Annual reports

Australia's notifiable disease status, 2008: Annual report of the National Notifiable Diseases Surveillance System

NNDSS Annual Report Writing Group

Abstract

In 2008, 65 communicable diseases and conditions were nationally notifiable in Australia. States and territories reported a total of 160,508 notifications of communicable diseases to the National Notifiable Diseases Surveillance System, an increase of 9% on the number of notifications in 2007. In 2008, the most frequently notified diseases were sexually transmissible infections (69,459 notifications, 43% of total notifications), vaccine preventable diseases (34,225 notifications, 21% of total notifications) and gastrointestinal diseases (27,308 notifications, 17% of total notifications). There were 18,207 notifications of bloodborne diseases; 8,876 notifications of vectorborne diseases; 1,796 notifications of other bacterial infections; 633 notifications of zoonoses and 4 notifications of quarantinable diseases. *Commun Dis Intell* 2010;34(3):157–225.

Keywords: Australia, communicable diseases, epidemiology, surveillance

Introduction

Australia's notifiable diseases status, 2008, is an annual surveillance report of nationally notifiable communicable diseases. Communicable disease surveillance in Australia operates at the national, state and territory, and local levels. Primary responsibility for public health action lies with the state and territory health departments. The purpose of communicable disease surveillance at a national level is to:

- identify national trends and compare the rates of specific diseases across Australia with national averages;
- guide policy development and resource allocation at a national level;
- monitor the need for and impact of national disease control programs;
- identify national or multi-jurisdictional outbreaks and coordinate a national response;
- describe the epidemiology of rare diseases in Australia;
- meet international reporting requirements, such as providing disease statistics to the World Health Organization (WHO); and
- support quarantine activities, which are the responsibility of the national government.

Methods

Australia is a federation of 6 states (New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia) and 2 territories (the Australian Capital Territory and the Northern Territory).

State and territory health departments collect notifications of communicable diseases under their public health legislation. In September 2007, the *National Health Security Act 2007*[1] received royal assent. This Act provides a legislative basis for and authorises the exchange of health information, including personal information, between jurisdictions and the Commonwealth. The Act provides for the establishment of the National Notifiable Diseases List,[2] which specifies the diseases for which personal information can be shared. The *National Health Security Agreement 2008*[3] establishes operational arrangements to formalise and enhance existing surveillance and reporting systems, an important objective of the Agreement.

Under the Agreement, in 2008 states and territories forwarded de-identified data on the nationally agreed set of 65 communicable diseases to the Department of Health and Aging for the purposes of national communicable disease surveillance, although not all 65 diseases were notifiable in each jurisdiction. States and territories provided data

to the National Notifiable Diseases Surveillance System (NNDSS) electronically, daily or several times a week. The system was complemented by other surveillance systems, which provided information on various diseases, including four that are not reported to NNDSS, namely human immunodeficiency virus (HIV), acquired immune deficiency (AIDS) and the classical and variant forms of Creutzfeldt-Jakob disease (CJD).

In 2008, the NNDSS core dataset included the following 5 mandatory data fields: unique record reference number; notifying state or territory; disease code; confirmation status and the date when the public health unit was notified (notification receive date). In addition, the following core but non-mandatory data fields were supplied where possible: date of birth; age at onset; sex; indigenous status; postcode of residence; disease onset date; date when the medical practitioner signed the notification form (notification date), death status, date of specimen collection and outbreak reference number (to identify cases linked to an outbreak). Where relevant, information on the species, serogroups/subtypes and phage types of organisms isolated, and on the vaccination status of the case were collected and reported to NNDSS. Data quality was monitored by the Office of Health Protection and the National Surveillance Committee (NSC) and there was a continual process of improving the national consistency of communicable disease surveillance through the daily, fortnightly and quarterly review of these data.

While not included in the core national dataset, enhanced surveillance information for some diseases (invasive pneumococcal disease, hepatitis C, tuberculosis and some sexually transmissible infections) were reported from states and territories to NNDSS but not included in this report. Additional information concerning mortality and specific health risk factors for some diseases were obtained from states and territories and included in this annual report.

Newly diagnosed HIV infection and AIDS were notifiable conditions in each state or territory health jurisdiction in 2008 and these data were forwarded directly to the National HIV Registry and National AIDS Registry at the National Centre in HIV Epidemiology and Clinical Research (NCHECR). Further information can be found in NCHECR's annual surveillance report.[4]

Surveillance of the classical and variant forms of CJD in Australia has been conducted through the Australian National Creutzfeldt-Jakob Disease Registry (ANCJDR) since its establishment in October 2003. CJD is a nationally notifiable disease and by June 2006, CJD was notifiable in all states and territories. Further surveillance information on CJD can be found in surveillance reports from the ANCJDR.[5]

Information from communicable disease surveillance is communicated through several avenues. The most up-to-date information on topics of interest is provided at fortnightly teleconferences of the Communicable Diseases Network Australia (CDNA) and a summary of these reports is available online from http://www.health.gov.au/cdnareport[6] The *Communicable Diseases Intelligence* (*CDI*) quarterly journal publishes surveillance data and reports of research studies on the epidemiology and control of various communicable diseases.

Notification rates for each notifiable disease were calculated using the estimated 2008 mid-year resident population supplied by the Australian Bureau of Statistics[7] (ABS) (Appendix 1 and Appendix 2). Where diseases were not notifiable in a state or territory, national rates were adjusted by excluding the population of that jurisdiction from the denominator. For some diseases, age adjusted rates were calculated using either the direct method of standardisation for gastrointestinal diseases, or indirect method for sexually transmissible infections, with 2006 census data as the standard population.

The 4 maps produced for this report (chlamydia, influenza, pertussis, Q fever) were created with ArcGIS mapping software (ESRI, Redlands, CA) and based on the NNDSS notifications' residential postcode recorded in the NNDSS.

With one exception, maps were based on Statistical Divisions (SDs), as defined by the Australian Standard Geographical Classification (AGSC) (Map 1, Table 1), for all states and territories. The Northern Territory was represented by Statistical Subdivisions (SSD) and in the case of Greater Darwin, by the combination of the Tiwi Islands, Darwin, Palmerston and Litchfield SSD. This combination helped preserve confidentiality while improving legibility at the scale the maps to be printed. The geocode 77777 for Greater Darwin is only nominal.

Notifications were summed by the postcode weighting calculated by the Australian Bureau of Statistics Postcode Concordance.[8] These ABS concordance data were used to proportionally allocate notifications into SDs/SSDs according to the percentage of the population of the postcode living in the region. The total notifications per region are displayed in the relevant area.

Disease rates were calculated per 100,000 population for the relevant areas using ABS population

data.[7] Rates were mapped for different SDs and ordered into 5 groups using the Jenks Natural Breaks method (http://resources.arcgis.com/content/kbase?fa=articleShow&d=26442) whereby the largest breaks between natural clusters of ordered data were identified and used as class boundaries. A class '0' was added to account for areas with no notifications, resulting in a total of 6 rate classes per map. Note that the classification is data dependent and changes from map to map.

Notes on interpretation

The present report is based on 2008 'finalised' data from each state or territory agreed upon in September 2009 and represents a snapshot of the year after duplicate records and incorrect or incomplete data were removed. Therefore, totals in this report may vary slightly from the totals reported in *CDI* quarterly publications.

Analyses in this report were based on the date of disease diagnosis in an attempt to estimate disease activity within the reporting period. The date of diagnosis is the onset date or where the date of onset was not known, the earliest of the specimen collection date, the notification date, or the notification receive date. As considerable time may have elapsed between the onset and diagnosis dates for hepatitis B (unspecified), hepatitis C (unspecified) and tuberculosis, the earliest specimen date, health professional notification date or public health unit notification receive date was used for these conditions.

Notified cases only represent a proportion (the 'notified fraction') of the total incidence (Figure 1) and this has to be taken into account when interpreting NNDSS data. Moreover, the notified fraction varies by disease, by jurisdiction and by time.

A survey of jurisdictional public health departments was conducted in 2009 to ascertain the source of each notification (Table 2). Five jurisdictions reported notifications in their jurisdictions originating from laboratory only, of greater than or equal to 95%. South Australia and Western Australia reported notifications in their jurisdictions originating from laboratory and doctor of 77% and 66.2% respectively, whilst Victoria reported 46%. South Australia reported the greatest percentage of notifications in their jurisdictions originating from doctors only, at 9%.

Whilst most jurisdictions have data on laboratory notifications, the percentage of notifications attributed to doctor only and laboratory and doctor for each state and territory are based on estimates deduced from the data that are available, noting that fields for these data may be incomplete. Western Australia is the only jurisdiction that maintains data on the source of notifications from laboratories and/or doctors.

Methods of surveillance vary between states and territories, each having different requirements for notification by medical practitioners, laboratories and hospitals. Although the National Notifiable Diseases List[2] was established under the *National Health Securities Act, 2007*, some diseases are not yet notifiable in all 8 jurisdictions (Table 3).

Figure 1: Communicable diseases notifiable fraction

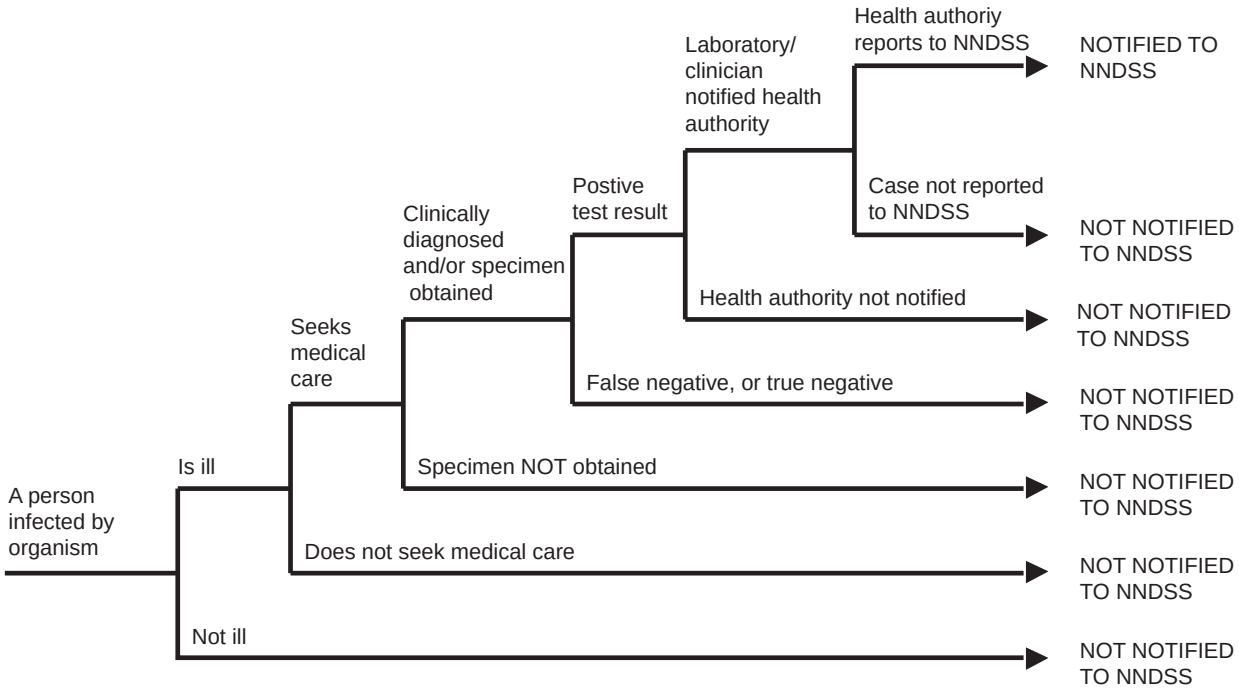
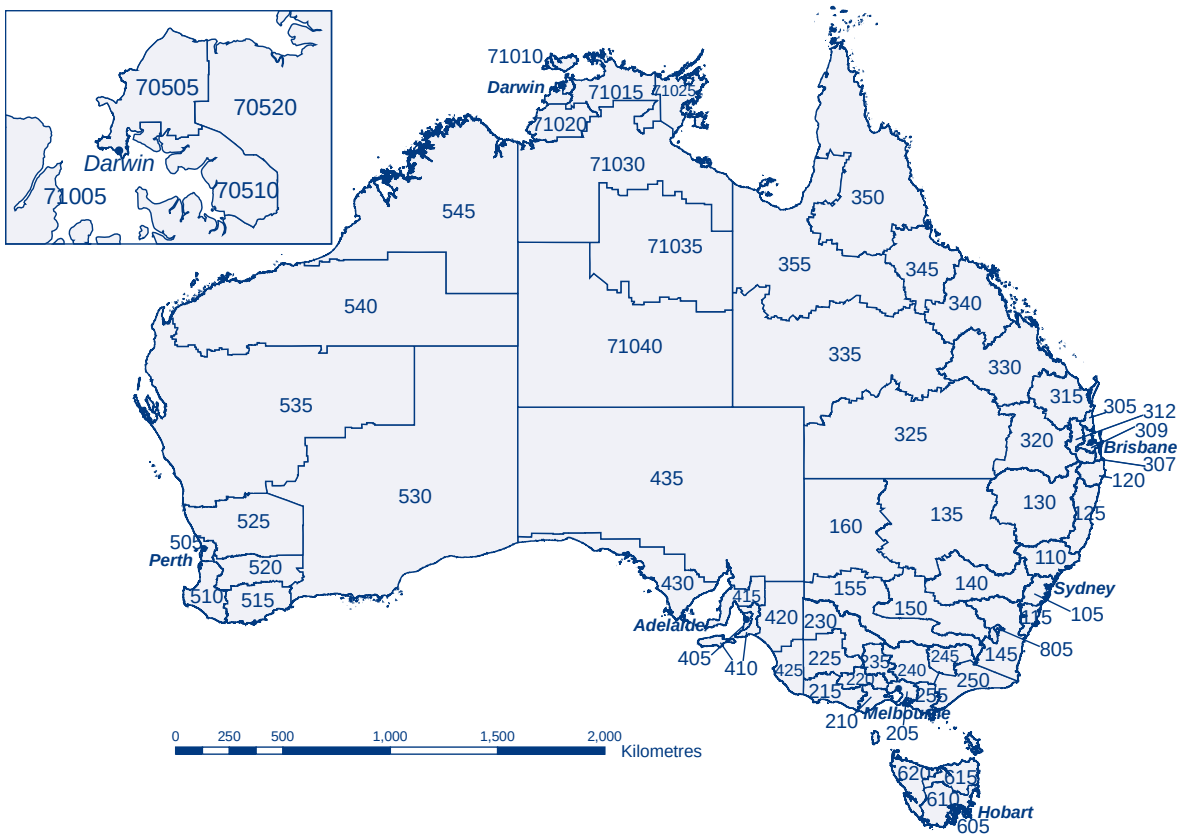


Table 1: Australian population by Statistical Division and Statistical Subdivision for the Northern Territory, 2008

SD code	Statistical Division	Population
Australian Capital Territory		
805	Canberra	345,257
810	ACT balance	294
New South Wales		
105	Sydney	4,399,722
110	Hunter	632,851
115	Illawarra	423,487
120	Richmond–Tweed	237,361
125	Mid-North Coast	304,323
130	Northern	181,667
135	North Western	116,736
140	Central West	180,074
145	South Eastern	212,238
150	Murrumbidgee	155,868
155	Murray	117,108
160	Far West	22,737
Northern Territory (Subdivisions)		
71005	Finniss	2,214
71010	Bathurst–Melville	2,501
71015	Alligator	6,913
71020	Daly	4,353
71025	East Arnhem	16,077
71030	Lower Top End NT	18,894
71040	Central NT	40,299
77777	Greater Darwin	123,139
Queensland		
305	Brisbane	1,945,639
307	Gold Coast	497,848
309	Sunshine Coast	312,804
312	West Moreton	90,738
315	Wide Bay–Burnett	277,965
320	Darling Downs	231,599
325	South West	26,150
330	Fitzroy	214,753
335	Central West	12,256
340	Mackay	167,666
345	Northern	220,656
350	Far North	262,095
355	North West	33,746
South Australia		
405	Adelaide	1,172,105
410	Outer Adelaide	134,085
415	Yorke and Lower North	46,396
420	Murray Lands	70,125
425	South East	65,402
430	Eyre	35,174
435	Northern	80,074
Tasmania		
605	Greater Hobart	209,287
610	Southern	36,875
615	Northern	140,275
620	Mersey–Lyell	111,092
Victoria		
205	Melbourne	3,892,419
210	Barwon	278,668
215	Western District	104,709
220	Central Highlands	152,075
225	Wimmera	50,404
230	Mallee	93,568
235	Loddon	179,948
240	Goulburn	207,685
245	Ovens–Murray	98,250
250	East Gippsland	85,318
255	Gippsland	170,779
Western Australia		
505	Perth	1,602,559
510	South West	236,058
515	Lower Great Southern	57,439
520	Upper Great Southern	18,887
525	Midlands	54,603
530	South Eastern	58,074
535	Central	63,409
540	Pilbara	45,983
545	Kimberley	34,185
Other territories		–
Total		21,423,938

Source: ABS 3218.0 Regional Population Growth, Australia, 23 April 2009 (http://abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02007–08).

Map 1: Australian Bureau of Statistics Statistical Division codes, Australia, and Statistical Subdivision codes, Northern Territory, 2008



Changes in surveillance practices have been introduced in some jurisdictions and not in others, and making the comparison of data across jurisdictions difficult. In this report, some information was obtained from states and territories, including changes in surveillance practices, screening practices, laboratory practices, and major disease control or prevention initiatives to assist in the interpretation of the 2008 data.

Postcode information usually reflects the residential location of the case, but this does not necessarily represent the place where the disease was acquired. In December 2008, the CDNA endorsed the NNDSS cross-border notification protocol, which determines that the jurisdiction of residence of a case has the responsibility of reporting the notification to NNDSS. This was implemented from 1 January 2009, and may also affect some retrospective notifications by removing duplicates and preventing the loss of notification data in NNDSS.

