Government of **Western Australia**
North Metropolitan Health Service

Report of notifiable infectious diseases in metropolitan Perth

2018

nmhs.health.wa.gov.au

Report of notifiable infectious diseases in metropolitan Perth, 2018.

Metropolitan Communicable Disease Control

Mental Health, Public Health and Dental Services

North Metropolitan Health Service

Note: For this report, the geographical boundaries of metropolitan Perth are defined by the area within the East, North and South Metropolitan Health Services (EMHS, NMHS and SMHS).

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

Metropolitan Communicable Disease Control would like to acknowledge the assistance of medical and nursing staff working in general practices, hospitals and laboratories, in monitoring and implementing public health interventions to secure communicable disease control in the Perth metropolitan area.

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Table of Contents

Executive Summary

Metropolitan Communicable Disease Control (MCDC) is responsible for the public health management of notifiable infectious diseases in metropolitan Perth. This report aims to inform health care providers and stakeholders about local trends in communicable diseases in 2018, and highlight issues requiring attention.

27 980
notifiable infectious diseases in metropolitan Perth in 2018
(🡻 of 2.4% from 2017)

On the rise:
Sexually Transmitted Infections
Measles
Influenza
Varicella

93.7%
of 1–year–olds fully immunised across metropolitan Perth
(benchmark 95%)

- The number of **gonorrhoea and syphilis** notifications reached their highest recorded levels, and chlamydia notifications fell just short of the peak number of notifications recorded in 2016. All three infections have increased almost year–on–year, implying widespread circulation in the community.
- Of particular concern is an increase in the number of **women of childbearing age becoming infected with syphilis**; this is a new issue for metropolitan Perth and results in a significant public health response to mitigate the risk of mother to child transmission.
- The number of **measles cases in metropolitan Perth more than doubled** in 2018, to 33. While measles is not endemic to Australia, small outbreaks occur when travellers return from overseas with the virus. Measles is highly infectious and potentially severe, and each case requires considerable effort to prevent onward infection in vulnerable contacts. As measles cases increased internationally, cases notified in returned travellers within Australia have increased accordingly.
- This year, the WA Department of Health has announced **free measles vaccines for adults** who were born since 1966 and have not previously received two doses of measles–containing vaccine. People are urged to ensure that children are vaccinated on time[1], and that their own vaccinations are up to date, particularly when planning to travel.
- The 2018 **influenza season was longer than usual** (May to October) and was followed by higher than average rates of inter–seasonal summer flu. Health care workers, pregnant women, Aboriginal people, children aged 6 months to 5 years, and those medically at risk are encouraged to have the annual influenza vaccination and timed to precede the seasonal peak (usually in winter).
- The total number of invasive meningococcal disease cases was lower than in 2017 (23 in total, down from 34 cases), but the recent **rise in cases due to W_{135} and Y strains is continuing.** The timely addition of the Meningococcal ACWY vaccine to the WA Immunisation Schedule for infants and secondary school children has likely contributed to the overall reduction in notifications.
- Childhood immunisations are the foundation to curb preventable infectious diseases in our community**. Immunisation coverage in children across metropolitan Perth remains below the national benchmark of 95%.** No local government area (LGA) or geographical health service provider (HSP) achieved the benchmark in all three of the measured age groups (1, 2, and 5–year–olds). Six LGAs met the 95% benchmark in at least one age group (Bayswater, Cambridge, Swan and Victoria Park for 1–year–olds, and Kwinana and Mosman Park for 5–year–olds).

[1] Government of Western Australia, Department of Health. Immunisation schedule and catch–up immunisations [access 29 March 2019] https://ww2.health.wa.gov.au/Articles/F_I/Immunisation–schedule–and–catch–up–immunisations

Background

Purpose

The aim of this report is to inform healthcare providers about important trends in notifiable diseases in metropolitan Perth in 2018. The **Metropolitan Communicable Disease Control (MCDC)** team was established on 1 July 2016 and has responsibility for the public health management of notifiable infectious diseases for the East, North and South Metropolitan Health Services (EMHS, NMHS, SMHS).

Notifiable diseases

Under the *Public Health Act 2016*[2] (Part 9), any medical practitioner or nurse practitioner attending a patient who is known, or suspected, to have a notifiable disease has a legal obligation to report it to the Western Australian Department of Health (WA DOH). Laboratory notification is also mandatory.

Notifiable diseases are entered into the **Western Australian Notifiable Infectious Diseases Database (WANIDD)**. Communicable disease notifications are used to inform public health interventions and enhance prevention and control of these diseases. A list of current notifiable diseases in Western Australia (WA), along with case definitions, fact sheets and more, are available online[3].

Data sources

Notification data

Notifiable diseases data for metropolitan Perth and WA was extracted from the WANIDD on 1 April 2019 and is subject to revision. Data was retrieved using an **optimal date of onset** of disease (ODO) from 1 January 2018 to 31 December 2018. Exceptions to this were diseases with a long delay between diagnosis and onset of disease, namely, non–infectious syphilis, tuberculosis, leprosy, Creutzfeldt–Jakob disease, and unspecified hepatitis B and hepatitis C. These diseases were retrieved by the **date of receipt** of notification (DOR) from 1 January 2018 to 31 December 2018. National notification rates for 2018 were obtained from the National Notifiable Diseases Surveillance System (NNDSS) website, which is maintained by the Australian Government Department of Health and Ageing, on 1 April 2019. **OzFoodNet** provided summary statistics of enteric disease outbreaks in the metropolitan area in 2018.

Population data

Projected population data for metropolitan Perth and for the state of WA[4], as well as Aboriginal-specific population projections[5], were obtained from the Epidemiology Branch, Public and Aboriginal Health Division, WA DOH. Population estimates for metropolitan Perth and WA were 2 069 962 and 2 599 947 respectively in 2018.

Immunisation data

The **Australian Immunisation Register (AIR)** provides quarterly reports of immunisation coverage for three age groups: 12–<15 months, 24–<27 months, and 60–<63 months. The Communicable Disease Control Directorate (CDCD), Public and Aboriginal Health Division, WA DOH provided collated data on vaccine wastage and rabies post–exposure prophylaxis during 2018.

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[2] Government of Western Australia, Department of Justice. Western Australian Legislation – Public Health Act 2016 [accessed 29 March 2019] https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_13791_homepage.html

[3] Government of Western Australia, Department of Health. Notification of infectious diseases and related conditions [accessed 29 March 2019] https://ww2.health.wa.gov.au/Articles/N_R/Notification–of–infectious–diseases–and–related–conditions

[4] Received from Jag Atrie, Epidemiology Branch, Public and Aboriginal Health Division, WA DOH, on 02/04/2019.

[5] Received from Jag Atrie, Epidemiology Branch, Public and Aboriginal Health Division, WA DOH, on 22/05/2019.

Overview of notifiable diseases

In metropolitan Perth, there were 27 980 mandatory notifications for gazetted communicable diseases in 2018. This was a decrease of 2.4% from 28 672 notifications in 2017 but largely resulted from a decrease in notifications that require limited public health management and were countered by an increase in notifications that required intensive public health management. The largest upward trends occurred in sexually transmitted infections (STIs) and some vaccine preventable diseases including varicella, influenza and measles. The largest downward trends were in notifications of Salmonella species and Ross River virus following spikes of both these infections in 2017.

The relative proportion of notifications by disease category is shown in the bar graph (**Figure 1**). The major contributors to disease notifications in 2018 were sexually transmitted infections (42.2%) and vaccine preventable diseases (34.2%).

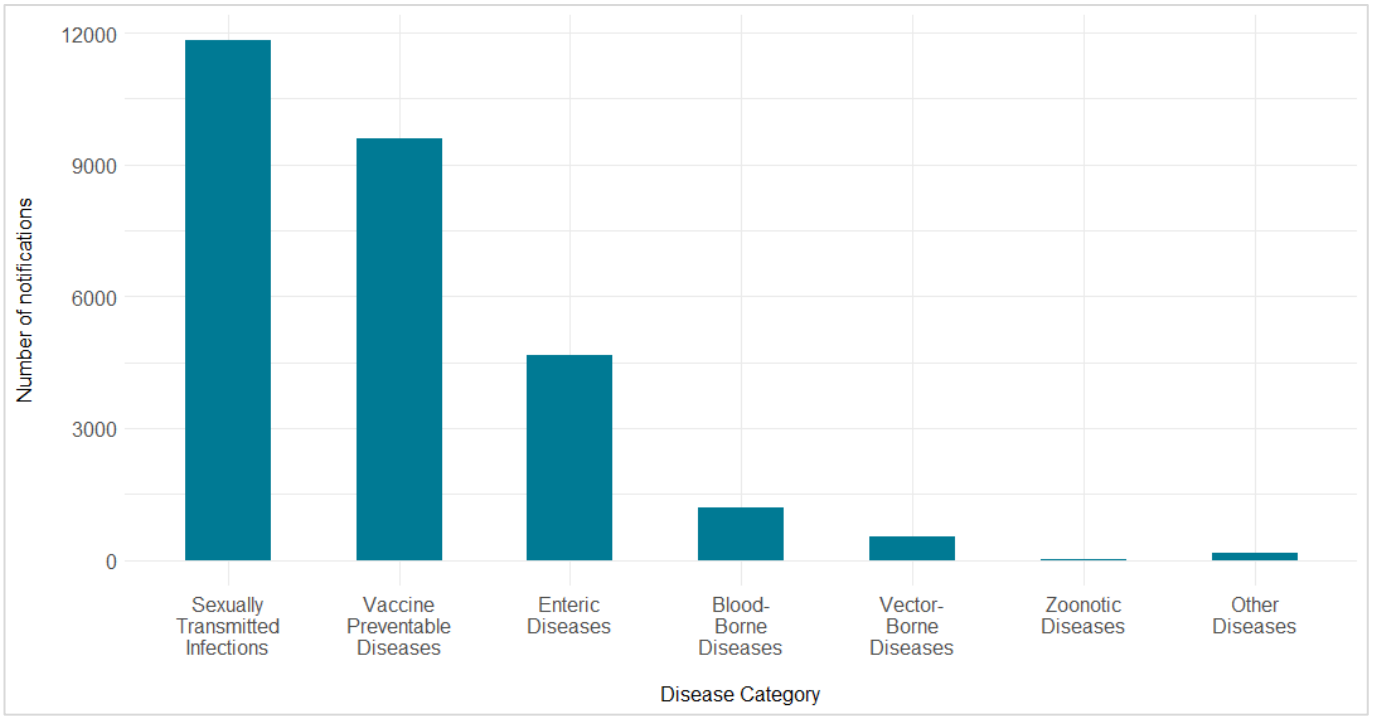

Figure 1: Number of notifications by disease category in 2018

The total number of notifications for each disease notified in metropolitan Perth between 2014 and 2018 is presented in **Table 1**. The 2018 crude notification rates for each disease are also presented and compared to crude state and national rates (where available). Communicable disease notification data by geographical health service provider is presented in **Appendix 1**.

