



Government of Western Australia
North Metropolitan Health Service
Mental Health, Public Health and Dental Services

Epidemiology of notifiable infectious diseases in metropolitan Perth

Annual report 2023



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Epidemiology of notifiable infectious diseases in metropolitan Perth: Annual report 2023.

Boorloo (Perth) Public Health Unit
Mental Health, Public Health and Dental Services
North Metropolitan Health Service

Note: For this report, the geographical boundaries of metropolitan Perth (henceforth referred to as Perth) are defined by the area within the East, North and South Metropolitan Health Services (EMHS, NMHS and SMHS). The use of the term 'Aboriginal' within this document refers to Australians of both Aboriginal and Torres Strait Islander people. The term "Aboriginal" is used in preference to "Aboriginal and Torres Strait Islander" in recognition that Aboriginal people are the original inhabitants of Western Australia. No disrespect is intended to our Torres Strait Islander colleagues and community.

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The NMHS acknowledges the traditional owners of the land, the Noongar people. We pay our respects to the elders past and present and recognise the continuing cultural and spiritual practices of the Noongar people.

Boorloo Public Health Unit would like to acknowledge the assistance of medical, nursing and scientific staff working in general practices, hospitals and laboratories, for their assistance with public health follow-up of persons with notifiable diseases, and their essential contributions to prevention and control of communicable diseases in the Perth metropolitan area.

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Executive summary

Boorloo (Perth) Public Health Unit (Boorloo PHU) is responsible for the public health management of notifiable infectious diseases and supports strategies to prevent communicable disease, including through immunisation, in Perth, Western Australia (WA). This report aims to inform healthcare providers and stakeholders about local trends in communicable disease epidemiology in 2023 and highlight public health actions and issues that require attention.

 <p>102,570 infectious disease notifications in Perth in 2023 (including COVID-19)</p>	 <p>On the rise: Congenital syphilis, gonorrhoea & travel-related diseases</p>	 <p>Hep C progress: Strong results from an active follow-up project</p>	 <p>Key factors: Demographic changes, ↑ priority groups, ↓ immunisation rates</p>
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Rising notifications for congenital syphilis, gonorrhoea and chlamydia:

- **The syphilis outbreak continues:** Infectious syphilis notifications remained high, including among pregnant women, people experiencing homelessness, and women of reproductive age.
- **Four congenital syphilis cases were diagnosed in 2023;** now 11 cases since 2018.
- **Gonorrhoea and chlamydia** notifications reached record high levels in 2023.

Steps towards Hepatitis C elimination:

- **Successful Hepatitis C pilot program:** Over a six month period, Boorloo PHU improved hepatitis C PCR testing rates by 10% and treatment rates by 6%. This was done by actively supporting clinicians, and linking patients to care.

Successful programs for immunisation in priority groups:

- **Moorditj programs:** Boorloo PHU's Aboriginal Health Team and Immunisation Team coordinated several successful programs that provide support to Aboriginal families, ensuring children and adolescents have timely access to immunisation services.

Increases in travel related diseases:

- **Hepatitis A, typhoid and paratyphoid** notifications increased as travel resumed; more than double 2022 numbers, and a 36% increase from average numbers in 2010-2019.

Factors affecting rising notifiable diseases - Demographic changes in Perth:

- **Population growth:** From 2011 to 2021, Perth experienced a population surge of 359,000 people with significant population changes noted in priority groups in Perth. The population of Aboriginal people in Perth increased by 55% from 2011 to 2021 and over 250,000 people in Perth are living in areas with the greatest social disadvantage.



Background

Purpose

The **Boorloo (Perth) Public Health Unit (Boorloo PHU)**, formerly Metropolitan Communicable Disease Control, was established on 1 July 2016 and has responsibility for the public health management of notifiable diseases for the East, North and South Metropolitan Health Services (EMHS, NMHS, and SMHS). The aim of this annual report is to inform healthcare providers and other stakeholders about important trends in notifiable infectious diseases and immunisation activities in Perth in 2023.

Notifiable diseases

Under Part 9 of the [Public Health Act 2016](#)¹, medical practitioners or nurse practitioners attending to a patient with a notifiable infectious disease have a legal obligation to report it to the WA Department of Health (WA DOH). Similar obligations apply to pathology laboratories where test results indicate a notifiable disease.

Data on individuals with most notifiable diseases and related conditions are recorded in the Western Australian Notifiable Infectious Diseases Database (WANIDD). Communicable disease notifications are crucial for informing disease surveillance, public health management, policy, and interventions. A list of current notifiable infectious diseases and related conditions in WA, along with case definitions, is available [online](#).²

Data sources

Notification data

Notifiable diseases data for Perth and WA were extracted from WANIDD on 19 June 2024 and 31 May 2024, respectively, and are subject to revision. Data were retrieved using an **optimal date of onset of disease** (ODOO) from 1 January to 31 December 2023. Exceptions to this were diseases with a long delay between diagnosis and onset, namely, non-infectious syphilis, tuberculosis, leprosy, Creutzfeldt-Jakob disease, and unspecified hepatitis B and C. For these, data were retrieved by the **date of receipt** of notification (DOR) from 1 January to 31 December 2023. COVID-19 data for Perth was obtained from Communicable Disease Control Directorate (CDCD) on 24 May 2024.³ National notification rates for 2023 were obtained from the National Notifiable Diseases Surveillance System (NNDSS) data visualisation tool on 10 May 2024.⁴

Population data

Population data were obtained from the Australian Bureau of Statistics. The estimated resident population (ERP) for Greater Perth at 30 June 2023 was 2,309,338.⁵ The ERP for WA at 30 June 2023 was 2,878,600.⁶

Immunisation data

The Australian Immunisation Register (AIR) provides quarterly reports of immunisation coverage for 3 age groups: 12-<15 months, 24-<27 months, and 60-<63 months. Approval was provided by the AIR Data Steward for usage of these data from the quarterly reports for 2023 (see Appendix 2 for standard data suppression rules).⁷



Overview of notifiable diseases

In 2023, Boorloo PHU received 102,570 notifications for notifiable diseases in Perth. Excluding COVID-19 for comparability, this was a 64.6% increase from 31,362 notifications received on average in the previous 5 years (2018 to 2022). The relative proportion of notifications by disease category is illustrated in **Figure 1** below. Vaccine preventable infections were the largest contributor to disease notifications in Perth, accounting for 41.8% of notifications.

Compared to 2022, there was an increase in the number of notifications for all categories except vector-borne diseases. Notifications for vaccine-preventable diseases rose significantly from 15,337 in 2022 to 21,571 in 2023, driven primarily by a surge in influenza notifications (10,608 in 2022 to 15,875 in 2023). Notifications for sexually transmitted infections (STI) increased by 24%, largely due to increases in chlamydia and gonorrhoea. In 2023, there was a resurgence of travel-related enteric diseases, including hepatitis A, paratyphoid fever and typhoid fever.

Compared to the previous 5-year average for disease notifications (2018 to 2022), there was a notable increase in the 'other diseases category' (as shown in **Figure 1**), largely due to the inclusion of invasive Group A streptococcus (iGAS) and respiratory syncytial virus (RSV) since 2021. Both vaccine-preventable diseases and STI were above their 5-year average.

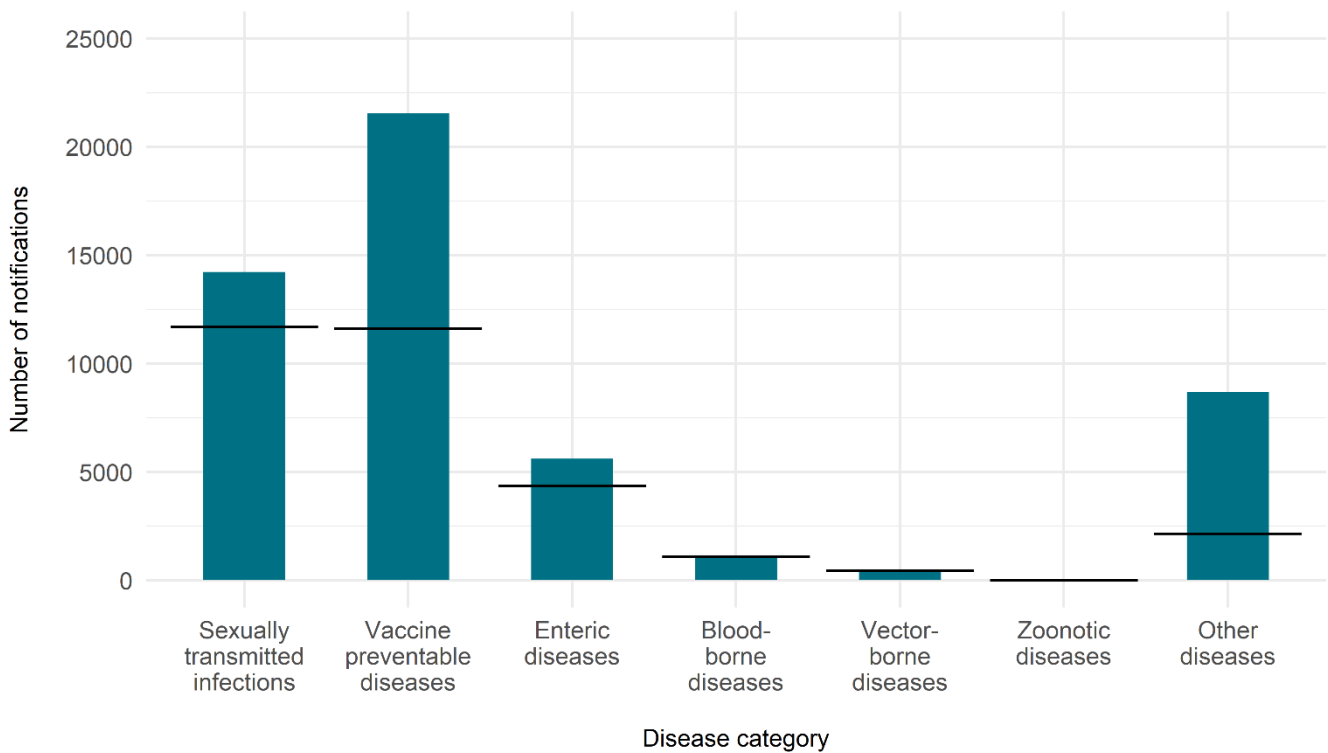


Figure 1: Number of notifications by disease category in 2023 (teal) not including COVID-19. The black lines represent the average number of notifications across previous 5 years (2018 to 2022) by disease category.

The number of notifications in Perth for each disease is listed in **Table 1**, for the years 2019 to 2023. Crude notification rates for 2023 are also presented and compared with state and national rates where available. Most diseases reported in Perth had similar rates to those in WA and nationally. Notification data by geographical health service area are presented in **Appendix 1**.



Table 1: Perth notifications 2019 – 2023 & notification rates for Perth, WA and Australia in 2023.

Notifiable disease	Number of notifications per year					2023 notification rate per 100 000 population		
	2019	2020	2021	2022	2023	Perth	WA	National
Blood-borne viruses								
Hepatitis B (newly acquired)	16	11	7	5	16	0.7	0.8	0.3
Hepatitis B (unspecified)	372	422	405	347	424	18.4	17.3	19.9
Hepatitis C (newly acquired)	89	73	73	51	97	4.2	4.0	3.3
Hepatitis C (reinfection)	NN	NN	NN	NN	23	1.0	1.0	N/A
Hepatitis C (unspecified)	600	611	697	537	574	24.9	29	25.6
Hepatitis D	10	2	9	6	2	0.1	0.1	0.3
Enteric diseases								
Campylobacteriosis	2,881	2,284	2,437	3,127	3,789	164.1	169	155.5
Cholera	0	0	0	0	0	0	0	<0.1
Cryptosporidiosis	122	425	53	194	135	5.8	7.3	13.9
Hepatitis A	22	5	1	12	16	0.7	0.6	0.8
Hepatitis E	4	3	0	0	6	0.3	0.2	0.1
Listeriosis	7	6	4	8	5	0.2	0.2	0.3
Paratyphoid fever	9	0	0	1	14	0.6	0.5	0.5
Salmonellosis	1,699	1,369	639	693	1,062	46	50.4	42.7
Shiga toxin-producing E.coli	119	80	83	123	119	5.2	7.6	3.5
Shigellosis	277	102	38	95	320	13.9	14.5	11.0
Typhoid fever	18	7	1	15	18	0.8	0.8	1.1
Vibrio parahaemolyticus	12	3	33	5	8	0.3	0.3	NN
Yersiniosis	22	14	32	26	84	3.6	3.4	NN
Sexually transmitted infections								
Chlamydia	9,176	8,397	8,716	8,635	10,195	441.5	453.5	412.8
Lymphogranuloma venereum	2	3	0	0	0	0	0	NN
Gonorrhoea	2,913	2,287	1,871	2,169	3,451	149.4	165.9	151.8
Syphilis (infectious)	333	465	479	518	421	18.2	24.4	24.5
Syphilis (non-infectious)	154	179	158	134	155	6.7	9	10.6
Syphilis (congenital)	0	3	1	1	4	16.0*	12.7*	6.7*
Vaccine-preventable diseases								
Diphtheria	0	0	0	1	2	0.1	0.1	<0.1
Haemophilus influenzae type B	1	1	0	0	0	0	0	<0.1
Influenza	18,483	982	23	10,608	15,875	687.4	741.0	1,085
Measles	42	4	0	0	6	0.3	0.2	0.1
Meningococcal disease (invasive)	12	5	5	14	4	0.2	0.3	0.5
Mumps	17	7	0	0	2	0.1	0.1	0.5
Pertussis	440	99	40	21	56	2.4	2.7	9.2
Pneumococcal disease (invasive)	150	73	108	125	165	7.1	9.2	8.5
Rotavirus	443	154	531	289	742	32.1	31.9	31.6



Rubella	1	1	2	1	3	0.1	0.1	<0.1
Tetanus	0	1	1	0	0	0	0	<0.1
Varicella-Zoster	3,420	3,977	4,149	4,318	4,716	204.2	202.6	129.6
Vector-borne diseases								
Barmah Forest virus	5	3	4	6	8	0.3	1.2	1.3
Chikungunya virus	9	3	0	8	8	0.3	0.3	0.2
Dengue virus	275	48	0	62	161	7	7.3	4.2
Japanese encephalitis virus	0	0	0	0	0	0	0	0
Malaria	52	22	9	34	42	1.8	1.9	1.5
Murray Valley encephalitis virus	0	0	0	0	1	<0.1	0.2	0.1
Rickettsial disease (typhus)	20	9	7	9	26	1.1	1.2	NN
Ross River virus	261	237	375	284	150	6.5	11.1	6.4
Zika virus	0	0	0	1	0	0	0	NN
Zoonotic diseases								
Brucellosis	0	0	0	0	0	0	0	0.1
Leptospirosis	4	0	0	1	5	0.2	0.3	0.5
Psittacosis	0	0	0	0	0	0	0	0.2
Q Fever	3	2	1	4	3	0.1	0.3	2.1
Other diseases								
Botulism	0	0	0	0	0	0	0	<0.1
Creutzfeldt-Jakob disease	7	7	6	6	6	0.3	0.2	NN
Haemolytic uraemic syndrome	0	0	2	1	2	0.1	0.1	0.1
Legionellosis	29	60	47	49	54	2.3	3	2.5
Leprosy	1	3	3	2	0	0	0	<0.1
Melioidosis	2	0	3	1	3	0.1	0.3	NN
Tuberculosis	127	131	131	86	148	6.4	5.6	5.4
COVID-19	NN	538	227	996,767	50,954	2,206	3,318	3,251
Invasive Group A streptococcus	NN	NN	12	129	166	7.2	9.6	10.5
Acute post-streptococcal glomerulonephritis	0	0	4	3	2	0.1	0.6	NN
Respiratory syncytial virus	NN	NN	331	9,386	8,320	360.3	368.5	480.8
Mpox	NN	NN	NN	7	3	0.1	0.1	0.1

Data were retrieved from WANIDD; disease rows were excluded where no cases occurred locally, statewide, and nationally in the past 5 years. Data for rheumatic heart disease, antibiotic resistant organisms and human immunodeficiency virus (HIV) are collected and managed separately. NN=not notifiable; N/A=not available; <0.1 denotes a number less than 0.1 that would otherwise be rounded to zero. Varicella-Zoster includes chickenpox and shingles as well as those unspecified. From June 2021, iGAS and RSV were added as notifiable diseases. An iGAS case classification audit was completed in July 2023, the previously reported notification numbers for iGAS in 2022 have reduced as a result. From January 2023, the case definition for hepatitis C (unspecified and newly acquired) case definition changed to account for reinfections, accounting for a small part of the increased case numbers. Comparability of COVID-19 notifications between years is limited by the temporary inclusion of positive Rapid Antigen Test (RAT) cases. Reporting of positive RAT results was compulsory between 8 February 2022 and 4 November 2022 and continued voluntarily until 9 October 2023. Between 1 January 2023 and 9 October 2023, RAT positive cases comprised 86% of notifications. Following 9 October 2023, only polymerase chain reaction (PCR)-positive results were notified. Congenital syphilis rates are presented per 100,000 births (* denotes that numbers of births for Perth, WA and Australia are from 2022 data)⁸.



