NORTHERN TERRITORY GOVERNMENT
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Editor's Note:

In the September 2022 edition of *The Northern Territory Disease Control Bulletin* a routine COVID-19 Situation Report from 30 September shows that these Reports have expanded. They now include a Figure that shows Northern Territory (NT) COVID-19 vaccination coverage for the total NT population over 5 year of age for the first and second doses of vaccine and by key target groups. Two further Figures show the booster rates for the total eligible population for the 3rd dose and 4th dose vaccines, respectively, and by key target groups.

An *NT CDC COVID-19 Epidemiology Report* covering 2 weeks in mid July 2022 showing further pandemic analysis is also included on pages 8-15.

During the 3rd quarter of 2022 high rates of diseases caused by Group A Streptococcus (GAS) continued to occur in the NT, leading to 2 Health Alerts specifically regarding acute post streptococcal glomerulonephritis (APSGN) to be issued in July and September and a 3rd Alert in September highlighted APSGN, invasive (iGAS) and acute rheumatic fever (ARF), see page 23. NT Health Alerts also were issued for monkeypox and rotavirus with links included.

A note is made in 'Comments on selected disease notifications - 2nd quarter 2022' that a case of congenital syphilis was notified. This was the 2nd case reported in the NT in 2022.

There are 12 NT related abstracts (or journal citations) from peer reviewed published articles in this edition including the *Japanese Encephalitis in Australia – A Sentinel Case* and many more, all very well worth a read to better understand the scope of disease, the progress towards, and the challenges faced in improving health in the NT.

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NORTHERN TERRITORY GOVERNMENT

Contents

CDC NT COVID-19

Situation report – no. 328

Coronavirus (COVID-19)

Report date: 30 September 2022

Reporting period: 23 - 29 September @1600

Table 1: Summary of COVID-19 cases in the last 3 weeks

	29 – 23 Sep	22 – 16 Sep	15 – 9 Sep	Total
Cases notified in this reporting period	339	372	392	97483^
Case classification				
Confirmed	53	66	93	21388
Probable	286	306	299	76047
Age group (years)				
≤4	10	11	20	5012
5-11	15	18	22	9270
12-19	10	24	17	9674
20-39	146	135	138	37996
40-59	84	109	141	25187
≥60	73	75	54	10292
Not recorded	1	0	0	4
Indigenous status				
Aboriginal and/or Torres Strait Islander	110	94	117	24797
Neither Aboriginal nor Torres Strait Islander	222	272	266	71546
Missing	7	6	9	1092
Deaths	2	0	1	73
Region**				
Barkly	11	16	16	2135
Big Rivers	9	14	21	5988
Central Australia	73	51	65	15115
East Arnhem	11	11	27	3966
Top End	209	236	232	64941
Interstate	23	40	26	5073
Overseas	0	0	0	77
Not recorded	3	4	5	140

**Resident location or place of infection, if unknown. ^Total cases may vary each day due to the addition of historic cases or deletion of duplicates.

COVID-19 case numbers

There were 339 cases notified from 23rd to 29th September 2022. This was a 9% decrease in cases from the previous week. There were 2 deaths notified this reporting week. The rolling 7-day average has stabilised at 48 cases per day (Figure 1).

Of the active cases, 65% are non-Indigenous (n=222/339), 33% are Indigenous (n=110/339) and 2% are missing Indigenous status (n=7/339). The urban LGAs continue to have the greatest proportion of active cases.

Table 2: Active cases (% of cases) by local government area

Local government area*	Count	Percent (%)
Alice Springs	56	16.5
Barkly	11	3.2
Belyuen	0	0
Central Desert	5	1.5
Coomalie	0	0
Darwin City	120	35.4
East Arnhem[1]	11	3.2
Katherine	9	2.7
Litchfield	23	6.8
MacDonnell[2]	12	3.5
Palmerston	58	17.1
Roper Gulf	0	0
Tiwi Island	1	0.3
Victoria Daly	0	0
Wagait	0	0
West Arnhem	4	1.2
West Daly	1	0.3
Interstate	23	6.8
Overseas	0	0
Unincorporated	2	0.6
Unknown	2	0.9
Total	**339**	**100**

*Residential location. [1]Includes the Unincorporated Areas of Nhulunbuy and Alyangula. [2]Includes the Unincorporated Area of Yulara.

Figure 1: Epidemiological curve of COVID-19 cases by classification and notification date, diagnosed in the Northern Territory (NT) since 1 Dec 2021

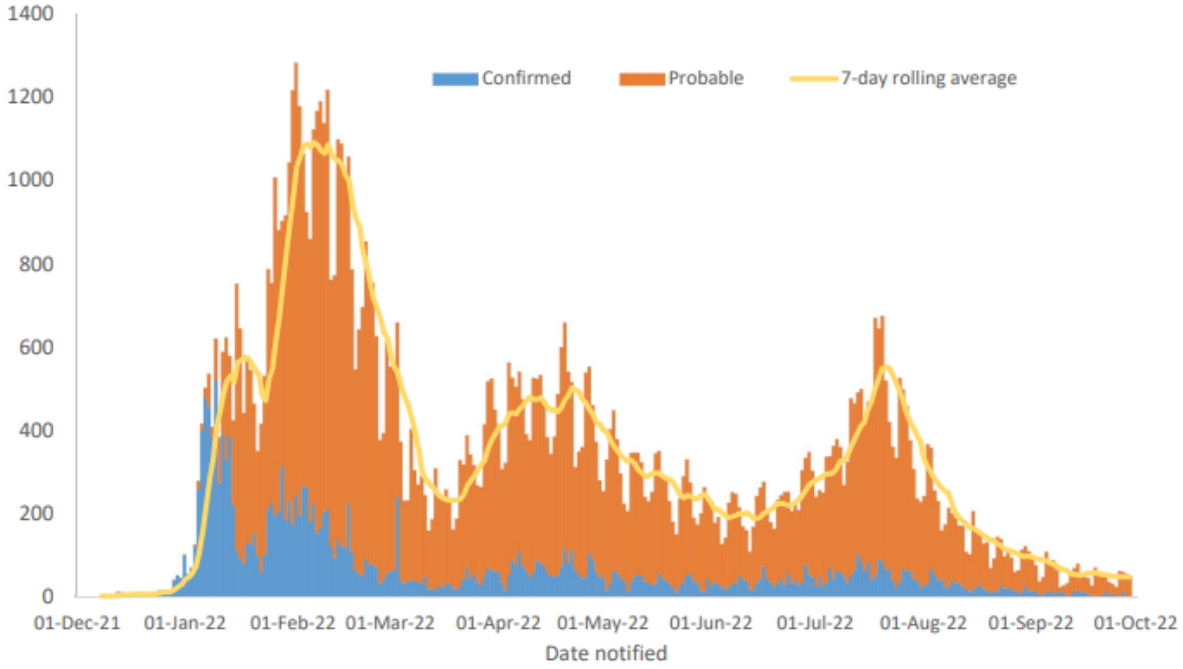


Table 3: COVID-19 deaths by Indigenous status, sex and age groups

	Non-Indigenous		Indigenous		
	Female	Male	Female	Male	Total
30-39	0	0	0	1	**1**
40-49	0	0	4	0	**4**
50-59	0	0	3	6	**9**
60-69	3	6	6	6	**21**
70-79	3	9	6	0	**18**
≥80	5	10	4	1	**20**
Total	**11**	**25**	**23**	**14**	**73**

Note: There have been no deaths reported in cases aged ≤29 years.

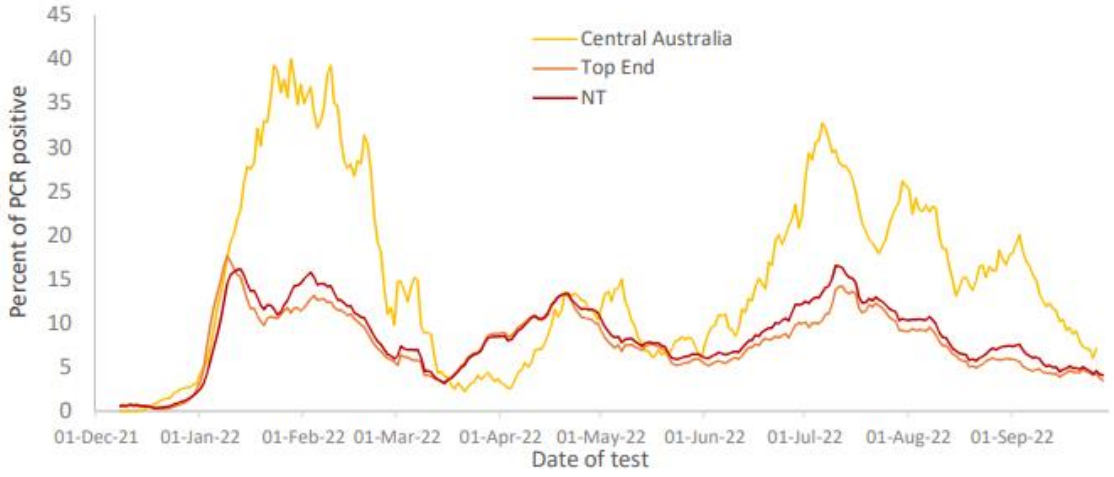
Testing

COVID-19 authorised PCR results are sourced from Territory Pathology and Western Diagnostic Pathology (WDP). Territory Pathology performs 85-90% of COVID-19 testing in the NT. PCR test numbers are available on the Authorised Test Results Dashboard - Power BI Report Server dashboard (NT Government employee access only).

Figure 2: Authorised PCR tests by authorisation date

Figure 3 shows the rolling 7-day average of percent positive PCR tests in the NT and by region from 1 December 2021 to 20 September 2022. For all PCR tests the rolling 7-day average is 4.1%, and by regions, Top End is 3.5% and Central Australia is 7.1%. The Central Australia numbers can fluctuate due to reduced PCR testing (average number of PCR tests in Central Australia in the last 7 days was 24 tests/day).

Figure 3: 7-day rolling average of PCR positivity rate, NT and by region



Hospitalisations

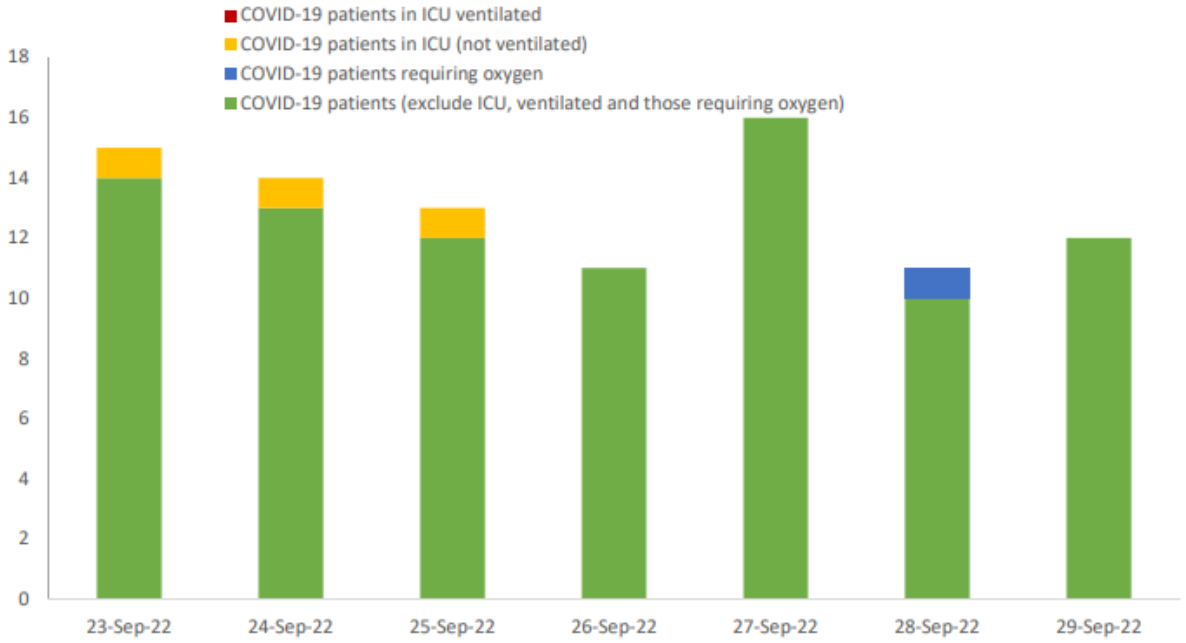
There were 12 patients in hospital with COVID-19.

Table 4: COVID-19 hospitalisations (including ICU admissions and patients requiring oxygen)

Hospital	General ward	ICU	Requiring O_2	TOTAL
Alice Springs Hospital	4	0	0	4
Gove District Hospital	0	0	0	0
Katherine District Hospital	0	0	0	0
Royal Darwin Hospital*	8	0	0	8
Tennant Creek Hospital	0	0	0	0
Total	**12**	**0**	**0**	**12**

* Includes Palmerston Regional Hospital

Figure 4: COVID-19 hospital patient numbers in the last 7 days



Vaccination

Figure 5: COVID-19 Vaccination coverage first and second doses, NT and by key target groups, 23 Sept

5+ years old	1st dose	2nd dose
Total Population (n=228,381)	93% 211,594	88% 200,422
Total Aboriginal Population (n=69,738)	87% 60,790	78% 54,720
Total Non Aboriginal Population* (n=158,643)	95% 150,804	92% 145,702

Figure 6: COVID-19 Vaccination booster rates (third dose) for eligible population, NT and by key target groups, 23 Sept

Eligible Booster Population	Booster dose
Total Population 16+	78% 140,792
Aboriginal Population 50+	80% 9,943
Non Aboriginal Population 65+	90% 16,236

Figure 7: COVID-19 Vaccination booster rates (fourth dose) for eligible population, NT and by key target groups, 23 Sept

Eligible Fourth Dose Population (estimated population eligible)	Fourth Dose
Aboriginal Population 50+ (9,575)	38% 3,624 (↑ 61)
Non Aboriginal Population 65+ (15,921)	62% 9,950 (↑ 85)
Total Population 30-49 yrs (56,179)	9% 4,980 (↑ 170)
Total Population 50+ (51,726)	39% 20,156 (↑ 259)

1. *Number of doses administered in the NT data as at 11:59pm 21 Sep 2022, data from AIR for doses administered by NT providers, population as per ABS ERP June 2020.*
2. *Vaccinations as per AIR report based on AIR NT residential address, Aboriginality and age - as at 11:59pm 21 Sep 2022. Total Population data as per Australian Bureau of Statistics (ABS) ERP June 2020 Data. Aboriginal Population as per AIR population for 16+ and ABS ERP June 2020 population for 5-15 year olds.*
3. *Third doses administered to people with a NT AIR address who are eligible to receive their booster dose. Individuals are considered eligible for a booster three months after the date they were fully vaccinated and aged 16+. Includes both boosters and 3rd primary doses administered to persons aged 16 years and over. Aboriginality is based on status recorded within AIR, persons with missing indicator are included in Non-Aboriginal population.*
4. *Fourth doses administered to people with a NT AIR address as at 11:59pm 21 Sep 2022. Eligibility is based on numbers of persons who have received a booster three months or more ago. Recent COVID-19 infection is not factored into the eligibility numbers. Includes both fourth doses and boosters doses administered to severely immunocompromised persons. Aboriginality is based on status recorded within AIR, persons with missing indicator are included in Non-Aboriginal population. NOTE fourth dose coverage is via AIR-QLIK app as of 11 Aug 2022 this has resulted in a slight change in eligibility. NOTE (↑ in last week) indicates the number of fourth doses administered to the population in the last 7 days and eligible population will change week to week.*

NT CDC COVID-19 Epidemiology report #11

Reporting period: 9 July - 22 July 2022

Summary of reporting periods

Table 1: COVID-19 cases for the last three fortnightly reporting periods and cumulative total (21 February 2020 to 22 July 2022)

Fortnight period	9/7-22/7	25/6-8/7	11/6-24/6	Cumulative total
Cases notified in the reporting period	6,781	4,251	3,006	88,051
Case classification				
Confirmed	983	719	580	19,703
Probable	5,798	3,532	2,426	68,348
Indigenous status				
Aboriginal and/or Torres Strait Islander	811	481	384	22,891
Neither Aboriginal nor Torres Strait Islander	5,790	3,696	2,571	63,054
Missing	180	74	51	2,106
Deaths				
Deaths	0	1	1	54
Cumulative crude case fatality rate				0.07%
Health region				
Greater Darwin	4,513	2,352	1,555	54,177
Top End	141	54	56	4,547
East Arnhem	135	69	58	3,601
Big Rivers	369	232	187	5,533
Barkly	109	64	41	2,011
Central Australia	750	916	758	13,927
Interstate	748	538	338	4,098
Overseas/missing	16	26	12	157
Hospitalisations (since 2 February 2022)				
Mean daily number of inpatients	44	19	17	45
Mean daily number of ICU inpatients	1.1	0.6	0.9	1.4
Mean daily number requiring oxygen	4.4	2.7	1.6	6.6

Changes from the previous report:

- There was a 60% increase in case numbers compared to the previous fortnight (from 4,251 cases to 6,781 cases). In this fortnight, case numbers among aged care staff and residents (n=169) was the highest recorded since community transmission began in the NT, see Figure 15.
- There has been a two-fold increase in COVID-19 inpatients, with an average of 44 patients per day in this fortnight compared to 19 reported in the previous fortnight. No deaths have been reported this fortnight and ICU numbers have remained low.
- Omicron BA.5 was the most prominent sub-lineage sequenced in this reporting period (see Figure 12). In Central Australia, BA.5 became the predominant sub-lineage of samples sequenced in June 2022, however in the Top End BA.2 remained the prominent sub-lineage until the end of June 2022 (Figure 13).

