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COVID-19 and Children's Surveillance Report

Number 4

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The Royal Children's Hospital Melbourne

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Overview

- This weekly summary documents the latest COVID-19 surveillance data in children and adolescents, with a focus on Victoria and New South Wales (NSW) as well as specific countries that are relevant to the Australian context because of their size, COVID-19 epidemiology, the mitigation measures in place and data availability.
- Data on Multisystem Inflammatory Syndrome in Children (MIS-C), otherwise known as Paediatric Inflammatory Multisystem Syndrome (PIMS-TS), is also searched for but is not always available.
- This report is updated weekly using the most recently available data from government websites.
- Surveillance data for the Omicron variant of concern is included where available, including for NSW, South Africa, Denmark and the United Kingdom.
- The number of infections in unvaccinated children may also increase if school mitigation measures are few, there are changes to testing criteria and the adoption of screening in schools. The number of cases will be biased towards the age groups that are tested most.

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Summary

- Throughout 2021, the proportion of infections in unvaccinated children has generally increased as vaccination of adults has increased.[1,2] This proportion may continue to increase in countries where a low proportion of children are vaccinated. Many countries are now vaccinating adolescents and the USA and several other countries have begun vaccinating children aged 5 years and over.
- COVID-19 epidemiology in children and adolescents varies by setting.
- Following the return to school in September 2021, many settings with high vaccination coverage and school mitigation measures have had few infections and outbreaks. Other settings with low coverage in all ages, including adolescents, and/or few mitigation measures have experienced an increase in case numbers in children, and school outbreaks.
- The **Omicron variant** of concern[3] was first reported from South Africa on 25 November 2021. At the time of writing, it has been detected in 94 countries[4], up from 67 countries in the last report. Omicron is now the predominant variant in Australia, South Africa, the UK and many other countries already due to its high transmissibility. Early reports from NSW, the UK and Denmark, regions which have intensive surveillance, indicate that transmission mainly occurs in 20-29 year olds initially, with children and adolescents less affected so far.
- There has been an increase in hospitalisations in paediatrics but this has been a combination of being admitted for treatment for COVID-19 and testing positive when admitted for treatment for an unrelated condition. While paediatric infections and hospitalisations are reportedly rising in the US, the outcomes are milder with Omicron compared to Delta. Early data from the US also suggests that Omicron is less severe in children compared with Delta, with children 70-80% less likely to attend an emergency department for care and about 50-60% less likely to be hospitalised for treatment.[5]

- Up until school holidays and before the predominance of the Omicron variant, infections appear to be stable in children and adolescents in **Victoria** and declined in **New South Wales (NSW)** with the return of face-to-face learning despite many school infections. This could be attributable to high vaccine coverage in ≥12 year olds and implementation of mitigation measures in schools including test, trace, isolate and quarantine (TTIQ).
- **Victoria** opened all schools for onsite fulltime schooling on 1 November before closing for the holidays from 18 December 2021.
    - There is currently a steep increase in infections, with now 14,000 confirmed cases per day in all ages, highest in the 20-29 and followed by the 30-39 year age group.
    - Infections remain stable in children aged 0-19 years but testing capacity has been constrained in all ages due to increased demand.
    - Omicron is now the dominant strain in Victoria, ~76% of samples collected in late December 2021 were the Omicron variant.
    - There is no hospitalisation data available by age but total numbers for all age groups have increased in recent weeks.
- In **NSW**, onsite fulltime schooling commenced on 8 November before closing for the holidays from 18 December 2021.
    - Case numbers have increased to ~16,000 confirmed cases per day in all ages, highest in the 16-39 year group.
    - Hospitalisations have increased in recent weeks.
    - Omicron is now the dominant variant in NSW.
- In **Canada**, there is a steep increase in infections due to the Omicron variant, which is overtaking the Delta variant.
    - Hospitalisations are now increasing with the Omicron wave.
    - In the province of British Columbia, infections increased in children 5-11 years of age during the first two weeks of school reopening in September 2021, primarily in areas of lower vaccine coverage. Infections in this age group were trending downwards and now remain relatively stable. The increase in infections in September was partly due to a significant increase in testing among children. Serious illness in children has been rare in this province.
    - Since November, all 5-11 year old children are offered COVID-19 vaccine with an eight week interval between doses. Canada has vaccinated ~40% of this age group with a single dose.
- In **Europe and North America**, cases are on the rise across all age groups in many countries.

[1] Russell FM, Anderson V, Crawford N, Curtis N, Danchin M, Goldfeld S, Hart J, Keeble T, Medley T, Mulholland K, Ranganathan S, Suryawijaya Ong D, Overmars I, Perrett K, Steer A. COVID-19 in Early Childhood Education and Care & Schools. Research Brief Number 1, Version 1: 14 October 2021. Parkville, Victoria, Australia: Murdoch Children's Research Institute, The Royal Children's Hospital, University of Melbourne Department of Paediatrics; 2021.
[2] American Academy of Pediatrics (AAP). Children and COVID-19: State-Level Data Report 14 October 2021. Illinois, US: AAP; 2021.
[3] https://www.who.int/news/item/28-11-2021-update-on-omicron
[4] https://www.gisaid.org/hcov19-variants/
[5] Wang L, Berger NA, Kaelber DC, Davis PB, Volkow ND, Xu R. Comparison of outcomes from COVID infection in pediatric and adult patients before and after the emergence of Omicron. medRxiv [preprint]. 2022;21268495. https://doi.org/10.1101/2021.12.30.21268495

- In **Denmark**, Public Health and Social Measures (PHSM) including a three-week lockdown has been introduced due to a rapid rise in COVID-19 cases due to Omicron.
    - Total infection and hospitalisation rates are on a steep upward trend, with the Omicron variant increasingly being detected in positive cases. As of mid-December 2021, Omicron was responsible for ~44% of all infections.
    - Children and adolescents have the lowest rate of Omicron infections so far.
    - Schools have closed early for the holiday period and the 5-11 year old vaccination program has commenced.
- In **England**, Omicron predominates and infections across most age groups are now on a steep upward trajectory, primarily in the 20-39, followed by the 5-19 year age group.
    - Vaccine uptake is low in 12-15 year olds (~49% single dose, which was the recommended schedule for this age group in the UK until late November 2021) and ~64% single dose in 16-17 year olds. Infections declined in children aged 5-19 years, following the extension of the vaccination program to 12-17 year olds in mid-September 2021.
    - Overall hospitalisations remain stable. There was an initial increase in hospitalisations in the 5-14 year age group but this is now stable and rates in children this age remain the lowest compared to all other age groups. Hospitalisations include children who test positive, irrespective of the reason for admission, so is an overestimate of hospitalisations for COVID-19.
    - Mandatory mask wearing indoors, work from home and proof of vaccination have been re-introduced due to the current surge in Omicron cases. Close contacts who are fully vaccinated or under 18 years and six months of age and produce a negative PCR test result are not required to isolate. Rapid antigen testing (RAT) testing is available for all twice weekly.
- In **Finland**, where ~77% of 12-15 year olds and ~84% of 16-19 year olds have received at least one dose of vaccine, there has been a steep increase in infections in all age groups, especially in children aged <15 years.
    - Hospitalisations remain very low in children and adolescents but data is reported up to 10 December 2021.
    - There have been no deaths in anyone <30 years old.
    - There are far fewer infections and hospitalisations in the vaccinated compared to the unvaccinated.
    - 5-11 year old children who have underlying medical conditions or live with clinically vulnerable people are now offered COVID-19 vaccine.
- In **Scotland**, with Omicron predominance, there is now an increase in cases in all age groups, with the 20-39 year age group having the highest rates of infection.
    - Hospitalisations include children who test positive, irrespective of the reason for admission, so is an overestimate of hospitalisations for COVID-19.
    - Additional restrictions have been reinstated, including mandatory masks indoors, density limits and work from home.
    - The country has vaccinated ~64% of 12-15 year olds with a single dose.
- In **Singapore**, schools re-opened with <70% total vaccine coverage in July 2021.
    - Currently there is a downward trend in infections with ~390 cases per day.
    - There has been one ICU admission due to MIS-C and no deaths in children for the entire pandemic.
    - A total of five cases of MIS-C have been reported, all from the Delta wave in mid-late 2021.
    - Mitigation measures now include vaccination of 5+ years, mask wearing, cohorting and screening with RAT.
- In **South Africa**, certain restrictions such as the curfew and density limits have been eased since late December 2021.
    - Infections in children aged 5-19 years old increased following the re-opening of schools in early August 2021, before decreasing in early September.
    - There was a rapid increase in infections due to Omicron in all age groups but this is now decreasing.
    - Overall hospitalisations are also now decreasing. However, many admissions were incidental (admitted for other reasons and subsequently test positive).
    - The Omicron case fatality rate, which means the proportion of infected people who die, in all ages is much lower than previous waves. For children it is very low and so far is 0% for 5-9 year olds.
    - A total of 730 deaths in children with COVID-19 have been reported, accounting for <1% of all COVID-19 deaths in the country.

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- In the **United States**, there are large differences in Delta infection and hospitalisation rates (up to four-fold differences) and the number of deaths in children between States and Territories, most likely due to differences in vaccination coverage and adherence to PHSM.
    - Where there is high uptake of PHSM, such as in San Francisco, there are low infection and hospitalisation rates in children, and infections have declined in all age groups with school reopening.
    - There is currently an upward trend in infections and hospitalisations in most US states, with an estimated 59% of infections due to Omicron and 41% Delta as of 25 December 2021.
    - There have been 678 deaths in children with COVID-19 throughout the pandemic, accounting for <0.2% of all COVID-19 deaths in the US.
    - Hospitalisations and deaths include children who test positive, irrespective of the reason for admission or death, so is likely an overestimate of hospitalisations and deaths due to COVID-19.
    - Texas has had the highest number of child deaths (119) and there are six States that have reported 0 deaths throughout the entire pandemic.[6]
    - A total of 5973 cases of MIS-C have been reported, including 52 deaths (data up to report #1).
    - Since November 2021, all 5-11 year old children are offered COVID-19 vaccine with a three week interval between doses.

