Protecting children from COVID-19 and making schools and childcare safer.

1 October 2021

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Summary

During a pandemic of an airborne disease like COVID-19, nearly all unvaccinated individuals will eventually be infected. Most children in Australia are currently unvaccinated. If they are not protected, 1-3% of unvaccinated Australian children may become hospitalised with COVID-19, and more may suffer from ongoing symptoms lasting for a year or more. Paediatric wards, hospitals and health systems may become overwhelmed. School closures and educational disruption are likely.

We still do not know enough about the long-term risks posed by COVID-19 to children, but given what is currently known, and based on the precautionary principle, we should do what we can to protect children. San Francisco is an example where children have been successfully protected, whilst keeping schools open.

Protecting children requires vaccinating children when possible, ensuring access to safe air through ventilation, and, where there is community transmission, using high quality masks, letting families make their own decisions about attending in-person school, and protecting children's mental health.

Risks to children from COVID-19

An approach to assessing risk

To protect children from COVID-19, we first need to consider what risks they face. There are three types of risk we will consider:

- Short-term infection impacts, such as hospitalisation or death
- Longer-term infection impacts ("long COVID")
- Indirect impacts of infections, such as disrupted education

In order to assess these risks, we need to understand **how many children** may be infected, and what the **impact on each infected child** may be. Assessing risk does not mean predicting the single most likely outcome – but rather it means understanding what range of outcomes are possible, given the level of uncertainty.

How many children could be infected?

It is well known that in an unprotected population, all, or nearly all, unvaccinated individuals will be infected in a pandemic. The speed at which this happens depends on the effective reproduction number of the virus. This can be estimated using modelling, or by looking at comparative international data. Modelling by the Doherty Institute suggests that over 300,000 children will get symptomatic COVID-19 and over 1.4 million kids will be infected in the next 6 months if restrictions are reduced when 70% of adults (56% of all persons) are vaccinated. The predictions of this model are supported by data from England, where after schools reopened without vaccines or masks, 7% of high school students and 3% of pre-primary and primary school children recently tested positive.

In general, when assessing risk, we need to consider the range of possible outcomes; if we simply assume that the lowest estimated impact will happen, then we are not actually fully understanding the risk. For risk assessment, we should consider the projections of modelling that indicate millions of Australian children could become infected with COVID-19 within a few months, if they are not protected.

What are the short-term risks of child infections?

During the second wave in England, approximately 1 out of every 100 children who tested positive required admission to hospital. This year in Australia, 3% of children who tested positive for COVID-

19 have been hospitalised, although some of these admissions were due to social factors, such as parents being temporarily unable to care for their children due to their own hospitalisation for COVID-19. If there were 1.4 million infections in children as projected, a 1-3% hospitalization rate would result in tens of thousands of child hospitalisations in Australia.

It is estimated that between 1 in 20,000 and 1 in 50,000 infections in children are fatal. Australia does not have any experience of large numbers of paediatric hospitalisations due to COVID-19; the impact on child mortality in a setting of uncontrolled infection may be significant. In the setting of health system stress an increase in mortality has been demonstrated.

What are the long-term risks of child infections?

It is unclear if COVID-19 has any long-term consequences for children's health. Adults who contract COVID-19 can experience persistent symptoms, which include shortness of breath, fatigue, and memory and concentration problems. This syndrome is known as long COVID. Emerging research indicates that children can also experience long COVID, although the precise incidence and duration of symptoms is unclear. Different studies estimate the incidence of long COVID at 2-14%, but these studies have substantial limitations which make determining the true incidence difficult. A small study of very young children (median age 3 years) from Melbourne who mostly had mild COVID-19, found that 8% had persistent symptoms lasting up to 8 weeks, although all eventually recovered.

In contrast, a study conducted by the UK's Office for National Statistics found that 7-8% of children and adolescents experienced persistent symptoms lasting at least 12 weeks. They estimate that 11,000 children and adolescents have been living with self-reported long COVID for at least 12 months, and that two thirds of those with long COVID find it significantly impacts their day-to-day life. As noted previously, if many Australian children are infected, we can expect the number of children affected by long COVID to be large in absolute terms, even if the proportion who develop long COVID-19 is small.

The National Health Service in England has recently opened 15 clinics to care for children and adolescents experiencing long COVID. US Congress provided US$1.15 billion in funding to support research into the prolonged health consequences of SARS-CoV-2 infection. Until we know more about the long-term effects of COVID-19, it would be prudent to follow the precautionary principle and safeguard children from infection.

What are the impacts of child infections on families and the wider community?

Research conducted in England found that adults living with children had an increased risk of testing positive and of being hospitalised with COVID-19 during the second wave (but not during the first wave when schools were closed). Older adults living with children during the second wave were at an increased risk of death from COVID-19. Even very young children can transmit the virus to their household members. A recent study from Canada found that toddlers were more likely to infect their household members than teenagers, probably reflecting the close contact that parents have with young children. Outbreaks in childcare centres have led to parents being hospitalised after children brought the virus home. A report into the current outbreak in NSW found that children who caught COVID-19 at school or a childcare centre often passed it on to their household contacts. Transmission of the Delta variant in schools, childcare centres, and households is about five times higher than that seen in NSW in the first year of the pandemic. Unless mitigation measures are put in place to safeguard schools and childcare centres, there will be ongoing transmission in these settings and the wider community.

What are the impacts of child infections on schooling?