For more information, visit coronavirus.nt.gov.au
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Summary of cases

A total of 88,051 cases of COVID-19 have been notified in the Northern Territory (NT) up to 22 July 2022. This includes 19,703 confirmed cases and 68,348 probable cases. Since the start of the pandemic, 33.2% (n=82,520) of the NT population have reported a COVID-19 infection. This total excludes overseas and interstate cases (n=4,230) who were diagnosed in the NT and people who have had greater than one infection recorded in the NT COVID-19 case dataset (n=1,301).

In this fortnightly reporting period (9 July to 22 July 2022) 6,781 new cases of COVID-19 were notified (Figure 1). Notifications increased by 60% from the previous fortnight (Table 1). In this period, the highest number of daily cases was notified on 19 July (n=660); case numbers ranged from 265 cases to 660 cases per day.

The national guidelines for COVID-19 define a COVID-19 reinfection as any case who has a confirmed or probable reinfection more than 4 weeks from recovery of previous illness. As COVID-19 isolation is typically 7 days, reinfection has been defined as a positive test 35 day or more after first test with our case data. Cases whose initial infection was overseas or interstate are contacted for confirmation. In total 1.7% of cases (n=1,522) were identified as a reinfection. Among cases identified as reinfections, the median time between COVID-19 infections was 138 days (range 38-847 days). Of all reinfections, 62% were female (n=937) and 73% were non-Indigenous (n=1,105).

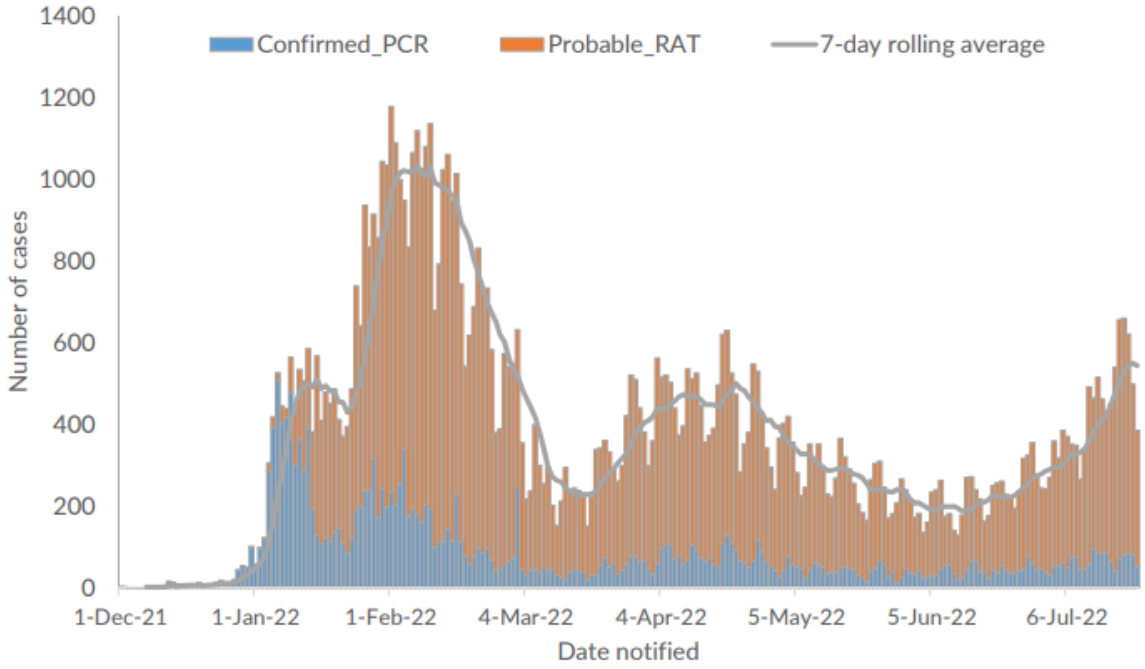

Figure 1: COVID-19 cases by notification date, 02 December 2021 to 22 July 2022

Note: Confirmed case definition: COVID-19 detected by polymerase chain reaction (PCR). Probable case definition: COVID-19 detected by rapid antigen test (RAT).

Mortality

There has been a total of 54 COVID-19 related deaths since the beginning of the pandemic, with no deaths notified during this reporting period (Table 2). Since the beginning of the pandemic, the majority of deaths have been Indigenous people (n=31/54, 57%) and in older age groups, with 91% (n=49/54) of deaths in people older than 50 years.

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Deaths have been reported are across all NT Health regions (Table 3). There is no statistically significant difference in death rates across the regions; the region with the greatest number of deaths was Greater Darwin (n=26), followed by Central Australia (n=11).

Table 2: Total deaths by Indigenous status, gender and age group

	Indigenous		Non-Indigenous		
Age (years)	Female	Male	Female	Male	**Total**
30-39	0	1	0	0	**1**
40-49	4	0	0	0	**4**
50-59	3	5	0	0	**8**
60-69	5	6	2	6	**19**
70-79	4	0	2	4	**10**
≥80	2	1	3	6	**12**
Total	**18**	**13**	**7**	**16**	**54**

Table 3: Total deaths by NT Health region

Region	Deaths	Percent (%)
Greater Darwin	26	48.2
Central Australia	11	20.4
Big Rivers	5	9.2
East Arnhem	5	9.2
Barkly	4	7.4
Top End	2	3.7
Interstate	1	1.9
Total	**54**	**100**

To examine case fatality rates, we included only cases reported before 9 July 2022, which was 2 weeks prior to the reporting period end date. Case fatality rates can be biased downward if recent cases are included because those recently diagnosed with COVID-19 have not had time to develop complications and become unwell.

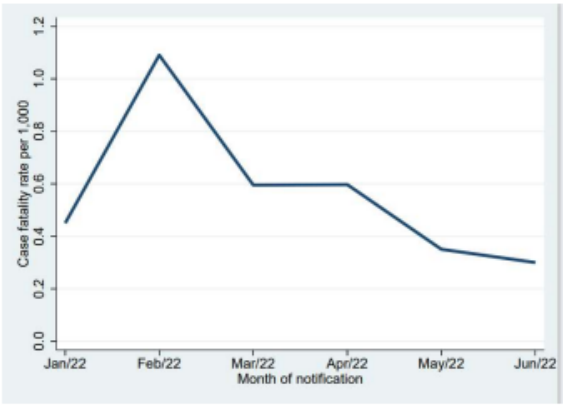
Of the 81,271 cases notified prior to 9 July, there were 54 deaths with a crude case fatality rate of 0.66 per 1,000 cases. The case fatality rate was 3.5 (95%CI 2.4–5.0, p≤0.0001) times greater in the Indigenous cases compared to non-Indigenous cases (Table 4): 1.37 per 1,000 Indigenous cases and 0.39 per 1,000 non-Indigenous cases.

Table 4: Case fatality rates by Indigenous status

	Non-Indigenous	Indigenous	All*
Deaths	23	31	**54**
Cases	58,654	22,617	**81,271**
Rate per 1,000 cases	0.39	1.37	**0.66**

* Those with unknown Indigenous status (2.3%) were distributed according to the proportions of known cases in the same stratum.

Monthly crude case fatality peaked in February 2022 for all cases (Figure 2) at 1.1 per 1,000 cases. By Indigenous status, monthly case fatality rates were highest at 2.0 deaths per 1,000 cases in February 2022 compared with non-Indigenous cases peaking at 0.6 deaths per 1,000 cases in April 2022 (Figure 2a). There were no deaths recorded among Indigenous people in the NT in May 2022 as shown in Figure 2a.



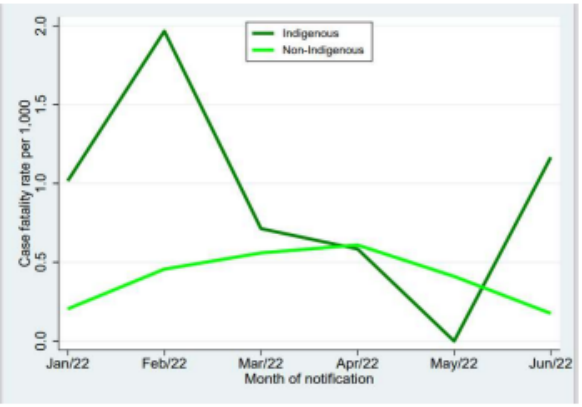


Figure 2: Monthly case fatality rates for all cases, NT. **Figure 2a. Monthly case fatality rates by Indigenous status.**
Those with unknown Indigenous status (2.4%) were distributed according to the proportions of known cases in the same stratum. Case fatality rates only calculated up to cases counts on 9 July, therefore July is not included in this current month.

Demographics

Of the 88,051 cases notified, 52% were female compared to 48% male. The age group with the greatest number of cases was 30-34 years for both males and females (Figure 3).

Figure 4 illustrates the age and gender specific rates. For females, the 25-29 years age group had the highest rate at 49,678 cases per 100,000 population. For males, the 25-29 years age group also had the highest rate at 40,180 cases per 100,000 population. The rates were generally lower among male age groups compared to females except for those aged 80-84 years and greater than 85 years. Notably, rates for males aged 80-84 years and greater than 85 years rose sharply in this reporting period compared to the previous reporting period.

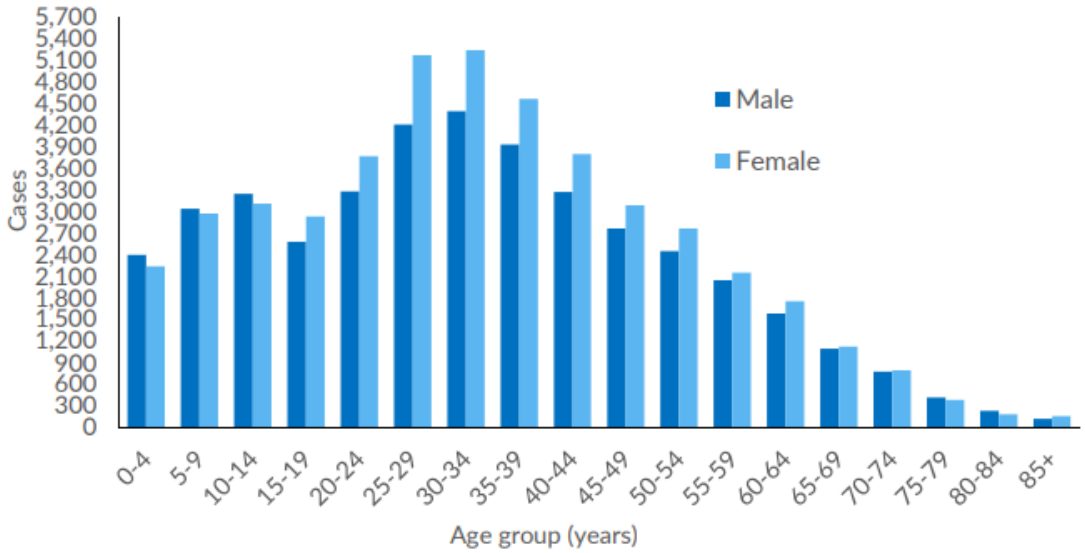


Figure 3: Number of cases by age group and gender

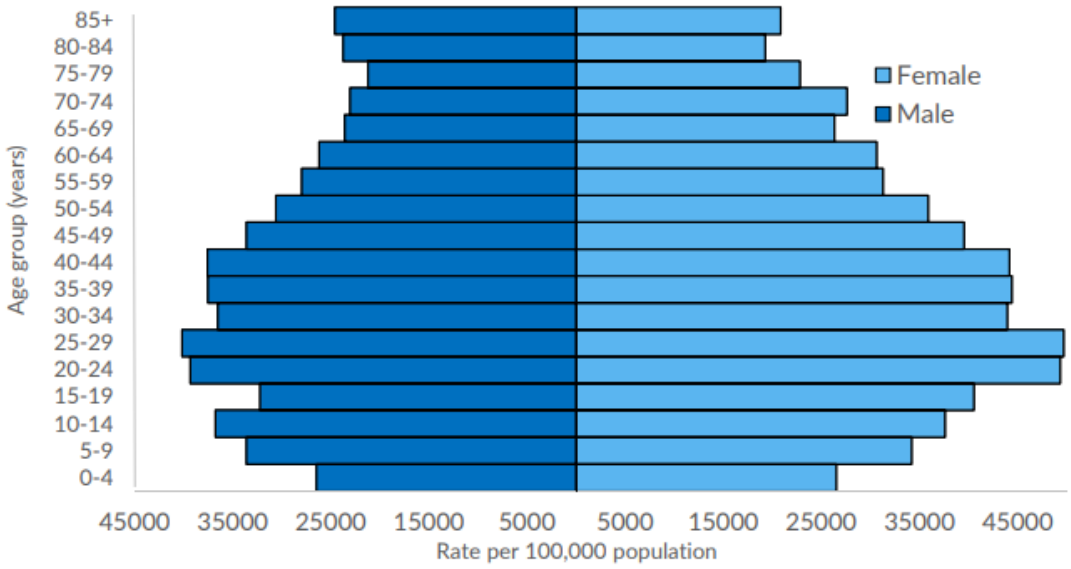


Figure 4: COVID-19 infection rate by age group and gender (cumulative)
Cases with unknown gender (n=1,126 1.3%) were distributed according to the proportions of known cases in the same stratum. Rates derived using 2021 NT population data.

In this reporting period, case numbers among school aged children increased marginally but remained low overall despite an increase in cases among the broader population. The highest number of school aged cases was on 20 July 2022 at 87 cases and ranged from 28 to 87 cases per day.

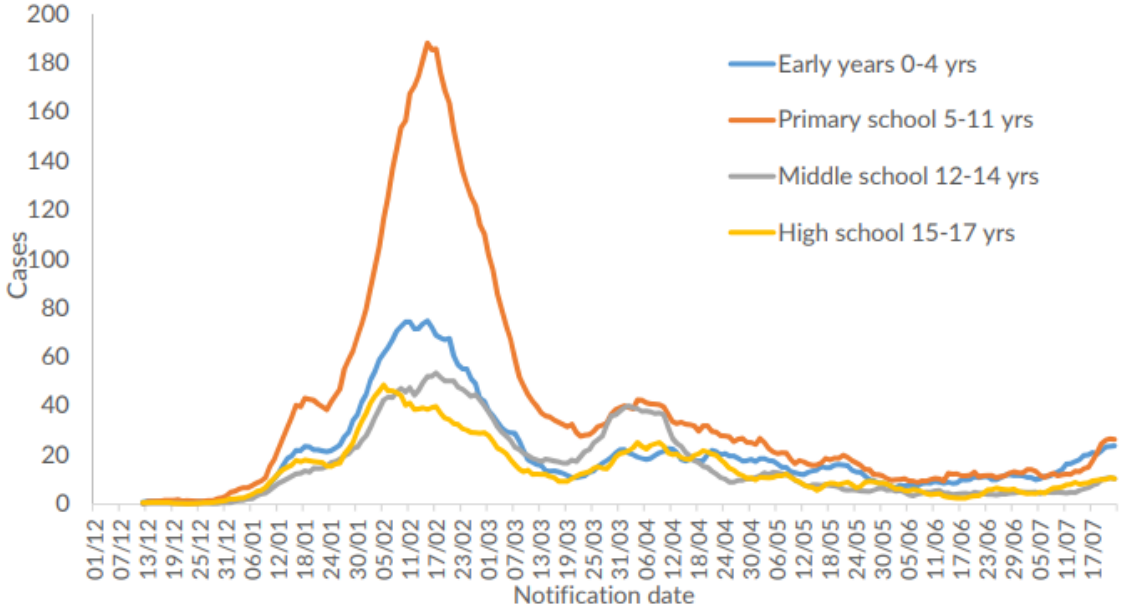


Figure 5: Rolling 7-day average of school aged cases by date of notification[a]
[a]School term commenced 31st January 2022. Age groups are different sizes, according to school year groupings.

