

## In brief

### Paediatrics and COVID-19 – reporting, rates and differences

27 January 2022

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#### Summary

- In Australia, COVID-19 statistics provided by federal, and most state governments, report on distribution of cases by age groups; with children and young people split into age groups of 0-9 and 10-19 years. Age groupings vary across countries.
- Commonly reported measures on paediatric COVID-19 cases include number of new infections, active cases, hospitalisations, intensive care unit (ICU) admissions, occurrence of multisystem inflammatory syndrome, mortality, patient characteristics, and features of healthcare encounters (such as symptoms, disease severity, respiratory support required, mechanical ventilation, length of stay in the hospital or ICU, viral coinfection, complications, time to symptom resolution and multiple admissions).
- Reasons for hospitalisation, including rates of 'incidental COVID-19' among paediatric cases, are reported by three retrospective cohort studies from the United States (pre-Omicron, range 19.3% to 45%)<sup>1-3</sup> and one from South Africa (Omicron, 37.6%).<sup>4</sup> The definition of incidental COVID-19 cases varied in these reports.
- Reports about the Omicron variant point to a rise in the overall counts of new infections and hospitalisations among children, especially children under the age of five.<sup>4-7</sup> One study from United States, however, reported that the risk of hospitalisation in children under the age of five with confirmed COVID-19 was lower during the Omicron period compared to Delta period (1.04% vs 3.14%).<sup>8</sup>
- Reports from the United States, South Africa, and UK indicated that children admitted to hospitals during the Omicron variant wave with COVID-19 had lower risk of severe clinical outcomes.<sup>4, 8, 9</sup> They were less likely to need ICU admission, oxygen therapy or ventilation, and had shorter lengths of stay, compared to previous waves.
- International opinion suggests Omicron causes more upper respiratory infections and some children are presenting with a croup-like cough. Other symptoms include runny or congested nose, cough and a sore throat.<sup>10, 11</sup>

#### Evidence

##### Omicron differences in rates and severity

Pre peer reviewed literature

- A [study from Tshwane District, South Africa](#) reported that during the early stages of the Omicron wave, a total of 462 paediatrics patients (aged 19 or under) were hospitalised, accounting for 7.2% of the total recorded cases. The mean age of the hospitalised children with 4.2 years. The number of paediatrics hospitalisations rose rapidly during the six-week period, to a level higher than the previous three waves. More than 90% of the hospitalised patients received standard ward care, with one in four receiving oxygen therapy. All children were unvaccinated.<sup>4</sup> COVID-19 was deemed as an incidental diagnosis in 37.6% of the hospitalised children.

- A US study comparing [COVID-19 infection severity in children under five years](#) old found that infections which occurred during the Omicron period had significantly lower likelihood of severe clinical outcomes compared to those occurring during the Delta period. The outcomes included emergency department visits (18.83% vs 26.67%), hospitalisations (1.04% vs 3.14%), ICU admissions (0.14% vs 0.43%) and mechanical ventilation (0.33% vs 1.15%).<sup>8</sup>