Children are also impacted by infections due to school closures and absenteeism. For instance, in Florida, where children were sent to school with little protection, whole school districts have been forced to close. Singapore primary schools had to shift to online learning, despite a very high adult vaccination rate. During periods of high community transmission in England, one-fifth of secondary school children were not attending school due to quarantine requirements. In England, concerns have been raised regarding the impact on children being unwell with COVID-19 around the time of exams, when being unwell for 2 weeks and the anxiety associated with missing exams may have significant impact on the child's education and well-being.

To ensure the safe operation of schools and avoid disruption to children's education, it is crucial to keep community transmission at low levels, while putting mitigation measures in place to reduce the risk of in-school transmission.

What are the risks of child infections on mental health?

What is good for our physical health is also good for our mental wellbeing, as mental and physical health are interdependent. By protecting staff and students within the school setting we are investing in better mental health both directly (for example, decreased anxiety about infection) and indirectly (for example, avoidance of traumatic loss of family members to COVID-19). A range of measures and risk mitigations can be taken that will depend on the circumstances of the school and its community at any particular point in time; the options are broader than having schools 'open' or 'closed'.

We need to be careful not to pre-emptively link any reduction in wellbeing during a pandemic (which might arise from a multitude of factors) to the public health interventions which are used to reduce transmission of disease and loss of life. Rather, it must be recognised that harms are at least partially offset, and possibly outweighed, by the benefits of preventing trauma secondary to COVID-19 morbidity and mortality within family units.

Protecting children from COVID-19

Can we protect children?

There are jurisdictions where schools have successfully reopened without significant outbreaks. We know therefore, that it is possible to protect children from COVID-19 and keep schools open.

The experience of San Francisco provides a useful model of successful reopening. In that city, 90% of children aged 12+ are fully vaccinated, all children aged 2+ are required to wear masks in schools at all times (except lunch, which is eaten outside), and following a ventilation audit, High Efficiency Particulate Air (HEPA) grade air purifiers were purchased for classrooms with inadequate ventilation. Despite over 100 daily COVID-19 cases in the community, only seven instances of in-school transmission have been identified in San Francisco schools since schools reopened in April 2021.

Should we protect children?

If we fail to protect children there is a significant risk that tens of thousands of children will be hospitalised (which may overwhelm children's hospitals and affect routine care for other diseases, such as cancer), and many more could develop long COVID, negatively impacting their day-to-day life. School closures and a high level of absenteeism are likely, as well as negative mental health impacts. It seems clear that we should endeavour to protect children, in order to avoid the potentially catastrophic outcomes of not doing so.

To put this in context, we work hard to protect children from many illnesses that are mild in most cases. For instance, polio is mild or asymptomatic in 99% of children. At the peak of polio in Australia, we had 357 deaths in 1951. Now, 70 years later, we still protect children against polio. From 1956-1975 we had 356 deaths from measles in Australia. That is less than 20 deaths a year, and we think it is worth protecting children from measles. There were 290 deaths a year between 1910 and 1942 from whooping cough. To be consistent with the high value we place on protecting the health of children against other infections, we must do what we can to protect the children who are going back to school unvaccinated against COVID-19.

Pandemics exacerbate existing societal inequalities. Some control measures may have unexpected or unseen complications, particularly for disadvantaged communities. A fair and just society must consider the ethics of leaving some sectors of the community behind in pursuit of a perceived greater good.

The aim of these recommendations is to allow us as a society to better maintain continuity in education and social connections while minimising restrictions with a considered balancing of the risks and benefits of a broad range of options.

How can we protect children?
In the second half of this document, we provide detailed recommendations and steps to help protect children. In this current section we give a short summary of the key approaches.

Protecting children with vaccines
The Australian Technical Advisory Group on Immunisation (ATAGI) has recommended full vaccination for adolescents aged 12 years and older. There is now rapid uptake in this age group, although there are still many unvaccinated. No vaccine has yet been approved for younger children. Results from clinical trials are very promising, and vaccines for younger children may be available before the end of 2021. In adults, the Pfizer vaccine clinical trials showed that severe cases were ten times more likely in the single-dose group compared to the double-dose group. Based on these results, it is likely that younger children will require full vaccination as well.

Since vaccines have been highly effective against severe disease, and reduce the risk of long COVID, it is important that children are given the opportunity to get vaccinated. If mitigation measures are not put in place in schools and childcare centres, then the virus will primarily circulate in this age group and COVID-19 will become a pandemic of the young.

It will be important to ensure that teachers and childcare staff are prioritised for vaccination. However, it is important to note that vaccination doesn't completely prevent transmission, so vaccinating adults around children is not sufficient on its own to fully protect children or other staff. It is vitally important that all adults that come into contact with school aged children are vaccinated for their own protection, and to reduce incursions of disease into schools.

Change in our understanding of COVID-19 transmission
There have been major changes in the understanding of how COVID-19 is transmitted. At the beginning of the COVID-19 pandemic, the main emphasis was on cleaning surfaces and the sanitisation of hands. We now know that the focus must urgently shift to safer indoor air.

Most transmission of COVID-19 occurs indoors, and transmission has a relationship to indoor ambient aerosols. These are very small particles that can linger in the air and are produced by coughing, speaking, and even normal breathing. Our recommendations for protecting children are

based on this understanding of COVID-19 transmission, including improving indoor air quality through ventilation, along with the careful and appropriate use of face masks.