Aboriginal and Torres Strait Islander people

There have been 22,891 (26.0%) cases in the Indigenous population and 63,054 (71.6%) in the non-Indigenous population, with 2,103 (2.4%) cases of unknown Indigenous status. The cumulative incidence rates for the non-Indigenous population (36.4%) is now higher than that of the Indigenous population (30.9%), see Figure 6. This may be due to better case ascertainment. Note: testing and registering of results may not be as complete in the Indigenous population (see Figure 10 for rates of testing by Indigenous status).

Rates of infection across the age groups in the Indigenous population were similar, whereas rates of infection in the non-Indigenous population were higher among children (10-14 years) and young adults (20-24 years & 25-29 years) compared with older age groups (Figure 7). The highest rates among Indigenous cases were in the age groups: 20-24 years and 25-29 years. The highest rates among non-Indigenous cases were also in the same age groups: 20-24 years and 25-29 years, with 47,165 and 46,925 cases per 100,000 population respectively. The median age among Indigenous cases was 28 years compared with 33 years for non-Indigenous cases.

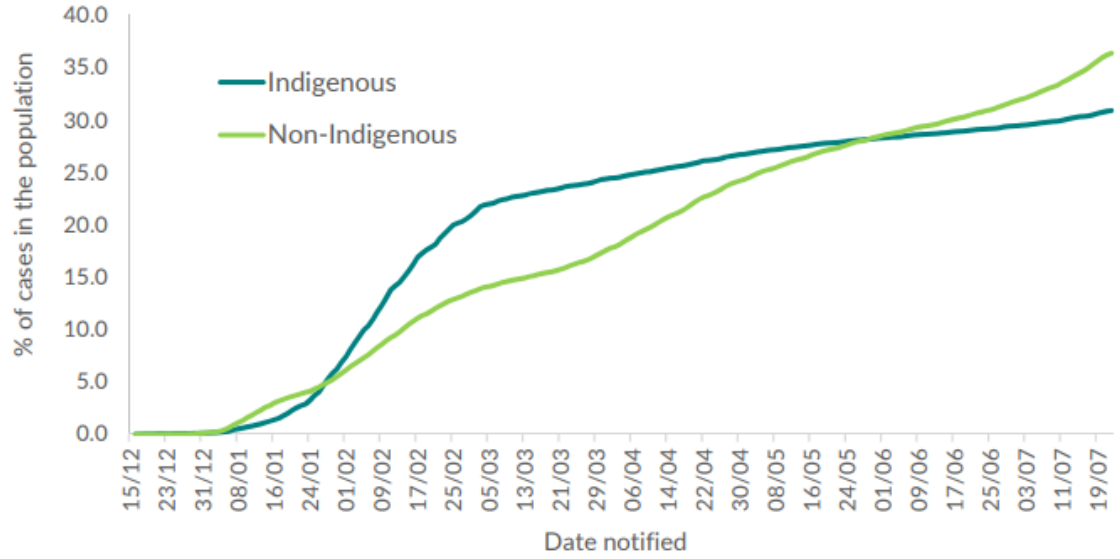


Figure 6: Cumulative proportion of the NT population that has been infected with COVID-19, by Indigenous status[a]

[a] Those with unknown Indigenous status (2.4%) were distributed according to the proportions of known cases in the same stratum. Rates derived using 2021 NT population data

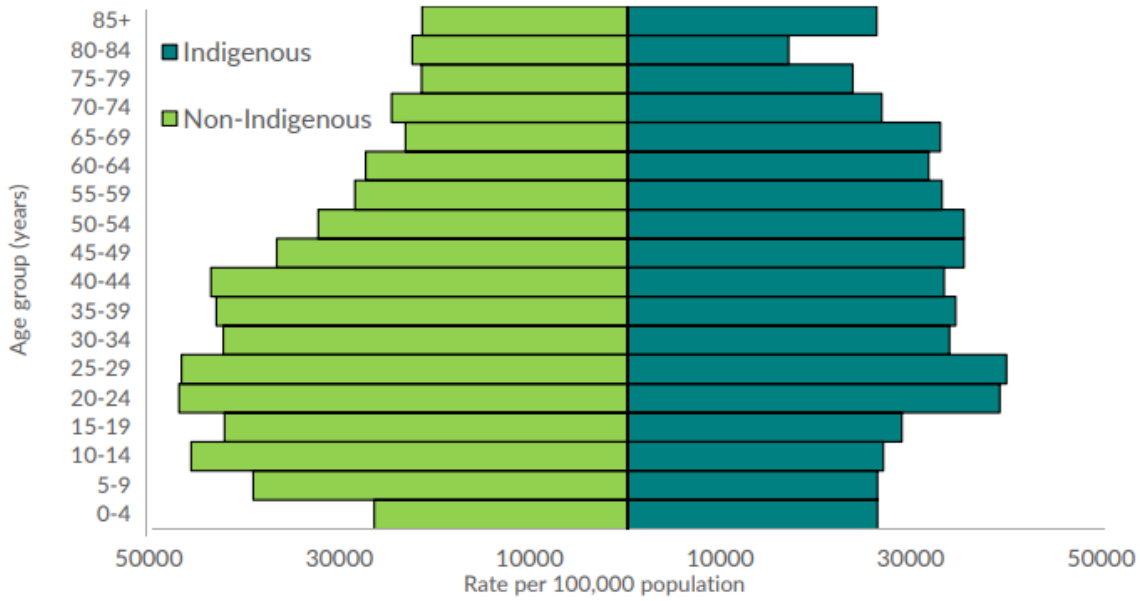


Figure 7: Attack rate by Indigenous status and age group[a]

[a] Those with unknown Indigenous status (2.4%) were distributed according to the proportions of known cases in the same stratum. Rates derived using 2021 NT population data

Regions and Local Government Areas

In this current reporting period, urban areas continue to have the greatest cumulative case rates. Both Greater Darwin and Central Australia (includes Alice Springs) with the largest urban centres have cumulative case greater than 36,000 per 100,000 (Table 5). There is likely to be reduced testing and reporting in more regional and remote areas of the NT. The Indigenous rates are higher than non-Indigenous rates in all regions, except East Arnhem and Central Australia (Table 5).

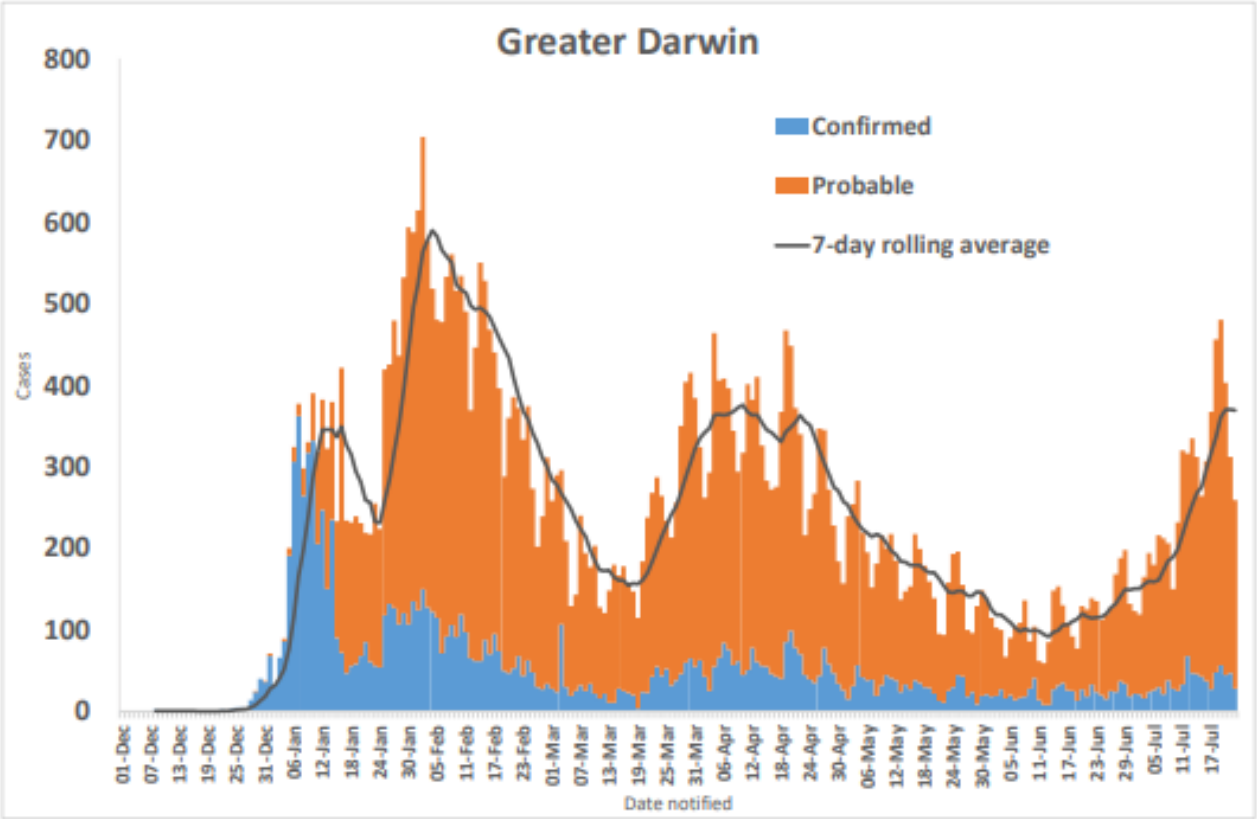
The epidemiological curves in Figure 8 illustrate the pattern of spread of COVID-19 in the regions. In this period, case numbers continued to increase in Top End and Central Australia, and slight increases in the Big Rivers and Barkly regions.

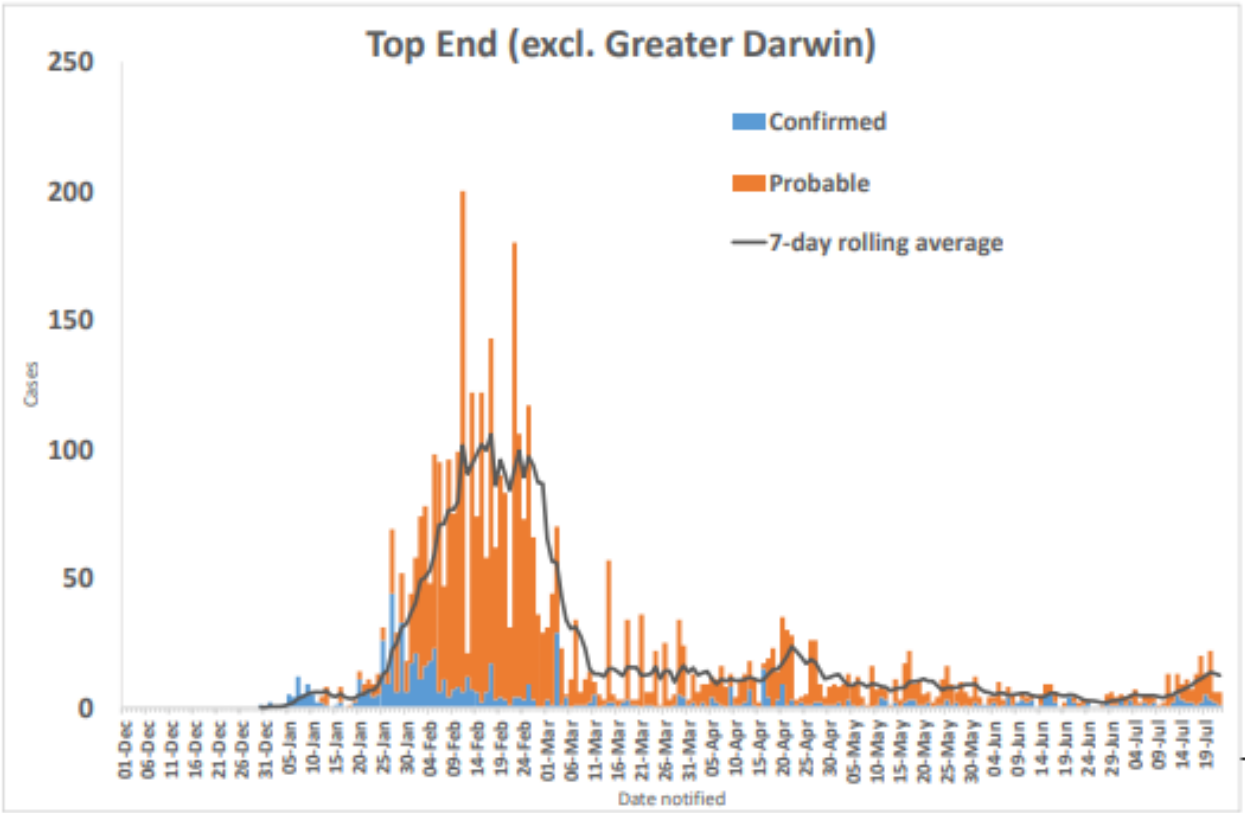
Table 5. Cumulative COVID-19 cases and rates per 100,000 population by region and Indigenous status

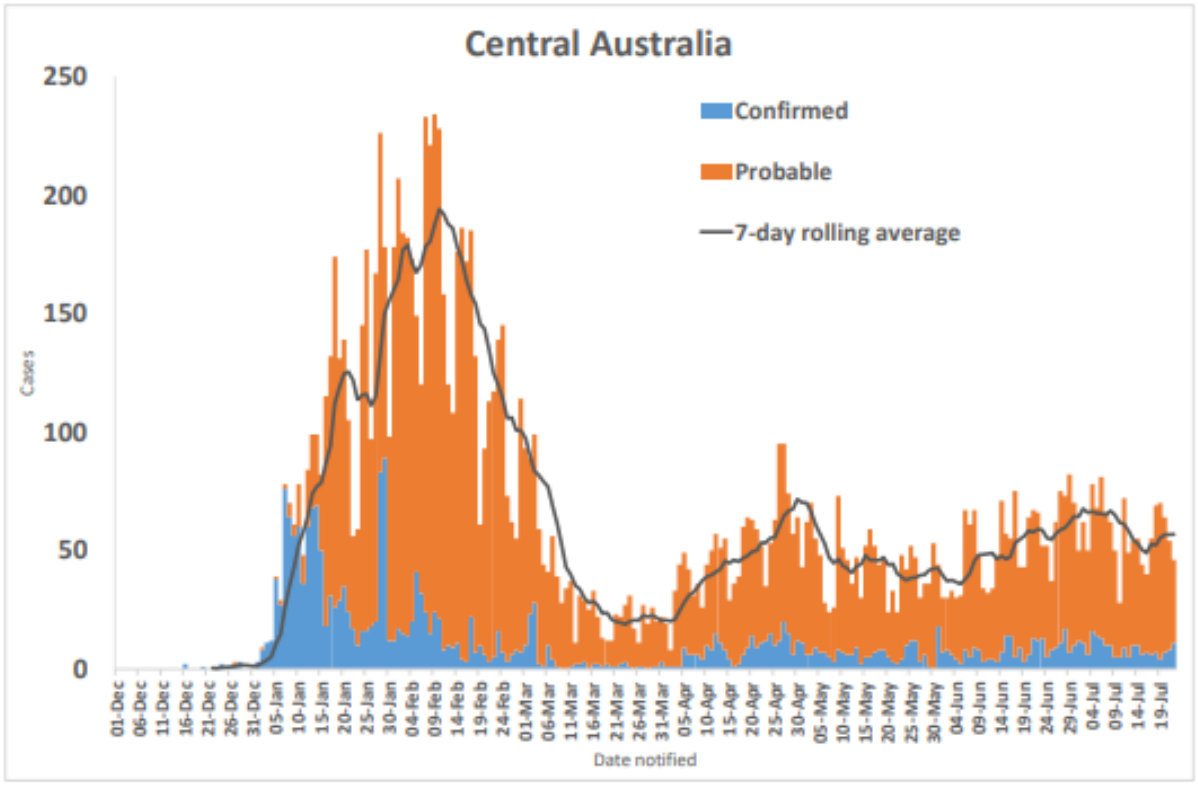
	Indigenous		Non-Indigenous		Unknown	Total	
Health region	Cases	Rate[ab]	Cases	Rate[ab]		Cases	Rate[ab]
Greater Darwin	7,301	43,247	45,593	35,792	1,283	54,177	36,651
Top End	3,608	28,658	857	18,188	82	4,547	25,940
East Arnhem	2,053	20,313	1,439	36,020	109	3,601	24,993
Big Rivers	2,968	25,291	2,492	27,229	73	5,533	26,295
Barkly	1,415	27,972	570	27,014	26	2,011	29,775
Central Australia	5,337	33,293	8,415	38,167	175	13,927	36,382
Interstate	203	n/a	3,595	n/a	300	4,098	n/a
Unknown/Overseas	6	n/a	93	n/a	58	157	n/a
Total	22,891	31,499	63,054	36,542	2,106	88,051	35,818

