Government of **Western Australia**
Department of **Health**

Review of notifiable infectious diseases in Western Australia, 2022 and 2023

health.wa.gov.au

Acknowledgements

The Communicable Disease Control Directorate appreciates the cooperation and efforts of diagnosing clinicians and laboratories who contribute to the reporting of notifiable infectious diseases. The efforts of the public health nurses and medical practitioners from metropolitan and regional public health units who conduct contact tracing and follow-up of notifiable infectious diseases are also gratefully acknowledged.

Contributors and editors

Alison Brown, Rebecca Hogan, Nevada Pingault, Barry Combs, Kellie Mitchell, Dylan Barth

Contact details

Communicable Disease Control Directorate
Department of Health, Western Australia
PO Box 8172
Perth Business Centre
Western Australia 6849

Telephone: (08) 9222 4222 (switchboard)
Facsimile: (08) 9222 0227
Email: cdcd.directorate@health.wa.gov.au
Web: www.health.wa.gov.au/Health-for/Health-professionals/Communicable-Diseases

Disclaimer

Contents

Executive summary

The Surveillance and Disease Control Program within the Communicable Disease Control Directorate at the Department of Health, manages the surveillance and reporting of notifiable infectious diseases and related conditions (as specified in the Public Health Act 2016) in Western Australia. The purpose of this report is to inform stakeholders, healthcare providers and the public on trends in infectious disease epidemiology in WA in 2022 and 2023.

WA recorded the highest number of notifiable infectious diseases in 2022 and 2023, with 55,152 and 67,358 notifications, respectively, excluding over 1.35 million COVID-19 cases also notified during this period.

The most commonly notified infectious diseases

1. COVID-19: 1,260,163 and 95,376 notifications in 2022 and 2023, respectively
2. Influenza: 14,058 and 21,177 notifications
3. Respiratory syncytial virus: 11,653 and 10,536 notifications
4. Genital chlamydial infections: 11,043 and 12,933 notifications
5. Campylobacteriosis: 4,033 and 4,820 notifications

Acute respiratory infections

- Western Australia experienced sustained community transmission of COVID-19 for the first time since the beginning of the pandemic, following emergence of the Omicron variant and lifting of border restrictions allowing quarantine-free travel in and out of the state.
- Respiratory syncytial virus infection was newly notifiable in 2021 and had its first full year of notifications in 2022, becoming one of the most commonly notified infectious diseases in Western Australia.
- There was a rebound in the number of influenza notifications, after very few cases being notified in 2020 and 2021; after COVID-19, influenza was the most frequently notified infection in both 2022 and 2023.

Enteric diseases

- Campylobacteriosis remained the most commonly notified enteric disease, with increased cases compared to recent years.
- Salmonellosis notifications and outbreaks decreased compared to previous years, with 950 cases notified in 2022 and 1,427 cases notified in 2023. This follows work by the *Salmonella* taskforce to address recurrent outbreaks and widespread contamination of egg farms in Western Australia.
- There was a notable impact of the resumption of international travel on typhoid fever, paratyphoid fever and hepatitis A, with notifications returning to usual low levels after few cases were notified in 2020 and 2021. A clinician alert was distributed to advise medical practitioners of increased notifications of these overseas-acquired infections.

Blood-borne viruses

- Hepatitis B and hepatitis C continued to disproportionately affect Aboriginal people, with an age-standardised rate 2.4 times (hepatitis B) and 13 times (hepatitis C) the rate among non-Aboriginal Western Australians.

Sexually transmitted infections

- The ongoing syphilis outbreak remained a concern, with 804 and 695 notifications of infectious syphilis in 2022 and 2023, and four cases of congenital syphilis each year. While cases of infectious syphilis decreased compared to 2021, notifications remained high and the reduction was not noted across all areas.
- Chlamydial and gonococcal infections both increased, with record high numbers of notifications in 2023; there were 4,727 gonococcal infections notified in 2023, with the crude rate 1.4 times higher than the 2015-19 average rate.
- Although there was an overall decrease in notifications of human immunodeficiency virus infection, there was an increase in the number of cases among Aboriginal people.
- An international outbreak of mpox was declared in 2022, with the infection newly notifiable in Western Australia later that year. Ten cases were notified in Western Australia over the 2022-23 period.

Vaccine-preventable diseases

- Cases of measles continued to be imported by unvaccinated overseas travellers and highlights the importance of vaccination programs. Of the six cases of measles notified in 2023, five were imported by returning overseas travellers, and one secondary case was subsequently acquired in Western Australia.
- There were 19 cases of invasive meningococcal disease notified in 2022 and eight cases notified in 2023, representing an overall downward trend in notifications since 2017, when the MenACWY vaccine was introduced. Meningococcal B was the predominant serogroup among cases notified in 2022 and 2023.

Vector-borne diseases

- Seven cases of Murray Valley encephalitis virus infection were notified over the 2022-23 period, after three years of no cases being reported; two of these cases died from their illness. One case of West Nile (Kunjin) virus infection was also reported in 2023 – the first case notified since 2017.
- No cases of Japanese encephalitis virus were notified in Western Australia since 2018. However, response activities occurred at the state and national level following the emergence of the virus circulating on the east coast of mainland Australia, resulting in human cases. Evidence of Japanese encephalitis virus activity was identified via feral pig detections in the Kimberley in late 2022, and via the sentinel chicken surveillance program in the Kimberley and Pilbara in early 2023.

Zoonotic and other diseases

- There were 161 cases of tuberculosis notified in 2023, after only 100 cases being notified in 2022 – this is thought to be due to a delayed effect of the closure of international borders during the COVID-19 pandemic, followed by a large backlog of immigration from mid-2022. Over 90% of cases were in people born overseas.
- Invasive group A streptococcal disease was newly notifiable in 2022, with 209 notifications in 2022 and 272 notifications in 2023. Rates were highest in the Kimberley region.

Acronyms

Abbreviation	Definition
ABS	Australian Bureau of Statistics
APSGN	Acute post-streptococcal glomerulonephritis
BBV	Blood-borne virus
CDCD	Communicable Disease Control Directorate
CDNA	Communicable Diseases Network Australia
HIV	Human immunodeficiency virus
iGAS	Invasive group A streptococcal disease
IQR	Interquartile range
JEV	Japanese encephalitis virus
NIP	National Immunisation Program
PCR	Polymerase chain reaction
PHOCUS	Public Health Operations COVID-19 Unified System
RACF	Residential aged care facility
RAT	Rapid antigen test
RSV	Respiratory syncytial virus
SORG	Syphilis Outbreak Response Group
STEC	Shiga toxin-producing *Escherichia coli*
STI	Sexually transmitted infection
WA	Western Australia

Introduction

Overview of infectious disease surveillance in WA

This report provides an overview of notifiable infectious diseases and related conditions in Western Australia (WA) reported to the Communicable Disease Control Directorate (CDCD) at the Department of Health during 2022 and 2023. The infectious disease notification system supports disease surveillance in the WA population. This enables the management and control of these diseases and helps to inform, evaluate and improve public health policies and programs.

In WA, the notification of specified infectious diseases is mandated under the Public Health Act 2016[1] and Public Health Regulations 2017.[2] The Act provides the legal framework for the establishment of the list of diseases deemed to be notifiable. In accordance with the Act, it is mandatory for medical and nurse practitioners, and pathology laboratories, to notify cases of specified infectious diseases to the Chief Health Officer.

At the end of 2023, there were 74 notifiable infectious diseases and related conditions in WA, excluding healthcare-associated infections which are not within the scope of this report. The majority of these diseases are also nationally notifiable and have standardised national surveillance case definitions endorsed by the Communicable Diseases Network Australia (CDNA) and available at www.health.gov.au/casedefinitions. A small number of notifiable infectious diseases in WA are not nationally notifiable, for which surveillance case definitions can be found at www.health.wa.gov.au/Articles/N_R/Notification-of-infectious-diseases-and-related-conditions.

Changes to infectious disease surveillance during this reporting period

Invasive group A streptococcal disease (iGAS) was made a notifiable infectious disease in WA in August **2021**, and respiratory syncytial virus (RSV) infection was made a notifiable infectious disease in July **2021**. Both diseases had their first full year of notifications in the period covered by this report.

Monkeypox virus infection (mpox) was made a notifiable infectious disease in May **2022**, and has its first full year of notifications in 2023.

No new conditions were added to the notifiable infectious disease list in **2023**.

Methods

Data storage

Notification data relating to all infectious diseases and related conditions included in this report, with the exception of human immunodeficiency virus (HIV) and COVID-19, are stored on the Western Australian Notifiable Infectious Diseases Database (WANIDD). WANIDD is an intranet-based real-time application and database that stores information on person(s) with notifiable infectious diseases from 1990 onwards. Data-cleaning procedures initiated by the CDCD, in cooperation with the responsible public health units, are conducted regularly to validate as well as maintain the quality and integrity of the data. HIV notifications are stored in the WA HIV Notifications Database, while COVID-19 notifications are stored in the Public Health Operations COVID-19 Unified System (PHOCUS).

Data extraction and cleaning

Data on notifiable diseases for the period 01 January 2022 to 31 December 2023 inclusive were extracted from WANIDD on 01 February 2025, WA HIV database on 10 January 2025 and PHOCUS on 10 February 2025.

All analyses of data for long-term and/or chronic infections such as non-infectious syphilis, HIV, unspecified hepatitis B infection, unspecified hepatitis C infection, Creutzfeldt Jakob disease, leprosy and tuberculosis was exported from WANIDD using the date of receipt of notification, i.e. the date on which the notification was first received by CDCD. Data for all other notifiable diseases were exported using optimal date of onset. This is a composite of the 'true' date of onset provided by the notifying doctor, the date of specimen collection for laboratory notified cases, and when neither of these dates are available, the date of notification by the doctor or laboratory, or the date of receipt of the notification, whichever is earliest is used. For consistency over the 2022-23 period, COVID-19 data was exported from PHOCUS based on the date of first positive test. Because of differences in inclusion criteria or different dates of export, during which time the notification data could have been revised, notification numbers in this report may vary slightly from the numbers reported in quarterly and annual reports published by the CDCD; these minor changes to the data will not substantially affect the overall trends and patterns.

Case inclusion and exclusion

Case counts presented in this report exclude cross-border disease notifications with a usual residential address in another Australian jurisdiction, and cases with a residential address on Cocos or Christmas islands, or in immigration detention centres. Those classified as WA residents, but without a known post code, are excluded from **Appendix Table A2** and **Table A3** (notifications by public health region).

HIV notifications include WA residents and overseas students living in WA, but exclude overseas visitors, interstate residents and cases that have been previously notified in other states or territories. HIV data is described within the report but not presented per region in **Table A2** and **Table A3**.

Although notifiable, cases of acute rheumatic fever and rheumatic heart disease are managed by the WA Rheumatic Heart Disease Register and Control Program and are not included in this report. Further information about acute rheumatic fever and rheumatic heart disease is available at www.health.wa.gov.au/Articles/U_Z/WA-rheumatic-heart-disease-register.

Notifiable infections or colonisation due to *Candida auris*, carbapenemase-producing organisms (*Acinetobacter baumannii*, *Enterobacterales* and *Pseudomonas aeruginosa*), methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci, are also not included within this report. Further information about these predominantly healthcare-associated infections can be found at www.health.wa.gov.au/Articles/F_I/Healthcare-associated-infections.

Disease categories

The 74 notifiable infectious diseases are grouped into eight major disease categories (**Table A1**). Some diseases could potentially fit into more than one category, where this is possible, the most appropriate has been chosen. For example, as per previous annual reports, HIV has

been included among sexually transmitted infections category, as sexual contact is the predominant mode of acquisition in WA.

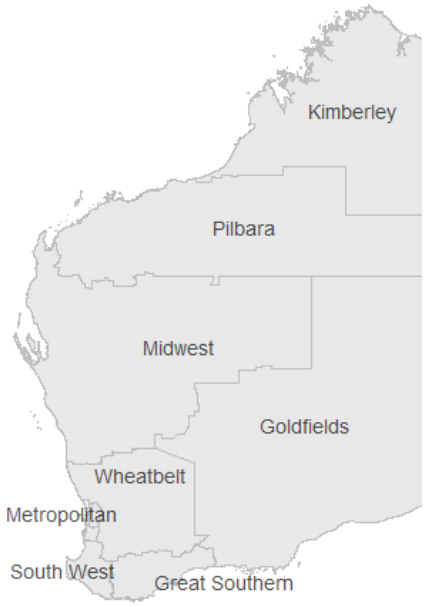
WA population

WA's estimated population denominators used for calculation of rates were obtained from Rates Calculator version 9.5.5.1 (Epidemiology Branch, WA Department of Health). The Rates Calculator provides population estimates by age, sex, Aboriginality, year and area of residence, and is based on population figures based upon 2016 Australian Bureau of Statistics (ABS) Census data. For this report, the population of WA was estimated at 2.67 million people in 2022 and 2.69 million people in 2023.

Aboriginal status

In the 2021 ABS Census, 3.3% of the WA population identified as Aboriginal and/or Torres Strait Islander. For the purposes of this report, the term Aboriginal is used in preference to Aboriginal and Torres Strait Islander to recognise that Aboriginal people are the original inhabitants of WA. Due to the relatively small size of the Aboriginal population in WA, especially in remote regions of the state, inaccuracies in the population estimates for Aboriginal people can have a disproportionate impact on calculated rates. In the preparation of this report, these factors are acknowledged as limitations. Information on Aboriginal status is missing for some notifications. In this report, records with missing Aboriginal status were excluded from analysis by Aboriginal status.

Geographical regions of WA



WA is divided into ten health administrative regions. Three of the regions are in the Perth metropolitan area (north, south and east) and the seven regional areas are Goldfields-Esperance (Goldfields), Great Southern, Kimberley, Midwest-Gascoyne (Midwest), Pilbara, SouthWest and Wheatbelt. For the purposes of this report, the three metropolitan regions have been combined into one metropolitan Perth region.

Within each region, there is a public health unit that is responsible for public health activities, which include follow-up of notifiable infectious disease cases. In metropolitan Perth, the three regions are serviced by one public health unit. In addition, the CDCD is responsible for providing public health and epidemiological advice to public health units and for the follow-up of specified notifiable diseases via OzFoodNet.

Where numbers permitted and regional differences were notable, notification data were analysed and reported by public health region. The residential postcode of the case at the time of disease notification was used to identify the region. The residential postcode may not be representative of the place of acquisition.

Data analysis

Disease notifications were analysed descriptively by number, proportion and rates. Crude notification rates were calculated by dividing the number of notifications of infections within the

relevant population by the total number of people within that population, and were expressed per 100,000 population. Due to differences in age structure, direct age standardisation was used to compare rates of disease between Aboriginal and non-Aboriginal populations.

The rate ratio is the notification rate in the most recent reporting year (2023), compared with the average 5-year crude notification rate from 2015-19. Public health measures in place in WA for most of 2020-2021 due to the COVID-19 pandemic meant much lower rates of disease at this time.

SARS-CoV-2 wastewater surveillance was performed by sampling three metropolitan wastewater treatment plants (Beenyup, Woodman Point and Subiaco) twice a week, which cover 79% of Perth's population. Quantitative analysis was performed on all samples and reported as the estimated SARS-CoV-2 concentration (genome copies/50mL). Wastewater SARS-CoV-2 concentrations were estimated using a specific standard curve to estimate the viral concentration. The estimated 14-day average SARS-CoV-2 concentration in wastewater samples were then compared with the combined, rolling 14-day average COVID-19 case rates per 100,000 population reported for each catchment area. COVID-19 case rates for each catchment area were calculated by dividing the number of COVID-19 cases in the wastewater catchment area by the estimated population within that catchment area.

Limitations

Notifications to the Department of Health are incomplete and will therefore be an underestimate of the true incidence of diseases. Each notification relies on a patient seeking healthcare, performing a diagnostic test, and having that test notified. Cases of disease with no, or mild symptoms, are especially likely to be under reported to public health. Rates of disease are not accurate with small numbers of notifications.

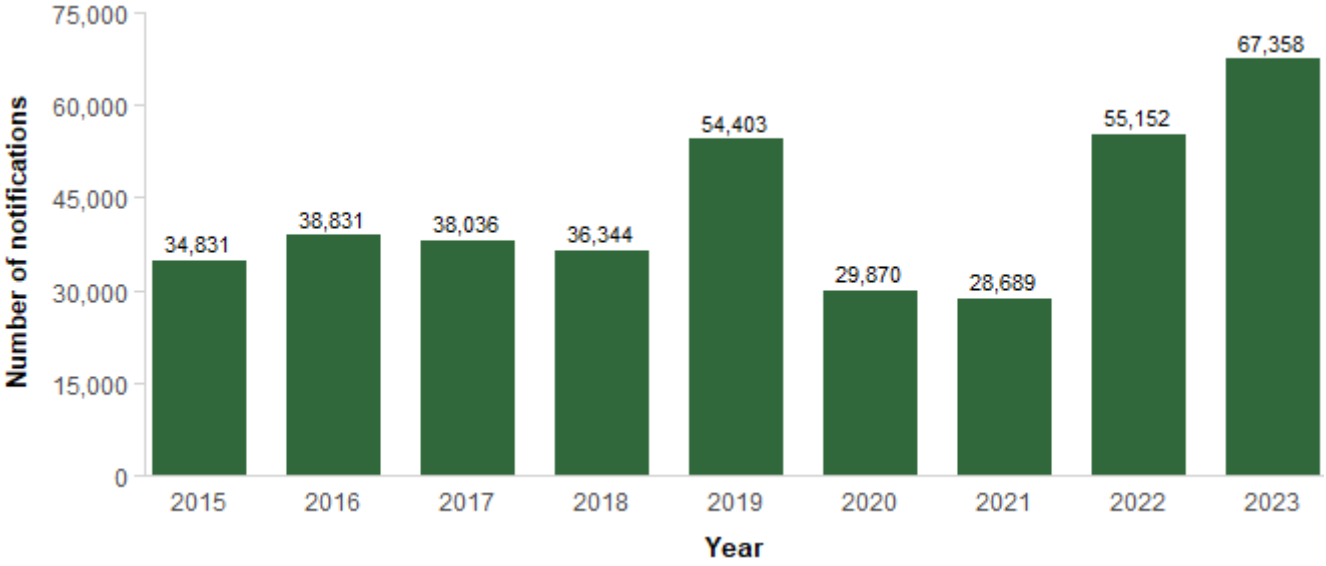
Caution should be exercised when interpreting trends in notifiable infectious disease data over several years, as observed patterns may reflect both true changes in disease transmission, or changes in how cases are detected, classified or reported. Factors that can influence reported data include varying levels of community awareness or concern due to media campaigns, changes in testing practices or diagnostic methods, updates to case definitions, introduction of new immunisation programs or treatments, and changes in public health policy (such as border closures during the COVID-19 pandemic). In addition, some diseases, such as pertussis, exhibit natural cyclical patterns that can affect year-to-year comparisons.