Table 1: Metropolitan notifications 2014–18, & 2018 metropolitan, WA & national rates

Notifiable disease	Number of notifications/year					2018 notification rate/100 000		
	2014	2015	2016	2017	2018	Metro	WA	National
Blood borne diseases								
Hepatitis B (newly acquired)	22	24	22	13	20	1.0	1.0	0.5
Hepatitis B (unspecified)	497	454	553	448	421	20.3	19.5	24.0
Hepatitis C (newly acquired)	124	143	94	94	96	4.6	4.8	2.4
Hepatitis C (unspecified)	734	679	800	775	660	31.9	34.3	43.3
Hepatitis D	3	0	1	2	7	0.3	0.3	0.3
Enteric diseases								
Campylobacteriosis	2324	2250	2715	2679	2728	131.8	133.9	130.5
Cholera	0	0	0	1	0	0	0	0
Cryptosporidiosis	205	124	168	292	65	3.1	4.7	12.2
Hepatitis A	14	22	16	10	11	0.5	0.5	1.8
Hepatitis E	0	1	2	4	2	0.1	0.1	0.2
Listeriosis	5	6	5	6	5	0.2	0.3	0.3
Paratyphoid fever	8	10	11	4	9	0.4	0.3	0.3
Salmonellosis	875	1258	1508	1999	1602	77.4	80.0	57.6
Shiga toxin–producing E.coli	1	0	20	44	79	3.8	3.6	2.3
Shigellosis	37	41	59	56	123	5.9	10.3	10.5
Typhoid fever	10	7	9	19	12	0.6	0.5	0.7
Vibrio parahaemolyticus	14	5	22	18	14	0.7	0.6	NN
Yersiniosis	2	23	12	14	10	0.5	0.4	NN
Sexually transmitted infections								
Chlamydia	8635	8595	9115	8978	9015	435.5	445.4	398.7
Lymphogranuloma venereum	2	13	7	8	5	0.2	0.2	NN
Gonorrhoea	1258	1433	2274	2178	2327	112.4	132.5	125.9
Syphilis (infectious)	75	114	262	240	304	14.7	16.5	20.4
Syphilis (non–infectious)	52	59	50	138	169	8.2	8.6	9
Syphilis (congenital)	0	0	0	0	1	0	0	0
Vaccine preventable diseases								
Diphtheria	NR	NR	0	1	0	0	0	0
Haemophilus influenzae type B	0	1	0	0	0	0	0	0.1
Influenza	3757	4700	6109	4463	4665	225.4	226.4	239.2
Measles	34	6	11	16	33	1.6	1.5	0.4
Meningococcal disease (invasive)	10	12	12	34	23	1.1	1.6	1.1
Mumps	20	46	28	19	17	0.8	0.7	2.6
Pertussis	1340	1326	1178	1036	917	44.3	50.7	51.1
Pneumococcal disease (invasive)	113	100	112	127	124	6.0	8.0	8.3
Rotavirus	306	433	152	328	236	11.4	12.6	11.6
Rubella	1	2	1	2	1	0	0	0
Tetanus	1	0	0	0	1	0	0	0
Varicella–Zoster	2416	2766	3163	3437	3577	172.8	170.9	128.4

Vector–borne diseases								
Murray Valley encephalitis virus	0	0	0	0	1	0	0	0
Japanese encephalitis virus	0	0	0	0	1	0	0	0
Barmah Forest virus	22	15	5	11	7	0.3	1.4	1.4
Chikungunya virus	22	8	14	9	1	0	0.1	0.2
Dengue virus	353	451	455	149	118	5.7	5.3	3.7
Malaria	40	42	43	49	44	2.1	1.9	1.6
Rickettsial disease (typhus)	10	19	29	11	10	0.5	0.7	NN
Ross River Virus	987	568	232	609	347	16.8	19.3	12.7
Zika virus	0	2	13	2	1	0	0	NN
Zoonotic diseases								
Leptospirosis	2	1	3	1	5	0.2	0.2	0.6
Psittacosis	0	1	0	1	0	0	0	0
Q Fever	3	2	5	5	6	0.3	0.5	2.1
Brucellosis	0	0	2	0	0	0	0	0.1
Other diseases								
Botulism	0	1	0	0	0	0	0	0
Creutzfeldt–Jakob disease	1	4	5	4	5	0.2	0.3	NN
Haemolytic uraemic syndrome	0	1	2	3	0	0	0	0
Legionellosis	91	50	50	30	37	1.8	1.7	1.8
Leprosy	2	2	4	1	1	0	0	0
Melioidosis	0	2	1	3	2	0.1	0.2	NN
Tuberculosis	125	105	128	115	115	5.6	5.3	5.9

Data retrieved from WANIDD; disease rows were excluded where no cases occurred locally, state–wide or nationally in the previous five years. Data for Rheumatic Heart Disease and Human Immunodeficiency Virus are collected and managed separately; NN= Not notifiable; NR=not reported. Varicella–Zoster includes chickenpox and shingles, as well as those unspecified. From July 2018, the case definitions for Shigella and Rotavirus 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, contributing to a smaller number of notifications.[6]

[6]Government of Western Australia, Department of Health. Case definitions of notifiable infectious diseases and related conditions [accessed 29 March 2019] https://ww2.health.wa.gov.au/~/media/Files/Corporate/general%20documents/communicable%20diseases/Word/wa_notifiable_infectious_disease_case_definitions.docx

1. Sexual health disease patterns are changing

1.1 Number of notifications trending upward

The number of notifications for chlamydia, gonorrhoea and syphilis in metropolitan Perth all rose in 2018 as compared to 2017. The 304 notifications for infectious syphilis and 2327 notifications for gonorrhoea were the highest ever recorded in this region, and the 9015 notifications for chlamydia fell just short of the record high number notified in 2016 (9115 cases). This is in the context of large increases in notifications of these STIs over time (**Figures 2 and 4**). Aboriginal people experienced a disproportionate burden of STIs, comprising 11.3% of gonorrhoea notifications, and 6.0% of chlamydia notifications while representing only 2.1% of the metropolitan population.

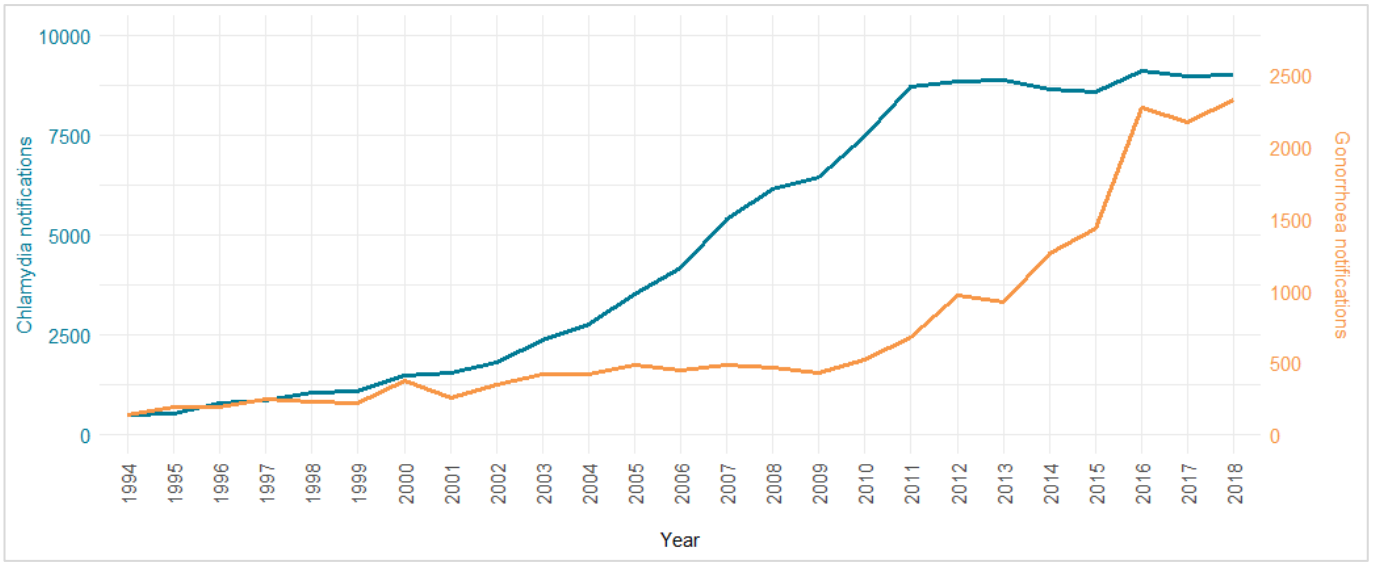

Figure 2: Number of notifications of chlamydia (left axis, blue line) and gonorrhoea (right axis, orange line) over time, 1994–2018

A majority of STI notifications are received from general practice (Figure 3). MCDC offers targeted education to practices with a large throughput of patients with STIs, and interested general practitioners (GPs). MCDC contributes to the training of GP registrars to improve the appropriateness of investigation and treatment of STIs in metropolitan Perth. MCDC actively follows up all notifications of syphilis. A real–time, faxed mail out is sent to GPs for all cases of gonorrhoea with advice on treatment, contact tracing, and routine follow up. GPs also receive a mail out for notifications of chlamydia belonging to certain high risk groups (including all cases aged 16 to 24 years). MCDC provides a support service when additional resources are required for complex contact tracing or management issues.