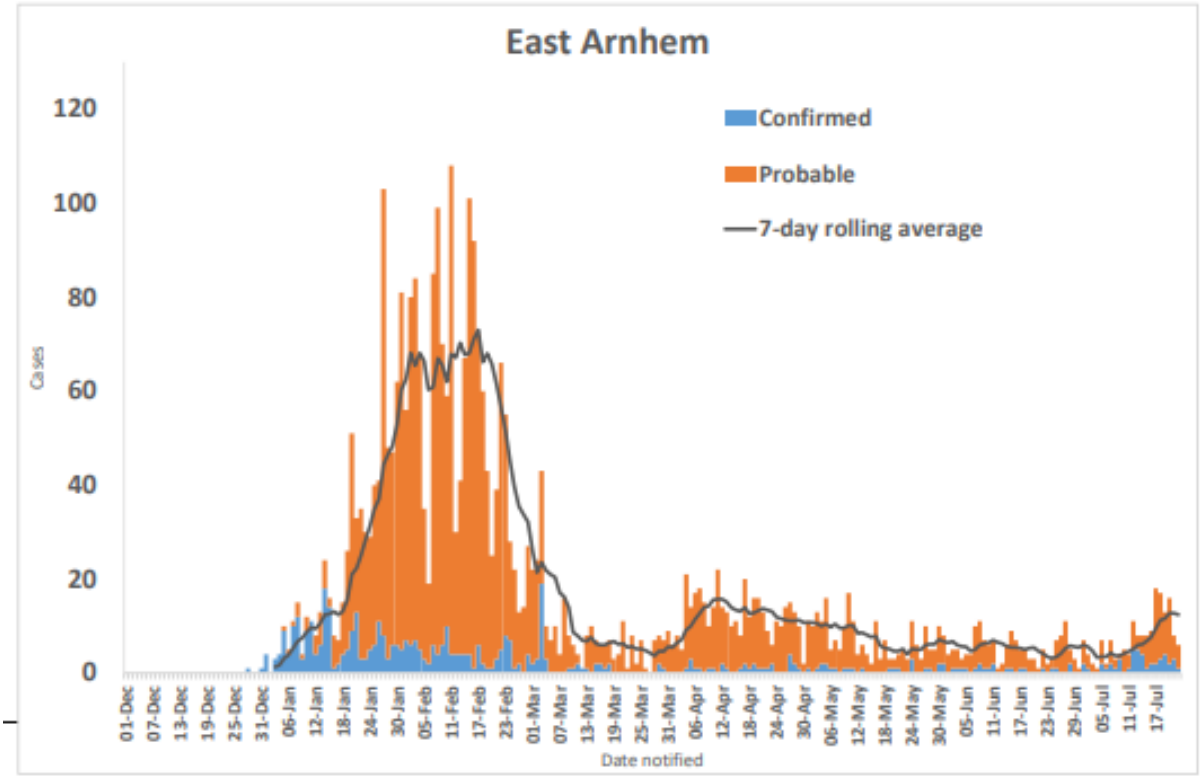
[a]Those with unknown Indigenous status (2.4%) were distributed according to the proportion of known cases in the same stratum.
[b]Rates derived using 2021 NT population data.

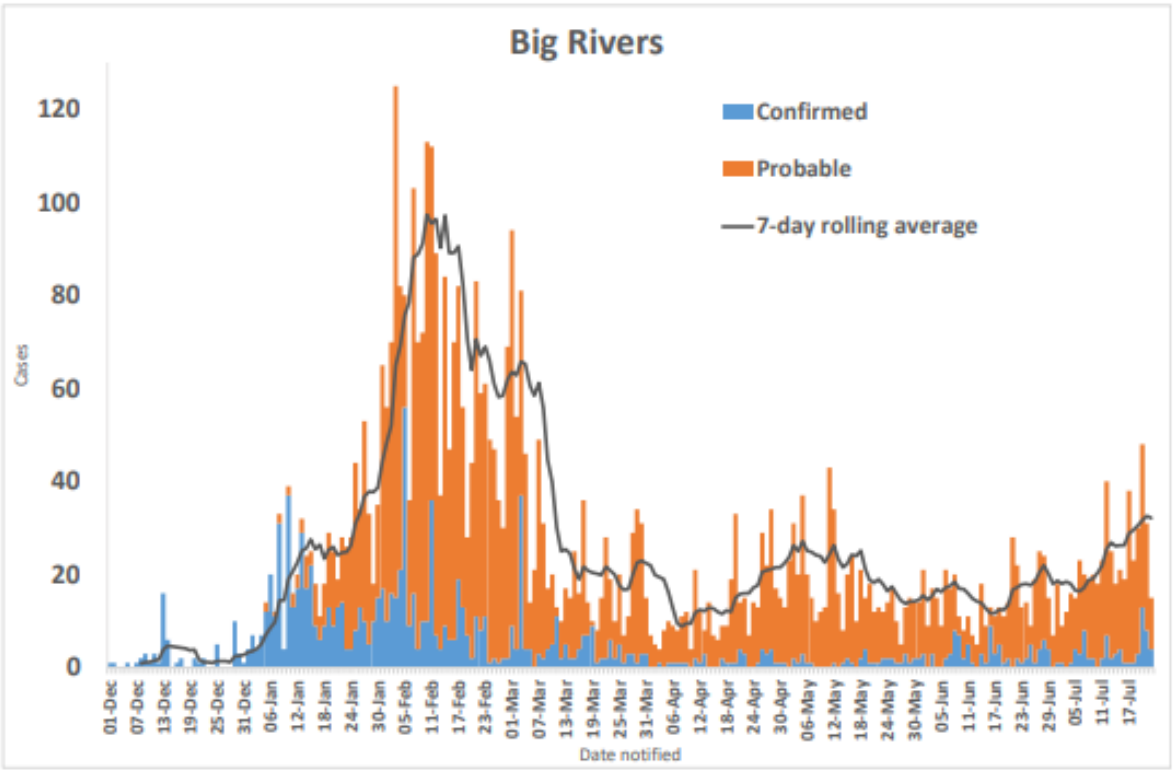
Figure 8: Epidemiological curves of cases notified, by region since 1 December 2021






Central Australia
Confirmed
Probable
7-day rolling average
Cases
Date notified


East Arnhem
Confirmed
Probable
7-day rolling average
Cases
Date notified


Big Rivers
Confirmed
Probable
7-day rolling average
Cases
Date notified

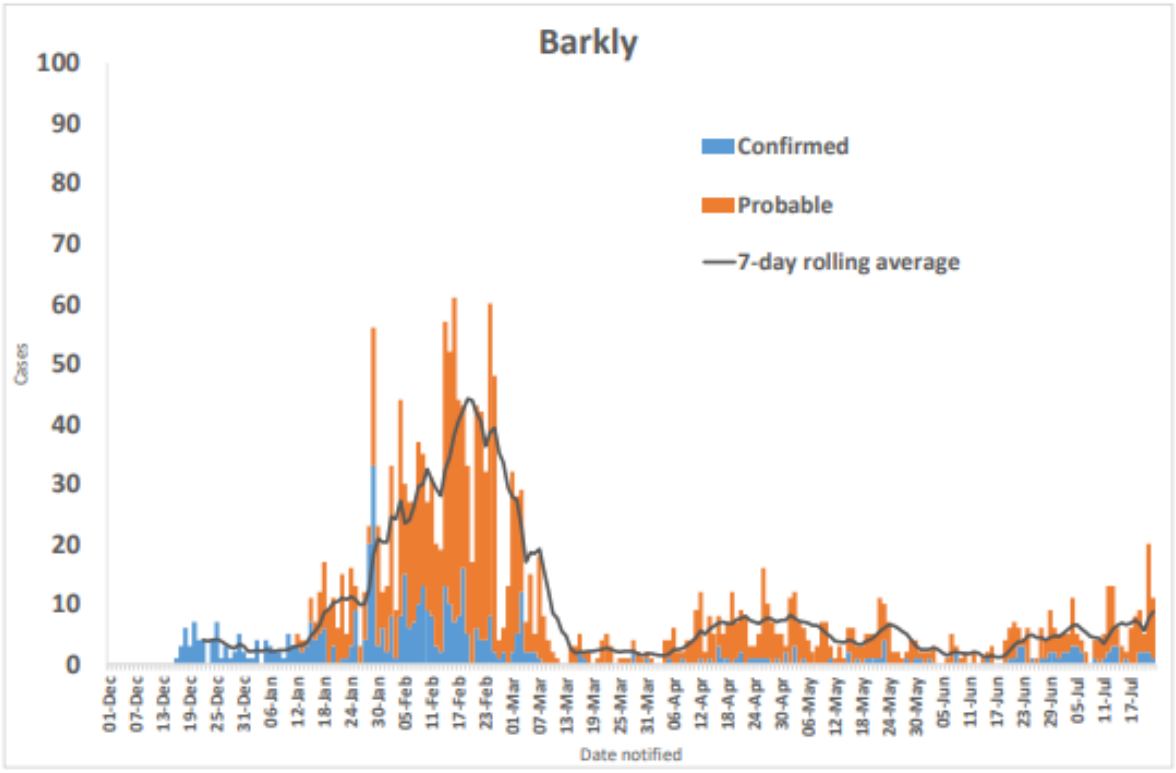

Barkly
Confirmed
Probable
7-day rolling average
Cases
Date notified

Figure 9 presents the cumulative rates of infection within local government areas (LGAs).

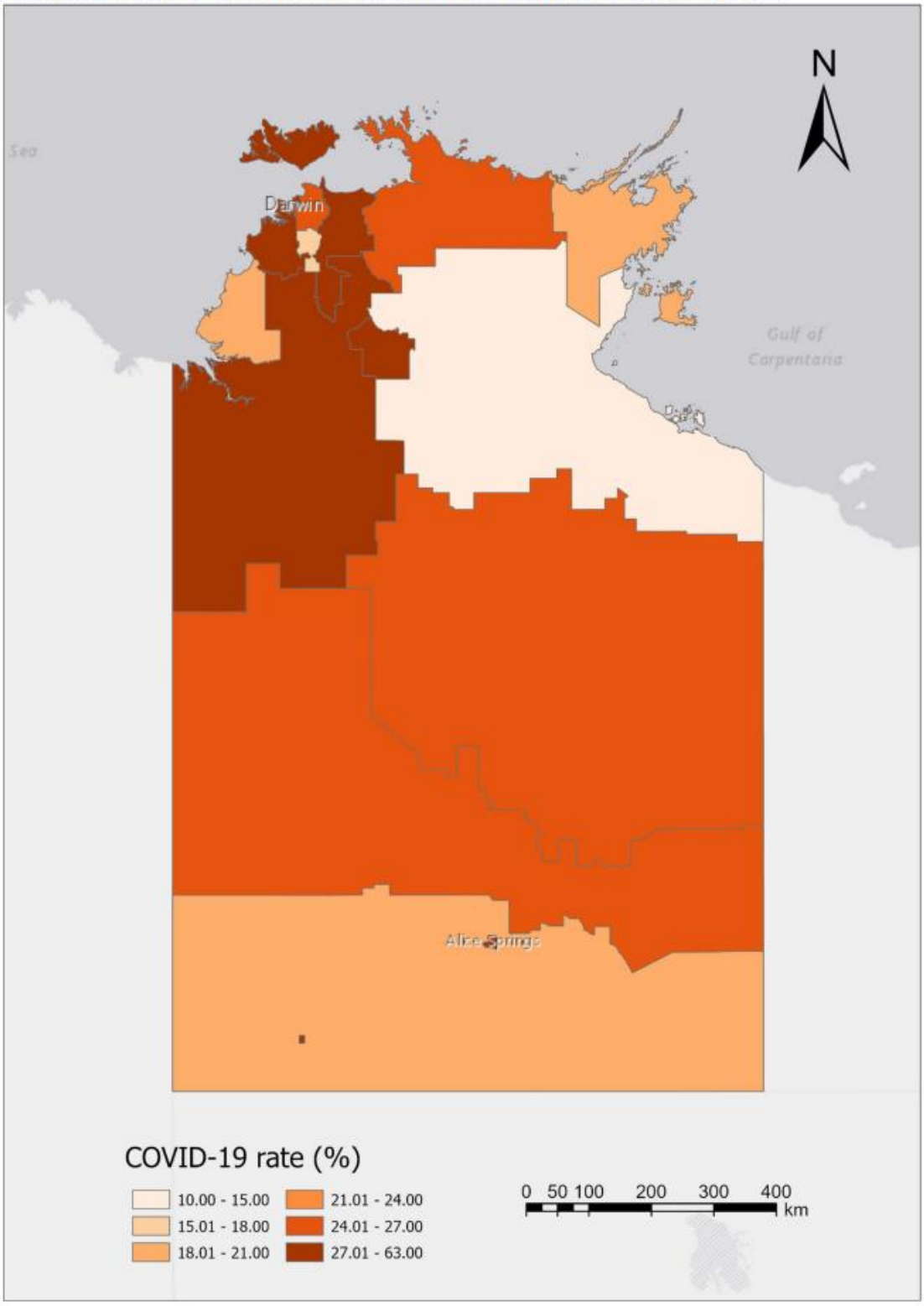


Figure 9: Cumulative rates of COVID-19 infection by Northern Territory Local Government Areas

For more information, visit coronavirus.nt.gov.au
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Testing and whole genome sequencing

At the end of this reporting period, the 7-day average PCR test positivity rate for the NT was 12.5%, which was a decrease from the end of the previous fortnight (14.2%). The mean PCR test positivity rate was 18.8% in Central Australia compared to 11.7% in Top End (Figure 10). PCR testing rates in regional areas were lower than last reporting period, an average of 45 tests per day were notified in Central Australia. The low testing rate can result in large fluctuations in the positivity rates.