Up-to-date data about notifiable infectious diseases can be viewed on the Notifiable infectious diseases dashboard, available at www.health.wa.gov.au/articles/n_r/notifiable-infectious-disease-dashboard and updated daily.

Notifiable infectious diseases and related conditions, 2022 to 2023

In 2022 and 2023, there were **55,152** and **67,358** infectious disease notifications in WA, respectively, excluding over 1.35 million COVID-19 cases also notified during this period (**Figure 1**). These numbers of disease notifications were the highest ever recorded in WA. Notification rates for many diseases were comparatively low during 2020 and 2021, due to public health and social measures that were in place to limit the transmission of COVID-19,

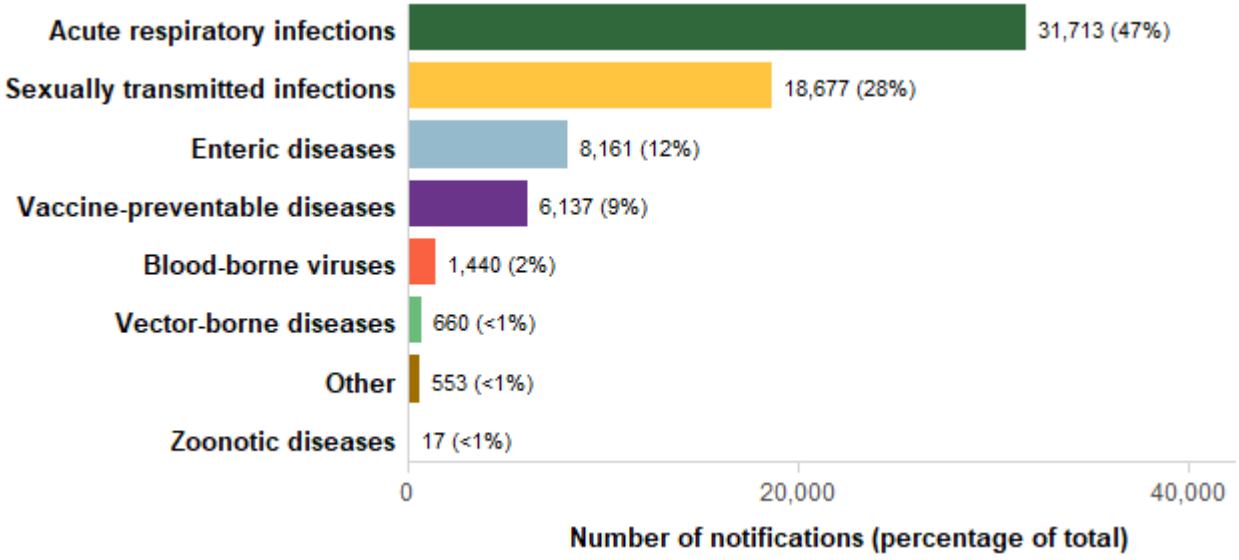
including restrictions on interstate and international travel. The relaxation of these measures during 2022, and resumption of interstate and international travel, was followed by a rebound in the number of notifications of imported diseases and respiratory viruses. After COVID-19, influenza was the most frequently notified infection in both 2022 and 2023. Furthermore, RSV was newly notifiable in 2022 and contributed to the notable increase in total notifications across these years.



Note: Excludes 1.36 million COVID-19 notifications between 2020 and 2023.

Figure 1: Number of disease notifications in WA, 2015 to 2023

The number and rate of notifications for all diseases by public health region are presented in **Appendix Table A2**. To allow more direct comparison with reports from previous years, **Figure 2** presents notifications by disease category in 2023, excluding 95,376 COVID-19 notifications that also occurred in that year. Acute respiratory infections (influenza and RSV) made up 47% of notifications in 2023, 28% were sexually transmitted infections (STIs), 12% were enteric diseases and 9% were vaccine-preventable diseases. However, acute respiratory infections accounted for 78% of notifications in 2023 if COVID-19 notifications were also included.



Note: Excludes 95,376 COVID-19 notifications in 2023.

Figure 2: Total number of notifications in 2023 by disease category

Apart from COVID-19, the most frequently notified diseases in 2022 and 2023 were influenza, RSV and genital chlamydial infection, accounting for two-thirds of notifications across these years.

Acute respiratory infections

Transmission of **COVID-19** in WA was negligible until the more transmissible but less pathogenic Omicron variant of COVID-19 emerged in early 2022. WA's hard border was also lifted on 03 March 2022, once 90% of the WA population was vaccinated against COVID-19, allowing quarantine-free travel in and out of the state (see **Box 1**). WA experienced sustained community transmission of COVID-19 for the first time since the beginning of the pandemic, and cases rapidly increased (**Figure 3**). Relaxation of further public health and social measures in April 2022, such as limits on public gatherings, was followed by a peak of more than 17,000 COVID-19 cases on a single day on 16 May 2022 (543 cases per 100,000 population per day).

Box 1: COVID-19 public health and social measures[3]

On 16 March 2020, a State of Emergency was declared in WA in response to the COVID-19 pandemic, and a range of public health and social measures implemented to limit transmission, including lockdowns, interstate and international border closures, and comprehensive local outbreak control measures when breaches occurred.

A phased roll-out of COVID-19 vaccines commenced from 22 February 2021, starting with frontline workers and people vulnerable to severe disease from COVID-19, and gradually extending to the wider WA community. COVID-19 vaccinations were mandated in WA for workers in certain occupational groups from 20 October 2021.

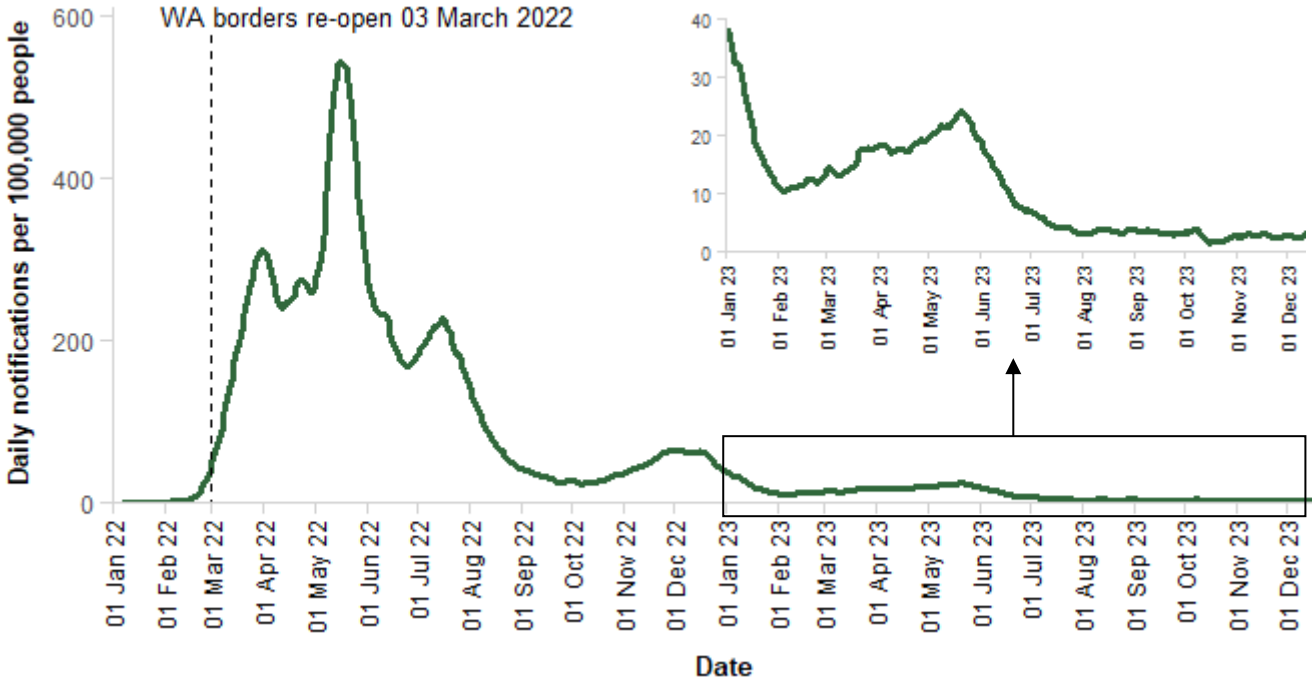
The international border was reopened to fully vaccinated visa holders on 21 February 2022. WA effectively re-opened its borders on 03 March 2022, with vaccinated interstate travellers permitted entry.

WA launched a free rapid antigen test (RAT) program on 27 February 2022 to promote and expediate testing. Free tests were offered to all WA households, with expansion of the program and additional tests available from pop-up venues from 15 March 2022. Reporting of positive RATs was mandatory until 04 November 2022.

Capacity limits for hospitality were removed on 13 April 2022. Additional public health and social measures were relaxed on 26 April 2022, with face masks no longer mandatory except in specific settings, the two square metre rule and proof of vaccination requirements removed for venues, and asymptomatic close contacts no longer subject to isolation requitements.

Mandatory isolation for COVID-19 cases was removed across Australia from 14 October 2022, and WA's State of Emergency and the Public Health State of Emergency subsequently ended on 04 November 2022, with no remaining declarations about COVID-19 in place.

In total, there were **1,260,163** and **95,376** cases of COVID-19 notified in 2022 and 2023, respectively (47,185 and 3,546 cases per 100,000 population per year). The median age for COVID-19 cases was 43 years (interquartile range 27 to 59 years) in 2022, and 33 years (interquartile range 18 to 48 years) in 2023.

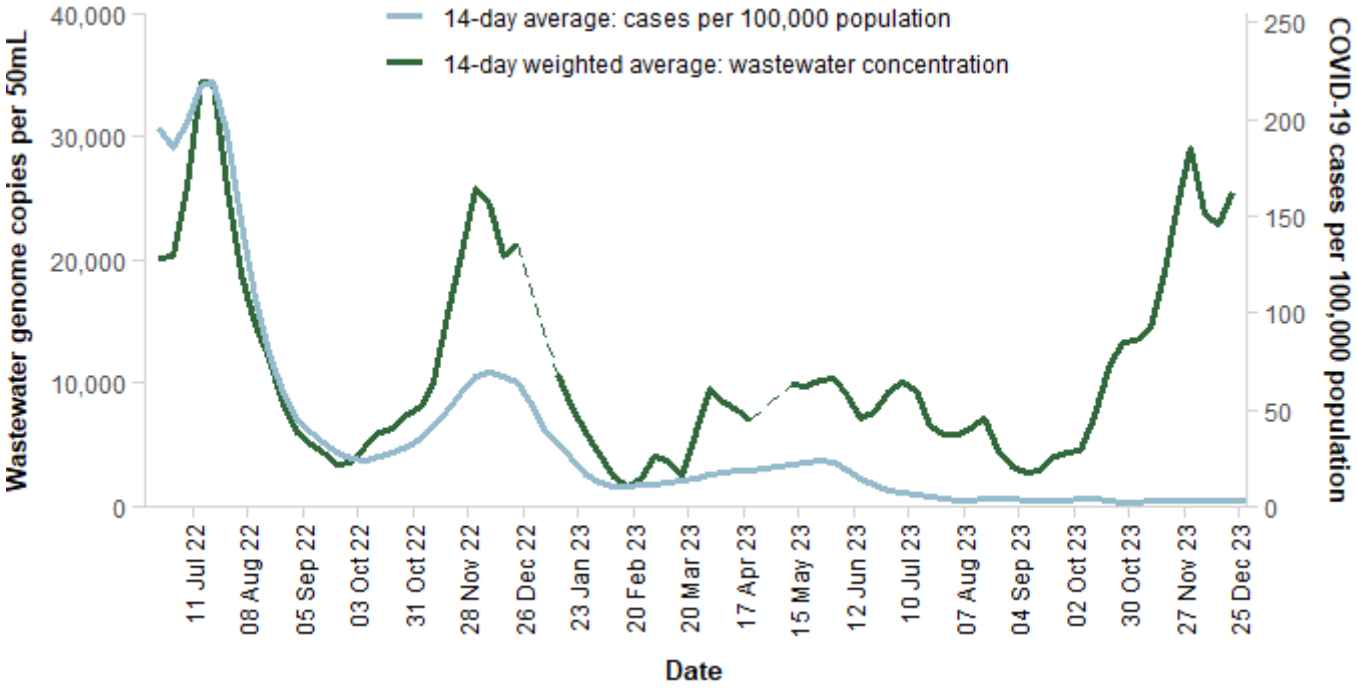


Note: Reporting of positive RATs was mandatory between 08 February 2022 and 04 November 2022, and continued voluntarily until 09 October 2023 when the RAT register was closed. RAT positive cases comprised 68% of cases between 01 February 2022 and 09 October 2023. COVID-19 cases notified after 09 October 2023 represent positive PCR samples only.

Figure 3: Number of COVID-19 cases per day, 2022 to 2023 (rolling 7-day average)

There were 802 and 491 deaths from COVID-19 in 2022 and 2023, respectively. The vast majority of these deaths occurred in the older age groups, with a median age of 86 years (interquartile range 78 to 91 years) in 2022 and 84 years (interquartile range 76 to 91 years) in 2023.

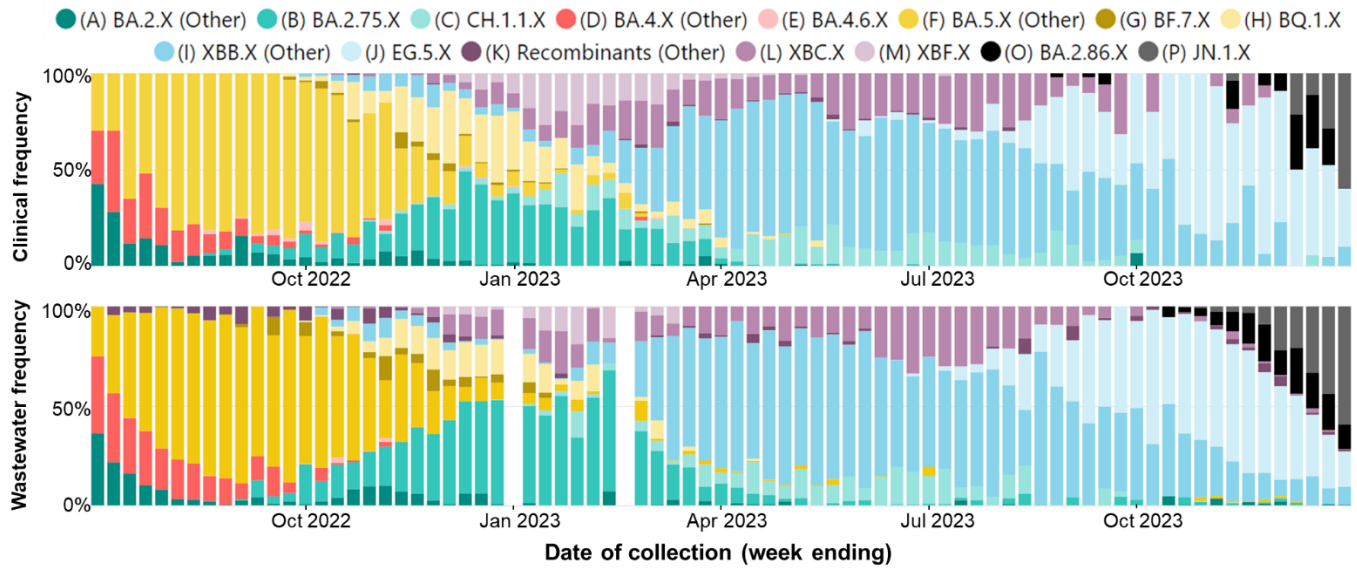
Quantitative wastewater surveillance for COVID-19 commenced in June 2022, providing an additional metric for monitoring COVID-19 activity in the WA community, independent of health-seeking behaviours, and barriers and access to clinician-dependent testing. **Figure 4** shows that COVID-19 notifications closely reflected the concentration of SARS-CoV-2 fragments in wastewater until October 2023 when the RAT register closed and only positive polymerase chain reaction (PCR) tests were counted, indicating that there was more COVID-19 circulating in the community than detected by PCR notifications alone.



Note: Case rates and genome copies per sample across three sampling sites were weighted by population size per site. COVID-19 case rates in the metropolitan catchment areas (Beenyup, Subiaco and Woodman Point) and wastewater genome concentrations are presented as a 14-day average. A recalibration of the methodology was undertaken, and results revised as of October 2023. The dashed lines in the graph represent results that could not be determined for that period.