Protecting children through safer indoor air

OzSAGE's advice on Safe Indoor Air states:

> *"We know how important clean water is – with COVID-19 we need to be just as fussy about the air we breathe, and ventilation is key. In this context, ventilation means provision of safe, clean indoor air... Respiratory aerosols from breathing and speaking accumulate in indoor spaces, much like cigarette smoke but invisible.... Good ventilation is one of the most effective ways to reduce the risk of COVID-19 infection"*

The first step to ensuring safer air is testing; using a carbon dioxide (CO_2) monitor to measure ventilation. This provides an indicator of how much of other people's exhaled breath is in the air that you may be inhaling. Ideally the CO_2 concentration should be as close to outdoor air values as possible (400-420 ppm). In spaces without HEPA filtration, if CO_2 is greater than 800ppm, use the recommendations in the second half of this document and in the OzSAGE advice on Safe Indoor Air to improve ventilation. If immediate ventilation improvements are impractical, ameliorate conditions using HEPA purifying devices. The state of Victoria has purchased over 50,000 HEPA filter air purifying devices for use in schools for this purpose.

HEPA filters have been successfully deployed in universities and hospitals to reduce airborne transmission risks and have the added benefits of reducing bushfire smoke, mould, and pollen, all of which is protective for the school community.

Internationally, the incidence of COVID-19 has been significantly reduced when masks were worn, and further reduced when ventilation was improved.

Protecting children through face masks

Scientists have found that using better masks is vital to decreasing viral transmission in a classroom setting. They showed that if all teachers and students wear masks with good fit and filtration, transmission is reduced. It has been reported that schools without universal masking had outbreaks of COVID-19 at a rate of more than 3.5 times those without. Further, there have been documented increases in paediatric COVID-19 case rates in school districts that have not had mask requirements. International experience shows that school children are able to wear masks. For instance, all children over two years of age in San Francisco and New York City are required to wear masks at school. We recommend that masks should be mandated for primary and high school students and staff. Implementing mask requirements in schools, in combination with other strategies, was noted to lower cases of COVID-19 in school-aged children.

We strongly recommend well-fitted face masks be worn by everyone aged five years or older who can do so, along with 2- to 5-year-old children where developmentally appropriate, in line with recommendations of the American Academy of Pediatrics and the Centers for Disease Control and Prevention (CDC). It is important to acknowledge that there are some people who cannot wear a mask, or cannot safely wear a mask, due to reasons including disability. While masks with good fit for children are not widely available in Australia at present, investment in importing and locally manufacturing effective children's masks is paramount.

Supporting children to wear a mask helps them learn community responsibility, and reflects a desire not only to help protect your child, but also help protect other children and adults. To support mask use, ensure the mask is comfortable and use behavioural techniques such as modelling and reinforcing desired behaviours to help students with adjusting to the transition of using masks at school. For some children, there may be a benefit in using picture schedules or visual cues. Schools should provide masks to students and staff that need them for any reason such as difficulty affording masks, or if the mask has been forgotten.

Protecting children by giving families options

Existing research on the mental health effects of the pandemic on children, adolescents and families is limited and often reaches contradictory conclusions. The impact of not attending school differs among individual children and adolescents. While the benefits for social development and learning of face-to-face school environments are acknowledged, an inability to attend in-person does not affect all children in the same way: some children need and benefit from school interactions, some have less anxiety and dysphoria learning from home, and some adapt to both environments.

Although the indoor classroom setting is the education system's standard mode of delivery, social development and academic learning can also occur via a range of other activities. The risk-benefit analysis of the classroom setting for children with differing health and mental health risks, and differing risks related to transmission to family members, is complicated. Individual families may be best-placed to make decisions for their children in the setting of widespread COVID-19 transmission, particularly when insufficient risk mitigations are in place. For some children, even repeated and prolonged home learning may be preferable to severe illness or bereavement due to the death of a significant attachment figure or figures from COVID-19.

The health and wellbeing of children is also dependent on interrelated impacts of the pandemic on their primary attachment figures, families and communities.

Protecting schools with testing

RT-PCR (reverse transcriptase polymerase chain reaction) of a nasopharyngeal and throat swab is the reference standard test at this time, and is the test used most frequently in Australia for the diagnosis of COVID-19. RT-PCR tests may take several days to return results however, because of the need to ship samples to centralised laboratories, during which time an infectious individual in the school environment can spread disease. Also, RT-PCR tests usually require the supervision of a healthcare provider to administer, in addition to expensive instrumentation, making them more expensive and logistically challenging to scale across large numbers of facilities/ schools. Pooled testing may be used to scale up RT-PCR testing, but this also then requires time to narrow down the positive case if a batch is positive.

To overcome these challenges rapid antigen testing (RAT) kits were developed and will be available for use by untrained people (including home use) from November 1, 2021 in Australia. RATs are faster than the RT-PCR tests. RATs can give results in as little as 15 minutes, and can be done at home, subject to TGA approval of kits for home use.

 Rapid tests have both advantages and disadvantages:

+   Frequent rapid testing uniquely complements other strategies
+   RATs can more readily be used frequently and work best when people are most infectious
+   Universal access to low-cost RATs is crucial for promoting equity
+   Self-testing is effective when performed properly
+   There is some evidence that RATs may reduce transmission

- Logistics could be challenging, given the scale and required frequency
- Completing the tests correctly may not be possible for smaller children
- If tests need to be done at home, compliance may be a problem
- It can give people a false sense of security
- There is still much uncertainty about how best to use this tool, including the effectiveness of approaches such as "test to stay" (TTS)

Protect children's mental health

Studies have emphasised the need for practical financial, psychological, and social support for parents and caregivers to enable them to better-support the emotional needs of their children during the pandemic. The parent/primary caregiver role is central in regulating and supporting the wellbeing of children. Hence the importance of supporting the mental health of parents and caregivers.