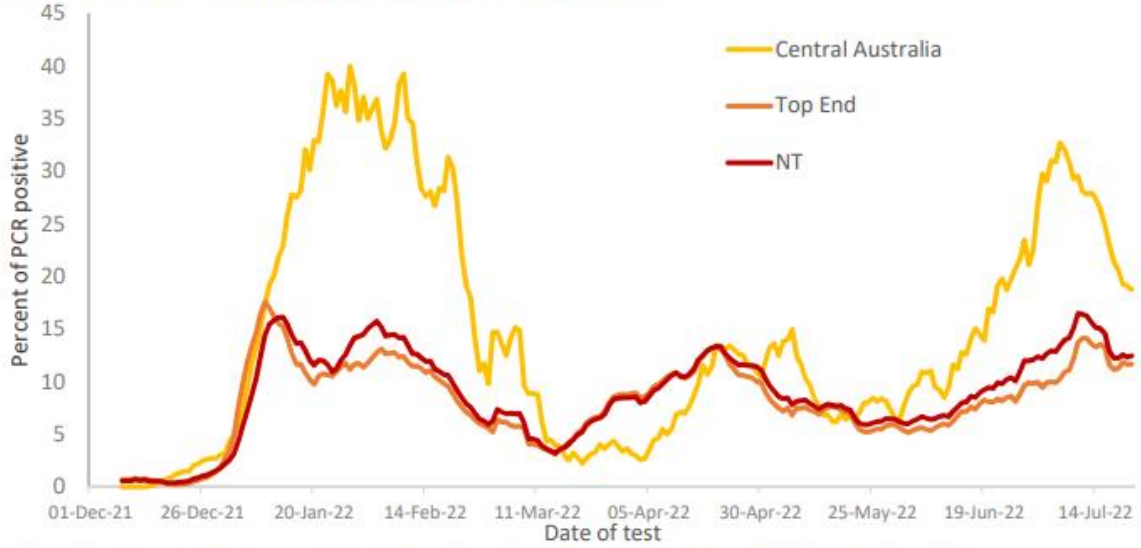

Figure 10: PCR test, rolling 7-day average positivity rate. 1 December 2021 – 22 July 2022

The rates of PCR testing have been lower in the Aboriginal and Torres Strait Islander population (see Figure 11) than non-Indigenous population, weekly rates have remained consistently below 2,000 tests per 100,000 since early March 2022. Among non-Indigenous population, the rate of PCR testing dropped to below 2,000 per 100,000 in June 2022, when public testing facilities in urban locations ceased operating. The recent spike in testing rates may be due to hospital staff testing requirements, or reflect an increase in acute respiratory infection (ARI) symptoms due to an increased number of COVID-19 cases, influenza or other ARIs.

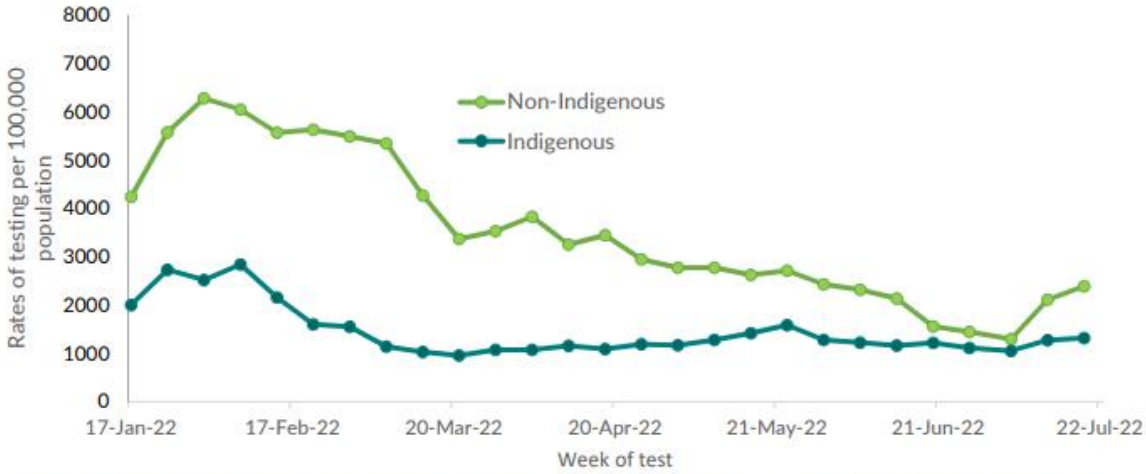

Figure 11: Weekly PCR testing rates per 100,000 population by Indigenous status, 17 February 2022 – 22 July 2022

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Territory Pathology undertakes whole genome sequencing (WGS) on a small number of PCR tests in order to identify circulating strains and detect new variants (to date 1,103 samples have been WGS, 981 since 1 December 2021). PCR samples prioritised for WGS are primarily cases who are: international travellers, hospitalised or from remote areas. In this reporting period, there were 2 recombinant sequences identified with a mix of Omicron BA.1 and BA.2, these have been recorded as BA.1 (Figure 12). Omicron BA.4 and BA.5 have continued to increase in the NT, however Omicron BA.5 has become the most prevalent sub-lineage in this reporting period, with 69% of samples identified as BA.5 (n=130/188) (Figure 12).

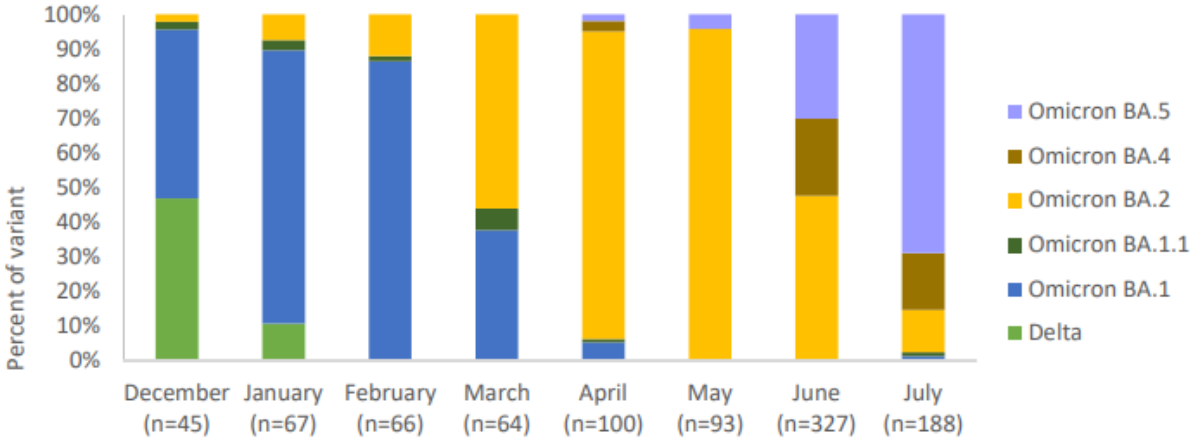

Figure 12: Proportion of COVID-19 variant (sub-lineage) identified from samples whole genome sequenced by month, 1 December 2021 to 22 July 2022

There are regional differences in the dominant strains of the samples sequenced since 1 Dec 2021. In Central Australia, the highest proportion of cases sequenced is BA.5, and no recording of Delta or BA1.1 in sample sequenced in this region. BA.5 has been the predominant strain in samples sequence cases in Central Australia since June 2022, whereas in Top End BA.5 became the predominant strain in samples sequenced in July 2022 (Figure 13).

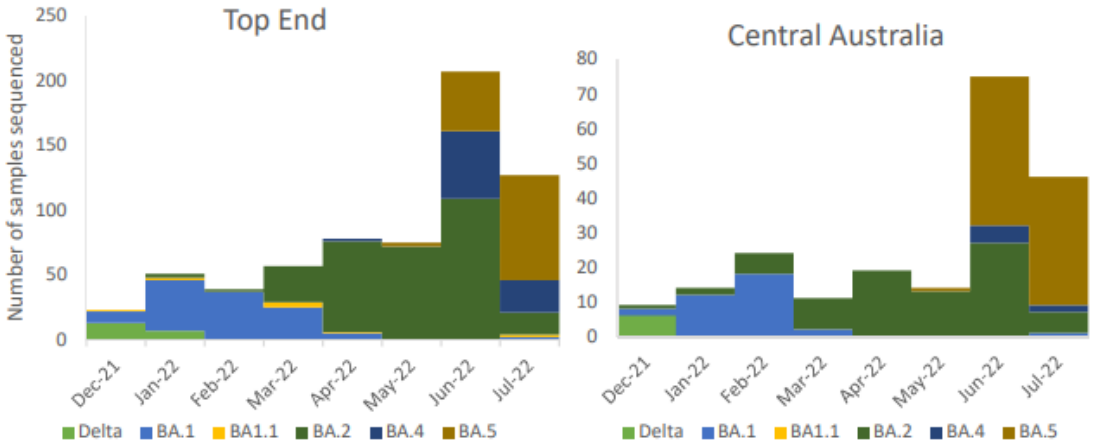

Figure 13: Sub-lineage of cases sequenced by regions since December 2021 to 22 July 2022

Hospitalisation

The number of hospitalised cases has increased since the last reporting period, in line with an increase of cases notified during this period (Figure 1). The majority of hospital admissions remain in urban hospitals in Darwin and Alice Springs (Figure 14). The mean daily number of COVID-19 inpatients increased to 44 (range 6-64), compared to an average of 19 in the last reporting period. In this period, an average of 4 patients per day were requiring oxygen (range 1-8) and there was 1 patient per day in ICU (range 0-3).

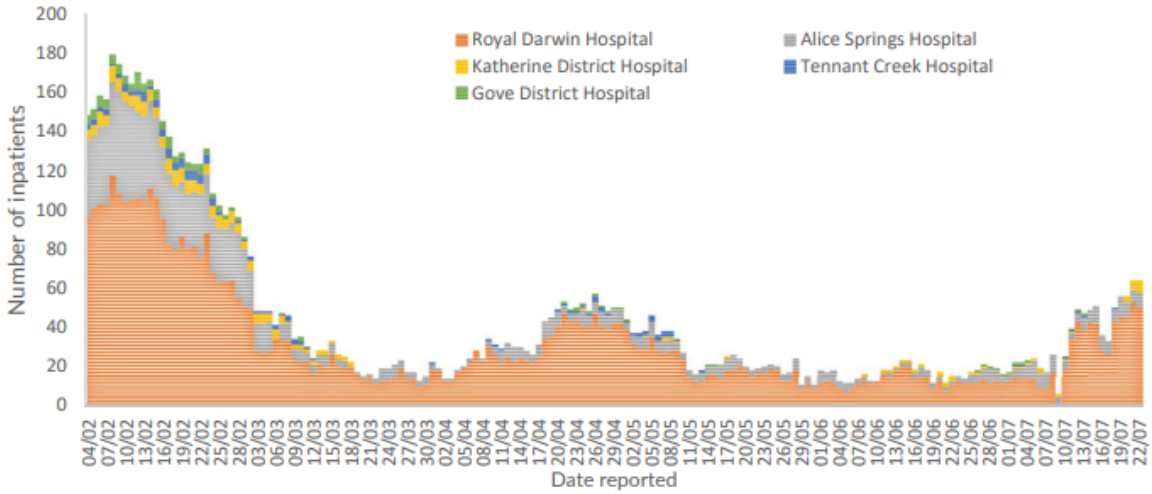

Figure 14: Daily number of inpatients in Northern Territory hospitals due to COVID-19 since 4 February 2022.
Data provided by all hospitals. Palmerston Hospital is included in total numbers of Royal Darwin Hospital. 9/7/2022 RDH case numbers were not provided.

Aged care

Cases in residential aged care settings are of particular concern and are identified as a high risk setting to support increased public health action. In this reporting period, case numbers have increased and are the highest observed over this outbreak. For this period, 167 cases were notified, including 69 aged care residents and 98 staff. Since the beginning of the pandemic, cumulatively 682 cases have been notified from residential aged care settings, including 270 residents and 412 staff (Figure 15). The notification of positive cases among residents usually follows notification from staff and/or other visitors. Of all COVID-19 related deaths, 7/54 (13%) have been aged care residents.

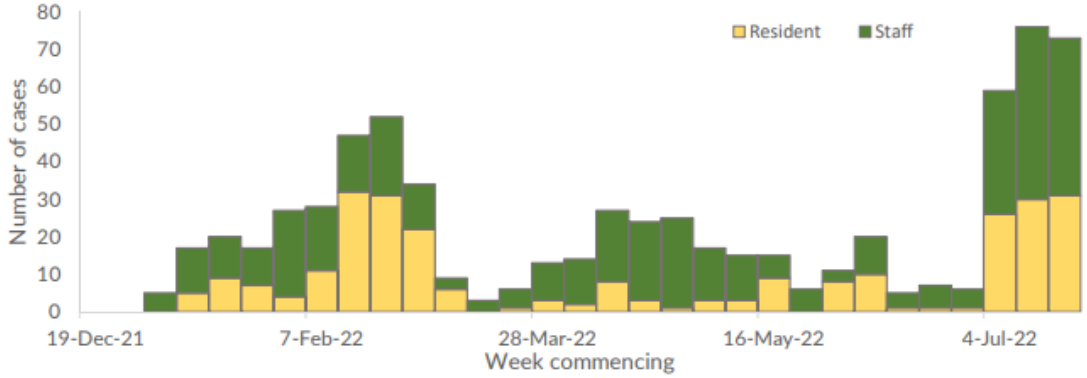

Figure 15: Weekly number of cases in residential aged care settings, by resident and staff since 19 December 2021

For more information, visit coronavirus.nt.gov.au

Vaccination rates

Vaccination against COVID-19 remains the key public health strategy for reducing severity of the disease. In major urban areas of Darwin, Palmerston and Alice Springs, vaccination rates are over 85% for those 5 years and older with two doses. For those 16 years and older in major urban areas, vaccination rates for booster or third dose are over 75%. Figure 16 displays the vaccination rates for 5 years and older with 2 doses across NT remote health centres as of 16 June 2022. In a number of remote areas, particularly in Central Australia and Barkly regions, vaccination rates are between 50% and 70% (Figure 16). Figure 17 displays the vaccination rates for 16 years and older with a booster or third dose across NT remote health centres as of 16 June 2022. For many remote areas in Central Australia and Barkly regions, vaccination rates for a third dose are between 30% and 60% (Figure 17).

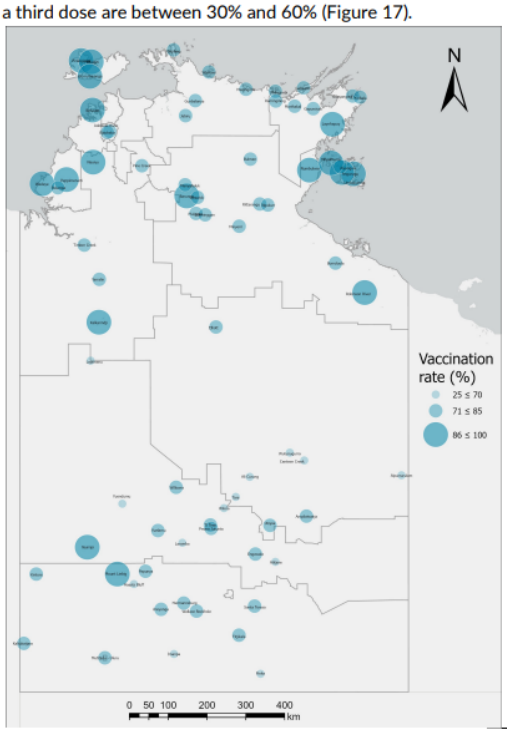

Figure 16: COVID-19 vaccination rates by NT remote communities for 5 years and older receiving two doses, 16 June 2022

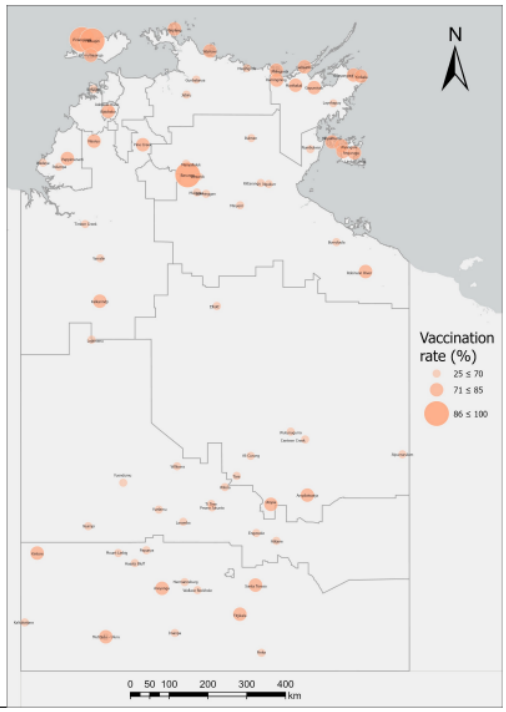

Figure 17: COVID-19 vaccination rates by NT remote communities for 16 years and older receiving three doses, 16 June 2022

(data obtained from NT Remote Health Centres and available here: https://coronavirus.nt.gov.au/__data/assets/pdf_file/0014/1111082/vaccine-coverage-remote-health.pdf)

Data source

The COVID-19 data for this report were extracted from the Centre for Disease Control's (CDC) outbreak database, REDCap. Prior to early January 2022 all cases were based on PCR results only. Positive rapid antigen tests (RAT) were reported as probable cases after this time. Most RAT data has relied on website registration of positive results through the NT coronavirus website. As such, there is likely to be an under reporting and there is the potential underestimation of case numbers.