Figure 4: SARS-CoV-2 wastewater surveillance and reported COVID-19 cases in Perth WA

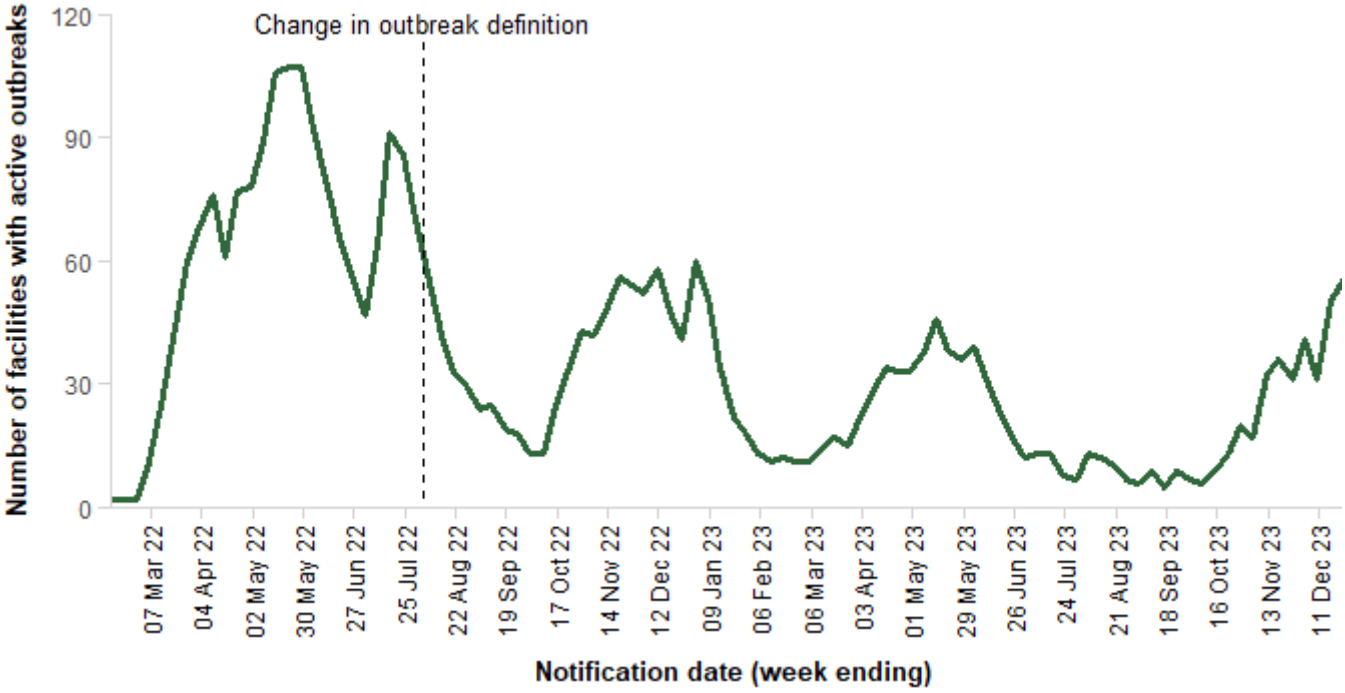
Analysis of both clinical and wastewater samples provided information about the predominance of Omicron subvariants across 2022 and 2023. The BA.2.X (other) sublineage predominated in early 2022, before the emergence of BA.4.X (other) and BA.5.X in mid-2022 (**Figure 5**). The BA.2.75.X sublineage emerged in late 2022 to early 2023, with XBB.X (other) and EG.5.X predominating in mid- to late 2023, and JN.1.X emerging late 2023 to early 2024. Further information about COVID-19 wastewater surveillance and sub-variant analysis is available at www.health.wa.gov.au/articles/a_e/coronavirus/covid19-wastewater-surveillance.



Source: Email from J.Gazeley (PathWest) on 06 March 2025.

Figure 5: Weekly proportion of monitored SARS-CoV-2 Omicron key sub-lineages in metropolitan clinical sequences (top) and wastewater catchments (bottom), mid-2022 to 2023

There is an increased risk of transmission of acute respiratory infections such as COVID-19 in residential aged care facilities (RACFs), where people live in close proximity to others, and there are high levels of contact between residents, staff and visitors. Additionally, older people are at higher risk of severe illness, hospitalisation or death due to COVID-19. Outbreaks of COVID-19 in RACFs were therefore closely monitored during 2022 and 2023; **Figure 6** shows the number of facilities with active (ongoing) outbreaks of COVID-19 at any particular time over this period.



Note: Initially a COVID-19 outbreak was declared if two or more residents tested positive to COVID-19 within 5 days and were at the facility at any time during their infectious period, or if five or more staff, visitors and/or residents tested positive to COVID-19 within 7 days and were at the facility during their infectious period. From August 2022, a COVID-19 outbreak was only declared if two or more residents tested positive to COVID-19 within a 72-hour period.

Figure 6: Active COVID-19 outbreaks in WA residential aged care facilities

The **14,058** and **21,177** cases of **influenza** that were notified in 2022 and 2023 (526 and 787 per 100,000 population), after a record high of 23,279 cases notified in 2019, and only 1,213 and 37 cases notified in 2020 and 2021. Influenza accounted for around a quarter and a third of all non-COVID-19 notifications in 2022 and 2023, respectively. However, part of this increase is likely due to the increased laboratory use of multiplex PCR-based testing for respiratory viruses since the COVID-19 pandemic. Of the 21,177 influenza cases in 2023, hospitalisation status was available for 11,415 cases (54%), of whom 3,870 (34%) were hospitalised.

Influenza season peaked in July in 2022 and June in 2023 (**Figure 7**). Free influenza vaccinations were offered to all West Australians over the age of 6 months during June and July in 2022, and during May and June in 2023.[4,5]

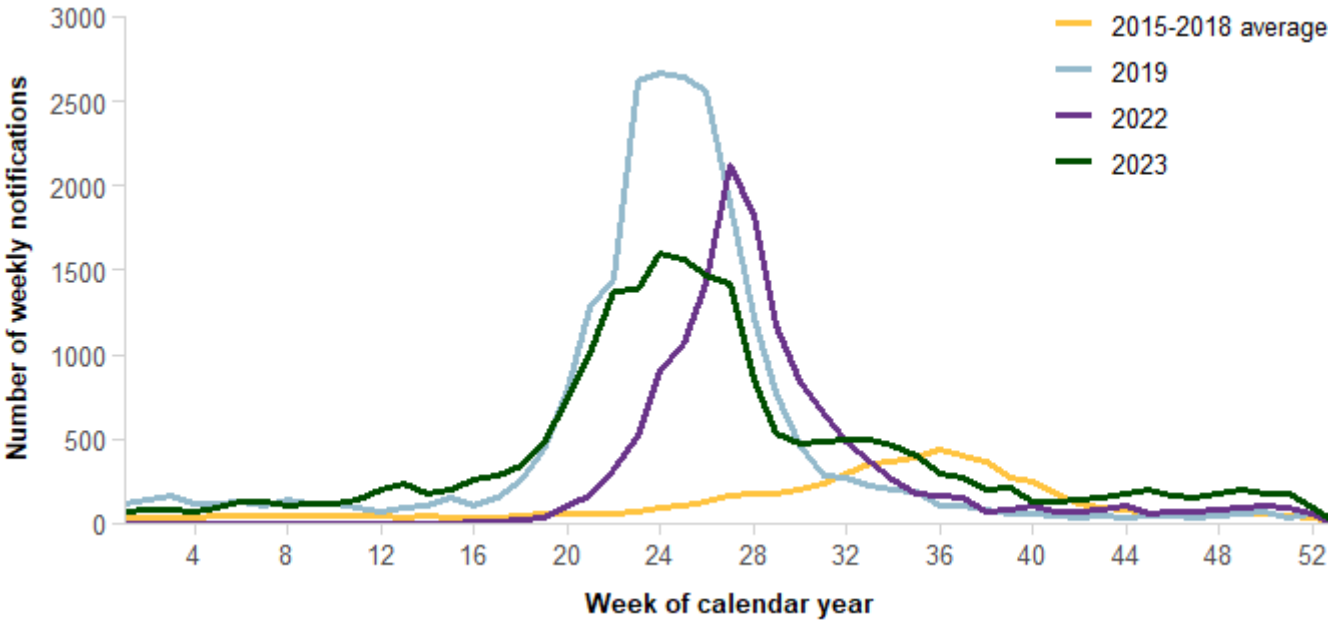


Figure 7: Number of influenza notifications by calendar week, 2015-18 average, 2019, 2022 and 2023

There were **11,653** and **10,536** notifications of **RSV** in 2022 and 2023 (436 and 392 per 100,000 population). Children in the 0-4-year-old age group were disproportionately represented, accounting for around half of the notifications in each year (48% in 2022 and 51% in 2023). In 2023, hospitalisation status was available for 5,525 cases (52%), of which 3,148 (57%) were hospitalised, including 995 infants under one year of age (**Figure 8**).

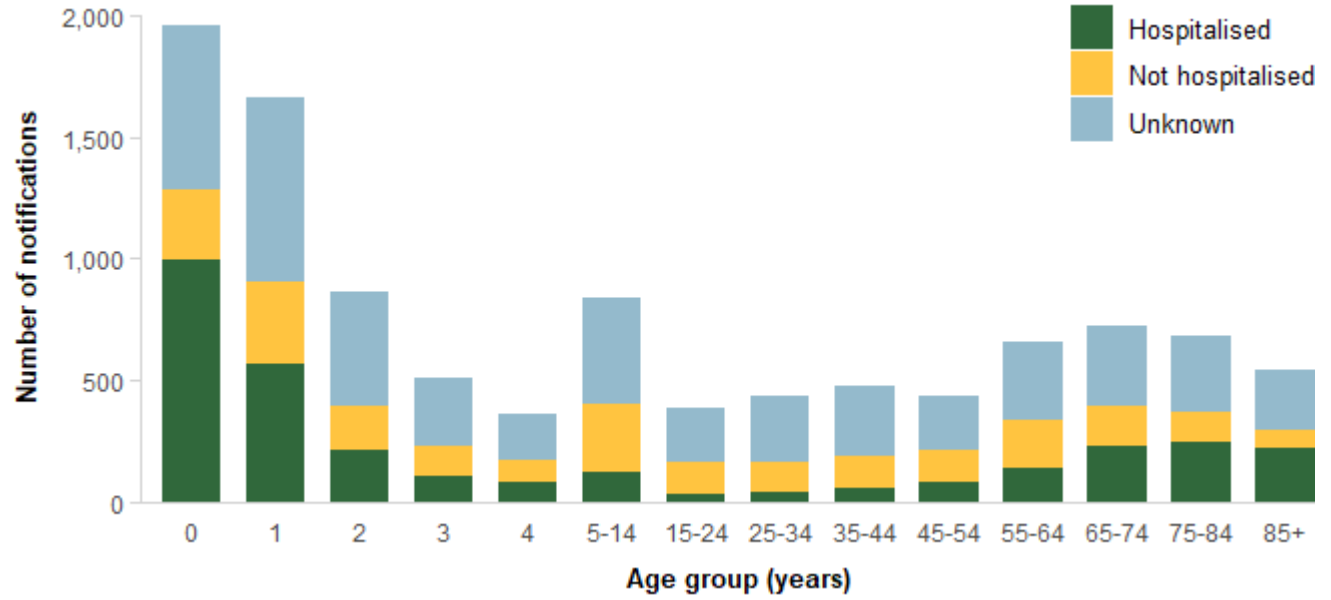
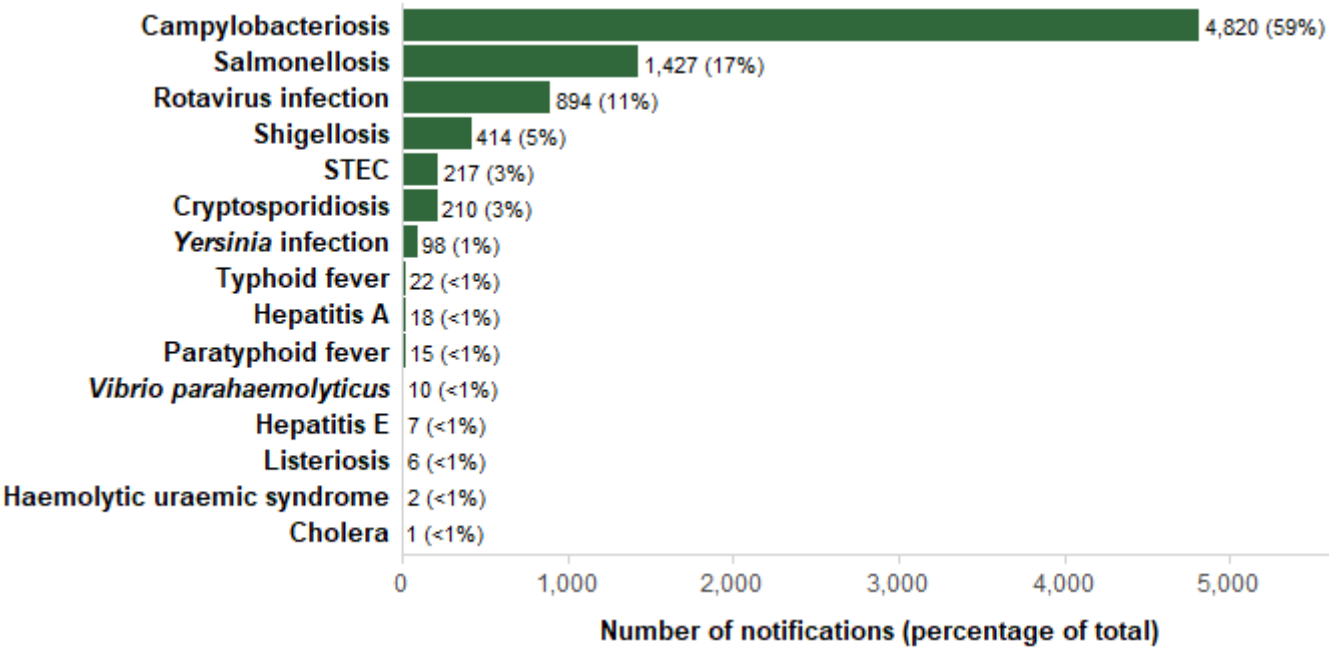


Figure 8: Number of RSV notifications and hospitalisations by age group, 2023

Enteric diseases

Enteric infections primarily cause gastroenteritis with diarrhoea and/or vomiting, but can also be associated with more serious complications including hepatitis, sepsis or kidney disease. Enteric infections may be transmitted via the faecal-oral route, or through consumption of contaminated water or food. There were **6,121** enteric disease notifications in 2022 or 229

cases per 100,000 population, slightly lower than the 2015-2019 average rate of 250 cases per 100,000. However, this increased in 2023 to **8,161** enteric disease notifications (303 cases per 100,000). The number of cases of each of the 16 notifiable enteric diseases in 2023 is shown in **Figure 9**.



Note: Figure excludes botulism, with the last case notified in 2015.

Figure 9: Number of enteric notifications by disease, 2023

A largely similar distribution of enteric disease notifications was observed in 2022. However, while campylobacteriosis, salmonellosis and rotavirus were also the most commonly notified enteric diseases in 2022, there were fewer cases of shigellosis notified in 2022 than either Shiga toxin-producing *Escherichia coli* (STEC) or cryptosporidiosis (**Appendix Table A1**).

Enteric diseases were most commonly notified in the 0-4-year-old age group, with a rate of 562 cases per 100,000 population in 2022 and 726 cases per 100,000 in 2023. This was particularly true for salmonellosis and rotavirus infection, where the number of notifications in 0-4 years olds accounted for 25% and 23% of all salmonellosis notifications, and 70% and 51% of all rotavirus notifications, in 2022 and 2023.

There were also higher rates of enteric disease notifications in the Aboriginal population, with 277 and 338 cases per 100,000 population in 2022 and 2023, compared with 217 and 287 cases per 100,000 in the non-Aboriginal population. These higher rates were observed for shigellosis, salmonellosis, cryptosporidiosis, STEC and rotavirus infection across both years.

The rates of enteric infections are higher in the tropical climate of northern WA. **Figure 10** shows the crude rate of notifications per population in each of WA's public health regions, with the Kimberley reporting higher rates of salmonellosis, rotavirus infection, shigellosis and cryptosporidiosis than the other regions.

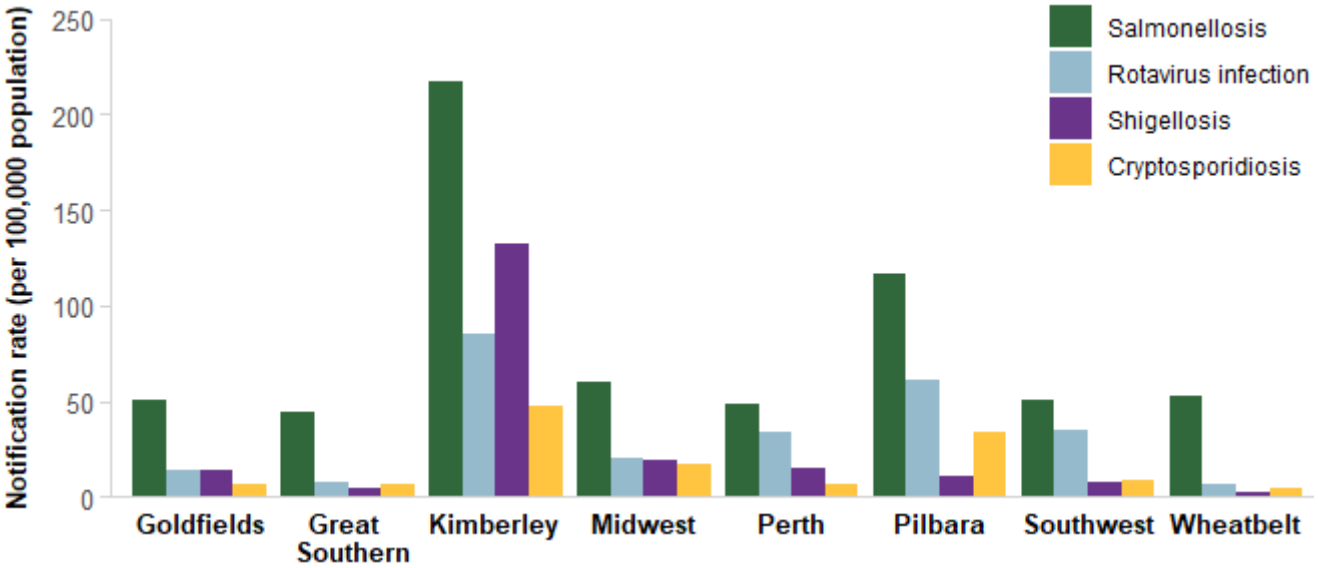


Figure 10: Crude notification rates per 100,000 population of selected enteric diseases by public health unit, 2023

Campylobacteriosis, a bacterial infection most often associated with consumption of contaminated chicken meat, remained the most commonly notified enteric disease in both 2022 and 2023, with **4,033** and **4,820** notifications per year (151 and 179 per 100,000 population). The increase in cases compared to recent years (**Appendix Table A1**) is in part due to the use of more sensitive PCR diagnostics for this pathogen by one pathology provider since 2022.

Salmonellosis was the second most commonly notified enteric disease, with **950** and **1,427** notifications (36 and 53 per 100,000 population) in 2022 and 2023, respectively. This is much lower than the 2015-2019 average of 2,087 notifications per year (81 per 100,000 population). Of salmonellosis cases with known place of acquisition in 2023 (70%), 62% of cases acquired their illness in WA, 37% were acquired overseas and 1% were acquired interstate. *Salmonella* Typhimurium remained the most commonly notified serotype, accounting for 309 cases (33%) in 2022 and 284 cases (20%) in 2023.

Although most cases of salmonellosis are sporadic, *Salmonella* was responsible for five and six **foodborne** outbreaks in 2022 and 2023, respectively, including two multi-jurisdictional outbreaks. The largest outbreaks over this period were caused by contaminated bean sprouts, baby cucumbers and banh mi (Vietnamese sandwich), with 77, 23 and 16 cases of illness, respectively. The number of foodborne outbreaks due to *Salmonella* reduced from the 2015-2019 average of 27 foodborne outbreaks per year (see **Box 2**).

