

# Research Brief

## COVID-19 and Child and Adolescent Health

### Executive Summary

#### Why is this issue important?

Global data is constantly emerging about the direct effects of COVID-19 on child and adolescent health. A concise but comprehensive summary is required to enable the best decision making about their health in the context of the global pandemic.

#### What does the research tell us?

##### Disease severity

- COVID-19 disease in children and adolescents is rarely severe, and very rarely causes death
- Children and adolescents who have COVID-19 will commonly have no, or only mild symptoms, similar to a cold
- Severe disease is characterised by pneumonia and respiratory distress, and may lead to admission to hospital or intensive care
- Children and adolescents living with pre-existing health conditions, disadvantage, low socioeconomic or minority ethnic status have a greater risk of severe disease from COVID-19.

##### Delta variant

- The Delta strain does not appear to cause more severe disease than previous variants, but because it spreads faster, the number of children who will develop severe disease and go to hospital will be greater
- More data are needed to describe the burden of COVID-19 that children and adolescents will carry as older cohorts are vaccinated

##### Medical complications

- Multisystem inflammatory syndrome in children (MIS-C, or PIMS-TS) is a very rare but serious condition. In Australia there have been four confirmed cases
- Long COVID in children is not well described, studies have generally been of poor quality. Commonly reported physical symptoms of long COVID are also found to affect children without COVID-19

##### Indirect effects

- The main risks to children and adolescents' health in this pandemic continues to be due to indirect effects on mental health, wellbeing and education, which are worsened by continued lockdowns and school closures

This document outlines information about how COVID-19 directly affects children and adolescents, to inform decisions in Australia.

# COVID-19 and Child and Adolescent Health

## Why is this important?

With new global data emerging every week, better understanding of COVID-19 among children and adolescents will help inform policies that impact this group, including vaccination and school re-opening.

Children and adolescents who have COVID-19 commonly have no symptoms, or only mild symptoms, similar to a cold. Severe disease can occur among children and adolescents, which may result in admission to hospital or intensive care, but this is uncommon. To date in Australia, there have been no deaths from COVID-19 among children aged less than 10 years, and one death in an adolescent.

The Delta variant does not appear to cause more severe disease among children and adolescents compared to previous variants. However, the total number of children and adolescents who develop severe disease is likely to increase with the Delta variant, as Delta is more transmissible. Numbers of children and adolescents getting COVID-19 will also likely increase as restrictions are eased and more adults become vaccinated, compared to children and adolescents.

The main risks to the health of children and adolescents in this pandemic continues to be from indirect effects on mental health, wellbeing and education, which are worsened by continued lockdowns and school closures.

## What does the research tell us?

**COVID-19 in children and adolescents is mild, and severe disease is rare.**

Most children and adolescents with COVID-19 have no, or only mild, symptoms. Typical symptoms include fever, cough, a sore throat, blocked or runny nose, sneezing, muscle aches, and fatigue. Changes in smell or taste, diarrhoea and vomiting are less common.<sup>1</sup> Severe disease typically manifests as pneumonia with respiratory distress, and may require admission to hospital or intensive care.<sup>2</sup> Severe COVID-19 disease in children and adolescents is very uncommon, and only very rarely causes death.<sup>3</sup>

**The Delta strain does not appear to cause more severe disease than previous variants, but because it spreads faster, the number of children who will develop severe disease will be greater.**

The Delta variant is more transmissible than other variants, which means there is more COVID-19 among all age groups, including children and adolescents.<sup>4</sup> After 10 months of circulating globally,<sup>5</sup> the Delta strain does not appear to cause more serious disease than previous variants.<sup>6-8</sup> This means we would expect the proportion of children and adolescents that will develop serious illness will be the same as previous variants. Although the proportion of them having severe disease remains the same, the number of children infected will be higher, so therefore the number of children who will develop severe disease will be higher too.<sup>9</sup> Additionally, as the majority of older age groups are now vaccinated, there are likely to be relatively more infections among children and adolescents, who are largely unvaccinated at this stage.