Priority groups on the rise: the pursuit of equity

Australia’s population has grown at a rate of 1.3% per year over the past three decades, with growth concentrated in major cities. The population of Perth was calculated to be 2.12 million in the 2021 Census, having increased by 358,700 (19.6%, **Figure 2A**) since 2011.¹³ In the same period, regional WA grew by 37,800 (7.3%).⁹

Beyond the overall numbers, Census data highlights key changes in the demographics of the population in Perth, which have implications for communicable disease control. Certain groups are at increased risk for several notifiable diseases or poorer outcomes as a consequence of access issues. These groups include Aboriginal people, people living in lower socioeconomic areas, and people from culturally and linguistically diverse (CaLD) backgrounds. Perth is now home to almost half (47.4%) of the Aboriginal population in WA (**Figure 2B**), and if trends continue, Perth will house a greater number of Aboriginal people than regional WA by the next Census in 2026. Furthermore, Perth is home to more than two-thirds (67.8%) of people living in the most disadvantaged areas of the state (lowest quintile by Index of Relative Socio-economic Disadvantage, which factors in low income, disability, unemployment, and single parenthood), and 91% of people from CaLD backgrounds.

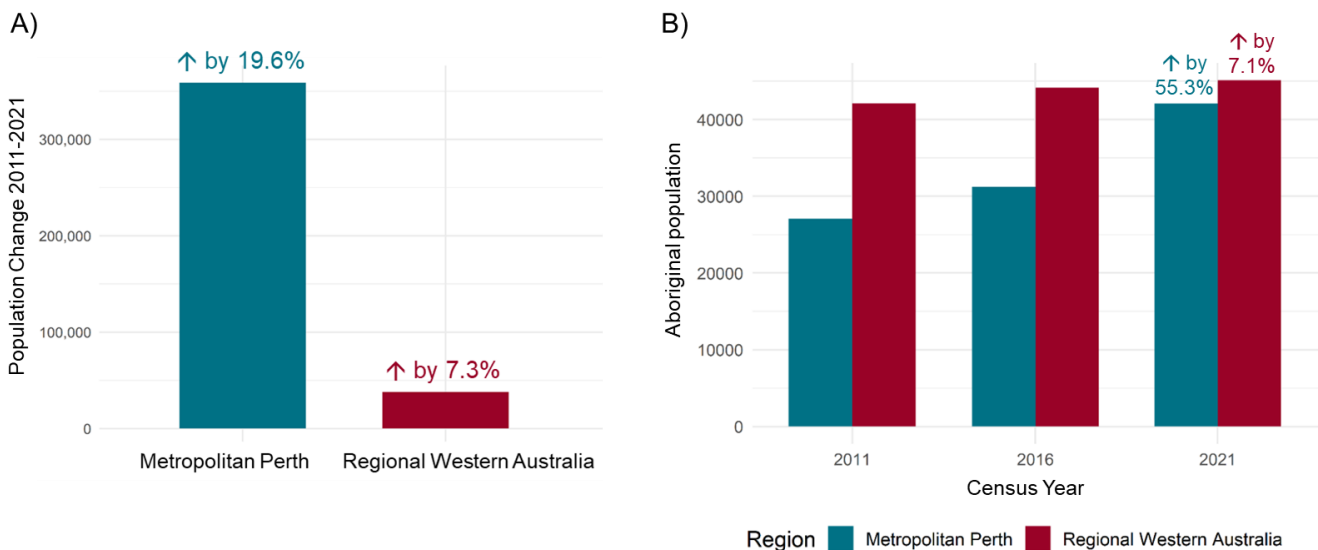


Figure 2: Key population changes demonstrated in Census data. A) Population increase in Perth and Regional WA, from 2011 to 2021. B) Aboriginal population increases in Perth and Regional WA, for 2011, 2016 and 2021.

Health inequities exist in each of these priority groups in comparison to other Australians, including in relation to communicable diseases. For example, Aboriginal people are 3 times more likely to suffer a meningococcal infection and 7 times more likely to have tuberculosis than non-Aboriginal people. For people of CaLD backgrounds, language barriers, poor health literacy and challenges navigating the health system can result in less favourable outcomes than other Australians with comparable conditions. It is important for Boorloo PHU to be responsive to population changes, and tailor services to ensure accessibility and appropriateness.



Sexually transmissible infections

The syphilis outbreak - persistent impact on priority groups

After consecutive year-on-year increases, infectious syphilis case numbers in Perth declined by 18.7% in 2023, to 421 notifications (**Figure 3**). More syphilis tests were completed in 2023 than in 2022 (126,270 tests, a 12.3% increase), thus the reduction in case numbers is not explained by a decrease in testing.

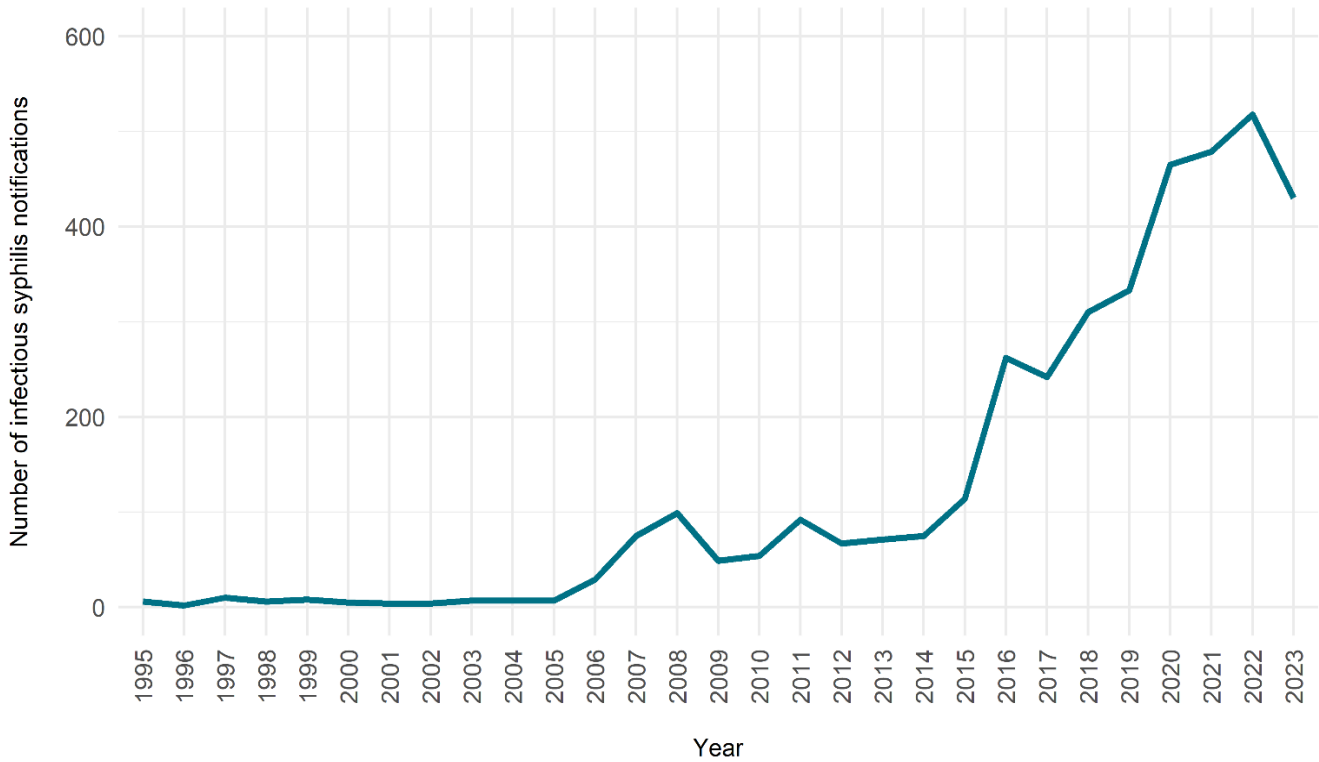


Figure 3: Number of notifications of infectious syphilis from 1995 to 2023 in Perth.

Despite the small decline, the syphilis outbreak in Perth continues and the burden remains high in subgroups of concern, including Aboriginal people, women of reproductive age, individuals of CaLD background, people experiencing homelessness, and people who use illicit drugs (**Figure 4**). There has been an 18-fold increase in syphilis cases among Aboriginal people and a 10-fold increase in women of reproductive age in Perth since 2016. There were 24 infectious syphilis cases among people experiencing homelessness in 2023, accounting for 5.7% of notifications.

Boorloo PHU has been coordinating the response to the metropolitan outbreak with the establishment of the Metropolitan Syphilis Outbreak Response Team, in collaboration with CDCD and a range of other health services and organisations. In 2021, Boorloo established a dedicated Syphilis Response Team (SRT) to provide public health management for persons with syphilis, such as pregnant women, persons experiencing homelessness, Aboriginal people, and other priority populations.¹⁰



As a part of routine disease control processes, Boorloo PHU undertakes extensive follow up of every syphilis notification, including reviewing current and previous results to determine stage of disease, ensuring cases are adequately treated, providing public health advice on risk-reducing behaviours, and assisting with contact tracing to prevent further spread. More broadly, the SRT delivers education sessions to healthcare providers, collaborates on guidelines, facilitates multi-agency case management meetings for pregnant cases and cases experiencing homelessness, and ensures high quality surveillance of the outbreak.

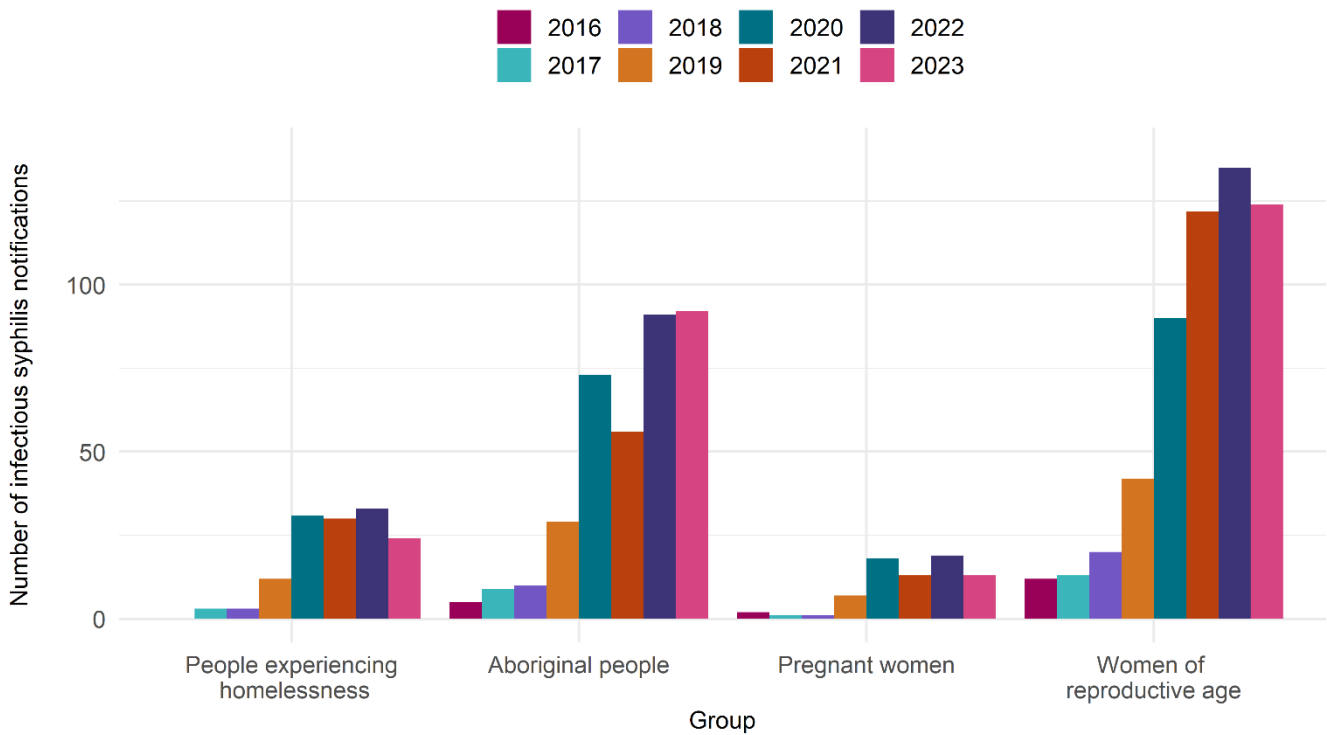


Figure 4: Number of infectious syphilis notifications among people experiencing homelessness, Aboriginal people, pregnant women, and women of reproductive age, from 2016 to 2023 (categories are not mutually exclusive) in Perth.

Pilot program of syphilis testing in homelessness centres

In May 2023, Boorloo PHU piloted an outreach program aimed at increasing syphilis testing among people experiencing homelessness. Staff conducted point-of-care testing at venues expected to be frequented by people experiencing, or at risk of homelessness, such as accommodation services and drop-in centres. It is estimated that over one-quarter of people experiencing homelessness in Perth were tested for syphilis through this pilot. Despite the increased screening, only one new syphilis case was identified and treated suggesting that the community does not have a significant rate of undiagnosed syphilis.

When examining the demographics of the population who was screened, it appears an older cohort were well engaged, but this type of program did not draw in the younger cohort who may be more at risk for syphilis. The program also offered influenza and COVID-19 immunisation which may partly explain the participation of an older group. The pilot had other benefits such as



improving syphilis awareness among people experiencing homelessness and strengthening relationships between Boorloo PHU and homelessness service providers.