Summary of COVID-19 epidemiology in children and adolescents

Country	Cases	Hospitalisations	MIS-C/PIMS-TS	Total deaths^
VIC, Australia	↑	Not available	Not reported	2[b]
NSW, Australia	↑	Stable*	Not reported	1[b]
Canada	↑	↑*	Not reported	20[b]
Denmark	↑	↑*	Not reported	3[b]
England, UK	↑	Stable	Not reported	72[b]
Finland	↑	↑*	Not reported	0
Scotland, UK	↑	Stable	Not reported	4[a]
Singapore	↓	↓	5 cases	0
South Africa	↓	↓*	Not reported	730[b]
USA	↑	↑	5973 cases	678[b]

Note: Trends and values are for children only, unless otherwise specified.
**Available data includes both children and adults.*
^Age range for child deaths between 0-19y except Scotland (0-14y) and USA (0-17y). Deaths [a]due to COVID-19 or [b]with COVID-19.

[6] American Academy of Pediatrics (AAP). Children and COVID-19: State-Level Data Report 30 December 2021. Illinois, US: AAP; 2021.

List of abbreviations

Abbreviation	Term
MIS-C	Multisystem inflammatory syndrome in children
NSW	New South Wales, Australia
PCR	Polymerase chain reaction
PHSM	Public health & social measures
PIMS-TS	Paediatric inflammatory multisystem syndrome
RAT	Rapid antigen testing
TTIQ	Test, trace, isolate, quarantine

Australia: Victoria

(population 6.6 million)

PHSM[7]

All gathering limits, capacity and density limits removed, indoor mask-wearing required for all aged 8+, onsite work can return for fully vaccinated people, all shops open, TTIQ, QR check-in, proof of vaccination to attend some premises.

Schools & mitigation[8]

All students returned to onsite fulltime schooling from 1 Nov and all closed for holidays from 18 Dec 2021.

Standard PHSM, staggered return, cohorting, masks in primary & secondary, mandatory vaccination for staff from 18 Oct, RAT available for students and staff who are close contacts at an educational setting, all educational contacts can return to school after a negative standard PCR following exposure.

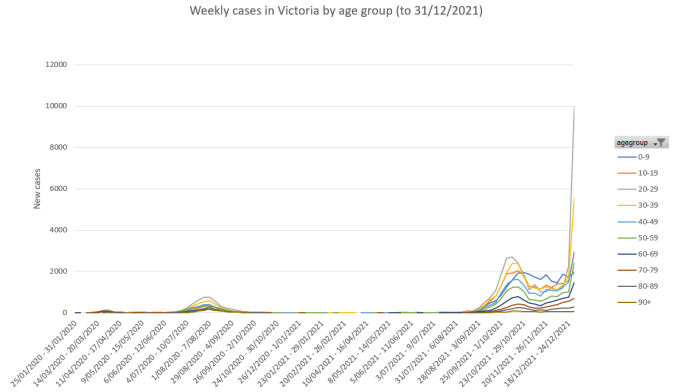
Mandatory vaccination for staff.

Vaccination coverage[9]

Age group (years)	1st dose (%)	2nd dose (%)
12-15	87.8	83.5
16+	93.8	92.4

Third dose for immunocompromised available from early Oct 2021, booster dose available to all eligible adults aged 18y+. Coverage data not available. Vaccination for 5-11y will become available from 10 Jan 2022.

Infections by age group[10,11]



Community sample testing of positive cases for the Omicron variant indicates that it is now the dominant variant in Victoria, ~76% of samples collected in late Dec 2021 were the Omicron variant.

Hospitalisations in children[12]

Current cases in hospital	491 cases in hospital	56 cases in ICU

No age breakdown

Deaths by age group[13]

People who have passed away with COVID-19

03/01/2022

Age group	Male	Female	Total
00-09	0	1	1
10-19	0	1	1
20-29	2	1	3
30-39	5	0	5
40-49	12	5	17
50-59	39	22	61
60-69	80	42	122
70-79	206	124	330
80-89	309	264	573
90+	165	262	427
Total	818	722	1,540

One 15 year old and one child under 10 with multiple underlying conditions and in palliative care died with COVID-19.

[7] https://www.coronavirus.vic.gov.au/coronavirus-covidsafe-settings
[8] https://www.coronavirus.vic.gov.au/education-information-about-coronavirus-covid-19
[9] https://www.health.gov.au/resources/collections/covid-19-vaccination-daily-rollout-update
[10] Data from: https://www.coronavirus.vic.gov.au/victorian-coronavirus-covid-19-data
[11] https://www.health.vic.gov.au/media-releases/coronavirus-update-for-victoria-3-january-2022
[12] https://www.coronavirus.vic.gov.au/victorian-coronavirus-covid-19-data
[13] https://www.coronavirus.vic.gov.au/additional-covid-19-case-data#cases-in-hospital

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Australia: New South Wales

(population 8.2 million)

PHSM[14]

Mandatory masks indoors and on public transport for all aged 12+, TTIQ, QR check-in, all shops open, proof of vaccination to attend some premises.

Schools & mitigation[15,16]

All students returned to onsite fulltime schooling from 8 Nov and all closed for holidays from 18 Dec 2021.

Standard PHSM, RAT home testing for educational contacts.

Mandatory vaccination for staff from 8 Nov 2021.

Vaccination coverage[17]

Age group (years)	1st dose (%)	2nd dose (%)
12-15	81.4	78.1
16+	95.0	93.6

Third dose for immunocompromised available from early Oct 2021, booster dose available to all eligible adults aged 18y+. Coverage data not available. Vaccination for 5-11y will become available from 10 Jan 2022.

Infections by age group[18]

Figure 3. Seven day backward rolling average of COVID-19 cases rate per 100,000 population by age and notification date, NSW, from 16 June 2021 to 11 December 2021

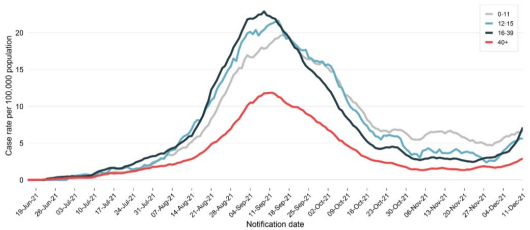


Table 3. Demographics of confirmed and probable Omicron infections by gender, age, vaccination status and source of infection, NSW, 26 November to 11 December, 2021

	Confirmed Omicron Cases				Probable Omicron Cases[b]
	Week ending				
	11 Dec 2021	04 Dec 2021	27 Nov 2021	21 Nov 2021	26 Nov to 11 Dec 2021
Gender					
Female	21 (61.8%)	13 (44.8%)	0 (0.0%)	-	34 (53.1%) 35 (44.9%)
Male	13 (38.2%)	16 (55.2%)	1 (100%)	-	30 (46.9%) 43 (55.1%)
Age group					
0-9	5 (14.7%)	3 (10.3%)	1 (100%)	-	9 (14.1%) 5 (6.4%)
10-19	5 (14.7%)	10 (34.5%)	0 (0.0%)	-	15 (23.4%) 14 (17.9%)
20-29	8 (23.5%)	2 (6.9%)	0 (0.0%)	-	10 (15.6%) 23 (29.5%)
30-39	6 (17.6%)	2 (6.9%)	0 (0.0%)	-	8 (12.5%) 17 (21.8%)
40-49	6 (17.6%)	8 (27.6%)	0 (0.0%)	-	14 (21.9%) 14 (17.9%)
50-59	1 (2.9%)	3 (10.3%)	0 (0.0%)	-	4 (6.2%) 3 (3.8%)
60-69	2 (5.9%)	1 (3.4%)	0 (0.0%)	-	3 (4.7%) 2 (2.6%)
70-79	1 (2.9%)	0 (0.0%)	0 (0.0%)	-	1 (1.6%) 0 (0.0%)
80-89	0 (0.0%)	0 (0.0%)	0 (0.0%)	-	0 (0.0%) 0 (0.0%)
90+	0 (0.0%)	0 (0.0%)	0 (0.0%)	-	0 (0.0%) 0 (0.0%)
Vaccination status					
Fully vaccinated	13 (38.2%)	19 (65.5%)	0 (0.0%)	-	32 (50.0%) 49 (62.8%)
Partially vaccinated	1 (2.9%)	3 (10.3%)	0 (0.0%)	-	4 (6.2%) 4 (5.1%)
No effective dose	8 (23.5%)	4 (13.8%)	0 (0.0%)	-	12 (18.8%) 6 (7.7%)
Under investigation[a]	7 (20.6%)	0 (0.0%)	0 (0.0%)	-	7 (10.9%) 13 (16.7%)
Not eligible (aged 0-11 years)	5 (14.7%)	3 (10.3%)	1 (100%)	-	9 (14.1%) 6 (7.7%)
Source of infection					
Overseas acquired	5 (14.7%)	9 (31.0%)	1 (100%)	-	15 (23.4%) 5 (6.4%)
Interstate	0 (0.0%)	1 (3.4%)	0 (0.0%)	-	1 (1.6%) 0 (0%)
Locally acquired	29 (85.3%)	19 (65.5%)	0 (0.0%)	-	48 (75.0%) 73 (93.6%)
Clinical Severity					
Hospitalised	1 (2.9%)	0 (0.0%)	0 (0.0%)	-	1 (1.6%) 0 (0.0%)
ICU	0 (0.0%)	0 (0.0%)	0 (0.0%)	-	0 (0.0%) 0 (0.0%)
Deaths	0 (0.0%)	0 (0.0%)	0 (0.0%)	-	0 (0.0%) 0 (0.0%)
Total	34 (100%)	29 (100%)	1 (100%)	0	64 (100%) 78 (100%)