Table 2: Percentage of notifications from different sources in each jurisdiction, 2008

State or territory	Source of notifications		
	Laboratory only	Doctor only	Laboratory and doctor
ACT	98.0	1.0	1.0
NSW*	95.0	1.5	1.2
NT	99.0	1.0	<1.0
Qld	97.5	0.5	2.0
SA*	8.5	9.0	77
Tas	98.0	2.0	<1.0
Vic	48.0	6.0	46.0
WA	30.5	3.3	66.2

* Not all percentages add up to 100% due to other sources of notifications and/or incomplete data for laboratory and medical notification fields.

Table 3: Diseases notified to the National Notifiable Diseases Surveillance System, Australia 2008

Disease	Data received from
Bloodborne diseases	
Hepatitis (NEC)	All jurisdictions
Hepatitis B (newly acquired)*	All jurisdictions
Hepatitis B (unspecified)†	All jurisdictions
Hepatitis C (newly acquired)*	All jurisdictions, except Queensland
Hepatitis C (unspecified)†,‡	All jurisdictions
Hepatitis D	All jurisdictions
Gastrointestinal diseases	
Botulism	All jurisdictions
Campylobacteriosis§	All jurisdictions, except New South Wales
Cryptosporidiosis	All jurisdictions
Haemolytic uraemic syndrome	All jurisdictions
Hepatitis A	All jurisdictions
Hepatitis E	All jurisdictions
Listeriosis	All jurisdictions
Salmonellosis	All jurisdictions
Shigellosis	All jurisdictions
STEC,VTEC‖	All jurisdictions
Typhoid	All jurisdictions
Quarantinable diseases	
Cholera	All jurisdictions
Highly pathogenic avian influenza in humans	All jurisdictions
Plague	All jurisdictions
Rabies	All jurisdictions
Severe acute respiratory syndrome	All jurisdictions
Smallpox	All jurisdictions
Viral haemorrhagic fever	All jurisdictions
Yellow fever	All jurisdictions
Sexually transmissible infections	
Chlamydial infections¶	All jurisdictions
Donovanosis	All jurisdictions
Gonococcal infection**	All jurisdictions
Syphilis – < 2 years duration†	All jurisdictions
Syphilis – > 2 years or unspecified duration†	All jurisdictions, except South Australia
Syphilis – congenital	All jurisdictions
Vaccine preventable diseases	
Diphtheria	All jurisdictions
Haemophilus influenzae type b	All jurisdictions
Influenza (laboratory confirmed)††	All jurisdictions
Measles	All jurisdictions
Mumps	All jurisdictions
Pertussis	All jurisdictions
Pneumococcal disease (invasive)	All jurisdictions
Poliomyelitis	All jurisdictions
Rubella	All jurisdictions
Rubella – congenital	All jurisdictions
Tetanus	All jurisdictions

Table 3: Diseases notified to the National Notifiable Diseases Surveillance System, Australia, *continued*

Disease	Data received from
Vaccine preventable diseases, *continued*	
Varicella zoster (chickenpox)‡‡	All jurisdictions, except New South Wales
Varicella zoster (shingles)‡‡	All jurisdictions, except New South Wales
Varicella zoster (unspecified)‡‡	All jurisdictions, except New South Wales
Vectorborne diseases	
Arbovirus infection (NEC)§§	All jurisdictions
Barmah Forest virus infection	All jurisdictions
Dengue virus infection	All jurisdictions
Japanese encephalitis virus infection	All jurisdictions
Kunjin virus infection‖‖	All jurisdictions
Malaria	All jurisdictions
Murray Valley encephalitis virus infection‖‖	All jurisdictions
Ross River virus infection	All jurisdictions
Zoonoses	
Anthrax	All jurisdictions
Australian bat lyssavirus	All jurisdictions
Brucellosis	All jurisdictions
Leptospirosis	All jurisdictions
Lyssavirus (NEC)	All jurisdictions
Ornithosis	All jurisdictions
Q fever	All jurisdictions
Tularaemia	All jurisdictions
Other bacterial infections	
Legionellosis	All jurisdictions
Leprosy	All jurisdictions
Meningococcal infection¶¶	All jurisdictions
Tuberculosis	All jurisdictions

* Newly acquired hepatitis includes cases where the infection was determined to be acquired within 24 months prior to diagnosis.

† Unspecified hepatitis and syphilis includes cases where the duration of infection could not be determined.

‡ In Queensland, includes incident hepatitis C cases.

§ Notified as 'foodborne disease' or 'gastroenteritis in an institution' in New South Wales.

‖ Infection with Shiga toxin/verotoxin-producing *Escherichia coli* (STEC/VTEC).

¶ Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; the Northern Territory and Western Australia excludes ocular infections. Where data fields were complete, infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

** Where data fields were complete, gonococcal infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

†† Influenza (laboratory confirmed) became notifiable in South Australia on 1 May 2008.

‡‡ Varicella zoster became notifiable in Victoria on 21 September 2008.

§§ Arbovirus (NEC) replaced Flavivirus (NEC) in 2008.

‖‖ In the Australian Capital Territory, Murray Valley encephalitis virus infection and Kunjin virus infection are combined under Murray Valley encephalitis virus infection.

¶¶ Only invasive meningococcal disease is nationally notifiable. However, New South Wales, the Australian Capital Territory and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

Data completeness was assessed for the notification's sex, age at onset, and indigenous status, and reported as the proportion of complete notifications. The completeness of data in this report is summarised in the Results.

The percentage of data completeness was defined as:

Percentage of data completeness = (total notifications – missing or unknown)/total notifications x 100

The indigenous status was defined by the following nationally accepted values:[10]

1=Indigenous – (Aboriginal but not Torres Strait Islander origin)

2=Indigenous – (Torres Strait Islander but not Aboriginal origin)

3=Indigenous – (Aboriginal and Torres Strait Islander origin)

4=Not indigenous – (not Aboriginal or Torres Strait Islander origin)

9=Not stated

Notes on cases definitions

All notifiable diseases reported to the NNDSS must meet their respective national surveillance case definitions. These case definitions were agreed by CDNA and implemented nationally from January 2004 and were used by all jurisdictions for the first time in 2005. The national surveillance case definitions and their status are available from http://www.health.gov.au/casedefinitions

Results

There were 160,508 communicable disease notifications received by NNDSS in 2008 (Table 4).

In 2008, the most frequently notified diseases were sexually transmissible infections (69,459 notifications, 43.3% of total notifications), vaccine preventable diseases (34,225 notifications, 21.3% of total notifications) and gastrointestinal diseases (27,308 notifications, 17% of total notifications).

There were 18,207 notifications of bloodborne diseases; 8,876 notifications of vectorborne diseases; 1,796 notifications of other bacterial infections; 633 notifications of zoonoses and 4 notifications of quarantinable diseases. In 2008, the total number of notifications was the highest recorded in the NNDSS since the surveillance system commenced data collection in 1991. There was an increase of 9% compared with the total number of notifications in 2007 (Figure 2).

Notifications and notification rates per 100,000 population for each disease by state or territory, in 2008, are shown in Table 5 and Table 6 respectively. Trends in notifications and rates per 100,000 population for the period 2003 to 2008 are shown in Table 7.

The year in which diseases became notifiable to NNDSS in each jurisdiction is shown in Table 8.

Table 4: Notifications to the National Notifiable Diseases Surveillance System, Australia, 2008, by disease category rank order

Disease category	Number	%
Sexually transmitted infections	69,459	43.3
Vaccine preventable diseases	34,225	21.3
Gastrointestinal diseases	27,308	17.0
Bloodborne diseases	18,207	11.3
Vectorborne diseases	8,876	5.5
Other bacterial diseases	1,796	1.1
Zoonoses	633	0.4
Quarantinable diseases	4	<0.1
Total	160,508	100.0

Figure 2: Trends in notifications received by the National Notifiable Diseases Surveillance System, Australia, 1991 to 2008

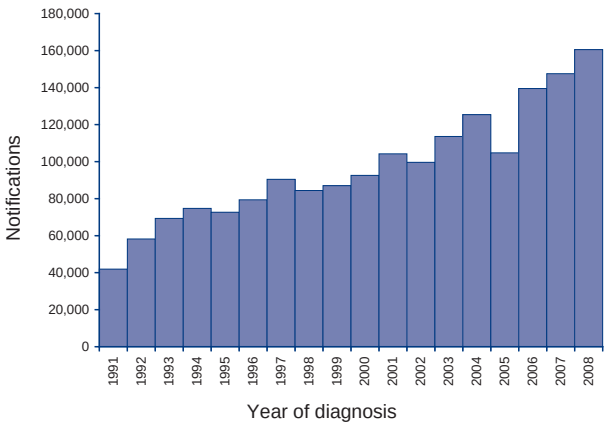


Table 5: Notifications of communicable diseases, Australia, 2008, by state or territory

Disease	State or territory								
	ACT	NSW	NT*	Qld	SA	Tas	Vic	WA	Aust
Bloodborne diseases									
Hepatitis (NEC)	0	0	0	0	0	0	1	0	1
Hepatitis B (newly acquired)†	1	46	8	45	11	12	88	34	245
Hepatitis B (unspecified)	67	2,555	197	843	417	58	1,832	631	6,600
Hepatitis C (newly acquired)†	5	24	6	NN	65	24	154	103	381
Hepatitis C (unspecified)‡,§	195	3,555	222	2,634	515	324	2,252	1,241	10,938
Hepatitis D	0	14	1	7	0	0	14	6	42
Gastrointestinal diseases									
Botulism	0	0	0	0	0	0	0	0	0
Campylobacteriosis‖	381	NN	257	4,821	1,992	475	5,780	1,829	15,535
Cryptosporidiosis	11	484	102	695	63	36	449	165	2,005
Haemolytic uraemic syndrome	0	17	1	7	2	0	4	0	31
Hepatitis A	5	69	3	71	20	1	85	22	276
Hepatitis E	0	14	3	7	0	0	14	6	44
Listeriosis	1	34	0	12	1	1	11	8	68
Salmonellosis	132	2,261	497	2,047	661	206	1,651	855	8,310
Shigellosis	3	109	175	97	137	4	134	169	828
STEC,VTEC¶	0	19	0	37	39	0	11	0	106
Typhoid	0	43	1	18	3	0	32	8	105
Quarantinable diseases									
Cholera	0	2	0	0	0	0	0	2	4
Highly pathogenic avian influenza in humans	0	0	0	0	0	0	0	0	0
Plague	0	0	0	0	0	0	0	0	0
Rabies	0	0	0	0	0	0	0	0	0
Severe acute respiratory syndrome	0	0	0	0	0	0	0	0	0
Smallpox	0	0	0	0	0	0	0	0	0
Viral haemorrhagic fever	0	0	0	0	0	0	0	0	0
Yellow fever	0	0	0	0	0	0	0	0	0
Sexually transmitted infections									
Chlamydial infection**	988	14,019	2,296	15,197	3,653	1,481	12,210	8,640	58,484
Donovanosis	0	0	1	1	0	0	0	0	2
Gonococcal infection††	21	1,332	1,567	1,638	521	25	926	1,693	7,723
Syphilis – all‡‡	36	1,407	253	390	52	22	793	290	3,243
Syphilis < 2 years duration‡	4	416	83	187	52	7	374	180	1,303
Syphilis > 2 years or unspecified duration‡	32	991	170	203	NDP	15	419	110	1,940
Syphilis – congenital	0	3	1	3	0	0	0	0	7
Vaccine preventable diseases									
Diphtheria	0	0	0	0	0	0	0	0	0
Haemophilus influenzae type b	0	9	2	6	1	1	6	0	25
Influenza (laboratory confirmed)§§	244	1,814	199	3,703	473	388	1,300	1,016	9,137
Measles	0	39	3	11	2	0	2	8	65
Mumps	0	77	53	29	17	2	13	95	286
Pertussis	145	7,818	477	2,260	1,459	200	1,694	463	14,516
Pneumococcal disease (invasive)	20	547	60	326	120	39	355	162	1,629
Poliomyelitis	0	0	0	0	0	0	0	0	0
Rubella	0	17	0	4	1	0	8	7	37
Rubella – congenital	0	0	0	0	0	0	0	0	0
Tetanus	0	1	0	1	0	0	1	1	4

Table 5: Notifications of communicable diseases, Australia, 2008, by state or territory, *cont'd*

Disease	State or territory								
	ACT	NSW	NT*	Qld	SA	Tas	Vic	WA	Aust
Vaccine preventable diseases, *continued*									
Varicella zoster (chickenpox)‖‖	12	NN	115	429	620	29	230	355	1,790
Varicella zoster (shingles)‖‖	7	NN	106	447	931	125	185	508	2,309
Varicella zoster (unspecified)‖‖	102	NN	2	3,138	223	46	162	754	4,427
Vectorborne diseases									
Arbovirus infection (NEC)¶¶	0	1	0	21	0	0	6	0	28
Barmah Forest virus infection	7	533	76	1,242	37	1	32	174	2,102
Dengue virus infection	6	154	23	232	31	6	8	98	558
Japanese encephalitis virus infection	0	1	0	0	0	0	0	0	1
Kunjin virus infection***	0	0	0	1	0	0	0	0	1
Malaria	15	116	20	167	17	8	105	85	533
Murray Valley encephalitis virus infection***	0	1	0	0	0	0	0	1	2
Ross River virus infection	21	1,152	261	2,838	197	77	231	874	5,651
Zoonoses									
Anthrax	0	0	0	0	0	0	0	0	0
Australia bat lyssavirus	0	0	0	0	0	0	0	0	0
Brucellosis	0	2	0	46	0	0	0	0	48
Leptospirosis	0	17	1	89	0	0	4	1	112
Lyssavirus (NEC)	0	0	0	0	0	0	0	0	0
Ornithosis	0	41	0	3	0	0	53	6	103
Q fever	2	164	3	158	17	0	20	6	370
Tularaemia	0	0	0	0	0	0	0	0	0
Other bacterial diseases									
Legionellosis	4	89	1	31	21	1	54	70	271
Leprosy	0	4	1	2	0	0	2	2	11
Meningococcal infection†††	3	81	8	85	20	1	64	24	286
Tuberculosis	12	501	32	144	54	8	379	98	1,228
Total	**2,446**	**39,186**	**7,034**	**43,983**	**12,393**	**3,601**	**31,355**	**20,510**	**160,508**

* Due to delays in data quality checks, data for Northern Territory was preliminary at the time of analysis.

† Newly acquired hepatitis includes cases where the infection was determined to be acquired within 24 months prior to diagnosis.

‡ Unspecified hepatitis and syphilis includes cases where the duration of infection could not be determined.

§ In Queensland, includes incident hepatitis C cases.

‖ Notified as 'foodborne disease' or 'gastroenteritis in an institution' in New South Wales.

¶ Infection with Shiga toxin/verotoxin-producing *Escherichia coli* (STEC/VTEC).

** Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; the Northern Territory and Western Australia excludes ocular infections. Where data fields were complete, infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

†† Where data fields were complete, gonococcal infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

‡‡ Does not include congenital syphilis.

§§ Influenza (laboratory confirmed) became notifiable in South Australia on 1 May 2008.

‖‖ Varicella zoster became notifiable in Victoria on 21 September 2008.

¶¶ Arbovirus (NEC) replaced Flavivirus (NEC) in 2008.

*** In the Australian Capital Territory, Murray Valley encephalitis virus infection and Kunjin virus infection are combined under Murray Valley encephalitis virus infection.

††† Only invasive meningococcal disease is nationally notifiable. However, New South Wales, the Australian Capital Territory and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

NN Not notifiable.

NDP No data provided.

Table 6: Notification rates of nationally notifiable communicable diseases, Australia, 2008, by state or territory. (Annualised rate per 100,000 population)

Disease	State or territory								
	ACT	NSW	NT*	Qld	SA	Tas	Vic	WA	Aust
Bloodborne diseases									
Hepatitis (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hepatitis B (newly acquired)†	0.3	0.7	3.6	1.0	0.7	2.4	1.7	1.6	1.1
Hepatitis B (unspecified)	19.4	36.6	89.6	19.6	26.0	11.7	34.5	29.1	30.8
Hepatitis C (newly acquired)†	1.4	0.3	2.7	NN	4.1	4.8	2.9	4.7	2.2
Hepatitis C (unspecified)‡,§	56.4	50.9	101.0	61.3	32.1	65.1	42.4	57.2	51.0
Hepatitis D	0.0	0.2	0.5	0.2	0.0	0.0	0.3	0.3	0.2
Gastrointestinal diseases									
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis‖	110.3	NN	116.9	112.3	124.2	95.5	108.8	84.2	107.5
Cryptosporidiosis	3.2	6.9	46.4	16.2	3.9	7.2	8.4	7.6	9.4
Haemolytic uraemic syndrome	0.0	0.2	0.5	0.2	0.1	0.0	0.1	0.0	0.1
Hepatitis A	1.4	1.0	1.4	1.7	1.2	0.2	1.6	1.0	1.3
Hepatitis E	0.0	0.2	1.4	0.2	0.0	0.0	0.3	0.3	0.2
Listeriosis	0.3	0.5	0.0	0.3	0.1	0.2	0.2	0.4	0.3
Salmonellosis	38.2	32.4	226.1	47.7	41.2	41.4	31.1	39.4	38.8
Shigellosis	0.9	1.6	79.6	2.3	8.5	0.8	2.5	7.8	3.9
STEC,VTEC¶	0.0	0.3	0.0	0.9	2.4	0.0	0.2	0.0	0.5
Typhoid	0.0	0.6	0.5	0.4	0.2	0.0	0.6	0.4	0.5
Quarantinable diseases									
Cholera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Highly pathogenic avian influenza in humans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plague	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smallpox	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sexually transmitted infections									
Chlamydial infection**	285.9	200.7	1044.5	353.9	227.8	297.7	229.8	397.9	272.9
Donovanosis	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Gonococcal infection††	6.1	19.1	712.9	38.1	32.5	5.0	17.4	78.0	36.0
Syphilis – all‡‡	10.4	20.2	115.1	9.1	3.2	4.4	14.9	13.4	15.1
Syphilis < 2 years duration‡	1.2	6.0	37.8	4.4	3.2	1.4	7.0	8.3	6.1
Syphilis > 2 years or unspecified duration‡	9.3	14.2	77.3	4.7	NDP	3.0	7.9	5.1	9.8
Syphilis – congenital	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0
Vaccine preventable diseases									
Diphtheria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	0.0	0.1	0.9	0.1	0.1	0.2	0.1	0.0	0.1
Influenza (laboratory confirmed)§§	70.6	26.0	90.5	86.2	29.5	78.0	24.5	46.8	42.6
Measles	0.0	0.6	1.4	0.3	0.1	0.0	0.0	0.4	0.3
Mumps	0.0	1.1	24.1	0.7	1.1	0.4	0.2	4.4	1.3
Pertussis	42.0	111.9	217.0	52.6	91.0	40.2	31.9	21.3	67.7
Pneumococcal disease (invasive)	5.8	7.8	27.3	7.6	7.5	7.8	6.7	7.5	7.6
Poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella	0.0	0.2	0.0	0.1	0.1	0.0	0.2	0.3	0.2
Rubella – congenital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 6: Notification rates of nationally notifiable communicable diseases, Australia, 2008, by state or territory. (Annualised rate per 100,000 population), *continued*