**Some specific groups of children and adolescents are at greater risk of severe COVID-19.**

Children living with disadvantage, low socioeconomic or minority ethnic status,<sup>10,11</sup> and those with pre-existing health conditions (referred to as comorbidities) are at greater risk. These comorbidities include, but are not limited to: cancer, obesity, chronic respiratory disease, chronic kidney disease, cardiovascular disease, neurological disorders, immune disorders, metabolic disease and hematologic disorders.<sup>12-14</sup> A systematic review of children and adolescents analysing 42 studies that included 275,661 without comorbidities and 9,353 with comorbidities found that severe COVID-19 occurred in 5.1% of those with comorbidities, and in 0.2% without.<sup>12</sup>

## COVID-19 Infections, hospitalisations and deaths in children and adolescents.

**In Australia:** As of 5 September 2021, 22% of all COVID-19 cases have been among children or adolescents aged less than 19 years. Of these, 5374 (43%) were among children aged 9 years or younger, and 7223 (57%) were among those aged 10-19 years (Table 1). Some children and adolescents have been admitted to hospital due to COVID-19, but admissions are uncommon, often precautionary and brief.<sup>15,16</sup> In Australia in 2020, with considerable lockdowns and infection mitigation measures in place, there were about 50 children admitted to hospital with COVID-19.<sup>15</sup> This number will likely be higher for 2021. There has been one death in an adolescent who also had another serious infection in addition to COVID-19.<sup>17</sup> There have been many more infections and deaths among adults.

**Table 1: COVID-19 Cases and Deaths among Children and Adolescents, compared to Adults, in Australia (as of 5 September 2021).<sup>17</sup>**

Age Group	Cases	Deaths (% of cases)
0 - 9 years	5,374	0 (0%)
10 - 19 years	7,223	1 (0.01%)
20 - 59 years	36,707	35 (0.1%)
60+ years	8,515	995 (12%)
<b>Total</b>	<b>57,819</b>	<b>1031</b>

**New South Wales outbreak, winter 2021:** During the recent outbreak between 16 June and 19 August 2021, while the Delta variant was circulating, there were 2,864 COVID-19 cases in children and adolescents aged less than 19 years (27% of all cases).<sup>13</sup> Of these, 810 (28%) were 0-5 years, 945 (33%) were 6-12 years, and 1,109 (39%) were 13-18 years. Of the 2864, 70 (2.4%) were admitted to hospital - 43 of these were for medical reasons (1.5%). There were 5 admissions to intensive care (0.2%), all aged 15-18 years and all unvaccinated, and some admitted because of comorbid conditions. There were no deaths.

**In the United Kingdom:** Between February 2020 and March 2021 (pre-Delta), there were around 470,000 infections among those aged 0-17 years old, around 6000 hospital admissions, around 250 admissions to intensive care, and 25 deaths (Table 2).<sup>19-21</sup> Between 1 March 2021 and 10 September 2021, there have been 52 deaths among those aged 0-19 years, yet there has been no increase in the death rate overall for children due to COVID-19.<sup>22,23</sup> It is important to note that in the United Kingdom there is a relatively high level of immunity to COVID-19 among children and adolescents acquired as a result of natural infection over the course of the pandemic (between 40 to 70% of children and adolescents are thought to be immune) - this is different to the situation in Australia where very few children have been exposed to SARS-CoV-2 because of the success of public health interventions.

**Table 2: COVID-19 Infections, Hospitalisations and Deaths among those aged 0-17 years in the United Kingdom (February 2020 - March 2021)<sup>19-21</sup>**

Age Group	Cases (% of infections)
Infections	469,982
Hospital Admissions	6338 (1.3%)
Intensive Care Admissions	259 (0.055%)
Deaths	25 (0.005%)

**In the United States:** There have been increasing numbers of hospitalisations among children and adolescents since the Delta variant became predominant, with 5-10 times more children and adolescents admitted to hospital.<sup>7</sup> Those who are unvaccinated, or those who are 0-4 years old, were more likely to be admitted to hospital in the United States. Importantly, among all hospitalised children and adolescents, the proportion with severe disease due to Delta is similar to that earlier in the pandemic.

## MIS-C is a serious condition that occurs rarely in children and adolescents.

Multisystem inflammatory syndrome in children (MIS-C) (also known as Paediatric Inflammatory Multisystem Syndrome, temporally associated with SARS-CoV-2, or PIMS-TS) is a rare but serious condition that occurs approximately one month after exposure to COVID-19.<sup>24</sup> MIS-C can occur even in those with no symptoms from initial COVID-19 infection. MIS-C can cause inflammation in different parts of the body. Children and adolescents with MIS-C usually have a fever, rash and abdominal pain. Severe MIS-C may cause inflammation of the heart muscle, and this may result in low blood pressure. Some MIS-C patients do not require treatment, but patients with more severe disease often need admission to an intensive care unit. MIS-C has caused deaths among a small proportion of children overseas, mainly early in the pandemic. However, increased awareness of MIS-C has allowed for earlier diagnosis, more appropriate treatments and improved outcomes. In 2021, almost all children with MIS-C have recovered fully, and the long-term outcomes appear good, with resolution of the inflammation of the heart.