Syphilis in pregnancy high; four congenital syphilis cases

Syphilis among pregnant women continues to be a critical issue in Perth. Thirteen women were diagnosed with infectious syphilis while pregnant in 2023; and in total, 37 women had infectious or non-infectious syphilis during or just prior to pregnancy, warranting close monitoring by Boorloo PHU and others in the multi-disciplinary team, comprised of midwives and nurses, microbiology, paediatrics, neonatology, sexual health, and other medical staff.

There were 4 cases of congenital syphilis born to women residing in Perth in 2023, bringing the total to 11 cases since the first was diagnosed in 2018. Unfortunately, the four mothers were not known to the Boorloo PHU team prior to birthing and therefore not able to benefit from the support of the unit. Once a case of congenital syphilis is confirmed, Boorloo PHU and other stakeholders hold a review meeting to identify service gaps and areas for improvement. Recent reviews have identified issues with timely communication of positive syphilis results to public health; routine syphilis testing in pregnancy not being performed; and challenges identifying women who have had limited antenatal care. There were also opportunities to promote reflex testing (where syphilis PCRs are added to genital lesion swabs being tested for herpes).

Chlamydia and gonorrhoea notifications reaching record numbers

The number of notifications for chlamydia and gonorrhoea in Perth rose in 2023 as compared to 2022. The 3,451 cases of gonorrhoea and 10,195 cases of chlamydia were the highest ever recorded in this region (**Figure 5**). Gonorrhoea numbers are 18.6% higher than the notification peak recorded in 2019 (2,907 cases), and 49.3% higher than the 5-year average of 2,310 (2018-2022). Testing rates increased by 26% for both diseases, as compared to 2022. Similar increases have been observed around the world, particularly Europe^{11,12}. Higher case numbers may reflect trends of increased testing, and reductions in consistent condom use.¹¹



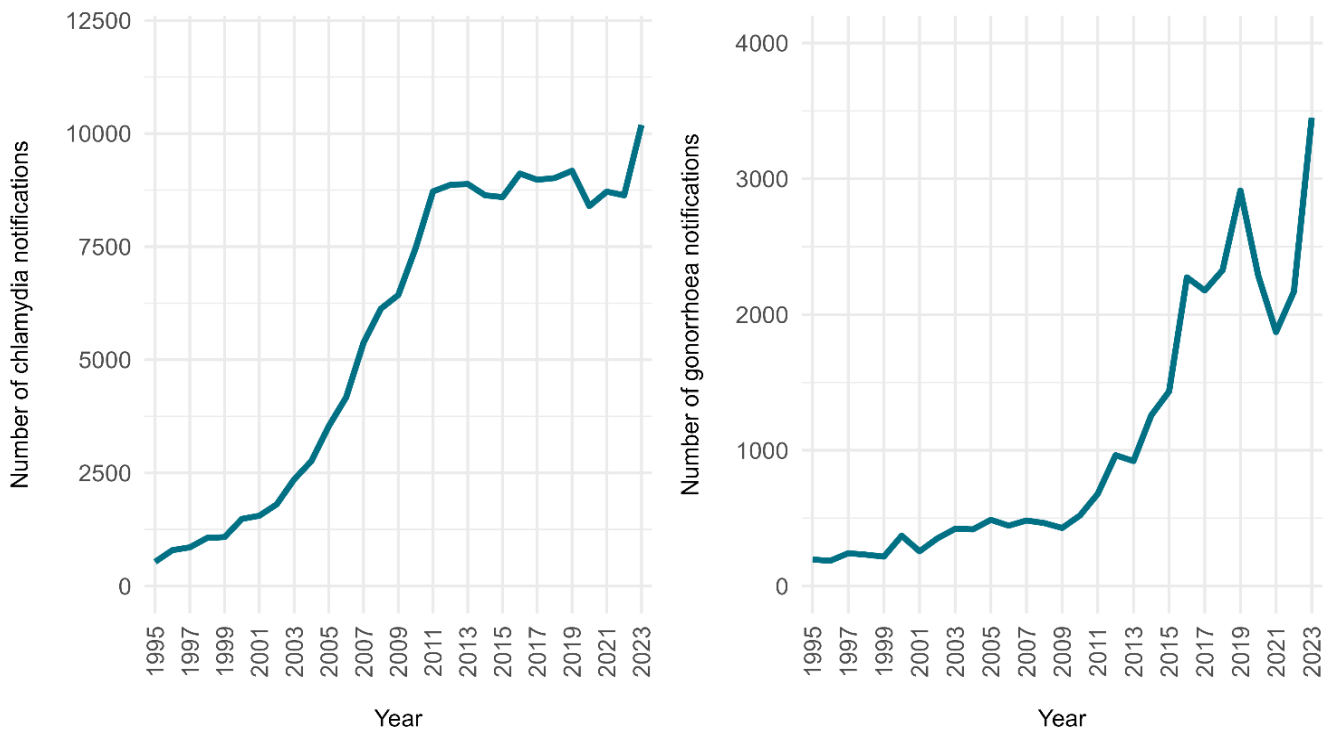


Figure 5: Number of chlamydia (left) and gonorrhoea (right) notifications from 1995 to 2023 in Perth.

Drug resistant gonorrhoea – incursions and local acquisition

Four cases of gonorrhoea with antimicrobial resistance of public health significance were notified to Boorloo PHU in 2023. Two isolates met the criteria for critical drug resistance (high-level resistance to azithromycin and/or resistance to ceftriaxone),¹³ one isolate had azithromycin resistance, and one had decreased susceptibility to ceftriaxone. Two cases were likely acquired in South-East Asia, two cases were likely locally acquired. All cases described above were successfully treated, a proof of cure obtained, and contact tracing undertaken. Treatment of multi-drug resistant infections can be complex, often requiring specialist sexual health follow-up and may require intravenous antimicrobials. One of the challenges in monitoring resistance patterns of gonorrhoea is that most diagnoses are made using PCR testing rather than culturing the organism. As a result, antibiotic susceptibility testing cannot be undertaken. If a discharge, cervical pus or cervical inflammation is noted, where possible, specimens should be sent for microscopy, culture and antibiotic sensitivity.¹⁴

STI co-infections have increased

In 2023, there were 858 people notified to Boorloo PHU for two or more notifiable STIs (excluding HIV which is not notified to Boorloo PHU) detected on specimens collected within three days of each other, accounting for 1721 notifications in total. This was a 58.9% increase from the 541 people notified for STI co-infections in 2022. Of the total occurrences of STI co-infections, 94.3% were for chlamydia and gonorrhoea, 3.7% were for chlamydia and syphilis, 1.4% were for gonorrhoea and syphilis, and 0.6% were for chlamydia, gonorrhoea and syphilis. Most coinfections were among young people, with 44.5% among people aged 20 to 29 years (**Figure 6**), most (63.6%) were among males, and 16.4% were among Aboriginal people.



In the context of growing antimicrobial resistance and growing re-infection risk, conducting a repeat test after 3 months is recommended for people with chlamydia, gonorrhoea or syphilis.¹⁴⁻¹⁶ When one STI is diagnosed, testing for other STIs including syphilis serology should be undertaken, as co-infections are increasingly notified in metropolitan Perth. The WA [Silver Book](#) provides recommendations on STI screening for people who are asymptomatic and STI testing among people with compatible symptoms.

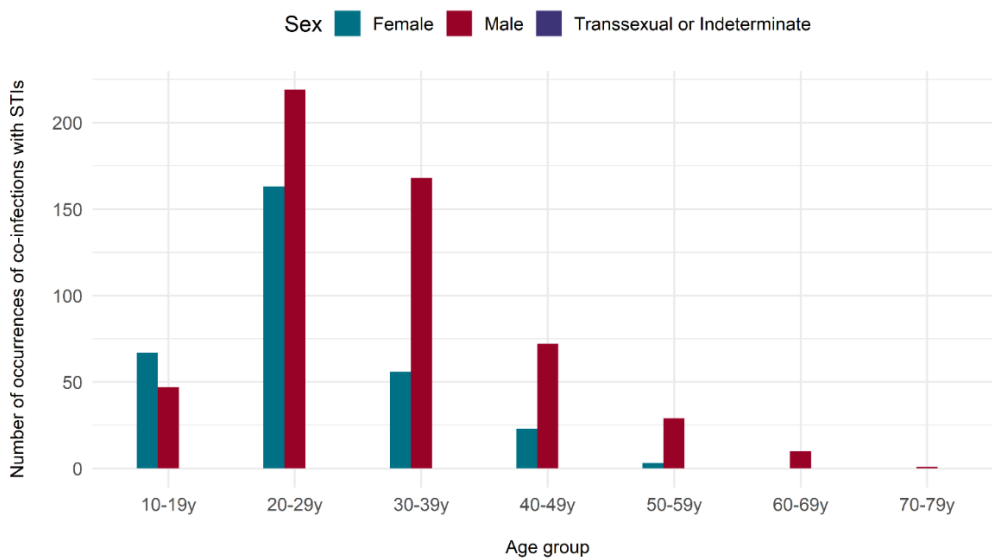


Figure 6: Number of occurrences of co-infections with STIs in metropolitan Perth in 2023 grouped by age group and sex.

Blood-borne viruses

Hepatitis C elimination in Australia - inequity may be the greatest barrier

There were 694 notifications for hepatitis C in Perth in 2023; a 17.6% decrease from 2016 (the year direct-acting antivirals became widely available in Australia), but an increase from the 588 notifications in 2022. In contrast to the general decrease in notifications observed among the non-Aboriginal population in recent years, notifications among Aboriginal people are increasing (**Figure 7**) and now comprise nearly a third (30.3%) of all cases. Most cases (70.5%) are men, and 31.3% were diagnosed upon testing in the criminal justice system.

The number of infections deemed to be newly acquired (within 2 years) has increased significantly from 51 notifications in 2022, to 120 notifications in 2023. This is largely an artefactual change, with Boorloo PHU commencing verification of these classifications from January 2023. The lower numbers in previous years should be interpreted with caution as these are impacted by under-counting.

For cases with newly acquired infections, 79.4% were men, 45.4% were Aboriginal, the median age at diagnosis was 30.8 years of age, and 63.9% were within the criminal justice system at the time of notification. The WA Department of Justice has a hepatitis C testing and treatment program which contributes to the high levels of case ascertainment in that setting.



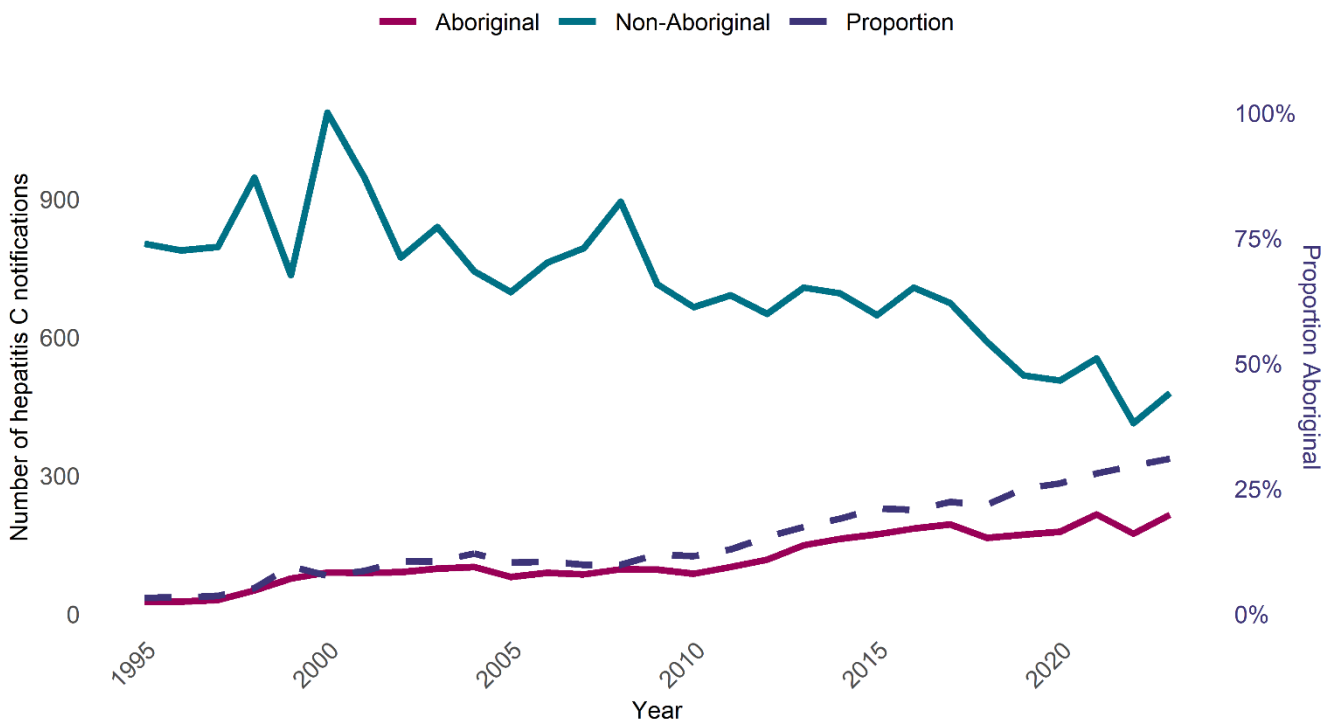


Figure 7: Number of hepatitis C notifications in Perth over time, 1995-2023, by Aboriginal status; dashed line in purple represents the proportion of all notifications (% , right axis) identifying as Aboriginal.

Positive results from a hepatitis C pilot program

From January to June 2023, Boorloo PHU piloted proactive public health follow-up of hepatitis C notifications for the first time. Support was provided to both clinicians and patients, with the aim of actively connecting eligible patients to RNA testing and/or commencement of antivirals. The intervention was applied to 209 notifications in this period and was successful in increasing the hepatitis C RNA testing rates from 82% to 92%, and treatment rates from 79% to 85%.

By extending this intervention throughout 2023, Boorloo PHU augmented the proportion of cases known to be either cleared or treated, from 74% (n=293) to 85% (n=334). The pilot program underscored the significant role that PHUs can play in monitoring and maintaining the momentum towards the elimination of hepatitis C (**Figure 8**).