The Australian Institute of Health and Welfare (AIHW) reports that suicide rates have remained stable during the COVID-19 pandemic. However, the proportion of the community experiencing psychological distress has increased. This reinforces the importance of improving access to, and support for, mental health and early intervention services in addition to addressing broader social determinants of health.

Impacts are likely to be greater for children and adolescents who have previously experienced adverse childhood experiences (ACEs). Those with pre-existing barriers to accessing care are also at increased risk; for example, Aboriginal and Torres Strait Islander people, families for whom there may be cultural or language barriers, low socio-economic status households, children with underlying medical conditions or disability, and children exposed to family violence. Mental health impacts of the pandemic, resulting from additional adverse experiences and/or loss of life, may take time to surface and be recognised.

Strategies for assisting with mental health

Young people and parents are primary stakeholders in their own mental health, and should be consulted directly, with care taken to include a diverse range of voices.

It is important that children and adolescents receive developmentally appropriate, factual information about COVID-19 as it becomes available. Children, even at a young age, have the capacity to understand health information and how to keep themselves safe. Information and support for parents around how to discuss health and safety with children and educational material and support for schools and teachers should be developed as an urgent priority. Resources should meet language, literacy, and cultural considerations.

We can emphasise to children and adolescents that we, as adults, are also learning and adapting to what is a dynamic situation, and are interested in their ideas, suggestions, and feelings. These conversations have been found to be protective against anxiety and depression.

Younger children in particular use play and drawings as a strategy to process their emotions. Resources can model to parents to show interest, ask non-judgemental questions, following the lead of their child in play and joining in. Programs such as the UK's Fading Rainbows, using art, history, and stories to help young people to articulate and process their feelings provide a useful model.

General practitioners, maternal and child health nurses, and child health services are valuable partners in supporting health messaging. Telehealth services should continue to be supported and promoted.

Educators play a [crucial role](#) in supporting students to navigate distress and complex emotions, particularly for vulnerable children. A taskforce to develop programs in partnership with mental health and education sectors would support [training](#), increased capacity and resources to benefit children's mental health and safe return to school.

Equality and access to education and safe workplaces

COVID-19 poses unique challenges that very according to the needs of children and staff working in educational settings. Where possible, each section of this strategy document has adaptations recommended for special circumstances that have been brought to the attention of OzSAGE. Staff unable to be vaccinated for medical reasons may be referred by the employer to an Occupational Physician (medical specialists in workplace safety) if assistance is required to review vaccination concerns with workers and support safer placement if necessary.

It must be recognised that schools are workplaces. There are specific workplace health and safety legislative duties of those who engage workers to provide that safe working environment including a duty of care, a duty to exercise due diligence, and a duty to ensure the health and safety of workers so far as is reasonably practicable. While employers may not be able to control or otherwise affect the conduct of persons that workers interface with, the employer is able to directly control and dictate the measures which should properly be made in preparing and equipping workers to perform duties which are of such a nature that will ensure the health and safety of those workers and keep safe those they serve.

Feasibility of the strategy

The measures required to make schools and childcare centres safer are not complex and are relatively inexpensive to implement. Although throughout this document schools and day-cares are referenced, much of the strategy can be applied to anywhere that children interact in groups, particularly indoors. A safer-schools strategy is best implemented as a package of layered interventions. Effectiveness will be diminished if only some parts of the strategy are used.

Audit

Opening schools during an outbreak of airborne viral disease cannot be made risk free. The effectiveness of risk mitigations should be under constant review. If there is evidence to indicate that the mitigations are failing, a switch should be made to remote or hybrid learning until a more detailed assessment can be made, and any breaches in protocol/engineering failures are identified. Occupational and environmental medical professionals, mechanical engineers, aerosol scientists, or occupational hygienists can review the worksite and assist if needed to provide advice and building-specific strategies to keep students and staff safe.

Data transparency is key to school safety. Data should be made available (for example on a school or centralised dashboard) of incursions of COVID-19 into the school environment and any subsequent in-school transmission. Each school should be assigned a named public health officer that undertakes case identification, contact tracing and isolation work. Close partnership between schools and public health officials should be maintained throughout, facilitating timely communications.

Disclaimer

This position statement has been written with the best available evidence and was last updated on the date shown on the title page. No liability is accepted for the outcomes associated with the implementation of the advice contained herein. OzSAGE strongly recommends continuous quality assurance activities and ongoing adaptation to the circumstances.

Recommendations

Control COVID-19 in the community

- Controlling disease in the area from which the school draws staff and students significantly reduces the risk of in-school transmission.
- Reopening of schools should be prioritised above other venues, and the relaxation of public health measures should be balanced carefully against the threat posed to the feasibility of face-to-face learning.
- Guided by the Australian pandemic plans, clear signals to guide school responses should be established. The catchment area of students and staff should be considered in the risk assessment for schools as well as consideration of any ring-fencing that may be in place.
  - Green:
    - No cases of COVID-19 known outside of border quarantine
    - No unexpected positive sewage detection
  - Amber:
    - Case identified
    - Source of case known
    - No sustained community transmission suspected or all known contacts in isolation for the duration of the infectious period
  - Red:
    - Case identified
    - Source of case unknown
    - Unexplained sewage positive detection
    - Sustained community transmission
  - Black
    - Exponential community transmission (R>1)
    - Healthcare systems unable to maintain normal services

Alternatives to face-to-face learning

- Develop flexible learning models that can quickly adapt to changing circumstances so that children isolating can continue to participate in learning, and to allow for school closures in event of a disaster.
  - Use of online learning, provision of IT equipment and internet access to students
  - Where possible structure lesson plans that can be delivered online and face-to-face simultaneously.
- Outdoor learning whenever circumstances allow.
- Online learning when the community the school is a part of is experiencing exponential community transmission (R>1) and where an individual school is an identified cluster.
- Reduce the number of people onsite in schools during outbreaks.