### Grey literature

- The [UK Health Security Agency](#) reported on 14 January 2022 that the number of paediatric admissions with COVID-19 saw a 3-fold rise in 2 weeks – from 40 to 120 admissions per day. The rise in rolling 7-day average numbers was most rapid among children under 5 years, and highest in infants aged under 1 year. Data was for all variants, but Omicron represented over 90% of sequenced samples in the UK. A clinical case review of a small sample of infants found they were not severely unwell.<sup>5</sup>
- [Covid-19 Clinical Information Network \(CO-CIN\) study](#) update from UK published on 14 January 2022 suggests a proportional increase in hospital admissions for children aged less than 1 year, in the period 14 December 2021 to 6 January 2022. Of all paediatric admissions with COVID-19 diagnosis during this period, 37.8% were under the age of 1, an increase from 30.1% from the previous period (13 May 2021 to 13 Dec 2021). Compared to the Delta period, a lower proportion of all hospitalised paediatric patients (0-17 years) required oxygen use (13.1% vs 21.7%), invasive ventilation (2.9% vs 3.9%), noninvasive ventilation (1.0% vs 4.5%) and had shorter mean length of stay (1.9 vs 3.6). However, the ICU and high dependency unit (HDU) admission rates were higher for all children during the Omicron period than the Delta period (20.6% vs 13.9%).<sup>9</sup> Expert reaction has been published in the [Science Media Centre](#).<sup>12</sup>
- [Ontario data](#) on 18 January 2022 show an increase in cases ranging from 0-4 years and 5-11 years, with 3,622 and 7,002 cases respectively within the past 14 days with a three-day lag. Hospitalisation rates among these age groups are 10.2 and 2.3 per 100,000 population.<sup>13</sup> Ontario hospitals [issued a public service announcement](#) on 5 January 2022 stating that six infants had been hospitalised for COVID-19 infections since mid-December 2021, despite the previous rarity of infant admissions.<sup>14</sup>
- The US [Centers for Disease Control and Prevention](#) reported hospitalisation rates (calculated by the number of residents of a defined area who are hospitalised with a positive SARS-CoV-2 laboratory test divided by the total population within that defined area) increased rapidly in children aged 0-17 years since December 2021.<sup>7</sup> For the week ending 25 December 2021, the weekly rate of COVID-19-associated hospitalisations for 0-4 years was 4.5 per 100,000 population; higher than rates seen for children ages 5-11 years (1.1 per 100,000) and adolescents aged 12-17 years (2.6 per 100,000).<sup>7</sup> The 7-day average new admissions in children aged 0-17 from 11 January to 17 January was 909.<sup>6</sup>
- The South African [National Institute for Communicable Diseases](#) hospital surveillance report showed 5,573 hospital admissions in people under 20 years, 13,407 in 20-39 years, 8,857 in 40-59 years, and 10,388 in over 60 years during the Omicron outbreak. There were 74 deaths in people under 20 years.
- Expert [opinion from paediatricians across Canada](#) is that Omicron causes different symptoms in children compared to other variants, however it does not appear to cause a higher rate of serious outcomes.<sup>15</sup>

- International opinion from news articles report that Omicron causes more upper respiratory infections and are presenting with croup-like cough.<sup>11, 16</sup> Other symptoms include runny or congested nose, cough, and a sore throat.<sup>10</sup>
- The UK [Royal College of Paediatrics and Child Health](#) issued a response to increased hospital admissions on 13 January 2022. Paediatricians are not reporting Omicron to be a more serious or severe disease in children and young people in the UK.<sup>17</sup>

### Reporting

Peer reviewed literature

Delta variant period

- [Centers for Disease Prevention and Control \(CDC\) in the United States](#) reported on 915 paediatric patients identified as having COVID-19 across six hospitals during Delta outbreak between July and August 2021. Patient data extracted from electronic medical records included:
  - Reason for hospitalisation:
    - 713 (77.9%) had acute COVID-19 as the primary or contributing reason for hospitalisation
    - 177 (19.3%) had incidental COVID-19 (asymptomatic or mild infection unrelated to the reason for hospitalisation)
    - 25 (2.7%) had multisystem inflammatory syndrome (MIS-C) as a result of COVID-19
  - Demographic characteristics included age group, sex, race/ethnicity and COVID-19 vaccination status. Of 713 patients who were hospitalised with COVID-19 as a primary reason:
    - 272 (38.1%) were aged 12 to 17, 176 (24.7%) were aged under 1, 143 (20.1%) were aged five to 11 and 122 (17.1%) were aged one to four
    - 1 (0.4%) was fully vaccinated, 12 (4.4%) were partially vaccinated, and the rest were either not vaccinated (72.1%) or had unknown vaccination status (23.2%)
  - Hospitalisation and illness course included underlying medical conditions, multiple admissions, admission to ICU, highest level of respiratory support required, extracorporeal membrane oxygenation (ECMO) required, viral coinfection, and discharge status.
    - 366 (51.3%) had one to two underlying medical conditions, 115 (16.1%) had three or more underlying medical conditions
    - The five most prevalent conditions by system included metabolic or endocrine (36.2%), neurologic or developmental (20.2%), respiratory (19.9%), gastrointestinal or hepatic (11.9%) and psychiatric (8.1%)
    - 210 (29.5%) were admitted to ICU with a median length of stay at ICU of three days
    - 113 (15.8%) had a viral coinfection and among them more than half (66.4%) were coinfecting with respiratory syncytial virus (RSV)<sup>3</sup>