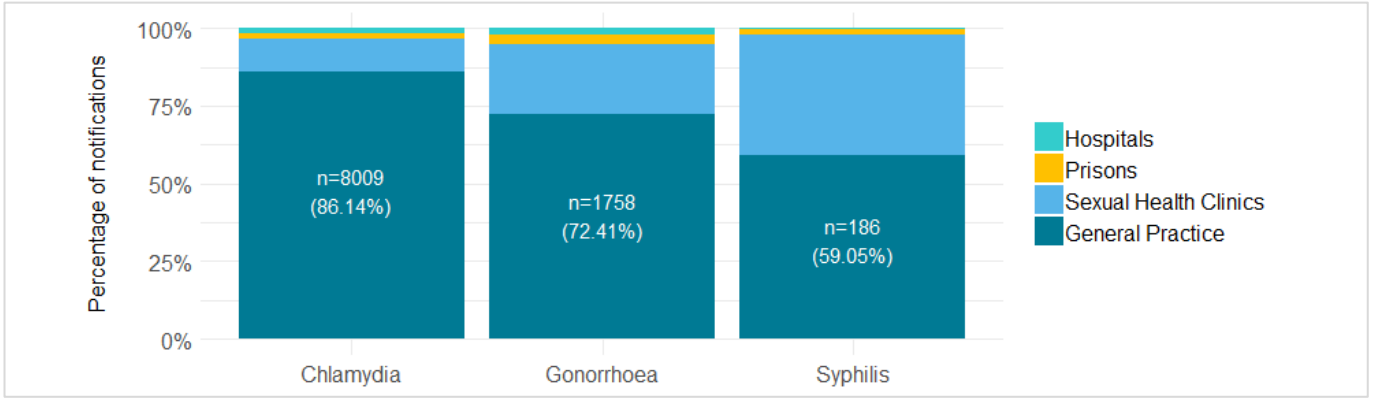

Figure 3: Proportion of STI cases notified by the different health providers

1.2 Changing profile of groups at risk for syphilis

Syphilis remains a key concern in metropolitan Perth. No longer a rare disease, there were 304 notifications of infectious syphilis in 2018; 91% of cases were men, and 97.6% identified as non–Aboriginal (**Figure 4**). Cases among Aboriginal people have remained steady at low levels in the metropolitan setting.

Syphilis in metropolitan Perth has historically occurred among non–Aboriginal men, particularly among men who have sex with men (MSM). However, in recent years, there has been an insidious increase in infectious syphilis among non–Aboriginal women (both Australian– and overseas–born). Syphilis in women of childbearing age requires a high priority public health response, and an urgent response in suspected or confirmed pregnant women, given the high risk of transmission to the fetus in utero.

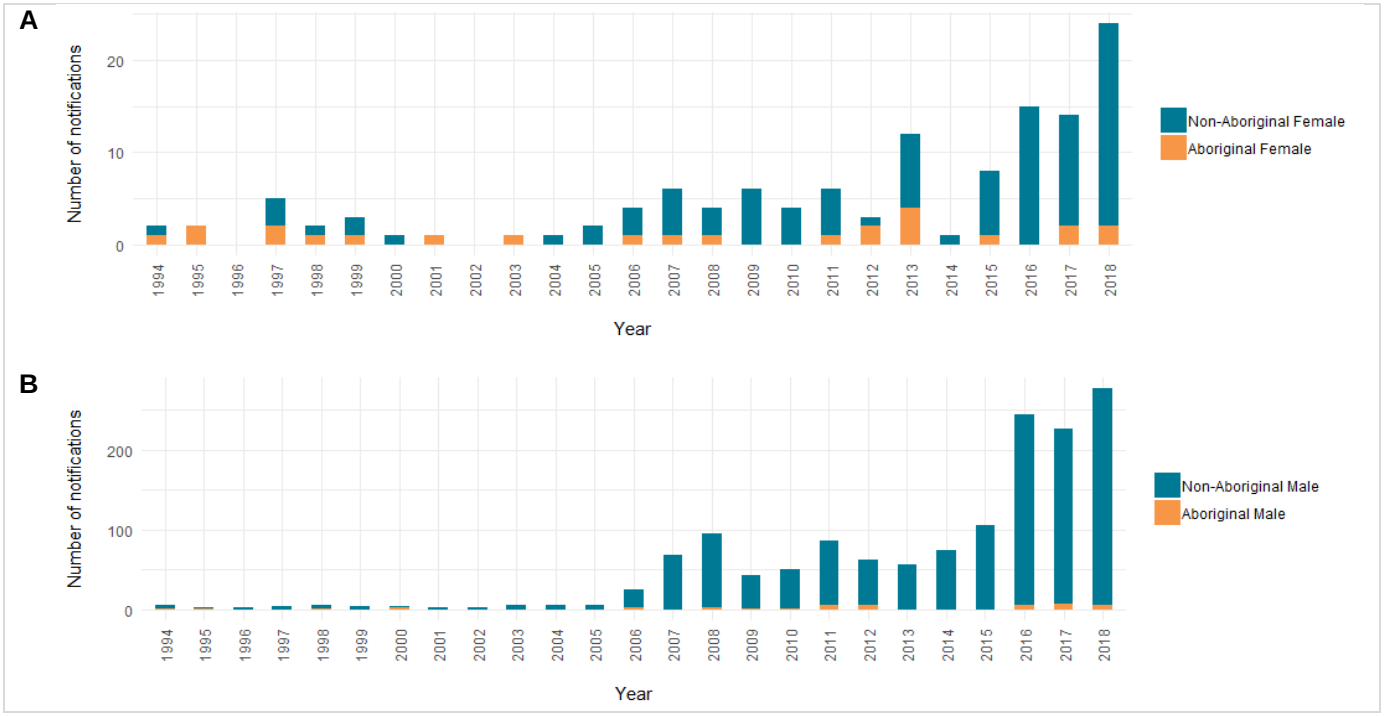

Figure 4: Number of infectious syphilis notifications among females (A) and males (B) by Aboriginal status, 1994–2018

1.3 Syphilis during pregnancy increasing, and a case of congenital syphilis

In 2018, two women were diagnosed with infectious syphilis, and a further two with non–infectious syphilis, as part of their first trimester screening. This is a newly emerging issue for metropolitan Perth, where such occurrences were previously rare and sporadic. This is the first time there were multiple cases in a single year. Additionally, MCDC assisted a woman from a non–metropolitan region diagnosed with infectious syphilis, who stayed in Perth for most of her pregnancy. These cases require extensive follow up by MCDC and others, with regular specialist consultations and ongoing testing. Difficulties engaging and retaining women in antenatal care are common, especially when there are additional access issues such as cultural factors or socioeconomic challenges.

There was one case of vertical transmission and congenital syphilis in 2018. The case was not managed by MCDC as she tested negative for syphilis at antenatal screening. She became infected late in her pregnancy and as no further testing was performed (and not required as per policy), the diagnosis was not made until after birth. The child was born prematurely, with abnormalities consistent with congenital syphilis. Congenital syphilis is preventable, and health professionals should consider re–screening for syphilis during pregnancy in high–risk settings. This is the first case in the metropolitan region since 2013, and only the sixth since 1990.

1.4 A local case of antimicrobial resistant gonorrhoea

Antimicrobial resistant *Neisseria gonorrhoea* is an emerging issue worldwide. These bacteria have demonstrated remarkable efficiency in acquiring novel resistance mechanisms over time, progressively overcoming sulphonamides (in the 1940s), penicillins and tetracyclines (in the 1970s), spectinomycin (in the 1980s), and ciprofloxacin and macrolides (in the 1990s); rendering the preferred antibiotics of the time ineffective.[7] Third–generation cephalosporins subsequently became the treatment of choice, but when resistant strains appeared in the mid–2000s, dual treatment with azithromycin or doxycycline was recommended to preserve cephalosporin sensitivity. Despite this, some strains of *N. gonorrhoea* are becoming resistant to these options.

Monitoring of resistance patterns in metropolitan Perth is difficult, because most diagnoses are made using DNA testing, not by culturing the organism. This means that antibiotic susceptibility testing cannot be undertaken. Only 28.9% of confirmed gonorrhoea cases had culture and susceptibility testing performed in 2018. If a discharge is present, it is important for health care providers to collect a specimen and order a microscopy, culture and antibiotic sensitivity (M,C&S), where possible.

There was one case of gonorrhoea diagnosed in WA in 2018 resistant to both ceftriaxone and azithromycin. This infection was acquired in South-East Asia. Treatment of such infections can be complex and may require intravenous antimicrobials.

With the emergence of resistant strains, doctors should take a sexual history (including overseas travel); order appropriate tests (including comprehensive STI and blood-borne virus screen with consideration of window periods); discuss and support partner notification and treatment; and recall patients for test–of–cures.

2. Early success for Hepatitis C elimination efforts

2.1 Hepatitis C declining as curative treatment becomes available

There were 764 notifications of Hepatitis C virus in metropolitan Perth in 2018. This is the lowest figure in eight years; a modest decline of 13.0% since 2017, and 15.4% since 2016. The downward trend, also seen in national data[8], may be associated with the introduction of new treatments for Hepatitis C, which became widely available in Australia in 2016.

The new Hepatitis C treatments are curative in up to 95% of patients[9], raising a real opportunity for treatment as prevention to be leveraged in efforts to eliminate Hepatitis C. However, despite widely–available, low cost and effective treatment options, the proportion of infected patients accessing treatment remains low (only 11% of people living with chronic hepatitis C infection in WA commenced treatment in 2017)[7]. This is in part because Hepatitis C disproportionately affects already marginalised populations, including Aboriginal people, people who inject drugs, the homeless, people who engage in high–risk sexual behaviour and people who are incarcerated.