Engineering Controls and Physical Environment

(See also paper "Safe Indoor Air (Ventilation) Recommendations")

Optimisation and ongoing quality assurance/audit of:

- Air
- Sewage
- General cleaning

Air

- Source control (see PPE and source control section)
- Ventilation (see document "Safe Indoor Air (Ventilation) Recommendations")
- Filtration (HEPA)
- Humidification
- (UV no recommendations currently. Remains under review)

Warning:

- Do not open windows or external/fire doors to improve air quality in buildings with mechanical ventilation systems (HVAC) unless checked with a mechanical engineer.
- Do not operate fans for longer than they are designed to run to avoid the risk of overheating fan motors. Purchase of more than one device or devices made specifically for continuous use may be required if extended hours of run time are needed.

Resources:

- Functional windows
- CO_2 monitor
- Fan(s)
- Tape measure
- HEPA filter(s)
- Humidifier
- Outdoor spaces

Safer Indoor Air for Kids

OzSAGE

To be used with masks as part of a complete strategy.

- schools
- out of hours care
- day-care
- youth groups
- clubs
- anywhere kids get together

Mechanically OR Naturally Ventilated?

Mechanically Ventilated

Call a mechanical engineer to review the HVAC system.

Complete the recommended work to increase outdoor air intake.

Once the building is in use, monitor the ventilation with CO2 monitors.

Use Portable HEPA filters if ventilation is not enough.

CO2 Monitors

LOW RELATIVE RISK
- Below 800ppm

MODERATE RELATIVE RISK
- 800-1500 ppm
- work to improve indoor air quality to low relative risk range

HIGH RELATIVE RISK
- Above 1500 ppm
- moderate risk reading not improving
- Leave room until air quality improved.
- Increase ventilation bringing outdoor air indoors.
- Use HEPA filters with ventilation to assist if occurs repeatedly.
- Reduce occupancy or cease activity causing high risk air quality.

Portable HEPA filters

- Use filtration to clean the air, do not add anything to the air.
- Use the right size and avoid low flow settings.
- CADR = clean air delivery rate
- Aim for an equivalent of minimum 6 air changes per hour (ACHe)
- ACHe X Room volume = CADR needed
- Use of more filters may allow for less noise.
- HEPA filters will not lower the CO2 reading on the monitor.

*Fans, if used, must be placed to direct indoor air outside & encourage cross ventilation. Take care not to recirculate, including avoiding the use of split system air-conditioning.

For more detailed advice & warnings please see OzSAGE document for Safe Indoor Air.

Naturally Ventilated

Open windows and doors where it is safe to do so.

Work to create a cross breeze of fresh air. On still days may use a child safe fan.*

While the building is in use monitor the ventilation with CO2 monitors.

Use Portable HEPA filters if ventilation is not enough, outdoor air is polluted or bad weather

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Outdoor spaces as classrooms
- Whenever possible, use outdoor spaces for learning.
- Avoid if extremes of weather or heavy air pollution (e.g., bushfires, traffic, dust storms).
- Ensure children are dressed appropriately for the weather. Supply warm clothing, hats, sunscreen and long shirts if required.
- Maintain hydration, particularly in warmer weather.
- Avoid setting up near flowering plants, flowering trees and long grasses. Be mindful of allergies and special needs regarding this.
- Shelter from the sun, however avoid constructing outdoor marquees with enclosed sides. These do not offer sufficient disease control advantage and require CO_2 monitoring.
- Maintain masks when outdoors in a group.
- Maintain physical distancing during outdoor lessons.

Perspex screens
- Avoid Perspex screens. Generally, these trap air and may cause more harm than good.
- Usually only recommended in situations where one person may interact with many people at close range, such as a school reception. However, if installed to take care to consider ventilation effectiveness.

Fans
- Can be used to expel air out of the classroom into outdoor spaces, or to draw fresh air in from outdoors, particularly if there is not much of a breeze.
- Must think about where the air is being expelled to. Avoid discharging into areas where people may be directly exposed (e.g., straight at the tuck shop queue).
- Must be placed in such a way to optimise whole of classroom ventilation with fresh air and to avoid recirculation of air (see example diagrams below) as this will increase disease transmission.
- Fans must not be used for longer periods than they are designed for. More than one fan may need to be used to prevent motor overheating.

Split system air conditioning
- Does not filter the air like a HEPA filter.
- Causes recirculation of aerosol-containing air and has been shown to direct the path of transmission.
- May be needed for thermal comfort, however strongly recommend adequate HEPA filtering of air in addition.

CO_2 monitors
- Help estimate the relative risk of infection in addition to outdoor air-changes-per-hour.
- May be affected by sources of combustion (e.g., Bunsen burners) or placement.
- Place on a wall away from open windows, sources of combustion, not within 1m of a student or teacher, at about "breathing level". CO_2 is usually well mixed over time in a classroom. Place in as many spaces as possible, including shared areas such as halls.
- Recommend CO_2 consistently maintained below 800 parts-per-million (ppm) and preferably less than 600 ppm to indicate low relative risk of infection.
- Refer to OzSAGE's advice on Safe Indoor Air for detailed advice.