Disease	State or territory								
	ACT	NSW	NT*	Qld	SA	Tas	Vic	WA	Aust
Vaccine preventable diseases, *continued*									
Varicella zoster (chickenpox)‖‖	3.5	NN	52.3	10.0	38.7	5.8	NRC	16.4	19.6
Varicella zoster (shingles)‖‖	2.0	NN	48.2	10.4	58.1	25.1	NRC	23.4	25.3
Varicella zoster (unspecified)‖‖	29.5	NN	0.9	73.1	13.9	9.2	NRC	34.7	48.5
Vectorborne diseases									
Arbovirus infection (NEC)¶¶	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.1
Barmah Forest virus infection	2.0	7.6	34.6	28.9	2.3	0.2	0.6	8.0	9.8
Dengue virus infection	1.7	2.2	10.5	5.4	1.9	1.2	0.2	4.5	2.6
Japanese encephalitis virus infection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kunjin virus infection***	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaria	4.3	1.7	9.1	3.9	1.1	1.6	2.0	3.9	2.5
Murray Valley encephalitis virus infection***	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ross River virus infection	6.1	16.5	118.7	66.1	12.3	15.5	4.3	40.3	26.4
Zoonoses									
Anthrax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australia bat lyssavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.2
Leptospirosis	0.0	0.2	0.5	2.1	0.0	0.0	0.1	0.0	0.5
Lyssavirus (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ornithosis	0.0	0.6	0.0	0.1	0.0	0.0	1.0	0.3	0.5
Q fever	0.6	2.3	1.4	3.7	1.1	0.0	0.4	0.3	1.7
Tularaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other bacterial diseases									
Legionellosis	1.2	1.3	0.5	0.7	1.3	0.2	1.0	3.2	1.3
Leprosy	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.1	0.1
Meningococcal infection†††	0.9	1.2	3.6	2.0	1.2	0.2	1.2	1.1	1.3
Tuberculosis	3.5	7.2	14.6	3.4	3.4	1.6	7.1	4.5	5.7

* Due to delays in data quality checks, data for Northern Territory was preliminary at the time of analysis.

† Newly acquired hepatitis includes cases where the infection was determined to be acquired within 24 months prior to diagnosis.

‡ Unspecified hepatitis and syphilis includes cases where the duration of infection could not be determined.

§ In Queensland, includes incident hepatitis C cases.

‖ Notified as 'foodborne disease' or 'gastroenteritis in an institution' in New South Wales.

¶ Infection with Shiga toxin/verotoxin-producing *Escherichia coli* (STEC/VTEC).

** Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; the Northern Territory and Western Australia excludes ocular infections. Where data fields were complete, infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

†† Where data fields were complete, gonococcal infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

‡‡ Does not include congenital syphilis.

§§ Influenza (laboratory confirmed) became notifiable in South Australia on 1 May 2008.

‖‖ Varicella zoster became notifiable in Victoria on 21 September 2008.

¶¶ Arbovirus (NEC) replaced Flavivirus (NEC) in 2008.

*** In the Australian Capital Territory, Murray Valley encephalitis virus infection and Kunjin virus infection are combined under Murray Valley encephalitis virus infection.

††† Only invasive meningococcal disease is nationally notifiable. However, New South Wales, the Australian Capital Territory and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

NN Not notifiable.

NDP No data provided.

NRC No rate calculated – due to part year reporting. Varicella zoster became notifiable in Victoria on 21 September 2008.

Table 7: Notifications and notification rate per 100,000 population for communicable diseases, Australia, 2003 to 2008

Disease	Number of notifications						5 year mean	Ratio	Notification rate per 100,000 population					
	2003	2004	2005	2006	2007	2008			2003	2004	2005	2006	2007	2008
Bloodborne diseases														
Hepatitis (NEC)	0	0	1	1	0	1	0.4	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Hepatitis B (newly acquired)*	347	283	251	291	294	245	293.2	0.8	1.7	1.4	1.2	1.4	1.4	1.1
Hepatitis B (unspecified)	5,803	5,781	6,291	6,254	6,887	6,600	6,203.2	1.1	29.2	28.7	30.8	30.2	32.7	30.8
Hepatitis C (newly acquired)*	514	456	373	436	385	381	432.8	0.9	3.2	2.8	2.3	2.6	2.3	2.2
Hepatitis C (unspecified)†,‡	13,606	12,661	11,955	11,931	11,905	10,938	12,411.6	0.9	68.4	62.9	58.6	57.6	56.5	51.0
Hepatitis D	26	29	32	30	34	42	30.2	1.4	0.1	0.1	0.2	0.1	0.2	0.2
Gastrointestinal diseases														
Botulism	1	1	3	1	1	0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis§	15,360	15,589	16,497	15,423	16,996	15,535	15,973.0	1.0	116.2	116.2	121.0	111.1	120.0	107.5
Cryptosporidiosis	1,222	1,685	3,215	3,203	2,812	2,005	2,427.4	0.8	6.1	8.4	15.8	15.5	13.3	9.4
Haemolytic uraemic syndrome	15	16	20	14	19	31	16.8	1.8	0.1	0.1	0.1	0.1	0.1	0.1
Hepatitis A	431	319	327	281	165	276	304.6	0.9	2.2	1.6	1.6	1.4	0.8	1.3
Hepatitis E	12	28	30	24	18	44	22.4	2.0	0.1	0.1	0.1	0.1	0.1	0.2
Listeriosis	69	67	54	61	50	68	60.2	1.1	0.3	0.3	0.3	0.3	0.2	0.3
Salmonellosis	7,001	7,839	8,424	8,255	9,533	8,310	8,210.4	1.0	35.2	38.9	41.3	39.9	45.2	38.8
Shigellosis	442	520	729	546	602	828	567.8	1.5	2.2	2.6	3.6	2.6	2.9	3.9
STEC,VTEC‖	52	49	86	70	107	106	72.8	1.5	0.3	0.2	0.4	0.3	0.5	0.5
Typhoid	51	76	52	77	91	105	69.4	1.5	0.3	0.4	0.3	0.4	0.4	0.5
Quarantinable diseases														
Cholera	1	5	3	3	4	4	3.2	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Highly pathogenic avian influenza in humans	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plague	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabies	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smallpox	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 7: Notifications and notification rate per 100,000 population for communicable diseases, Australia, 2003 to 2008, *continued*

Disease	Number of notifications						5 year mean	Ratio	Notification rate per 100,000 population					
	2003	2004	2005	2006	2007	2008			2003	2004	2005	2006	2007	2008
Sexually transmissible infections														
Chlamydial infection[¶]	30,419	36,212	41,346	47,458	52,022	58,484	41,491.4	1.4	152.9	179.9	202.7	229.3	246.9	272.9
Donovanosis	16	10	13	6	3	2	9.6	0.2	0.1	0.0	0.1	0.0	0.0	0.0
Gonococcal infection**	6,779	7,175	8,070	8,562	7,676	7,723	7,652.4	1.0	34.1	35.6	39.6	41.4	36.4	36.0
Syphilis – all[††]	2,004	2,347	2,234	2,687	3,161	3,243	2,486.6	1.3	10.1	11.7	11.0	13.0	15.0	15.1
Syphilis < 2 years duration[†]	NN	634	650	878	1,422	1,303	716.8[‡‡]	1.8	NN	3.1	3.2	4.2	6.7	6.1
Syphilis > 2 years or unspecified duration[†]	NN	1,713	1,584	1,809	1,739	1,940	1,369.0[‡‡]	1.4	NN	9.2	8.4	9.5	8.9	9.8
Syphilis – congenital	13	13	15	14	7	7	12.4	0.6	0.1	0.1	0.1	0.1	0.0	0.0
Vaccine preventable diseases														
Diphtheria	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	19	15	17	22	17	25	18.0	1.4	0.1	0.1	0.1	0.1	0.1	0.1
Influenza (laboratory confirmed)[§§]	3,479	2,138	4,561	3,254	10,449	9,137	4,776.2	1.9	17.5	10.6	22.4	15.7	49.6	42.6
Measles	93	45	10	125	12	65	57.0	1.1	0.5	0.2	0.0	0.6	0.1	0.3
Mumps	77	102	240	275	586	286	256.0	1.1	0.4	0.5	1.2	1.3	2.8	1.3
Pertussis	5,096	8,750	11,200	10,995	5,345	14,516	8,277.2	1.8	25.6	43.5	54.9	53.1	25.4	67.7
Pneumococcal disease (invasive)	2,226	2,373	1,706	1,463	1,483	1,629	1,850.2	0.9	11.2	11.8	8.4	7.1	7.0	7.6
Poliomyelitis	0	0	0	0	1	0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella	55	31	31	59	34	37	42.0	0.9	0.3	0.2	0.2	0.3	0.2	0.2
Rubella – congenital	3	1	1	0	2	0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus	4	5	2	3	3	4	3.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Varicella zoster (chickenpox)[¶¶]	NN	NN	NN	1,558	1,667	1,790	1,080.3[¶¶]	1.7	NN	NN	NN	17.8	18.6	19.6
Varicella zoster (shingles)[¶¶]	NN	NN	NN	1,092	1,561	2,309	886.7[¶¶]	2.6	NN	NN	NN	12.5	17.4	25.3
Varicella zoster (unspecified)[¶¶]	NN	NN	NN	3,677	4,286	4,427	2,701.3[¶¶]	1.6	NN	NN	NN	42.0	47.9	48.5
Vectorborne diseases														
Arbovirus infection (NEC)***	58	60	28	32	22	28	40.0	0.7	0.3	0.3	0.1	0.2	0.1	0.1
Barmah Forest virus infection	1,367	1,103	1,323	2,140	1,716	2,102	1,529.8	1.4	6.9	5.5	6.5	10.3	8.1	9.8
Dengue virus infection	861	351	220	187	314	558	386.6	1.4	4.3	1.7	1.1	0.9	1.5	2.6
Japanese encephalitis virus infection	1	1	0	0	0	1	0.4	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Kunjin virus infection[†††]	9	6	1	3	1	1	4.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Malaria	585	547	817	770	568	533	657.4	0.8	2.9	2.7	4.0	3.7	2.7	2.5
Murray Valley encephalitis virus infection[†††]	0	1	2	1	0	2	0.8	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Ross River virus infection	3,844	4,209	2,540	5,545	4,207	5,651	4,069.0	1.4	19.3	20.9	12.5	26.8	20.0	26.4

Table 7: Notifications and notification rate per 100,000 population for communicable diseases, Australia, 2003 to 2008, *continued*

Disease	Number of notifications						5 year mean	Ratio	Notification rate per 100,000 population					
	2003	2004	2005	2006	2007	2008			2003	2004	2005	2006	2007	2008
Zoonoses														
Anthrax	0	0	0	1	1	0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	20	38	41	51	38	48	37.6	1.3	0.1	0.2	0.2	0.2	0.2	0.2
Leptospirosis	127	177	129	145	108	112	137.2	0.8	0.6	0.9	0.6	0.7	0.5	0.5
Ornithosis	200	239	164	165	93	103	172.2	0.6	1.0	1.2	0.8	0.8	0.4	0.5
Q fever	560	463	351	408	445	370	445.4	0.8	2.8	2.3	1.7	2.0	2.1	1.7
Other bacterial infections														
Legionellosis	333	312	331	349	306	271	326.2	0.8	1.7	1.6	1.6	1.7	1.5	1.3
Leprosy	7	6	10	7	13	11	8.6	1.3	0.0	0.0	0.0	0.0	0.1	0.1
Meningococcal infection‡‡‡	558	405	391	318	306	286	395.6	0.7	2.8	2.0	1.9	1.5	1.5	1.3
Tuberculosis	986	1,052	1,083	1,208	1,174	1,228	1,100.6	1.1	5.0	5.2	5.3	5.8	5.6	5.7
Total	**102,748**	**113,593**	**125,384**	**139,481**	**147,530**	**160,508**	**125,747.2**							

* Newly acquired hepatitis includes cases in whom the infection was determined to be acquired within 24 months prior to diagnosis.

† Unspecified hepatitis and syphilis includes cases in whom the duration of infection could not be determined.

‡ Data provided from Queensland (2003–2008) and the Northern Territory (2003–2004) includes both newly-acquired and unspecified hepatitis C notifications.

§ Notified as 'foodborne disease' or 'gastroenteritis in an institution' in New South Wales.

‖ Infection with Shiga toxin/verotoxin-producing *Escherichia coli* (STEC/VTEC).

¶ Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; the Northern Territory and Western Australia excludes ocular infections. Where data fields were complete, infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

** Where data fields were complete, infections defined as non-sexually acquired (e.g. perinatal) in individuals aged less than 13 years, were excluded from the data.

†† Does not include congenital syphilis.

‡‡ Ratios for Syphilis < 2 years; syphilis > 2 years or unspecified duration are based on 4 years data.

§§ Influenza (laboratory confirmed) became notifiable in South Australia on 1 May 2008.

‖‖ Nationally notifiable in 2006 and first full year of national reporting from 2007. Varicella zoster became notifiable in Victoria on 21 September 2008.

¶¶ Ratios for varicella zoster (chickenpox); varicella zoster (shingles); and varicella zoster (unspecified) are based on 2 years data.

*** Arbovirus (NEC) replaced Flavivirus (NEC) in 2008.

††† In the Australian Capital Territory, Murray Valley encephalitis virus infection and Kunjin virus infection are combined under Murray Valley encephalitis virus infection.

‡‡‡ Only invasive meningococcal disease is nationally notifiable. However, New South Wales, the Australian Capital Territory and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

NN Not notifiable.

Table 8: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Bloodborne diseases										
Hepatitis (NEC)	1991	1991	1991	1991	1991	1991	1991	NN	1991 to present	WA do not report
Hepatitis B (newly acquired)	1995	1993	1993	1994	1993	1993	1993	1994	1995 to present	
Hepatitis B (unspecified)	1991	1991	2004	1994	1991	1991	1991	1991	1991 to present	
Hepatitis C (newly acquired)	1995	1993	2005	NN	1993	1995	1997	1995	1993 to present	All jurisdictions except Qld
Hepatitis C (unspecified)	1991	1991	1991	1991	1994	1991	1991	1993	1995 to present	Includes reports of incident hepatitis C, 1991 to 1994
Hepatitis D	1999	1999	1999	1997	1999	1999	1999	2001	1999 to present	WA did not report 1999–2000
Gastrointestinal diseases										
Botulism	1992	1998	1998	1997	1993	1992	1992	2001	1992 to present	State reporting started as shown
Campylobacteriosis	1991	NN	1991	1991	1991	1991	1991	1991	1991 to present	NSW do not report
Cryptosporidiosis	2001	2001	2001	1996	2001	2001	2001	2001	2001 to present	
Haemolytic uraemic syndrome	1999	1999	1999	1997	1999	1999	1999	1999	1999 to present	
Hepatitis A	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Hepatitis E	1999	1999	1999	1999	1999	1999	1999	2001	1999 to present	WA did not report 1999–2000
Listeriosis	1991	1991	1994	1991	1992	1991	1991	1991	1991 to present	SA did not report 1991 NT did not report 1991–1993
Salmonellosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Shigellosis	1991	2001	1991	1997	1991	1991	1991	1991	1991 to present	NSW did not report 1991–2000 Qld did not report 1991–1996
STEC, VTEC	1999	1999	1999	2002	1999	1999	1999	2001	1999 to present	Qld did not report 1991–2001 WA did not report 1999–2000
Typhoid†	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Quarantinable diseases										
Cholera	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Highly pathogenic avian influenza in humans	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Plague	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Rabies	1993	1997	1991	1991	1991	1991	1991	1991	1991 to present	
Severe acute respiratory syndrome	2003	2003	2003	2003	2003	2003	2003	2003	2003 to present	
Smallpox	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Viral haemorrhagic fever	1993	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Yellow fever	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Sexually transmissible infections										
Chlamydial infection (NEC)	1993	1991	1991	1991	1993	1991	1991	1993	1994 to present	NSW did not report 1994–1998
Donovanosis	1991	2002	1991	1991	2002	1993	1991	1991	1991 to present	NSW and SA did not report 1991–2001 Tasmania did not report 1991–1992
Gonococcal infection‡	1991	1993	1991	1991	1991	1991	1991	1991	1991 to present	

Table 8: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory,* *continued*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Sexually transmissible infections, *continued*										
Syphilis – all[§]	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Syphilis < 2 years	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Syphilis > 2 years or unspecified duration	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Syphilis – congenital	2003	2003	2003	2003	2003	2003	2003	2003	2003 to present	
Vaccine preventable diseases										
Diphtheria	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Haemophilus influenzae type b	1991	1991	1991	1991	1991	1991	1991	1994	1991 to present	WA did not report 1991–1993
Influenza (laboratory confirmed)	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Measles	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Mumps	1992	1992	1995	1997	1994	1995	1992	1994	1995 to present	Qld did not report (1992–1996 and 2000)
Pertussis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Pneumococcal disease (invasive)	2001	2001	2001	1997	2001	2001	2001	2001	2001 to present	
Poliomyelitis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Rubella[‖]	1991	1991	1993	1991	1993	1995	1992	1994	1993 to present	Tasmania did not report 1993–1994
Rubella – congenital	2003	2003	2003	1997	2003	2003	2003	2003	2003 to present	
Tetanus	1991	1991	1991	1997	1991	1991	1991	1991	1991 to present	Qld did not report 1991–1996
Varicella zoster (chickenpox)	2006	NN	2006	2006	2006	2006	2008	2006	2006 to present	All jurisdictions except NSW Reported by Victoria in September 2008
Varicella zoster (shingles)	2006	NN	2006	2006	2006	2006	2008	2006	2006 to present	All jurisdictions except NSW Reported by Victoria in September 2008
Varicella zoster (unspecified)	2006	NN	2006	2006	2006	2006	2008	2006	2006 to present	All jurisdictions except NSW Reported by Victoria in September 2008
Vectorborne diseases										
Barmah Forest virus infection	1995	1995	1997	1995	1995	1995	1995	1995	1995 to present	
Dengue virus infection	1993	1991	1991	1991	1991	1991	1991	1995	1991 to present	ACT did not report 1991–1992
Arbovirus infection (NEC)[¶,**]	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	Includes JEV, MVEV and Kunjin 1991–2000
Japanese encephalitis virus infection	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Kunjin virus	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	Reported under MVEV in ACT
Malaria	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Murray Valley encephalitis virus infection	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	Combined with Kunjin in ACT
Ross River virus infection	1993	1993	1991	1991	1993	1993	1991	1991	1993 to present	

Table 8: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory,* *continued*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Zoonoses										
Anthrax	2001	2001	2001	1991	2002	2001	2001	2001	2001 to present	
Australian bat lyssavirus	2001	2001	2001	1998	2001	2001	2001	2001	2001 to present	
Brucellosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Leptospirosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Lyssavirus (NEC)	2001	2001	2001	1998	2001	2001	2001	2001	2001 to present	
Ornithosis	1991	2001	1991	1992	1991	1991	1991	1991	1991 to present	NSW did not report 1991–2000 Qld did not report 1997–2001
Q fever	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Tularaemia	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Other bacterial infections										
Legionellosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Leprosy	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Meningococcal infection	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Tuberculosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	

* Data from the National Notifiable Diseases Surveillance System annual reports from 1991. First full year of reporting to the Department of health and Ageing is shown. Some diseases may have been notifiable to state or territory health departments before the dates shown here.