To improve the accuracy of rate estimates, cases with unknown Indigenous status were distributed according to the proportion of known cases in the same stratum. Data in epidemiological curves has been reported based on notification date.

Data on hospitalisations was provided by each hospital. Vaccination data was obtained from NT Remote Health Centres and is available:
https://coronavirus.nt.gov.au/__data/assets/pdf_file/0014/1111082/vaccine-coverage-remote-health.pdf

This report was prepared by the Surveillance section and the COVID-19 Unit at the Centre for Disease Control.

Health alerts issued July to September 2022

The following public health alerts were issued by NT Centre for Disease Control (CDC) between July and September 2022. Below are excerpts from the health alerts, noting these alerts may no longer be active at the time of publishing this issue. Current and previous health alerts can be viewed at the NT Health website.

Ongoing cases of Acute Post-Streptococcal Glomerulonephritis (APSGN)

Year to date, there are nearly twice the expected number of cases of acute post-streptococcal glomerulonephritis (APSGN) based on the 5 year mean for the same period. Read the full alert issued 5 July 2022.

Brucellosis suis in pigs in NT– implications for human health

Brucella suis is a disease associated with pigs that can also affect humans, dogs and other animals. It is has recently been identified in local pigs. Read the full alert here or view on the next page.

Monkeypox (MPX) Update

The Northern Territory has had 1 confirmed case of MPX, diagnosed in a returned traveller from overseas. Case numbers continue to rise in Australia and overseas. Clinicians are asked to look out for signs and symptoms of MPX, especially in returned travellers, or contacts of returned travellers and those with a clinically compatible rash. Read the full alert issued 11 August 2022.

Outbreak of Acute Post-Streptococcal Glomerulonephritis (APSGN)

There have again been 4 newly identified cases of APSGN that have occurred in the NT in the past 2 weeks. Historical data suggest that when 4 or more cases of APSGN occur anywhere in the NT in a 2 week period APSGN disease is likely to be occurring Territory-wide. Read the full alert issued 1 September 2022.

Rotavirus

The Centre for Disease Control has detected an increase in the number of rotavirus notifications in the Northern Territory with 67 cases reported since 1 August 2022. Read the full alert issued 23 September 2022.

Increase in group A Streptococcal (GAS) diseases

In the past 4 weeks there has been an increase in Acute Post-Streptococcal Glomerulonephritis (APSGN), Invasive Group A Streptococcal (iGAS) and Acute Rheumatic Fever (ARF) notifications across the NT. Read the full alert issued 29 September 2022.

Brucellosis suis in pigs in NT– implications for human health

NORTHERN TERRITORY GOVERNMENT | NT HEALTH

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File reference
EDOC2022/332722

29/07/2022

Health Alert: *Brucellosis suis* in pigs in NT– implications for human health

Brucella suis has been detected for the first time in feral pigs in the Northern Territory. Enhanced testing has identified this first detection of *Brucella suis* in local pigs in the Daly Region and more recently in other areas of the Top End. *Brucella suis* is known to be widespread in pig populations in Queensland, and pig cases have been previously detected in Northern NSW. *Brucella suis* has also been found in dogs used in pig-hunting activities, or that have been fed raw feral pig meat in these states. While disease in humans from *Brucella suis* is found in many parts of the world, it is rare in most developed countries like Australia. In 2021, a single human case of brucellosis was identified in a patient who had not travelled outside of the NT.

> ***Brucella suis* is a disease associated with pigs that can also affect humans, dogs and other animals. It is has recently been identified in local pigs. Human transmission has been associated with the hunting, butchering or consumption of feral pigs.**

Brucellosis
Brucellosis is a zoonotic disease caused by the intracellular bacteria, *Brucella* species. There are several types of *Brucella* bacteria, but *Brucella suis* is the only species in Australia that can cause human disease. It is transmitted to humans from infected animals. *Brucella suis* usually infects pigs, but can also infect other animals such as dogs. See fact sheet for Swine brucellosis. Different *Brucella* species infect different animals, for example *Brucella melitensis* usually infects goats, sheep and camels but is not present in Australia. Travellers from overseas may present with brucellosis acquired from other species that are not present in Australia.

Transmission
In Australia, most infections are the result of direct contact with the tissues or body fluids of an animal infected with *Brucella suis* (such as feral pigs or dogs). The risk of disease increases if the person has open wounds that come into contact with the infected animal tissues or fluids. The disease can also occur following consumption of undercooked meat from an infected animal. In rare cases the disease may be spread through inhalation of the *Brucella* bacteria. Human to human transmission is extremely rare.

Symptoms
The incubation period is highly variable, but is commonly 1 to 2 months. Following the incubation period, human cases may experience:

- fever (relapsing, mild or protracted) and drenching sweats
- weight loss and anorexia
- malaise
- headache

- arthralgia, myalgia, back pain
- depression (common, and often severe)

Brucellosis typically begins with a flu-like illness. Symptom onset can be acute or insidious. Fever is the most common symptom, and is usually accompanied by a variety of other complaints. Joint involvement (particularly sacroilitis) and symptoms of arthritis are common, whereas orchitis, epididymitis, osteomyelitis, meningitis, endophthalmitis, and endocarditis are rare. Endocarditis is the leading cause of death, and the case-fatality rate of brucellosis endocarditis is approximately 2%. Disease relapse occurs in up to 10% of cases. Pregnant women and their babies are at risk of developing severe disease.

Brucellosis should be considered as a differential diagnosis in hunters, farmers and veterinarians presenting with a compatible febrile illness. The clinical manifestations are varied, but symptomatic patients will usually report fevers, sweats, headache, and joint pain following exposure.

Testing
Bacterial culture and isolation from blood, bone marrow, and other tissues can be used to identify *Brucella*, and PCR can be conducted to determine the species. If acute brucellosis is suspected, serology and blood cultures are recommended. Serological testing may be difficult to interpret (particularly in relapsed disease), and requires convalescent serum samples.

Treatment
Doxycycline is the mainstay of treatment. Adjunctive gentamicin or rifampicin reduces the rate of treatment failure and relapse. Oral therapy with doxycycline is required for six weeks, with adjunctive daily intravenous gentamicin for the initial seven days. Rifampicin can be used as an alternative agent if gentamicin is contraindicated.

Prevention
There are no human vaccinations available to prevent brucellosis. Farmers, hunters, and handlers of potentially infected animals should exercise care when handling carcasses, and placentae/foetuses. Hunters, farmers, and veterinarians handling feral pigs or pig-hunting dogs should protect themselves with Personal Protective Equipment (PPE) and adopt good personal hygiene measures. PPE should be worn to prevent bare skin contact with animal tissue and fluids. The slaughtering of unwell animals should be avoided.

Dogs should not be fed raw feral pig meat or bones, and should be taken to a veterinarian if there are concerns of illness.

All confirmed human cases need to be notified to the NT Centre for Disease Control (CDC).
Thank you for being alert to possible cases of brucellosis in your practice.

Yours sincerely,

Dr Vicki Krause
Director, Public Health Unit (Centre for Disease Control and Environmental Health)

Centre for Disease Control	Darwin	Katherine	Nhulunbuy	Tennant Creek	Alice Springs
Phone	08 89228044	08 89739049	08 89870357	08 89624259	08 89517540
Fax	08 89228310	08 89739049	08 89870355	08 89624420	08 89517900

Northern Territory disease notifications by onset date and district – 1 April to 30 June, 2nd quarter, (2021 and 2022)

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		N T	
	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021
Acute Post Strep GN	9	4	6	1	3	2	4	0	2	1	24	8
Adv Vacc Reaction	4	61	0	4	41	262	0	17	3	19	48	363
Barmah Forest	0	0	0	0	0	2	0	0	0	0	0	2
Campylobacteriosis	19	12	0	0	44	44	1	3	10	5	74	64
Chickenpox	2	4	3	0	8	13	0	0	1	0	14	17
Chikungunya	0	0	0	0	1	0	0	0	0	0	1	0
Chlamydia	189	176	17	12	327	321	46	40	54	47	633	596
Chlamydial conj	0	1	0	0	3	1	0	0	2	0	5	2
CJD	0	0	0	0	1	0	0	0	0	0	1	0
COVID-19	781	2	57	0	3895	109	69	0	118	1	4920	112
Crusted scabies	0	3	0	1	9	6	3	1	2	2	14	13
Cryptosporidiosis	3	0	0	0	3	71	2	1	0	2	8	74
Food/water borne dis	0	0	0	0	1	0	0	0	0	0	1	0
Gastro - related cases	0	1	0	0	0	0	0	0	0	0	0	1
Gonococcal conj	0	1	0	1	0	0	0	0	0	0	0	2
Gonococcal infection	221	176	29	14	143	116	21	26	52	40	466	372
Group A strep invasive	4	9	2	0	11	14	1	0	5	1	23	24
Hepatitis B - chronic	1	1	0	0	3	1	0	0	0	0	4	2
Hepatitis B - new	0	0	0	0	0	0	1	0	0	0	1	0
Hepatitis B - unspec	2	0	0	0	10	11	0	1	1	0	13	12
Hepatitis C - new	0	1	0	0	0	1	0	0	0	0	0	2
Hepatitis C - unspec	5	2	1	0	10	26	1	0	0	1	17	29
H Influenzae b	1	0	0	0	0	0	0	0	0	0	1	0
H Influenzae non-b	1	1	1	0	1	4	0	0	0	1	3	6
HIV	0	2	0	0	2	0	0	0	0	0	2	2
HTLV1 adult TCL	0	0	0	0	1	0	0	0	0	0	1	0
HTLV1 asyptom/unspec	12	15	0	0	2	2	0	0	0	0	14	17
HTLV1 TSP	0	1	0	0	0	0	0	0	0	0	0	1
Influenza	821	0	251	0	2698	8	506	0	414	0	4690	8
Japanese Encephalitis	0	0	0	0	1	1	0	0	0	0	1	1
Lead - elevated	0	1	0	0	2	71	1	11	1	0	4	83
Legionellosis	0	0	0	0	4	1	0	0	0	0	4	1
Leptospirosis	0	0	0	0	2	0	0	0	1	0	3	0
Listeriosis	0	0	0	0	0	1	0	0	0	0	0	1
Malaria	2	0	0	0	0	0	0	0	1	0	3	0
Melioidosis	0	0	0	0	12	4	4	1	3	1	19	6
Non TB Mycobacteria	0	0	0	0	0	2	0	1	0	0	0	3
Pneumococcal disease	12	6	2	1	5	4	1	0	5	0	25	11
Rheumatic Fever	18	28	12	1	8	11	4	4	9	6	51	50
Rheumatic heart disease	5	12	3	0	6	10	3	4	7	4	24	30
Ross River Virus	0	1	1	0	8	19	0	2	0	0	9	22
Rotavirus	3	2	1	0	3	6	0	0	0	1	7	9
RSV infection	15	11	4	1	72	0	1	0	2	0	94	12
Salmonellosis	16	13	3	0	79	91	3	7	12	15	113	126

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		N T	
	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021
Shigellosis	4	4	2	0	3	10	4	3	5	3	18	20
Syphilis < 2y duration	25	25	10	2	3	17	1	10	4	6	43	60
Syphilis > 2y or unk duration	8	10	5	1	4	11	0	0	2	1	19	23
Syphilis congenital	0	0	1	0	0	0	0	0	0	0	1	0
Trichomoniasis	213	191	55	23	233	247	76	75	87	90	664	626
Tuberculosis	2	0	1	0	5	3	0	0	1	1	9	4
Typhoid	0	0	0	0	1	0	0	0	0	0	1	0
Varicella - unspec	2	3	0	0	27	31	0	1	0	2	29	37
Yersiniosis	3	0	0	0	3	0	0	0	1	0	7	0
Zoster	17	16	1	3	68	63	4	2	3	9	93	93
Sum:	**2,420**	**796**	**468**	**65**	**7,766**	**1,617**	**757**	**210**	**808**	**259**	**12219**	**2947**

Malaria notifications for April to June, 2nd quarter 2022

Number of cases	Origin of infection	Agent	Chemoprophylaxis	NT Region
2	Uganda	*P. falciparum*	None	Alice Springs
1	Nigeria	*P. falciparum*	None	Katherine

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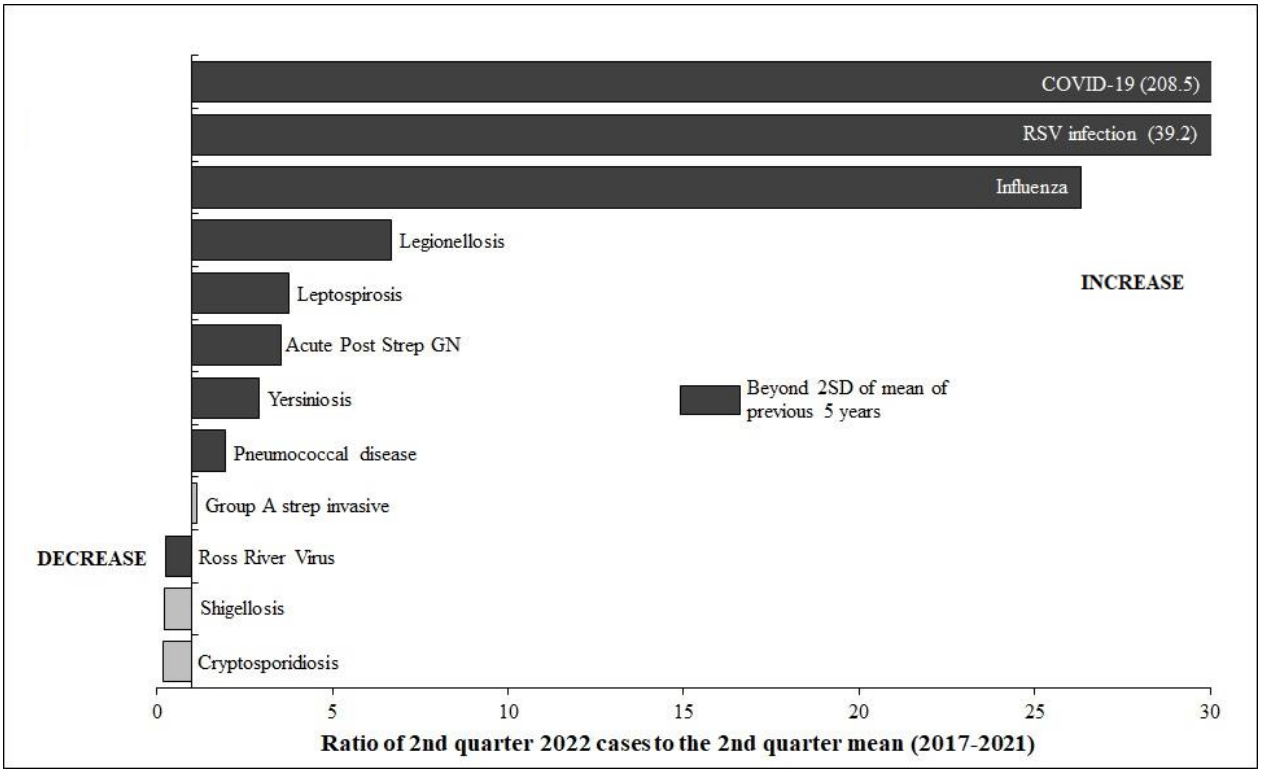
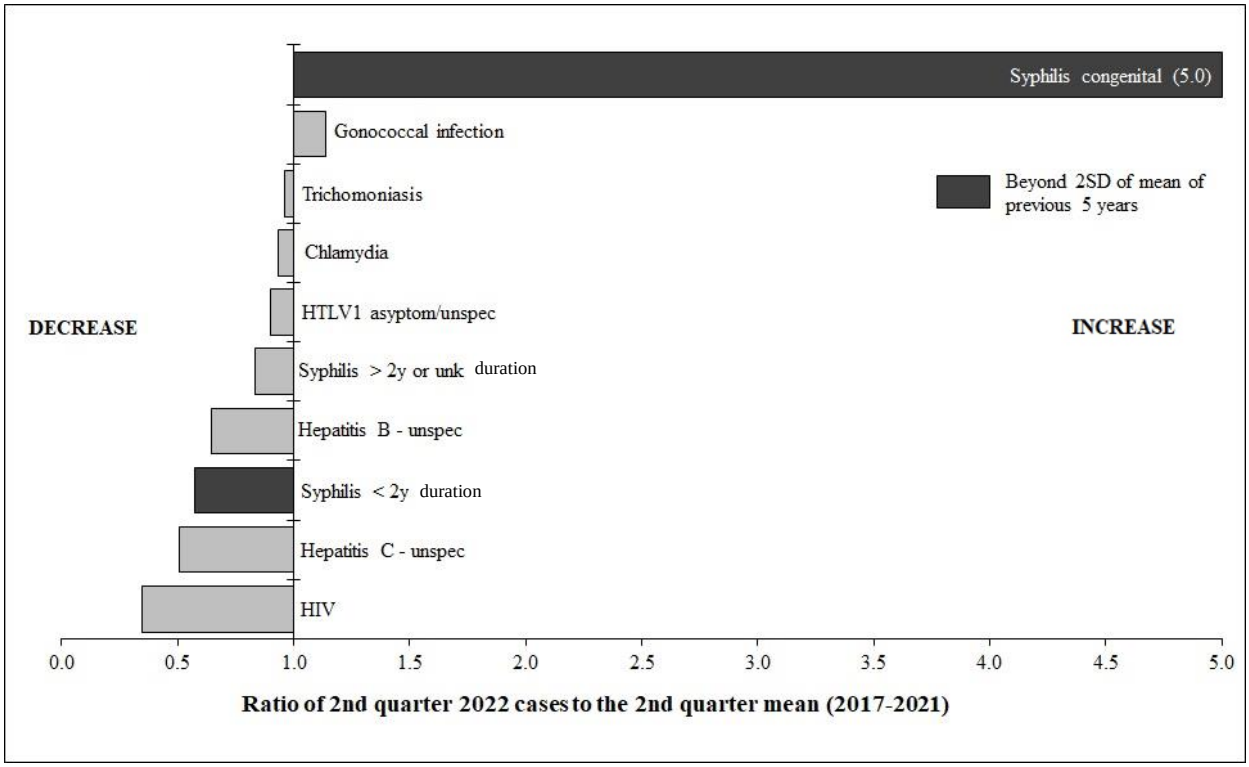
Graphs of selected diseases and STIs – 2nd quarter, 2022