Box 2: *Salmonella* taskforce

Established in 2019, the *Salmonella* taskforce was established to address the recurrent outbreaks and widespread contamination of WA egg farms with *Salmonella*.[6] Comprised of OzFoodNet, the CDCD, the Food Unit within the Environmental Health Directorate and PathWest Laboratory, the Taskforce identified the farm origins of *Salmonella* Typhimurium. They worked with affected producers to enhance their biosecurity practices associated with shed cleaning, pest control measures and fumigation, and delivered free salmonella vaccinations to chickens. There has been a clear public health benefit to the measures, with the sustained reduction in salmonellosis, including outbreaks, since this time.

Rotavirus infection was the third most commonly notified enteric disease, responsible for **370** and **894** notifications in 2022 and 2023 (14 and 33 per 100,000 population). The number of cases in 2023 was more than twice the 2015-2019 average of 423 cases per year (16 per 100,000 population). Before rotavirus vaccines were available, rotavirus infection was the most common cause of severe gastroenteritis in infants and young children.[7] Infants aged less than 6 months are now recommended to receive rotavirus vaccine as part of the National Immunisation Program (NIP) Schedule at 2 and 4 months of age.[7] However, rotavirus remains one of the most common causes of infectious diarrhoea in children, with at least half of all rotavirus notifications in 2022 and 2023 in the 0-4-year-old age group.

Shigellosis is caused by the *Shigella* bacterium and can be transmitted through contaminated food or water, or person-to-person close contact. There were **191** and **414** cases of shigellosis in 2022 and 2023 (7.2 and 15 per 100,000 population). Shigellosis is most commonly acquired overseas, although locally acquired cases also occur. In 2023, 62% of shigellosis cases had a known place of acquisition, and of those, 39% were acquired in WA, 59% overseas, and 3% interstate.

There has been an increase in multi-drug resistant *Shigella* strains in WA, particularly among men who have sex with men, including emergence of extensively-drug resistant *Shigella* strains from 2023.[8] Although the highest rates of shigellosis in WA occur in remote areas (**Figure 10**), and particularly among Aboriginal people, most *Shigella* strains infecting people living in remote communities are non-multi-drug resistant.[9] Therefore, separate guidelines have been developed for the management of multi-drug resistant shigellosis in WA[5] and shigellosis in remote populations of WA.[9]

Notifications of **cryptosporidiosis** remained stable at **277** and **210** cases in 2022 and 2023 (10 and 7.8 per 100,000 population), when compared to a 2015-2019 average of 246 cases per year (9.6 per 100,000 population). Infection is caused by exposure to the *Cryptosporidium* parasite found in contaminated soil, food or water, and on surfaces contaminated with faeces from infected people or animals. Large outbreaks of cryptosporidiosis generally occur approximately every five years, with cases peaking in late summer/autumn. An increase in cases over the late summer/autumn period in 2022 was noted, with three outbreaks (two in childcare centres and one in a splash park) identified. No outbreaks were identified in 2023.

There were **98** cases of ***Yersinia* infection** notified in 2023 – more than twice the number of cases notified in any other year; **31** cases were notified in 2022. *Yersinia* infection is usually caused by the *Yersinia enterocolitica* bacterium, although other species may also be implicated. The bacterium can be found in the intestines of pets, livestock and other animals, and people are normally infected through consumption of contaminated food.

There were **222** and **217** cases of **STEC** notified in 2022 and 2023 (8.3 and 8.1 cases per 100,000 population), an increase on the 2015-2019 average of 68 cases per year (2.6 per 100,000). This is largely due to the increased use of PCR testing. Nine cases in 2023 were linked to a foodborne outbreak, and **two** of these outbreak cases developed **haemolytic uraemic syndrome** as a complication of their illness.

There was a notable impact of the resumption of international travel on **typhoid fever** and **paratyphoid fever** notifications. While there were only eight cases of typhoid fever and no cases of paratyphoid fever notified across 2020-21, in 2022 there were **17** cases of typhoid fever and **one** case of paratyphoid fever. This further increased in 2023, where there were **22**

and **15** notifications of typhoid fever and paratyphoid fever (0.8 and 0.6 per 100,000 population), with all cases acquiring their infection overseas. India was the most common country of acquisition in 2023, accounting for 17 typhoid fever cases and 12 paratyphoid fever cases. A typhoid vaccine is available and recommended for travellers to typhoid-endemic regions.[7]

Notifications of **hepatitis A** returned to usual low levels in 2022 and 2023, after few cases were notified in 2020 and 2021. Only **14** cases of hepatitis A were notified in 2022 and **18** cases in 2023 (0.5 and 0.7 per 100,000 population), with the majority (79%) acquired overseas. A hepatitis A vaccine is available, but only recommended for Aboriginal people in living in certain jurisdictions (including WA), people with medical, occupational or lifestyle risk factors, and travellers to moderately to highly endemic areas for hepatitis A.[7]

There were **five** notifications of ***Vibrio parahaemolyticus*** in 2022 and **10** notifications in 2023. The bacterium is found in marine and coastal waters, and usually causes a gastrointestinal illness associated with the consumption of contaminated water or undercooked shellfish. However, wound infections from exposure to contaminated water are also possible. Just over half of the infections notified in 2022 and 2023 were acquired overseas (eight cases), with the remainder being acquired within WA.

There were **seven** cases of **hepatitis E** notified in 2023, after **no** cases being notified in 2021 or 2022. Hepatitis E is uncommon in Australia and cases normally acquire their infection consuming contaminated food or water while overseas. Sources of infection in Australia have included undercooked pork products, particularly pork livers. Three of the cases notified in 2023 were acquired overseas and four cases were acquired in WA.

Listeriosis is usually caused by consumption of foods contaminated with *Listeria monocytogenes* bacteria. Listeriosis is uncommon in healthy people, with immunosuppressed people or pregnant women at greater risk of infection. There were **nine** cases and two deaths in 2022, and **six** cases and two deaths in 2023. The cases were aged between 57 and 94 years, and almost all had documented immunocompromise and/or multiple comorbidities. Two cases were part of multijurisdictional investigations with meat products implicated as the source of infection. Another case was part of an investigation in WA that included a second case notified in 2024 where commercially prepared salad was implicated.

One case of **cholera** was notified in 2023 – the first since 2017. Cholera is a bacterial illness usually spread through water contaminated with *Vibrio cholerae*. All cases of cholera notified in WA have been acquired overseas, mostly in Asia. Although a cholera vaccine is available, the risk to travellers is very low, and vaccination is only recommended for those travelling to endemic countries who have a high risk of exposure to cholera or with a higher risk of severe or complicated infection due to medical conditions.[7]

Further details on enteric disease notifications and outbreaks over this period are available in the 2022 and 2023 WA OzFoodNet reports at www.health.wa.gov.au/Articles/F_I/Infectious-disease-data/Enteric-infection-reports-and-publications-OzFoodNet.

Blood-borne viruses

Hepatitis B can cause an acute disease, with a proportion remaining chronically infected. Its long-term complications include liver cancer and death. Hepatitis B is preventable through immunisation and good antenatal care, and complications of the disease can be managed

through early diagnosis, engagement in health care and treatment. In 2022 and 2023, there were **417** and **509** notifications of hepatitis B (16 and 19 cases per 100,000 population), a decrease from the 2015-19 average of 530 cases per year (21 per 100,000 population). Of the cases notified in 2023, 23 were classified as 'newly acquired', and 486 were 'unspecified' and did not meet the criteria for a newly acquired case. Key groups affected by hepatitis B include migrants from endemic countries and Aboriginal people (**Table 1**). Hepatitis B vaccination is recommended for infants and children as part of the NIP, and for non-immune individuals from high-risk groups including Aboriginal people, people with medical, occupational or lifestyle risk factors, and certain travellers to endemic areas for hepatitis B.[7]

Hepatitis C also causes a chronic liver infection that can remain undiagnosed for many years. Hepatitis C is most commonly acquired through intravenous drug use, and while there is no vaccine, it can be prevented through safe injecting practices. Hepatitis C is curable with the highly effective direct-acting antiviral agents that have been available since 2016. Since January 2023, all hepatitis C notifications with clinical and laboratory evidence of reinfection after curative treatment are included as 'newly acquired reinfections'.

In 2022 and 2023, there were **796** and **928** notifications of hepatitis C (30 and 35 cases per 100,000 population), a decrease from the 2015-19 average of 1,084 cases per year (42 per 100,000 population). In 2023, this included 145 newly acquired cases (including 28 newly acquired reinfections) and 783 unspecified cases (including one unspecified reinfection) not meeting the criteria for a newly acquired case. Males accounted for 70% of notifications. Hepatitis C disproportionately impacts several key priority populations including people who inject drugs, those that are incarcerated (in prison or immigration detention)[10] and Aboriginal people (**Table 1**).

Table 1: Number and rate of hepatitis B and C notifications in Aboriginal and non-Aboriginal people in WA, 2023

	Aboriginal			Non-Aboriginal			Rate ratio[b]
	Notifications	Crude rate	ASR[a]	Notifications	Crude rate	ASR[a]	
Hepatitis B	33	29.7	38.5	411	15.9	15.8	**2.4**
Hepatitis C	325	292.4	275.9	547	21.2	21.2	**13.0**

Notes:

a. ASR: Age-standardised rate per 100,000 standard estimated resident population of WA in 2023.

b. Rate ratio is the ASR of notifications in Aboriginal people divided by the ASR of notifications in non-Aboriginal people.

c. 65 cases of hepatitis B (13%) and 56 cases of hepatitis C (6%) had no Aboriginal status recorded and are not included in the above table.

There are few cases of **hepatitis D** notified each year in WA, with only **eight** cases notified in 2022 and **three** cases notified in 2023. As hepatitis D only affects people infected with hepatitis B, vaccination against hepatitis B prevents hepatitis D infection.[11]

Further details about blood-borne viruses (BBVs) in WA are available from the STI/BBV reports at www.health.wa.gov.au/Articles/A_E/Epidemiology-of-STIs-and-BBVs-in-Western-Australia.

Sexually transmitted infections

Genital **chlamydial infection** remained one of the most commonly notified infections accounting for 11,043 and 12,933 notifications in 2022 and 2023. Notifications of chlamydial infection have remained fairly stable since 2011, increasing in 2023 to 481 cases per 100,000

(2015-2019 average 447 cases per 100,000) (**Figure 11**). Although the chlamydial infection testing rate remained stable between 2021 and 2023, the notification rate increased by 15% and the test positivity rate increased by 13%, reflecting increased disease transmission.[12]

Gonococcal infections also increased, to 4,727 notifications in 2023 (176 cases per 100,000 population) compared with the 2015-2019 average of 127 cases per 100,000; notifications in 2022 were comparable to previous years (3,302 cases or 124 per 100,000). Similar to chlamydial infections, the testing rate for gonococcal infections remained stable between 2021 and 2023, while the notification rate increased by 58% and test positivity rate increased by 52%.[12] This indicates that the increase in notifications over this period may have primarily resulted from increased disease transmission.

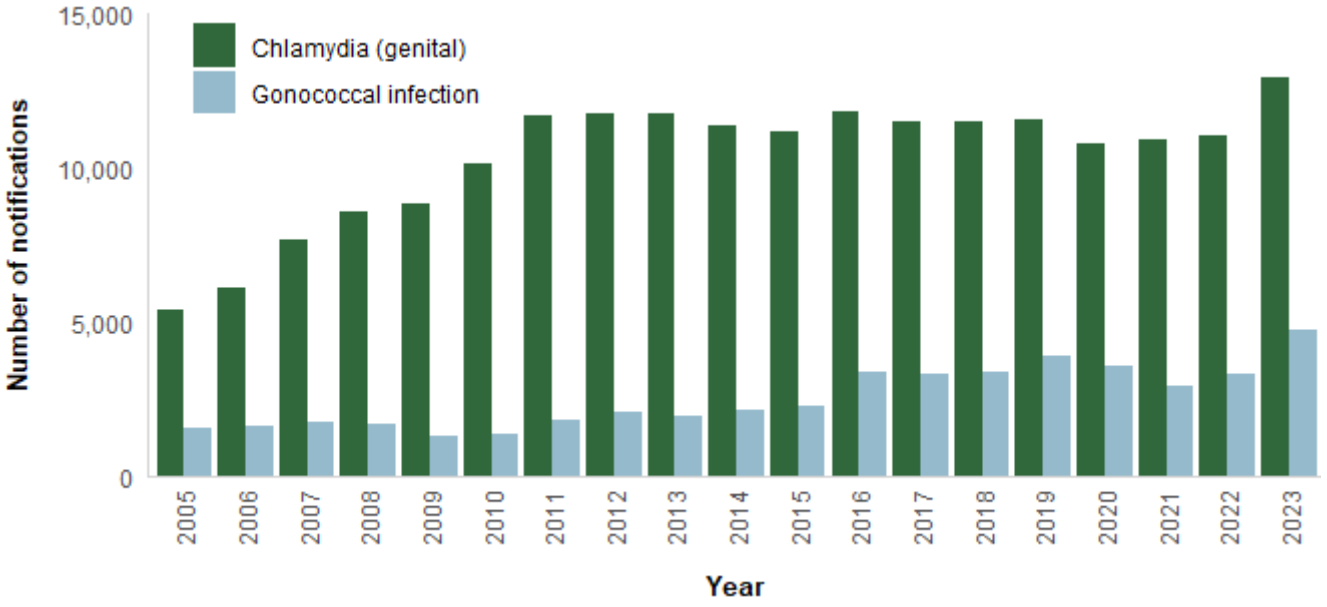


Figure 11: Number of chlamydial and gonococcal notifications in WA, 2005 to 2023

Overall, in 2023, just under half of chlamydial infections (47%) and just over half of gonococcal infections (59%) were in men. However, the sex distribution of notifications was also age dependent. While more women than men were notified with chlamydial and gonococcal infections in the youngest age groups, men made up the majority of notifications for those aged 25 years or older **(Figure 12).**

Chlamydial infections were concentrated in adolescents and young adults, with 70% of notifications in those aged between 15 and 29 years, and 19% in those aged between 30 and 39 years in 2023. Those with gonococcal infections were slightly older; 54% of notifications occurred in those aged between 15 and 29 years, with a further 27% in those aged between 30 and 39 years.

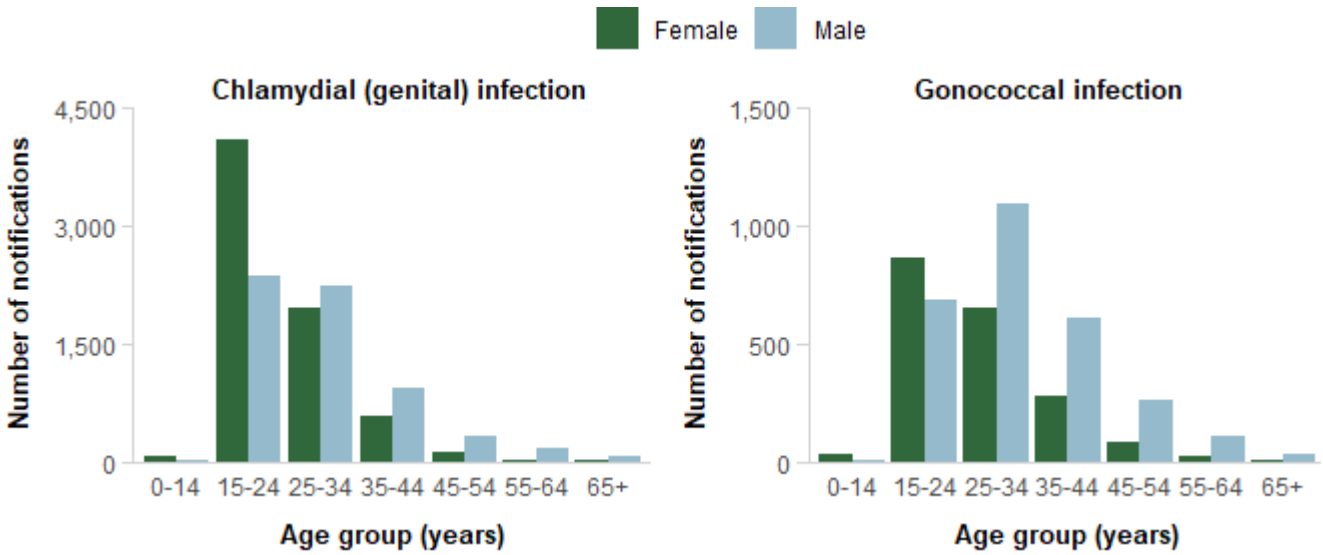
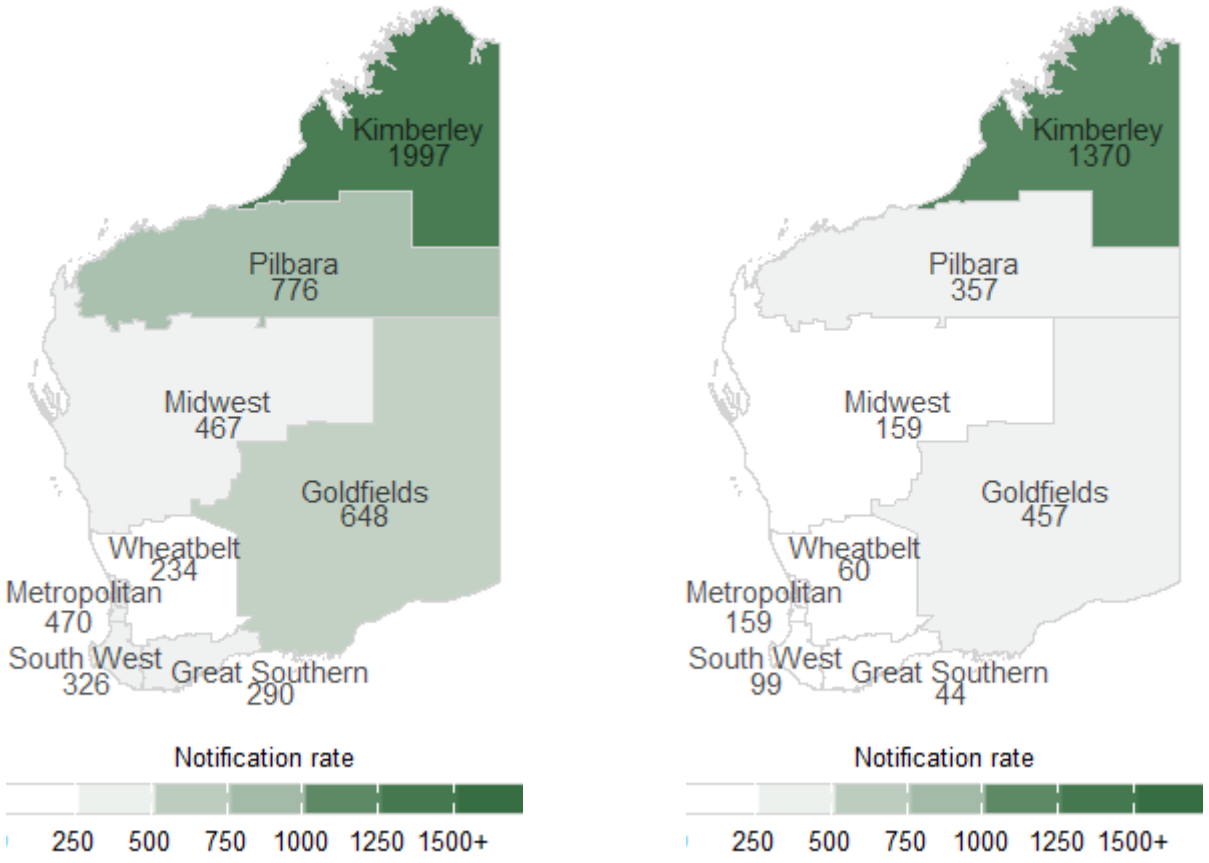


Figure 12: Number of chlamydial and gonococcal notifications in WA, by sex and age group, 2023

The Kimberley had the highest rates of chlamydial and gonococcal infections in 2023, with 1,997 and 1,370 infections of each disease per 100,000 population (**Figure 13**).