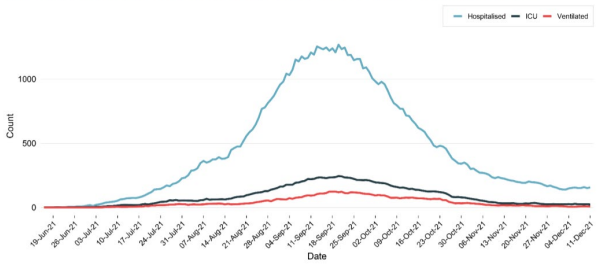
a Vaccination status is updated regularly using both the Australian Immunisation Register and the patient's interview.
b Probable Omicron cases are confirmed cases that are yet to have genomic sequencing but have PCR results that show an S gene dropout, a feature caused by a mutation in the Omicron variant. Following genomic sequencing, these cases will be reported with their confirmed variant.

Hospitalisations in children[19]

Hospitalisations among people diagnosed with COVID-19, by age group, NSW

Age-group (years)	Since 16 Jun 2021			Jan 2020 – 15 Jun 2021	
	Hospitalised	Percentage of cases hospitalised[4]	Hospitalised per 100,000 population	Hospitalised	Percentage of cases hospitalised[1]
0-9	291	2%	28.8	4	2%
10-19	363	3%	37.7	10	3%
20-29	987	6%	84.2	27	2%
30-39	1267	9%	108.2	46	4%
40-49	1315	13%	127.3	48	7%
50-59	1281	18%	131.8	78	11%
60-69	1055	26%	125.5	117	18%
70-79	784	39%	134.5	92	23%
80-89	523	53%	190.7	52	43%
90+	131	52%	188.9	16	38%
Total	7,997	10%	98.9	490	9%

Figure 5b. Number of cases in hospital, in ICU and ventilated by date, NSW, from 16 June to 11 December 2021



Many admissions in <12y children are for social reasons as parents are hospitalised for treatment of COVID-19. ~1% of primary school age cases are admitted for treatment of COVID-19. Graph is not available by age group.

Deaths by age group[20]

Table 6. Deaths following recent infection with COVID-19, by age group, from January 2020 to 11 December 2021

Age-group (years)	Since 16 Jun 2021			Jan 2020 – 15 Jun 2021	
	Number of deaths	Case fatality rate	Fatality rate per 100,000 population[2]	Number of deaths	Case fatality rate[2]
0-9	0	0%	0.0	0	0%
10-19	1	<1%	0.1	0	0%
20-29	6	<1%	0.5	0	0%
30-39	15	<1%	1.3	0	0%
40-49	27	<1%	2.6	0	0%
50-59	66	1%	6.8	1	<1%
60-69	104	3%	12.4	4	1%
70-79	135	7%	23.2	15	4%
80-89	168	17%	61.3	20	16%
90+	64	26%	92.3	16	38%
Total	586	1%	7.2	56	1%

Proportion of cases with a severe outcome (ICU and/or death) amongst all cases, by age, time of infection, and vaccination status, NSW, 1 January 2020 to 11 December 2021

Age-group (years)	% cases with severe outcomes (ICU and/or death)					
	Jan 2020 - 15 Jun 2021		16 Jun - 11 Dec 2021: Fully vaccinated		16 Jun – 11 Dec 2021: Un-vaccinated	
0-9	0%	(0 / 251)	-	-	<1%	(10 / 13,260)
10-19	<1%	(1 / 325)	0%	(0 / 379)	<1%	(29 / 10,600)
20-29	<1%	(4 / 1,115)	<1%	(3 / 1,760)	1%	(98 / 10,266)
30-39	1%	(15 / 1,098)	<1%	(5 / 1,898)	2%	(157 / 8,123)
40-49	2%	(12 / 718)	<1%	(6 / 1,669)	3%	(181 / 5,653)
50-59	4%	(30 / 710)	1%	(16 / 1,401)	7%	(268 / 3,849)
60-69	7%	(44 / 656)	2%	(18 / 957)	13%	(232 / 1,799)
70-79	12%	(46 / 394)	6%	(39 / 648)	22%	(163 / 732)
80-89	21%	(26 / 122)	11%	(38 / 333)	36%	(131 / 365)
90+	38%	(16 / 42)	20%	(25 / 124)	45%	(29 / 65)
Total	4%	(194 / 5,431)	2%	(150 / 9,169)	2%	(1,298 / 54,712)

* For this table, un-vaccinated includes those with no effective dose, and those who are ineligible for vaccination (aged 0-11 years).

One 15 year old died with pneumococcal meningitis and COVID-19.

[14] https://www.nsw.gov.au/covid-19/stay-safe/rules
[15] https://education.nsw.gov.au/covid-19/advice-for-families/vaccination-requirements-for-school-sites
[16] https://education.nsw.gov.au/covid-19/advice-for-families
[17] https://www.health.gov.au/resources/collections/covid-19-vaccination-daily-rollout-update
[18] https://www.health.nsw.gov.au/Infectious/covid-19/Pages/weekly-reports.aspx
[19] https://www.health.nsw.gov.au/Infectious/covid-19/Pages/weekly-reports.aspx
[20] https://www.health.nsw.gov.au/Infectious/covid-19/Pages/weekly-reports.aspx

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Canada

(population 38 million)

PHSM[21]

Standard PHSM including TTIQ and mask wearing encouraged in shared spaces and subject to local advice.

Ontario closed indoor dining from early Jan 2022.

Schools & mitigation[22]

Re-opened in Sep 2021

Standard PHSM and additional measures depending on local advice: physical distancing, cohorting, masks when required, screening tests.

Ontario resumed online learning from early Jan 2022.

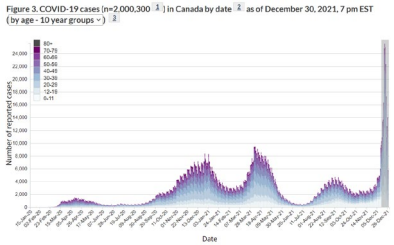
Vaccination coverage[23]

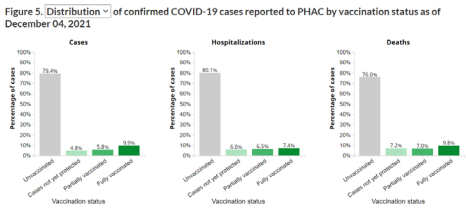
Age group (years)	1st dose (%)	Fully vaccinated* (%)	3rd/booster (%)
12+	90.0	87.3	9.0
5-11	39.5	1.3	-
12-17	87.0	82.6	0.1

*Canada also uses the J&J/Janssen vaccine which is a single-dose vaccine.

Third/booster doses have been available to high-risk individuals in phases since Sep 2021.
Vaccination of 12y+ commenced mid-May and 5-11y in mid-Nov 2021.

Infections by age group[24,25]





British Columbia (pop. 5.1 million):

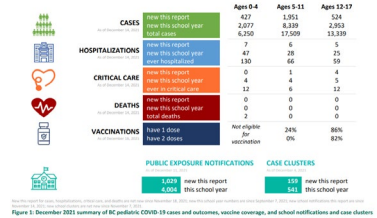


Figure 1: December 2021 summary of BC pediatric COVID-19 cases and outcomes, vaccine coverage, and school notifications and case clusters

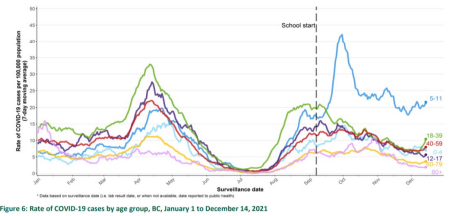
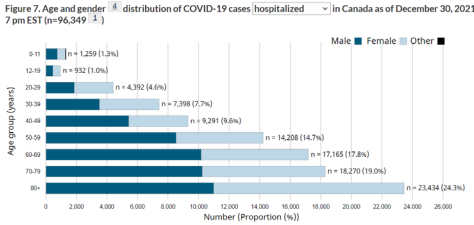
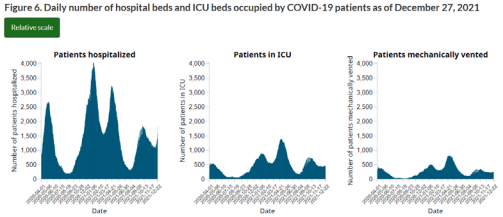


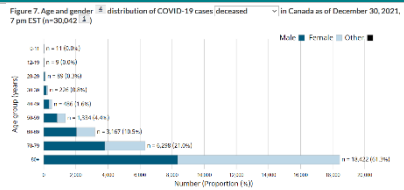
Figure 6: Rate of COVID-19 cases by age group, BC, January 1 to December 14, 2021

Hospitalisations in children[26]



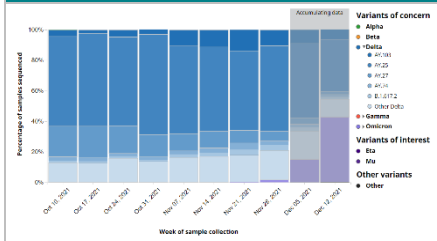


Deaths by age group[27]



There have been 20 deaths with COVID-19 in children aged 0-19y throughout the pandemic.