- A [CDC report](#) which analysed paediatric COVID-19 case data obtained from various surveillance systems from 1 August 2020 and 27 August 2021 found that, when the Delta variant became predominant, there was an increasing trend in rates for new COVID-19 cases, COVID-19 related emergency department visits, and hospital admissions with confirmed COVID-19 for patients aged 0-17. This report was inconclusive about whether the increases were related to increased severity of the disease for the Delta variant or other factors such as increased transmission. The rate of ICU admission for paediatric patients hospitalised for COVID-19 remained at around 20% during Delta outbreak, similar to that of the pre-Delta period.
- A [European surveillance study](#) based on data from 10 European Union countries reported that between 3 August 2020 to 3 October 2021, there were a total of 820,404 symptomatic paediatric (0-17 years of age) cases. Among them, 9,611 (1.17%) were hospitalised, 640 (0.08%) were admitted to ICU and 84 (0.01%) had died.
  - Stratification by presence of any comorbidity: paediatric cases with one or more comorbidities had seven-, nine- and 27-fold increase in the rates of hospitalisation, ICU admission and death, respectively, compared to cases without any comorbidities.<sup>18</sup>

Pre Delta variant period (previous to May 2021)

- A [retrospective cohort study from a children’s hospital in the United States](#) reported that from 10 May 2020 to 10 February 2021, of 117 paediatric hospitalisations, 46 (39.3%) were asymptomatic, 33 (28.2%) had mild to moderate disease, 9 (7.7%) had severe illness, 15 (12.8%) had critical illness and 14 (12%) had multisystem inflammatory syndrome. This study categorised hospitalisations as likely or unlikely to have been caused by COVID-19 based on admission and discharge documentation and used the following criteria as shown in Figure 2. Near half (45%) of all hospitalisations were categorised as unlikely to be caused by COVID-19.<sup>2</sup>

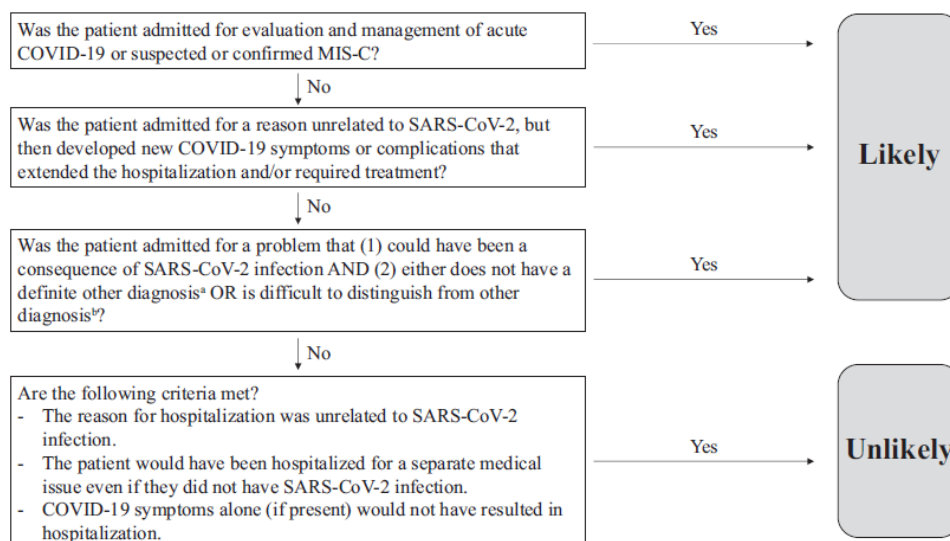


Figure 2. Designation of a hospitalisation as being likely or unlikely from COVID-19.<sup>2</sup>