Among those newly diagnosed with Hepatitis C in 2018 in metropolitan Perth, 61.5% were men, 21.9% were Aboriginal, and the mean age was 40.6 years. At least 20% were within the criminal justice system at the time of notification. The WA Department of Justice has a hepatitis C management program in place.

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[7] Unemo M, del Rio C, Shafer W. Antimicrobial resistance expressed by Neisseria gonorrhoeae: a major global public health problem in the 21st century. Microbiology spectrum. 2016 Jun;4(3). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4920088/

[8] Kirby Institute. HIV, viral hepatitis and sexually transmissible infections in Australia: annual surveillance report 2018. Sydney: Kirby Institute, UNSW Sydney; 2018.

[9] HepatitisWA: Hepatitis C [accessed 29 March 2019] http://www.hepatitiswa.com.au/about–hepatitis/hepatitis–c/

3. Vaccine preventable diseases remain challenging

3.1 Long influenza season, impacting young and old

The total number of influenza cases in 2018 was higher than in 2017, and cases were spread over a longer influenza season (**Figure 5**). The seasonal peak in notifications in metropolitan Perth is typically July through October, however substantially higher notification rates were seen between May and October in 2018. This was followed by higher than average rates of inter–seasonal summer flu during November and December. Strains of subtype A were more common than subtype B, with A/H1N1 the most frequently isolated strain (21.8% of cases) in 2018.

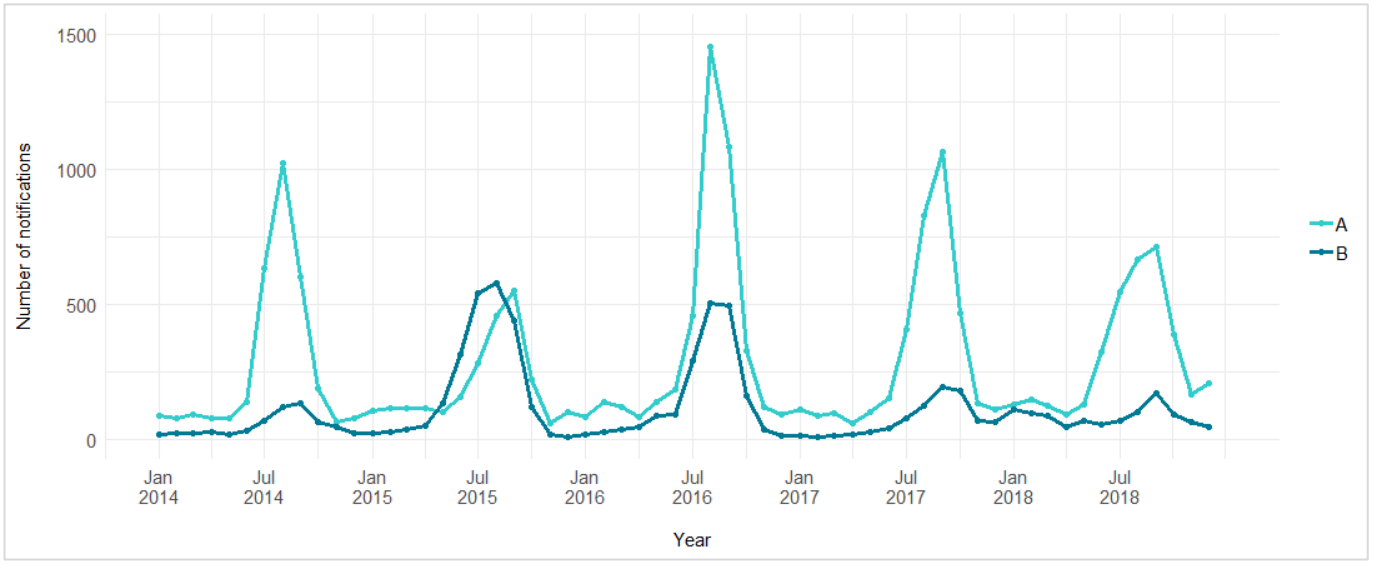

Figure 5: Seasonal trends in influenza notifications over five years, by subtype

The notification rates of influenza by age group in 2018 demonstrated a typical bi–modal distribution, whereby rates were highest among infants and the elderly (**Figure 6**). In children aged under 5 years (where data is most reliable), only 5.9% of influenza notifications were in children already vaccinated with the annual influenza vaccine. At least 19.6% of all notified influenza cases in 2018 were hospitalised, with hospitalisation rates again highest in the 0 to 4 year age group and those aged over 65 years (20.7% and more than 30%, respectively).

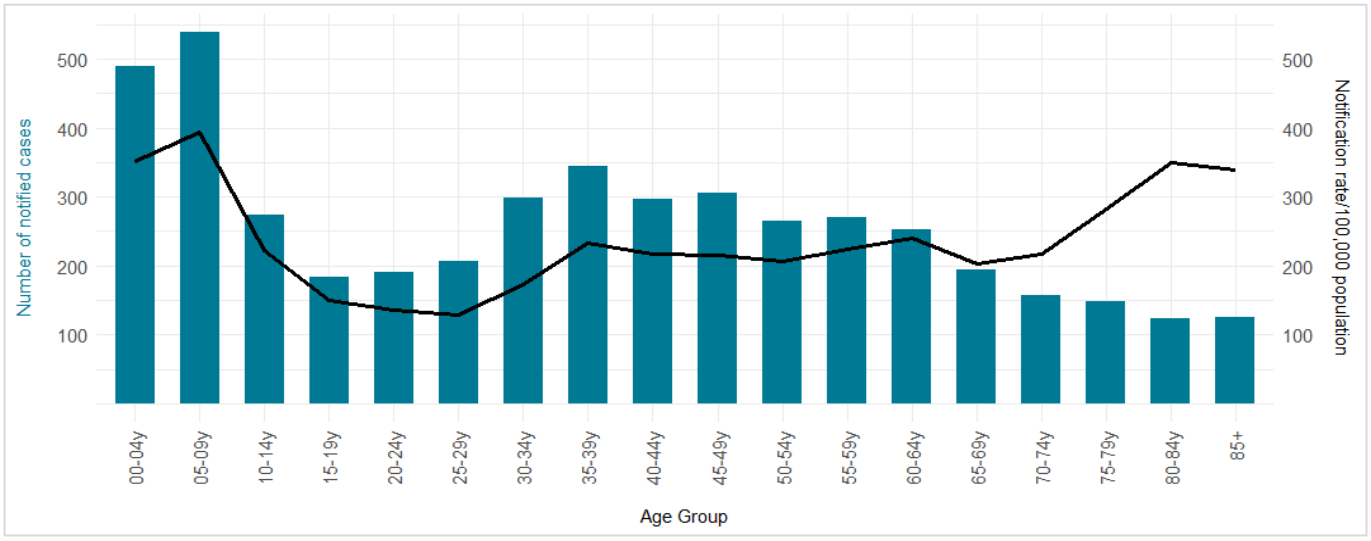

Figure 6: Influenza notifications in 2018; bar plot reflects number of notifications (left y axis) and line plot reflects notification rate per 100 000 population (right y axis)

There were 41 outbreaks of influenza–like illness in residential care facilities in 2018. Of these, 13 were confirmed influenza outbreaks (down from 24 outbreaks in 2017); 12 were influenza A subtypes, and one was influenza B. Other causative organisms isolated include rhinovirus (five facilities) and human metapneumovirus (one facility); no organism was isolated in the remainder. MCDC supports facilities to confirm diagnoses and implement infection control measures, monitors outbreak progress, and advises on antiviral prophylaxis and treatment for residents and staff.

3.2 Measles on the rise, following global trends

Measles is a highly infectious viral illness with potentially severe complications. There were over 324 000 cases of measles worldwide in 2018, more than double the number of cases in 2017, and the end of three consecutive years of declining numbers.[10] The concerning trend was seen in all regions, but was most pronounced in Europe, the Eastern Mediterranean, and Africa (**Figure 7**).

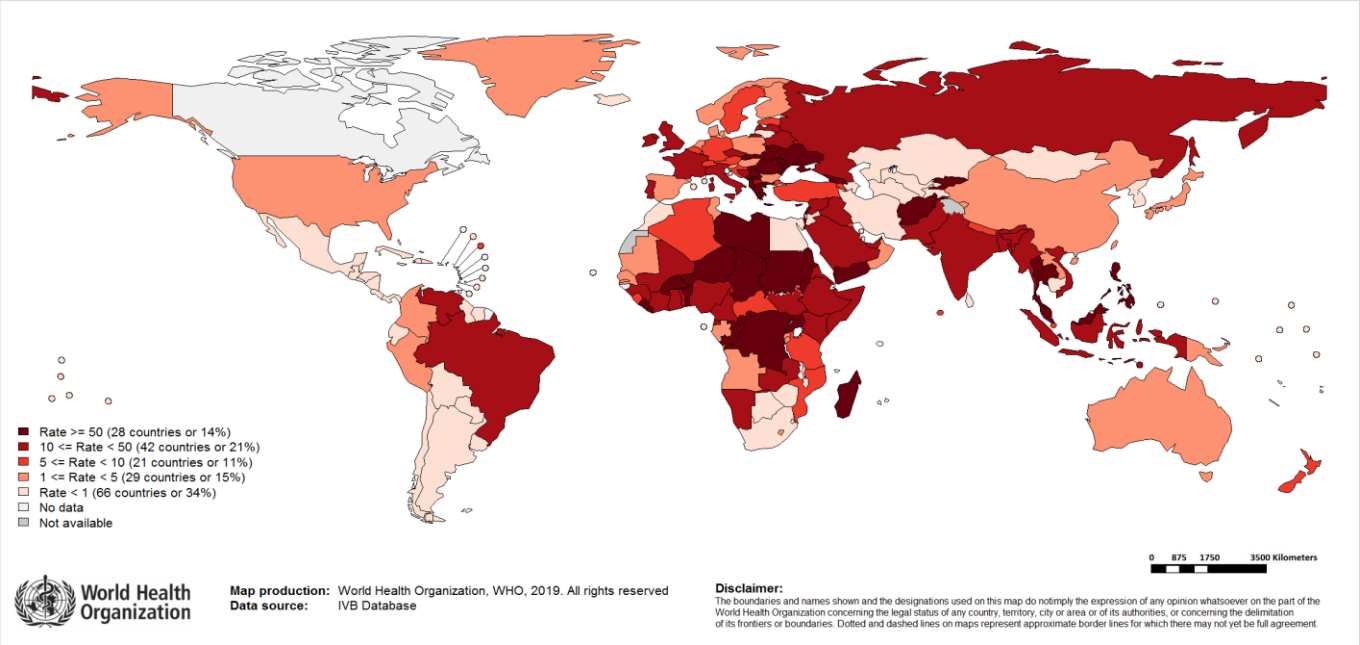

Figure 7: Measles incidence rate per million population, using data from December 2017 – November 2018; reproduced from the World Health Organization's Global Measles and Rubella Update, January 2019[11]

Endemic cases of measles do not occur in Australia, as a result of our immunisation coverage and strong public health responses. However, an increase in measles cases across the world has led to greater numbers of measles cases among returned travellers. There were 33 measles notifications in metropolitan Perth in 2018, plus two overseas travellers who spent their infectious period in the metropolitan area. This is more than double the number of cases in 2017. Fifteen of the cases were female and 20 were male, ranging in age from 8 months to 45 years.