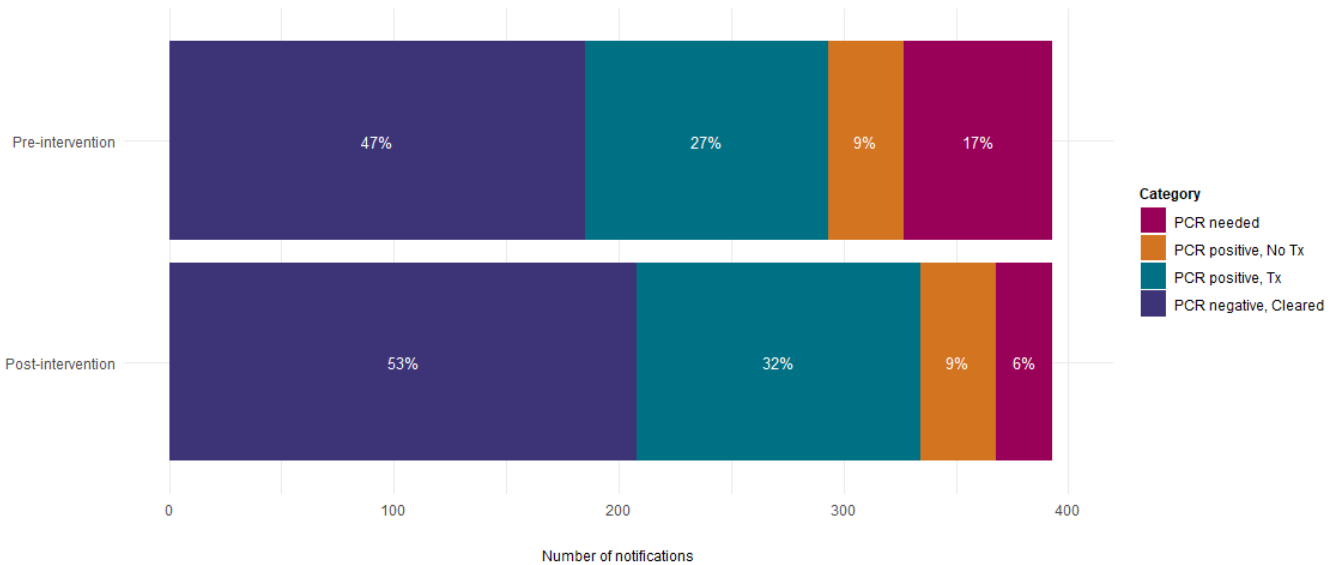


Figure 8: Impact of Boorloo PHU active hepatitis C case follow-up, pre-intervention compared with post-intervention, for all of 2023. 'Cleared' refers to either spontaneous self-clearance of virus, or previous treatment.

Hepatitis B – increasing local acquisition

There were 440 notifications of hepatitis B in Perth in 2023, an increase from the 352 cases in 2022 but broadly steady with the previous 5-year average of 414 cases per year. In comparison with the year 2000, which is when hepatitis B vaccination was added to the National Immunisation Program, there has been a 23.2% reduction in case numbers, most prominently in people under 40 years of age.

Of the total notifications in 2023, 16 (3.6%) were newly acquired hepatitis B infections, all among unvaccinated individuals. New infections were more common among men than women, and the majority of cases were in the 30-59 year-old age bracket, which corresponds with the age group less likely to have received immunisations in childhood. Nine of the 16 newly acquired infections (56%) were among individuals born in Australia, and half were thought to have been acquired in WA. There appears to be an increase in people acquiring hepatitis B locally, with unprotected sex and intravenous drug use the primary risk factors.

Respiratory pathogens

Influenza - second highest notifications in a decade

Boorloo PHU recorded 15,875 notifications of influenza in 2023. This was the second highest number of notifications in the last 10 years (only 2019 was higher, at 18,483 notifications), and was 106.6% higher than the 5-year average pre-COVID-19. The higher numbers may be due in part to increased availability and access to PCR testing for respiratory pathogens. Influenza notifications peaked in June with 4,864 notifications that month (**Figure 9**). Influenza A accounted for 11,889 of notifications (of which 85.4% were unspecified, and 11.7% were H1N1). There were 3,948 Influenza B infections, and 38 samples were not genotyped.



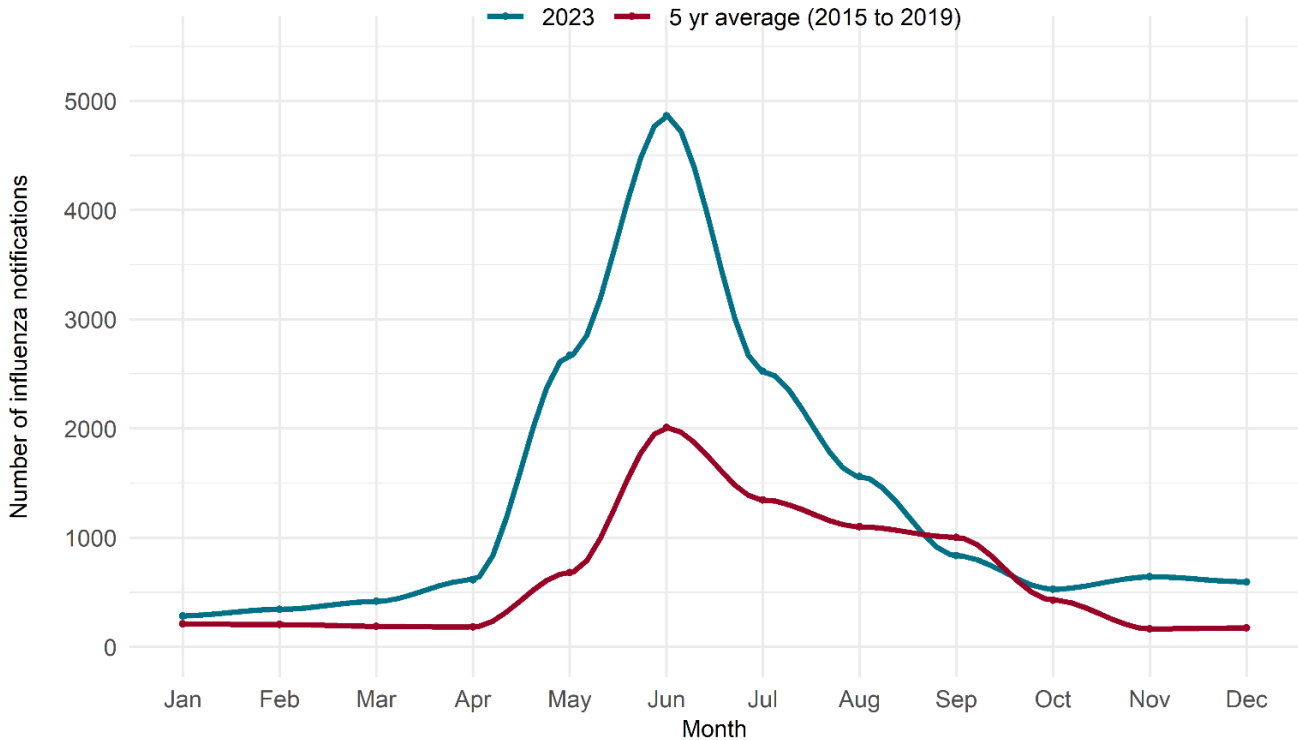


Figure 9: Number of influenza notifications in Perth by month for 2023 and 5-year average (2015 to 2019).

Institutional outbreaks of respiratory illness – above historical average

Residential aged care homes (RACH) reported 529 suspected acute respiratory infection outbreaks to Boorloo PHU in 2023. This includes suspected outbreaks of COVID-19, influenza, and other respiratory pathogens. This was a decline from the 790 outbreaks reported in 2022 but remains a substantial increase from the 5-year average pre-COVID-19, of 54 outbreaks per year. In 2023, COVID-19 was detected in 447 outbreaks (84.5%), and influenza in 31 (5.9%). The number of influenza outbreaks in RACH were considerably lower than experienced in 2019 despite similarly high influenza activity in the community. The change was likely due to a combination of public health measures used to mitigate transmission in RACH, including strengthening of facility infection control planning, increased use of personal protective equipment, and physical distancing and visitor restrictions.

SARS-CoV-2 wastewater surveillance - an indication of COVID-19 in the community

The WA Wastewater Surveillance Program regularly samples and tests untreated sewage from multiple collection sites around Perth to detect the concentration of viral fragments of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).³ This surveillance allows an assessment of COVID-19 prevalence in the community, and detection of Variants of Concern.¹⁷

The SARS-CoV-2 variants from wastewater samples taken from January to December 2023 in Perth are displayed in **Figure 10**. All variants are of the Omicron lineage, with the predominant



subvariants being BA.2.75.X in the first quarter of 2023, XBB.X(Other) in the second and third quarter, and EG.5.X in the final quarter of 2023.

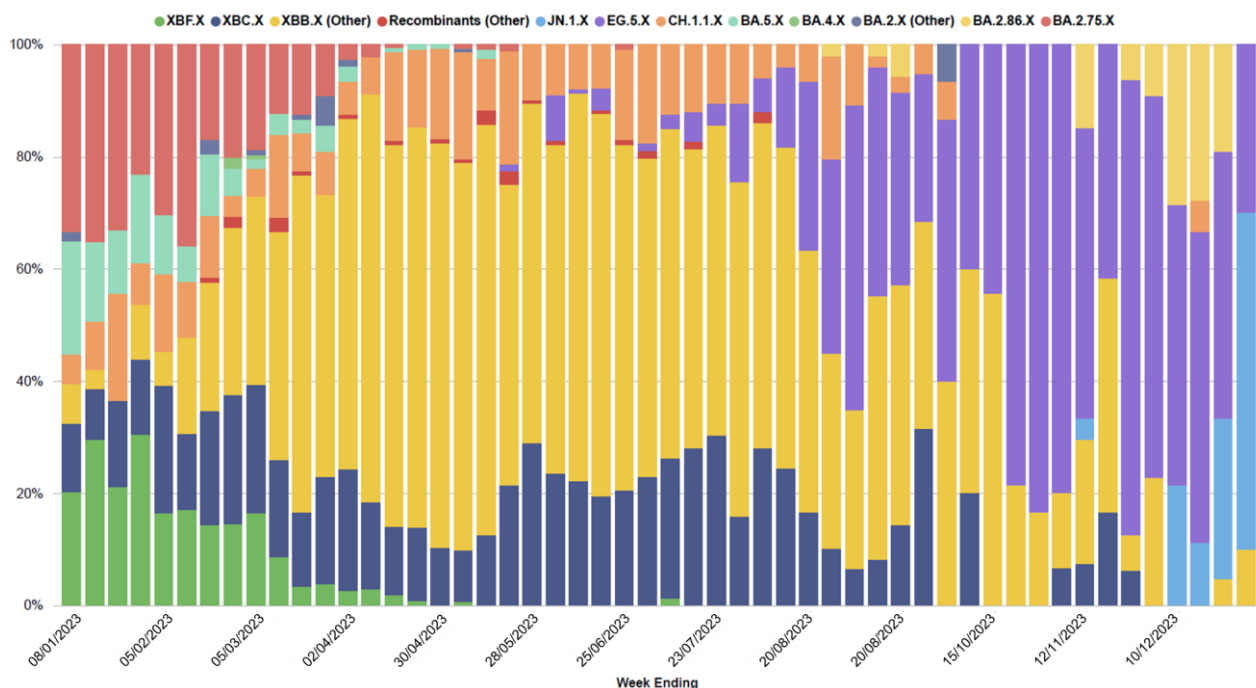


Figure 10: Distribution of SARS-CoV-2 variants in wastewater samples from Perth, July 2022 to January 2024. CDCD, WA DOH.

The 14-day rolling average of wastewater genome copies per sample of SARS-CoV-2 is displayed in **Figure 11a**, alongside the 14-day rolling average of reported COVID-19 cases per 100,000 population.³ The wastewater concentration trend shows periods of high community case load of COVID-19 during 2023, alternating with periods of low community case load.³

COVID-19 case notifications diverged from wastewater SARS-CoV-2 genome concentrations when changes were made to COVID-19 in 2022. On the 4th of November 2022 mandatory RAT registration for the WA community was revoked,¹⁸ and on the 9th October 2023 the RAT register was withdrawn and all reported cases were from PCR samples only.¹⁹ As a result, case ascertainment was greatly reduced, and genome concentrations in wastewater suggested far greater case numbers than could be inferred from notification data.

In addition to case notifications and wastewater concentrations, a further marker of COVID-19 activity is the number of reported RACH outbreaks of COVID-19 (**Figure 11b**). Over the course of 2023, the number of outbreaks mirrors the trend demonstrated by the 14-day rolling average of wastewater concentrations more closely than notification data.



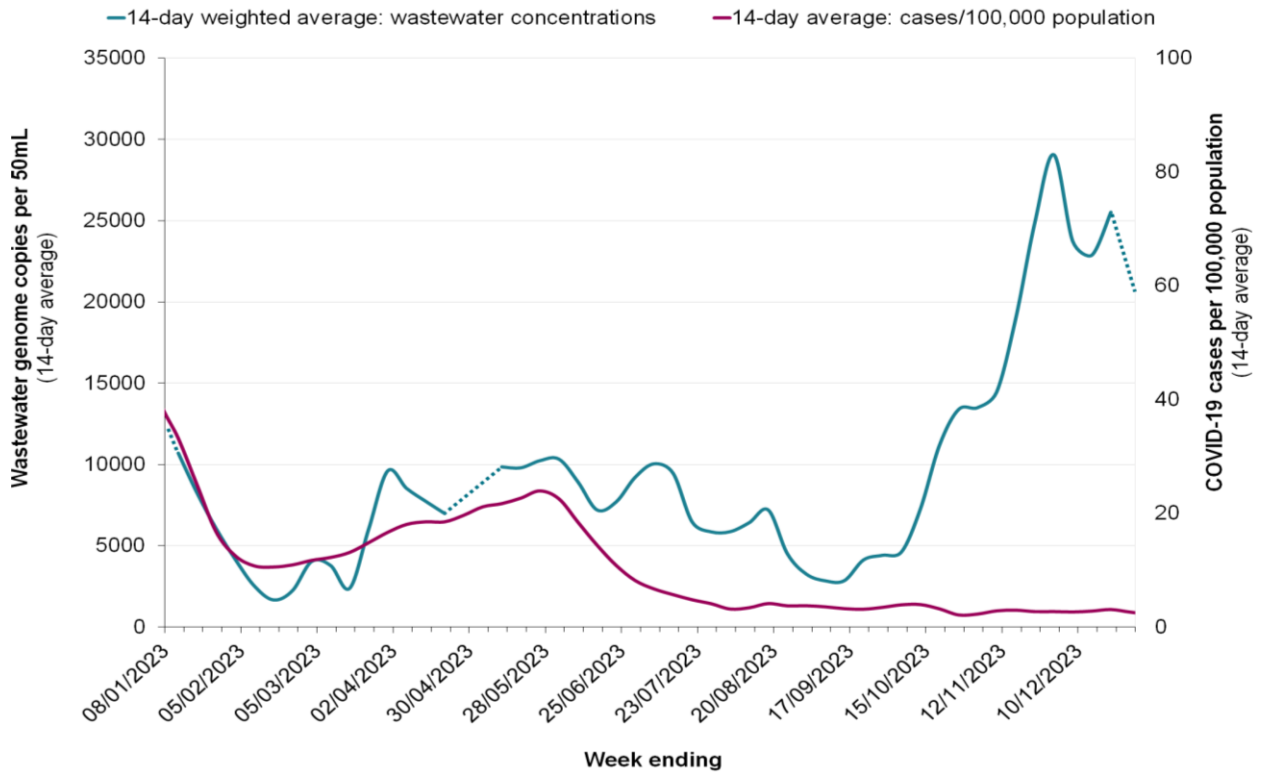


Figure 11a: SARS-CoV-2 wastewater surveillance trends and reported COVID-19 cases in Perth, WA, 01/01/2023 to 31/12/2023. CDCD, WA DOH.