- A [retrospective cohort study across 45 United States children's hospitals](#) reported that between April 2020 to September 2020, a total of 19,976 paediatric patients were discharged from the emergency departments or inpatient settings with a primary diagnosis of COVID-19. The COVID-19 severity outcomes were reported as follows:
  - Mild (ED discharge): 15,913 (79.7%)

- Moderate (inpatient admission): 3,222 (16.1%)
- Severe (ICU admission without mechanical ventilation, shock, or death): 461 (2.3%)
- Very severe (ICU admission with mechanical ventilation, shock, or death): 380 (1.9%)
- Paediatric patients with comorbidities such as cardiovascular, obesity, type 2 diabetes, pulmonary and neurologic or neuromuscular diseases had increased odds of hospitalisation and in-hospital illness severity.<sup>19</sup>
- A [study from an integrated health care system in the United States](#) which analysed the first 1,000 symptomatic paediatric patients with COVID-19 diagnosis during March 2020 to September 2020 reported that, 41 (4%) of these patients were hospitalised, 8 (0.8%) were admitted to ICU, 2 (0.2%) required mechanical ventilation and 1 (0.1%) developed multisystem inflammatory syndrome.<sup>20</sup> Symptoms resolved in 45% of the patients by day five and 94% of patients by day 30. The predictors for hospitalisations included pre-existing medical conditions, dyspnea, Black race or Hispanic ethnicity and vomiting.<sup>20</sup>
- A [retrospective cohort study from 184 hospitals within a private hospital network in the United States](#) reported that from January 2020 to July 2020, of 24,781 paediatric patient encounters, the test positivity rate was 11.15%. The hospital admission rate for 2,709 symptomatic patients was 5.24%. Of those 142 patients who were hospitalised, 54.93% were admitted to ICU, however, only 15.49% were determined to have severe COVID-19. The overall mortality rate was 0.04%.<sup>21</sup>
- An [international analysis of electric health records of children and youth hospitalised with COVID-19 infection in six countries](#) between February and October 2020 reported that, of 671 cases under the age of 21, patients aged 0-2 accounted for the highest proportion (199, 30%), followed by patients aged 12-17 (170, 25%). Common complications included cardiac arrhythmias (15%), viral pneumonia (13%), and respiratory failure (10.5%).<sup>22</sup>
- A [retrospective cohort study from South Korea](#) found that, between 1 January 2020 and 30 May 2020, paediatric patients aged 0-19 and with COVID-19 infections had lower odds of being hospitalised and admitted to ICU compared to older age groups. The hospitalisation period was also shorter by 31% and 37%, respectively, for age groups of 10-19 and 0-9.<sup>23</sup>
- A [retrospective case series study from a Children’s hospital in the United States](#), which collected data from all patients aged 22 or under and hospitalised with a positive COVID-19 test result between 1 May 2020 and 30 September 2020, reported that 40% (58 out of 163) of these patients had incidental COVID-19 infection. The remaining 47% of the patients were potentially symptomatic or significantly symptomatic.<sup>1</sup>
  - Incidental diagnosis was defined as “patients with no documentation of fever, respiratory symptoms (cough, shortness of breath, or difficulty breathing), or gastrointestinal (GI) symptoms (nausea, vomiting, or abdominal pain) before admission or during hospitalisation” or “admitted with these symptoms but had a clearly documented alternative reason for them”.<sup>1</sup>
  - Compared to significantly symptomatic patients, both the potentially symptomatic and incidental cases had significantly lower proportions of patients with comorbidities (90% vs 55% and 53%). 60% and 35% of the significantly symptomatic cases had obesity and asthma, respectively, significantly more than that of potentially symptomatic and incidental cases.<sup>1</sup>