† Includes paratyphoid in New South Wales, Queensland and Victoria.

‡ Includes neonatal ophthalmia in the Northern Territory, Queensland, South Australia, and Victoria.

§ Includes syphilis – congenital from 1991 to 2002.

|| Includes rubella – congenital from 1991 to 2002.

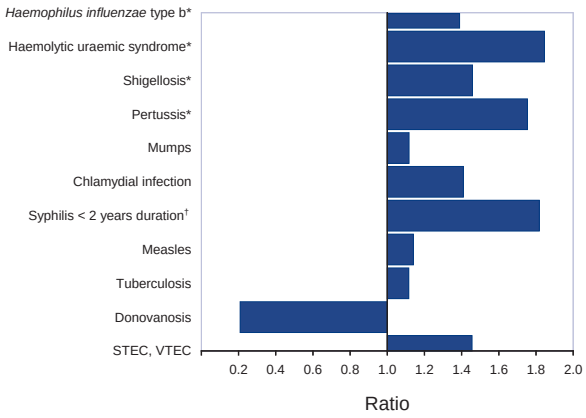
¶ Before 1997, includes Ross River virus infection, dengue virus infection and Barmah Forest virus infection.

** Flavivirus (NEC) replaced arbovirus (NEC) 1 January 2004. Arbovirus (NEC) replaced Flavivirus (NEC) in 2008.

NN Not Notifiable

The major changes in communicable disease notifications in 2008 are shown in Figure 3 as the ratio of notifications in 2008 to the mean number of notifications for the previous 5 years, or in the case of infectious syphilis < 2 year duration, 4 years. Notifications of Murray Valley encephalitis virus infection, *Haemophilus influenzae* type b, haemolytic uraemic syndrome (HUS), shigellosis and pertussis were highest since 2003 and surpassed the expected range (5-year mean plus 2 standard deviations). Notifications of mumps, chlamydial infection, syphilis < 2 years duration, measles, tuberculosis, donovanosis and Shiga toxin/verotoxin-producing *Escherichia coli* (STEC/VTEC) were within the historical range.

Figure 3: Comparison of total notifications of selected diseases reported to the National Notifiable Diseases Surveillance System in 2008, with the previous 5-year mean



* Exceeded 2 standard deviations above the 5 year mean.

† Syphilis < 2 years duration based on a 4-year mean.

Data completeness

The case's sex was complete for 99.8% of notifications and age at onset for close to 100% of notifications (Table 9). In 2008, indigenous status was complete for 49.9% of notifications, and varied by jurisdiction. Indigenous status was complete for

Table 9: Completeness of National Notifiable Diseases Surveillance System data received, Australia, 2008, by state or territory*

	State or territory								
	ACT	NSW	NT†	Qld	SA	Tas	Vic	WA	Aust
Total notifications	2,446	39,186	7,034	43,983	12,393	3,601	31,355	20,510	160,508
Sex									
Unknown/ missing	2	121	5	2	1	1	193	1	326
Per cent complete	99.9	99.7	99.9	100.0	100.0	100.0	99.4	100.0	99.8
Age at onset									
Unknown/ missing	0	0	0	0	1	0	47	0	48
Per cent complete	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0
Indigenous status									
Unknown/ missing	2,162	29,290	531	25,841	1,854	1,572	14,592	4,565	80,407
Per cent complete	11.6	25.3	92.5	41.2	85.0	56.3	53.5	77.7	49.9

* Indigenous status is usually obtained from medical notification and completeness varies by disease and by state and territory. This reflects differences in notification requirements (i.e. depending on the jurisdiction, some diseases are primarily or completely notified by pathology laboratories rather than clinicians) and the fact that it is not possible to follow-up all cases for diseases with a large volume of notifications and/or not requiring specific case-based public health action.

† Due to delays in data quality checks, data for the Northern Territory were preliminary at the time of analysis.

92.5% of data reported in the Northern Territory, 85.0% in South Australia and 77.7% in Western Australia. In the remaining jurisdictions, less than 57% of data were complete for indigenous status.

Data completeness on indigenous status also varied by disease as summarised in Appendix 3. There were 5 diseases for which notifications were 100% complete for indigenous status.[10] A further 5 diseases equalled or exceeded 90% completeness for indigenous status. Of the 18 priority diseases agreed to by CDNA and the NSC in 2008 for improving Indigenous identification, seven had an indigenous completeness that exceeded 90% (donovanosis, leprosy, measles, tuberculosis, meningococcal infection, *Haemophilus influenzae* type b, syphilis < 2 years duration). The diseases for which there was less than 90% Indigenous completeness included hepatitis A, pneumococcal disease (invasive), shigellosis, gonococcal infection, and locally-acquired dengue virus infection. HIV, which is one of the priority diseases, is not reported to the NNDSS. In 2008, CDNA set target thresholds of 95% completeness for key diseases and 80% completeness for the remainder of the notifiable diseases.

Bloodborne diseases

Bloodborne viruses reported to the NNDSS include hepatitis B, C, and D. HIV and AIDS diagnoses are reported directly to NCHECR. Information on national HIV/AIDS surveillance can be obtained through the NCHECR web site at www.nchecr.unsw.edu.au

Hepatitis B

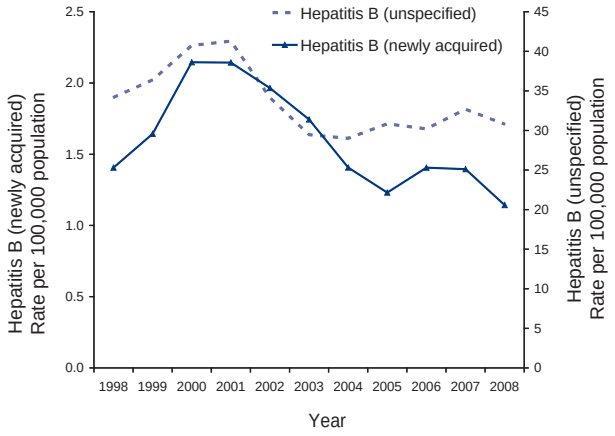
Hepatitis B notifications are classified as either 'newly acquired' (infection acquired within 24 months prior to diagnosis) or 'unspecified' (infection acquired greater than 24 months prior to diagnosis or not able to be specified). The classification of hepatitis B cases is primarily based on serological evidence or evidence of a previously negative test within the 24 months prior to diagnosis. In 2008, there were 6,845 notifications of hepatitis B (both newly acquired and unspecified), corresponding to a rate of 31.9 notifications per 100,000 population. Following a peak of notifications between 2000 to 2001 (42.5 and 43.0 per 100,000 population, respectively), the overall hepatitis B notification rate has declined and remained stable at around 32 notifications per 100,000 population between 2003 and 2008. In 2008, the Northern Territory recorded the highest rate of hepatitis B notifications at 93.3 per 100,000 population, followed by New South Wales (37.2 per 100,000 population) and Victoria (36.1 per 100,000 population).

Since the introduction of the adolescent hepatitis B vaccination program for children aged between 10 and 13 years in 1997,[11] there has been a general decline in overall hepatitis B notification rates amongst the 15–19 and 20–29 year age groups. In 2008, 2 notifications of newly acquired hepatitis B and 24 notifications of hepatitis B (unspecified) were reported in children in the 0–4 year age group, representing 0.8% and 0.4% of hepatitis notifications in these categories respectively. Approximately 93% of the 2008 Australian birth cohort received the full-course of the hepatitis B vaccine.[9, 12–14]

Newly acquired hepatitis B notifications

In 2008, 245 newly acquired hepatitis B notifications (1.1 per 100,000 population) were reported to NNDSS, which was lower than in 2007 (294 notifications; 1.4 per 100,000 population). The 2008 notification rate was the lowest identified over the past 10 years, following a peak of 2.1 notifications per 100,000 population between 2000 and 2001 (Figure 4).

Figure 4: Notification rate for newly acquired hepatitis B* and unspecified hepatitis B,† Australia, 1998 to 2008, by year‡



* Data for newly acquired hepatitis B for the Northern Territory (1998–2004) includes some unspecified hepatitis B cases.

† Data for unspecified hepatitis B for all jurisdictions except the Northern Territory between 1998 and 2004.

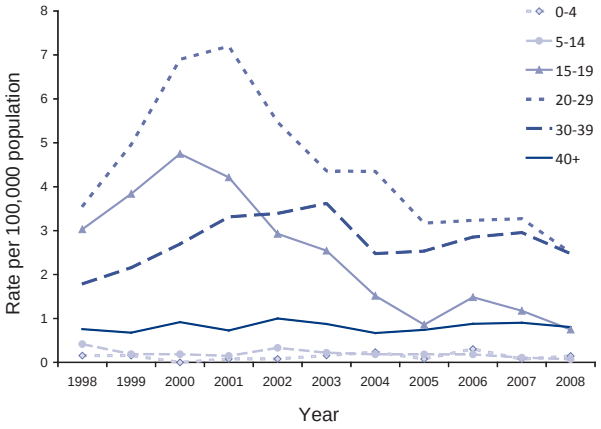
‡ Year of diagnosis for newly acquired hepatitis B and for hepatitis B (unspecified) notifications, and not necessarily year of infection.

Nationally, the proportion of all hepatitis B notifications in 2008 that were documented as newly acquired cases was 3.6%, compared with 4.1% in 2007. The proportion of newly acquired infections compared to total hepatitis B infections varied substantially – Tasmania (17%); Queensland, Victoria and Western Australia (5%); the Northern Territory (4%); South Australia (3%); and the Australia Capital Territory and New South Wales (2%). The highest rates of newly acquired hepatitis B infection were reported from the Northern Territory with 3.6 per 100,000 population and Tasmania (2.4 per 100,000 population). The identification and classification of newly acquired hepatitis B is reliant upon public health follow-up, and the level at which this occurs varies between jurisdictions and over time.

Trends for newly acquired hepatitis B infection by year and age group are shown in Figure 5.

Between 2000 and 2008, the notification rate of newly acquired hepatitis B fell by 85% in the 15–19 year age group. In the 20–29 year age group, there was a steady decline of 66% following a peak of 7.2 notifications per 100,000 population in 2001. The trends in these age groups were seen for both sexes.

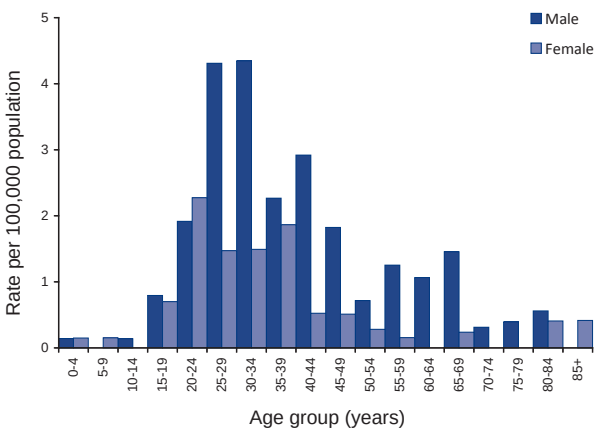
Figure 5: Notification rate of newly acquired hepatitis B,* Australia, 1998 to 2008, by year and age group



* Data for newly acquired hepatitis B for the Northern Territory (1998–2004) includes some unspecified hepatitis B cases.

In 2008, the highest notification rate of newly acquired hepatitis B infection was observed in the 25–29 and 30–34 year age groups amongst males (4.3 per 100,000 population each). Among females, the highest notification rate was in the 20–24 year age group (2.3 per 100,000 population) (Figure 6). Notifications of newly acquired hepatitis B infection were higher amongst males, with a male to female ratio of 2.2:1.

Figure 6: Notification rate for newly acquired hepatitis B, Australia, 2008, by age group and sex



In 2008, the exposure history for notifications of newly acquired hepatitis B was collected by health authorities in South Australia, Tasmania and Victoria and reported to the NCHECR. From 2003 to 2008, approximately half of the annual newly acquired hepatitis B notifications reported injecting drug use. The proportion of diagnoses reporting a history of heterosexual contact with a hepatitis B positive partner decreased from 21% in 2004 to 11% in 2006 and increased to 18% in 2008. The source of exposure to hepatitis B was undetermined in around 20% of cases.[4]

Unspecified hepatitis B notifications

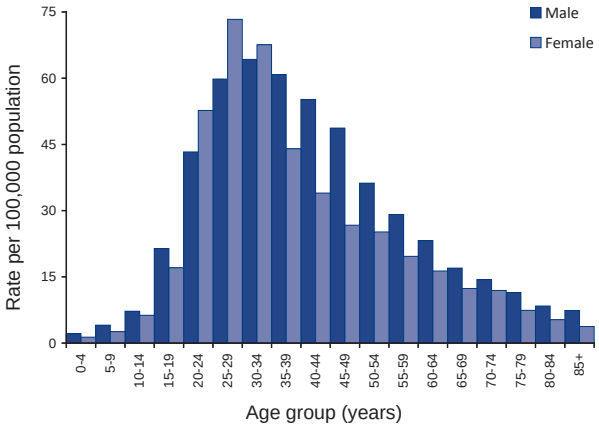
In 2008, a total of 6,600 notifications of unspecified hepatitis B infection were reported to the NNDSS, compared with 6,887 notifications in 2007. The Northern Territory recorded the highest notification rate (89.6 per 100,000 population), compared with other jurisdictions such as New South Wales (36.6 per 100,000 population) and Victoria (34.5 per 100,000 population).

In 2008, sex was recorded in 6,528 of the 6,600 notifications (99%). The male to female ratio of notifications was 1.2:1. Among males, the highest notification rate was amongst the 30–34 year age group (64.3 per 100,000 population) followed by the 35–39 and 25–29 year age groups with rates of 60.8 and 59.8 per 100,000 population respectively. Among females, the highest notification rate was amongst the 25–29 year age group (73.3 per 100,000 population), followed by the 30–34 year age group (67.6 notifications per 100,000 population) (Figure 7).

The notification rates of hepatitis B (unspecified) have generally declined over the past 10 years, despite a peak of 41.3 notifications per 100,000 population in 2001 and a low point of 29.0 per 100,000 population in 2004 (Figure 4). In 2008, the rate of hepatitis B (unspecified) notifications (30.8 per 100,000) was approximately the same as those for 2005–2007 (range 30.2–32.7 per 100,000 population).

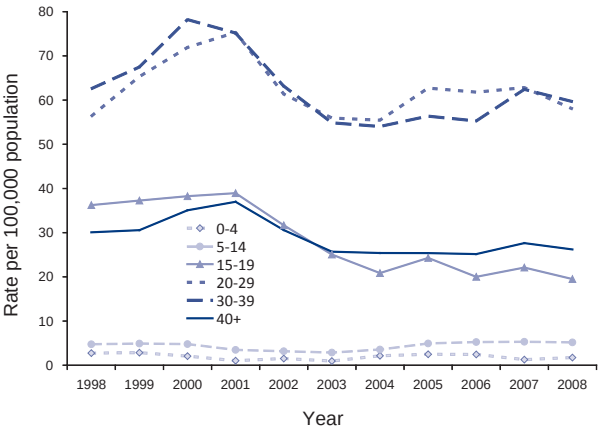
Trends in hepatitis B (unspecified) infection by age group, sex and year are shown in Figure 8. Rates across most age groups decreased in 2008, compared with 2007, with the 15–19 year age group declining by 11.8% (22.1 to 19.5 notifications per 100,000 population). The highest notification rates were amongst the 25–29 and 30–34 year age groups (67.4 and 66.7 per 100,000 population respectively).

Figure 7: Notification rate for unspecified hepatitis B, Australia, 2008, by age group and sex*



* Excluding 72 cases whose sex or age were not reported.

Figure 8: Notification rate for unspecified hepatitis B,* Australia, 1998 to 2008, by year and age group



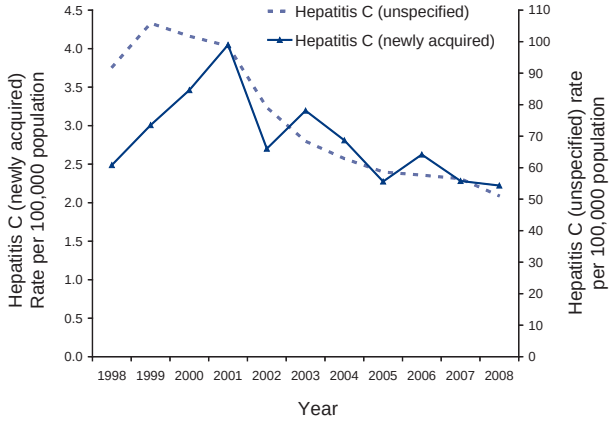
* Data for hepatitis B (unspecified) from all states except the Northern Territory between 1998 and 2004.