Ratio of the number of notifications in 2nd quarter of 2022 to the 2nd quarter, 5 year mean (2017 – 2021): Selected diseases



Ratio of the number of notifications in 2nd quarter of 2022 to the 2nd quarter, 5 year mean (2017 – 2021): Sexually transmitted infections (STIs)



Comments on selected disease notifications – 2nd quarter, 2022

COVID-19

There were 4,920 confirmed cases of COVID-19 notified in the 2nd quarter of 2022 compared to the 5 year 2nd quarter mean of 23.6 cases. There was a large number of COVID-19 cases in the quarter following the lifting of travel and quarantine restrictions which began from December 2021. COVID-19 was only gazetted as a notifiable condition in the NT in 2020.

Respiratory syncytial virus (RSV) infection

There were 94 respiratory syncytial virus (RSV) notifications in the 2nd quarter of 2022 compared to a 5 year 2nd quarter mean of 2.4 notifications per year; however RSV was only made a notifiable disease in 2021. The re-introduction of circulating respiratory viruses following the gradual easing of COVID-19 restrictions in 2022, along with the inclusion of RSV and influenza virus on the same testing panel as COVID-19, has likely resulted in high case numbers and case ascertainment.

Influenza

There were 4,690 notifications of influenza in the 2nd quarter of 2022 compared to a 5 year 2nd quarter mean of 178.2 notifications. The inclusion of influenza virus on the same testing panel as COVID-19 likely led to an increase in case ascertainment. The increase is also however due to the re-introduction of circulating influenza viruses to the NT population following the gradual easing of COVID-19 travel and quarantine restrictions in 2022. The peak number of cases occurred in May-June and 99% of notifications were due to influenza A.

Legionellosis

There were 4 notifications of legionellosis which is 6.7 times the 5 year 2nd quarter mean of 0.6 cases.

Leptospirosis

There were 3 notifications of leptospirosis in the 2nd quarter of 2022 which is 3.75 times the 5 year 2nd quarter mean (0.8 cases).

Acute post-streptococcal glomerulonephritis (APSGN)

There were 24 cases of acute post-streptococcal glomerulonephritis (APSGN) notified in the 2nd quarter of 2022 compared to the 5 year 2nd quarter mean of 6.4 cases. Health alerts have been issued throughout the year encouraging clinicians to report suspected cases to facilitate contact tracing and prophylaxis.

Yersiniosis

There were 7 notifications of yersiniosis in the 2nd quarter of 2022 which is 2.9 times the 5 year 2nd quarter mean of 2.4 cases. There has been an increase in notifications since the introduction of faecal multiplex PCR testing in 2013.

Pneumococcal disease

There were 25 notifications of invasive pneumococcal disease in the 2nd quarter of 2022 which is 2.0 times the 5 year 2nd quarter mean of 12.8 cases.

Ross River Virus

There were only 9 notifications of Ross River virus infection in the 2nd quarter of 2022 compared to a 5 year 2nd quarter mean of 34.2 cases.

Congenital syphilis

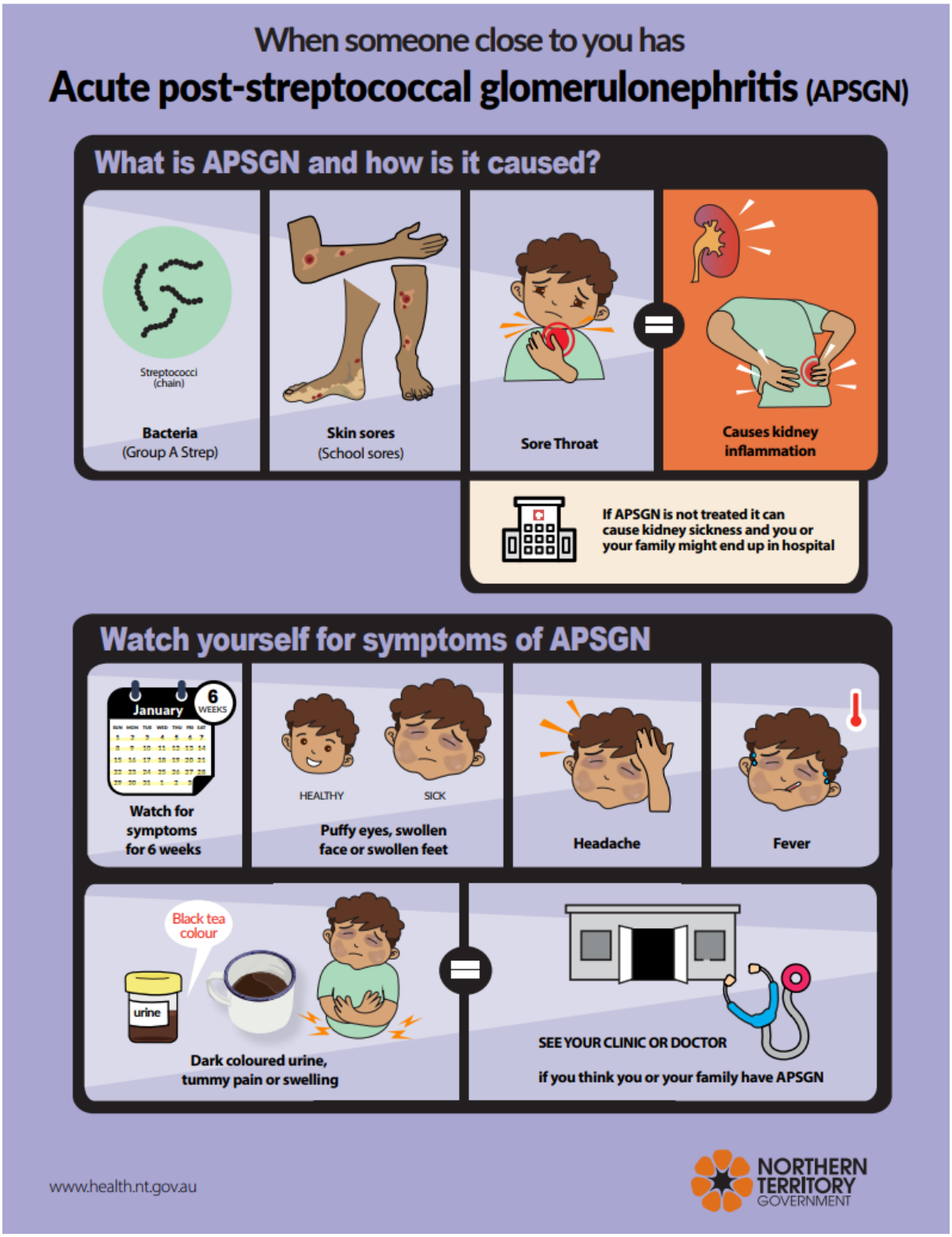
There was a case of congenital syphilis in the 2nd quarter of 2022 – the 5 year 2nd quarter mean is 0.2 cases. This was the second case notified in 2022.

Syphilis < 2y duration

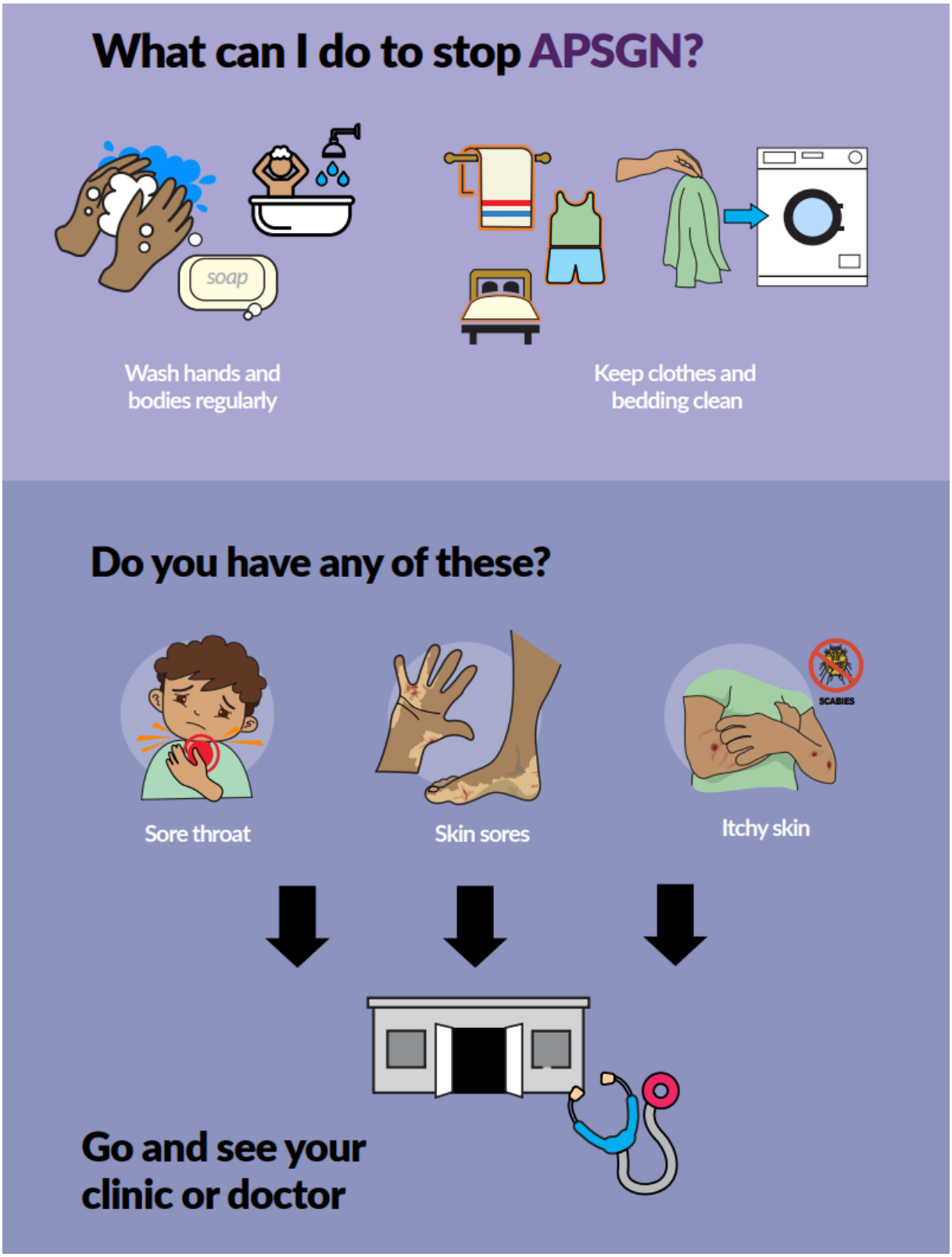
There were 43 notifications of syphilis < 2y duration in the 2nd quarter of 2022 compared to a 5 year 2nd quarter mean of 75 cases.

Acute post-streptococcal glomerulonephritis (APSGN) Fact Sheet

NT HEALTH TOP END REGION



NT HEALTH TOP END REGION



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Abstracts from peer reviewed published articles related to the Northern Territory

Japanese Encephalitis in Australia - A Sentinel Case

Waller C, Tiemensma M, Currie BJ, Williams DT, Baird RW, Krause VL

N Engl J Med. 2022; 387(7):661-662.

https://doi.org/10.1056/nejmc2207004

No abstract – Correspondence

Summary

Japanese encephalitis was identified as a "communicable disease incident of national significance" in Australia on March 4th 2022. This notification followed the detection of Japanese encephalitis virus (JEV) in mummified, stillborn, and weak newborn piglets from multiple commercial piggeries across NSW, Victoria, South Australia and Queensland, with concomitant recognition of human cases of Japanese encephalitis in those States. However 1 year earlier, in February 2021, a fatal case of Japanese encephalitis occurred in the Top End of the Northern Territory. Genotyping of the virus from that 2021 case showed it belonged to genotype 4 and was closely related to the 2022 Southeast Australian outbreak strains. This NT case therefore appeared to be a sentinel human case of the Australian JE outbreak that was identified a year later at a location that was more than 3000 km to the south.

Salmonellosis in Australia in 2020: possible impacts of COVID-19 related public health measures

Davis BPF, Amin J, Franklin N, Beggs PJ

Commun Dis Intell (2018). 2022;46

https://doi.org/10.33321/cdi.2022.46.2

Background: More than seventy per cent of salmonellosis in Australia is thought to be due to contaminated food. Rates of salmonellosis vary across the Australian states and territories, with the highest rates in the Northern Territory. In 2020, to control coronavirus disease 2019 (COVID-19), Australia implemented public health measures including border closures, physical distancing and hygiene advice. This study analyses salmonellosis notification rates in 2020 and considers possible impacts of COVID-19 measures.

Methods: Monthly and annual salmonellosis notifications per 100,000 population, for each of Australia's eight states and territories for the years 2015 to 2020, were extracted from Australia's publicly accessible National Notifiable Diseases Surveillance System. For each jurisdiction, the salmonellosis rate each month in 2020 was compared with the previous 5-year median rate for that calendar month. The possible impacts of COVID-19 public health measures on salmonellosis notifications in the respective states and territories were examined.

Results: The annual Australian salmonellosis notification rate was 27% lower in 2020 than the previous 5-year median. The reduction in salmonellosis rate varied throughout Australia. States and territories with more stringent, more frequent or longer COVID-19 public health measures had generally greater salmonellosis rate reductions. However, Tasmania had a 50% deeper reduction in salmonellosis rate than did the Northern Territory, despite similar restriction levels.

Conclusions: Salmonellosis notifications decreased in Australia during the global COVID-19 pandemic. The reduction in notifications corresponded with the implementation of public health measures. Persistence of high rates in the

Northern Territory could indicate the overarching importance of demographic and environmental factors.

