, there is currently no consensus on any threshold for this decision.

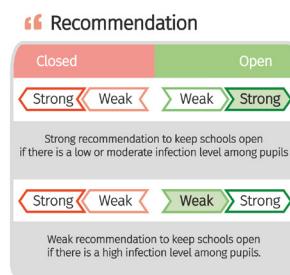
Results of other studies/reviews

The results of our rapid review were consistent with the results of our primary data: there is no strong evidence

that the closure of schools reduces the number of infections. Although some studies reported significant declines in both incidence and mortality when schools closed,²⁴ it is difficult to disentangle the effects of closing schools with other corona measures. A prospective cohort study in Australia reported that children and teachers did not contribute significantly to COVID-19 transmission via attendance in educational settings, where effective case-contact testing and epidemic control strategies exist for the population.²⁵ Sweden, where schools remained open, reported low incidence of severe COVID-19 cases.²⁶ The importance of stringent COVID-19 measures is supported by two studies on youth camps: one showing that outbreaks may be completely prevented by adhering to clear measures²⁷ versus increased infections when these measures were less strict/not adhered to.²⁸ French guidelines therefore also conclude that the educational and social benefits of school far outweigh the risk of possible infections.²⁹

The susceptibility and role of children in the transmission of SARS-CoV-2 has been widely discussed in the literature. There is a consensus that transmission of SARS-CoV-2 is plausible, but based on the published reports to date from both prior to COVID-19 lockdown and following reopening, the risk of transmission from

Closure of schools during COVID-19: Rapid Recommendation



This recommendation applies:
To primary schools, nursery schools and secondary schools, but not technical colleges or universities.

This recommendation does not apply:
If the school system can no longer function (e.g. because of a shortage of teachers)
If the vast majority of the pupils cannot follow regular lessons at school
If there are problems with support services (such as CLB, technical staff, childcare, etc.)

Figure 1 Infographic. Population, comparison, recommendation.

children to children and children to adults in primary school and day care settings appears low, particularly when infection control measures are in place.^{1 17 30 31}

COVID-19 impacts those with low socioeconomic status unequally.^{32 33} Although we did not examine the effect of school closure on social inequalities, an increase is likely as the learning delay also affects disadvantaged children disproportionately. The reduction of social inequalities would be an argument to keep schools open. Another argument is that schools are an entry point for reaching all population groups, also those people that the normal media cannot reach.

Strengths and limitations of this recommendation

Although the methodology for this recommendation was originally developed for the field of medicine,³ it appeared to be useful for this COVID-19 question as well. There was also added value in having a broad panel, as a large number of different views were considered.

Using stringent methods, we rated the certainty of evidence for the effect of closing schools. This provides the reader with insight into how certain we are that the effects from the studies reflect the effect in the real world. This strict methodology illustrates that it is difficult to examine the effects of school closure and it also contributes to the transparency of the guideline process.

Certainty of evidence for benefits underpinning this recommendation is very low for the following reasons.

Comparison of benefits and harms



Balance of favourable versus unfavourable effects

We are uncertain whether the closure of schools has a favourable effect on the number of infections among direct (teachers and children) and indirect contacts. There are other factors at play that have a significant influence on the infection numbers (total lockdown, phase of epidemic, etc.).

The closure of schools probably leads to a major learning delay and possibly to an increase in child abuse.

We are uncertain about the effect on the mental well-being of children and the risk of neglect.

There are no Belgian data about the effect on the risk of transmitting the virus to the home situation and the mental well-being of teachers and parents.

Values/preferences of schoolchildren

There is a great difference between schoolchildren in nursery, primary and secondary education. Each age group has its own way of learning and its own needs in relation to social contacts. There are also differences between children themselves; How well can they study, how do they prefer studying (alone or in a classroom), what is the home situation like?

Within secondary education there is a huge diversity between the different study trajectories (e.g. between theoretical or more practical subjects). A small minority of schoolchildren prefer to follow lessons at home. Others really prefer to stay at home out of apathy (e.g. extra sleep, more gaming, more smartphone use).

Figure 2 Infographic. Comparison of benefits and harms.

First, SARS-CoV-2 is a new virus, and evidence is changing regarding its characteristics and impact on society. Second, the data collected are based on observational studies, and because multiple COVID-19 measures were implemented at the same time we could not separate out the effect of closing schools. Third, we compared two periods that had a different dynamic of virus transmission (decreasing in May and rising in September). Fourth, the testing strategy slightly evolved between the two periods, with increased testing of asymptomatic people (all high-risk contacts and travellers returning from high-risk areas) in September. Finally, although one study suggests the GHQ-12 is a valid index of psychological well-being in young adolescents,³⁴ this needs further assessment, also in younger children. While these limitations do not change our conclusion, it is important to remember that they may distort the results. In the field of medicine, many guidelines are based on low-quality evidence.³⁵

Pandemics such as COVID-19 force governments to make choices, as keeping schools open comes at a cost for other domains (health, economy). Governments should communicate their priorities, and they should do so in a way that allays any concerns from parents, teachers and children about not closing schools.³⁶ The whole community needs to make responsible choices about their social