Hepatitis C

Hepatitis C notifications are classified as either 'newly acquired' (infection acquired within 24 months prior to diagnosis) or 'unspecified' (infection acquired greater than 24 months prior to diagnosis or not able to be specified). Current testing methods cannot distinguish between newly acquired (incident) and chronic infections (greater than 2 years or unspecified). The identification of newly acquired cases is therefore dependent on evidence of a previously negative test result within 24 months prior to their diagnosis (i.e. seroconversion). Ascertainment of hepatitis C testing histories usually requires active follow-up by public health units.

From 1999 to 2008, total hepatitis C notification rates declined by 51.2% (108.3 to 52.8 notifications per 100,000 population). The greatest reductions were between 2001 and 2002 (20% decline), and are believed to be associated with the detection and accounting of prevalent cases that occurred in the late 1990s through the expansion of testing in high risk groups[15] (Figure 9). The continuing decline in the notification rate may be attributable to reductions in the prevalence of injecting drug use, and risk behaviours related to injecting practices, especially amongst young people, and the implementation of needle exchange programs.[4,15] Changes in hepatitis C laboratory testing practices may have also contributed to the observed decline.

Figure 9: Notification rates for newly acquired hepatitis C* and unspecified hepatitis C,† Australia, 1998 to 2008



* Data for newly acquired hepatitis C from all states and territories except Queensland 1998–2008 and the Northern Territory 1998–2004.

† Data for unspecified hepatitis C provided from Queensland (1998–2008) and the Northern Territory (1998–2004) include both newly acquired and unspecified hepatitis C notifications.

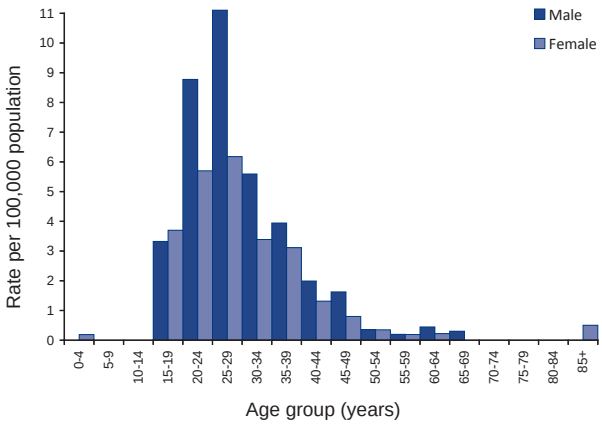
Newly acquired hepatitis C notifications

Notifications of newly acquired hepatitis C were received from all jurisdictions except Queensland, where all cases of hepatitis C, regardless of whether they are newly acquired, are reported as unspecified hepatitis C. There were 381 newly acquired hepatitis C notifications reported in 2008 (385 notifications in 2007), giving a notification rate of 2.2 per 100,000 population (Figure 9).

As a proportion of all hepatitis C notifications in 2008, 3.4% were identified as newly acquired infections, compared with 3.1% in 2007. Amongst jurisdictions, the proportion of newly acquired infections compared with total hepatitis C infections varied substantially – South Australia (11%), Western Australia (8%), Tasmania (7%), Victoria (6%), the Australia Capital Territory and the Northern Territory (3%), and New South Wales (1%). The highest rates of newly acquired hepatitis C infection were reported in Tasmania (4.8 per 100,000 population), Western Australia (4.7 per 100,000 population) and South Australia (4.1 per 100,000 population). The identification and classification of newly acquired hepatitis C is reliant upon public health follow-up to identify testing and clinical histories. The level of case follow-up and method varies among jurisdictions.

Notification rates of newly acquired hepatitis C were highest in males in the 25–29 and 20–24 year age groups (11.1 and 8.8 per 100,000 population respectively), with peaks in females also occurring for the same 5 year age groups (6.2 and 5.7 per 100,000 population respectively) (Figure 10).

Figure 10: Notification rate for newly acquired hepatitis C, Australia,* 2008, by age group and sex†



* Data from all states and territories except Queensland.

† Excludes 1 case whose sex was not reported.

Trends in the age distribution of newly acquired hepatitis C infection are shown in Figure 11. While rates for individual age groups can vary markedly from year to year, there is a general downward trend in the 15–19 and 20–29 year age groups. Overall, the annual rates in the other age groups are similar to trends in previous years.

Enhanced surveillance data for newly acquired infections in 2008 were collected in all jurisdictions except Queensland. Of the newly acquired hepatitis C notifications within these jurisdictions, 88% had exposure history information recorded (335 of 381) (Table 10). Approximately 78% of these hepatitis cases were amongst people with a

Table 10: Newly acquired hepatitis C notifications, selected jurisdictions,* 2008, by sex and exposure category in the 24 months prior to diagnosis

Exposure category	Number of exposure factors reported			Percentage§ of total cases‖ (*n*=335)
	Male	Female	Total‡	
Injecting drug use	95	54	150	44.8
Imprisonment	72	12	84	25.1
Skin penetration procedure	50	39	89	26.6
Tattoos	*35*	*19*	*54*	*16.1*
Ear or body piercing	*14*	*18*	*32*	*9.6*
Acupuncture	*1*	*2*	*3*	*0.9*
Healthcare exposure	6	10	16	4.8
Surgical work	*5*	*5*	*10*	*3.0*
Major dental surgery	*1*	*4*	*5*	*1.5*
Blood/tissue recipient	*0*	*1*	*1*	*0.3*
Sexual contact	15	25	40	11.9
Household contact	11	9	20	6.0
Needlestick or biohazardous injury¶	3	3	6	1.8
Other	3	3	6	1.8
Risk factor unable to be determined	4	3	7	2.1
Total number of exposure factors reported†	259	158	418	–

* Includes diagnoses in the Australian Capital Territory, New South Wales, South Australia, Tasmania, Victoria, Western Australia and the Northern Territory.

† More than 1 exposure category for each case could be recorded.

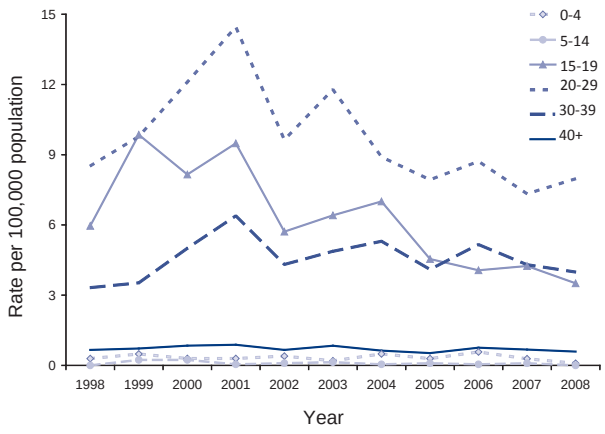
‡ Total includes notifications in cases whose sex was not reported.

§ The denominator used to calculate the percentage is based on the total number of cases with exposure information recorded and as more than 1 exposure category for each case could be recorded, the total percentage does not equate to 100%.

‖ Total number of cases where exposure history reported.

¶ Includes both occupational and non-occupational exposures.

Figure 11: Notification rate for newly acquired hepatitis C, Australia,* 1998 to 2008, by age group and year



* Data from all states and territories except Queensland (1998–2008) and the Northern Territory (1998–2004).

history of injecting drug use (45% with injecting drug use in the 24 months prior to diagnosis), and 25% were amongst persons detained in a correctional facility within the 24 months prior to their diagnosis. Screening rates are higher in the prison entry population than the general population. A screening survey of prison entrants conducted over a 2-week period in 2007 found that the prevalence of hepatitis C, based on hepatitis C antibody detection, was 35% amongst this population.[16]

Unspecified hepatitis C notifications

In 2008, 10,938 unspecified hepatitis C infections were notified to the NNDSS (51.0 notifications per 100,000 population) compared with 11,905 notifications in 2007 (56.5 notifications per 100,000 population).

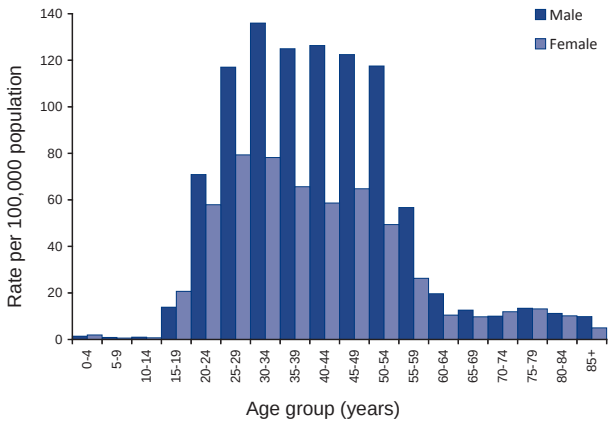
The national notification rate for unspecified hepatitis C infection declined from 105.8 per 100,000 population in 1999 to 51.0 per 100,000 population in 2008 (Figure 9). Changes in surveillance practices; increased duplicate notification checks;

changes in rates of testing; and the Northern Territory separately reporting newly acquired hepatitis C notifications from 2003, may account for some of the decrease in unspecified hepatitis C notifications since 2000, in addition to broader reductions in the prevalence of injecting drug use.[4,15]

In 2008, the Northern Territory continued to have the highest notification rate (101.0 per 100,000 population) followed by Tasmania (65.1 per 100,000 population), Western Australia (57.2 per 100,000 population) and the Australian Capital Territory (56.4 per 100,000 population). Queensland's rate was also high, at 61.3 per 100,000 population, however this included both newly acquired and unspecified cases.

The male to female ratio remained consistent with historical trends at 1.7:1. The highest notification rate occurred in the 30–34 year age group (136.0 per 100,000 population) amongst males and in the 25–29 and 30–34 year age groups (79.4 and 78.2 per 100,000 population respectively) amongst females (Figure 12).

Figure 12: Notification rate for unspecified hepatitis C,* Australia, 2008, by age group and sex†

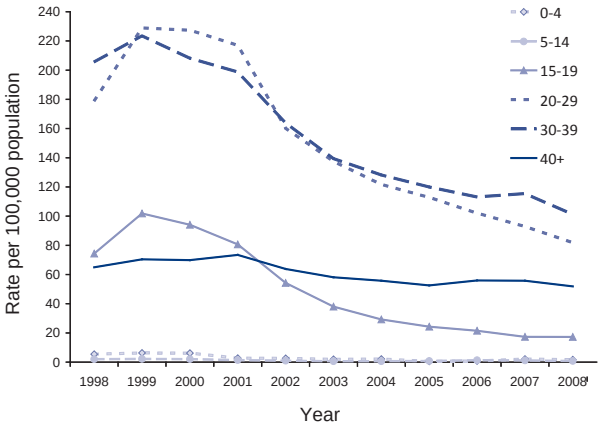


* Data provided from Queensland includes both newly acquired and unspecified hepatitis C notifications.

† Excludes 38 cases whose sex was not reported.

Trends in the age distribution of unspecified hepatitis C infection are shown in Figure 13. From 2001 to 2008, the notification rates of unspecified hepatitis C declined by 79% amongst the 15–19 year age group, by 62% amongst the 20–29 year age group and by 49% in the 30–39 year age group. Trends in the 0–4 and the 40 years and over age groups have remained relatively stable over the past 10 years.

Figure 13: Notification rate for unspecified hepatitis C,* Australia, 1998 to 2008, by age group



* Data provided from Queensland (1998–2008) and the Northern Territory (1998–2004) include both newly acquired and unspecified hepatitis C notifications.

Although initial infection with the hepatitis C virus is asymptomatic or mildly symptomatic in more than 90% of cases, approximately 50%–80% of cases will go on to develop a chronic infection. Of those who develop a chronic infection, half will eventually develop cirrhosis or cancer of the liver.[17] In 2008, it was estimated that 284,000 people living in Australia had been exposed to the hepatitis C virus. Of these, approximately 162,000 had chronic hepatitis C infection and early liver disease, and 44,000 had chronic hepatitis C infection and moderate liver disease associated with chronic hepatitis C infection; 5,700 were living with hepatitis C related cirrhosis; and 72,100 had cleared their infection.[4]

Hepatitis D

Hepatitis D is a defective single-stranded RNA virus that requires the presence of the hepatitis B virus to replicate. Hepatitis D infection can occur either as a co-infection with hepatitis B or as a super-infection with chronic hepatitis B infection.[17] The modes of hepatitis D transmission are similar to those for hepatitis B, and in countries with low hepatitis B prevalence, injecting drug users are the main group at risk for hepatitis D.

In Australia, the rate of hepatitis D remains low. In 2008, there were 42 notifications of hepatitis D, compared with 34 notifications in 2007, giving a notification rate of 0.2 per 100,000 population. The male to female ratio was 4.3:1. Of the 42 notifications, 14 were reported from New South Wales, 13 from Victoria, 7 from Queensland, 6 from Western Australia and 1 case from the Northern Territory.

Gastrointestinal diseases

In 2008, gastrointestinal diseases notified to NNDSS were: botulism, campylobacteriosis, cryptosporidiosis, haemolytic uraemic syndrome (HUS), hepatitis A, hepatitis E, listeriosis, salmonellosis, shigellosis, Shiga toxin-producing *Escherichia coli* (STEC) infections and typhoid.

Overall notifications of gastrointestinal diseases in 2008 decreased 10% from 30,325 in 2007 to 27,308 in 2008. However, notifications of hepatitis E, HUS, shigellosis and typhoid were notably increased compared with the 5-year mean (exceeded the mean by more than 2 standard deviations).

OzFoodNet, Australia's enhanced foodborne disease surveillance network, monitors the incidence of diseases caused by pathogens commonly transmitted by food using population-based passive and enhanced surveillance for notifiable gastrointestinal diseases and for outbreaks of gastroenteritis and enteric disease. In 2008, OzFoodNet aggregated and analysed data from the NNDSS supplemented by enhanced surveillance data from OzFoodNet sites on the following 9 diseases or conditions, a proportion of which may be transmitted by food: non-typhoidal salmonellosis; campylobacteriosis infections (except in New South Wales); listeriosis; shigellosis; typhoid; STEC infections; botulism; HUS; and hepatitis A. The data and results from these analyses are summarised in the following sections but are reported in more detail elsewhere. [18]

Botulism

Foodborne botulism arises from the consumption of a food that is contaminated with pre-formed *Clostridium botulinum* toxin.

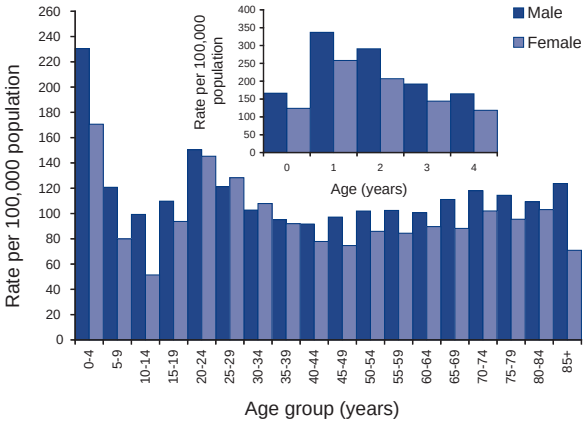
No cases of botulism were reported to NNDSS in 2008, compared with 1 case in 2007.

Campylobacteriosis

Campylobacteriosis is notifiable in all Australian jurisdictions, except New South Wales.

In 2008, there were 15,535 notifications of campylobacteriosis, a 9% decrease compared with the 16,996 notifications reported in 2007. The national rate of campylobacteriosis notifications in 2008 was 107.5 per 100,000 population. The lowest and highest rates of *Campylobacter* notification were in Western Australia (84.2 per 100,000 population) and in South Australia (124.2 per 100,000 population) respectively. The highest age specific notification rates of *Campylobacter* were amongst males and females aged 0–4 years. Amongst children aged under 5 years, the highest notification rate was in boys aged 1 year (336.9 per 100,000 population) (Figure 14).

Figure 14: Notification rate for campylobacteriosis, Australia, 2008, by age group and sex, and inset: age and sex in children aged under 5 years



Cryptosporidiosis

In 2008, 2,005 notifications of cryptosporidiosis were reported to the NNDSS, with a national notification rate of 9.4 per 100,000 population, a 29% decrease over the number of notifications reported in 2007.

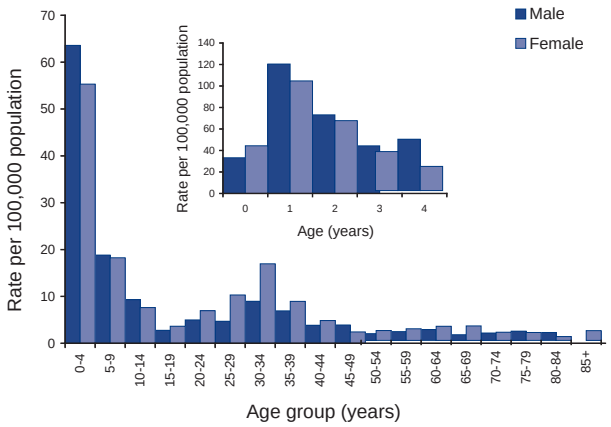
The highest notification rates of cryptosporidiosis were reported in the Northern Territory (46.4 per 100,000 population) and Queensland (16.2 per 100,000 population).

Fifty-three per cent of all cryptosporidiosis notifications in 2008 were in children aged under 10 years, the majority of which were male (54%) (Figure 15). Overall, the number of cryptosporidiosis notifications were similar between males (49%) and females (51%), however, the number of notifications was higher among females (54%) (Figure 15), while in the 20–39 year age range (62%) than in males of the same age.