Thirteen were index cases imported from overseas (**Figure 8**). Nine of these did not transmit the infection to others; however, six index cases collectively led to 18 secondary infections, three tertiary infections, and one quaternary infection in the metropolitan area. One large workplace outbreak occurred, in which a single case transmitted measles to eight other people.

Notably, eight notified measles cases had documentary evidence of at least two vaccinations against measles virus, and would typically have been considered immune to the disease. These cases included

[10] World Health Organization: Measles and Rubella Surveillance Data [accessed 29 March 2019] https://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/measles_monthlydata/en/

[11] World Health Organization: Global measles and Rubella Update, January 2019 [accessed 29 March 2019] https://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/Global_MR_Update_November_2018.pdf?ua=1

males and females aged between 17 and 28, with a range of 13 to 20 years since their most recent vaccination. Most but not all had a milder 'attenuated' clinical illness; as an indicator of severity, only 1 of 10 previously vaccinated cases (10%) were admitted to hospital, compared with 8 of 25 unvaccinated cases (32%). There was only one instance of a vaccinated case transmitting wild-type measles to another person (a close household contact of unknown vaccination status). This suggests that previously vaccinated persons are less likely to infect others in the unlikely event that they acquire measles.

Each measles case is resource intensive, requiring urgent work to limit onward spread. At least 4378 people in metropolitan Perth were exposed to measles in 2018; MCDC staff performed intensive contact tracing among these to identify high risk and non–immune contacts. As a result, 300 measles–containing vaccinations and 41 doses of intramuscular Normal Human Immunoglobulin were administered to protect the most vulnerable. MCDC also co–wrote nine media releases in 2018, to reach contacts that could not be reached personally.

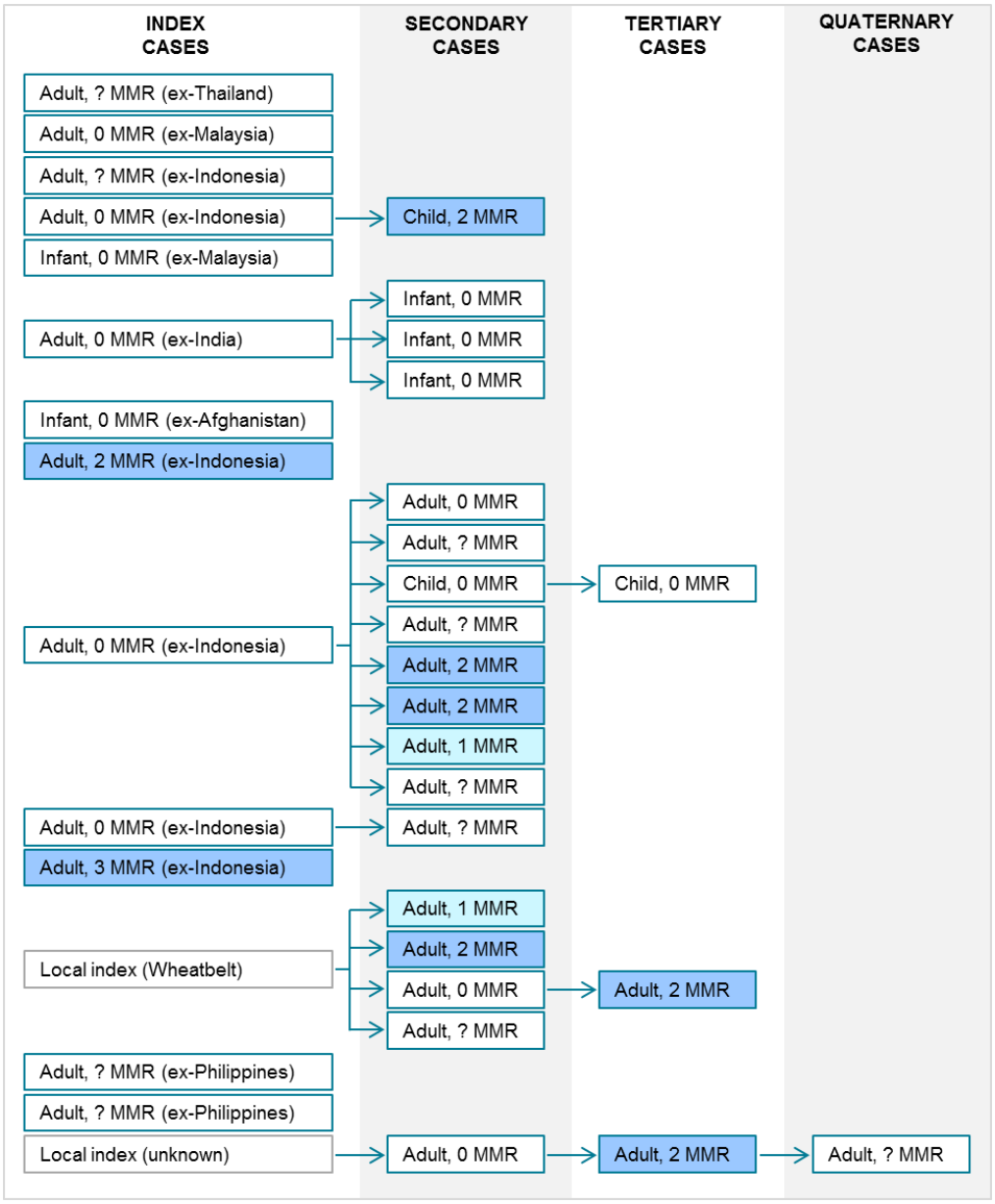

Figure 8: Transmission patterns of measles in metropolitan Perth in 2018. Columns reflect generations of infection; infant refers to <12 months old, child refers to 12 months to <18 years old, adult refers to 18 years or older; MMR = documented evidence of measles–containing vaccinations; shading of boxes represents vaccination status: white=nil or unknown, light blue=partially vaccinated, blue=fully vaccinated.

3.3 Infants under 6 months remain at risk for pertussis

There were 12 notifications of pertussis in infants under the age of 6 months in 2018, half the number notified in 2017. These infants are too young to be fully vaccinated (the third dose in the primary vaccination course is due at 6 months) and typically experience a more severe course of disease. Of the infants with pertussis in 2018: two were too young to have received any pertussis-containing vaccine (one was hospitalised); six had received one pertussis–containing vaccine (four were hospitalised); and four had received two pertussis–containing vaccines (none were hospitalised).

Placental transfer of maternal antibodies can aid early protection, therefore maternal pertussis vaccination during pregnancy is recommended to maximise antibody transfer. Across WA, 68.6% of mothers were known to be vaccinated for pertussis at some time during their pregnancy in 2018.[12] Five of the mothers of these infants notified for pertussis were not vaccinated. Of the vaccinated mothers, one was vaccinated in the second trimester, and six were vaccinated in the third trimester as per recommendations at the time. Among the seven infants of vaccinated mothers, four were diagnosed with mucosal IgA (a test subsequently rescinded for high false positive rates) and may represent artefact.

3.4 School outbreak of mumps suggests waning immunity

An outbreak of mumps occurred at a secondary school in metropolitan Perth in 2018, with four students between ages 13 and 17 years affected. The index case was born overseas and had unclear vaccination status. Secondary cases included a household contact of the index, also with unclear vaccination status, and a fully vaccinated Aboriginal school colleague. Tertiary transmission occurred in another fully vaccinated Aboriginal school colleague. The latter two cases had their last mumps–containing vaccine more than 10 years ago. Waning immunity to mumps vaccine is known to occur.

3.5 Changing patterns of invasive cocci

There were 23 notifications of **invasive meningococcal disease** in metropolitan Perth in 2018. Most cases (61%) were male, and a third were Aboriginal. Although the age range of cases was 0 to 80 years, younger age groups were predominantly affected, with 57% of cases aged 5 years or less. Clinical presentations included meningitis and septicaemia, and less typically, septic arthritis, pneumonia and chorioamnionitis (an infection of fetal membranes, placental tissues and amniotic fluid).