Keywords: salmonellosis, rates, notifications, COVID-19, Australia, public health measures

Improved life expectancy for Indigenous and non-Indigenous people in the Northern Territory, 1999–2018: overall and by underlying cause of death

Zhao Y, Li SQ, Wilson T, Burgess CP

Med J Aust. 2022; 217(1):30-35.

https://doi.org/10.5694/mja2.51553

Objectives: To provide updated estimates of life expectancy at birth for Indigenous and non-Indigenous people in the Northern Territory, 1999-2018; to quantify the contributions of changes in life years lost to disease-specific causes of death to overall changes in life expectancy.

Design, setting, participants: Analysis of Australian Coordinating Registry data on underlying and nine multiple causes of death (ICD-10) for deaths in the NT, by age, sex, and Indigenous status, 1 January 1999 - 31 December 2018.

Main outcome measures: Life expectancy at birth by year and 5-year period, by Indigenous status and sex; change in life expectancy by year and 5-year period, by Indigenous status and sex; contributions in changes in life years lost to leading underlying causes of death, by 5-year period, Indigenous status and sex.

Results: Life expectancy for Indigenous men increased from 56.6 years in 1999 to 65.6 years in 2018 (change, 9.0 years; 95% CI, 7.9-10.0 years) and from 64.8 to 69.7 years for Indigenous women (4.9 years; 95% CI, 3.2-6.7 years); for non-Indigenous men, it increased from 77.4 to 81.0 years (3.6 years; 95% CI, 2.8-4.4 years), and from 84.3 to 85.1 years for non-Indigenous women (0.8 years; 95% CI, -0.4 to 1.9 years). Increased life expectancy for Indigenous men was primarily linked with fewer years of life lost to cancer (23% of overall change), unintentional injuries (18%), and cardiovascular disease (17%), and for Indigenous women with fewer life years lost to cancer (24%), intentional injuries (17%), and kidney disease (14%). During 1999-2018, the difference in life expectancy between Indigenous and non-Indigenous people declined by 26% for men (from 20.8 to 15.4 years) and by 21% for women (from 19.5 to 15.4 years).

Conclusions: Life expectancy improved markedly during 1999-2018 for Indigenous people in the NT, particularly with respect to fewer years of life lost to cancer, injuries, and chronic disease. The smaller gains in life expectancy for non-Indigenous people were linked with improved survival for those with cancer and neurological conditions.

Keywords: Epidemiology; Life expectancy; Population health.

Neglected tropical diseases in Australia: a narrative review

Kurcheid J, Gordon CA, Clarke NE, Wangdi K, Kelly M, Lal A, Mutombo PN, Wang D, Mationg ML, Clements AC, Muhi S, Bradbury RS, Biggs BA, Page W, Williams G, McManus DP, Gray D

Med J Aust. 2022; 216(10):532-538

https://doi.org/10.5694/mja2.51533

- Neglected tropical diseases (NTDs) represent a threat to the health, wellbeing and economic prosperity of billions of people worldwide, often causing serious disease or death.
- Commonly considered diseases of low and middle-income nations, the presence of NTDs in high income countries such as Australia is often overlooked.
- Seven of the 20 recognised NTDs are endemic in Australia: scabies, soil-transmitted helminths and strongyloidiasis,

echinococcosis, Buruli ulcer, leprosy, trachoma, and snakebite envenoming.

- Dengue, while not currently endemic, poses a risk of establishment in Australia. There are occasional outbreaks of dengue fever, with local transmission, due to introductions in travellers from endemic regions.
- Similarly, the risk of introduction of other NTDs from neighbouring countries is a concern. Many NTDs are only seen in Australia in individuals travelling from endemic areas, but they need to be recognised in health settings as the potential consequences of infection can be severe.
- In this review, we consider the status of NTDs in Australia, explore the risk of introducing and contracting these infections, and emphasise the negative impact they have on the health of Australians, especially Aboriginal and Torres Strait Islander peoples.

Keywords: Arbovirus infections; Bacterial infections; Parasitic diseases; Zoonoses.

Living with Rheumatic Heart Disease at the Intersection of Biomedical and Aboriginal Worldviews

Haynes E, Marawili M, Marika MB, Mitchell A, Walker R, Katzenellenbogen JM, Bessarab D

Int J Environ Res Public Health. 2022; 19(8):4650.

https://doi.org/10.3390%2Fijerph19084650

Rheumatic heart disease (RHD) significantly impacts the lives of First Nations Australians. Failure to eliminate RHD is in part attributed to healthcare strategies that fail to understand the lived experience of RHD. To rectify this, a PhD study was undertaken in the Northern Territory (NT) of Australia, combining Aboriginal ways of knowing, being and doing with interviews (24 participants from clinical and community settings) and participant observation to privilege Aboriginal voices, including the interpretations and experiences of Aboriginal co-researchers (described in the adjunct article). During analysis, Aboriginal co-researchers identified three interwoven themes: maintaining good feelings; creating clear understanding (from good information); and choosing a good djalkiri (path). These affirm a worldview that prioritises relationships, positive emotions and the wellbeing of family/community. The findings demonstrate the inter-connectedness of knowledge, choice and behaviour that become increasingly complex in stressful and traumatic health, socioeconomic, political, historical and cultural contexts. Not previously heard in the RHD domain, the findings reveal fundamental differences between Aboriginal and biomedical worldviews contributing to the failure of current approaches to communicating health messages. Mitigating this, Aboriginal co-researchers provided targeted recommendations for culturally responsive health encounters, including: communicating to create positive emotions; building trust; and providing family and community data and health messages (rather than individualistic).

Keywords: First Nations Australians, Aboriginal Australians, Indigenous Australians, Aboriginal ways of knowing, being and doing, rheumatic heart disease, biomedical worldview, colonisation, wellbeing, empathy

Genomic Evidence of In-Flight SARS-CoV-2 Transmission, India to Australia, April 2021

Hogarth F, Coffey P, Goddard L, Lewis S, Labib S, Wilmot M, Andersson P, Sherry N, Seemann T, Howden BP, Freeman K, Baird R, Hosegood I, McDermott K, Walsh N, Polkinghorne B, Marshall C, Davies J, Krause V, Meumann EM

Emerg Infect Dis. 2022 Jul; 28(7):1527-1530

https://doi.org/10.3201%2Feid2807.212466

Epidemiologic and genomic investigation of SARS-CoV-2 infections associated with 2 repatriation

flights from India to Australia in April 2021 indicated that 4 passengers transmitted SARS-CoV-2 to >11 other passengers. Results suggest transmission despite mandatory mask use and predeparture testing. For subsequent flights, predeparture quarantine and expanded predeparture testing were implemented.

Keywords: COVID-19, 2019 novel coronavirus disease, coronavirus disease, severe acute respiratory syndrome coronavirus 2, SARS-CoV-2, viruses, respiratory infections, zoonoses, quarantine, covid-19, genome viral, in-flight transmission, genomics, epidemiology, airplane, India, Australia

Hepatitis B prevalence in women giving birth in the Northern Territory, Australia, 2005-2015

Dyda A, McGregor S, Binks P, Davies J, Tong SY, Krause V, Markey P, Qin Li SL, Davis JS, Kaldor JM, Liu B

Commun Dis Intell (2018). 2022 Sep 26;46.

https://doi.org/10.33321/cdi.2022.46.62

Background: Hepatitis B virus (HBV) vaccination in the Northern Territory (NT) was funded for all Aboriginal and Torres Strait Islander newborns in 1988 and for all newborns in 1990. The prevalence of HBV in the Northern Territory was found to be higher in Aboriginal and Torres Strait Islander women than in non-Indigenous women across 2005-2010. We examined more recent data to assess whether the gap remains.

Methods: We linked data from two routinely collected registries, the NT Perinatal Register and the NT Notifiable Diseases System, to investigate the prevalence of HBV infection, according to eligibility for infant HBV vaccination, in women giving birth during 2005-2015.

Results: There were 22,781 women recorded as giving birth in public hospitals in the Northern Territory during 2005-2015. Hepatitis B virus prevalence was highest in Aboriginal and Torres Strait Islander (1.8%) and overseas-born women (1.8%). Among Aboriginal and Torres Strait Islander women, estimated hepatitis B virus prevalence was significantly higher in those born before the implementation of the vaccination program than in those born afterwards (2.4% versus 0.3%). Prevalence was highest amongst those living in very remote areas, both overall (2.2%) and within the birth cohort eligible for HBV vaccination.

Conclusions: Hepatitis B virus prevalence in Northern Territory Aboriginal and Torres Strait Islander women appears to be declining as more individuals vaccinated as part of infant vaccination programs reach adulthood. Prevalence remains highest in remote areas, highlighting the importance of ongoing monitoring and of promoting vaccination in these regions.

Keywords: Australia; Hepatitis B; data linkage; epidemiology; prevalence.

Arthropod-Borne Virus Surveillance as a Tool to Study the Australian Mosquito Virome

Colmant AMG, Warrilow D, Hall-Mendelin S, Onn M, Hobson-Peters J, Huang B, Kurucz N, Warchot A, Primmer BR, Isberg S, Bielefeldt-Ohmann H, Hall RA

Viruses. 2022 Aug 26;14(9):1882.

https://doi.org/10.3390/v14091882

Mosquitoes (*n* = 4381 in 198 pools) were collected in March and April 2018 to survey the presence of West Nile virus Kunjin strain in mosquito populations around crocodile farms in the Darwin region of the Northern Territory (NT) of Australia. While no Kunjin virus was detected in these mosquitoes, we applied our viral replicative intermediates screening system termed monoclonal antibodies to viral RNA intermediates in cells or MAVRIC to this set of samples. This resulted in the detection of 28 pools with virus replicating in C6/36 mosquito cells and the

identification of three insect viruses from three distinct virus classes. We demonstrate the persistence of the insect-specific flavivirus Palm Creek virus in *Coquillettidia xanthogaster* mosquitoes from Darwin over almost a decade, with limited genetic drift. We also detected a novel Hubei macula-like virus 3 strain in samples from two mosquito genera, suggesting the virus, for which the sequence was originally detected in spiders and soybean thrips, might be involved in a horizontal transmission cycle between arthropods and plants. Overall, these data demonstrate the strength of the optimized MAVRIC system and contribute to our general knowledge of the mosquito virome and insect viruses.

Keywords: MAVRIC; insect virus; insect-specific flavivirus; macula-like virus; mosquito virus; mosquito virus screening.

Health care cost of crusted scabies in Aboriginal communities in the Northern Territory, Australia

Campbell M, van der Linden N, Gardner K, Dickinson H, Agostino J, Dowden M, O'Meara I, Scolyer M, Woerle H, Viney R, van Gool K

PLoS Negl Trop Dis. 2022 Mar 28; 16(3):e0010288.

https://doi.org/10.1371/journal.pntd.0010288

Background: Crusted scabies is a debilitating dermatological condition. Although still relatively rare in the urban areas of Australia, rates of crusted scabies in remote Aboriginal communities in the Northern Territory (NT) are reported to be among the highest in the world.

Objective: To estimate the health system costs associated with diagnosing, treating and managing crusted scabies.

Methods: A disease pathway model was developed to identify the major phases of managing crusted scabies. In recognition of the higher resource use required to treat more severe cases, the pathway differentiates between crusted scabies severity grades. The disease pathway model was populated with data from a clinical audit of 42 crusted scabies patients diagnosed in the Top-End of Australia's Northern Territory between July 1, 2016 and May 1, 2018. These data were combined with standard Australian unit costs to calculate the expected costs per patient over a 12-month period, as well as the overall population cost for treating crusted scabies.

Findings: The expected health care cost per patient diagnosed with crusted scabies is $35,418 Australian dollars (AUD) (95% CI: $27,000 to $43,800), resulting in an overall cost of $1,558,392AUD (95% CI: $1,188,000 to $1,927,200) for managing all patients diagnosed in the Northern Territory in a given year (2018). By far, the biggest component of the health care costs falls on the hospital system.

Discussion: This is the first cost-of-illness analysis for treating crusted scabies. Such analysis will be of value to policy makers and researchers by informing future evaluations of crusted scabies prevention programs and resource allocation decisions. Further research is needed on the wider costs of crusted scabies including non-financial impacts such as the loss in quality of life as well as the burden of care and loss of well-being for patients, families and communities.

Using Genomics to Understand the Epidemiology of Infectious Diseases in the Northern Territory of Australia

Meumann EM, Krause VL, Baird R, Currie BJ

Trop Med Infect Dis. 2022 Aug 12;7(8):181

https://doi.org/10.3390/tropicalmed7080181

The Northern Territory (NT) is a geographically remote region of northern and central Australia. Approximately a third of the population are First Nations Australians, many of whom live in remote

regions. Due to the physical environment and climate, and scale of social inequity, the rates of many infectious diseases are the highest nationally. Molecular typing and genomic sequencing in research and public health have provided considerable new knowledge on the epidemiology of infectious diseases in the NT. We review the applications of genomic sequencing technology for molecular typing, identification of transmission clusters, phylogenomics, antimicrobial resistance prediction, and pathogen detection. We provide examples where these methodologies have been applied to infectious diseases in the NT and discuss the next steps in public health implementation of this technology.

Keywords: epidemiology; genomics; infectious diseases; sequencing; tropics.

Aboriginal social housing in remote Australia: crowded, unrepaired and raising the risk of infectious diseases

Memmott P, Lansbury N, Go-Sam C, Nash D, Redmond AM, Barnes S, Simpson P, Frank, PN

Global Discourse 12.2 (2022): 255-284.

https://doi.org/10.1332/204378921X16315375796362

Sufficient, well-maintained housing infrastructure can support healthy living practices for hygiene, safety and nutrition. This article focuses on the relationship between housing and health through a case study in the remote Barkly region in the Northern Territory, Australia. A research partnership between Anyinginyi Health Aboriginal Corporation and academic researchers employed a mixed methodological approach, involving interviews with residents, clinical and outreach staff, and clinical database analysis. The results revealed much higher levels of crowding in remote communities and in Tennant Creek than officially recorded, with up to 22 residents in surveyed households. Interviews with clinicians and public health staff highlighted the impact of crowding on infection transmission, poor sleep and reduced personal safety, and damage to health hardware. The database analysis detailed the types of preventable, hygiene-related infectious diseases that dominated, with over half of the total infectious disease diagnoses being skin, respiratory and ear, nose and throat infections. Repeated infection likely contributes to increased rates of chronic kidney and rheumatic heart diseases. The combined overall findings highlight the parallel conditions of the prevalence of hygiene-related infectious diseases, crowding and environmental health issues (including health hardware). No objective evidence of direct causal relationships was obtained due to the small scale and methodological limitations of the study. More complex future research is outlined in order to understand how to further investigate the burden of disease that the affects morbidity and mortality of Aboriginal Australians, and underlies the urgency for housing policy reform and funding to upgrade housing.

Keywords: Australia; Aboriginal; social housing; remote communities; infectious diseases

Epidemiological and clinical characteristics of legionellosis in Northern Australia, 2010-2021

Waller C, Freeman K, Labib S, Baird R

Commun Dis Intell (2018). 2022 Jun 23;46.

https://doi.org/10.33321/cdi.2022.46.34

Objective: This study describes characteristics of the legionellosis cases occurring between 2010 and 2021 in the Northern Territory (NT), Australia.

Methods: We retrospectively reviewed 53 cases of legionellosis during the defined period and documented patient and clinical characteristics, diagnostics, and seasonality of infection.

Results: All cases were sporadic. The incidence rate in the NT was higher than the Australian median rate (2.1 and 1.5 per 100,000 population per year respectively). Aboriginal and Torres Strait Islander patients presented at a younger age than did non-Indigenous patients (median 41 and 60 years of age respectively), and overall there was a male preponderance. There was a higher proportion of legionellosis in the months with increased humidity, with a greater number of L. longbeachae infections detected overall (59%) than of L. pneumophila (41%). The majority of cases were diagnosed serologically (57% of L. pneumophilia and 93% of L. longbeachae).

Conclusions: Legionellosis in the NT is more common, seasonal, and may be underreported due to current reliance on serological testing for diagnosis. The higher incidence of legionellosis, and the younger age of Aboriginal and Torres Strait Islander patients of the NT, have public health implications, given that the clinical presentation of legionellosis is indistinguishable from other forms of pneumonia.

Keywords: Legionella; Northern Territory; legionellosis.

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