Know-C19
Knowledge Hub for COVID-19
A policy, health response and implementation Hub
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COVID-19 in Australia - School closures. A Rapid Review

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1. What is the evidence for school closure as part of COVID-19 pandemic response?

Evidence from SARS-CoV-2

School closures were deployed rapidly across mainland China and Hong Kong for COVID-19.

By 18 March, 2020, 107 countries had implemented national school closures in response to COVID-19.

However, there are no data on the relative contribution of school closures to transmission control of this particular coronavirus.

Evidence from influenza outbreaks

The evidence for the effectiveness of school closures and other school social distancing measures comes almost entirely from influenza outbreaks, for which transmission of the virus tends to be driven by children. Four systematic reviews of the effects of school closure on influenza outbreaks or pandemics suggest that school closure can be a useful control measure, although the effectiveness of mass school closures is often low.[1,2,3,4]

There are several theoretical reasons why school closures might be less effective in COVID-19 than in influenza outbreaks.

- **Children's role in the epidemic**: Children contribute more to influenza transmission than do adults,[5] with low levels of immunity and high levels of transmission due to symptomatic disease. However, in the COVID-19 pandemic thus far, children appear to form a much lower proportion of all cases than expected.
- **Infectiousness**: Systematic reviews of influenza outbreaks suggest that school closures are likely to have the greatest effect if the virus has low transmissibility (R<2), particularly if attack rates and transmission are higher in children than in adults.[6] Although our information on SARS-CoV-2 remains incomplete, this appears not to be the case with COVID-19 outbreaks. Reported R values for COVID-19 overall are high (≥2.5), but may be much lower in children.

[1] Jackson C, Mangtani P, Vynnycky E. Impact of school closures on an influenza pandemic: scientific evidence base review. London:Public Health England, 2014.

[2] Jackson C, Mangtani P, Hawker J, Olowokure B, Vynnycky E. The effects of school closures on influenza outbreaks and pandemics:systematic review of simulation studies. *PLoS One* 2014; **9:** e97297

[3] Bin Nafisah S, Alamery AH, Al Nafesa A, Aleid B, Brazanji NA. School closure during novel influenza: a systematic review. *J Infect Public Health* 2018; **11:** 657–61.

[4] Rashid H, Ridda I, King C, et al. Evidence compendium and advice on social distancing and other related measures for response to an influenza pandemic. *Paediatr Respir Rev* 2015; **16:** 119–26.

[5] Wallinga J, Teunis P, Kretzschmar M. Using data on social contacts to estimate age-specific transmission parameters for respiratory spread infectious agents. Am J Epidemiol 2006; 164: 936‑44.

[6] Jackson C, Mangtani P, Vynnycky E. Impact of school closures on an influenza pandemic: scientific evidence base review. London:Public Health England, 2014.

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Evidence from SARS

To assess the effectiveness of school closures in previous coronavirus epidemics, a team at the UCL Institute of Child Health conducted a systematic review. All 16 articles reviewed were based on the SARS epidemic in China, Hong Kong, and Singapore. **Data from these studies suggest that school transmission played no substantial role in the outbreak, and that school closures and other activities such as school temperature monitoring did not contribute to control of infection transmission.**

Viner R, Russell SJ, Croker H et al. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. *Lancet Child Adolesc Health* 2020. Published Online April 6, 2020. https://doi.org/10.1016/S2352-4642(20)30095-X

Modelling for SARS-CoV-2

Modelling studies from the COVID-19 pandemic, **support** the use of national school closure as part of a package of social distancing measures. Yet, the only study to examine school closures as a separate intervention warned that **the impact was relatively marginal**, given the reasonable assumptions that household and community contacts would rise as a consequence.[1]

The US CDC advises that available modelling data indicate that early, **short to medium closures do not impact the epi curve** of COVID-19 or available health care measures (e.g. hospitalisations). There may be **some impact of much longer closures** (8-20 weeks) limiting further community spread, but that modelling also shows that other mitigation efforts (e.g. handwashing, home isolation) have more impact on both spread of disease and health care measures.[2]

[1] Ferguson NM, Laydon D, Nedjati-Gilani G, et al. Report 9: impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand. London: Imperial College, 2020.