- A [Danish population-based cohort study](#) based on data from March 12 and September 30, 2020 estimated that the proportion of hospital admissions due to COVID-19 among children was 0.08% (14 out of 18,498).
- A [retrospective cohort study of 12,306 paediatric COVID-19 patients](#) in the United States reported that the rate for hospitalisation was 5.5% (n=672). Of those who were hospitalised, 17.6% (n=118) required critical care services and 4.1% (n=38) required mechanical ventilation. The rate of hospitalisation was lower for patients without any comorbidities at 3.5%. The risk of hospitalisation was greater for children from non-Hispanic Black or Hispanic backgrounds.<sup>24</sup>
- A study based on [CDC COVID-19-associated hospitalisation surveillance network in the United States](#) analysed data from 2 March 2020 to 17 August 2020 and reported that, of 27,045 children with COVID-19, 1,274 (4.7%) required hospitalisation. The morbidity rate for in-hospital death was 0.19%. Being African American or mixed race or having an underlying medical condition strongly predicted hospitalisation.<sup>25</sup>
- A [review study](#) found that in the United States Black and Hispanic children account for three quarters of the COVID-19 related hospitalisations and deaths, widening the gap in healthcare disparities.<sup>26</sup>
- A [national surveillance study from England](#) reported that after the partial reopening of schools and between 1 June and 30 June 2020, 446 primary school-aged children were tested positive for COVID-19. Among those who were agreed to be interviewed (n=259), 50.58% were symptomatic and 8.49% were hospitalised. Children identified through community testing sites as opposed to hospitals were more likely to be symptomatic (53.67% vs 34.15%), however none were hospitalised (0% vs 53.66%). The partial reopening of some schools was not associated with any increase in confirmed SARS-CoV-2 infections among primary school-age children.<sup>27</sup>
- A [nationwide study from Israel](#) found that from March 2020 to July 2020, the incidence of COVID-19 infections gradually increased across all age groups, including children, following school reopening. However, school reopening was not associated with an increase in hospitalisations and mortality.<sup>28</sup>

### Grey literature

- The [Australian Government Department of Health](#) reports on COVID-19 cases and deaths by age groups. Children and young people are split into age groups 0-9 years and 10-19 years.<sup>29</sup>
- The [NSW COVID-19 weekly surveillance reports](#) provides a breakdown of infections, hospitalisations, ICU hospitalisations and deaths by age groups. Children and young people are split into age groups 0-9 years and 10-19 years.<sup>30</sup>
- [Victoria](#), [Queensland](#), [South Australia](#), and [Western Australia](#) report on distribution of cases by age groups.<sup>31-34</sup> Children and young people are usually split into age groups of 0-9 and 10-19. The [Australia Capital Territory \(ACT\)](#) groups children aged 0-17 years together in their epidemiological updates.<sup>35</sup>
- The [National Centre for Immunisation Research and Surveillance \(NCIRS\)](#) published reports on COVID-19 in educational settings, including schools and early childhood education and care settings.<sup>36</sup>
- The [Murdoch Children's Research Institute](#) publishes weekly COVID-19 and children's surveillance reports, with a main focus on Victoria and New South Wales. They also document the latest data from specific countries such as Canada, United States, Denmark, England, Finland, Scotland, Singapore and South Africa. This provides a summary of the COVID-19

epidemiology, including trends in case numbers, hospitalisations, multisystem inflammatory syndrome, total deaths and vaccination coverage.<sup>37</sup>

- The [UK Health Security Agency](#) reports on children and young people split into age groups 0-5 years and 6-17 years. They report trends in change in case numbers over time.<sup>38</sup>
- [Public Health Ontario](#) report on children and young people split into age groups 0-4 years, 5-11 years and 12-19 years. They report recent cases within the past 14 days, hospitalisation rates and COVID-19 rates per 100,000 population.<sup>13</sup> The [Government of Quebec](#) report on children and young people split into age groups 0-9 years and 10-19 years.<sup>39</sup>
- [Centers for Disease Control and Prevention](#) report on children and young people split into age groups 0-4 years, 5-11 years, 12-15 years, and 16-17 years. They report recent cases and COVID-19-associated hospitalisation rates among the paediatric age groups.<sup>6</sup>
- The Scientific Advisory Group for Emergencies report on children and young people split into age groups 0-1 years, 1-4 years, 5-11 years and 12-17 years in the [Covid-19 Clinical Information Network \(CO-CIN\) study](#).<sup>9</sup>

To inform this brief, PubMed and Google searches were conducted using terms related to children, paediatrics, reporting, hospitalisation, Omicron and COVID-19 on 17 January 2022.

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