HEPA filters

- HEPA filtration traps aerosols from the air passing through it. Due to the high demand for true HEPA, there are a number of inferior products entering the market. These should be avoided. They include products that include filters called 'HEPA like' or use electrostatic precipitators or ion generation in addition to a filter. These should not be used as the addition of free radicals, or ozone etc. can aggravate respiratory conditions. Further, they provide no additional benefit to a HEPA filter.
- Use when mechanical and natural ventilation is insufficient or unknown.
- Ideally there should always be some fresh air supply to all indoor spaces, in addition to HEPA filtration.
- HEPA filters need to be turned on prior to the start of the day to clear the air and left on after the room is emptied.
- The effectiveness of an air cleaner is described by its Clean-Air-Delivery-Rate (CADR) - (the rate at which air is cleaned/has 100% of particles of a given size removed).
- DIY Corsi-box filters have been tested for safety, CADR, and effectiveness in classrooms in other countries, but cannot be recommended at this time in Australia due to materials required being unavailable, and any adaptations being untested. Recommendations may change in future.
- Several smaller HEPA filters in a space will be quieter, an important consideration in a learning environment.
- Do not run the HEPA filter on low air flow settings as this may not provide adequate air cleaning and may leave dead spaces of air that are not cleaned.
- Check and remain within the maximum continuous run time for the HEPA filter to prevent overheating through prolonged use.
- ACHe means equivalent air change, as with HEPA filter the air is cleaned rather than exchanged. Aim for at least six equivalent air changes per hour.
- Measure the room in the same units as the CADR (clean air delivery rate) of the HEPA filter (m^3 or ft^3) to keep calculations simple. Many online calculators available to assist in conversions. For example, calculation to size a HEPA filter for a classroom. Measure the length, width, and height (average height is 2.5m) of the room.
- HEPA filtration should be sized to be adequate for the room occupancy independent of potential fresh air intake to ensure a minimum safety standard is always met.

Humidifiers

- Prevention of low humidity conditions assists in the prevention of COVID-19 transmission.
- A humidifier is an option to maintain humidity between 40-60% (steady state) when conditions are very dry.
- If used, monitor visually for development of any damp, and adjust the humidity or ventilate accordingly.

Indoor Air Specialists

Engineers, occupational hygienists, and indoor air quality specialists can be engaged prior to return to full attendance face-to-face learning/care if needed and can help to accelerate the response and ensure safety standards are met by:

- Developing guidelines to reduce aerosol-mediated disease transmission and updating guidelines as new evidence emerges.
- Developing standardized testing protocols for HEPA devices.

- Developing guidance to standardize the process for optimizing indoor air safety.
- Investigating further the role of UVC/URUVGI and setting standards for the same.
- Identifying high risk areas prior to occupancy.
- Working with school staff to prioritise areas to be made safe so that immediate needs of children and staff can be met.
- Adjust and improve filtration of and fresh air supply to HVAC systems (reduce re-circulation) and assess feasibility of delivering continuous airflow.

Government

OzSAGE has published "Safe Indoor Air (Ventilation) Recommendations" which provide overarching principles and general principles dependant on whether a building is naturally or mechanically ventilated. Departments of Health and Education and private providers should:

- Immediately embark on a process of measuring ventilation levels at every school and take action where required in line with the "Safe Indoor Air (Ventilation) Recommendations".
- Improve ventilation starting from the areas that are in use/need to be in use and of highest risk, in line with the advice.
- Develop regulations to ensure the delivery of effective safety standards based on the implementation of scientific advice recommended and update these regulations in a timely manner.
- Introduction of continuous mandatory CO_2 monitoring with maximum safe levels.
- Mandate HEPA filtration if fresh air intake is inadequate.

Sewage

SARS-CoV-2 has been shown to persist with very few symptoms in the gastrointestinal system. The virus retains the ability to infect and is shed in stools for many weeks post infection. Therefore toilets, changing rooms and assisted bathrooms require mitigation against the hazard of faecal aerosol.

- Close the lid to flush (may not be possible in accessible toilets).
- No touch equipment recommended where possible (taps/soap dispensers).
- Avoid the use of toilets that share air with changing rooms, or avoid the use of those changing rooms if possible.
- Wear a well-fitting mask or respirator when entering toilets.
- Maximise ventilation in toilets.
- Upgrade capacity of extractor fans so that they can run continuously throughout the school day and for some time after.
- Air filtration may help, but only if can be safely placed (avoid risk of electrocution and trip hazards).
- UV sanitation under review. Recommendations cannot be given at this time.
- Addition of slow-release disinfectant to water in toilet cisterns (may cause corrosion over long term).
- Ensure all water traps are functional and all pipes are sealed/not leaking.
- Use respiratory protection when assisting with toileting all children, including changing nappies or processing commodes.

General cleaning

Given SARS-CoV-2 is primarily transmitted by aerosols, the airborne route of transmission is the most important when prioritising risk mitigations. According to the CDC, "each contact with a

contaminated surface has less than a 1 in 10,000 chance of causing an infection" therefore the risk of infection via the fomite transmission route is low.

- Make sure rooms are well ventilated and/or filtered and unoccupied for a minimum of 30 minutes prior to commencing cleaning
- P2/N95 respirators are recommended (ideally fit-tested) to be worn by cleaners, particularly if cleaning areas with higher aerosol load such as toilets.
- Standard contact precautions including hand hygiene to be maintained.
- A list of suitable disinfectant products can be obtained from the Therapeutic Goods Administration (TGA).
- Cleaning of high touch surfaces may be reduced by keeping seating the same during the day.