Genomic surveillance[28]



[21] https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks.html
[22] https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/guidance-documents/planning-2021-2022-school-year-vaccination.html
[23] https://health-infobase.canada.ca/covid-19/vaccination-coverage/
[24] https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html
[25] http://www.bccdc.ca/schools/news-resources/data-for-k12
[26] https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html
[27] https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html
[28] https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html

murdoch children's research institute
The Royal Children's Hospital Melbourne
THE UNIVERSITY OF MELBOURNE

Denmark

(population 5.9 million)

PHSM[29]

Partial lockdown reinstated from 19 Dec 2021.

Previously all PHSM lifted on 8 Oct 2021, except for mask wearing in airports & hospitals.

Schools & mitigation[30]

Re-opened in May 2021 and closed early for winter holidays.

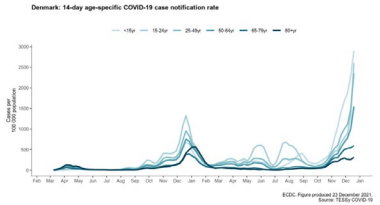
Standard PHSM; PCR or RAT screening tests: Recommended weekly for staff & students from grade 1 unless fully vaccinated or previously infected with COVID-19 in the last 6 months, twice weekly tests recommended for areas with high infection rates.

Vaccination coverage[31]

Age group (years)	1st dose (%)	2nd dose (%)	3rd/ booster (%)
12+	81.8	78.0	48.5

Commenced 3rd/booster vaccination for people 65+y in late Oct and for all adults from late Nov 2021. Vaccination for 5-11y age group commenced late Nov 2021, coverage data not available.

Infections by age group[32,33,34]



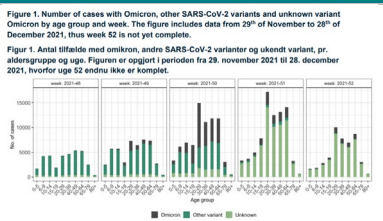


Figure 1. Number of cases with Omicron, other SARS-CoV-2 variants and unknown variant Omicron by age group and week. The figure includes data from 29th of November to 28th of December 2021, thus week 52 is not yet complete.

Figur 1. Antal tilfælde med omikron, andre SARS-CoV-2 varianter og ukendt variant, pr. aldersgruppe og uge. Figuren er opgjort i perioden fra 29. november 2021 til 28. december 2021, hvorfor uge 52 endnu ikke er komplet.

Number of school outbreaks by school level since return to school:

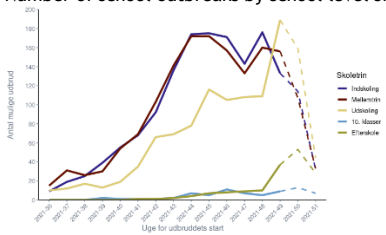


Table 8. Age distribution for individuals infected with Omicron compared to other variants, from 21st of November to 28th of December 2021. The table only includes samples with a known variant.

Tabel 8. Aldersfordeling for personer med omikron-infektion sammenlignet med andre varianter i perioden fra 21. november 2021 til 28. december 2021. Tabellen indeholder kun data på prøver med en kendt variant.

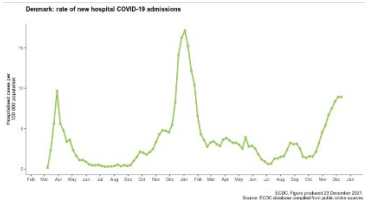
Age distribution among individals tested positive prior or within 48 hrs after admission	Other variants (No. of cases)	Other variants (%)	Omicron (No. of cases)	Omicron (%)
0-5	36	2.5	29	6.4
6-14	49	3.4	11	2.4
15-19	17	1.2	21	4.6
20-29	118	8.4	82	18.1
30-39	208	14.7	72	15.9
40-49	211	14.9	55	12.1
50-64	311	22	75	16.5
65-79	317	22.4	65	14.3
80+	146	10.3	44	9.7
Total	1,413	99.8	454	100

Grades: 0-3, 4-6, 7-9, 10, 10+

Hospitalisations in children[35,36]

Age group	Confirmed cases	Total hospitalised (%)	Comorbid. (%)	Short hospital stay	Hospitalised females	Hospitalised males
Aldersgrupper	Bekræftede tilfælde	Indlagte i alt (%)	Heraf med komorbiditet (%)	Korte indlæggelser**	Indlagte kvinder	Indlagte mænd
0-9	80.888	582 (1)	123 (21)	273	263	319
10-19	125.569	486 (0)	161 (33)	186	265	221
20-29	136.178	1.554 (1)	663 (43)	569	960	594
30-39	102.987	2.211 (2)	977 (44)	793	1.332	879
40-49	107.299	2.626 (2)	1.281 (49)	800	1.283	1.343
50-59	88.421	3.446 (4)	2.048 (59)	756	1.530	1.916
60-69	46.754	3.345 (7)	2.406 (72)	479	1.359	1.986
70-79	26.527	4.571 (17)	3.910 (86)	406	1.923	2.648
80-89	10.219	3.568 (35)	3.185 (89)	284	1.746	1.822
90+	2.621	933 (36)	847 (91)	59	544	389
I alt	727.463	23.322 (3)	15.601 (67)	4605	11.205	12.117

For the entire pandemic, a total of 38 children in ICU, which included 12 children with comorbidities.



Graph is not available by age group

Deaths by age group[37]

Age group	Confirmed cases	Deaths (%)	Comorbid. (%)	Hospitalised females	Hospitalised males
Aldersgrupper	Bekræftede tilfælde	Dødsfald (%)	Heraf med komorbiditet (%)	Dødsfald kvinder	Dødsfald mænd
0-9	80.888	2 (0)	2 (100)	0	2
10-19	125.569	1 (0)	0 (0)	0	1
20-29	136.178	7 (0)	4 (57)	4	3
30-39	102.987	9 (0)	4 (44)	5	4
40-49	107.299	26 (0)	19 (73)	8	18
50-59	88.421	98 (0)	76 (78)	36	62
60-69	46.754	272 (1)	235 (86)	101	171
70-79	26.527	840 (3)	787 (94)	304	536
80-89	10.219	1243 (12)	1171 (94)	568	675
90+	2.621	689 (26)	632 (92)	411	278
I alt	727.463	3187 (0)	2930 (92)	1437	1750

Total of 3 deaths with COVID-19 in children aged 0-19y throughout the pandemic.

[29] https://en.coronasmitte.dk/rules-and-regulations
[30] https://en.coronasmitte.dk/rules-and-regulations
[31] https://experience.arcgis.com/experience/9824b03b114244348ef0b10f69f490b4/page/page_3/
[32] https://covid19-country-overviews.ecdc.europa.eu/countries/Denmark.html
[33] https://covid19.ssi.dk/overvagningsdata/ugentlige-opgorelser-med-overvaagningsdata
[34] https://files.ssi.dk/covid19/omikron/statusrapport/rapport-omikronvarianten-03012022-9gj3
[35] https://covid19.ssi.dk/overvagningsdata/ugentlige-opgorelser-med-overvaagningsdata
[36] https://covid19-country-overviews.ecdc.europa.eu/countries/Denmark.html
[37] https://covid19.ssi.dk/overvagningsdata/ugentlige-opgorelser-med-overvaagningsdata

England, UK

(population 56.6 million)

PHSM[38]

Standard PHSM including TTIQ and mandatory mask wearing indoors, work from home default, proof of vaccination/negative test required for certain venues; previously most PHSM lifted until re-introduced in late Nov 2021.

Schools & mitigation[39]

Re-opened after summer holiday in mid-Sep 2021. Standard PHSM, cohorting, mask wearing required for adults and students from year 7 onwards, twice-weekly RAT screening for staff and secondary school students, vaccination of 16-17y commenced mid-Aug & 12-15y commenced mid-Sep 2021 (initially as single dose).

Close contacts who are fully vaccinated or under 18.5y and produce a negative PCR test result do not need to isolate.

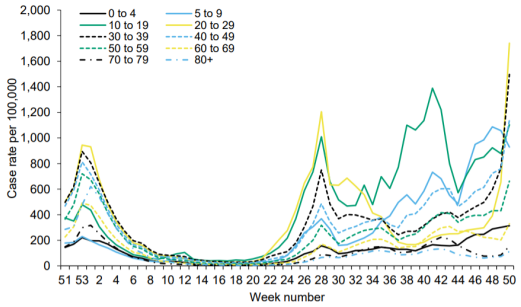
Vaccination coverage[40]

Age group (years)	1st dose (%)	2nd dose (%)	3rd/booster (%)
12+	90.0	82.3	59.3
12-15	49.0	3.3	-
16-17	64.3	40.7	2.9

Third/booster dose available for all 18y+ and other high-risk groups.

