Background

Jurisdictions globally are facing different situations when it comes to COVID-19 cases, distribution of new variants, patient outcomes and vaccine rollout. Understanding how these variables interplay as the pandemic progresses can provide insights for NSW.

Evidence

- In countries with high vaccination rates such as Canada, Israel and the United States, low rates of new infections are being reported in vaccinated people.1-3
- There are however reports of sharp rises in case numbers in countries such as Israel following Delta’s arrival, despite more than 60% of the population being fully vaccinated.4
- Real world effectiveness data on hospitalisations and mortality following vaccination (namely Pfizer, AstraZeneca, Moderna, and Sinovac), show vaccines range from 71% to 98% effective at preventing COVID-19 related hospitalisation, and range from 88% to 97% effective at preventing COVID-19 related death.5-8
- Viruses constantly change through mutation and, over time, new variants of a virus are expected to occur. Some variants have characteristics that have a significant impact on transmissibility, severity of disease and the effectiveness of vaccines.9
- For SARS-CoV-2, there are currently four variants of concern as determined by the World Health Organization.10

The four variants of concern are:

- Alpha (B.1.1.7), which originated in the United Kingdom. Currently 155 countries are reporting detection of the variant.
- Beta (B.1.351), which originated in South Africa. Currently 105 countries are reporting detection of the variant.
- Gamma (B.1.1.28.1 or P.1), which originated in Brazil. Currently 68 countries are reporting detection of the variant.
- Delta (B.1.617.2), which originated in India. Currently 106 countries are reporting detection of the variant. Delta-AY.1 (Delta with K417N) has been reported.10-12

- There is emerging evidence on the impact of COVID-19 vaccines on variants. Generally, vaccines are effective at neutralising Alpha, while there is reduced neutralisation for Gamma, Beta and Delta. All variants elicit cross-reactive neutralising antibodies.10,13-16
Table 1: Vaccination rates (select countries) as at 10 August 2021

<table>
<thead>
<tr>
<th>Country</th>
<th>Average daily vaccine doses*</th>
<th>Population covered (%)**</th>
<th>Time to cover 75% of the population***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>189,893</td>
<td>26.9%</td>
<td>4 months</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>182,106</td>
<td>64.8%</td>
<td>2 months</td>
</tr>
<tr>
<td>United States</td>
<td>715,547</td>
<td>55.0%</td>
<td>6 months</td>
</tr>
<tr>
<td>Canada</td>
<td>202,047</td>
<td>67.4%</td>
<td>1 month</td>
</tr>
<tr>
<td>Israel</td>
<td>84,729</td>
<td>65.0%</td>
<td>3 weeks</td>
</tr>
<tr>
<td>India</td>
<td>4,409,167</td>
<td>18.6%</td>
<td>12 months</td>
</tr>
<tr>
<td>Taiwan</td>
<td>130,012</td>
<td>19.4%</td>
<td>7 months</td>
</tr>
<tr>
<td>Vietnam</td>
<td>427,229</td>
<td>4.9%</td>
<td>10 months</td>
</tr>
</tbody>
</table>

More than 4.48 billion doses have been administered across 181 countries.

* Average daily vaccine doses based on the last seven days.
** Population covered divides the doses administered for each vaccine type by the number of doses required for full vaccination.
*** Time to cover 75% of the population based on the number of doses required and the current average daily vaccine doses.

COVID-19 confirmed cases

The following graph shows the daily rates (rolling seven-day average) of confirmed COVID-19 cases in Australia, the United Kingdom, United States, Canada, Israel and India, from February to August 2021. Data is presented on a log (base 10) scale.

Figure 1: Daily rates of COVID-19 cases (select countries), February – August 2021

Note: Limited testing and delayed reporting likely result in underestimation of the actual number of confirmed cases.
COVID-19 vaccination rates

The following graph shows the daily (rolling seven-day average) vaccination rates in Australia, the United Kingdom, United States, Canada, Israel and India, from February to August 2021.

Figure 2: Daily vaccination rates (select countries), February – August 2021

COVID-19 mortality rates

The following graph shows the daily (rolling seven-day average) mortality rates in Australia, United Kingdom, United States, Canada, Israel and India, from February to August 2021.

Figure 3: Daily mortality rates (select countries), February – August 2021

Note: Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

Source: Our World in Data. Accessed 10 August 2021.18
COVID-19 vaccines, cases, hospitalisations, deaths and variants

The following graphs (figures 4-8) show COVID-19 cases and vaccination rates, hospitalisation and death rates, and the variant distribution for Australia, the United Kingdom, United States, Canada and Israel.

Series a: COVID-19 cases and vaccinations

The graphs in series a show COVID-19 cases and vaccination rates specific for each of these countries, including the daily number of confirmed COVID-19 cases, the cumulative number of people who have received at least one vaccine dose (per 100 population) and the cumulative number of people fully vaccinated (per 100 population) from February to August 2021.