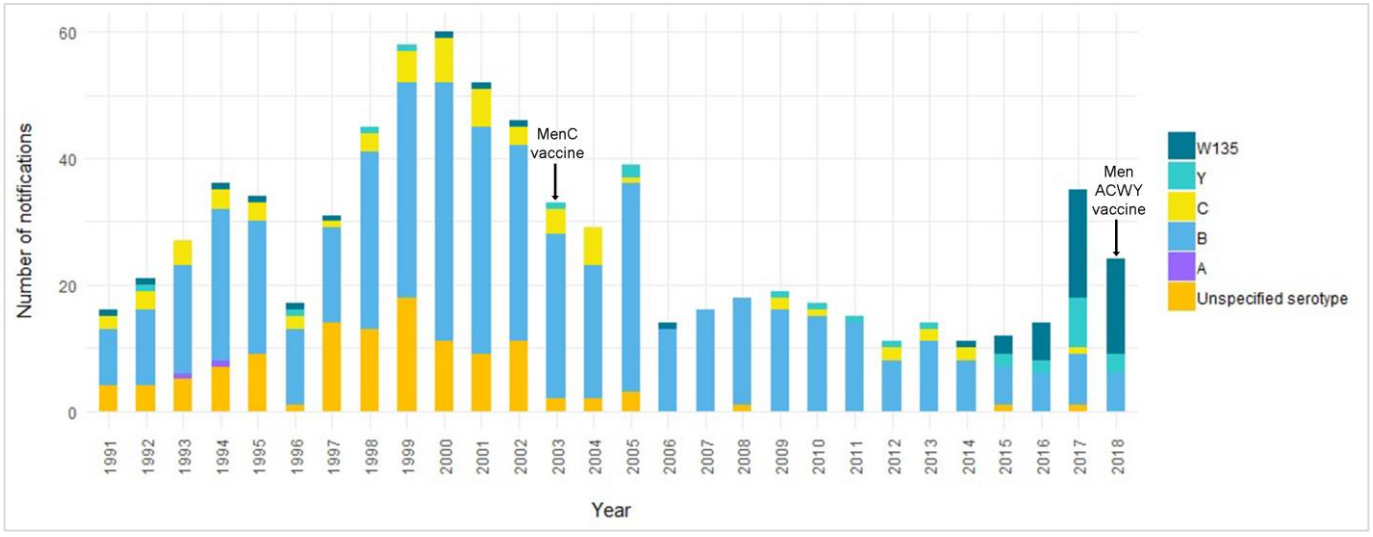

Figure 9: Notifications of invasive meningococcal disease since surveillance commenced, by serotype

[12] Government of Western Australia, Department of Health. Western Australias Mothers and Babies summary information – Pertussis vaccination [accessed 29 March 2019]. https://ww2.health.wa.gov.au/Reports–and–publications/Western–Australias–Mothers–and–Babies–summary–information/data?report=mns_pertv_y

In recent years, an emergence of W_{135} and Y serotype cases has occurred; these serotypes now constitute a majority of cases (**Figure 9**). In response, the WA DOH introduced a Meningococcal ACWY vaccination program for the two most at risk groups; 15 to 19 year olds since April 2017, and 1 to 4 year olds since January 2018. The vaccine was then added to the National Immunisation Program (NIP) for 1 year olds in July 2018.

Vaccinations targeting Meningococcal B have been registered in Australia since 2013 but are not on the NIP, thus coverage is much lower; only 11.7% of children less than 5 years had received at least one dose by the end of 2018.[13] Meningococcal C vaccines were added to the NIP for 1 year olds in January 2003, and cases attributed to serotype C have since declined (there were no cases in 2018). Interestingly, this also coincided with a substantial and sustained reduction in B serotype cases.

Invasive pneumococcal disease includes bacterial pneumonia, meningitis or sepsis caused by the many different serotypes of *Streptococcus pneumoniae*, some of which are vaccine preventable. There were 124 notifications of invasive pneumococcal disease in metropolitan Perth in 2018. Males and females were affected equally, and 9.7% were Aboriginal. There was a dual peak in affected age ranges, with 19% of cases aged 5 years or less, and 32.3% of cases aged 60 to 79 years.

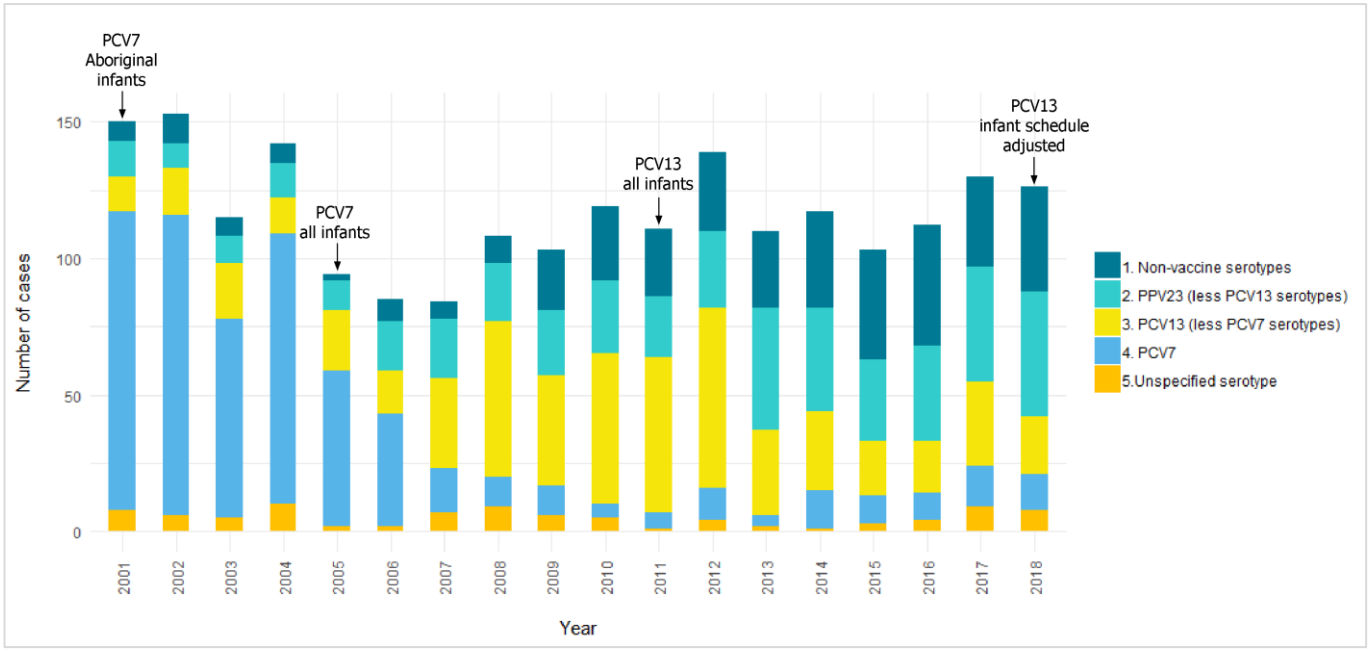

Figure 10: Notifications of invasive pneumococcal disease since becoming notifiable in 2001, by serotype

The serotypes contributing to burden of invasive pneumococcal disease in metropolitan Perth are changing over time (**Figure 10**). PCV7 is a conjugate vaccine targeting seven serotypes, listed on the Australian NIP for Aboriginal infants in 2001, and all children in 2005. The burden of disease attributed to PCV7 serotypes declined considerably following introduction of the vaccine, however new invasive serotypes emerged (a 'serotype replacement' phenomenon). PCV13, which covered an additional six serotypes, superseded PCV7 in July 2011, and also led to a reduction in cases attributed to these serotypes. Adjustment to the timing of PCV13 vaccines on the infant schedule in July 2018 may yet have a greater effect on these serotypes. The most common serotypes causing invasive disease in 2018 were 3, 19A (8.7% and 7.9% respectively, both contained in PCV13) and 19F (8.7%, contained in PPV23).

PPV23 is a vaccination containing pneumococcal capsular polysaccharides for 23 serotypes. It is poorly immunogenic in infants, and is not a routine childhood vaccination. However, PPV23 has been available in Australia to Aboriginal adults aged over 50 years and those medically at risk over 15 years since 1999, medically at risk children at 4 years since 2001, and all adults aged over 65 since 2005.

[13] Received from Jenny Vo, Perth Public Health Intelligence, North Metropolitan Health Service, on 15 May 2019.

4. Enteric diseases and food outbreaks are steady

4.1 Gastroenteritis in child care, schools, hospitals and residential care

There were 22 outbreaks of gastroenteritis in child care centres, and a further five in schools, across metropolitan Perth in 2018. One outbreak was confirmed giardiasis (with one staff member and one student testing positive), and others were not sampled.

There were two outbreaks of gastroenteritis in metropolitan hospitals, both attributed to norovirus. There were a further 57 outbreaks in residential care facilities (down from 92 in 2017); 61% of these had a causative organism isolated; norovirus was implicated in 58%, with adenovirus and rotavirus contributing in smaller numbers.

4.2 Multi–jurisdictional outbreak of Hepatitis A

Metropolitan Perth was involved in one multi–jurisdictional enteric disease outbreak in 2018. All states and territories except Tasmania experienced an increase in locally acquired hepatitis A cases, resulting in a national recall of frozen pomegranate arils. At least four cases of hepatitis A in metropolitan Perth occurring between December 2017 and March 2018 were related to this outbreak.

5. Rare communicable diseases

5.1 Tetanus: vigilance with boosters is required

An older adult sustained an injury to the hand while gardening, and developed clinical signs of tetanus 10 days later. This individual was previously vaccinated for tetanus, but could not recall a recent booster within the last 20 years. Despite administration of immunoglobulin, the illness required a long stay in intensive care. This is the first case of tetanus in the metropolitan region since 2014, and highlights the benefit of booster doses of tetanus–containing vaccine in adults.

5.2 Meningococcal conjunctivitis: a harbinger of severe disease

In addition to the 23 invasive meningococcal disease notifications in 2018, there were 4 cases of meningococcal conjunctivitis, an uncommon presentation of *N. meningitidis*, and a harbinger of potentially severe invasive disease. The cases included one child, two adults, and an adult overseas traveller who passed through the metropolitan area. One case was serogroup W, the others were non–serotypable. The potential for deterioration in these cases should be recognised, with cases and their contacts managed as per national guidelines for invasive meningococcal disease.