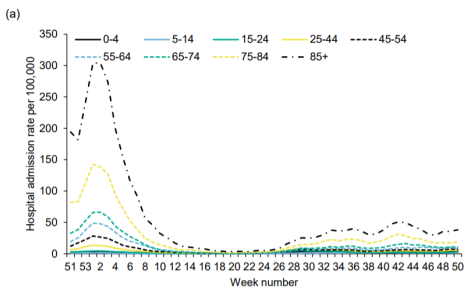
Infections by age group[41]

Figure 5: Weekly confirmed COVID-19 case rates per 100,000, tested under Pillar 1 and Pillar 2, by age group

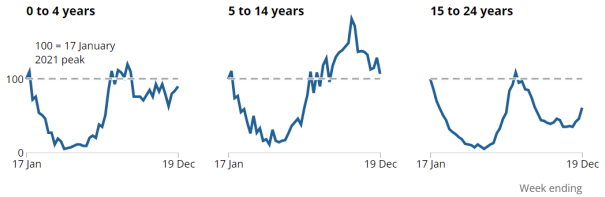


Hospitalisations in children[42,43]

Figure 43: Weekly hospital admission rate by age group for new (a) COVID-19 positive cases and (b) influenza reported through SARI Watch

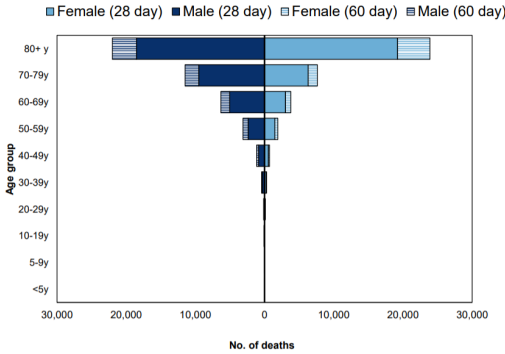


COVID-19-positive hospital admissions as a percentage of the rate during the January peak (rate in week ending 17 January = 100%), by age, England



Deaths by age group[44]

Figure 55: Age-sex pyramid of laboratory confirmed COVID-19 deaths, for the past year



Deaths with COVID-19 in the past year:

<5y: 14
5-9y: 9
10-19y: 49

[38] https://www.gov.uk/guidance/covid-19-coronavirus-restrictions-what-you-can-and-cannot-do
[39] https://www.gov.uk/government/publications/actions-for-schools-during-the-coronavirus-outbreak/schools-covid-19-operational-guidance
[40] https://coronavirus.data.gov.uk/details/vaccinations?areaType=nation&areaName=England
[41] https://www.gov.uk/government/statistics/national-flu-and-covid-19-surveillance-reports-2021-to-2022-season
[42] https://www.gov.uk/government/statistics/national-flu-and-covid-19-surveillance-reports-2021-to-2022-season
[43] https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/coronaviruscovid19latestinsights/hospitals
[44] https://www.gov.uk/government/statistics/national-flu-and-covid-19-surveillance-reports-2021-to-2022-season

Finland

(population 5.5 million)

PHSM[45]

Restrictions reinstated in late Dec 2021, including mandatory indoor mask wearing, proof of vaccination to attend premises, work from home default and density limits.

Schools & mitigation[46]

Schools have reopened from Aug and closed for winter holiday in late Dec 2021.

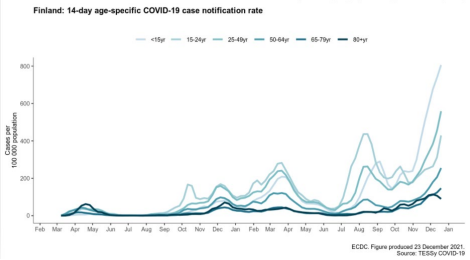
Standard PHSM, cohorting, masks, ventilation, vaccination of 12y+ commenced early Aug 2021.

Vaccination coverage[47,48]

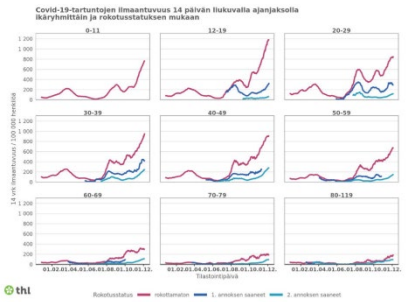
Age group (years)	1st dose (%)	2nd dose (%)	3rd/booster (%)
12+	87.8	83.8	24.8
12-15	76.5	67.8	0.2
16-19	84.2	76.9	1.3

Third/booster dose is recommended for all aged 18y+. Vaccine available to 5-11y children in high-risk groups.

Infections by age group[49,50]



Infections by age group (14-day average):

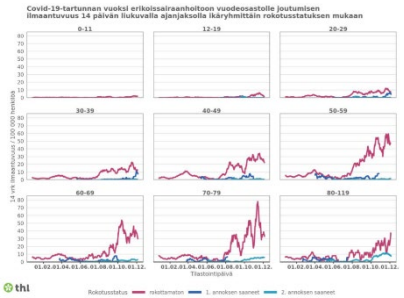


Note: This graph has not been updated since report #2 (10 Dec 2021).

Pink (unvaccinated)
Dark blue (1 dose)
Light blue (2 doses)

Hospitalisations in children[51,52]

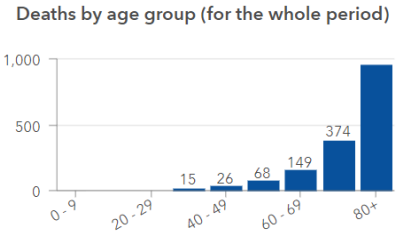
Incidence of hospitalisation by age group (14-day average):



Note: This graph has not been updated since report #2 (10 Dec 2021).

Pink (unvaccinated)
Dark blue (1 dose)
Light blue (2 doses)

Deaths by age group[53]



There have been 0 deaths in children throughout the entire pandemic.

[45] https://valtioneuvosto.fi/en/information-on-coronavirus/current-restrictions
[46] https://valtioneuvosto.fi/en/information-on-coronavirus/current-restrictions
[47] https://sampo.thl.fi/pivot/prod/en/vaccreg/cov19cov/summary_cov19ageareacov
[48] https://www.thl.fi/episeuranta/rokotukset/koronarokotusten_edistyminen.html
[49] https://thl.fi/fi/web/infektiotaudit-ja-rokotukset/ajankohtaista/ajankohtaista-koronaviruksesta-covid-19/tilannekatsaus-koronaviruksesta/koronaviruksen-seuranta
[50] https://covid19-country-overviews.ecdc.europa.eu/countries/Finland.html
[51] https://thl.fi/fi/web/infektiotaudit-ja-rokotukset/ajankohtaista/ajankohtaista-koronaviruksesta-covid-19/tilannekatsaus-koronaviruksesta/koronaviruksen-seuranta
[52] https://covid19-country-overviews.ecdc.europa.eu/countries/Finland.html
[53] https://experience.arcgis.com/experience/92e9bb33fac744c9a084381fc35aa3c7

Scotland, UK

(population 5.5 million)

PHSM[54]

Minimal restrictions before reinstated in Dec 2021, including mandatory masks indoors, density limits, recommendation to travel only for essential reasons, work from home default and proof of vaccination to attend premises.

Schools & mitigation[55]

Re-opened after summer holiday in mid-Aug and closed for winter holidays in late-Dec 2021.
Standard PHSM, cohorting, mask wearing recommended for adults and students from year 7 onwards, twice-weekly RAT screening for staff and secondary school students, vaccination of 16-17y commenced mid-Aug & 12-15y commenced mid-Sep 2021 (initially as single dose).

Close contacts who are fully vaccinated or under 18.5y and produce a negative PCR test result do not need to isolate.

Vaccination coverage[56]

Age group (years)	1st dose (%)	2nd dose (%)	3rd/booster (%)
12+	91.6	84.0	62.6
12-15	64.4	5.5	0.6
16-17	80.5	43.3	6.4

Third/booster dose available for all 18y+ and other high-risk groups.

Infections by age group[57]

Figure 3: Seven day case rate in Scotland by age group by specimen date[8]. Refers to PCR testing only. Data up to 18 December 2021.

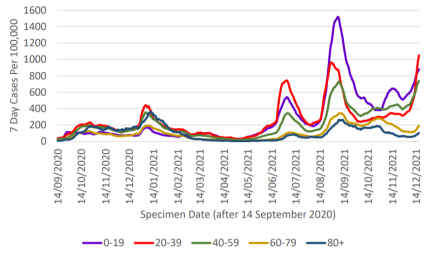
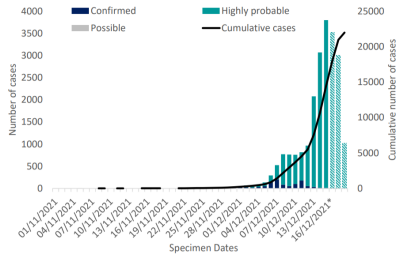
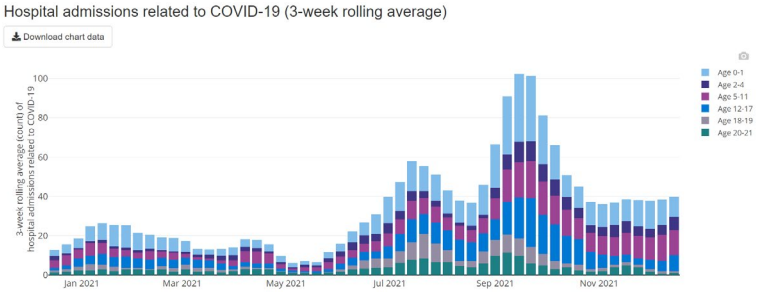


Figure 5: Confirmed, highly probable and possible Omicron cases in Scotland by specimen date[17 18]



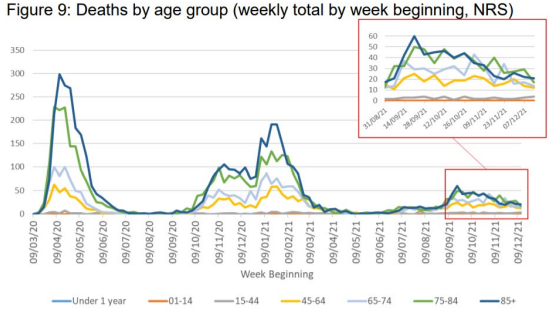
Hospitalisations in children[58]



Any admitted child who is COVID-19 positive is included, so this overestimates the number of children being admitted and needing treatment for COVID-19.