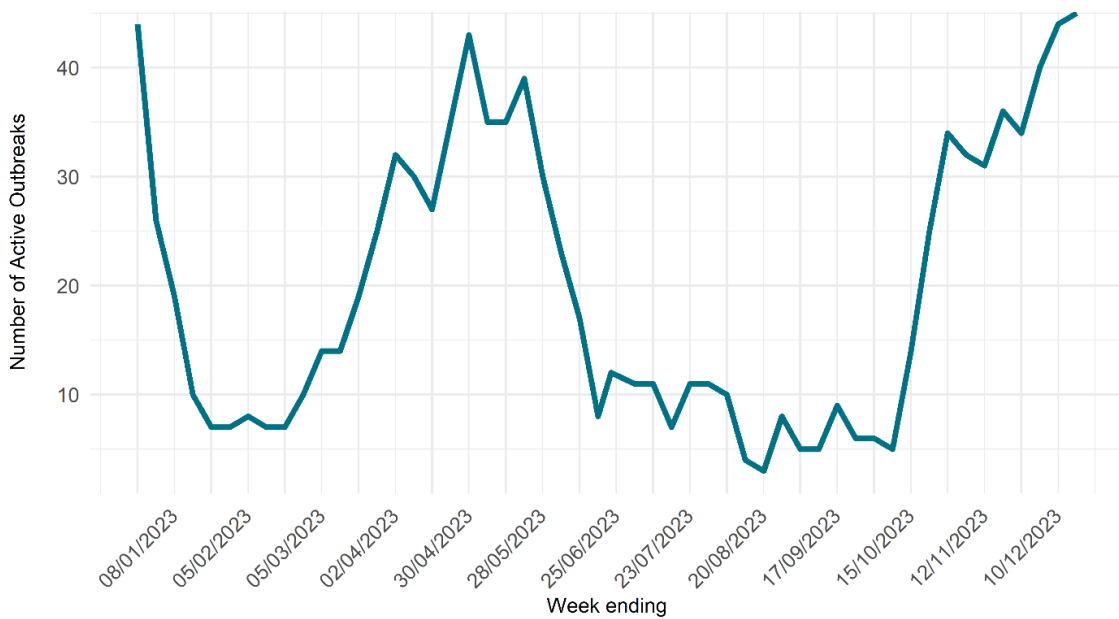


Figure 11b: Reported COVID-19 outbreaks in RACH across Perth, WA, 01/01/2023 to 31/12/2023.



Vaccine-preventable diseases

Measles - the impact of declining vaccination coverage felt worldwide

There were six measles notifications in Perth in 2023, an increase from zero cases notified in the previous two years. Two cases were acquired in Indonesia, two in Romania, one in India, and one case was a contact of one of the above cases. Four cases were unvaccinated, one had an unknown vaccination history, and one was fully vaccinated albeit more than 20 years prior to diagnosis. Breakthrough infections may occur infrequently in fully vaccinated individuals.²⁰

An increase in measles cases across the world has led to greater numbers of cases among returned travellers. The World Health Organization (WHO) reported a 79% increase in measles cases and a 59% rise in large-scale outbreaks in 2023 as compared to 2022. Large outbreaks were observed in several countries frequented by Australian travellers. Specifically, Indonesia reported 3,200 cases, and India reported 12,301 cases from July to December 2023.²¹ Further compounding the risk, more than 61 million doses of measles-containing vaccine were missed or postponed between 2020 and 2022 as a result of COVID-19-related delays.²¹ WA Health continues to offer a free measles, mumps, rubella (MMR) immunisation for adults born after 1965 who have not already received two documented doses of a measles-containing vaccine.

Invasive meningococcal disease – all time low case numbers

In 2023, there were 4 notifications of invasive meningococcal disease (IMD) in Perth, a decrease compared to the 14 notifications in 2022, and the lowest since surveillance commenced (Figure 13).

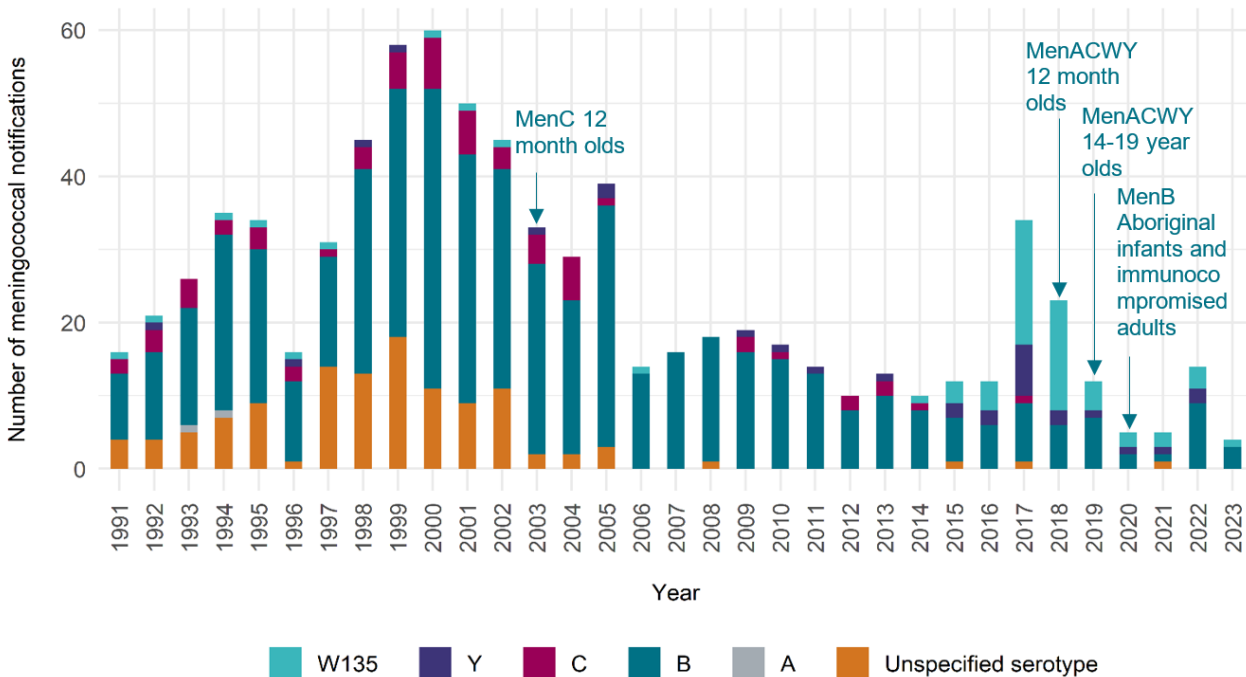


Figure 13: Number of invasive meningococcal disease notifications, 1991 – 2023, by serotype.



All IMD cases were under 40 years of age, with zero cases in Aboriginal people. Serogroup B (3 notifications) and serogroup W135 (1 notification) were responsible for the meningococcal notifications in 2023. Two cases of serogroup B and one case of W135 were identified as not having received vaccinations.

Invasive pneumococcal disease - highest numbers on record

Invasive pneumococcal disease (IPD) describes a spectrum of clinical conditions including bacterial pneumonia, meningitis and sepsis that are caused by the different serotypes of *Streptococcus pneumoniae*, some of which are vaccine preventable. Many countries described a decline in cases during the COVID-19 pandemic, with a subsequent increase following the removal of social restrictions.²²⁻²⁴ This appears to be in keeping with the epidemiology of cases in Perth, where case numbers reached historically low levels in 2020 and have steadily risen since (**Figure 14**). In 2023, 165 cases were recorded, which was the highest on record, and a 42.0% increased above the 10-year average from 2012 to 2022 (116 notifications).

Of notifications in 2023, 11.0% were among Aboriginal people. The age of cases ranged from 0 to 95 years, with 24.4% of notifications in children under 5 years of age. The most common serotypes causing IPD in Perth in 2023 were serotypes 3, 19F, 19A, and 8. These serotypes have all caused cases in Perth in recent years, with 3, 19F and 8 also prominent in 2022.

Overall, 46.3% of IPD notifications were unvaccinated and a further 8.5% were partially vaccinated. Of the unvaccinated IPD notifications, 19.7% were for PCV 7 serotypes, 27.6% were for PCV13 serotypes (less PCV7), 32.9% were for PPV23 serotypes (less PCV13) and 17.1% were for non-vaccine serotypes.

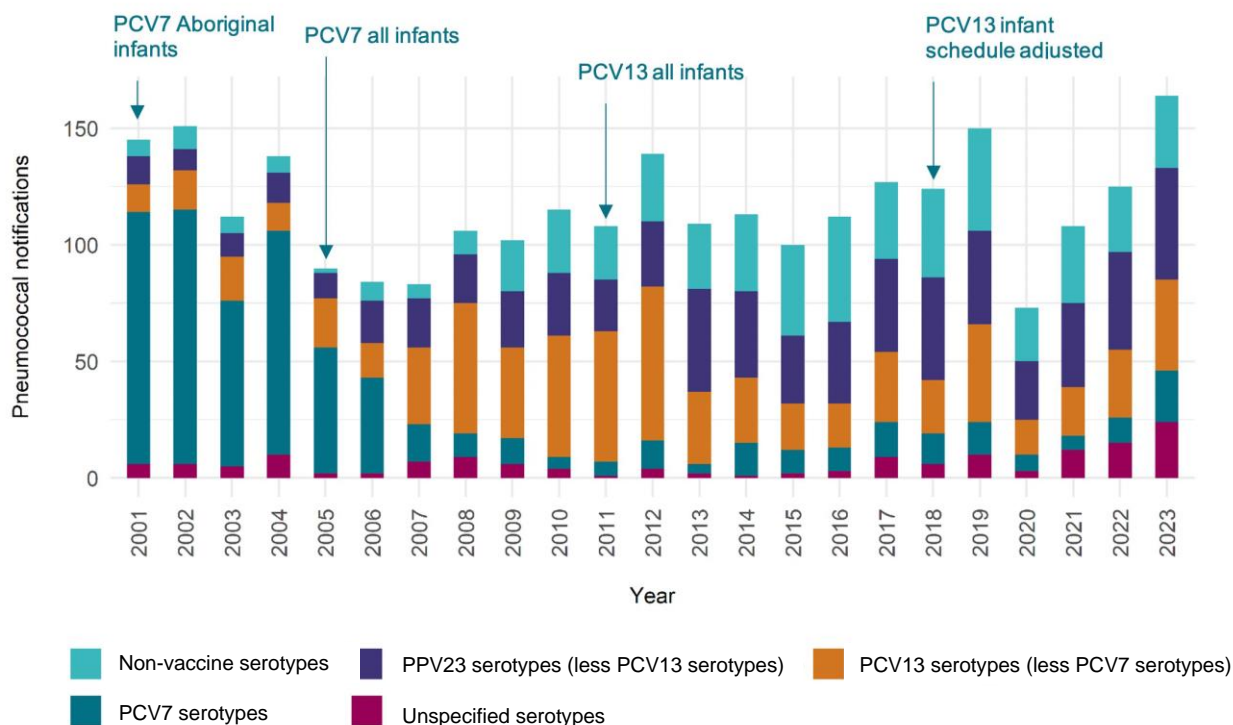


Figure 14: Number of IPD notifications since becoming notifiable in 2001, by serotype.



Pertussis - concerning vaccination rates in pregnancy

In 2023, there were 56 notifications for [pertussis](#) in Perth, a small increase from the low case numbers observed in 2020-2022. Pertussis is endemic in Perth, and numbers of notifications have previously demonstrated cyclical peaks (**Figure 15**). This periodicity has been altered in the past decade, with the most recent peak observed in 2011-2012. It was hypothesized that COVID-19 restrictions contributed to lower notifications in 2020 and 2021 however notifications did not increase following the easing of restrictions, despite the rapid increases observed for other respiratory notifiable diseases.

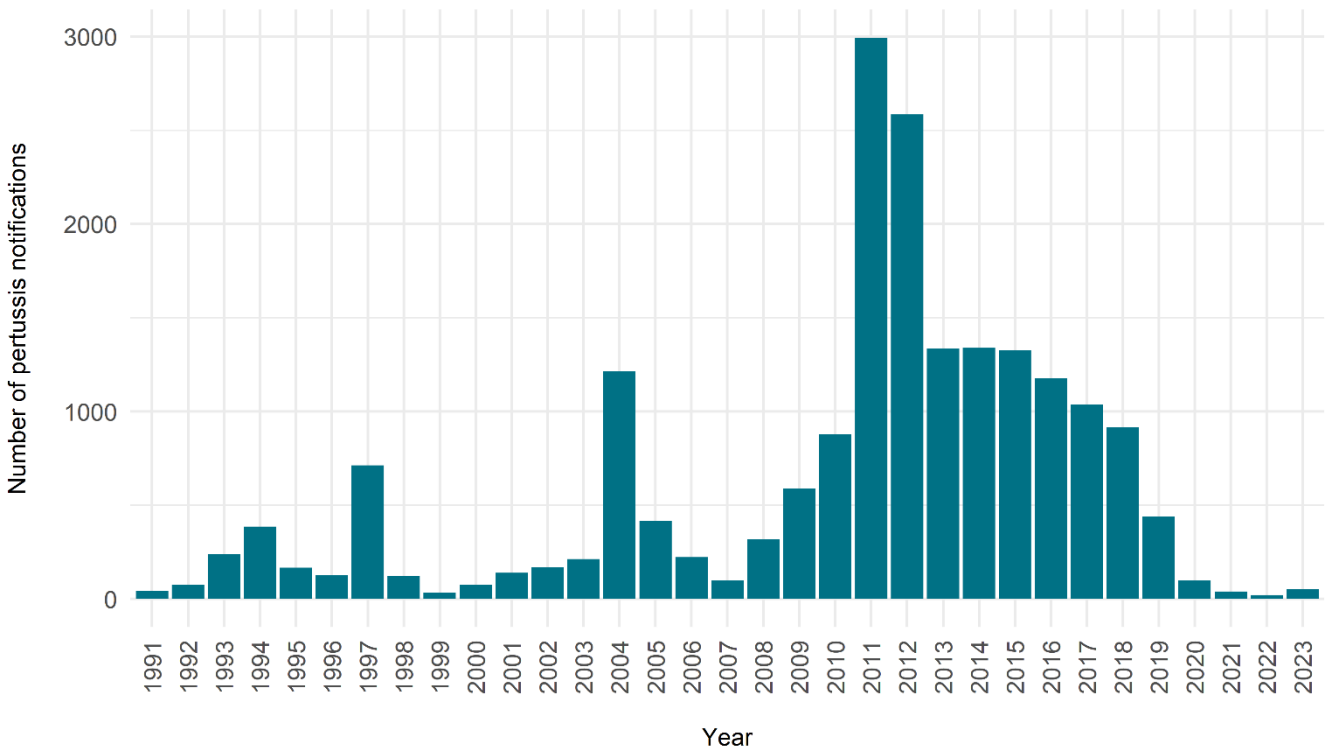


Figure 15: Number of pertussis notifications in Perth by year.

There were zero notifications for pertussis in infants under 6 months of age in 2023, as was the case in 2022. Infants under 6 months are at higher risk of more severe pertussis disease, as they are yet to receive all 3 doses of the primary vaccination course. Pertussis immunisation during pregnancy (recommended since 2013, between 20 to 32 weeks gestation) is important as the placental transfer of maternal antibodies helps to provide early protection to infants.