MIS-C is very rare. In Australia, there have been four confirmed cases and two possible cases of MIS-C since the start of the pandemic. In the United States to date, there have been 4,661 cases of MIS-C out of around 5,000,000 COVID-19 cases in children and adolescents. 41 patients have died of MIS-C in the United States.<sup>25, 26</sup>

**Table 3: MIS-C in Children and Adolescents, in the United States.**<sup>25, 26</sup>

Type	Cases (% of infections)
Infections	5,049,465
MIS-C	4,661 (0.09%)
MIS-C Deaths	41 (0.0008%)

*Total infections as of 2 September 2021, noting the numbers are collated from state-based reports, and the definition of "child" case varied in age ranges across states. Last MIS-C case reported on 22 August 2021.*

## Long COVID in children and adolescents is rare, more data is needed.

There is no agreed definition of long COVID, which makes it difficult to be certain about how common, severe or persistent it is. Data describing long COVID in children and adolescents are scarce.<sup>27</sup> Persistent symptoms reported following COVID-19 among children and adolescents include fatigue, headache, anosmia, and sore throat. Some studies have found that children who tested negative for COVID-19 have had similar symptoms, which are common after other viral infections, and could also be due to the experience of lockdown and other social restrictions.<sup>28, 29</sup>

A study in Melbourne in 2020 (pre-Delta) observed no cases of long COVID among 136 children who presented to the Royal Children's Hospital, noting they were a young cohort (median age three years).<sup>16</sup>

## There are other common respiratory viruses in children and adolescents, such as RSV and flu.

It is very common to have multiple respiratory viruses in childhood. Some of the most common childhood respiratory viruses are respiratory syncytial virus (RSV) and influenza (the flu).<sup>30</sup> About 6000 children in Australia are admitted to hospital every year from RSV, and this can have long-term complications.<sup>31</sup> There is no vaccine for RSV. Around 800 children in Australia are admitted to hospital with the flu every year.<sup>32, 33</sup> There is a seasonal influenza vaccine available for those six months and older.

## There are significant indirect effects of the pandemic on the mental health, learning and wellbeing of children and adolescents.

Prolonged school closures and lockdowns exacerbate these impacts, differentially affecting those living with disadvantage, diminishing social mobility and impacting economic productivity.<sup>34-37</sup> There have been substantial increases in admissions to paediatric hospitals for mental health, substance use, self-harm and suicide attempts.<sup>38</sup> Studies are continuing to emerge that highlight the negative effects of the pandemic on the mental health of children and adolescents.<sup>39-41</sup>

## Where are the research gaps?

### Long COVID in children and adolescents is not well understood

At this stage, long COVID does not appear to be common in children and adolescents, but existing studies are generally of poor quality with no consistent definition used. The studies have found that long COVID symptoms are difficult to distinguish from those attributable to the pandemic, such as the impact of school closures, deprivation of seeing friends or being unable to participate in sports and social activities. We need to understand this better to factor long-term effects into decision making. If long COVID is found to be common in children and adolescents, prevention and treatment strategies will be needed. At this stage, we do not know if vaccination prevents long COVID in children and adolescents.

### More evidence about the role of the Delta variant in COVID-19 disease in children and adolescents is needed

The Delta variant is more transmissible than other variants, and makes the control of outbreaks more challenging, even when public health measures are in place. More data are needed to describe the burden of COVID-19 that children and adolescents will carry as the pandemic evolves, given the emergence of the Delta variant and as older populations achieve high rates of vaccination. More information is needed as to how the changing number of infections will impact children's medical services. As restrictions are eased and other respiratory viruses increase in circulation, we will also need to understand whether co-infection with other respiratory viruses, such as RSV or influenza, increases severity of infection in children and adolescents.

### More evidence is needed regarding the vaccination of children and adolescents, including those with underlying special risk conditions

Whilst there is emerging evidence around the immune response to the COVID-19 vaccines in adults with immunosuppression (e.g. cancer, solid organ transplant recipients and biologic medications), very little is known about the response in those 12-17 years of age. More data are needed to know if the vaccines work well in these populations and whether additional third doses, or 'boosters' may be required to optimise their protection. There are also some rare adverse events following immunisation that require further investigation to support completion of the two dose COVID-19 vaccination schedule, including allergic reactions and myo- or pericarditis. A vaccine for children aged less than 12 years is not yet available. Safety and efficacy data from two phase 3 clinical trials are expected in the last quarter of 2021, and there will be a need to review these and other data for children aged less than 12 years as they become available.

This report was prepared by members of the MCRI COVID-19 Governance Group which draws on experts in paediatrics, mental health, epidemiology, public health, infectious disease, immunity, child development, and vaccine development and communication.

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