Haemolytic uraemic syndrome

During 2008, there were 31 cases of HUS notified to NNDSS, with a rate of 0.1 per 100,000 population, which is the same as the mean annual notification rate between 2003 and 2007. Over

Figure 15: Notification rate for cryptosporidiosis, Australia, 2008, by age group and sex, and inset: age and sex in children aged under 5 years



half of these notifications were reported from New South Wales (17 notifications). The median age of notifications was 14 years, with a range of 0–83 years. Similar to previous years, the highest notification rate was in children aged 0–4 years, with 11 of the 31 notifications in this age group (0.8 notifications per 100,000 population). [18]

Cases of HUS may be due to causes other than Shiga toxin-producing *E. coli*, including other non-foodborne pathogens and genetic predisposition. In 2008, an antecedent STEC infection was reported for 52% (16/31) of notifications. In 2008, 1 case of HUS was known to be due to a non-bacterial cause, 2 cases resulted from *Streptococcus pneumoniae* infection, and in the remaining 11 cases no aetiology was reported.

Hepatitis A

Notifications of hepatitis A declined in 2008, with 276 notifications compared with a mean of 306 per year between 2003 and 2007 (Table 11 and Figure 16).

In 2008, the median age of notifications was 24 years (range 1–97 years) of which 57% (158/276) of notifications were male.

Overseas travel was the most frequently reported risk factor for infection with hepatitis A in 2008, with 56% (154/276) of notifications reporting overseas travel (Table 11). The most commonly reported overseas travel destinations were India (29), Indonesia (11) and Pakistan (8).

Indigenous status was known for 89% of notifications in 2008. The proportion of cases of hepatitis A amongst Indigenous persons declined from a mean of 14% (167/1,193) of notifications for the years 2003–2006 to 1.2% (3/245) of notifications in 2008 (Table 12). This marked decrease in the number and proportion of cases that were Indigenous is likely to be due in part to targeted vaccination programs for Indigenous children commencing in Queensland in 1999, and the provision of free hepatitis A vaccine for all Indigenous children in South Australia, Western Australia and the Northern Territory from 2006 (Figure 16).[19]

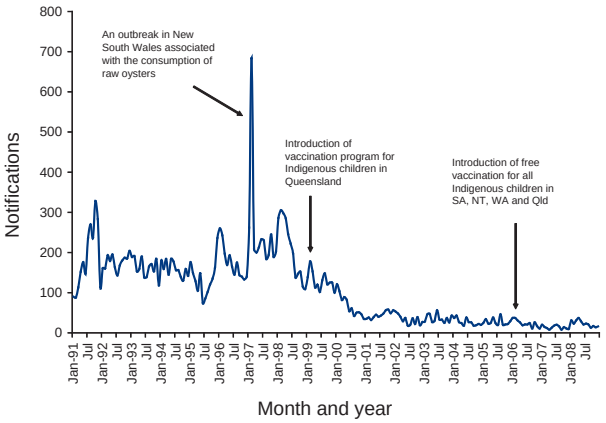
Table 11: Notifications of hepatitis A, Australia, 2008, by state or territory

State or territory	Number of cases	Number acquired overseas	Per cent acquired overseas
ACT	5	3	60
NSW	69	53	77
NT	3	2	67
Qld	71	30	42
SA	20	13	65
Tas	1	0	0
Vic	85	46	54
WA	22	7	32
Total	276	154	56

Table 12: Hepatitis A notifications, Australia, 2003 to 2008, by indigenous status

Year	Indigenous		Non-Indigenous		Unknown	
	n	%	n	%	n	%
2003	53	12	325	76	53	12
2004	37	12	251	79	31	10
2005	48	15	232	71	46	14
2006	28	10	218	78	35	12
2007	0	0	146	88	19	12
2008	3	1	243	88	30	11

Figure 16: Trends in notifications of hepatitis A, Australia, 1991 to 2008, by month of diagnosis



Hepatitis E

In 2008, there were 44 notifications of hepatitis E, compared with 18 notifications in 2007 and a mean of 22 cases per year between 2003 and 2007. Fourteen cases were reported from both New South Wales and Victoria, 7 cases from Queensland, 6 cases from Western Australia and three from the Northern Territory.

In 2008, 68% (30/44) of cases were known to have been acquired overseas. The median age of cases was 28 years (range 12–78 years), possibly reflecting higher rates of overseas travel in younger adults.

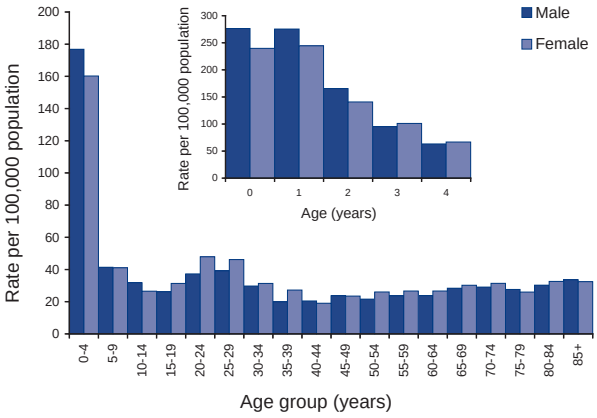
Listeriosis

In 2008, 68 cases of *Listeria monocytogenes* infection were reported to the NNDSS, a crude notification rate of 0.3 per 100,000 population including 12 deaths. The 2008 notification rate was consistent with the 5-year historical mean annual notification rate (0.3 per 100,000 population). Similar to previous years, 22% of cases (15/68) were pregnancy-associated infections, occurring in pregnant women or newborn babies. In 2008, 47% (25/53) of the non-pregnancy related cases were female. Forty-nine per cent (33/68) of notifications were in people aged 60 years or more. The highest age specific notification rate was in people aged 85 years or more (1.9 per 100,000 population, 7 cases). Seven per cent (1/15) of pregnancy related cases and 21% (11/53) of non-pregnancy associated cases in 2008 were fatal.[18]

Salmonellosis (non-typhoidal)

In 2008, there were 8,310 cases of *Salmonella* infection corresponding to a notification rate of 38.8 per 100,000 population and similar to the 5-year mean of 8,210 cases per year. Notification rates amongst jurisdictions ranged from 31.1 per 100,000 population in Victoria to 226.1 per 100,000 population in the Northern Territory. Approximately half (49%) of *Salmonella* notifications were in males. The highest age specific rate of *Salmonella* infection was 169.3 per 100,000 population in children aged from 0–4 years, with the highest rates in those aged 2 years or over (Figure 17).

Figure 17: Notification rate for *Salmonella* infection, Australia, 2008, by age and sex



In 2008, the most commonly notified *Salmonella* serotype was *S.* Typhimurium, which was responsible for approximately 42% of all notified infections. *S.* Typhimurium phage types 135, 44, 170/108 and 9 were commonly reported, representing four of the top 5 *Salmonella* infections nationally.[18]

In 2008, OzFoodNet reported 35 outbreaks of foodborne salmonellosis affecting 486 people. Individual notifications of salmonellosis are very rarely attributed to a food vehicle.

Shigellosis

In 2008, there were 828 cases of shigellosis reported to the NNDSS compared with 602 in 2007. The 2008 notification rate was 3.9 per 100,000 population, which was higher than the mean annual notification rate of 2.8 notifications per 100,000 between 2003 and 2007. As in previous years, the highest notification rate was in the Northern Territory, with 79.6 per 100,000 population compared with an average rate of 71.9 per 100,000 population per year between the years 2003 and 2007.[18]

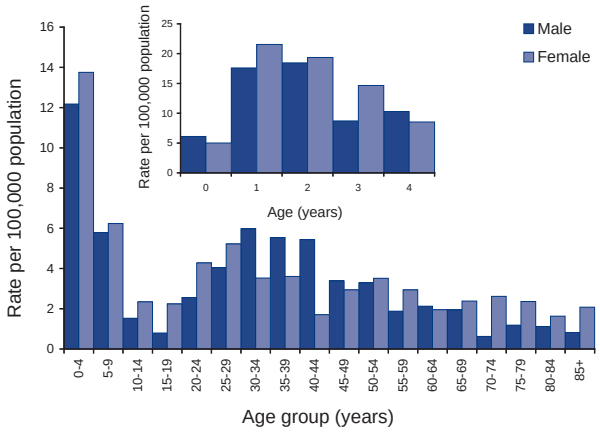
The highest age specific notification rates were amongst males and females aged 0–4 years, with age specific rates of 12.5 and 13.9 notifications per 100,000 population, respectively (Figure 18). Overall in 2008, 50% of all shigellosis notifications were male.

Notification rates were higher amongst men aged between 30 and 44 years than in females of the same age, which may in part be explained by the outbreak of shigellosis amongst men who reported sex with other men as a risk factor in 2008.[18]

Rates of shigellosis in Australia are higher amongst Indigenous people than in non-Indigenous people. In 2008, there were 318 notifications of shigellosis amongst Indigenous people (38% of notifications), with an age standardised rate of 58.9 per 100,000 population. Indigenous status information in 2008 was 81% complete. Shigellosis is one of the 18 priority diseases for which the NSC has agreed to improve Indigenous status reporting.

The most common biotypes of shigellosis in 2008 were *Shigella sonnei* biotype a (28%) and *Shigella sonnei* biotype g (22%). These 2 biotypes were also the most common in 2007, but different to 2006 when the most common biotype was *Shigella flexneri* 4a mannitol negative.[18]

Figure 18: Notification rate for shigellosis, Australia, 2008, by age and sex



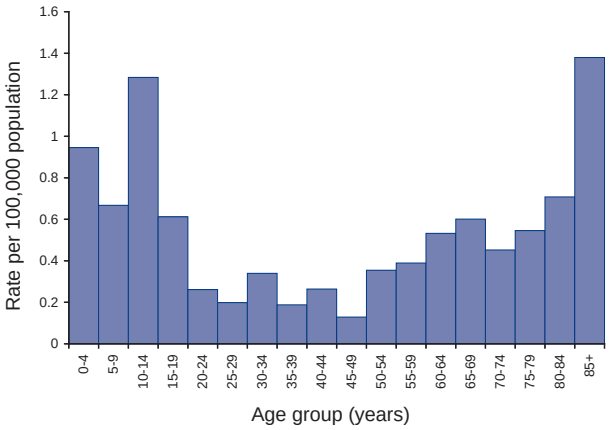
Shiga toxin-producing *Escherichia coli*

In 2008, there were 106 cases of STEC, corresponding to a rate of 0.5 notifications per 100,000 population. This was similar to the mean annual notification rate of 0.4 notifications per 100,00 population between 2003 and 2007.[18]

In 2008, 51.9% of cases were female and the median age of cases was 24 years (range 0–89 years). The highest age specific notification rate for STEC was amongst people over the age of 85 years. Other peaks were observed in the 0–4 and 10–14 year age groups (Figure 19).

South Australia reported 36% (39/106) of all STEC notifications, followed by Queensland

Figure 19: Notifications of Shiga toxin-producing *Escherichia coli*, Australia, 2008, by age group



(35%, 37/106), New South Wales (18%, 19/106) and Victoria (10%, 11/106). There were no cases notified in the Australian Capital Territory, the Northern Territory, Tasmania or Western Australia in 2008.

Rates of STEC infection are strongly influenced by jurisdictional practices regarding the screening of stool specimens.[20] In particular, South Australia routinely tests all bloody stools by polymerase chain reaction (PCR) for gene coding for Shiga toxins and other virulence factors, contributing to the higher rates of detection of infection for this State. Queensland conducts routine culture on bloody stools. If there is no growth in culture, PCR is not performed, instead, enzyme-linked immunosorbent assay for Shiga toxin is conducted on the specimen. In New South Wales, some routine screening for STEC genes in stools containing microscopic blood is conducted in the Hunter–New England region, but not elsewhere. In Western Australia, 2 pathology laboratories routinely screen bloody stools with either sorbitol Maconkey agar culture or tissue culture. Other jurisdictions do not routinely screen for STEC.

Typhoid

There were 105 cases of *Salmonella* Typhi infection (typhoid) notified during 2008. This equated to a notification rate of 0.5 per 100,000 population, slightly higher than the annual rate of 0.3 per 100,000 between 2003 and 2007. Cases were reported from all Australian states and territories except for the Australian Capital Territory and Tasmania.

Overseas travel was the primary risk factor for typhoid in Australia in 2008 with 92% (97/105) of notifications known to have been acquired

overseas. India was the most frequently reported country for overseas acquired cases, with 49% (48/97) of notifications, followed by Bangladesh, Indonesia, and Pakistan, each of which were reported as a travel destination for 9% (9/97) of overseas-acquired notifications. The highest typhoid notification rates were in the 20–24 year age group (1.4 per 100,000 population) and the 25–29 year age group (1.1 per 100,000 population) (Figure 20), reflecting higher rates of overseas travel in these age groups.

Quarantinable diseases

Human diseases covered by the *Quarantine Act 1908,* and notifiable in Australia and to the WHO in 2008 were cholera, plague, rabies, yellow fever, smallpox, highly pathogenic avian influenza in humans (HPAIH), severe acute respiratory syndrome (SARS) and 4 viral haemorrhagic fevers (Ebola, Marburg, Lassa and Crimean–Congo).

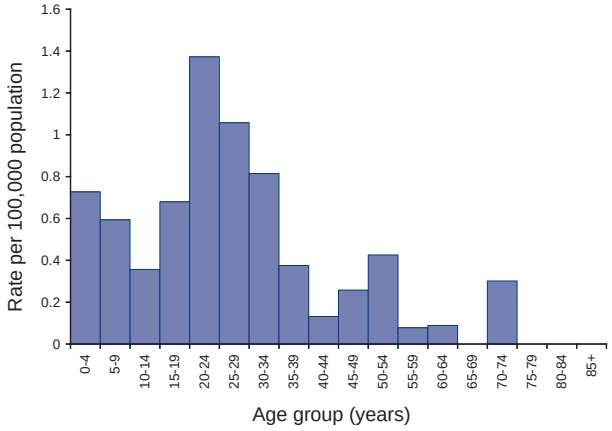
Cholera, plague, rabies, smallpox, yellow fever, SARS, HPAIH and viral haemorrhagic fevers are of international public health importance as they continue to occur around the world. Travellers are advised to seek information on the risk of contracting these diseases at their destinations and to take appropriate measures. More information on quarantinable diseases and travel health can be found on the following web sites:

Australian Government Department of Health and Ageing web site at: http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-quaranti-index.htm

Smartraveller: The Australian Government's travel advisory and consular assistance service at: http://www.smartraveller.gov.au/

There were no cases of plague, rabies, smallpox, yellow fever, SARS, HPAIH or viral haemorrhagic fevers reported in Australia in 2008. Table 13 provides information on the occurrence of quarantinable diseases in Australia.

Figure 20: Notifications of typhoid, Australia, 2008, by age group



Cholera

In 2008, 4 cases of cholera were notified in Australia, two from New South Wales and two from Western Australia and all were acquired overseas. One case had travelled to Singapore, 1 case had travelled to the Philippines and 2 cases had travelled to India. All cases of cholera reported since the commencement of the NNDSS in 1991 have

Table 13: Australia's status for human quarantinable diseases, 2008

Disease	Status	Date of last record and notes
Cholera	Free	Small number of cases are reported annually[22]
Plague	Free	Last case recorded in Australia in 1923[23]
Rabies	Free	Last case (overseas acquired) recorded in Australia in 1990[24]
Smallpox	Free	Last case recorded in Australia in 1938[25]
Yellow fever	Free	No cases recorded on shore in Australia – 5 occasions on which vessels arrived in Australian ports 1892–1915[23]
Severe acute respiratory syndrome	Free	Last case recorded in Australia in 2003[26]
Highly pathogenic avian influenza in humans	Free	No cases recorded[27]
Viral haemorrhagic fevers		
Ebola	Free	No cases recorded[28]
Marburg	Free	No cases recorded[28]
Lassa	Free	No cases recorded[28]
Crimean–Congo	Free	No cases recorded[28]

been acquired outside Australia except for 1 case of laboratory-acquired cholera in 1996 and 3 cases in 2006. There have been 16 cases of cholera notified between 2003 and 2007.[28]

Sexually transmissible infections

In 2008, the sexually transmissible infections (STIs) reported to NNDSS were chlamydial infection, donovanosis, gonococcal infection and syphilis. Other national surveillance systems that monitor STIs in Australia include the Australian Gonococcal Surveillance Programme (AGSP), which is a network of specialist laboratories monitoring antimicrobial susceptibility patterns of infection; and the NCHECR, which maintains the National HIV Registry and the National AIDS Registry.

Since 2004, 2 categories of non-congenital syphilis have been reported: infectious syphilis (primary, secondary and early latent) of less than 2 years duration; and syphilis of greater than 2 years or unknown duration. The NNDSS also received reports on cases of congenital syphilis. These conditions were notified in all states and territories, except in South Australia where cases of syphilis of greater than 2 years or unknown duration were not reported to the NNDSS.

The national trends in the number and rates of STI notifications reported to the NNDSS between 2003 and 2008 are shown in Table 7. In interpreting these data it is important to note that changes in notifications over time may not solely reflect changes in disease prevalence. Increases in screening rates,[29, 30] more targeted screening, the use of less invasive and more sensitive diagnostic tests, as well as periodic public awareness campaigns may contribute to changes in the number of notifications over time. For some diseases, changes in surveillance practices may also need to be taken into account when interpreting national trends.

Indirect age standardised notification rates, using the method described by the Australian Institute of Health and Welfare,[31] were calculated for Indigenous and non-Indigenous notifications for jurisdictions that had indigenous status data completed in more than 50% of notifications. Where the indigenous status was not completed, notifications were counted as non-Indigenous when analysing these notifications. These data however, need to be interpreted with caution as STI screening occurs predominately in specific high risk groups, including in Indigenous populations; and Indigenous and non-Indigenous population distributions and proportions vary widely for each jurisdiction. Previous research into high rates of STIs amongst the Indigenous population in the Northern Territory established that the disparity in notification rates could be attributed to more targeted screening programs and to poorer access to primary health care services, rather than increased levels of sexual activity amongst Indigenous people.[32, 33] Similarly, rates between females and males need to be interpreted with caution as rates of testing for STIs and health care-seeking behaviours differ between the sexes.

Notifications of chlamydial, gonococcal and non-congenital syphilis infections were excluded from analysis where the case was aged 13 years or less and the infection was deemed to be non-sexually acquired, e.g. perinatally acquired infections.