5.3 Pathogenic Aeromonas: germs in mud, unusually harmful

In March 2018, an outbreak of pustular skin lesions occurred among 132 school aged children who visited an adventure centre. *Aeromonas hydrophila*, a gram negative bacterium that resides in water, soil, and some foods, was cultured from skin lesions and from mud in one of the courses at the adventure centre. *A. hydrophila* is not commonly pathogenic in humans; it has previously been implicated in outbreaks of skin and soft tissue infections, but not in otherwise intact skin. The adventure centre permanently removed mud from their course, replacing it with clean sand.

6. Immunisation

6.1 Annual immunisation data summary

Annual immunisation data for 1 year–olds, 2 year–olds and 5 year–olds during 2018 was calculated by combining the quarterly AIR data, and represents the proportion of children who were up to date by age (**Table 2**). Aboriginal–specific data is also presented, as immunisation coverage in Aboriginal children has historically been lower. MCDC helps to identify and facilitate catch up for Aboriginal children who are not up to date. An immunisation coverage rate of 95% (or more) is considered the Australian benchmark. No region achieved the benchmark in 1 and 2 year–olds; however Aboriginal children aged 5 years in WA and Australia (but not metropolitan Perth) exceeded 95% coverage.

Table 2: Immunisation coverage by region and age cohort in 2018

Age Group	Region	No. of fully vaccinated children	Total children	Immunisation coverage (%)	Aboriginal immunisation Coverage (%)
1 year	Metro	25,438	27,151	93.69	87.85
	NMHS	8,373	8,903	94.05	86.13
	EMHS	9,347	9,969	93.76	87.91
	SMHS	7,718	8,279	93.22	88.99
	WA	31,599	33,801	93.49	89.01
	Australia	283,522	301,163	94.14	92.37
2 years	Metro	25,351	28,044	90.40	80.84
	NMHS	8,431	9,319	90.47	78.92
	EMHS	9,240	10,241	90.23	80.20
	SMHS	7,680	8,484	90.52	82.91
	WA	31,700	35,150	90.18	82.19
	Australia	287,055	314,933	91.15	88.59
5 years	Metro	25,872	27,755	93.22	93.86
	NMHS	8,690	9,334	93.10	93.84
	EMHS	8,951	9,601	93.23	93.26
	SMHS	8,231	8,820	93.32	94.79
	WA	32,611	34,907	93.42	95.15
	Australia	304,787	321,565	94.78	96.66

Immunisation coverage below 90% is shown in red, coverage between 90 and <95% is shown in blue, and coverage of >95% is shown in black

There are 33 Local Government Areas (LGAs) in metropolitan Perth. **Appendix 2** shows the percentage of children up to date in each age cohort by LGA in 2018. No LGA achieved the benchmark of 95% or above in all or even two age categories. Bayswater, Cambridge, Swan and Victoria Park achieved >95% coverage in 1–year–olds; and Mosman Park and Kwinana achieved >95% coverage in 5–year–olds.

6.2 Metropolitan immunisation coverage over time

Trends in immunisation coverage across metropolitan Perth between 2016 and 2018 are presented in **Figure 11**. Coverage appears to be improving in children across all age cohorts, and for Aboriginal 1–year–olds. The improvements are not consistent for Aboriginal 2–year–olds and 5–year–olds. The AIR uses definitions to determine whether each child is classified as fully immunised. These criteria have changed over time, so trends must be interpreted with caution.

To be considered fully vaccinated at present:

Since mid-2018, a 12–<15 month–old child requires three doses of diphtheria, tetanus, pertussis (DTPa), polio and hepatitis B vaccines; two or three doses of *Haemophilus influenzae type B* (HiB) vaccine; and two or three doses of PCV13. This change occurred because the infant vaccine schedule was changed from three PCV13 doses at 2, 4 and 6 months, to three doses at 2, 4 and 12 months from 1 July 2018. Thus, a child requires only two PCV13 doses to be considered fully vaccinated at 1 year of age. Some of the increase in vaccination coverage in 1–year–olds since mid–2018 may be attributable to this change.

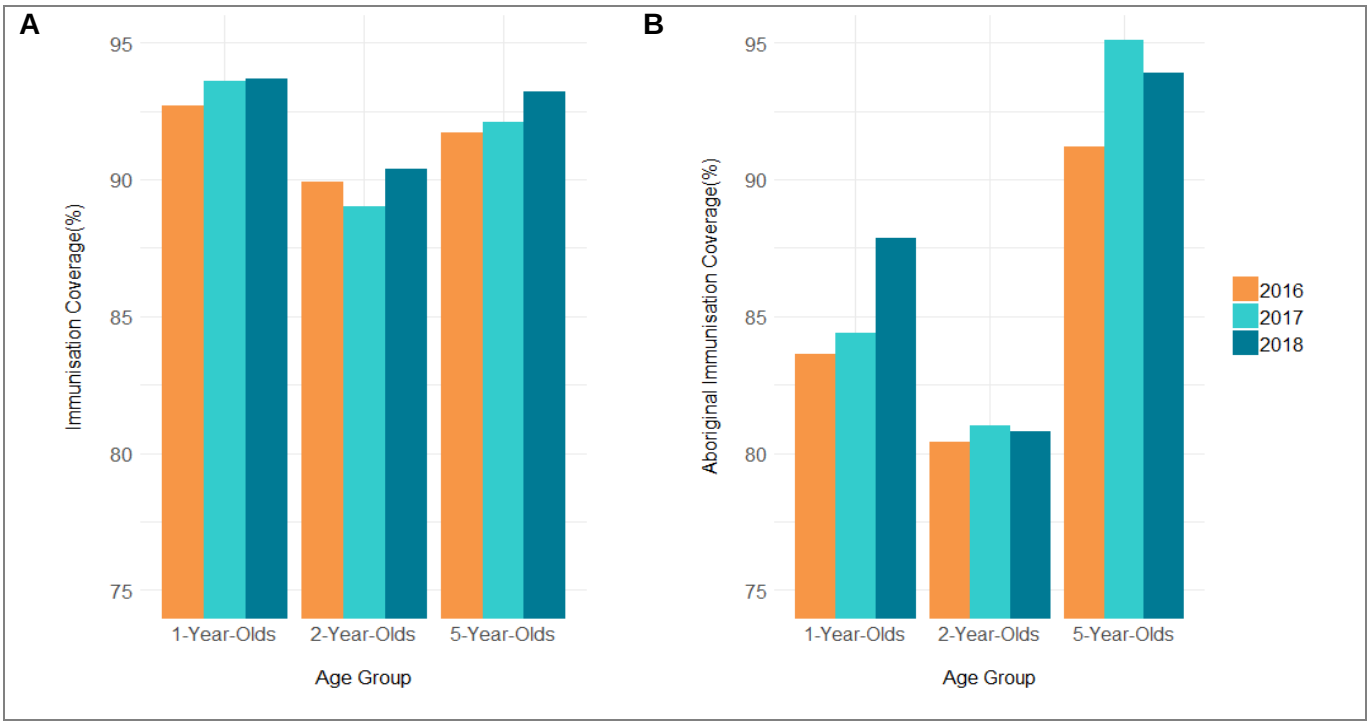

Figure 11: Immunisation coverage in metropolitan Perth, 2016 to 2018; graph A includes all children in the three measured age groups, graph B includes Aboriginal children only

A 24–<27 month–old child requires four doses of DTPa vaccine; three doses of polio, hepatitis B, and PCV13 vaccine; three or four doses of HiB vaccine; two doses of MMR; and one dose of Meningococcal C and varicella vaccines. This has been altered twice since the beginning of 2016. First, a fourth dose of DTPa was added to the schedule at 18 months in March 2016, and to the AIR definitions in December 2016, causing a decrease in the number of children classified as fully vaccinated from the last quarter of 2016. Second, from September 2018, the definition required the third PCV13 dose (typically at 12 months of age) to be recorded, possibly contributing to a decline in coverage among 2–year–olds from the latter half of 2018.

A 60–<63 month–old child requires five doses of DTPa vaccine, and four doses of polio vaccine. This has changed twice since the beginning of 2016. First, when the booster dose of DTPa at 18 months commenced, this age group was required to have a fifth dose of DTPa vaccine recorded from December 2016, rather than the previous four, possibly causing an artificial decline in coverage. Second, the second dose of MMR was removed from the criteria in December 2017 (already featuring in criteria for 2–year–olds), possibly contributing to more 5–year–old children classified as fully vaccinated from final quarter of 2017.

6.3 Rabies and Australian Bat Lyssavirus post–exposure prophylaxis

MCDC provides advice to doctors and practice nurses regarding post–exposure prophylaxis (PEP) for rabies, and authorises the use of WA DOH–funded supplies according to national guidelines. In metropolitan Perth in 2018, 230 courses of rabies PEP were arranged for 132 females and 98 males,

aged between 1.5 and 83 years of age.[14] This notification rate was steady compared with previous years. Indonesia was the most common location for rabies prone exposures, and monkeys were the most commonly implicated animal (**Table 4**).

Table 4: Persons sustaining rabies prone injuries, by animal and location, 2018

Country of Exposure	Monkey	Dog	Cat	Bat	Squirrel	Civet	Total
Indonesia	77	31	6	4	5	2	**126**
Thailand	12	19	5	0	0	0	**38**
India	3	9	1	0	0	0	**12***
Vietnam	2	6	1	0	0	0	**9**
Australia	0	0	0	8	0	0	**8**
Malaysia	3	0	2	0	0	0	**5**
Philippines	0	4	1	0	0	0	**5**
Sri Lanka	0	3	1	0	0	0	**4**
China	0	1	2	0	0	0	**3**
South Africa	1	1	0	0	0	0	**3**
Ecuador	1	1	0	0	0	0	**2***
Total	**99**	**86**	**22**	**12**	**5**	**2**	**230**

Table includes only animals and locations implicated in more than one exposure event;. *=two animal types implicated in one event, so Total is less than the sum of the contributing columns

6.4 Immunisation catch ups

MCDC provided general practices with immunisation catch up plans for 1363 metropolitan children in 2018. The written catch up plans for overdue or unvaccinated children also include information on the correct spacing between dosing. For children born overseas now living in WA, MCDC liaises with health care providers to ensure vaccines administered abroad are added to the AIR. MCDC also facilitates access to translation services, so that immunisation records in foreign languages can be added to the AIR. This process improves assessment of the individual's vaccination needs, and assists families whose children were identified as not fully immunised to access Commonwealth support services.