A. **B.**

Figure 13: Rate of chlamydial (A) and gonococcal (B) notifications per 100,000 population, by public health region, 2023

There were **59** and **68** newly diagnosed cases of **HIV infection** in 2022 and 2023, representing 2.2 and 2.5 cases per 100,000 population, lower than the 2015-19 average of 3.4 cases per 100,000 population. HIV infection is predominantly acquired by sexual contact in WA, via both heterosexual contact and amongst men who have sex with men. Most notifications of HIV in both 2022 (78%) and 2023 (71%) were in men, with smaller numbers of notifications in women or transgender people. Although there was an overall decrease in HIV notifications, the number of HIV cases among Aboriginal people increased; a clinician alert was distributed in 2022, advising medical practitioners to consider opportunistic HIV screening when offering testing for STIs or BBVs to Aboriginal patients.

WA first identified an outbreak of **infectious syphilis** in the Kimberley in 2014, with the disease since spreading throughout the state. The outbreak saw the reemergence of **congenital syphilis** in WA, with **four** cases notified each year between 2020 and 2023, after a total of six cases between 2004 and 2019. In 2020, the Chief Health Officer authorised a state-wide public health response to infectious syphilis in at-risk populations, which is coordinated through the WA Syphilis Outbreak Response Group (SORG). The SORG works closely with key community partners to: educate and promote sexual health; develop the health workforce to respond to syphilis; enhance testing, treatment and contact tracing of cases; improve monitoring and reporting; and improve antenatal care to prevent cases of congenital syphilis.

The activities of the SORG and key stakeholders resulted in the first downward trend in infectious syphilis notifications since 2017, with **804** and **695** infectious syphilis cases being notified in 2022 and 2023 (26 and 10 per 100,000 population). This is a reduction from a peak of 844 infections notified in 2021 (**Figure 14**). While the testing rate for syphilis increased by 13% between 2021 and 2023, the notification rate decreased by 15% and test positivity rate decreased by 24%.[12] However, this reduction has not been seen in all regions, with the Goldfields recording a peak of 40 cases of infectious syphilis in 2023, after 19 notifications in 2022 and 29 notifications in 2021.

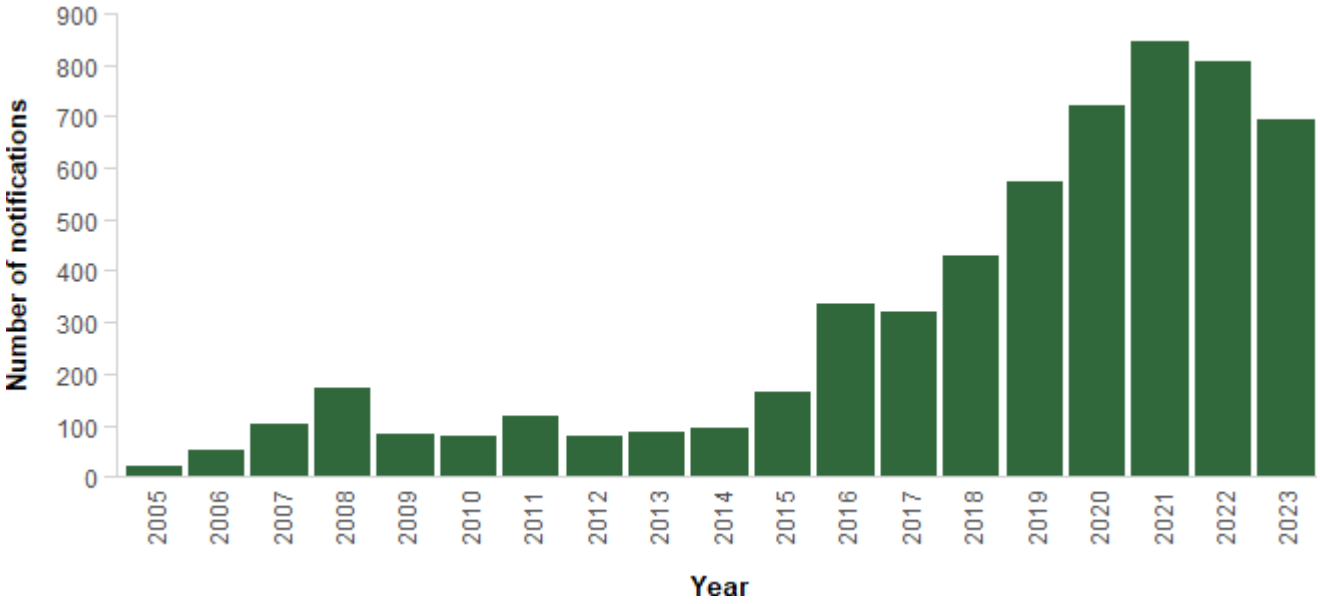


Figure 14: Number of notifications of infectious syphilis, 2005 to 2023

In 2022, **monkeypox virus infection** (**mpox**, formerly monkeypox) spread beyond endemic locations in central and west Africa to cause a global outbreak that has affected predominantly gay, bisexual and other men who have sex with men. Mpox was made a nationally notifiable

disease in May 2022, and a national public health response included development of public health and treatment guidelines, health promotion campaigns, education and upskilling of health care workers, and vaccination made available to those most at risk from August 2022.

WA's response included targeted mpox stakeholder meetings with clinicians and non-government organisations, targeted public communications and health promotion activities, development of clinician and public health resources, and a scalable and flexible immunisation program. Five clinician alerts were distributed to medical practitioners in 2022 to provide information and updates about the epidemiological situation, clinical presentation, specimen collection, vaccination program, and notification of cases. WA recorded **seven** cases of mpox in 2022, and **two** cases in 2023, all in men between 25 and 64 years of age, and all infections acquired overseas. While none of the cases notified in 2022 were vaccinated against mpox, both cases notified in 2023 had received the recommended vaccine course of two doses.[7]

There were **no** cases of **lymphogranuloma venereum** notified in 2022 or 2023. **No** cases of **chancroid** or **donovanosis** have been notified in WA since 2009 and 2014, respectively.

Further details about STIs in WA are available from the STI/BBV reports at www.health.wa.gov.au/Articles/A_E/Epidemiology-of-STIs-and-BBVs-in-Western-Australia.

Vaccine-preventable diseases

Endemic **measles** has been eliminated in Australia due to vaccination and other control measures. There were **no** cases notified in WA in 2022, and **six** cases notified in 2023. This is lower than the number of annual notifications between 2015 and 2019, where between eight and 52 cases were notified each year (an average of 25 cases per year); an increased number of cases were notified in 2019 due to an outbreak in an under-vaccinated subgroup of the population. Of the six cases in 2023, five were imported by travellers returning from Europe and Asia, and one secondary case was subsequently acquired in WA. Three clinician alerts were distributed in 2022-23 reminding medical practitioners to consider and test for measles in travellers returning from overseas with fever and a rash. Only one of the six cases notified in 2023 was confirmed to have been vaccinated against measles. This highlights the ongoing importance of both global and local vaccination programs in reducing the spread of this highly infectious, and potentially fatal disease (see **Box 3**).

Only **one** case of **mumps** was notified in 2022, and **seven** cases in 2023. Notifications between 2015 and 2019 ranged between 18 and 481 cases per year, due to large outbreaks of mumps that occurred in 2015 and 2016 in WA, particularly among Aboriginal people. Of the eight cases notified in 2022 and 2023, six acquired their infection overseas, and two acquired mumps in WA. Two cases were fully vaccinated, and one case was partially vaccinated, with the remaining five cases either unvaccinated or with an unknown vaccination status.

There were **5,352** and **5,768** cases of **varicella zoster virus infection** in 2022 and 2023 (200 and 214 cases per 100,000). In 2023, this included 503 cases of chickenpox, 2,501 cases of shingles, and 2,764 notifications of unspecified varicella zoster virus infection where clinical information was absent or did not meet the criteria for either chickenpox or shingles. The 2022 and 2023 rates for varicella zoster virus infection were both above the 2015-19 average rate (156 cases per 100,000 population). An increased proportion of unspecified varicella zoster infections between the 2015-19 and 2022-23 periods, makes it difficult to directly compare rates of chickenpox and shingles across these years.

Box 3: Measles, mumps, rubella and varicella-zoster vaccines[7]

A combination measles-mumps-rubella vaccine is recommended as part of the NIP Schedule at 12 months of age, and a combination measles-mumps-rubella-varicella vaccine recommended as part of the NIP Schedule at 18 months of age. Catch-up vaccination is recommended for non-immune adolescents and adults born after 1965 who have not received two doses of measles-, mumps- or rubella-containing vaccine, including healthcare workers, childhood educators and carers, workers in long-term care or correctional facilities, and overseas travellers. Non-pregnant seronegative women of childbearing age are also recommended to receive rubella-containing vaccine.

While only one dose of varicella-containing vaccine is included as part of the NIP Schedule at 18 months of age, a second varicella-containing vaccine dose is recommended for children aged less than 14 years to enhance protection. Two doses of varicella-containing vaccine are also recommended for non-immune adolescents and adults, including healthcare workers, childhood educators and carers, workers in long-term care facilities, and household contacts of immunocompromised individuals.

Zoster vaccines are recommended for immunocompetent people aged 50 years and over, and people aged 18 years and over with specific medical risk conditions. A two-dose schedule is currently funded under the NIP for all adults aged 65 years or older, Aboriginal people aged 50 years or older, and selected groups aged 18 years or older with moderate or severe immunocompromise.

Pertussis outbreaks normally occur every 4-6 years in WA. Vaccination is the best way to prevent pertussis, and booster doses are recommended for adolescents, pregnant women and people in contact with young infants, as vaccine-induced immunity wanes over time (**Box 4**).[7] There were **32** and **78** notifications of pertussis in 2022 and 2023 (1.2 and 2.9 cases per 100,000 population), significantly less than the 2015-2019 average of 1,351 cases per year (53 cases per 100,000 population). Infants under 6 months of age are at greatest risk of severe disease, hospitalisation and death; only one case from this age group was notified in either 2022 or 2023.

Box 4: Diphtheria, pertussis and tetanus vaccines[7]

Diphtheria-toxoid, tetanus-toxoid and acellular pertussis (DTPa) vaccines are recommended as part of a five-dose schedule under the NIP at:

- 2, 4 and 6 months of age as a combination DTPa, hepatitis B, inactivated poliovirus and *Haemophilus influenzae* type b vaccine
- 18 months of age as a combination DTPa vaccine
- 4 years of age as a combination DTPa and inactivated poliovirus vaccine.

Catch-up vaccination is recommended for children aged less than 10 years who have missed a dose of DTPa-containing vaccine, and adults and adolescents who have never received a diphtheria- or tetanus-toxoid vaccine are also recommended to receive a primary course and booster doses.

Booster doses of reduced antigen diphtheria-toxoid, tetanus-toxoid, and acellular pertussis (dTpa) vaccine are recommended for:

- adolescents aged 11-13 years
- pregnant women, in each pregnancy
- healthcare workers, and early childhood educators and carers, every 10 years
- other household contacts and carers of young infants, adults aged 50 years or older, adults aged 65 years or older, and travellers, if their last dose was more than 10 years ago.

Three cases of **diphtheria** were notified over the two-year period – **one** case in 2022 and **two** cases in 2023, and all with toxigenic *Corynebacterium diphtheriae* (rather than *Corynebacterium ulcerans*) as the causative organism. All three cases were cutaneous infections and were the first cases of diphtheria notified in WA since 2017. Two of the cases were acquired in WA (associated with wounds from a dog bite and cutting raw chicken), while the third case was acquired overseas. One case was fully vaccinated against diphtheria, one partially vaccinated, and the third case had an unknown vaccination history.

There were **19** and **eight** cases of **invasive meningococcal disease** in WA in 2022 and 2023 (0.7 and 0.3 per 100,000 population) representing a downward trend in overall notifications since 2017. Higher rates of invasive meningococcal disease are typically seen in young children and in adolescents and young adults. In 2022, four of the nineteen cases were aged between 0 and 4 years, and three cases were between 15 and 19 years of age. In 2023, five of the eight cases were aged between 0 and 4 years, and a single case was aged between 15 and 19 years. Most cases of invasive meningococcal disease were sporadic in 2022, except for a cluster of two household members, while all cases of disease in 2023 were sporadic.

Figure 15 shows the number of invasive meningococcal cases between 2014 and 2023 by serogroup. Vaccination against four serogroups (A, C, W135 and Y) was introduced via state vaccination programs in 2017, and later funded through the NIP for all children aged 12 months, adolescents aged 14-19 years, and people with certain medical conditions that increase their risk of invasive meningococcal disease.[7] Vaccination against serogroup B has been funded through the NIP for Aboriginal children aged less than 2 years, and people with certain medical conditions that increase their risk of invasive meningococcal disease, since mid-2020.[7] The vaccine is also available via private prescription for anyone else who wants to reduce their risk of invasive meningococcal disease, with the number of recommended doses depending on the age at which the vaccine course is started.[7]

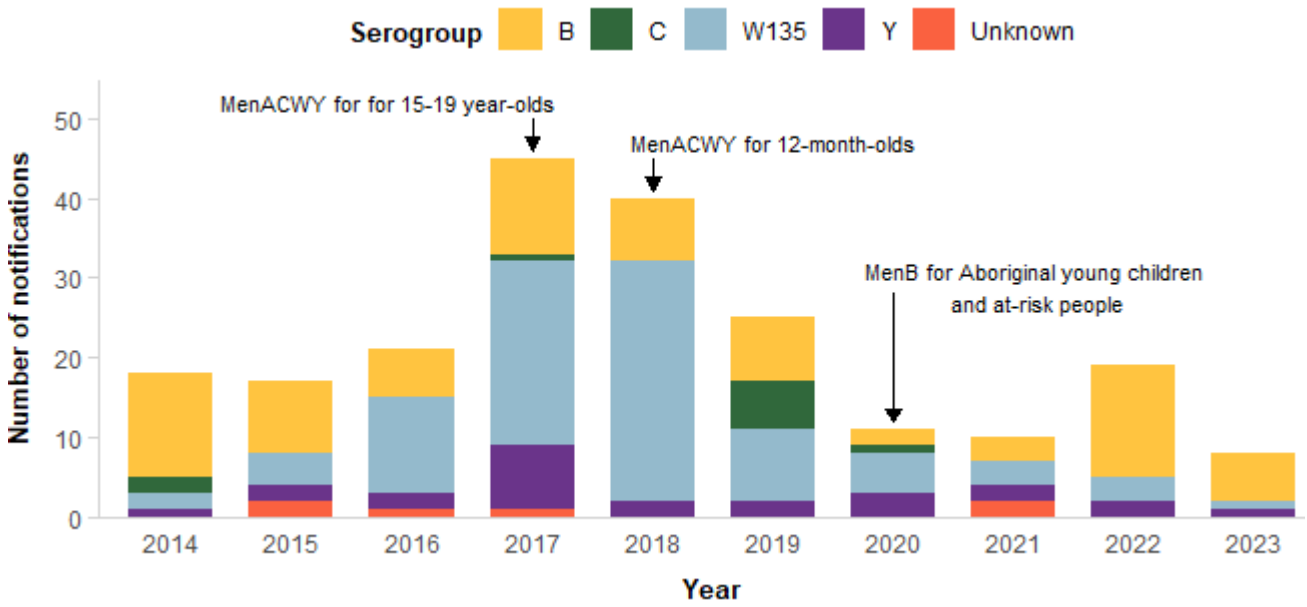


Figure 15: Number of notifications of invasive meningococcal disease by serogroup, 2014 to 2023

Pneumococcal disease is caused by the bacterium *Streptococcus pneumoniae*. There were **228** and **264** cases of **invasive pneumococcal disease** in 2022 and 2023 (8.5 and 9.8 cases

per 100,000 population) encompassing cases of pneumonia, meningitis and bacteraemia. This represents a slight increase on the 2015-19 average of 204 cases per year (7.9 cases per 100,000 population). Invasive pneumococcal disease can affect all age groups, but is more common in young children (**Figure 16**). Aboriginal people are also disproportionately affected, with the 2023 age-adjusted rate over ten times the rate in the non-Aboriginal population (82 cases compared with 7.1 cases per 100,000 population).