Rates of pertussis immunisation in pregnancy have declined in WA. In 2023, only 69.3% of pregnant women received a pertussis-containing vaccine during pregnancy; a decrease from the 76.9% recorded in 2020 (**Figure 16**).²⁵ However, an increase in unknown vaccination status since 2020 limits comparability. A recent review of immunisation acceptance for pregnant women suggested that a healthcare provider recommendation for immunisation was the biggest facilitator, whereas maternal concerns regarding safety of immunisations in pregnancy were the most prominent barrier. Given the low incidence of pertussis in the community since 2020, it is plausible that a low perceived risk of infection combined with vaccine fatigue post-pandemic has impacted the likelihood of immunisation acceptance.^{26,27}



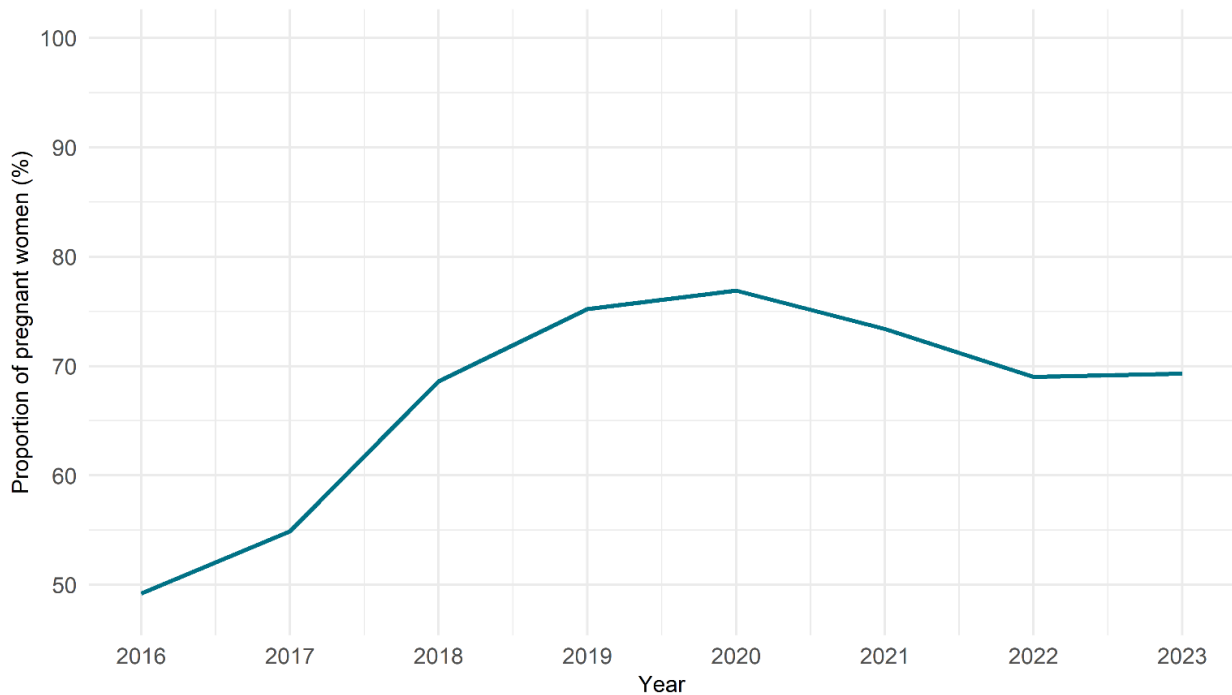


Figure 16: Percentage of pregnant women vaccinated for pertussis during pregnancy in WA by year.

Two cases of diphtheria

In 2023, Boorloo PHU received two notifications for diphtheria. Both cases were the cutaneous form of diphtheria, with bacteria isolated from wounds with negative respiratory samples. One case was caused by toxigenic *Corynebacterium ulcerans* and the other by toxigenic *Corynebacterium diphtheriae*. One infection was acquired locally, and one likely originated in South-East Asia. One case was considered fully vaccinated for diphtheria, and the other was unvaccinated. Both cases required a short admission in hospital and received antibiotics. Catch up immunisation and clearance antibiotics were arranged for close contacts.

Rubella identified during investigations for anterior uveitis

Three detections of rubella were obtained during ophthalmological workup for anterior uveitis. The uveitis is thought to be as a result of a past infection with rubella.²⁸ None of the cases were vaccinated or had acute symptoms of infection. These cases do not confer a risk of transmission to others.



Enteric diseases and food outbreaks

Gastroenteritis in childcare, schools and residential aged care

Boorloo PHU receives notifications of gastroenteritis outbreaks from childcare centres, schools, and RACH in Perth. Advice is provided to facilities on the collection of specimens, hygiene precautions and cleaning, and isolation requirements. Across Perth in 2023, 42 gastroenteritis outbreaks in childcare centres were reported (a 23.5% increase from the 34 outbreaks in 2022), and 3 outbreaks in schools were reported.

Across RACH in Perth, 103 gastroenteritis outbreaks were reported, an increase from the 47 outbreaks in 2022. Among these, 74 (71.8%) were attributed to norovirus. Other organisms implicated in RACH outbreaks in 2023 included rotavirus, Campylobacter and Aeromonas species. In total, there were 44 hospitalisations across all RACH gastroenteritis outbreaks, and 15 deaths.

Return of travel-related enteric notifications

There were 5,576 notifications for enteric diseases in Perth in 2023, 28% greater than the 4,354 notifications on average observed annually in the previous 5 years (2018-2022). Among this increase were important predominantly travel-related infections such as hepatitis A, typhoid and paratyphoid, which more than doubled from 2022 levels (**Figure 17**), correlating with the return of overseas travel after COVID-19 travel restrictions eased. Most cases were returned travellers from India (70%) and Pakistan (10%). The enteric disease that contributed the greatest number of notifications was Campylobacteriosis, which caused 69% of notified enteric infections in 2023. A list of key enteric infections by place of acquisition is presented in **Figure 18**.

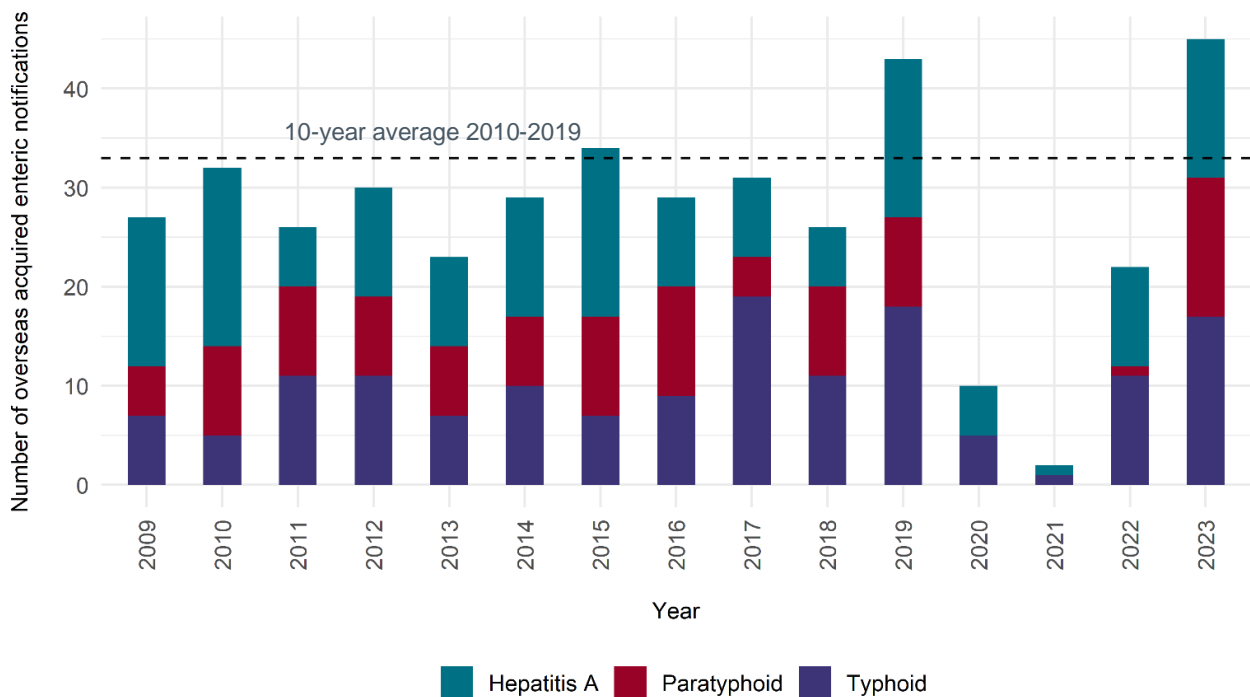


Figure 17: Number of overseas acquired enteric notifications in Perth actively managed by public health (typhoid, paratyphoid and hepatitis A), by year, with the 10-year average between 2009 and 2019 (dotted line).



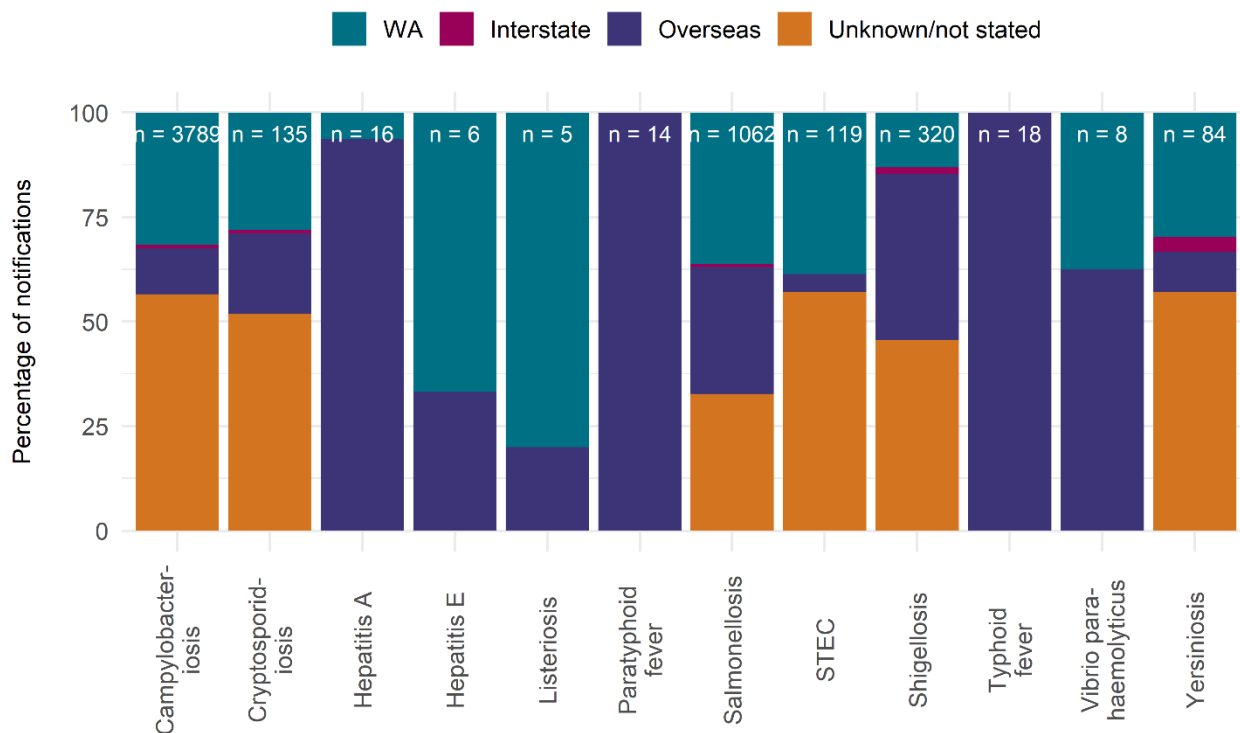


Figure 18: Enteric disease by place of acquisition in 2023; STEC= Shiga-toxin producing Escherichia coli.

Shigella notifications show sharp increase

Shigellosis is caused by one of four species of Shigella bacteria and is transmitted by the faecal-oral route.²⁹ Shigella notifications have risen sharply in 2023, with more than 3 times the number of cases diagnosed in 2022. Historically, from 2001 to 2019, Australia observed a trend of increasing Shigella notifications, particularly within the Aboriginal population.²⁹ The increasing use of multiplex PCR tests has been suggested as contributing to the increase during this period,²⁹ though an increase in disease activity is also probable. At present, *S. dysenteriae* is actively followed up by Boorloo PHU (3 notifications in 2023), and *S. flexneri*, *S. boydii* and *S. sonnei* are followed up by Ozfoodnet if multi-drug resistance is detected.

Vector-borne diseases

Murray Valley encephalitis acquisition in northern Australia

Boorloo PHU received one notification of Murray Valley encephalitis (MVE) in 2023; the first since 2018. The infection was likely acquired in northern Australia. MVE illness can be severe and potentially fatal and is transmitted by mosquitoes (generally *Culex annulirostris*). Flavivirus activity was detected in mosquitoes and sentinel chicken flocks in northern WA in 2023. Sentinel chicken flocks are used by WA DOH to provide an early warning system for mosquito-borne virus activity. Currently, there are no vaccines against MVE. The only effective protection against infection is to take precautions to avoid mosquito bites.³⁰



Emerging and newly notifiable diseases

Mpox update – evolving epidemiology, sporadic cases in Perth

Mpox is a zoonotic disease that is endemic to West and Central Africa with regular cases identified in humans since the 1970s.³¹ Mpox illness is typically mild, with most cases recovering within a few weeks.³² Outside of Africa, transmission has primarily occurred through contact with infected animals including rodents and primates.³¹ However, in 2022, sustained human to human transmission of clade II mpox was observed, triggering a global outbreak across 116 countries.³³ During this outbreak, transmission was most commonly through sexual contact (83.1%).³⁴ For cases with data on sexual behaviour, 85.1% identified as men who have sex with men.³⁴

Globally, there has been a vast reduction in the incidence of mpox since the latter half of 2022. However, a contrasting trend was observed in the WHO Western Pacific and South-East Asia regions. The Western Pacific Region, of which Australia is a member, reported the highest number of cases (1,982 cases) across all WHO regions from July to December 2023, primarily due to high case numbers in China. In this period, Thailand, Vietnam, and Indonesia also ranked among the top 10 high incidence countries globally.³⁵

In 2023, 12 mpox cases were notified in Australia,³⁴ with 3 cases in WA. All cases were acquired overseas without onward local transmission. Given the persistence of transmission in countries frequented by Australian travellers, clinicians are recommended to stay up-to-date on the public health testing recommendations for mpox.³⁶

iGAS update - CDNA guideline released

Invasive Group A streptococcus (iGAS) is defined as the isolation of Group A streptococcus from a normally sterile site and can present in various ways, including severe potentially fatal disease (sepsis, necrotising fasciitis and streptococcal toxic shock syndrome). In 2023, the Communicable Diseases Network Australia (CDNA) published a National guideline for PHUs on iGAS disease, alongside an updated surveillance case definition.³⁷ In July 2023, prior cases were reviewed to ensure consistency with this definition. Despite a more stringent case definition, notifications in Perth increased from 129 in 2022 (revised total) to 166 in 2023. Of these 56.1% were male and 7.7% were Aboriginal. Ages of the cases ranged from 3 months to 100 years, with those aged 70-79 years being the most affected group.

When managing an iGAS notification, Boorloo PHU focuses on identifying household and close contacts who are at higher risk of disease, and provides education and advice. Other priorities include ensuring birthing person and neonate pairs are given prophylactic antibiotics, and identifying clusters or outbreaks, which would lead to an escalation of public health management to contain and manage the outbreak.



Immunisation

Annual immunisation data summary

Immunisation coverage for children in Perth in 2023 was 92.3% at 12 months of age, 90.5% at 24 months of age, and 93.2% at 60 months of age (see **Figure 19A**). For Aboriginal children in Perth, immunisation coverage was 84.7% at 12 months of age, 83.6% at 24 months of age, and 94.0% at 60 months of age.