[1] https://www.cdc.gov/coronavirus/2019-ncov/downloads/considerations-for-school-closure.pdf

Summary

Currently, the **evidence to support national closure of schools to combat COVID-19 is weak** and data from influenza outbreaks *suggest* that **school closures could have relatively small effects** on a virus with COVID-19's high transmissibility and apparent low clinical effect on school children.

At the same time, these data also show that school closures can have **profound economic and social consequences** i.e. it is clear the intervention (school closures) causes harm but the benefits (disease transmission) are uncertain.

Decisions about closures and their timing and length involve a **series of trade-offs between conflicting factors** - public health interventions to address COVID-19 are not a zero sum game - and a substantial loss of health-care staff to childcare duties during closures might substantially reduce any benefit to health systems and populations brought by closures of schools. Broader loss of productivity for childcare duties assumed by non-healthcare workers is another major cost to consider.

2. What is the evidence for and triggers for re-opening schools

Given the lack of evidence to support the closure of schools, it is not surprising that there is no evidence that might suggest triggers to re-open schools.

The US CDC suggests that there is a role for school closure:

- **In response to school-based cases** of COVID-19 for decontamination and contact tracing (few days of closure);
- In response to significant absenteeism of staff and students (short to medium length i.e. 2-4 weeks of closure); or
- **As part of a larger community mitigation strategy** for jurisdictions with substantial community spread (medium to long length i.e. 4-8 weeks or more of closure).

As of April 24, 2020, Taiwan has been recognised to have effectively minimised spread of COVID-19, but with national policies that avoided widespread planned school closures and instead mandated initially local class closures, and subsequently local temporary school closures, based on low thresholds for infected cases within individual schools.[1]

[1] Wang CJ, Ng CY, Brook RH. Response to COVID-19 in Taiwan: big data analytics, new technology, and proactive testing. *JAMA* 2020; published online March 3. DOI:10.1001/jama.2020.3151

Recommendation for domestic knowledge gains

The impacts (disease transmission, psychosocial, economic) of opening schools in Australia could be formally assessed using a stepped wedge design (or controlled natural experiment if different jurisdictions stagger their actions). This would be a world first providing critical knowledge for releasing and re-imposing restrictions, if there are further waves of introduction of SARS-CoV-2, for other countries and for future pandemics.

3. What is the contribution of children to transmission of COVID-19

Burden of disease

- Children (aged <18 years) make up a low proportion of total reported cases in most countries
    - < 2% of documented infections in China (1%), Italy (1.2%), Spain (<1%), USA (1.7%)
    - Most data come from case-based studies which may under-report infection among children as they are more likely to have milder or asymptomatic disease
- Except for a higher proportion of cases among children aged <12 months, age does not seem to alter susceptibility to infection among people aged <18 years - studies of household contacts demonstrate attack rates consistent across age groups

TABLE. Signs and symptoms among 291 pediatric (age <18 years) and 10,944 adult (age 18–64 years) patients* with laboratory-confirmed COVID-19 — United States, February 12–April 2, 2020

Sign/Symptom	No. (%) with sign/symptom	
	Pediatric	Adult
Fever, cough, or shortness of breath†	213 (73)	10,167 (93)
Fever§	163 (56)	7,794 (71)
Cough	158 (54)	8,775 (80)
Shortness of breath	39 (13)	4,674 (43)
Myalgia	66 (23)	6,713 (61)
Runny nose¶	21 (7.2)	757 (6.9)
Sore throat	71 (24)	3,795 (35)
Headache	81 (28)	6,335 (58)
Nausea/Vomiting	31 (11)	1,746 (16)
Abdominal pain¶	17 (5.8)	1,329 (12)
Diarrhea	37 (13)	3,353 (31)

* Cases were included in the denominator if they had a known symptom status for fever, cough, shortness of breath, nausea/vomiting, and diarrhea. Total number of patients by age group: <18 years (N = 2,572), 18–64 years (N = 113,985).
† Includes all cases with one or more of these symptoms.
§ Patients were included if they had information for either measured or subjective fever variables and were considered to have a fever if "yes" was indicated for either variable.
¶ Runny nose and abdominal pain were less frequently completed than other symptoms; therefore, percentages with these symptoms are likely underestimates.