Deaths by age group[59,60]

Figure 9: Deaths by age group (weekly total by week beginning, NRS)



There have been 4 deaths due to COVID-19 in children aged 0-14y throughout the pandemic.

[54] https://www.gov.scot/coronavirus-covid-19/
[55] https://www.gov.uk/government/publications/actions-for-schools-during-the-coronavirus-outbreak/schools-covid-19-operational-guidance
[56] https://coronavirus.data.gov.uk/details/vaccinations?areaType=nation&areaName=Scotland
[57] https://www.gov.scot/collections/coronavirus-covid-19-the-state-of-the-epidemic/
[58] https://scotland.shinyapps.io/phs-covid19-education/_w_852fb58e/
[59] https://www.gov.scot/collections/coronavirus-covid-19-the-state-of-the-epidemic/
[60] https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/weekly-and-monthly-data-on-births-and-deaths/deaths-involving-coronavirus-covid-19-in-scotland

Singapore

(population 5.5 million)

PHSM[61]

Restrictions re-introduced on 27 Sep 2021 after temporary easing.
Mandatory masks indoors & outdoors, TTIQ, work from home, shops open with density limits and digital check-in, vaccination requirements to enter some premises, limits on guests at home.

Schools & mitigation[62]

Re-opened in Jul 2021 with temporary home-based learning so exams could be undertaken without interruption; secondary schools continue to study onsite; phased return of primary schools from 11 Oct 2021. Closed for end-of-year holidays in mid-Nov 2021.

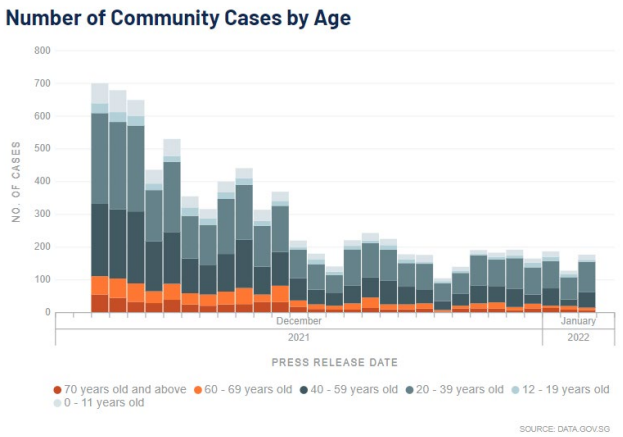
Standard PHSM, cohorting, RAT & temperature screening, mandatory masks 6y+ with exceptions, vaccination of 12y+ commenced early Jun 2021 and 5-11y in late Dec 2021.

Vaccination coverage[63]

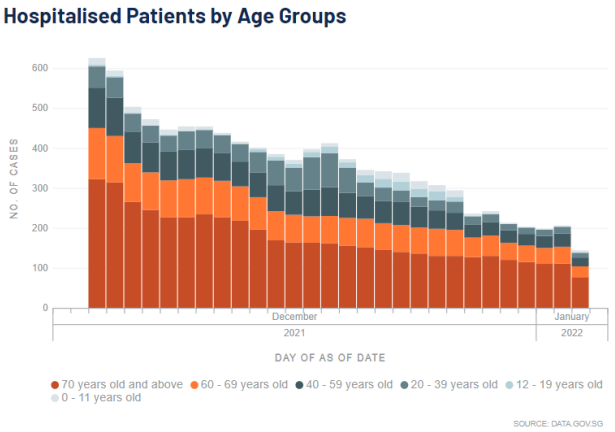
Age group (years)	1st dose (%)	2nd dose (%)	3rd/booster (%)
Total pop.	88.0	87.0	42.0

Third/booster dose available for all aged 18y+.

Infections by age group[64]



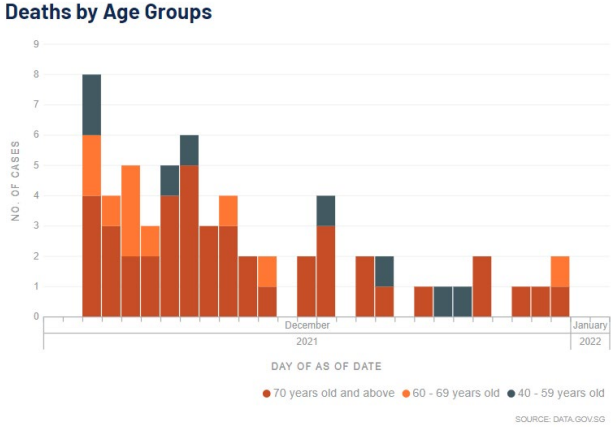
Hospitalisations in children[65]



One child was admitted to ICU due to MIS-C for the entire pandemic.

There have been five cases of MIS-C throughout the entire pandemic, last reported 8 Nov 2021.

Deaths by age group[66]



There have been 0 deaths in children throughout the entire pandemic.

[61] https://www.moh.gov.sg/covid-19-phase-advisory
[62] https://www.moe.gov.sg/faqs-covid-19-infection
[63] https://www.moh.gov.sg/
[64] https://www.moh.gov.sg/
[65] https://www.moh.gov.sg/
[66] https://www.moh.gov.sg/

South Africa

(population 60.4 million)

PHSM[67]

Since 1 Oct 2021, restrictions including partial curfew, mandatory masks 6y+ with exceptions, density limits.

Since 30 Dec 2021, lifting of certain restrictions including removal of curfew and increased density limits.

Schools & mitigation[68,69]

Re-opened in Aug and closed for end-of-year holidays in mid-Dec 2021.

Standard PHSM, ventilation, symptom screening, mandatory masks 6y+ with exceptions, visitor limits, vaccination of 12y+.

Vaccination coverage[70]

Age group (years)	Fully vaccinated* (%)
18+	44.9

*Note: South Africa also uses the J&J/Janssen vaccine which is a single-dose vaccine.
Coverage data for 12-17y not available.

Infections by age group[71]

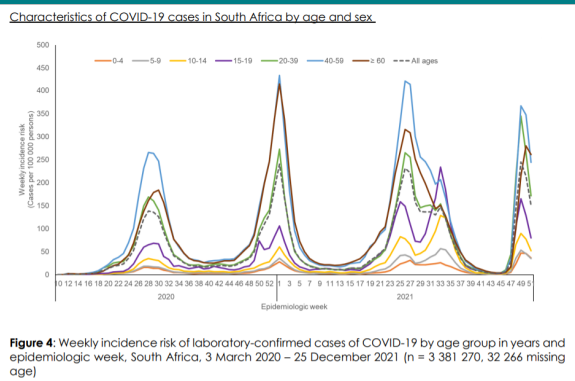
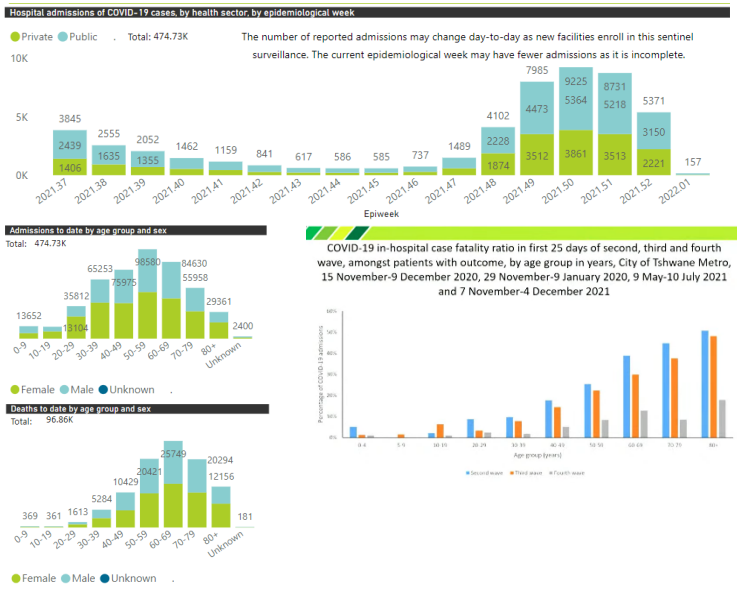


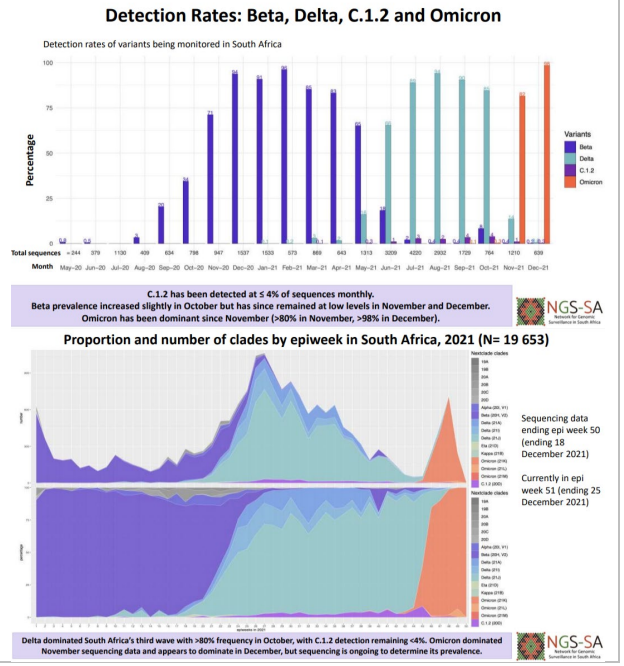
Figure 4: Weekly incidence risk of laboratory-confirmed cases of COVID-19 by age group in years and epidemiologic week, South Africa, 3 March 2020 – 25 December 2021 (n = 3 381 270, 32 266 missing age)

Hospitalisations in children and deaths by age group[72,73]



Total of 730 deaths with COVID-19 in children 0-19y throughout the entire pandemic. Deaths in children account for <1% of all deaths in South Africa.