Immunisation coverage in metropolitan Perth exceeded the target of 90% across all age-cohorts in 2023 (Western Australian Immunisation Strategy 2016-23)³⁸ but fell just short of the national benchmark of 95% coverage.³⁹

There are 33 Local Government Areas (LGA) in metropolitan Perth. Appendix 2 shows the immunisation coverage in each of the age cohorts by LGA in 2023. Bassendean and Mosman Park achieved over 95% coverage in the 12 month-old cohort, while Bassendean and Kwinana achieved over 95% coverage in the 60 month-old cohort.

Annual immunisation coverage for children at 12, 24 and 60 months of age was calculated as the number of children 'fully immunised' according to AIR (see **Appendix 3**) divided by the number of children enrolled with Medicare (as reported by AIR), annualised based on quarterly AIR coverage reports.

Metropolitan immunisation coverage over time

Figure 19B present the trends in immunisation coverage for Aboriginal and all children across metropolitan Perth from 2016 to 2023. Compared to 2022, coverage improved among Aboriginal children at 24 and 60 months of age in 2023, with increases of 1.4% and 2.3% respectively. A decline of 3.3% was observed in coverage among Aboriginal children at 12 months of age in 2023.

A persistent disparity in immunisation coverage was observed between Aboriginal children and the overall child population at both 12 and 24 months of age. Specifically, the immunisation coverage for Aboriginal children was 7.6% lower than the total child population at 12 months of age, and this gap slightly decreased to 6.9% at 24 months of age. This underscores the need for targeted interventions to bridge this immunisation gap.

Boorloo PHU undertook [several programs in 2023](#) which aim to close the gap in coverage between Aboriginal and non-Aboriginal children. In addition, Boorloo PHU are collaborating with Telethon Kids Institute in the investigation of barriers to immunisation uptake in the Aboriginal community in Perth in a project titled Moort Vax Waangkiny: Understanding reasons for routine vaccine uptake among Aboriginal children aged <5 years in Perth (Boorloo).



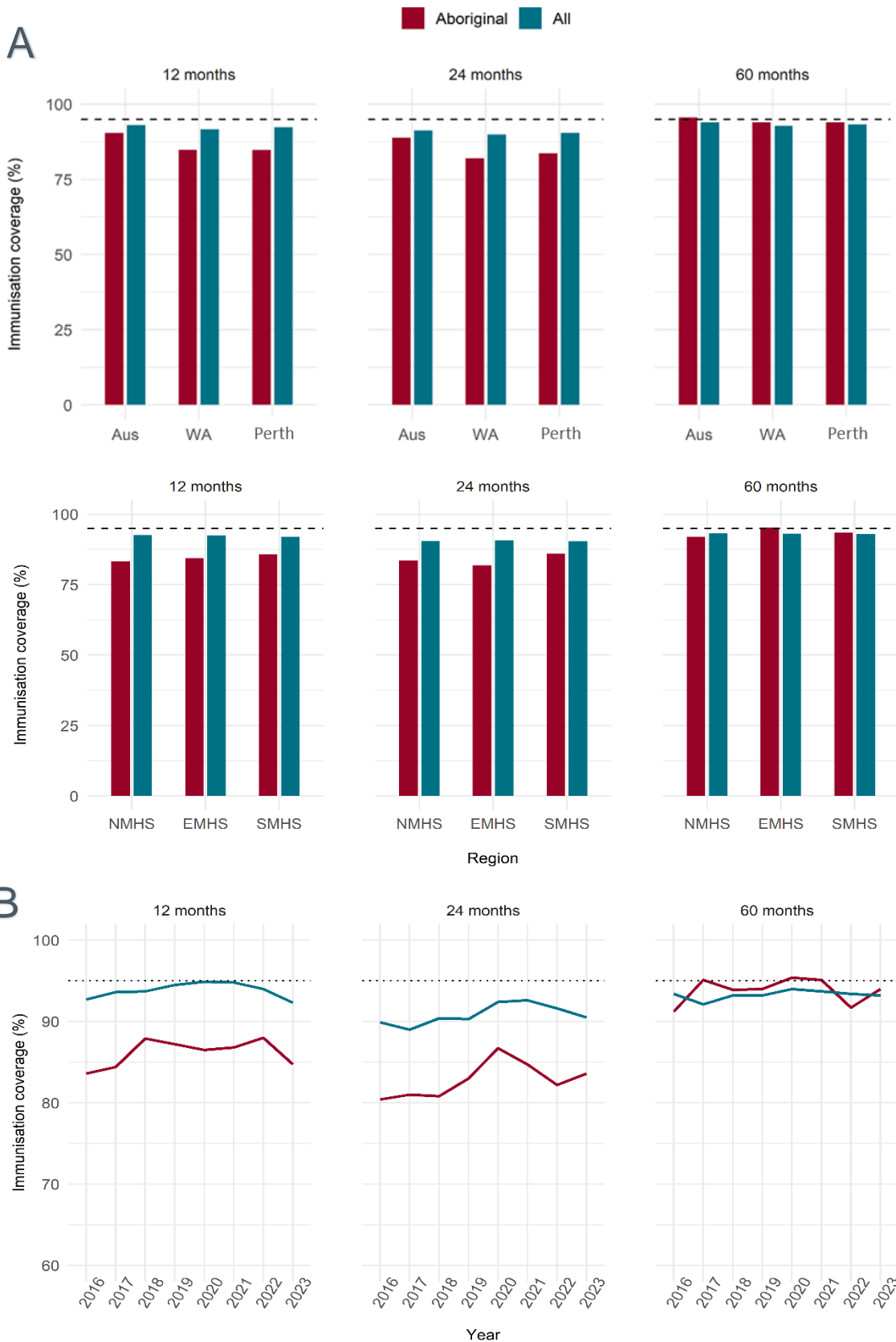


Figure 19 (A): Immunisation coverage by age cohort and region in 2023. (B): Perth metropolitan coverage by age cohorts and year. Dotted lines represent 95% benchmark for immunisation coverage in Australia.



Immunisation projects for priority groups

The **Moorditj Start** metropolitan-wide program commenced in March 2023 and provides culturally-safe support to families of Aboriginal infants, supporting them to commence the immunisation schedule on time. Both reminders and practical supports (including transport, appointment booking and home visiting) can be offered. The program is supported by the **Koorlongka packs** project, through which 616 immunisation promotional packs were delivered to families via maternity hospitals. In 2023, Moorditj Start followed-up 707 families when their child reached 6 weeks of age. Among the families successfully contacted, 31% were linked with an immunisation provider, of which 84% requested that Boorloo PHU book the appointment; and 8% requested a home visit. Of the families successfully contacted, 89% of children received their first dose of diphtheria-tetanus-pertussis immunisation on time.

The **Moorditj Kids** program continues to support Aboriginal families whose children are overdue for immunisation, and offers a culturally-safe home visiting service staffed by Aboriginal health liaison officers and immunisation nurses. In 2023, 1,004 families were followed-up; among those successfully contacted, 40% were linked with an immunisation provider, and 35% requested a home visit.

The **Moorditj Teens** program aims to address the gap in coverage of human papillomavirus (HPV) vaccine for Aboriginal adolescents. The program offers reminders, booking, transport and home visiting for 13-year old Aboriginal adolescents in year 8 who have not received HPV immunisation. In 2023, 362 families were followed-up; among those successfully contacted, 54% were linked with an immunisation provider, and 19% requested a home visit.

As a part of the **Priority Communities Project**, Boorloo PHU actively follows up children who are overdue for immunisation in local government areas with low immunisation coverage. Support is also provided for children who are not up-to-date prior to pre-school or childcare enrolment. Boorloo PHU followed up 877 children in low coverage areas in 2023 and supported an additional 1,293 children with pre-school entry requirements.

Immunisation catch-ups

Individuals who have not received their immunisations as per the WA Immunisation Schedule are recommended to follow an appropriate catch-up schedule as soon as possible. Immunisation catch-ups are available at no cost for Australian residents under 20 years of age, and for the HPV vaccine, the age limit extends to under 26 years. Boorloo PHU produces immunisation catch-up plans for immunisation providers in Perth. In 2023, 963 catch-up plans were developed by Boorloo PHU, a 48% increase from 2022.

Cold chain breaches

A cold chain breach is defined as vaccine storage temperatures outside the recommended range. Perth immunisation providers are required to notify Boorloo PHU of cold chain breaches affecting government-funded vaccines. Boorloo PHU provides advice on whether vaccines should be discarded, based on multiple factors, including the nature of the breach, the cumulative breach time and the vaccines involved. Boorloo PHU managed a total of 463 cold chain breaches in 2023. In rare cases, where vaccines have already been administered, Boorloo PHU can support providers with revaccination advice.



Immunisation providers are required to perform a vaccine cold chain management self-audit at least once every 12 months. Boorloo PHU collaborates closely with more than 1000 metropolitan immunisation providers to assist with this process. This self-audit evaluates specific criteria aligned with [National Vaccine Storage Guidelines 'Strive for 5'](#). Following completion of the survey, providers receive automated feedback, while the Boorloo PHU Immunisation Team Clinical Nurse Specialist provides customised follow-up, including targeted education, where needed.

Rabies and Australian Bat Lyssavirus post-exposure prophylaxis

Boorloo PHU provides advice to doctors and practice nurses regarding post-exposure prophylaxis (PEP) for rabies, and authorises the use of WA DOH-funded supplies according to national guidelines. In 2023, Boorloo PHU ordered 206 courses of rabies PEP. The rate of rabies PEP of 9.0 per 100 000 population in 2023 was similar to recent pre-COVID-19 years (9.3 per 100 000 population in 2018 and 11.1 per 100 000 in 2019).

In 2023, as in recent years, Indonesia was the country with the highest proportion of rabies-prone exposures (45.6%), with dogs (50.5%) and monkeys (23.3%) being the most commonly-implicated animals. Notably, Bali was the region in Indonesia where most of these exposures occurred (93.6%). Additionally, 13.1% of exposures occurred in Thailand, and 10.2% in the Philippines and India. Bat exposures in Australia accounted for the 8 local rabies-prone injuries.

Table 3: Persons sustaining rabies prone injuries, by animal and location, notified in 2023.

Country of exposure	Cat	Dog	Fruit Bat	Monkey	Other	Total
Australia	0	0	8	0	0	8
Belize	0	1	0	0	0	1
Bhutan	1	2	0	0	0	3
Cambodia	0	1	0	0	0	1
China	3	1	0	0	0	4
India	4	17	0	0	0	21
Indonesia	7	38	6	40	3	94
Malaysia	1	4	0	3	0	8
Nepal	0	1	0	0	0	1
Philippines	8	13	0	0	0	21
South Africa	0	2	0	0	0	2
Sri Lanka	2	3	0	0	0	5
Thailand	9	14	0	4	0	27
Turkey	1	1	0	0	0	2
Viet Nam	1	5	0	1	0	7
Zimbabwe	0	1	0	0	0	1
Total	37	104	14	48	3	206



Reference:

1. Department of Justice, Government of Western Australia. Public Health Act 2016. Accessed February 14, 2024. https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_13791_homepage.html
2. Department of Health, Government of Western Australia. Notification of infectious diseases and related conditions. Accessed February 14, 2024. https://www.health.wa.gov.au/Articles/N_R/Notification-of-infectious-diseases-and-related-conditions
3. Department of Health, Government of Western Australia. COVID-19 wastewater surveillance. Accessed February 13, 2024. https://www.health.wa.gov.au/articles/a_e/coronavirus/covid19-wastewater-surveillance
4. Australian Government Department of Health and Aged Care. National Communicable Disease Surveillance Dashboard. Accessed May 10, 2024. <https://nindss.health.gov.au/pbi-dashboard/>
5. Regional population, 2022-23 financial year | Australian Bureau of Statistics. March 26, 2024. Accessed March 26, 2024. <https://www.abs.gov.au/statistics/people/population/regional-population/latest-release>
6. Australian Bureau of Statistics. National, state and territory population, June 2023. December 14, 2023. Accessed February 14, 2024. <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release>
7. AIR Stewardship, Data Quality and Use, Immunisation and Communicable Disease Branch, Population Health Division, Primary and Community Care Group, Department of Health and Aged Care, Australian Government. Data use approval: Australian Immunisation Register (personal communication) on 10 May 2024.
8. Births, Australia, 2022 | Australian Bureau of Statistics. October 31, 2023. Accessed July 30, 2024. <https://www.abs.gov.au/statistics/people/population/births-australia/latest-release>
9. Australian Bureau of Statistics. Regional population, 2021. August 31, 2023. Accessed September 27, 2023. <https://www.abs.gov.au/statistics/people/population/regional-population/2021>
10. Metropolitan Communicable Disease Control. *MCDC Syphilis Response Team: Introduction and Overview*. Metropolitan Communicable Disease Control; 2024.
11. Health Protection Surveillance Centre. 2023 News Archive: Gonorrhoea and chlamydia notifications increase nationally. September 28, 2023. Accessed February 12, 2024. <https://www.hpsc.ie/news/newsarchive/2023newsarchive/title-23442-en.html>
12. European Centre for Disease Prevention and Control. Communicable disease threats report, 18-24 June 2023, week 25. June 22, 2023. Accessed February 12, 2024. <https://www.ecdc.europa.eu/en/publications-data/communicable-disease-threats-report-18-24-june-2023-week-25>
13. Australian Government Department of Health and Aged Care. Gonococcal infection – CDNA National Guidelines for Public Health Units. Australian Government Department of Health and Aged Care. February 12, 2020. Accessed January 17, 2024. <https://www.health.gov.au/resources/publications/gonococcal-infection-cdna-national-guidelines-for-public-health-units?language=en>
14. Department of Health, Government of Western Australia. Gonorrhoea. Accessed December 27, 2023. <https://www.health.wa.gov.au/Silver-book/Notifiable-infections/Gonorrhoea>
15. Department of Health, Government of Western Australia. Chlamydia. Accessed July 3, 2024. <https://www.health.wa.gov.au/Silver-book/Notifiable-infections/Chlamydia>
16. Department of Health, Government of Western Australia. Syphilis. Accessed July 3, 2024. <https://www.health.wa.gov.au/Silver-book/Notifiable-infections/Syphilis>