Severity of infection

- Children who do develop disease have fewer symptoms cf. adults
    - Most common symptoms: fever, cough, headache, myalgia, sore throat (see table below)
    - Shortness of breath is quite common among adults (43%) but uncommon in children (13%)
- However, there is a higher risk of severe disease in those aged < 12 months:
    - Up to (11%) develop severe or critical disease cf. (5%) for those aged between 1 and 18 years
- Risk factors for severe disease: age < 12 months OR multiple co-morbidities

Population-based studies

Iceland

Gudbjartsson, D. F., A. Helgason, H. Jonsson et al (2020). "Spread of SARS-CoV-2 in the Icelandic Population." N Engl J Med.	
In total 6% of the population was tested in three groups up to April 4. (1) Targeted testing of those with symptoms and epidemiological risk factors: 13.3% positive (1,221 / 9,199) (2) Open invitation for testing: 0.8% positive (87 / 10,797) (3) Random population testing: 0.6% positive. (13 / 2,283) <u>Children < 10 years</u> • Less likely to be positive overall = 6.7% positive in targeted testing (38/564 children <10yrs) • No children < 10 years were positive in population testing (0/800) NB: only 100 adults were positive)	Unclear if difference for children (and women) was due to exposure related or biological factors By the end of March: • 50% of positive cases were due to family contact with positive case • Another ~25% unknown contact.

ITALY - Vo' municipality

Lavezzo, E., E. Franchin, C. Ciavarella, et al (2020). "Suppression of COVID-19 outbreak in the municipality of Vo, Italy." medRxiv: 2020.2004.2017.20053157	

Lockdown of whole municipality for 14 days following first case.
 	
<u>Start of lockdown</u>
• 86% population screened at start of lockdown
• 2.6% prevalence of infection
 	
<u>End of lockdown</u>
• 71.5% population screened
• 1.2% prevalence of infection
	• 43% asymptomatic at time of testing
	• No viral load difference between those with and without symptoms
	• In population screening, equal age distribution across those tested BUT:
	  ○ NO positive swabs in those < 10 yrs
	  ○ 73 total positive in 1st survey but just 3 (4%) were <10 years

Case-based Studies

China

Wu, Z, J. M. McGoogan (2020). "Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases From the Chinese Center for Disease Control and Prevention." Jama.	
Chinese CDC - 72,134 mixed adult and paediatric 'cases' Lab confirmed (62%) + suspected cases (22%)	Age distribution: • <10yrs (1%) • 10-19 yrs (1%) • 20-29yrs (8%) • 30-79yrs (87%) • 80+yrs (3%)

South Korea

Choe, Y. J. (2020). "Coronavirus disease-19: The First 7,755 Cases in the Republic of Korea." medRxiv: 2020.2003.2015.20036368	
7,755 reported cases up until March 13, 2020 No deaths in in peopled aged <30 years	Age distribution: • 0-9yrs (1%) • 10-19 yrs (5.2%) • 20-29yrs (29%)

Italy

Livingston, E. and K. Bucher (2020). "Coronavirus Disease 2019 (COVID-19) in Italy." JAMA 323(14): 1335-1335.	
22,512 reported cases up until March 15, 2020 No deaths in in peopled aged <30 years	Age distribution: • 0-18yrs (1.2%) • 19-50 yrs (24%) • 51-70yrs (37%) • 70+ (38%)