Administration and workflow controls

During outbreaks, people without symptoms can still spread COVID-19. A layering of controls will decrease risk of spread and are essential.

School Community and Liaison with public health

- Each school should assign a public health liaison. Each school should have a named contact at the local public health unit.
- School to maintain records of known cases that have attended school and to inform Public Health. Parents and guardians can be encouraged to let school management know if they have a person in their household with a positive test confirmation.
- Online reporting of school incursions and transmissions recommended to be maintained by public health and accessible to the school community.
- Audit of transmissions to occur including, where applicable, root cause analysis of recurrent or large in-school transmissions followed by remedial action. Occupational physicians, occupational nurses and occupational hygienists can assist in this process in conjunction with public health and identify where controls can be strengthened.
- Public health to inform school of any exposure sites or hotspots, so that school management may consider which of their staff is at risk (and estimate level of risk with public health assistance). The school may then provide hybrid learning opportunities for students if needed.

Vaccination

- Vaccinate all teachers as a priority.
- Vaccinate all children for whom there is an approved vaccine and consent can be obtained.
- Anticipate the need to supply vaccines for teachers and children and plan ahead for boosters to minimize the disruption to education.
- Schools to be included as a point of delivery for vaccination of children.

Testing Staff and Students

- The best implementation plan needs to be identified urgently. RATs may be a useful complement to, but not substitute for, other measures.

Education and signage

- Use updated signage to remind persons of COVID-safe actions including how to stay safe from aerosol transmission.
- Provide the school community with regular bulletins regarding:

- o Reminders not to attend school while sick with any symptoms (including a list of COVID-19 symptoms and notation that symptoms are widely varied and may be subtle).
- o Links to government websites for information on common symptoms, which may vary from person to person and change over time depending on variants.

Sick leave and isolation periods

- Support staff sick leave and isolation periods financially such that there should be no temptation to come to work unwell.
- Support student absences with a dedicated home education officer and a curriculum that is structured so that it can be delivered both on-line and in person.

Welfare of the school community

Support children and families to make risk assessments based on their own needs. Support needs will vary.

- Clinically vulnerable families may feel the need to switch to online learning whenever community status is amber/red/black and should be able to access education.
- Clinically vulnerable children should have an individual health plan to assist schools and Public Health Units to understand and mitigate risks.
- Provide options for counselling and support groups for children who have not been able to attend school.
- Socially/educationally vulnerable children may need continuous access to face-to-face learning even during large outbreaks.
- School to continue to provide non-educational contact points such as welfare check phone calls, vaccination reminders and free meals.
- Consider the provision of information technology equipment for students that would otherwise be unable to access online learning and support for troubleshooting.

Staff

- Recommend all staff are vaccinated.
- Recommend all staff have priority access to vaccination and boosters.
- Recommend consider completing a voluntary personal risk assessment indicating whether they have a particular vulnerability to COVID-19 to be held with OHS. Occupational Physicians can take referrals, if required, to assist with safer placement including but not limited to staff that are:
  - o Unvaccinated
  - o Unable to wear airborne level PPE
  - o Have underlying health conditions
- Recommend all staff have priority access to PCR testing.
- Use centralised IT systems to be aware of LGA's that staff pool is drawn from and anticipate incursions.
- Staff to be supported financially for testing and isolation periods if unwell. This should be at a level that removes any motivation to attend work while unwell and include casual staff and visiting staff.
- Private contractors must have in place an equivalent support package, or to have access to support packages available to regular staff.

- Staff rest areas to be available near all work areas as usual. However, no consumption of food and drink in these but rather in outdoor, sheltered but open dining space to be provided with clearly marked physically distanced seating.
- To not speak while mask is removed for eating and drinking unless emergency.
- To not share food.

Academic support

- Number of days of isolation, days not able to access face-to-face learning, and bereavement should be recorded for each student and considered when assessing academic progress.
- Children that are bereaved to be provided access to mental health services/grief counselling being mindful that the child may not be able to verbalise this need, and therefore changes in behaviour indicating possible distress should be carefully observed and acted upon.
- Plan for catch-up days or summer schools to assist education if disruption has been severe.
- Tailored and individualised access to face-to-face learning for students for whom a need has been identified.

Children

Getting to and from school during community green/amber/red/black status

- Where possible walk or cycle to school.
- Mandatory, well-fitted, respirator or medical mask use on public transport.
- School buses and public transport to be ventilated with open windows, air recirculation switched off.
- School bus users to register route used with school administration to facilitate contact tracing.
- Avoid mingling at school gates, no parents/visitors on school site.
- Stagger start and finish times to reduce crowding on public transport and on school grounds to assist with maintaining physical distancing, particularly at the bus bays area.

School business during green status

- All school activities as per normal.
- Recommend ongoing efforts to reduce crowding. Where possible, consider increasing staffing to reduce class sizes.
- Measure CO_2 levels of all areas of the school, including gyms, classrooms, halls (at full capacity / usage) to establish the baseline CO_2 readings for future reference and control improvements if required.

The learning environment during amber/red/black community status

- Avoid the use of environments where it is known to be difficult to mitigate risks.
- Maintain physical distancing at all times.
- Reduce crowding.
  - Use CO_2 monitors to assist decision making in regard to reducing numbers, improvements in ventilation, and HEPA filtering.
  - Mark out physically distanced spacing for furniture.
  - Reduce numbers in class.
    - Half attendance.
    - Half days.