17. Australian Government Department of Health and Aged Care. SARS-CoV-2 Wastewater Surveillance CDNA National Strategy. Australian Government Department of Health and Aged Care. December 11, 2023. Accessed February 14, 2024. <https://www.health.gov.au/resources/publications/sars-cov-2-wastewater-surveillance-cdna-national-strategy?language=en>
18. Department of Health, Government of Western Australia. COVID-19 State of Emergency ceases in WA - what it means for you. Accessed February 14, 2024. <https://www.healthywa.wa.gov.au/News/2022/COVID-19-State-of-Emergency-ceases-in-WA>
19. Department of Health, Government of Western Australia. *Virus WAtch - Week Ending 11 February 2024.*; 2024. Accessed February 28, 2024. https://www.health.wa.gov.au/~/_media/Corp/Documents/Health-for/Infectious-disease/VirusWAtch/2024/20240211-virus_watch.pdf
20. Fappani C, Gori M, Canuti M, et al. Breakthrough Infections: A Challenge towards Measles Elimination? *Microorganisms*. 2022;10(8):1567. doi:10.3390/microorganisms10081567
21. Centers for Disease Control and Prevention. Global Measles Outbreaks. December 8, 2023. Accessed December 28, 2023. <https://www.cdc.gov/globalhealth/measles/data/global-measles-outbreaks.html>
22. Bertran M, Amin-Chowdhury Z, Sheppard CL, et al. Increased Incidence of Invasive Pneumococcal Disease among Children after COVID-19 Pandemic, England. *Emerg Infect Dis*. 2022;28(8):1669-1672. doi:10.3201/eid2808.220304
23. Khongyot T, Moriyasu T. Invasive Pneumococcal Disease diminish during the onset of COVID-19 in Japan between 2019 and 2022. *Int J Infect Dis*. 2022;122:307-309. doi:10.1016/j.ijid.2022.05.064
24. Perniciaro S, van der Linden M, Weinberger DM. Reemergence of Invasive Pneumococcal Disease in Germany During the Spring and Summer of 2021. *Clin Infect Dis*. 2022;75(7):1149-1153. doi:10.1093/cid/ciac100
25. Department of Health, Government of Western Australia. Pertussis vaccination. Accessed February 14, 2024. https://www.health.wa.gov.au/Reports-and-publications/Western-Australias-Mothers-and-Babies-summary-information/data?report=mns_pertv_y
26. Qiu X, Bailey H, Thorne C. Barriers and Facilitators Associated With Vaccine Acceptance and Uptake Among Pregnant Women in High Income Countries: A Mini-Review. *Front Immunol*. 2021;12:626717. doi:10.3389/fimmu.2021.626717
27. Su Z, Cheshmehzangi A, McDonnell D, da Veiga CP, Xiang YT. Mind the “Vaccine Fatigue.” *Front Immunol*. 2022;13. doi:10.3389/fimmu.2022.839433
28. Quentin CD, Reiber H. Fuchs heterochromic cyclitis: rubella virus antibodies and genome in aqueous humor. *American Journal of Ophthalmology*. 2004;138(1):46-54. doi:10.1016/j.ajo.2004.02.055
29. Ibrahim AF, Glass K, Williamson DA, et al. The changing epidemiology of shigellosis in Australia, 2001–2019. *PLoS Negl Trop Dis*. 2023;17(3):e0010450. doi:10.1371/journal.pntd.0010450
30. New Murray Valley encephalitis case prompts mosquito warning for the Kimberley. Accessed March 27, 2024. <https://www.health.wa.gov.au/Media-releases/2023/July/New-Murray-Valley-encephalitis-case-prompts-mosquito-warning-for-the-Kimberley>
31. Centers for Disease Control and Prevention. About Mpox. September 26, 2023. Accessed December 28, 2023. <https://www.cdc.gov/poxvirus/mpox/about/index.html>
32. Australian Government Department of Health and Aged Care. Mpox (monkeypox). December 19, 2022. Accessed December 28, 2023. <https://www.health.gov.au/diseases/monkeypox-mpox>



33. World Health Organization. Multi-country outbreak of mpox, External situation report #31. December 22, 2023. Accessed December 28, 2023. <https://www.who.int/publications/m/item/multi-country-outbreak-of-mpox--external-situation-report-31---22-december-2023>
34. World Health Organization. *2022-23 Mpox (Monkeypox) Outbreak: Global Trends.*; 2023. https://worldhealthorg.shinyapps.io/mpx_global/#2_Global_situation_update
35. World Health Organization. Mpox (monkeypox) outbreak 2022. January 25, 2024. Accessed December 28, 2023. <https://www.who.int/emergencies/situations/monkeypox-oubreak-2022>
36. Department of Health, Government of Western Australia. Mpox (monkeypox). February 6, 2023. Accessed February 21, 2024. https://www.health.wa.gov.au/Articles/J_M/Monkeypox
37. Australian Government Department of Health and Aged Care. Invasive Group A Streptococcal (iGAS) Disease – CDNA National guidelines for Public Health Units. Australian Government Department of Health and Aged Care. January 15, 2024. Accessed February 13, 2024. <https://www.health.gov.au/resources/publications/invasive-group-a-streptococcal-igas-disease-cdna-national-guidelines-for-public-health-units?language=en>
38. Western Australian Immunisation Strategy 2016-23. Accessed July 4, 2024. <https://www.health.wa.gov.au/Reports-and-publications/Immunisation-strategy>
39. Australian Government Department of Health and Aged Care. Childhood immunisation coverage. April 8, 2024. Accessed July 11, 2024. <https://www.health.gov.au/topics/immunisation/immunisation-data/childhood-immunisation-coverage>
40. Australian Government Department of Health and Aged Care. Method to calculate childhood immunisation coverage rates. August 27, 2021. Accessed June 25, 2024. <https://www.health.gov.au/topics/immunisation/immunisation-data/childhood-immunisation-coverage/method-to-calculate-childhood-immunisation-coverage-rates>



Appendix

Appendix 1: Communicable disease notification rate by geographical health service area

Notifiable Disease	2023 notification rate per 100 000 population					
	North	East	South	Metro	WA	National
Blood-borne disease						
Hepatitis B (newly acquired)	0.4	0.9	0.8	0.7	0.8	0.3
Hepatitis B (unspecified)	13.9	22.6	18.7	18.4	17.3	19.9
Hepatitis C (newly acquired)	1.6	4.5	9.8	5.2	2.6	3.3
Hepatitis C (unspecified)	12.1	30.7	32.5	24.9	29.1	25.6
Hepatitis D	0	0.3	0	0.1	0.1	0.3
Enteric diseases						
Campylobacteriosis	166.2	156.7	169.7	164.1	169	155.5
Cholera	0	0	0	0	0	<0.1
Cryptosporidiosis	7.8	5.8	3.7	5.8	7.3	13.9
Hepatitis A	0.3	0.9	1	0.7	0.6	0.8
Hepatitis E	0.3	0.1	0.4	0.3	0.2	0.1
Listeriosis	0.4	0.1	0.1	0.2	0.2	0.3
Paratyphoid fever	0.4	0.8	0.7	0.6	0.5	0.5
Salmonellosis	51.1	40.5	46.3	46	50.4	42.7
Shiga toxin-producing E.coli	4.3	6.1	5.1	5.2	7.6	3.5
Shigellosis	14.2	14.3	13	13.9	14.5	11
Typhoid fever	0.5	1.4	0.4	0.8	0.8	1.1
Vibrio parahaemolyticus	0.4	0.3	0.4	0.3	0.3	NN
Yersiniosis	3.5	3.5	3.9	3.6	3.4	NN
Sexually transmitted infections						
Chlamydia	383.6	511.1	428.8	441.5	453.5	412.8
Lymphogranuloma venereum	0	0	0	0	0	NN
Gonorrhoea	122.7	190.1	134.4	149.4	165.9	151.8
Syphilis (infectious)	12.2	26.6	15.6	18.2	24.4	24.5
Syphilis (non-infectious)	4.8	10.6	4.6	6.7	9	10.6
Syphilis (congenital)	16.3*	19.0*	13.3*	16.0*	12.7*	6.7*
Vaccine preventable diseases						
Diphtheria	0	0.3	0	0.1	0.1	<0.1
Haemophilus influenzae type B	0	0	0	0	0	<0.1
Influenza	769.6	653.6	634.2	687.4	741	1085
Measles	0.4	0.4	0	0.3	0.2	0.1
Meningococcal disease (invasive)	0.4	0	0.1	0.2	0.3	0.5
Mumps	0.1	0.1	0	0.1	0.1	0.5
Pertussis	2.8	1.6	2.9	2.4	2.7	9.2
Pneumococcal disease (invasive)	6.7	7.8	6.9	7.1	9.2	8.5



Rotavirus	31.2	32.2	33	32.1	31.9	31.6
Rubella	0.3	0	0.1	0.1	0.1	<0.1
Tetanus	0	0	0	0	0	<0.1
Varicella-Zoster	209.6	197.3	206	204.2	202.6	129.6
Vector-borne diseases						
Murray Valley encephalitis virus	0	0	0.1	0	0.2	0.1
Kunjin/West Nile virus	0	0	0	0	0	<0.1
Japanese encephalitis virus	0	0	0	0	0	0
Barmah Forest virus	0.1	0.1	0.8	0.3	1.2	1.3
Chikungunya virus	0.3	0.3	0.6	0.3	0.3	0.2
Dengue virus	6.2	6.7	8.2	7	7.3	4.2
Malaria	1.6	2.7	1.1	1.8	1.9	1.5
Rickettsial disease (typhus)	1.5	1	0.8	1.1	1.2	NN
Ross River Virus	2.8	4	13.3	6.5	11.1	6.4
Zika	0	0	0	0	0	NN
Zoonotic diseases						
Leptospirosis	0.3	0.4	0	0.2	0.3	0.5
Psittacosis	0	0	0	0	0	0.2
Q Fever	0	0.4	0	0.1	0.3	2.1
Other diseases						
Brucellosis	0	0	0	0	0	0.1
Botulism	0	0	0	0	0	<0.1
Creutzfeldt-Jakob disease	0.4	0.1	0.3	0.3	0.2	NN
Haemolytic uraemic syndrome	0	0	0.3	0.1	0.1	0.1
Legionellosis	2.3	1.6	3.2	2.3	3	2.5
Leprosy	0	0	0	0	0	<0.1
Melioidosis	0.1	0.3	0	0.1	0.3	NN
Tuberculosis	6.2	8.6	4.3	6.4	5.6	5.4
Invasive Group A Streptococcus	5.5	8.8	7.2	7.2	9.6	10.5
Acute Post-Streptococcal Glomerulonephritis	0.1	0.1	0	0.1	0.6	NN
Respiratory Syncytial Virus	404.9	353	319.3	360.3	368.5	480.8

Data were retrieved from WANIDD; disease rows were excluded where no cases occurred locally, statewide, and nationally in the past 5 years. Data for COVID-19, rheumatic heart disease, antibiotic resistant organisms and HIV are collected and managed separately. NN=not notifiable; <0.1 denotes a number less than 0.1 that would otherwise be rounded to zero. Varicella-Zoster includes chickenpox and shingles as well as those unspecified. Congenital syphilis rates are presented per 100,000 births (* denotes that numbers of births for Perth, WA and Australia are from 2022 data)⁸.



Appendix 2: Immunisation coverage by Local Government Area in 2023

Local Government Area (LGA)	Age Group	Immunisation coverage for all children (%)
Armadale	12 months	91.50
	24 months	91.64
	60 months	94.36
Bassendean	12 months	95.42
	24 months	93.15
	60 months	91.12
Bayswater	12 months	93.25
	24 months	90.52
	60 months	92.42
Belmont	12 months	92.74
	24 months	89.83
	60 months	92.18
Cambridge	12 months	93.30
	24 months	88.19
	60 months	93.44
Canning	12 months	93.56
	24 months	90.49
	60 months	93.44
Claremont	12 months	91.00
	24 months	88.39
	60 months	92.31
Cockburn	12 months	92.64
	24 months	91.21
	60 months	93.72
Cottesloe	12 months	83.87
	24 months	89.04
	60 months	88.89
East Fremantle	12 months	92.86
	24 months	90.32
	60 months	87.50
Fremantle	12 months	89.76
	24 months	87.18
	60 months	92.02
Gosnells	12 months	91.94
	24 months	90.61
	60 months	92.53



Joondalup	12 months	93.32
	24 months	90.60
	60 months	93.54
Kalamunda	12 months	91.21
	24 months	90.04
	60 months	92.82
Kwinana	12 months	93.69
	24 months	92.65
	60 months	96.48
Mandurah	12 months	90.79
	24 months	88.18
	60 months	90.67
Melville	12 months	92.82
	24 months	92.43
	60 months	93.20
Mosman Park	12 months	≥ 95.00*
	24 months	92.55
	60 months	93.18
Mundaring	12 months	88.94
	24 months	84.46
	60 months	90.95
Murray	12 months	89.57
	24 months	87.67
	60 months	91.56
Nedlands	12 months	94.94
	24 months	92.59
	60 months	94.12
Peppermint Grove	12 months	NP*
	24 months	NP*
	60 months	NP*
Perth	12 months	90.91
	24 months	84.66
	60 months	83.11
Rockingham	12 months	90.79
	24 months	89.34
	60 months	92.78
Serpentine-Jarrahdale	12 months	90.44
	24 months	90.86
	60 months	93.22



South Perth	12 months	92.31
	24 months	92.38
	60 months	90.86
Stirling	12 months	92.91
	24 months	90.79
	60 months	93.44
Subiaco	12 months	92.18
	24 months	90.64
	60 months	96.34
Swan	12 months	93.61
	24 months	91.15
	60 months	94.35
Victoria Park	12 months	94.55
	24 months	91.90
	60 months	93.39
Vincent	12 months	93.48
	24 months	92.80
	60 months	93.75
Wanneroo	12 months	91.90
	24 months	90.72
	60 months	93.12
Waroon	12 months	87.80
	24 months	85.71
	60 months	89.13

*The following data suppression rules have been applied to protect the privacy of individuals as per the requirements of AIR data publication:⁷

1. Not Published (NP) indicates the number of individuals for that row is less than 25.
2. ≥ 95.00 indicates that the number of individuals for that row is between 25 and 100, and the coverage rate for that population is equal to or greater than 95%.
3. ≥ 99.00 indicates that the number individuals for that row is greater than 100, and the coverage rate for that population is equal to or greater than 99%.



Appendix 3: AIR criteria for determining whether a child is classified as fully vaccinated

To be considered fully vaccinated:⁴⁰

A 12-<15 month old child requires three doses of **diphtheria, tetanus and pertussis vaccine**, polio, and hepatitis B vaccines; two or three doses of **Haemophilus influenza type b**; and two doses of pneumococcal vaccine.

A 24-<27 month old child requires four doses of **diphtheria, tetanus and pertussis vaccine**; three doses of polio, hepatitis B, and pneumococcal vaccines; three or four doses of **Haemophilus influenza type b**; two doses of **MMR**; one dose of **meningococcal C** and varicella vaccines.

A 60-<63 month old child requires a record on the AIR of dose 4 or 5 of a **diphtheria, tetanus and pertussis** containing vaccine; and dose 4 of a polio containing vaccine.



Appendix 4: List of acronyms used in this report

AIR:	Australian Immunisation Register
CaLD:	Culturally and Linguistically Diverse
CDCD:	Communicable Disease Control Directorate
CDNA:	Communicable Diseases Network Australia
DOR:	Date of receipt
EMHS:	East Metropolitan Health Service
ERP:	Estimated resident population
HIV:	Human immunodeficiency virus
HPV:	Human papillomavirus
iGAS:	Invasive Group A streptococcus
IMD:	Invasive meningococcal disease
IPD:	Invasive pneumococcal disease
LGA:	Local Government Area
MMR:	Measles, mumps, rubella vaccine
MVE:	Murray Valley encephalitis
NMHS:	North Metropolitan Health Service
NN:	Not notifiable
NNDSS:	National Notifiable Diseases Surveillance System
ODOO:	Optimal date of onset of disease
PCR:	Polymerase chain reaction
PEP:	Post-exposure prophylaxis
PHU:	Public health unit
RACH:	Residential aged care home
RAT:	Rapid antigen test
RSV:	Respiratory syncytial virus
SMHS:	South Metropolitan Health Service
SRT:	Syphilis Response Team
STI:	Sexually transmitted infection
WA:	Western Australian
WA DOH:	Western Australian Department of Health
WANIDD:	Western Australian Notifiable Infectious Diseases Database
WHO:	World Health Organisation