Paediatric case-based studies

CHINA

Dong, Y., X. Mo, Y. Hu, X. Qi, F. Jiang, Z. Jiang and S. Tong (2020). "Epidemiology of COVID-19 Among Children in China." Pediatrics: e20200702	
2,135 paediatric cases until Feb 8, 2020 Lab confirmed (34%) + suspected cases (66%) Median age 7 years Male (57%) ; Female (43%) Asymptomatic lab confirmed (13%) (94/728) Severity • Mild (51%) ; Moderate (40%) ; Severe/critical (5%) • <1yr olds: severe/critical (11%) • 1-18yrs: severe/critical (5%)	Age distribution of confirmed cases relatively even apart from the youngest: • <1yr (12%) • 1-5 yrs (19%) • 6-10yrs (23%) • 11-15yrs (25%) • 15-18yrs (21%)

CHINA

Lu, X., L. Zhang, H. Du, et al (2020). "SARS-CoV-2 Infection in Children." New England Journal of Medicine 382(17): 1663-1665.

171 paediatric cases to Feb 26, 2020 from Wuhan Children's Hosp

Majority from family clusters

Median age 6.7 years

Male (61%) ; Female (40%)

Severity

- None or Mild + NO radiological changes (15.8%) (n=27)
- None + radiological changes (7%) (n=12)
- Severe (<2%) (n=3) – req PICU + ventilation
- 1 death - 10mths old, intussuception, multi-organ failure

Age distribution of confirmed cases relatively even apart from the youngest:

- <1yr (18%)
- 1-5 yrs (23%)
- 6-10yrs (34%)
- 11-15yrs (25%)

Symptoms Signs

- Cough (48%)
- Fever (41%) (median 3 days)
- Tachypnoea (29%)
- Tachycardia (42%)
- Diarrhoea (9%)
- Fatigue (8%) ; Rhinorrhea (8%)
- Vomiting (6%)
- Hypoxia (2%) (Sats <92%)

SPAIN

Tagarro, A., C. Epalza, et al (2020). "Screening and Severity of Coronavirus Disease 2019 (COVID-19) in Children in Madrid, Spain." JAMA Pediatrics

<18yrs old (0.8%) laboratory confirmed cases (41 / 4,695)

Hospitalised (61%) (n=25/41)

PICU admission: overall (10%) (n=4/41) ; hospitalised (16%)

USA

CDC (2020). "Coronavirus Disease 2019 in Children - United States, February 12-April 2." MMWR Morbidity and Mortality Weekly Report 69: 422-426

<18yrs old (1.7%) (n= 2,572 / 149,082) until April 2, 2020

Median age 11yrs

Symptoms: Fever 56%, cough 54%, headache 28%, sore throat 24%, myalgia 23%, diarrhea 13%, SOB 13%, nausea/vomiting 11%

Age distribution of appears to be rise with age except most affects the very young:

- <1yr (11%)
- 1-4 yrs (11%)
- 5-9yrs (15%)
- 10-14yrs (27%)
- 15-17yrs (32%)

Why do fewer children appear to be infected and why do they have less severe disease?