Genomic surveillance[74]



[67] https://www.gov.za/covid-19/resources/regulations-and-guidelines-coronavirus-covid-19
[68] https://www.gov.za/covid-19/resources/regulations-and-guidelines-coronavirus-covid-19
[69] https://sacoronavirus.co.za/vaccine-updates/
[70] https://sacoronavirus.co.za/latest-vaccine-statistics/
[71] https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/surveillance-reports/weekly-epidemiological-brief/
[72] https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/surveillance-reports/daily-hospital-surveillance-datcov-report/
[73] https://www.youtube.com/watch?app=desktop&v=e4Y2sXkt-cw
[74] https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/sars-cov-2-genomic-surveillance-update/

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USA

(population 332.8 million)

PHSM[75]

The US CDC recommends indoor mask wearing for all unvaccinated and aged 2y+, physical distancing, hand & surface hygiene, TTIQ, but adoption varies by State.

Schools & mitigation[76]

Schools have reopened from Sep and closed for winter holidays in late Dec 2021.

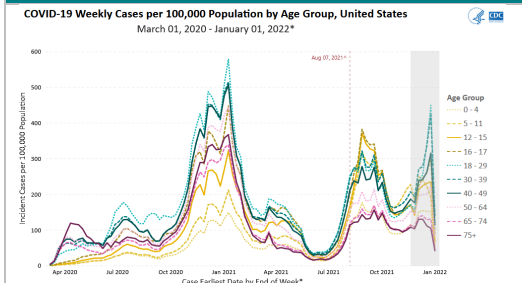
Standard PHSM, cohorting, masks, PCR & RAT screening, vaccination commenced mid-May for 12+y and early Nov 2021 for 5-11y, but adoption varies by State.

Vaccination coverage[77,78]

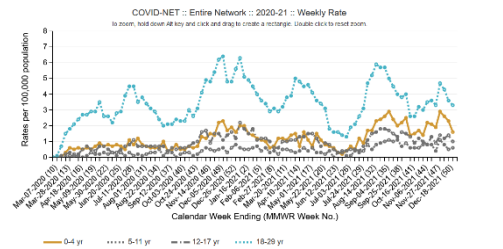
Age group (years)	1st dose (%)	Fully vaccinated* (%)	3rd/booster (%)
5-11	23.5	14.7	-
12-17	63.2	53.4	-
18+	85.5	72.8	36.3

*Note: The US also uses the J&J/Janssen vaccine which is a single-dose vaccine.
Third/booster dose for 65y+ and other high-risk individuals from Sep 2021, expanded to all 18y+ from late Nov 2021.

Infections by age group[79]

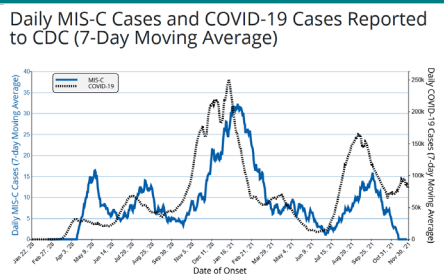


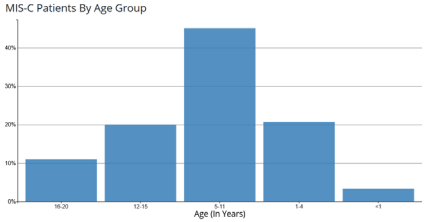
Hospitalisations in children[85]



Any admitted child who is COVID-19 positive is likely to be included, so this is likely to be an overestimation of the number of children needing treatment for COVID-19.

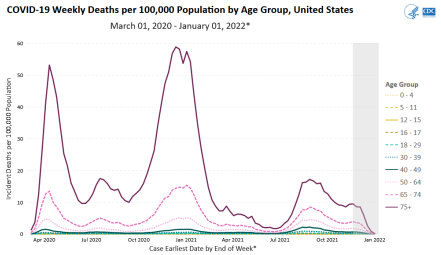
MIS-C[80]





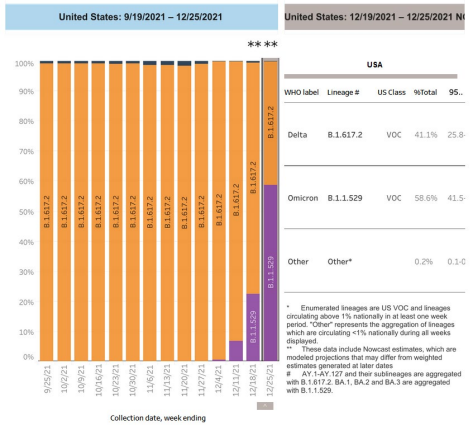
Note: This data has not been updated since report #1 (3 Dec 2021)
There have been 5973 cases of MIS-C throughout the entire pandemic, including 52 deaths.
The median age of MIS-C cases was 9y and half were between 5-13y.

Deaths by age group[81,82]



Total 678 deaths with COVID-19 in children 0-17y throughout the entire pandemic, accounting for <0.1% of all deaths in the US.
There is marked variation by State/Territory and case fatality rates are between 0-0.01% for the vast majority of States and Territories[84]:
e.g. Texas (n=119); Arizona (n=52); California (n=43); Tennessee (n=29); Puerto Rico (n=9); Guam (n=6); Hawaii (n=1); Alaska (n=0).

Genomic surveillance[83]



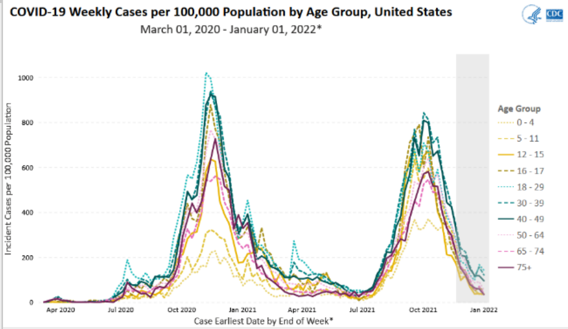
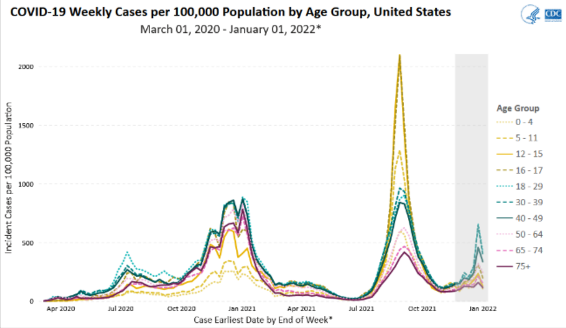
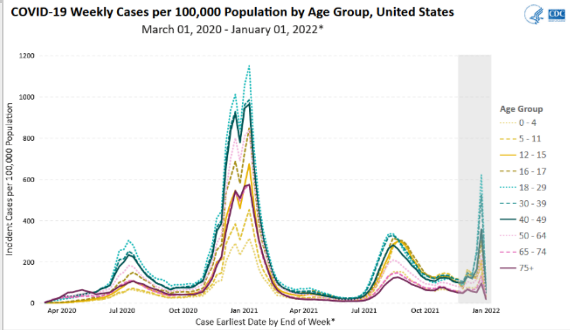
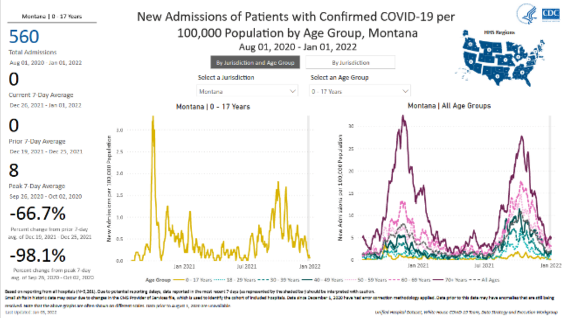
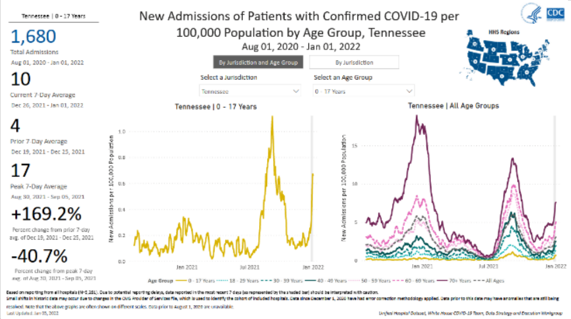
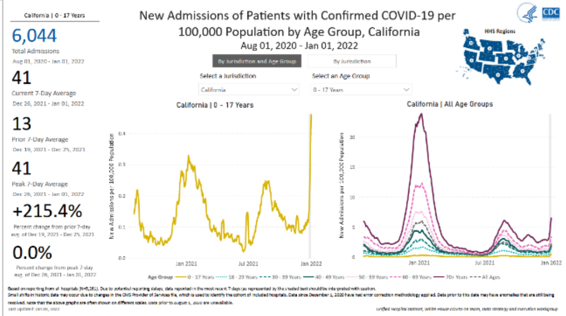
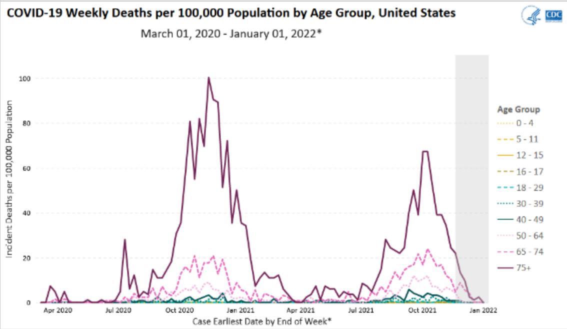
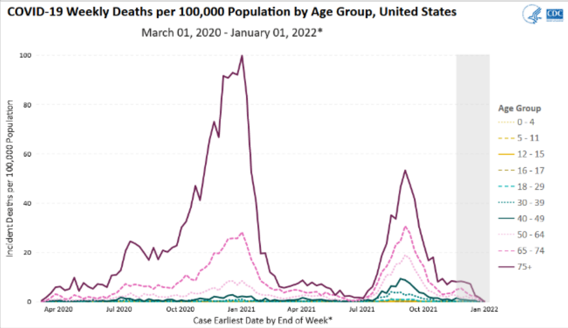
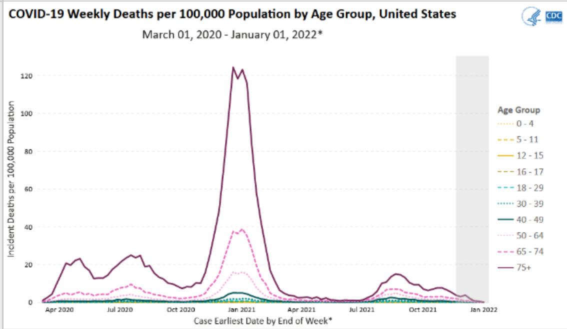
[75] https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html
[76] https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-guidance.html
[77] https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-total
[78] https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends
[79] https://covid.cdc.gov/covid-data-tracker/#demographicsovertime
[80] https://covid.cdc.gov/covid-data-tracker/#mis-national-surveillance
[81] https://covid.cdc.gov/covid-data-tracker/#demographicsovertime
[82] https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/index.htm
[83] https://covid.cdc.gov/covid-data-tracker/#variant-proportions
[84] https://www.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/children-and-covid-19-state-level-data-report/
[85] https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html