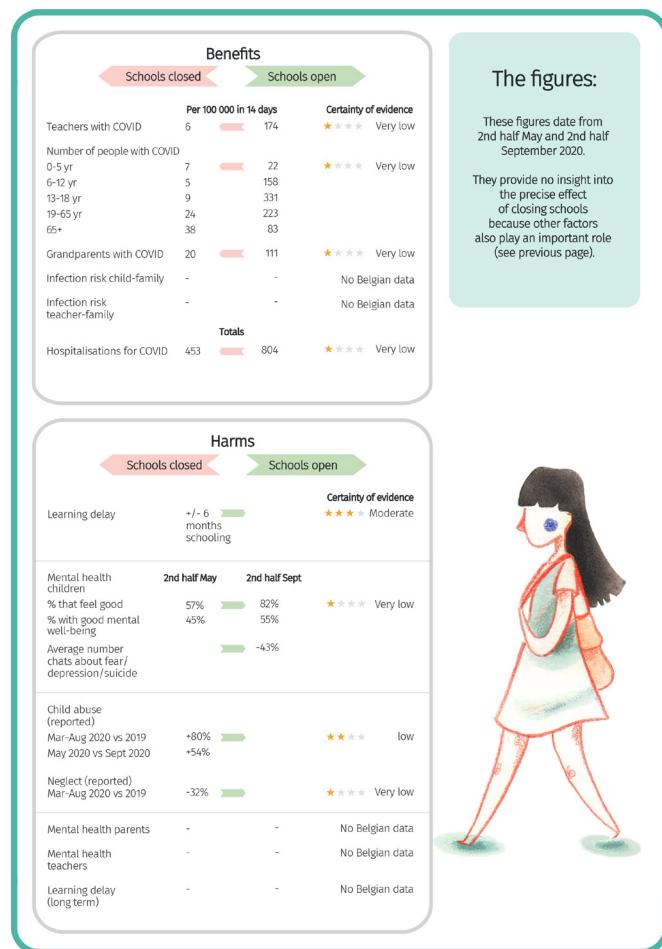


Figure 3 Infographic. Data on benefits and harms.

contacts to keep the virus circulation as low as possible in order for our children to benefit from lessons at school.

Further research

This study shows that there are still many questions to be answered. Most importantly, we need high-quality prospective studies evaluating where children become infected and the degree of risk of secondary infections in school settings, when all COVID-19 measures are correctly implemented.

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Correction notice This article has been corrected since it was first published. Name for author Pedro De Bruyckere has been corrected.

Acknowledgements We acknowledge the MAGIC Evidence Ecosystem Foundation (Per O Vandvik, Thomas Agoritsas, Gordon Guyatt, Reed Siemieniuk) for using their methods to derive high-quality rapid recommendations and Lisa van der Auwera for making the wonderful Infographic.

Contributors All authors were full panel members and involved in all steps of our recommendation developmental process. All participated in the teleconferences and met all authorship criteria.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

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Other considerations

General

Corona has had an enormous impact on all of us, and for the time being we will have to live with it. **This recommendation has been drawn up on the basis of current knowledge that is very inadequate.** We are still learning about this epidemic and the consequences of certain choices.

This continuous learning process is also taking place within education. **The recommendation concerns the impact of a total closure. On the basis of current insights, alternative measures are more likely, with the aim of minimising the learning delay and offering a safe place to those children that need it.** Examples include half-capacity classes, lessons just for certain children, re-arranging timetables.

These meetings took place during an upsurge of the virus. This influences the current recommendation. Experiencing first hand the serious effects of the virus can also change the arguments.

The number of children suffering abuse has risen despite schools being partially closed and therefore fewer opportunities for teachers to alert the CLB. These figures could therefore be an underestimation

Children can also transmit Covid-19, although the current scientific research shows that they transmit the virus less than adults. Everyone needs to continue respecting the basic guidelines as regards contact with children.

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School is also important for young people because of the **structure/security, regularity and social contacts**, especially for those with a difficult home life.

Suggestions for further research

This recommendation exposes many gaps in our current knowledge. Here we list a few that may be of added value in substantiating this research.

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How many infections actually take place at school?

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Summary

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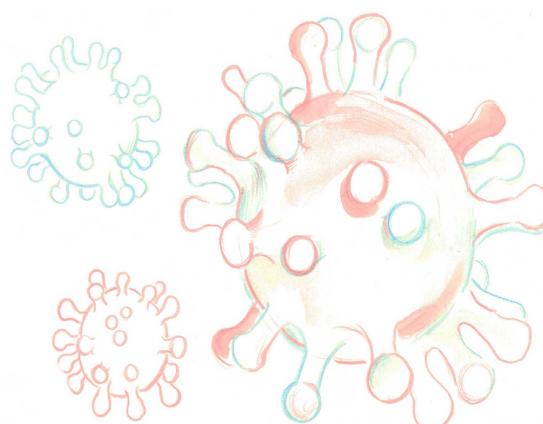
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Appendix 2. GRADE ratings and detailed data

Outcome	Study	Characteristics	Results	GRADE-rating	Final GRADE
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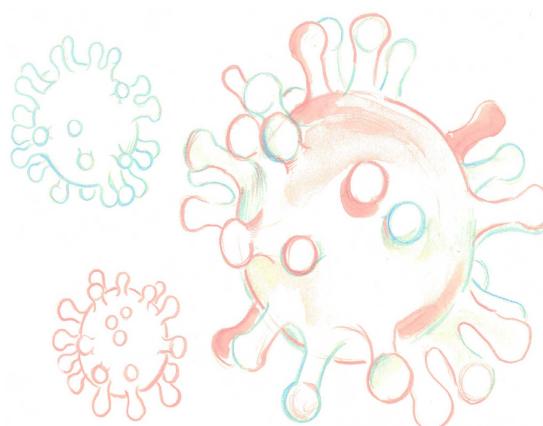
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