HYPOTHESIS	Children v adults	Likelihood
Differences in clotting function	Endothelium, platelets and plasma proteins all different SARS-CoV-2 an endothelial cell infection? as per Varga, Z et al (2020). "Endothelial cell infection and endotheliitis in COVID-19." Lancet.	***** Perfectly fits with epidemiology in children e.g. DVT incidence with age and M>F
Differences in ACE2 receptors	Less, lower affinity, and different distribution (? more in upper cf lower respiratory tract as per adults)	**** Fits well, but no conclusive evidence,
Differences in immune system	Stronger innate immune response Higher proportion of total lymphocytes Higher absolute numbers of T, B, NK cells Lower proinflammatory cytokine responses *Few diseases better in childhood than adulthood (Hep A, SARS/MERS, Varicella, Legionnaires, EBV, Polio)*	*** Possible but puts SARS-CoV-2 into an unusual bunch of (mostly viral) pathogens
Differences in (recent) pathogen exposure	Pre-existing immunity to coronaviruses including potential for cross-reacting antibodies to SARS-CoV-2	*** Doesn't fit pattern in older kids including into early 20s
Lesser affected by identified comorbidities	Less of the comorbidities associated with severe COVID-19 including DM, hypertension, chronic lung/heart/kidney disease, smoking	** Clearly contributing but unlikely to be whole story
Microbial interactions and competition	Higher mucosal colonisation by viruses and bacteria limiting colonisation and growth of SARS-CoV-2	** Could play a role but children do still get infected
Infection with second or third generation virus with reduced pathogenicity	Predominant transmission within households from adults especially from early studies in China	* No evidence, globally little change in virus
Protection from off-target effects of BCG vaccination	Possible correlation between BCG vaccination (particularly recent) and less severe disease	* No consistent data

Adpated from COVID-19 Research @ Melbourne Children's
Professor Nigel Curtis

4. What are key considerations for re-opening schools?

AHPPC Recommendations (Latest update April 25th)[1]

Key considerations:

- Physical distancing: a focus on adults with adaption of activities for children (reducing mixing and contact)
- Risks to vulnerable populations in schools: the following groups should seek medical advice for risk assessment eople aged 70 years and over, people aged 65 years and over with chronic medical conditions, all people with compromised immune systems, and Aboriginal and Torres Strait Islander people over the age of 50 with chronic medical conditions
- Hygiene: handwashing, cough hygiene, food (preparation and sharing). PPE and masks are not recommended.
- Environmental cleaning: cleaning and disinfection of common areas and surfaces
- Psychological wellbeing: head to health resources, eSafety and domestic violence prevention

The WHO recommends the following measures to reduce the risk of transmission to students and teachers in schools[2].

- Sick students, teachers and other staff should not come to school
- Schools should enforce regular hand washing with safe water and soap, alcohol rub/hand sanitiser or chlorine solution and, at a minimum, daily disinfection and cleaning of school surfaces (NB: some Australian schools ban soap as slippery, messy, dangerous)
- Schools should provide water, sanitation and waste management facilities and follow environmental cleaning and decontamination procedures
- Schools should promote physical distancing (NB: AHPPC states that this was not required for students, only teachers and parents)

Implementing physical distancing practices may include:

- Staggering the beginning and end of the school day
- Cancelling assemblies, sports games and other events that create crowded conditions
- When possible, create space for children's desks to be at least one metre apart
- Teach and model creating space and avoiding unnecessary touching

Establish procedures if students or staff become unwell

Plan ahead with local health authorities, school health staff and update emergency contact lists.

Ensure a procedure for separating sick students and staff from those who are well – without creating stigma – and a process for informing parents/caregivers, and consulting with health care providers/health authorities wherever possible.

[1] https://www.health.gov.au/news/australian-health-protection-principal-committee-ahppc-advice-on-reducing-the-potential-risk-of-covid-19-transmission-in-schools-24-april-2020

[2] https://www.who.int/docs/default-source/coronaviruse/key-messages-and-actions-for-covid-19-prevention-and-control-in-schools-march-2020.pdf?sfvrsn=baf81d52_4

Promote information sharing

- Share known information with staff, caregivers and students, providing updated information on the disease situation, including prevention and control efforts at school.
- Reinforce that caregivers should alert the school and health care authorities if someone in their home has been diagnosed with COVID-19 and keep their child at home.
- Utilise parent-teacher committees and other mechanisms to promote information sharing.
- Also be sure to address children's questions and concerns, including through the development of child-friendly materials such as posters which can be placed on notice boards, in restrooms, and other central locations.

NB: Children with disabilities and behavioural difficulties may require additional supports.