USA: Comparison of states

A comparison of select US states based on 7-day incidence per 100,000 population and PHSM.

INDICATOR	MONTANA (pop. 1.1 million)	TENNESSEE (pop. 6.8 million)	CALIFORNIA (pop. 39.5 million)
7-day incidence per 100,000 population[86]	153.8	546.7	375.1
PHSM	Mask wearing encouraged, physical distancing, TTIQ[87]	Mask wearing encouraged, physical distancing, TTIQ[88]	Indoor mask wearing mandatory in many indoor venues for all aged 2+, TTIQ[89]
Schools & mitigation	Schools reopened from Aug 2021 Standard PHSM as recommended by US CDC, school-based mask mandates with option for parents to opt-out, vaccination encouraged, vaccination of 12+y commenced mid-May and 5-11y in early Nov 2021.[90]	Schools reopened from Aug 2021 Standard PHSM as recommended by US CDC, mask wearing and vaccination encouraged, vaccination of 12+y commenced mid-May and 5-11y in early Nov 2021.[91]	Schools reopened from Sep 2021 Standard PHSM as recommended by US CDC, mask wearing mandatory for all aged 2+, PCR & RAT screening, vaccination of 12+y commenced mid-May and 5-11y in early Nov 2021, mandatory staff vaccination or weekly testing.[92]
Vaccination coverage[93]	**Age group (years)** / **1st dose (%)** / **Fully vacc.* (%)** 5-11 / 19.5 / 12.6 12-17 / 47.6 / 40.4 18-64 / 65.9 / 57.1 65+ / 99.9 / 91.2 *The US also uses the J&J/Janssen vaccine which is a single-dose vaccine. State-specific data on 3rd/booster dose coverage not available.	**Age group (years)** / **1st dose (%)** / **Fully vacc.* (%)** 5-11 / 12.6 / 8.2 12-17 / 41.6 / 34.7 18-64 / 65.1 / 56.5 65+ / 96.0 / 88.0	**Age group (years)** / **1st dose (%)** / **Fully vacc.* (%)** 5-11 / 28.0 / 17.2 12-17 / 78.4 / 64.1 18-64 / 92.0 / 74.6 65+ / 99.9 / 92.3

[86] https://covid.cdc.gov/covid-data-tracker/#cases_casesper100klast7days
[87] https://covid19.mt.gov/index
[88] https://covid19.tn.gov/prevention/
[89] https://covid19.ca.gov/masks-and-ppe/
[90] https://dphhs.mt.gov/publichealth/cdepi/diseases/CoronavirusMT/index
[91] https://www.tn.gov/health/cedep/ncov/educational-resources.html
[92] https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/K-12-Guidance-2021-22-School-Year.aspx
[93] https://www.mayoclinic.org/coronavirus-covid-19/vaccine-tracker

INDICATOR	MONTANA (pop. 1.1 million)	TENNESSEE (pop. 6.8 million)	CALIFORNIA (pop. 39.5 million)
Infections by age group[94]			
Hospitalisations in children[95]			
Deaths by age group[96]			

Note: Comparative graphs may have different scales on the y-axis.

94 https://covid.cdc.gov/covid-data-tracker/#demographicsovertime
95 https://covid.cdc.gov/covid-data-tracker/#new-hospital-admissions
96 https://covid.cdc.gov/covid-data-tracker/#demographicsovertime

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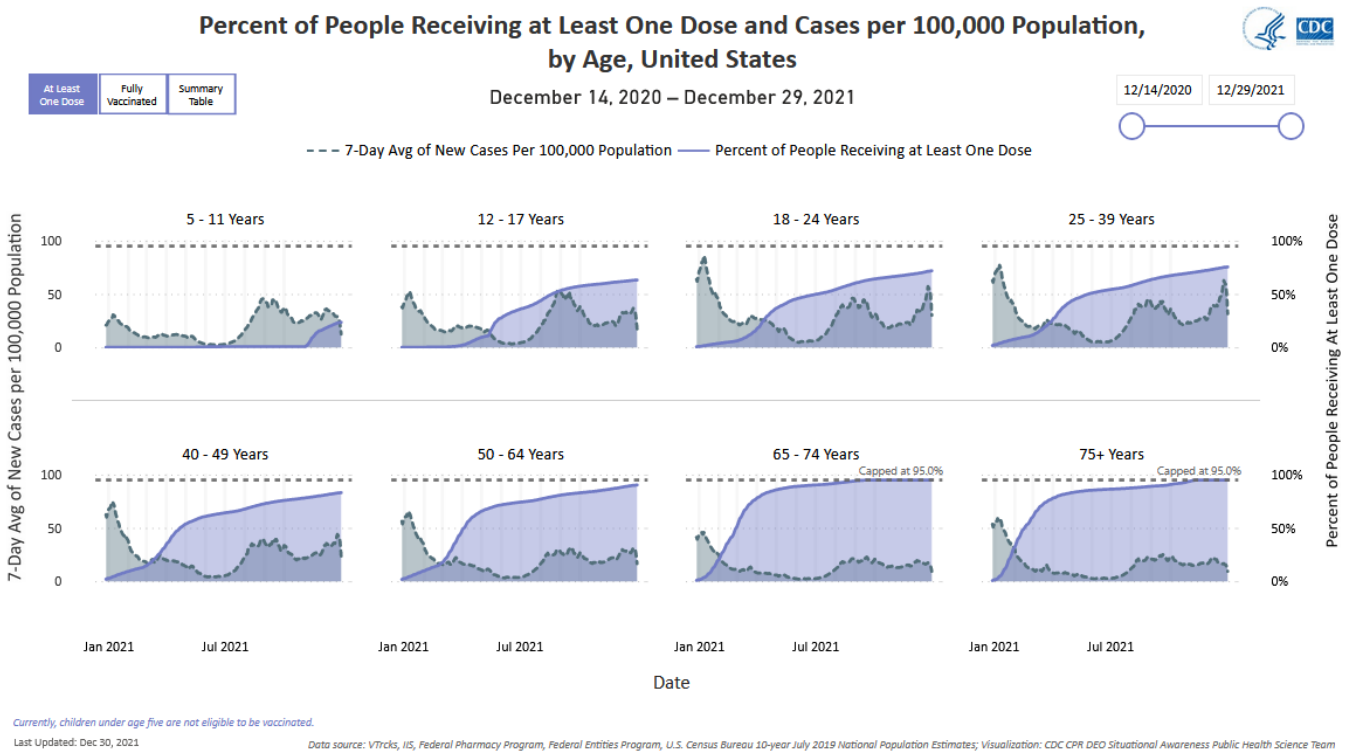
USA: Impact of vaccination on disease incidence

Seven-day incidence per 100,000 population in people who received at least one dose of vaccine, by age group.[97]



[97] https://covid.cdc.gov/covid-data-tracker/#vaccinations-cases-trends

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https://www.mcri.edu.au/research/themes/infection-and-immunity/asia-pacific-health