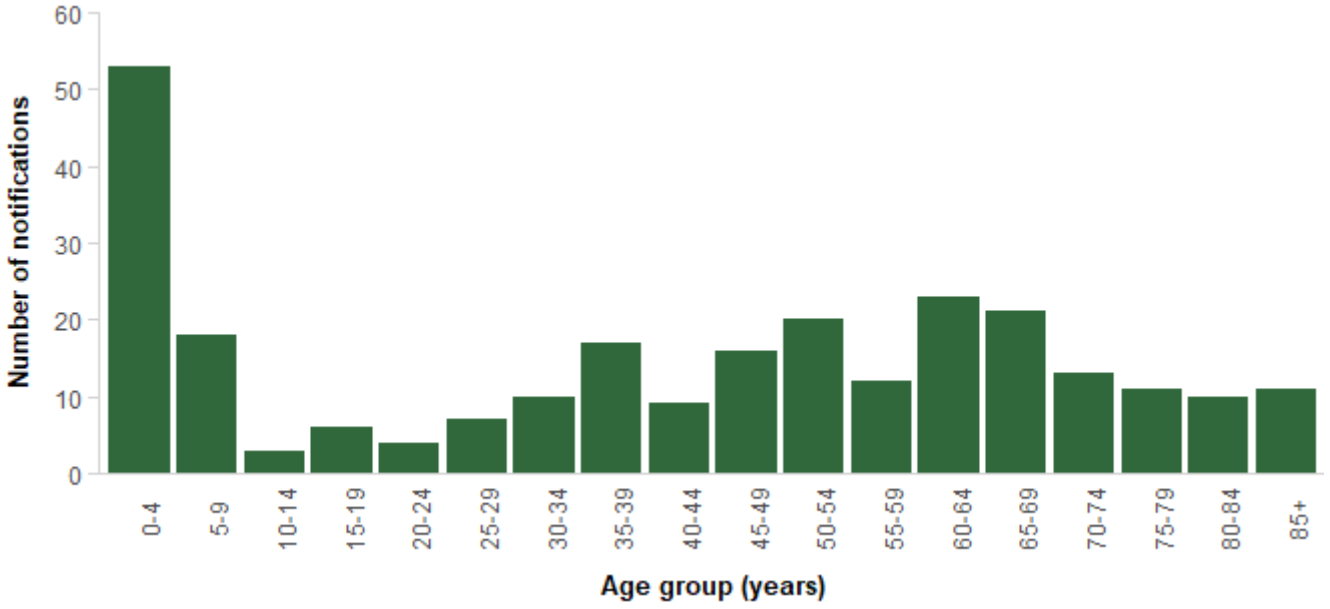


Figure 16: Number of notifications of invasive pneumococcal disease by age group, 2023

Pneumococcal conjugate vaccine is recommended as part of the NIP Schedule for children at 2, 4 and 12 months of age, Aboriginal adults aged 50 years or older, and non-Aboriginal adults aged 70 years or older. Additional doses of pneumococcal conjugate vaccine, and/or pneumococcal polysaccharide vaccine, is also recommended for Aboriginal children living in some jurisdictions (including WA), children, adolescents and adults with risk conditions for pneumococcal disease, and Aboriginal adults aged 50 years or older.[7]

Due to successful vaccination and control programs, there were **no** cases of **tetanus** notified in either 2022 or 2023, while cases of ***Haemophilus influenzae* type B infection** and **rubella** remained rare (see **Appendix Table A2**). Vaccines to protect against these infections are all part of the NIP Schedule (see **Box 3** and **Box 4**); *Haemophilus influenzae* type B vaccine is recommended in a four-dose schedule at 2, 4, 6 and 18 months of age.[7]

Vector-borne diseases

The 10 notifiable vector-borne diseases listed in **Appendix Table A2** are transmitted by either mosquitoes, ticks or mites. Disease transmission is determined by distribution of these vectors which can be affected by climate, land use, host animals and disease control programs.

Four of these vector-borne diseases are mosquito-borne diseases that are locally transmitted in WA, and include Barmah Forest virus, Ross River virus, Murray Valley encephalitis virus, and West Nile (Kunjin) virus infections. These are closely monitored by the Medical Entomology team within the Environmental Health Directorate who publish more detailed quarterly reports available at www.health.wa.gov.au/Articles/J_M/Mosquito-borne-disease-quarterly-reports.

There were **25** and **34** cases of **Barmah Forest virus infection** notified in 2022 and 2023 (0.9 and 1.3 per 100,000 population), comparable to notifications in previous years (average of 31 cases per year 2015-2019, or 1.2 cases per 100,000 population). In 2023, 15 cases occurred in Kimberley residents and eight cases occurred in Perth residents, with the remaining cases distributed among the other public health regions. Most infections were acquired in WA.

In 2022 and 2023, there were **443** and **317** cases of **Ross River virus infection** (17 and 12 cases per 100,000 population), a decrease from the 2015-19 average of 694 cases per year (27 cases per 100,000 population). There were relatively more cases in rural regions, particularly the Kimberley, compared with metropolitan Perth (**Figure 17**).

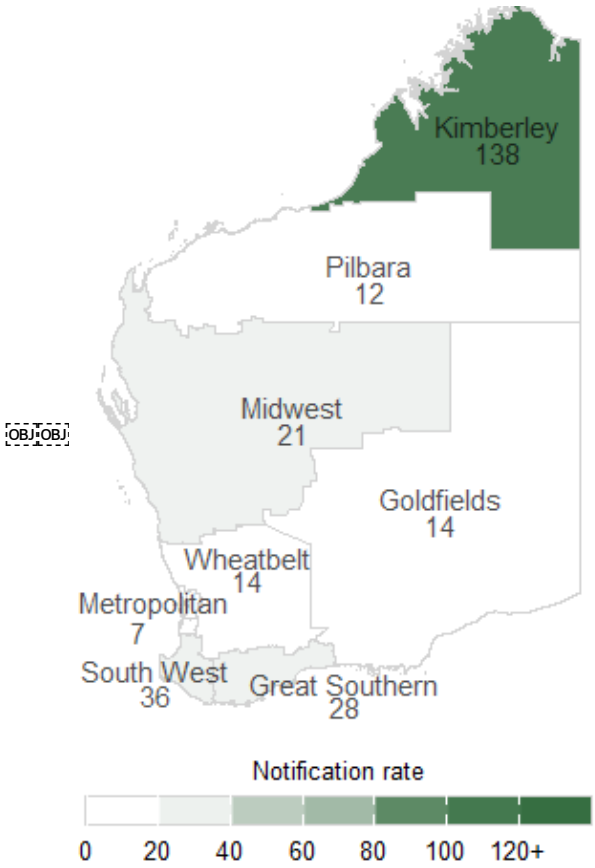


Figure 17: Rate of Ross River virus notifications per 100,000 population, by public health region, 2023

One case of **Murray Valley encephalitis virus infection** was notified in 2022, followed by **six** cases in 2023, after three years of no cases being reported. Two cases died from their illness. Five of the cases likely acquired their infections while residing or travelling in the Kimberley region of WA. Two other cases likely acquired their infections while interstate. **One** case of **West Nile (Kunjin) virus infection** was reported in 2023 (acquired in the Kimberley region) – the first case notified since 2017.

There is no vaccine or specific treatment for either Murray Valley encephalitis or West Nile (Kunjin) virus infection, and the only way to prevent infection is to avoid being bitten by mosquitoes.[13] In addition to surveillance of clinical case notifications, the Department of Health monitors Murray Valley encephalitis and West Nile (Kunjin) virus activity via its arbovirus surveillance and sentinel chicken surveillance programs.[14] Ten media statements were released during 2022 and 2023 to warn the WA community about cases of Murray Valley

encephalitis or West Nile (Kunjin) virus, and/or increased virus activity detected via the arbovirus surveillance and sentinel chicken surveillance programs, and advise on mosquito protection measures.

There are also several notifiable mosquito-borne diseases that are not transmitted within WA, but found exclusively in returning overseas travellers, and include **chikungunya virus infection**, **dengue virus infection**, **malaria** and **Zika virus infection**. **Table 2** shows the most common locations that travellers acquired these infections in 2022 and 2023. The occurrence of these diseases highlights the importance of travel preparation and mosquito avoidance.

Table 2: Most common locations of acquisition for chikungunya, dengue and malaria, 2022 and 2023 combined

Disease	Number of cases	Most common locations of acquisition (number of cases)
Chikungunya	19	Indonesia (10), India (4)
Dengue	277	Indonesia (159), Thailand (36), India (25), Malaysia (10), Philippines (10)
Malaria	90	Sub-Saharan Africa (54), Papua New Guinea (10)

Note: One case of Zika virus infection has been excluded from the table.

There was a notable increase in the number of cases of **dengue fever** in 2023 (205 cases or 7.6 cases per 100,000 population) after low numbers of notifications during 2020 and 2021, coinciding with travel restrictions during the COVID-19 pandemic. However, this was still lower than the 2015-19 average of 351 cases per year (14 cases per 100,000).

There were **19** and **35 rickettsial infections** such as scrub typhus, spotted fever and *Orientia tsutsugamushi* notified in 2022 and 2023. While only four cases in 2022 were thought to have acquired their infection overseas, 20 cases in 2023 were overseas-acquired infections (mostly from Indonesia).

No cases of **Japanese encephalitis virus (JEV)** have been notified in WA since 2018, although response activities have occurred at the state and national level following the emergence of JEV circulation on mainland Australia (see **Box 5**). A JEV vaccine is available via private prescription and recommended for certain at-risk groups such as laboratory workers who may be exposed to the virus and travellers spending a month or more in endemic areas during JEV transmission season.[7] The Department of Health started offered free vaccine to eligible persons in specific areas of the Kimberley and Pilbara from 2022.[15]

Box 5: Response to Japanese encephalitis virus

JEV is endemic to parts of Asia and the Torres Strait region of Australia. However, in 2022 JEV was also detected on the east coast of mainland Australia, resulting in human cases. A One Health approach was adopted, and joint response plans between the human health and agriculture sectors were developed. This led to improved surveillance and reporting, including data sharing mechanisms, and a vaccination program for people in at-risk areas.

Evidence of JEV activity in WA was later identified via feral pig detections in the Kimberley in late 2022, and via the sentinel chicken surveillance program in the Kimberley and Pilbara in early 2023. A joint response was undertaken by the Department of Health and Department of Primary Industry and Regional Development, including review and strengthening of human, animal and mosquito surveillance, development of response plans, health promotion activities and public communications, and roll-out of a vaccination program for high-risk workers and eligible populations in the Kimberley and Pilbara.

Three clinician alerts about Murray Valley encephalitis virus infection and/or JEV were distributed to medical practitioners in 2022-23 to provide information and updates about the epidemiological situation, clinical presentation, testing, mosquito bite prevention, vaccination, and notification of cases.

Zoonotic diseases

Notifiable zoonotic diseases remain rare in WA (**Appendix Table A1**). **Five** cases of **Q fever** were notified in 2022, and **eight** cases in 2023. Nine of these 13 cases were acquired in WA, two were acquired interstate, and two had unknown place of acquisition. Cattle, sheep and goats are the main sources of Q fever infection for people; vaccination is recommended for adolescents and adults who are at risk of Q fever infection, including abattoir workers, farmers, veterinarians and other people exposed to high-risk animals.[7] Two of the cases notified in 2022 were linked to the same hobby farm.

One case of **leptospirosis** was notified in 2022, and **eight** cases in 2023. Of these nine cases, only two infections were acquired in WA, both with exposures to cattle. The remaining infections were acquired overseas.

One case of **brucellosis** was notified in 2023 – the first since 2018. **No** cases of **psittacosis (ornithosis)** have been notified in WA since 2017.

Other diseases

Group A *Streptococcus* is a bacterium commonly found on the throat and skin. Most people who carry group A *Streptococcus* are asymptomatic, but it can sometimes cause throat or skin infections, or more seriously, invasive disease. People who carry group A *Streptococcus* can spread the infection to others via respiratory droplets or direct skin contact. Those unwell with a group A *Streptococcus* infection are more likely to be infectious to others than asymptomatic carriers. **Invasive group A streptococcal disease (iGAS)** is defined by the presence of the bacteria in a sterile site of the body such as soft tissue or the bloodstream. iGAS became nationally notifiable from July 2021 but was not notifiable in WA until August 2021, with 2022 representing the first full year of notifications for the disease.

There were **209** and **272** cases of iGAS in 2022 and 2023 (8 and 10 cases per 100,000 population). A total of 30 deaths were associated with these infections, including seven deaths among children. **Figure 18** shows the number of the iGAS notifications by month for 2022 and 2023. The emergence of highly virulent group A *Streptococcus* sub-lineages such as $M1_{UK}$ contributed to a global upsurge in scarlet fever and invasive infections over 2022-23.[17]

A clinician alert was distributed in early 2023 to advise medical practitioners of the increase in iGAS, and provide information about the clinical presentation and notification of cases. Mother-neonate pairs are considered to be the highest risk group for secondary iGAS; national guidelines were also developed in 2023, which included advice that mother-neonate pairs routinely receive antibiotic chemoprophylaxis if either the mother or neonate developed iGAS within the first 28 days after birth.[16]

Although most cases of iGAS are sporadic, a cluster of three cases of iGAS was linked to a dialysis unit in December 2022. This cluster required intensive public health follow up to identify contacts, coordinate the provision of prophylactic antibiotics, and educate staff, patients and their families to monitor for symptoms of infection.

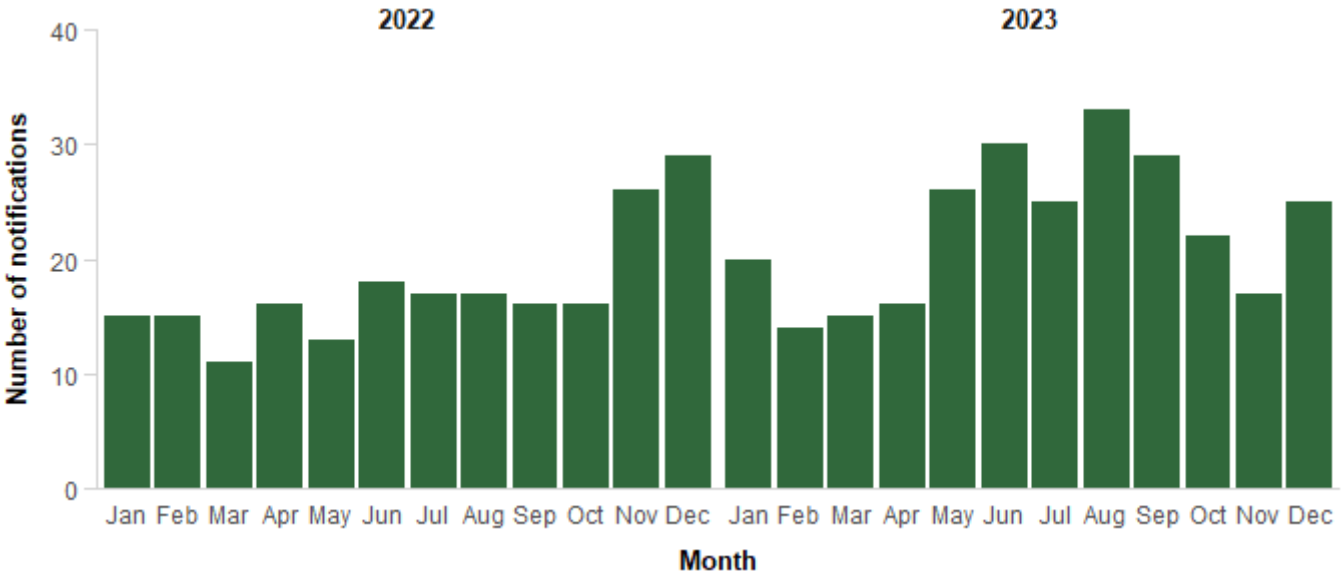


Figure 18: Number of notifications of invasive group A streptococcal disease by month, 2022 and 2023

iGAS rates are higher in regional areas of WA, with Kimberley residents most likely to experience infection (**Figure 19**). The disease also disproportionately affects Aboriginal children, who had an age standardised rate of infection 3.5 times higher than non-Aboriginal children in 2023 (21 compared with 6 infections per 100,000 children).

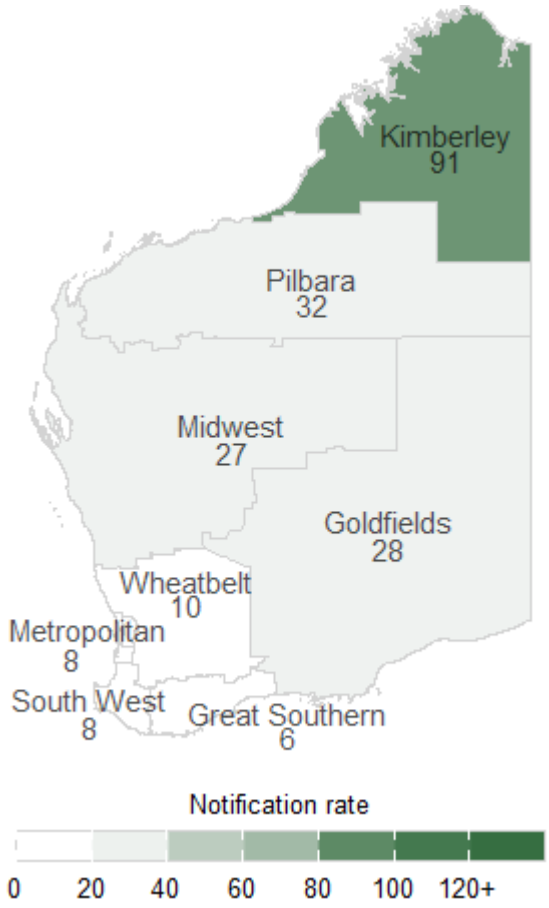


Figure 19: Rate of invasive group A streptococcal notifications per 100,000 population, by public health region, 2023

Acute post-streptococcal glomerulonephritis (APSGN) is an immune condition of the kidneys that uncommonly occurs after a group A streptococcal infection of the throat or skin. There were **14** and **17** cases of APSGN in 2022 and 2023 (0.5 and 0.6 per 100,000 population), with two-thirds of the cases in 2023 in Aboriginal children or adults.

There were **100** and **161** cases (3.7 and 6.0 per 100,000 population) of **tuberculosis** in 2022 and 2023, respectively. There were around 130 to 145 notifications per year in the 9 years to 2021, with the decrease in 2022 thought to be a delayed effect of the closure of international borders during the COVID-19 pandemic.[18] The increase in notifications in 2023 was considered mainly due to the large backlog of immigration that occurred from mid-2022.[18] The majority of cases in both 2022 (86%) and 2023 (92%) were residents in metropolitan Perth. However, most cases had been born overseas (predominantly the Philippines and India), with only 9% of cases in each of 2022 and 2023 born in Australia. Two separate outbreaks of tuberculosis in the Midwest and the Goldfields were identified amongst Aboriginal people in 2022. Further details are available from the WA Tuberculosis Control Program 2022 and 2023 reports available at www.nmhs.health.wa.gov.au/Hospitals-and-Services/Public-Health/TB.

There were **seven** cases of **Creutzfeldt-Jakob disease** notified in 2022 and **eight** cases notified in 2023 (0.3 cases per 100,000 population each year), similar to previous years. Creutzfeldt-Jakob disease is a rare, fatal neurodegenerative disease caused by an infectious protein called a prion. The median age of the 15 cases notified over this period was 70 years.

Leprosy remained uncommon, with **four** cases notified in 2022 and **no** cases notified in 2023. Three of these cases were acquired overseas, and one was acquired in WA.