6.5 Cold chain breaches and vaccine wastage

In 2018, MCDC managed 503 cold chain breaches. A vaccine cold chain breach occurs when vaccine storage temperatures have been outside the recommended range of +2 to +8 °C.[15] Immunisation providers are required to report cold chain breaches to MCDC as part of their supply agreement with the WA DOH for government–funded vaccines. Depending on the nature of the breach, cumulative breach time, and the vaccines involved, outcomes can include no action or discarding vaccines, as well as advice on appropriate cold chain management and monitoring. MCDC provides this advice to ensure that vaccines retain safety and potency, while minimising costly vaccine wastage.

There were 38 788 doses of vaccine wasted in the metropolitan area in 2018, with an estimated value of $1,033,832.[16] The two main reasons for this wastage were failure to use the dose before expiry (65.5% of doses), followed by cold-chain breaches (32.2% of doses).

[14]Received from Sharon Gough, Communicable Disease Control Directorate, Public and Aboriginal Health Division, WA DOH, on 13 March 2019.

[15] Australian Government, Department of Health and Ageing. National Vaccine Storage Guidelines: Strive for 5 [accessed 29 March 2019] https://beta.health.gov.au/resources/publications/national–vaccine–storage–guidelines–strive–for–5

[16]Received from Sharon Gough, Communicable Disease Control Directorate, Public and Aboriginal Health Division, WA DOH, on 14 May 2019.

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

Notifiable disease	2018 notification rate/100 000					
	North	East	South	Metro	WA	National
Blood borne diseases						
Hepatitis B (newly acquired)	0.7	1.4	0.8	1.0	1.0	0.5
Hepatitis B (unspecified)	18.5	25.6	16.6	20.6	19.5	24.0
Hepatitis C (newly acquired)	2.2	7.3	4.5	4.6	4.8	2.4
Hepatitis C (unspecified)	22.7	40.1	33.2	32.3	34.3	43.3
Hepatitis D	0.3	0.7	0	0.3	0.3	0.3
Enteric diseases						
Campylobacteriosis	130.5	124.9	140.7	133.7	133.9	130.5
Cholera	0	0	0	0	0	0
Cryptosporidiosis	4	2.6	2.8	3.2	4.7	12.2
Hepatitis A	0.3	0.9	0.5	0.5	0.5	1.8
Hepatitis E	0	0	0.3	0.1	0.1	0.2
Listeriosis	0.1	0.4	0.2	0.2	0.3	0.3
Paratyphoid fever	0	1.3	0	0.4	0.3	0.3
Salmonellosis	83.6	66.7	82.1	78.8	80	57.6
Shiga–toxin–producing E.coli	4	4.7	2.6	3.8	3.6	2.3
Shigellosis	6	5.5	6.4	6.1	10.3	10.5
Typhoid fever	0.4	0.9	0.5	0.6	0.5	0.7
Vibrio parahaemolyticus	0.6	0.3	1.2	0.7	0.7	NN
Yersiniosis	0.6	0.4	0.5	0.5	0.4	NN
Sexually transmitted infections						
Chlamydia	385.5	476.3	447.1	440.4	445.4	398.7
Gonorrhea	85.7	146.4	105.3	114.6	132.5	125.9
Syphilis (infectious)	13.4	19.3	11.0	15.0	16.5	20.4
Syphilis (non–infectious)	7.1	11.5	5.7	8.5	8.6	9.0
Syphilis (congenital)	0.1	0	0	0	0	0
Vaccine preventable diseases						
Diphtheria	0	0	0	0	0	0
Haemophilus influenzae type B	0	0	0	0	0	0.1
Influenza	252.8	199.5	222.9	227.7	226.4	239.2
Measles	2.1	2.0	0.6	1.7	1.5	0.4
Meningococcal disease (invasive)	0.8	1.6	0.9	1.2	1.6	1.1
Mumps	1.2	0.7	0.5	0.8	0.7	2.6
Pertussis	57.6	26.0	49.3	44.5	50.7	51.1
Pneumococcal disease (invasive)	5.7	6.7	5.6	6.1	8.0	8.3
Rotavirus	11.5	10.8	11.9	11.6	12.6	11.6
Rubella	0	0	0.2	0	0	0
Tetanus	0	0.1	0	0	0	0
Varicella–Zoster	180.8	150.7	188.0	175.2	170.9	128.4

Vector–borne diseases						
Murray Valley encephalitis virus	0.1	0	0	0	0	0
Kunjin/West Nile virus	0	0	0	0	0	0
Japanese encephalitis virus	0	0	0.2	0	0	0
Barmah Forest virus	0.1	0.1	0.8	0.3	1.4	1.4
Chikungunya virus	0	0	0.2	0	0.1	0.2
Dengue virus	6.1	4.0	7.1	6.0	5.3	3.7
Malaria	1.5	2.3	2.6	2.3	1.9	1.6
Rickettsial disease (typhus)	0.6	0.3	0.6	0.5	0.7	NN
Ross River Virus	9.3	14.1	28.1	17.1	19.3	12.7
Zika virus	0.1	0	0	0	0	NN
Zoonotic diseases						
Leptospirosis	0.3	0.1	0.3	0.2	0.2	0.6
Psittacosis	0	0	0	0	0	0
Q Fever	0	0.3	0.6	0.3	0.5	2.1
Brucellosis	0	0	0	0	0	0.1
Other diseases						
Botulism	0	0	0	0	0	0
Creutzfeldt–Jakob disease	0.4	0.1	0.2	0.3	0.3	NN
Haemolytic uraemic syndrome	0	0	0	0	0	0
Legionellosis	1.8	1.3	2.3	1.9	1.7	1.8
Leprosy	0	0.1	0	0	0	0
Melioidosis	0	0.1	0.2	0.1	0.2	NN
Tuberculosis	6.0	6.3	4.3	5.6	5.3	5.9

Appendix 2: Immunisation coverage by Local Government Area (LGA)

Local Government Area (LGA)	Age Group	Number of Fully Vaccinated Children	Total children in region	Immunisation coverage (%)
Armadale	1 year	1400	1493	93.77
	2 years	1495	1613	92.68
	5 years	1446	1539	93.96
Bassendean	1 year	201	214	93.93
	2 years	186	206	90.29
	5 years	211	223	94.62
Bayswater	1 year	856	900	95.11
	2 years	802	896	89.51
	5 years	680	746	91.15
Belmont	1 year	497	540	92.04
	2 years	508	582	87.29
	5 years	481	533	90.24
Cambridge	1 year	243	255	95.29
	2 years	263	291	90.38
	5 years	281	305	92.13
Canning	1 year	1091	1178	92.61
	2 years	1108	1224	90.52
	5 years	1176	1254	93.78
Claremont	1 year	80	85	94.12
	2 years	90	99	90.91
	5 years	93	103	90.29
Cockburn	1 year	1535	1629	94.23
	2 years	1495	1642	91.05
	5 years	1521	1608	94.59
Cottesloe	1 year	77	82	93.90
	2 years	43	54	79.63
	5 years	65	72	90.28
East Fremantle	1 year	65	69	94.20
	2 years	59	65	90.77
	5 years	62	68	91.18
Fremantle	1 year	307	339	90.56
	2 years	318	362	87.85
	5 years	281	309	90.94
Gosnells	1 year	1668	1780	93.71
	2 years	1682	1849	90.97
	5 years	1757	1864	94.26
Joondalup	1 year	1573	1671	94.14
	2 years	1734	1897	91.41
	5 years	1913	2054	93.14
Kalamunda	1 year	607	650	93.38
	2 years	608	684	88.89
	5 years	667	716	93.16
Kwinana	1 year	774	826	93.70
	2 years	718	780	92.05
	5 years	715	751	95.21
Mandurah	1 year	760	829	91.68
	2 years	745	838	88.90
	5 years	798	855	93.33

Melville	1 year	1001	1084	92.34
	2 years	987	1099	89.81
	5 years	1124	1216	92.43
Mosman Park	1 year	65	70	92.86
	2 years	73	81	90.12
	5 years	96	99	96.97
Mundaring	1 year	372	405	91.85
	2 years	323	390	82.82
	5 years	401	440	91.14
Murray	1 year	227	248	91.53
	2 years	227	255	89.02
	5 years	264	282	93.62
Nedlands	1 year	171	183	93.44
	2 years	185	202	91.58
	5 years	222	241	92.12
Peppermint Grove	1 year	22	24	91.67
	2 years	11	15	73.33
	5 years	16	18	88.89
Perth	1 year	169	186	90.86
	2 years	152	180	84.44
	5 years	101	118	85.59
Rockingham	1 year	1876	2003	93.66
	2 years	1963	2149	91.34
	5 years	2098	2249	93.29
Serpentine–Jarrahdale	1 year	511	545	93.76
	2 years	514	552	93.12
	5 years	504	534	94.38
South Perth	1 year	406	435	93.33
	2 years	372	428	86.92
	5 years	368	410	89.76
Stirling	1 year	2764	2955	93.54
	2 years	2565	2879	89.09
	5 years	2456	2671	91.95
Subiaco	1 year	199	218	91.28
	2 years	187	208	89.90
	5 years	208	229	90.83
Swan	1 year	2162	2274	95.07
	2 years	2105	2309	91.17
	5 years	2051	2171	94.47
Victoria Park	1 year	428	450	95.11
	2 years	421	471	89.38
	5 years	363	398	91.21
Vincent	1 year	344	369	93.22
	2 years	347	391	88.75
	5 years	341	383	89.03
Wanneroo	1 year	2905	3073	94.53
	2 years	2971	3244	91.58
	5 years	3021	3201	94.38
Waroona	1 year	39	43	90.70
	2 years	38	47	80.85
	5 years	49	52	94.23

Immunisation coverage below 90% is shown in red, coverage between 90 and <95% is shown in blue, and coverage of >95% is shown in black.

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