These graphs should be interpreted with caution as there are other factors that may influence the number of cases in addition to vaccine rates, including the level of social restrictions. The number of people fully vaccinated in Australia is only available from late May 2021 onwards.

Note, there is variation in x axis scales and some gaps in time series across these graphs due to missing data.

Series b: COVID-19 hospitalisation and death rates

The graphs in series b show COVID-19 hospitalisation and death rates for each of these countries. Specifically, they show the daily number of hospitalised patients (per million population), and the daily number of new deaths (per million population) from February to August 2021.

Series c: COVID-19 variant distribution

The graphs in series c show the COVID-19 variant distribution for each of these countries. Specifically, they show COVID-19 variant distribution for cases sequenced, and the percentage of total COVID-19 cases sequenced, from February to August 2021.

For most countries, weekly counts are shown; however, only monthly counts were available for Canada. Note, there is variation in x axis scales.
COVID-19 Critical Intelligence Unit: COVID-19 vaccines, cases and variants

Figure 4a: COVID-19 cases and vaccinations, Australia, February – August 2021

Figure 4b: COVID-19 hospitalisation and mortality rates, Australia, February – August 2021

Figure 4c: COVID-19 variant distribution for a sample of cases that have been sequenced, Australia, February – August 2021
COVID-19 Critical Intelligence Unit: COVID-19 vaccines, cases and variants

Figure 5a: COVID-19 cases and vaccinations, United Kingdom, February – August 2021

Figure 5b: COVID-19 hospitalisation and mortality rates, United Kingdom, February – August 2021

Figure 5c: COVID-19 variant distribution for a sample of cases that have been sequenced, United Kingdom, February – August 2021

In brief documents are not an exhaustive list of publications but aim to provide an overview of what is already known about a specific topic. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.
Figure 6a: COVID-19 cases and vaccinations, United States, February – August 2021

Figure 6b: COVID-19 hospitalisation and mortality rates, United States, February – August 2021

Figure 6c: COVID-19 variant distribution for a sample of cases that have been sequenced, United States, February – August 2021

In brief documents are not an exhaustive list of publications but aim to provide an overview of what is already known about a specific topic. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.
**Figure 7a: COVID-19 cases and vaccinations, Canada, February – August 2021**

![COVID-19 cases and vaccinations graph]

- Red line: People fully vaccinated (cumulative)
- Blue line: People received at least one vaccine dose (cumulative)
- Gray area: New cases (daily rate)

**Figure 7b: COVID-19 hospitalisation and mortality rates, Canada, February – August 2021**

![COVID-19 hospitalisation and mortality rates graph]

- Purple line: No. new deaths per million population
- Light blue area: No. hospitalised patients per million population

**Figure 7c: COVID-19 variant distribution for a sample of cases that have been sequenced, Canada, February – August 2021**

![COVID-19 variant distribution graph]

- Black line: Alpha (B.1.1.7)
- Blue line: Beta (B.1.351)
- Yellow line: Gamma (P.1)
- Red line: Delta (B.1.617.2)
- Gray area: Other Variant
- Red dashed line: % of cases sequenced

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COVID-19 Critical Intelligence Unit: COVID-19 vaccines, cases and variants

Figure 8a: COVID-19 cases and vaccinations, Israel, February – August 2021

Figure 8b: COVID-19 hospitalisation and mortality rates, Israel, February – August 2021

Figure 8c: COVID-19 variant distribution for a sample of cases that have been sequenced, Israel, February – August 2021
Notes

- With regards to the above figures on COVID-19 variants, all SARS-CoV-2 sequences were downloaded from the GISAID EpiCOV™ Database. PANGO lineage (variant) classification for each individual sequence was provided by GISAID.19
- Dates displayed are based on the sample collection date. Sequences with collection dates specifying the year only were excluded, while collection dates specifying the year and month were assigned to the 15th of that month.
- Sequences with lengths ≤20,000 base pairs were removed from the analysis as were non-human hosts.
- Only a non-random sample of cases are sequenced and for many countries the proportion of cases sequenced is very low. As a result, this report does not indicate the true prevalence of the variants but rather a best estimate currently available.
- All data used to generate these graphs is subject to the GISAID terms and conditions.20

Sources

- Data on variants enabled by GISAID. Accessed 10 August 2021.19
- Data on total number of cases and vaccinations sourced from Our World in Data; accessed 10 August 2021.21
- Data on number of hospitalisations and new deaths for the United Kingdom, the United States Canada and Israel sourced from Our World in Data. Data on number of hospitalisations and new deaths for Australia sourced from COVID LIVE, which verifies data against Australian State and Territory Government Health Departments. Both accessed 10 August 2021.21, 22

Method

The NSW Health Critical Intelligence Unit maintains living evidence tables on COVID-19 vaccines and SARS-CoV-2 variants.12, 23 To inform this brief, a review of the evidence included in the living tables was undertaken on 27 April 2021 and these are reviewed each week for new relevant information. Countries were chosen based on contemporary relevance with regards to the variables of interest in the NSW and Australian context (cases, variants, vaccines, and patient outcomes).
References