Chlamydial infection

Chlamydial infection continues to be the most commonly notified disease in 2008. A total of 58,484 notifications of chlamydial infection were received, corresponding to a rate of 273 per 100,000 population. This represents an increase of 10% on the rate reported in 2007 (247 per 100,000 population). The rate of chlamydial notifications has continued to increase since surveillance of the condition commenced in 1991 in all jurisdictions, except New South Wales where it became notifiable in 1997. Between 2003 and 2008, chlamydial infection notification rates increased from 152.9 to 272.9 per 100,000 population, an increase of 78% (Table 7). While the prevalence of chlamydial infection varies by age group and other demographic and behavioural factors, no major section of the population is spared.[34]

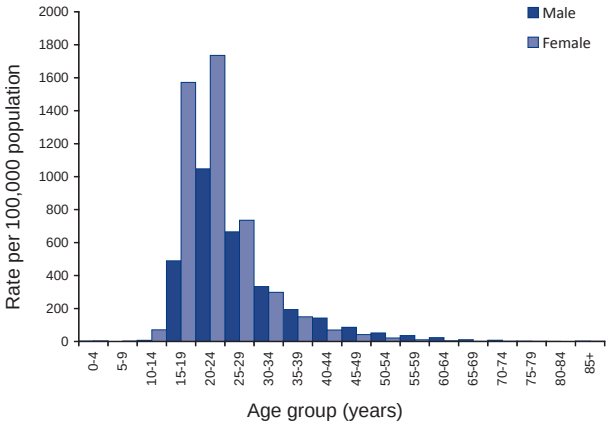
Chlamydial infection notification rates were substantially higher than the national average in the Northern Territory (1,044 per 100,000 population), Western Australia (397.9 per 100,000 population) and Queensland (353.9 per 100,000 population) (Table 6). At a regional level, chlamydial notification rates were highest in the Barkly and Central NT Statistical Subdivisions of the Northern Territory (range: 1144.6 to 2121.1 notifications per 100,000 population), noting that notification rates in geographic areas where the estimated residential population and case numbers are small, should be interpreted with caution. In the Statistical Divisions of Far North in Queensland and Pilbara in Western Australia and the Northern Territory Statistical Subdivisions of Alligator, East Arnhem, Finniss and the Lower Top End NT, notifications rates were also substantially higher than the national rate (range: 740.9 to 1144.5 notifications per 100,000 population) (Map 2).

In 2008, notification rates of chlamydial infection in males and females were 221.4 and 322.8 per 100,000 population respectively. When compared with 2007, notification rates increased by 11% in males and 10% in females. The male to female ratio in 2008 was 0.7:1, which is similar to previous years. Rates in females markedly exceeded those in males, especially in the 15–19 and 20–24 year age groups with ratios of 0.3:1 and 0.6:1 respectively (Figure 21).

Trends in age and sex specific notification rates between 2003 and 2008 show increases across all age ranges, especially between 15 and 29 years in both males and females (Figure 22). Since 2003, the highest notification rate increases occurred in males in the 20–24 year age group (80%) and amongst females in the 15–19 (90%) and 20–24 year age groups (70%).

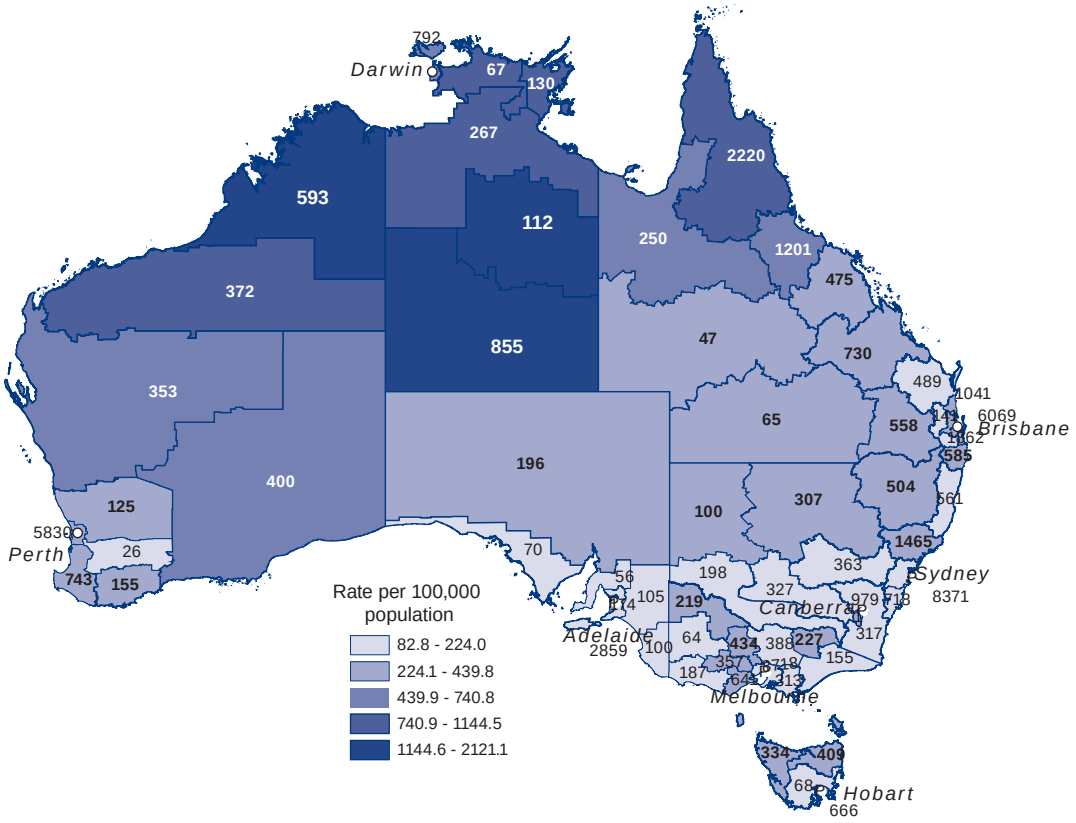
From 2003 to 2008 the rates of chlamydial infection diagnosis have increased in both Indigenous and non-Indigenous populations. Nationally in 2008, data on indigenous status were complete in 48% of notifications, higher than the preceding 5-year average of 43% (range: 40%–45%). Six jurisdictions had greater than 50% completeness of the indigenous status field: the Northern

Figure 21: Notification rate of chlamydial infection, Australia, 2008, by age group and sex*



* Excludes 114 notifications whose age or sex was not reported.

Map 2: Notification rates and counts* for chlamydial infection, Australia, 2008, by Statistical Division of residence and Statistical Subdivision of residence for the Northern Territory



* Numbers shown in the Statistical Divisions and Statistical Subdivisions represent the count of notifications.

Notification rates in geographic areas where estimated residential population and case numbers are small should be interpreted with caution.

Territory, Queensland, South Australia, Victoria, Tasmania and Western Australia. Among these jurisdictions, the combined age standardised notification rate was 1,134 per 100,000 in the Indigenous population and 279 per 100,000 in the non-Indigenous population.

The age standardised rate ratio of Indigenous to non-Indigenous chlamydial infection notifications across these jurisdictions was 4:1. Between 2006 and 2008, rates of chlamydial infection notifications in the Indigenous population increased by 7% in the Northern Territory and decreased by 34% in South Australia for the same period (Figure 23). Nationally, the disparity in notification rates between Indigenous and non-Indigenous populations has improved substantially since 2000. It should be noted that indigenous status identification completeness in the notification data varies both across years and by jurisdiction.

Although surveillance data continue to show substantial increases in chlamydial infection notifications nationally, a large proportion of cases with genital chlamydial infections are asymptomatic.[17] Enhanced surveillance of chlamydial notifications undertaken in Tasmania during 2008 identified that 57% of males presented as asymptomatic compared with 70% of females (personal communication, David Coleman, Tasmanian Department of Health and Human Services, 2 July 2010). A paper published on enhanced chlamydial surveillance data in Tasmania for the period 2001 to 2007 also noted that females were more likely to have been tested for chlamydial infection as a result of screening, and males were more likely to have been tested when presenting with symptoms or as a result of contact tracing.[35] Therefore, notification rates for this disease are particularly susceptible to overall rates of testing as well as targeted testing in certain high risk population sub-groups.

Figure 22: Trends in notification rates of chlamydial infection in persons aged 10–39 years, Australia, 2003 to 2008, by age group and sex

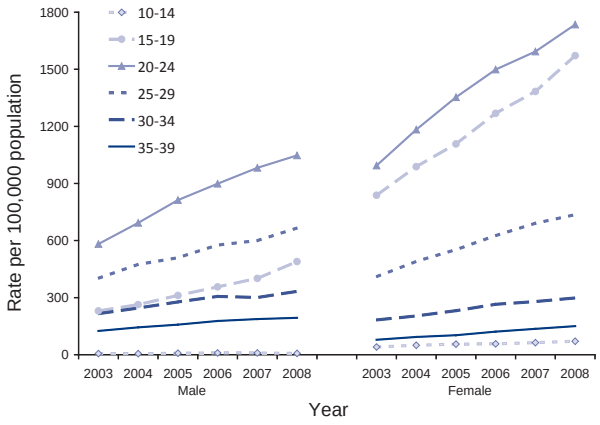
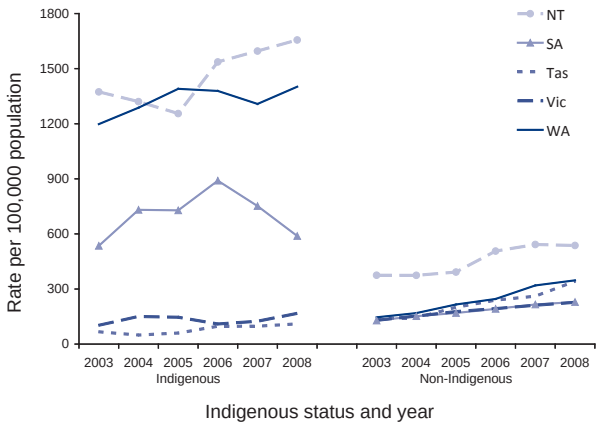


Figure 23: Trends in notification rates of chlamydial infection, selected states and territories,* 2003 to 2008, by indigenous status

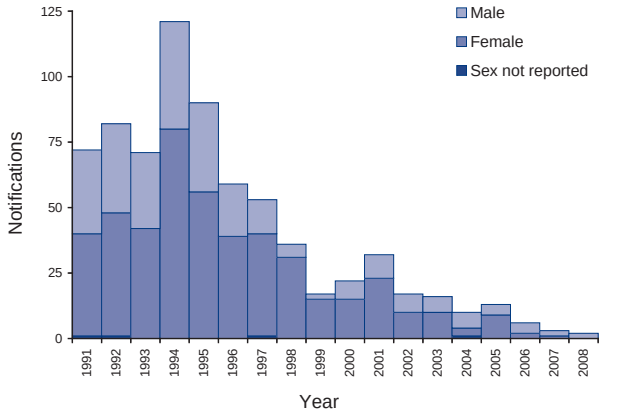


* States and territories in which Indigenous status completeness was reported for more than 50% of cases over a 5 year period.

Donovanosis

Donovanosis is a sexually transmissible infection characterised by a chronic ulcerative genital disease. Although it is now relatively uncommon, it is a disease of public health importance in Australia because it predominantly occurs in Indigenous communities and has been identified as a potential co-factor in HIV transmission. Donovanosis has been targeted for elimination in Australia through the National Donovanosis Elimination Project.[36] In 2008, 2 notifications in Indigenous males, one from Queensland and one from the Northern Territory, were reported to the NNDSS, one fewer than in 2007 (Figure 24).

Figure 24: Number of notifications of donovanosis, Australia, 1991 to 2008, by sex



Gonococcal infections

In 2008, 7,723 notifications of gonococcal infection were received by the NNDSS corresponding to a rate of 36.0 per 100,000 population, a slight decrease compared with 2007 (36.4 per 100,000 population).

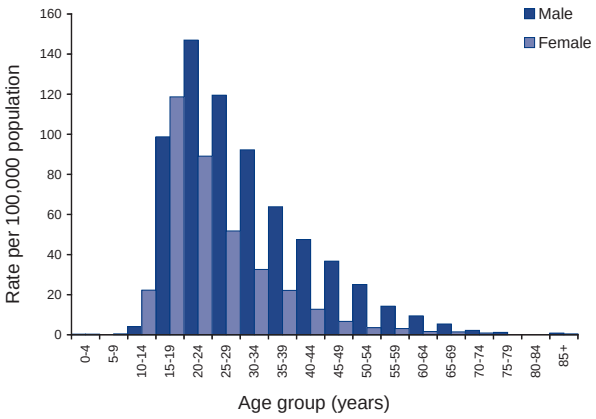
The highest notification rate in 2008 was in the Northern Territory (713 per 100,000 population), substantially higher compared with Western Australia, Queensland and South Australia (78.0, 38.1 and 32.5 per 100,000 population respectively) (Table 6). Considerable declines in notification rates between 2007 and 2008 were observed in the Australian Capital Territory (54%), Tasmania (35%) and Victoria (12%). Increases in notification rates for the same period were observed in South Australia (20%) and Queensland (16%).

Nationally, there was a decrease in the gonococcal infection notification rates in males (3%) and an increase in the notification rates in females (3%). Gonococcal infection notification rates were substantially higher amongst males than females, 47.1 and 25.0 per 100,000 population respectively. The male to female rate ratio in 2008 was 2:1, similar to the previous 5 years (2003 to 2007). As in previous years, the exception to this pattern was the Northern Territory, where females had an overall higher notification rate than males (748 versus 677 per 100,000 population). Nationally, notification rates of gonococcal infection in males exceeded those in females in all age groups except in the 10–14 and 15–19 year age groups (Figure 25).

Trends in sex specific notification rates show that in 2008 there has been an abatement of the declines seen in 2007 amongst males in the 20–34 year age range. In females, there were no marked change in notification rates; trends for all age groups appeared to remain relatively stable with a small increase occurring in the 15–19 year age group and a decrease continuing to occur in the 20–24 year age group (Figure 26).

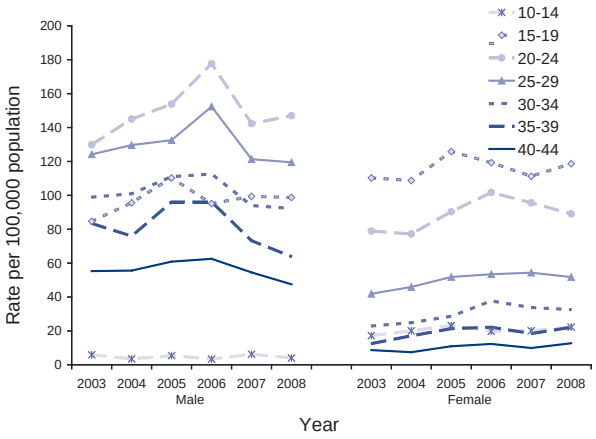
In 2008, the data completeness of the indigenous status field for gonococcal infection notifications was 72%, which is a slight increase compared with previous years. Six jurisdictions had greater than 50% completeness of the indigenous status field: the Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia. Among these jurisdictions the combined age standardised notification rate for gonococcal infection was 791 per 100,000 in the Indigenous population and 21 per 100,000 in the non-Indigenous population. The age standardised rate ratio of Indigenous compared with non-Indigenous gonococcal infection notifications across these

Figure 25: Notification rate of gonococcal infections, Australia, 2008, by age group and sex*



* Excludes 12 notifications whose age or sex was not reported.

Figure 26: Trends in notification rates of gonococcal infection in persons aged 10–44 years, Australia, 2003 to 2008, by age group and sex

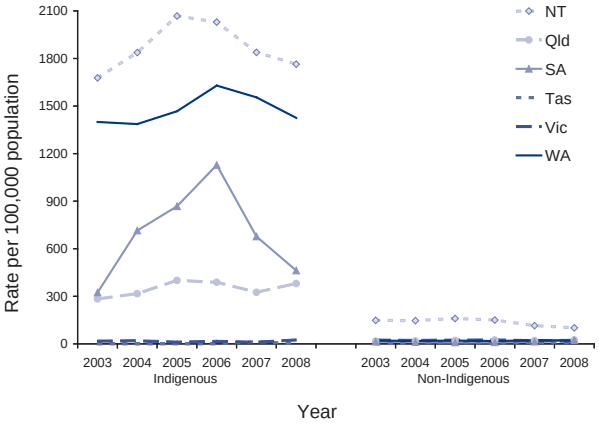


respective jurisdictions was 37:1. Between 2007 and 2008, rates of gonococcal infection notifications in the Indigenous population declined by 32% in South Australia, with declines also being seen in the Northern Territory, Tasmania and Western Australia. For the same period, increases in the notification rate of gonococcal infections were seen in Queensland (17%). In Victoria, there was a doubling of the rate, however this effect was due to changes in very small notification numbers in this population (Figure 27).

Other surveillance of gonococcal infections

The AGSP is the national surveillance system for monitoring the antimicrobial resistance of *Neisseria gonorrhoeae* isolates, via a network of public

Figure 27: Trends in notification rates of gonococcal infection, selected states and territories,* 2003 to 2008, by indigenous status



* States and territories in which indigenous status completeness was reported for more than 50% of cases over a 5 year period.

and private reference laboratories located in each jurisdiction. Susceptibility testing is performed on gonococcal isolates to a core group of antibiotics: penicillin, ceftriaxone, spectinomycin, quinolone and tetracycline, using a standard methodology. The following is a summary of the AGSP 2008 report.[37]

In 2008, a total of 3,192 gonococcal isolates were tested for antibiotic susceptibility, representing approximately 41% of gonococcal infection notifications. The number of gonococcal isolates available for susceptibility testing is affected by the increasing use of non-culture based diagnosis methods.

Of the total number of isolates collected through the AGSP in 2008, there were 2,509 isolates from males, 682 isolates from females (male to female ratio 4.7:1) and there was 1 isolate where the sex was not reported. In males, 73% of isolates were obtained from the urethra, 15% from the rectum and 9% from the pharynx. In females, the majority of isolates (88%) were obtained from the cervix.