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Annex 1 - Annotated bibliography

Adapted from COVID-19 Research @ Melbourne Children's
Professor Sharon Goldfeld

COVID

Wang, G., et al. (2020). "Mitigate the effects of home confinement on children during the COVID-19 outbreak." The Lancet **395**(10228): 945-947.

> In China, nationwide school closures were implemented during the COVID-19 outbreak, with rigorous implementation of an emergency home schooling plan. Schools and teachers created online courses and delivered them through TV broadcasts and the internet. However, Wang and colleagues discuss the potential negative effects of prolonged school closure and home confinement on children's physical and mental health. Possible physical health effects include: being physically less active, having longer screen time, and eating less healthy diets. Potential mental health effects include: fears of infection, frustration, boredom, lack of in-person contact with peers and teachers, lack of personal space in the home, and family financial hardship. The authors call for the government, community, schools, and families to recognise these issues, and to develop strategies for addressing the needs of children during this tie.

Pandemics / Epidemics

Berkman, B. (2008). "Mitigating pandemic influenza: The ethics of implementing a school closure policy." Journal of Public Health Management and Practice 14(4): 372-378.

> Berkman argues that public health interventions such as schools' closures during a pandemic are problematic: evidence for their efficacy has not been established; and they have the potential to create adverse consequences that disproportionately affect vulnerable populations. He outlines a number of possible adverse effects of school closures, including: school meal programs may be compromised; working parents may rely on self-care (leaving a child in their own care or with a sibling under 13 years); and disrupted education, which may impact children from vulnerable populations more severely. Berkman concludes by stating that: more evidence about the efficacy of school closures during a pandemic is needed; intermediate options such as partially closing schools should be considered; and school closures must be implemented in a way that does not unduly burden vulnerable populations.

Decosimo, C. A., et al. (2019). "Playing to live: outcome evaluation of a community-based psychosocial expressive arts program for children during the Liberian Ebola epidemic." Global Mental Health **6**: e3.

> A community-wide trauma such as an epidemic can have a substantial impact on individuals, families, and communities. Mental health needs are rarely prioritised by families or communities, and there is limited access to trained mental health professionals. The Ebola epidemic in Liberia had a large psychological impact on children and their families. A community psychosocial arts program was developed too build on mental health capacity. The authors reported that there was a decrease in post-psychological stress symptoms for two groups of participants: one which received five months of treatment, and the other which receive three months of treatment. However, the longer program was not more beneficial than the shorter program.

Sprang, G. and M. Silman (2013). "Posttraumatic stress disorder in parents and youth after health-related disasters." Disaster Medicine and Public Health Preparedness **7**(1): 105-110.

> Sprang and Silman highlight the importance of pandemic planning considering the needs of children and their families in order to ensure they do not suffer long-term trauma from these experiences. Reports from the National Commission on Children and Disasters and the National Center for Disaster Preparedness contain little reference to pandemics. While pandemics share many common factors with other disasters (e.g., impact on the community, unpredictability), responses to pandemics are unique in that responses discourage gathering of victims, instead requiring separation and quarantine. The authors examined rates of PTSD symptoms in parents and children exposed to pandemics. They found that almost a third of children who experienced isolation or quarantine met the threshold for PTSD; increasing to nearly 86% for those whose parents met the threshold. Sprang and Silman argue for the importance of post-pandemic mental health surveillance in parents and children, to be integrated into the standard public health response. They also call for collaboration during pandemic responses to implement disease-containment measures in a way that minimises the possibility of unintended negative psychosocial consquences for children and their families.

Stevenson, E., et al. (2009). "Pandemic influenza planning: Addressing the needs of children." American Journal of Public Health **99**(S2): S255-S260.

> Stevenson and colleagues discuss the needs of children during pandemic planning, including their mental health needs. They note that during a severe pandemic, school closures and social distancing strategies are likely to cause stress and confusion, as well as disrupting children's routines. Family stress levels are likely to be higher, and hospitalisations lead to parent and child separations. Children may experience the loss of loved ones, and there is likely to be a high demand for mental health services. The authors argue for national, state and local plans to include an organised mental health response to children's needs.