Legionellosis is a form of pneumonia, with *Legionella pneumophila* and *Legionella longbeachae* the most common species causing disease in Australia. While *L. pneumophila* is associated with warm water environments, *L. longbeachae* is associated with gardening soils and potting mix. There were **61** cases of legionellosis notified in 2022, of which 35 were due to *L. longbeachae* and 24 were due to *L. pneumophila*. Similarly, **85** cases of legionellosis were notified in 2023, of which 35 were due to *L. longbeachae* and 44 were due to *L. pneumophila*. All cases of legionellosis in 2022 and 2023 occurred in adults, with increasing age a risk factor for the disease (**Figure 20**).

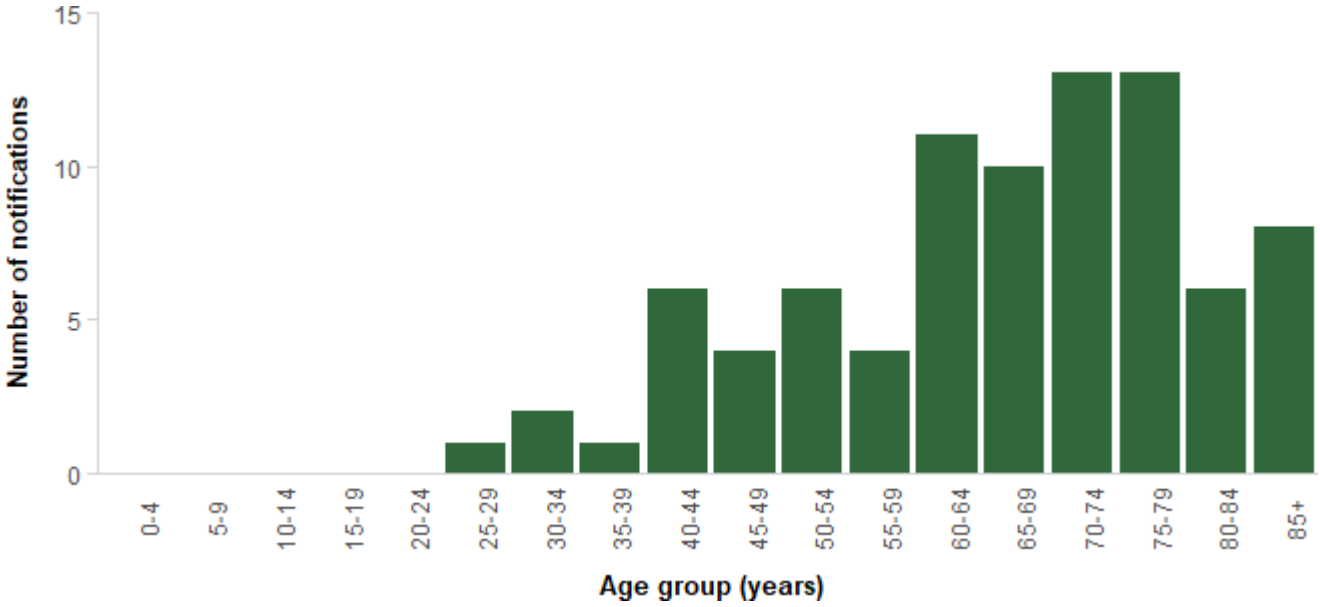


Figure 20: Number of notifications of legionellosis by age group, 2023

Melioidosis is a potentially fatal infection caused by the *Burkholderia pseudomallei* bacterium following contact with contaminated environmental sources such as soil or water. Melioidosis is endemic across the tropical north of Australia, although sporadic infections also occur elsewhere in WA.[19] Most infections occur in people with a background of chronic illness such as diabetes or alcoholic liver disease.

There were **five** and **10** cases of melioidosis notified in 2022 and 2023. Ten of these cases acquired their infection in WA, three cases acquired their infection in the Northern Territory, and two cases acquired their infection while overseas. Seven of the cases acquired in WA had exposures to water sources in the Kimberley, such as swimming, boating or drinking from rivers, watering holes or dams. Two cases had a repeat infection from recrudescence or reactivation of a previous infection, and the acquisition source was unclear in a further case.

One case of **amoebic meningoencephalitis** was notified in 2022 (*Balamuthia mandrillaris*) with an unclear source of acquisition, and **no** cases were notified in 2023. While there was also one case notified in 2021 (*Acanthamoeba* species), these two cases represent the only notifications of amoebic meningoencephalitis since 1990 when the current notifiable diseases database was established in WA.

References

1. Public Health Act 2016 (WA) [Internet]. Perth: Parliamentary Counsel's Office [cited 2025 Mar 13]. Available from: www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_13791_homepage.html.
2. Public Health Regulations 2017 (WA) [Internet]. Perth: Parliamentary Counsel's Office [cited 2025 Mar 13]. Available from: www.legislation.wa.gov.au/legislation/statutes.nsf/law_s49088.html.
3. Government of Western Australia. Review of Western Australia's COVID-19 Management and Response [Internet]. Perth (WA): Government of Western Australia; [2023; cited 2025 Mar 13]. Available from: www.wa.gov.au/system/files/2023-08/reviewofwascovid19managementandresponseaccessible.pdf.
4. Department of Health. Free Influenza Vaccination Program 2022: Frequently asked questions [Internet]. Perth (WA): Department of Health; [reviewed 2022; cited 2025 Mar 05]. Available from: www.healthywa.wa.gov.au/~/media/HWA/Documents/Healthy-living/Immunisation/FAQ-Free-influenza-vaccination-program-FAQ-June-July.pdf.
5. Department of the Premier and Cabinet. Free flu vaccines extended for June 2023 to help WA stay well this winter [Internet]. Perth (WA): Department of the Premier and Cabinet; [reviewed 2023 May 30; cited 2025 Mar 05]. Available from: www.wa.gov.au/government/announcements/free-flu-vaccines-extended-june-2023-help-wa-stay-well-winter.
6. Department of Health. WA Health *Salmonella* Taskforce: Final report. [Internet] Perth (WA): Department of Health; 2023 [cited 2025 Jan]. Available from: www.health.wa.gov.au/~/media/Corp/Documents/Reports-and-publications/WA-foodborne-illness-reduction-strategy/Foodborne-strategy-taskforce.pdf.

7. Department of Health and Aged Care. Australian Immunisation Handbook [Internet]. Canberra (ACT): Department of Health and Aged Care; [cited 2025 Mar 05]. Available from: https://immunisationhandbook.health.gov.au/.
8. Department of Health. Guidance for the management of multi-drug resistant (MDR) Shigella infections ('Shigellosis') in Western Australia [Internet]. Perth (WA): Department of Health; [2024; cited 2025 Mar 07]. Available from: www.health.wa.gov.au/~/media/Corp/Documents/Health-for/Communicable-Diseases/Guidelines/Guidance-for-the-management-of-multidrug-resistant-MDR-Shigella-infections-Shigellosis-in-Western-Au.pdf.
9. Department of Health. Guidance for the management of Shigella infections ('Shigellosis') in remote populations of Western Australia [Internet]. Perth (WA): Department of Health; [2024; cited 2025 Mar 07]. Available from: www.health.wa.gov.au/~/media/Corp/Documents/Health-for/Communicable-Diseases/Guidelines/Guidance-for-the-management-of-Shigella-infections-Shigellosis-in-remote-populations-of-Western-Aust.pdf.
10. Department of Health and Aged Care. Sixth National Hepatitis C Strategy 2023-2030: Draft for consultation. [Internet] Canberra (ACT): Department of Health and Aged Care; 2023 [cited 2025 Jan]. Available from: www.health.gov.au/sites/default/files/2023-05/draft-sixth-national-hepatitis-c-strategy-2023-2030-for-public-consultation.pdf.
11. Department of Health. Hepatitis D [Internet]. Perth (WA): Department of Health; [cited 2025 Mar 06]. Available from: www.health.wa.gov.au/Articles/F_I/Hepatitis-D.
12. Department of Health. The Epidemiology of Notifiable Sexually Transmitted Infections and Blood-Borne Viruses in Western Australia 2023. [2025; cited 2025 Mar 18].
13. Department of Health. Murray Valley encephalitis and Kunjin disease [Internet]. Perth (WA): Department of Health; [reviewed 2020 Sep 09; cited 2025 Mar 05]. Available from: www.health.wa.gov.au/Articles/J_M/Mosquito-borne-diseases/Murray-Valley-encephalitis-virus-and-West-Nile-virus-Kunjin-strain.
14. Department of Health. Arbovirus surveillance program [Internet]. Perth (WA): Department of Health; [reviewed 2020 Aug 21; cited 2025 Mar 05]. Available from: www.health.wa.gov.au/Articles/A_E/Arbovirus-surveillance-program.
15. Department of Health. HealthyWA: Japanese encephalitis [Internet]. Perth (WA): Department of Health; [reviewed 2023 Oct 25; cited 2025 Mar 07]. Available from: www.healthywa.wa.gov.au/Articles/J_M/Japanese-encephalitis.
16. Department of Health and Aged Care. CDNA National Guidelines for Public Health Units: Invasive Group A Streptococcal (iGAS) Disease (version 2.0). [Internet] Canberra (ACT): Department of Health and Aged Care; [reviewed 2024 Jan 01; cited 2025 Mar 06]. Available from: www.health.gov.au/resources/publications/invasive-group-a-streptococcal-igas-disease-cdna-national-guidelines-for-public-health-units.
17. Morris JM, Lacey, JA & Stevens K et al. Genomic interrogation of invasive group A Streptococcus (iGAS) epidemiology and COVID-19 impacts in Victoria, Australia: a 6-year retrospective study. *The Lancet Regional Health – Western Pacific*. 2025;55:101467. Available from: www.thelancet.com/journals/lanwpc/article/PIIS2666-6065(25)00004-5/fulltext.

18. North Metropolitan Health Service. Western Australian Tuberculosis Control Program: Tuberculosis notifications in Western Australia 2023. [2025; cited 2025 Mar 17].
19. Inglis TJ. Melioidosis in Australia. *Microbiology Australia*. 2021;42 (96-99).

Appendix

Table A1: Number and rate[1] of notifications in WA, by year

	Number									Rate			Rate ratio
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2022	2023	2015-19	
Acute respiratory infections													
COVID-19	NN	NN	NN	NN	NN	861	313	1260163	95376	47184.7	3546.4	N/A	N/A
Influenza	5986	7825	6006	5862	23279	1213	37	14058	21177	526.4	787.4	378.3	2.1
RSV	NN	NN	NN	NN	NN	NN	489	11653	10536	436.3	391.8	N/A	N/A
Enteric diseases													
Botulism	1	0	0	0	0	0	0	0	0	0	0	0.0	0
Campylobacteriosis	2889	3405	3388	3456	3533	2892	3152	4033	4820	151.0	179.2	129.4	1.4
Cholera	0	0	1	0	0	0	0	0	1	0	0.0	0.0	4.8
Cryptosporidiosis	255	245	400	121	211	495	131	277	210	10.4	7.8	9.6	0.8
HUS	1	3	3	1	1	4	2	1	2	0.0	0.1	0.1	1.1
Hepatitis A	25	17	12	12	24	6	1	14	18	0.5	0.7	0.7	1.0
Hepatitis E	2	3	4	2	4	3	0	0	7	0	0.3	0.1	2.2
Listeriosis	6	6	6	8	7	7	6	9	6	0.3	0.2	0.3	0.9
Paratyphoid fever	11	12	4	9	9	0	0	1	15	0.0	0.6	0.3	1.6
Rotavirus infection	598	180	519	298	519	189	717	370	894	13.9	33.2	16.4	2.0
Salmonellosis	1702	1948	2577	2052	2154	1760	922	950	1427	35.6	53.1	80.9	0.7
STEC	0	34	60	93	151	105	107	222	217	8.3	8.1	2.6	3.1
Shigellosis	97	93	198	264	390	226	100	191	414	7.2	15.4	8.0	1.9
Typhoid fever	8	12	21	13	20	7	1	17	22	0.6	0.8	0.6	1.4
Vibrio parahaemolyticus	7	24	21	14	16	3	39	5	10	0.2	0.4	0.6	0.6
Yersinia infection	31	15	15	11	24	16	38	31	98	1.2	3.6	0.7	4.9
Blood-borne viruses													
Hepatitis B (newly acquired)	29	25	18	25	23	20	7	11	23	0.4	0.9	0.9	0.9
Hepatitis B (unspecified)	530	621	496	460	423	494	524	406	486	15.2	18.1	19.7	0.9
Hepatitis C (newly acquired)	183	120	128	125	121	91	78	67	145	2.5	5.4	5.3	1.0
Hepatitis C (unspecified)	914	1069	1032	871	859	829	930	729	783	27.3	29.1	36.9	0.8
Hepatitis D	0	1	2	8	10	3	12	8	3	0.3	0.1	0.2	0.7
Sexually transmitted infections													
Chlamydial infection (genital)	11149	11792	11482	11510	11576	10782	10930	11043	12933	413.5	480.9	446.5	1.1
Gonococcal infection	2309	3360	3335	3417	3932	3574	2916	3302	4727	123.6	175.8	126.8	1.4
HIV	108	95	79	58	104	72	56	59	68	2.2	2.5	3.4	0.7
LGV	14	9	8	5	2	3	1	0	0	0	0	0.3	0
Mpox	NN	NN	NN	NN	NN	NN	NN	7	3	0.3	0.1	N/A	N/A
Syphilis (congenital)	0	0	0	1	1	4	4	4	4	0.1	0.1	0.0	9.7
Syphilis – infectious	162	335	321	429	573	720	844	804	695	30.1	25.8	14.1	1.8
Syphilis – non-infectious	68	58	160	217	229	215	239	230	247	8.6	9.2	5.7	1.6
Vaccine-preventable diseases													
Diphtheria	0	0	1	0	0	0	0	1	2	0.0	0.1	0.0	9.6
HiB (invasive)	2	1	0	1	2	3	1	1	0	0.0	0	0.0	0
Measles	8	11	17	38	52	4	0	0	6	0	0.2	1.0	0.2
Meningococcal (invasive)	17	21	45	40	25	11	10	19	8	0.7	0.3	1.1	0.3
Mumps	455	481	23	18	33	10	1	1	7	0.0	0.3	7.9	0.0

Table A1 *(continued)*: Number and rate[1] of notifications in WA, by year

	Number									Rate			Rate ratio
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2022	2023	2015-19	
Vaccine-preventable diseases *(continued)*													
Pertussis	1867	1521	1507	1311	550	125	47	32	78	1.2	2.9	52.6	0.1
Pneumococcal (invasive)	166	200	197	208	250	180	185	228	264	8.5	9.8	7.9	1.2
Rubella	2	1	2	1	1	1	3	1	4	0.0	0.1	0.1	2.7
Tetanus	0	1	0	1	0	1	1	0	0	0	0	0.0	0
Varicella (chickenpox)	490	617	699	668	627	649	537	435	503	16.3	18.7	24.1	0.8
Varicella (shingles)	1460	1731	2001	2226	2251	2555	2754	2402	2501	89.9	93.0	75.0	1.2
Varicella (unspecified)	1405	1518	1566	1513	1381	1694	1841	2515	2764	94.2	102.8	57.3	1.8
Vector-borne diseases													
Barmah Forest virus	46	13	47	36	14	21	23	25	34	0.9	1.3	1.2	1.0
Chikungunya	11	15	11	3	9	7	0	10	9	0.4	0.3	0.4	0.9
Dengue fever	553	556	177	138	332	60	0	72	205	2.7	7.6	13.7	0.6
Japanese encephalitis virus	0	0	0	1	0	0	0	0	0	0	0	0.0	0
Malaria	49	56	59	49	60	27	11	37	53	1.4	2.0	2.1	0.9
Murray Valley encephalitis virus	0	0	0	1	0	0	0	1	6	0.0	0.2	0.0	28.9
Ross River virus	953	478	1158	494	385	519	700	443	317	16.6	11.8	27.0	0.4
Typhus	31	39	19	18	29	20	20	19	35	0.7	1.3	1.1	1.2
West Nile (Kunjin) virus	0	0	4	0	0	0	0	0	1	0	0.0	0.0	1.2
Zika virus infection	2	15	1	1	0	0	0	1	0	0.0	0	0.1	0
Zoonotic diseases													
Brucellosis	0	2	0	1	0	0	0	0	1	0	0.0	0.0	1.6
Leptospirosis	1	6	3	5	4	3	4	1	8	0.0	0.3	0.1	2.0
Psittacosis (ornithosis)	1	0	3	0	0	0	0	0	0	0	0	0.0	0
Q fever	12	12	9	13	7	5	3	5	8	0.2	0.3	0.4	0.7
Other diseases													
APSGN	0	0	5	24	10	5	10	14	17	0.5	0.6	0.3	2.1
Amoebic meningitis	0	0	0	0	0	0	1	1	0	0.0	0	0	N/A
Creutzfeldt-Jakob disease	4	8	6	8	8	11	7	7	8	0.3	0.3	0.3	1.1
iGAS	NN	NN	NN	NN	NN	NN	19	209	272	7.8	10.1	N/A	N/A
Legionellosis	74	69	38	45	36	80	74	61	85	2.3	3.2	2.0	1.5
Leprosy	2	7	3	1	2	3	4	4	0	0.1	0	0.1	0.0
Melioidosis	6	3	7	5	3	5	7	5	10	0.2	0.4	0.2	2.0
Tuberculosis	129	142	132	134	136	137	143	100	161	3.7	6.0	5.2	1.1
Total all diseases (excluding COVID-19)	**34831**	**38831**	**38036**	**36344**	**54403**	**29870**	**28689**	**55152**	**67358**	**2065.1**	**2504.6**	**1569.7**	**1.6**

Notes:

1. Rates are per 100,000 population. 2015-19 rate is calculated as the sum of the rates between 2015 and 2019 divided by five. Rate ratio is calculated as the 2023 rate divided by the average 2015-19 rate.

2. Disease rows were excluded where no cases occurred statewide since 2015 or earlier (i.e. anthrax, chancroid, donovanosis, Hendra virus infection, lyssavirus infection, Middle East respiratory syndrome, plague, poliovirus infection, severe acute respiratory syndrome, smallpox, tularaemia, viral haemorrhagic fever and yellow fever).

3. From July 2018, the case definitions for shigellosis and rotavirus infection were altered; the former contributing to a larger number of notifications, and the latter having no substantial impact on number of notifications. From September 2018, the case definition for pertussis was made more stringent, likely contributing to a smaller number of notifications.