- Physical distancing of 2 meters may be effective to mitigate close range aerosol transmission. However, it does not mitigate long range aerosol transmission due to poor ventilation. During an outbreak, consider hybrid learning to allow for physical distancing.
- Avoid large assemblies and congregating.
- Maintain small "bubbles". Everyone that shares indoor air is in one bubble and it is imperative to set up the orderly flow of the school traffic to avoid cross contamination of bubbles. If there is a positive case identified, the whole bubble should be isolated.
- Lunch
  - Whenever possible, lunch should be staggered and eaten outdoors.
  - Eat in small groups / bubbles / cohorts.
  - Maintain physical distancing.
  - Sanitise hands.
  - Remove mask.
  - Sanitise hands.
  - Eat and drink quietly.
  - Wear mask (replace with a fresh mask if possible).
  - Leave the lunch area to have a break/talk with friends.
- Specialist subjects:
  - Sport
    - All sport to be played outdoors. Some indoor gymnasiums may be suitable, however due to the high-risk nature of this activity, no indoor gym should be used for sport until it has been assessed.
    - Sport to be timed to take advantage of cooler times of the day and lower UV levels.
    - Choose sports that allow distancing to be maintained.
    - Avoid the use of changing rooms, wear kit from home on relevant day. If changing rooms are used, masks must remain on, and changing clothes should be done quietly (avoid loud vocalizations), shower at home.
    - Cease sports at the school during community red/black status.
  - Music
    - Singing and use of wind instruments add to transmission risk, so should not occur indoors. After risk assessment, it may be possible to sing or play wind instruments outdoors with reduced numbers and generous physical distancing to further lower risk. Consider masking the wind instrument itself where air exits the instrument.
    - Physical distancing to be ensured.
    - Masks to be worn.
    - Consider online musical collaborations.
    - Switch to online music lessons during community red/black status.
  - Drama
    - Masks to be worn.
    - Avoid loud vocalizations.
    - Maintain physical distance.
    - Perform outdoors whenever possible.
    - Online collaborations and performances.

Personal protective equipment, source control and general etiquette.

Masks are the only means by which close-range aerosol transmission can be reduced. This is what makes them essential to the strategy. Ventilation cannot prevent the direct jet of aerosol released with a person breathes, speaks, coughs or sneezes from reaching any person that may be nearby. Masks also reduce the amount of aerosol released into the air in general, and this increases the ability for ventilation and filtration strategies to deliver safer air to reduce long-range transmission.

Mask use/technique does not have to be perfect to reduce risk.

Masks
- Masks are recommended to be mandatory in all schools from kindergarten to year 12 for children.
- Masks are recommended to be mandatory for all staff and to be worn prior to entering the building.
- Masks are recommended in 2- to 5-year-old children where developmentally appropriate.
- Masks should be quick release or ear loop style to reduce strangulation hazard.
- Masks should only be removed when outdoors while eating or drinking.
- Children should be taught in school how to wear and remove a mask, and this information should also be provided to parents.
- Mask should be comfortable for the child. Pressure areas should be checked for across the nose, under the chin and behind the ears.
- Mask should fit snuggly, but not tightly on the face. Improve mask fit by moulding any nose piece across the nose and have adjustable straps/ear loops. Nose and mouth should be completely covered at all times.
- Masks should be sized correctly for the child. Buy child sized masks where possible. A very large mask will not provide much protection at all.
- P2/N95 respirators, the knot and tuck technique, or double masking may offer greater protection.
- Masks must be changed if they feel difficult to breathe through.
- Schools should provide masks to those children that do not have access to supplies from home.

When the child cannot wear a mask
- It is important to increase the protection around the child, as the child is unable to protect themselves and may transmit to other vulnerable students.
- Usually, the issue of not being able to wear a mask is accompanied by other conditions that increase the susceptibility of the child to COVID-19 and disease severity.
- The child should be prioritised for vaccination as soon as one is approved for their age group.
- All members of the child's close contact circle, including family and staff ideally:
  - are vaccinated
  - engage in community and school testing programs
  - reduce other social interactions in high-risk settings (where possible choose outdoor interactions over indoor)
  - be trained to use and provided with reusable P2/N95 respirators as soon as possible.
    - Family to use these whenever they leave home for any reason such as going to work.
    - Staff to use respirators at work.

Communication and masks / respirators

- Exploration of transparent mask options, microphones, sign language and written mediums to help communication during an outbreak is worthwhile.
- Increase awareness and plan for children who may have undiagnosed hearing impairment, who may rely upon lip reading, where mask wearing might increase language and learning difficulties.
- Train educators in recognising children who may have an undiagnosed hearing impairment to look for signs such as being more distracted than usual and set up pathways for referral for hearing assessment.

Handwashing

- Provide hand sanitizing stations and hand sanitizer at multiple points.
- Set up laminated signs showing the WHO/CDC handwashing method in easy visual distance of the sanitation materials.

Further reading

- Gurdasani D, et al. School reopening without robust COVID-19 mitigation risks accelerating the pandemic. Lancet 2021;397(10280):1177-1178.
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- Hyde Z, et al. Australia must act to prevent airborne transmission of SARS-CoV-2. Med J Aust 2021;215(1):7-9.e1.
- Lessler J, et al. Household COVID-19 risk and in-person schooling. Science. 2021;372(6546):1092-1097.
- School Ventilation: A Vital Tool to Reduce COVID-19 Spread. Johns Hopkins Center for Health Security
- Reopening: Guidance for Schools. AIHA
- Harvard Healthy Buildings - Schools for Health. 5 Step Guide to Checking Ventilation Rates in Classrooms.
- New Zealand Ministry of Education. Designing quality learning spaces, Indoor air quality and thermal comfort.