Uscher-Pines, L., et al. (2018). "School practices to promote social distancing in K-12 schools: Review of influenza pandemic policies and practices." BMC Public Health **18**(1): 406.

> Research on social distancing interventions within schools during influenza pandemics has focused primarily on full school closures. Little work has been done to identify more sustainable, less costly, interventions. Uscher-Pines and colleagues reviewed the literature on social distancing interventions within schools. Schools tended to focus efforts on hand hygiene and cleaning of school buildings, but social distancing practices were rarely implemented. Little information is currently available to schools around how to develop social distancing policies and procedures. Practices identified from the literature included: cancelling after-school activities, cancelling activities with a high rate of contact (e.g., physical education), discouraging use of public transport, increasing spacing between students (e.g., rearranging desks), implementing shorter school days or weeks, implementing social distancing practices for staff, implementing home room stay (where children remain in the same room all day while teachers rotate), reducing load in common areas (e.g., lunch in classrooms, staggered start and break times across year groups), and limiting visitors. Further research is needed to determine the feasibility and effectiveness of these practices.

Quarantine

Brooks, S. K., R. K. Webster, L. E. Smith, L. Woodland, S. Wessely, N. Greenberg and G. J. Rubin (2020). "The psychological impact of quarantine and how to reduce it: rapid review of the evidence." The Lancet 395(10227): 912-920.

> Brooks and colleagues conducted a rapid review of the psychological impact of quarantine. Being quarantined has been found to be associated with factors such as acute psychological stress, post-traumatic stress symptoms (up to three years later), high depressive symptoms, and anxiety and anger after release. Stressors during quarantine include longer duration of quarantine, fears of infection, frustration and boredom, inadequate supplies, and inadequate information. Stressors following quarantine include finances and stigma. Results suggest that quarantine is associated with a substantial psychological effect that can persist for months or years. As such, effective mitigation mesasures are an essential part of quarantine planning. Officials should provide clear communication around what is happening, why it is happening, and how long it will continue. They should also provide meaningful activities to do during quarantine, and ensure basic supplies are available. It is important they highlight that quarantine is helping to keep vulnerable populations safe and that health authorities are grateful for their actions.

Natural disasters

Gibbs, L., et al. (2019). "Delayed disaster impacts on academic performance of primary school children." Child Development 90(4): 1402-1412.

> Natural disasters can result in children experiencing challenges associated with physical mental, cognitive and social development. The social disruption caused by natural disasters can impact children's academic performance. Gibbs and colleagues investigated the academic performance of primary school children in Victoria 2-4 years after the Black Saturday bushfires. They found that for reading and numeracy, the expected gains in academic scores from Grade 3 to Grade 5 were reduced for those students in schools with higher bushfire impact. The authors also note the importance of recognising that the same cognitive skills needed for this learning are known to be impacted by early trauma experiences. It is important for parents and schools to recognise there may be delayed impacts of disaster experience in addition to the initial impacts on academic performance. Disasters such as bushfires may also affect parent mental health for a number of years, which could create a lower quality home learning environment; for example, with reduced supported reading at home.

Lai, B. S., et al. (2018). "Trauma-informed schools: Child disaster exposure, community violence and somatic symptoms." Journal of Affective Disorders 238: 586-592.

> Disaster exposure is linked to post-traumatic stress symptoms (PTSS), and anxiety and depressive symptoms. Schools can help reduce the impact of the trauma associated with disasters on children by responding to children's needs and referring when appropriate. Lai and colleagues investigated whether exposure to community violence prior to a disaster contributed to children's vulnerability to developing symptoms of distress after a disaster. The authors found that community violence exposure was associated with an increased in PTSS following Hurricane Katrina. In order to help schools respond to the impact of disasters on children, the authors argue for policies that integrate screening for children in disaster affected areas, including an assessment of children's past exposure to community violence.