4. N/A=not applicable; RSV=respiratory syncytial virus infection; NN=not notifiable; HUS=haemolytic uraemic syndrome; STEC=shiga toxin-producing *Escherichia coli*; HIV=human immunodeficiency virus infection; LGV=lymphogranuloma venereum; Mpox=monkeypox virus infection; HiB=*Haemophilus influenzae* type b infection (invasive); APSGN=acute post-streptococcal glomerulonephritis; iGAS=invasive group A streptococcal disease.

5. Changes to case definitions may impact the number of notifications. The surveillance case definition revision history can be found at www.health.wa.gov.au/~/media/Corp/Documents/Health-for/Communicable-Diseases/definitions/wa-notifiable-infectious-disease-case-definitions.pdf.

Table A2: Number and rate[1] of disease notifications, by public health region, 2022

	Wheatbelt		Goldfields		Great Southern		Kimberley		Perth		Midwest		Pilbara		Southwest	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Acute respiratory infections																
COVID-19	24227	32619.3	22204	43930.9	22738	36992.8	16653	48380.3	1031556	48039.2	24573	41379.8	24587	41603.1	78442	42645.4
Influenza	149	200.6	329	650.9	387	629.6	876	2545.0	10614	494.3	428	720.7	599	1013.6	622	338.2
RSV	138	185.8	304	601.5	426	693.1	301	874.5	9385	437.1	316	532.1	230	389.2	526	286.0
Enteric diseases																
Campylobacteriosis	125	168.3	62	122.7	115	187.1	45	130.7	3127	145.6	99	166.7	89	150.6	352	191.4
Cryptosporidiosis	2	2.7	6	11.9	9	14.6	25	72.6	194	9.0	5	8.4	12	20.3	24	13.0
HUS	0	0	0	0	0	0	0	0	1	0.0	0	0	0	0	0	0
Hepatitis A	0	0	0	0	0	0	0	0	12	0.6	0	0	0	0	2	1.1
Listeriosis	0	0	0	0	0	0	0	0	8	0.4	0	0	1	1.7	0	0
Paratyphoid fever	0	0	0	0	0	0	0	0	1	0.0	0	0	0	0	0	0
Rotavirus infection	11	14.8	12	23.7	5	8.1	17	49.4	289	13.5	6	10.1	12	20.3	18	9.8
Salmonellosis	24	32.3	7	13.8	19	30.9	62	180.1	693	32.3	30	50.5	36	60.9	76	41.3
STEC	13	17.5	6	11.9	14	22.8	16	46.5	123	5.7	19	32.0	3	5.1	26	14.1
Shigellosis	1	1.3	17	33.6	1	1.6	49	142.4	95	4.4	10	16.8	14	23.7	2	1.1
Typhoid fever	0	0	0	0	0	0	0	0	15	0.7	0	0	0	0	0	0
Vibrio parahaemolyticus	0	0	0	0	0	0	0	0	5	0.2	0	0	0	0	0	0
Yersinia infection	2	2.7	0	0	0	0	0	0	26	1.2	0	0	0	0	3	1.6
Blood-borne viruses																
Hepatitis B (newly acquired)	0	0	0	0	1	1.6	0	0	5	0.2	0	0	1	1.7	4	2.2
Hepatitis B (unspecified)	4	5.4	7	13.8	4	6.5	10	29.1	343	16.0	11	18.5	12	20.3	11	6.0
Hepatitis C (newly acquired)	0	0	2	4.0	6	9.8	0	0	51	2.4	2	3.4	1	1.7	5	2.7
Hepatitis C (unspecified)	20	26.9	12	23.7	32	52.1	21	61.0	537	25.0	32	53.9	25	42.3	48	26.1
Hepatitis D	1	1.3	0	0	0	0	0	0	6	0.3	1	1.7	0	0	0	0
Sexually transmitted infections																
Chlamydial infection (genital)	172	231.6	306	605.4	142	231.0	619	1798.3	8632	402.0	262	441.2	381	644.7	490	266.4
Gonococcal infection	30	40.4	173	342.3	18	29.3	533	1548.5	2169	101.0	71	119.6	240	406.1	59	32.1
Mpox	0	0	0	0	0	0	0	0	7	0.3	0	0	0	0	0	0
Syphilis (congenital)	0	0	1	2.0	0	0	0	0	1	0.0	0	0	2	3.4	0	0
Syphilis – infectious	6	8.1	19	37.6	7	11.4	118	342.8	517	24.1	28	47.2	95	160.7	12	6.5
Syphilis – non-infectious	6	8.1	18	35.6	6	9.8	15	43.6	135	6.3	16	26.9	20	33.8	11	6.0
Vaccine-preventable diseases																
Diphtheria	0	0	0	0	0	0	0	0	1	0.0	0	0	0	0	0	0
HiB (invasive)	0	0	0	0	0	0	0	0	0	0	0	0	1	1.7	0	0
Meningococcal (invasive)	0	0	0	0	0	0	3	8.7	14	0.7	0	0	1	1.7	1	0.5
Mumps	0	0	1	2.0	0	0	0	0	0	0	0	0	0	0	0	0
Pertussis	1	1.3	2	4.0	2	3.3	0	0	21	1.0	2	3.4	0	0	4	2.2
Pneumococcal (invasive)	6	8.1	27	53.4	4	6.5	21	61.0	125	5.8	9	15.2	23	38.9	9	4.9
Rubella	0	0	0	0	0	0	0	0	1	0.0	0	0	0	0	0	0
Varicella (chickenpox)	13	17.5	11	21.8	8	13.0	8	23.2	334	15.6	9	15.2	15	25.4	35	19.0
Varicella (shingles)	90	121.2	65	128.6	101	164.3	67	194.6	1612	75.1	47	79.1	33	55.8	385	209.3
Varicella (unspecified)	29	39.0	2	4.0	53	86.2	0	0.0	2364	110.1	59	99.4	0	0	0	0.0

Table A2 *(continued)*: Number and rate[1] of disease notifications, by public health region, 2022

	Wheatbelt		Goldfields		Great Southern		Kimberley		Perth		Midwest		Pilbara		Southwest	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Vector-borne diseases																
Barmah Forest virus	1	1.3	3	5.9	3	4.9	7	20.3	6	0.3	1	1.7	2	3.4	2	1.1
Chikungunya	0	0	0	0	0	0	0	0	8	0.4	0	0	0	0	2	1.1
Dengue fever	1	1.3	0	0	0	0	0	0	62	2.9	0	0	0	0	3	1.6
Malaria	0	0	0	0	0	0	0	0	34	1.6	0	0	0	0	2	1.1
Murray Valley encephalitis virus	0	0	0	0	0	0	1	2.9	0	0	0	0	0	0	0	0
Ross River virus	16	21.5	6	11.9	24	39.0	29	84.3	285	13.3	8	13.5	12	20.3	63	34.3
Typhus	0	0	0	0	5	8.1	0	0	8	0.4	0	0	0	0	6	3.3
Zika virus infection	0	0	0	0	0	0	0	0	1	0.0	0	0	0	0	0	0
Zoonotic diseases																
Leptospirosis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5
Q fever	0	0	0	0	0	0	0	0	4	0.2	1	1.7	0	0	0	0
Other diseases																
APSGN	0	0	1	2.0	0	0	10	29.1	3	0.1	0	0	0	0	0	0
Amoebic meningitis	0	0	0	0	0	0	0	0	1	0.0	0	0	0	0	0	0
Creutzfeldt-Jakob disease	0	0	0	0	0	0	0	0	6	0.3	0	0	0	0	1	0.5
iGAS	4	5.4	8	15.8	4	6.5	23	66.8	129	6.0	9	15.2	21	35.5	9	4.9
Legionellosis	0	0	1	2.0	3	4.9	2	5.8	48	2.2	1	1.7	1	1.7	5	2.7
Leprosy	1	1.3	0	0	0	0	0	0	2	0.1	0	0	1	1.7	0	0
Melioidosis	0	0	0	0	0	0	4	11.6	1	0	0	0	0	0	0	0
Tuberculosis	0	0	4	7.9	2	3.3	0	0	86	4.0	3	5.1	1	1.7	4	2.2
Total (excluding COVID-19 and HIV)	**866**	**1166.0**	**1412**	**2793.7**	**1401**	**2279.3**	**2882**	**8372.8**	**42147**	**1962.8**	**1485**	**2500.7**	**1884**	**3187.9**	**2823**	**1534.7**

Notes:

1. Rates are per 100,000 population.

2. Disease rows were excluded where no cases occurred in any public health region in 2022 (i.e. anthrax, botulism, brucellosis, chancroid, cholera, donovanosis, Hendra virus infection, hepatitis E, Japanese encephalitis virus infection, lymphogranuloma venereum, lyssavirus infection, measles, Middle East respiratory syndrome, plague, poliovirus infection, psittacosis (ornithosis), severe acute respiratory syndrome, smallpox, tetanus, tularaemia, viral haemorrhagic fever, yellow fever and West Nile (Kunjin) virus infection).

3. HIV data is described within the report but not presented per region in Tables A2 and A3.

4. 193 notifications recorded as NOWA (not WA) were excluded from Table A2.

5. COVID-19 data is presented by public health unit at onset, where known, and otherwise most recently recorded public health unit.

6. N/A=not applicable; RSV=respiratory syncytial virus infection; NN=not notifiable; HUS=haemolytic uraemic syndrome; STEC=shiga toxin-producing *Escherichia coli*; HIV=human immunodeficiency virus infection; Mpox=monkeypox virus infection; HiB=*Haemophilus influenzae* type b infection; APSGN=acute post-streptococcal glomerulonephritis; iGAS=invasive group A streptococcal disease.

Table A3: Number and rate[1] of disease notifications, by public health region, 2023

	Wheatbelt		Goldfields		Great Southern		Kimberley		Perth		Midwest		Pilbara		Southwest	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Acute respiratory infections																
COVID-19	1788	2423.9	1533	3102.5	1932	3135.3	1197	3520.3	78537	3622.4	1924	3292.7	1053	1800.2	5755	3106.1
Influenza	252	341.6	468	947.2	591	959.1	1149	3379.1	15876	732.3	379	648.6	743	1270.2	1559	841.4
RSV	147	199.3	196	396.7	303	491.7	243	714.6	8320	383.7	260	445	274	468.4	741	399.9
Enteric diseases																
Campylobacteriosis	127	172.2	78	157.9	127	206.1	71	208.8	3788	174.7	80	136.9	72	123.1	447	241.3
Cryptosporidiosis	3	4.1	3	6.1	4	6.5	16	47.1	135	6.2	10	17.1	20	34.2	16	8.6
HUS	0	0	0	0	0	0	0	0	2	0.1	0	0	0	0	0	0
Hepatitis A	0	0	0	0	0	0	0	0	16	0.7	0	0	0	0	0	0
Hepatitis E	0	0	0	0	0	0	0	0	6	0.3	0	0	0	0	0	0
Listeriosis	1	1.4	0	0	0	0	0	0	5	0.2	0	0	0	0	0	0
Paratyphoid fever	0	0	0	0	0	0	0	0	14	0.6	1	1.7	0	0	0	0
Rotavirus infection	5	6.8	7	14.2	5	8.1	29	85.3	727	33.5	12	20.5	36	61.5	65	35.1
Salmonellosis	39	52.9	25	50.6	27	43.8	74	217.6	1061	48.9	35	59.9	68	116.3	94	50.7
STEC	18	24.4	9	18.2	12	19.5	11	32.4	119	5.5	7	12.0	9	15.4	27	14.6
Shigellosis	2	2.7	7	14.2	3	4.9	45	132.3	320	14.8	11	18.8	6	10.3	14	7.6
Typhoid fever	0	0	1	2.0	0	0	0	0	18	0.8	0	0	0	0	0	0
Vibrio parahaemolyticus	0	0	1	2.0	0	0	0	0	8	0.4	0	0	0	0	1	0.5
Yersinia infection	1	1.4	1	2.0	2	3.2	2	5.9	84	3.9	1	1.7	3	5.1	4	2.2
Blood-borne viruses																
Hepatitis B (newly acquired)	0	0	2	4.0	0	0	1	2.9	16	0.7	0	0	1	1.7	3	1.6
Hepatitis B (unspecified)	4	5.4	8	16.2	7	11.4	12	35.3	418	19.3	11	18.8	13	22.2	5	2.7
Hepatitis C (newly acquired)	1	1.4	2	4.0	12	19.5	1	2.9	121	5.6	4	6.8	0	0	4	2.2
Hepatitis C (unspecified)	20	27.1	20	40.5	41	66.5	24	70.6	575	26.5	30	51.3	22	37.6	45	24.3
Hepatitis D	1	1.4	0	0	0	0	0	0	2	0.1	0	0	0	0	0	0
Sexually transmitted infections																
Chlamydial infection (genital)	173	234.5	320	647.6	179	290.5	679	1996.9	10195	470.2	273	467.2	454	776.1	603	325.5
Gonococcal infection	44	59.6	226	457.4	27	43.8	466	1370.5	3452	159.2	93	159.2	209	357.3	183	98.8
Mpox	0	0	0	0	0	0	0	0	2	0.1	0	0	0	0	0	0
Syphilis (congenital)	0	0	0	0	0	0	0	0	4	0.2	0	0	0	0	0	0
Syphilis – infectious	9	12.2	40	81.0	7	11.4	70	205.9	421	19.4	22	37.6	106	181.2	17	9.2
Syphilis – non-infectious	12	16.3	18	36.4	6	9.7	6	17.6	153	7.1	22	37.6	18	30.8	9	4.9
Vaccine-preventable diseases																
Diphtheria	0	0	0	0	0	0	0	0	2	0.1	0	0	0	0	0	0
Measles	0	0	0	0	0	0	0	0	6	0.3	0	0	0	0	0	0
Meningococcal (invasive)	0	0	1	2.0	0	0	1	2.9	4	0.2	1	1.7	0	0	1	0.5
Mumps	0	0	2	4.0	0	0	0	0	5	0.2	0	0	0	0	0	0
Pertussis	1	1.4	5	10.1	1	1.6	0	0	56	2.6	3	5.1	1	1.7	11	5.9
Pneumococcal (invasive)	6	8.1	20	40.5	2	3.2	21	61.8	165	7.6	12	20.5	20	34.2	11	5.9
Rubella	0	0	0	0	0	0	0	0	4	0.2	0	0	0	0	0	0
Varicella (chickenpox)	12	16.3	11	22.3	12	19.5	12	35.3	381	17.6	4	6.8	17	29.1	52	28.1
Varicella (shingles)	75	101.7	75	151.8	115	186.6	49	144.1	1657	76.4	68	116.4	40	68.4	416	224.5
Varicella (unspecified)	33	44.7	7	14.2	23	37.3	0	0	2671	123.2	21	35.9	2	3.4	2	1.1

Table A3 *(continued)*: Number and rate[1] of disease notifications, by public health region, 2023

	Wheatbelt		Goldfields		Great Southern		Kimberley		Perth		Midwest		Pilbara		Southwest	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Vector-borne diseases																
Barmah Forest virus	2	2.7	3	6.1	1	1.6	15	44.1	8	0.4	2	3.4	0	0	3	1.6
Chikungunya	0	0	0	0	0	0	0	0	8	0.4	0	0	1	1.7	0	0
Dengue fever	0	0	1	2.0	3	4.9	2	5.9	160	7.4	8	13.7	2	3.4	21	11.3
Malaria	0	0	2	4.0	0	0	2	5.9	42	1.9	0	0	1	1.7	1	0.5
Murray Valley encephalitis virus	0	0	1	2.0	0	0	2	5.9	1	0.0	0	0	1	1.7	0	0
Ross River virus	10	13.6	7	14.2	17	27.6	47	138.2	150	6.9	12	20.5	7	12.0	67	36.2
Typhus	3	4.1	0	0	1	1.6	1	2.9	26	1.2	1	1.7	1	1.7	1	0.5
West Nile (Kunjin) virus	0	0	0	0	0	0	1	2.9	0	0	0	0	0	0	0	0
Zoonotic diseases																
Brucellosis	0	0	0	0	0	0	0	0	0	0	0	0	1	1.7	0	0
Leptospirosis	0	0	1	2.0	0	0	1	2.9	5	0.2	0	0	0	0	0	0
Q fever	1	1.4	0	0	1	1.6	0	0	3	0.1	2	3.4	0	0	1	0.5
Other diseases																
APSGN	0	0	2	4.0	0	0	11	32.4	2	0.1	0	0	2	3.4	0	0
Creutzfeldt-Jakob disease	0	0	1	2.0	0	0	0	0	6	0.3	0	0	1	1.7	0	0
iGAS	7	9.5	14	28.3	4	6.5	31	91.2	166	7.7	16	27.4	19	32.5	14	7.6
Legionellosis	7	9.5	0	0	4	6.5	0	0	54	2.5	2	3.4	3	5.1	12	6.5
Melioidosis	1	1.4	0	0	1	1.6	3	8.8	3	0.1	0	0	1	1.7	1	0.5
Tuberculosis	3	4.1	1	2.0	1	1.6	0	0	148	6.8	3	5.1	1	1.7	4	2.2
Total (excluding COVID-19 and HIV)	**1020**	**1382.8**	**1586**	**3209.8**	**1539**	**2497.6**	**3098**	**9111.0**	**51591**	**2379.6**	**1406**	**2406.2**	**2175**	**3718.3**	**4455**	**2404.5**

Notes:

1. Rates are per 100,000 population.

2. Disease rows were excluded where no cases occurred in any public health region in 2023 (i.e. amoebic meningoencephalitis, anthrax, botulism, chancroid, cholera, donovanosis, *Haemophilus influenzae* type b infection (invasive), Hendra virus infection, Japanese encephalitis virus infection, leprosy, lymphogranuloma venereum, lyssavirus infection, Middle East respiratory syndrome, plague, poliovirus infection, psittacosis (ornithosis), severe acute respiratory syndrome, smallpox, tetanus, tularaemia, viral haemorrhagic fever, yellow fever and Zika virus infection).

3. HIV data is described within the report but not presented per region in Tables A2 and A3.

4. 416 notifications recorded as NOWA (not WA) and four notifications recorded as WAUN (WA unknown) were excluded from Table A3.

5. COVID-19 data is presented by public health unit at onset, where known, and otherwise most recently recorded public health unit.

6. N/A=not applicable; RSV=respiratory syncytial virus infection; NN=not notifiable; HUS=haemolytic uraemic syndrome; STEC=shiga toxin-producing *Escherichia coli*; HIV=human immunodeficiency virus infection; Mpox=monkeypox virus infection; HiB=*Haemophilus influenzae* type b infection; APSGN=acute post-streptococcal glomerulonephritis; iGAS=invasive group A streptococcal disease.

This document can be made available in alternative formats on request for a person with disability.

health.wa.gov.au