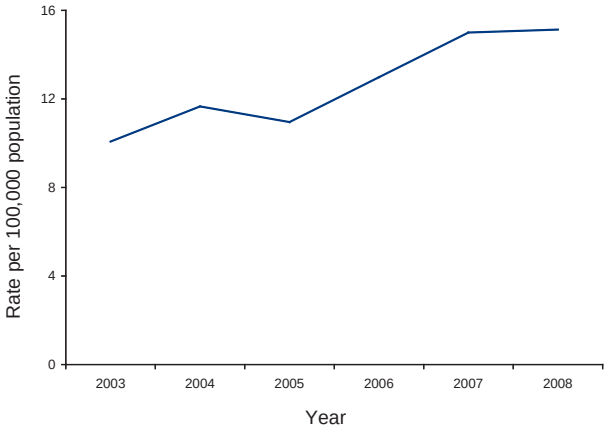
In 2008, approximately 44% of gonococcal isolates were resistant to penicillins and 54% to the quinolone antibiotic group. The number of isolates with high level tetracycline resistance continued to be at a historically high level. As in previous years, the pattern of gonococcal antibiotic susceptibility differed between states and territories, and rural and urban areas within each jurisdiction,[38] where for example in remote areas of some jurisdictions with high disease rates, penicillin based treatments continue to be effective.

Syphilis (all categories)

In 2004, all jurisdictions began reporting to the NNDSS non-congenital syphilis infections categorised as: infectious syphilis (primary, secondary or early latent) of less than 2 years duration; and syphilis of more than 2 years or unknown duration. However, in South Australia only notifications of infectious syphilis are reported to the NNDSS. Detailed analyses are reported for these 2 categories, as well as for syphilis of the combined categories (syphilis – all categories) for the purpose of showing trends in previous years.

In 2008, a total of 3,243 notifications of syphilis infection of all categories was reported, representing a notification rate of 15.1 per 100,000 population, a slight increase compared with 2007 (Table 7, Figure 28). The Northern Territory continued to have the highest notification rate of syphilis (115 per 100,000 population), although in 2008 the rate was 17% lower than in 2007. In 2008, there were increases in notification rates in Western Australia (30%), the Australian Capital Territory (27%), New South Wales (14%) and South Australia (5%). As in other developed countries syphilis infection rates have continued to rise in Australia amongst men who have sex with men.[39,40]

Figure 28: Notification rate of non-congenital syphilis infection (all categories), Australia, 2003 to 2008



Syphilis – infectious (primary, secondary and early latent), less than 2 years duration

In 2008, a total of 1,303 cases of infectious syphilis (primary, secondary and early latent), less than 2 years duration, were reported. This represents a notification rate of 6.1 per 100,000 population, a decrease of 9% compared with 2007 (6.7 per 100,000 population) (Table 7). The

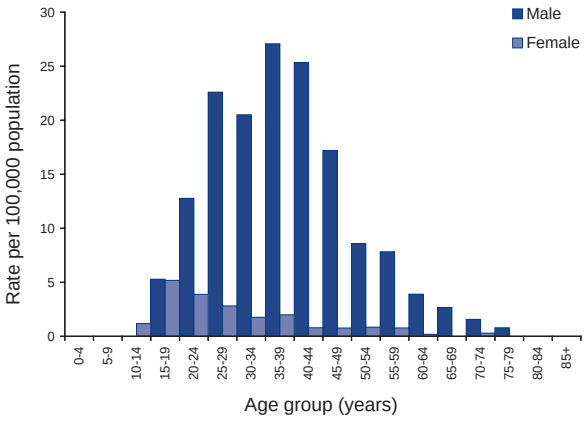
Northern Territory had the highest notification rate at 37.8 per 100,000 population in 2008, a decrease of 32% compared with 2007. Decreases in notification rates per 100,000 population compared with 2007 occurred across all jurisdictions, except Western Australian and South Australia, which increased by 69% (4.9 to 8.3) and 5% (3.1 to 3.2) respectively.

Nationally, the notification rates of infectious syphilis for males and females were 10.8 and 1.4 per 100,000 population respectively, and represented a male to female ratio of 8:1 (Table 14). Notification rates in males were highest in the 35–39 year age group (27.1 per 100,000 population), closely followed by the 40–44 year age group (25.3 per 100,000), whereas in females the highest notification rate was observed in the 15–19 year age group (5.2 per 100,000 population). In all jurisdictions and across all age groups, notification rates were higher in males than in females, except the 10–14 year age group where the rate was 1.2 per 100,000 for females compared with no notifications for males (Figure 29).

Over the period 2004 to 2008 notification rates amongst males increased substantially until 2007, especially in the 20–29, 30–34 and 40–49 year age groups, and then decreased or were similar in 2008. The overall increases observed during this period occurred mainly in men who have sex with men.[4] In females, for the 2004 to 2008 period, rates remained relatively steady, except in the 15–19 and 20–29 year age groups where they decreased by 21% and 41%, respectively, compared with 2007 (Figure 30).

In 2008, data on indigenous status were complete in 96% of notifications of infectious syphilis and all jurisdictions had greater than 50% completeness of the indigenous status field. The age standardised notification rate was 37.1 per 100,000 in the Indigenous population and 5.3 per 100,000 in the non-Indigenous population, representing a ratio of 7:1. These age standardised notification rates ranged substantially across jurisdictions. Over the past 5 years, the disparity in notification rates between Indigenous and non-Indigenous populations continued to decrease across all jurisdictions except the Australian Capital Territory (indigenous status less than 50% complete 2004–2007) (Figure 31). Analysis of age specific notification rates show that compared with the non-Indigenous population, rates of infectious syphilis in the Indigenous population are highest in a younger age group, 15–19 years, compared with the non-Indigenous population where notification rates are highest in the 35–39 year age group.

Figure 29: Notification rate of infectious syphilis (primary, secondary and early latent), less than 2 years duration, Australia, 2008, by age group and sex



* Excludes 2 notifications whose sex was not reported.

Table 14: Number and rates* of notifications of infectious syphilis (less than 2 years duration), Australia, 2008, by state or territory and sex†

State or territory	Male		Female		Total	
	Count	Rate*	Count	Rate*	Count	Rate*
ACT/NSW	398	11.0	22	0.6	420	5.7
NT	49	43.0	34	32.1	83	37.8
Qld	167	7.8	20	0.9	187	4.4
SA	45	5.7	7	0.9	52	3.2
Tas	5	2.0	2	0.8	7	1.4
Vic	355	13.5	17	0.6	374	7.0
WA	133	12.1	47	4.4	180	3.4
Total	1,152	10.8	149	1.4	1,303	6.1

* Notification rate per 100,000 population.

† Total includes 2 notifications whose sex was not reported.

Figure 30: Trends in notification rates of infectious syphilis (primary, secondary and early latent), less than 2 years duration, in persons aged 10 years or over, Australia, 2004 to 2008, by age group and sex

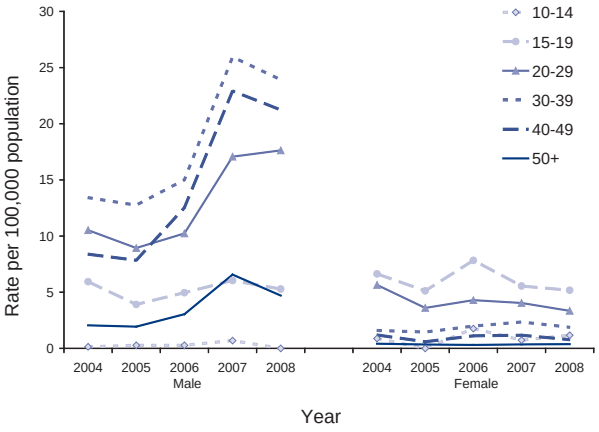
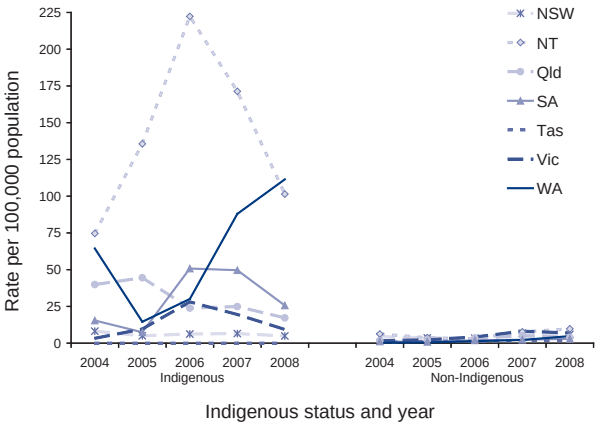


Figure 31: Trends in notification rates of infectious syphilis, selected states and territories,* 2003 to 2008, by indigenous status



* States and territories in which Indigenous status completeness was reported for more than 50% of cases over a 5 year period.

Syphilis of more than 2 years or unknown duration

In 2008, a total of 1,940 notifications of syphilis of more than 2 years or unknown duration were reported, a notification rate of 9.8 per 100,000 population. This rate represents an increase of 10% compared with 2007 (8.9 per 100,000 population). The Northern Territory continued to have the highest notification rate at 77.3 per 100,000 population, however, this was a decrease of 6% compared with 2007 (81.9 per 100,000 population).

In 2008, notification rates of syphilis of more than 2 years or unknown duration in males and females were 12.7 and 6.7 per 100,000 population, respectively (Table 15). Notification rates were higher in males than in females in all jurisdictions, except the Northern Territory, where males had a lower rate than females (74 and 81 per 100,000 population, respectively). Nationally, the male to female ratio was 1.9:1. The distributions of notification rates across age groups were similar in males and females with a bimodal distribution, noting however, that rates in males were substantially higher compared with females, especially in the older age groups. In males, the rate remained high from 35 years and over, peaking in the 35–49 year age range and again in the 85 or over year age group. Whilst amongst females, a younger peak was seen in the 30–34 year age group, with a second peak again in the 85 years or over age group (Figure 32).

Over the period 2004 to 2008, notification rates increased substantially between 2005 and 2008 amongst males aged 30 years or over. In females for the same period, notification rates have remained relatively stable, except in females aged 20–29 years where the rates have decreased from 14 per 100,000 population in 2004 to 8 per 100,000 population in 2008 (Figure 33).

Table 15: Number and rates* of notifications of syphilis of more than 2 years or unknown duration, Australia,† 2008, by state or territory and sex

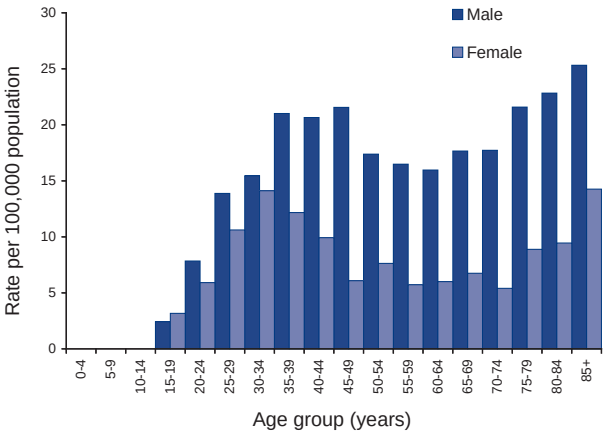
State or territory	Male		Female		Total‡	
	Count	Rate*	Count	Rate*	Count	Rate*
ACT/NSW	715	19.7	304	8.2	1,023	14.0
NT	84	73.7	86	81.3	170	77.3
Qld	115	5.4	88	4.1	203	4.7
Tas	11	4.5	4	1.6	15	3.0
Vic	273	10.4	139	5.2	419	7.9
WA	59	5.4	51	4.8	110	2.1
Total	1,257	12.7	672	6.7	1,940	9.8

* Notification rate per 100,000 population.

† Data from all states and territories except South Australia.

‡ Total includes 10 notifications whose sex was not reported.

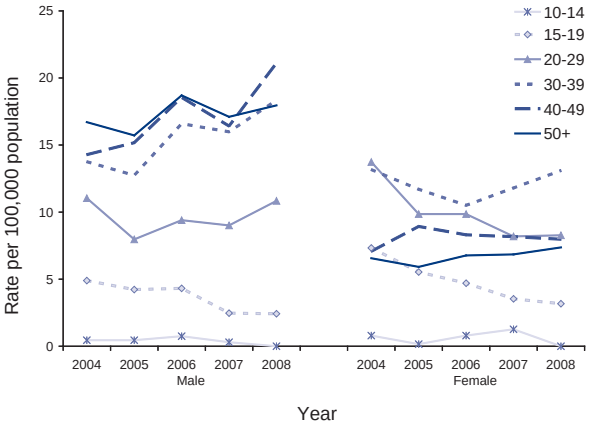
Figure 32: Notification rate of syphilis of more than 2 years or unknown duration, Australia,* 2008, by age group and sex†



* Data from all states and territories except South Australia.

† Excludes 11 notifications where sex was not reported.

Figure 33: Rates of notification of syphilis of more than 2 years or unknown duration, Australia,* 2004 to 2008, by age group and sex

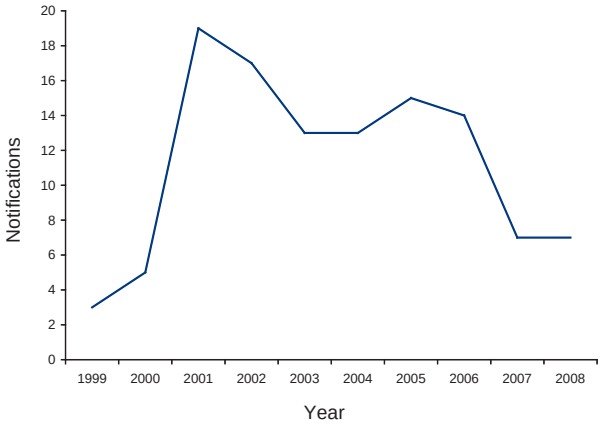


* Data from all states and territories except South Australia.

Congenital syphilis

There were 7 notifications of congenital syphilis reported in 2008, 3 males and 4 females. Three notifications each were reported from New South Wales and Queensland, and one from the Northern Territory. Two of the notifications were Indigenous, four non-Indigenous and one was reported as unknown indigenous status. Following a peak of 19 notifications in 2001, notifications of congenital syphilis have continued to decline (Figure 34).

Figure 34: Trends in notifications of congenital syphilis, Australia, 1999 to 2008



Vaccine preventable diseases

Introduction

This section summarises the national notification surveillance data for laboratory-confirmed influenza and notifiable diseases targeted by the National Immunisation Program (NIP) in 2008. These include diphtheria, *Haemophilus influenzae* type b (Hib) infection, measles, mumps, pertussis, invasive pneumococcal disease, poliomyelitis, rubella, tetanus and varicella zoster infections (chickenpox, shingles and unspecified). Data on hepatitis B and invasive meningococcal disease, which are also targeted by the NIP, can be found in this report under 'Bloodborne diseases' and 'Other bacterial infections' respectively. Other vaccine preventable diseases (VPDs) presented in this report include hepatitis A and Q fever under the 'Gastrointestinal diseases' and 'Zoonoses' sections respectively.

In 2008, there were 34,225 notifications of VPDs (20% of total notifications). This is 25% more than the 27,332 notifications of VPDs reported in 2007. Pertussis was the most commonly notified VPD (14,516, 42% of all VPD notifications). The number of notifications and notification rates for VPDs in Australia are shown in Tables 5 and 6.

There were no new vaccines added to the NIP in 2008. However, due to an international shortage of some Hib vaccines (monovalent Hib *PedvaxHib*® and Hib-hepatitis B *Comvax*®) those vaccines were replaced by the hexavalent DTP-IPV-HepB-Hib vaccine at 2, 4 and 6 months and another monovalent Hib vaccine (Hiberix®) at 12 months in March 2008 in Victoria, Queensland and South

Australia. For the remainder of 2008, Comvax® and PedvaxHib® were used only in Western Australia for Indigenous children and for all children in the Northern Territory.

Information on receipt of vaccines has been recorded on the NNDSS using the 'vaccination status' field (full, partial or unvaccinated), plus a field capturing number of doses. In January 2008, new more detailed fields were added to record 'vaccine type' and vaccination date for each dose. The new fields were intended to replace the old fields, with a transition period allowing either type of vaccination details. In 2008, 2 jurisdictions commenced using the new fields (Northern Territory and Queensland), while the remaining jurisdictions continued using the old fields. In this report data on receipt of vaccines are presented for each disease combining data from the 2 different formats.

Diphtheria

There were no notifications of diphtheria reported to the NNDSS in 2008. The last notification of diphtheria reported in Australia was a case of cutaneous diphtheria in 2001, the only notification reported since 1992.

Haemophilus influenzae type b disease

There were 25 notifications of Hib disease in 2008 corresponding to a rate of 0.1 notifications per 100,000 population. There were eight more notifications than reported in 2007. Thirty-six per cent (9/25) of notifications were amongst children aged less than 10 years, with the remainder being distributed between those aged between 30 and 84 years. Sixty per cent (15/25) of the notifications were in males with a male to female ratio of 1.5:1, unlike in 2007 when the ratio was 0.9:1 (Figure 35).

Indigenous status was recorded for 24 of the 25 notifications; three were Indigenous and 21 were non-Indigenous. The Hib notification rate in 2008 was 0.6 per 100,000 in the Indigenous population and 0.1 per 100,000 in the non-Indigenous population, equating to a ratio of 6:1. Between 2003 and 2007, Hib notification rates in the Indigenous population were 6.6 to 30.3 times higher than the rates in the non-Indigenous population. However the figures vary dramatically because of the low number of notifications (Figure 36). This analysis excludes those notifications with an unreported or unknown indigenous status (6 for 2003, 4 for 2006 and one for each of the remaining years).

Figure 35: Notifications of *Haemophilus influenzae* type b infection, Australia, 2008, by age group and sex

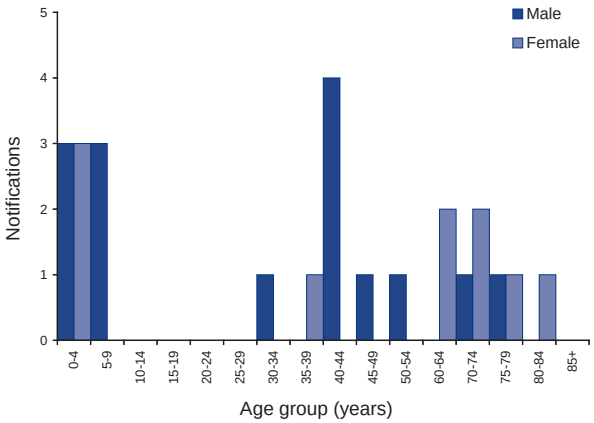
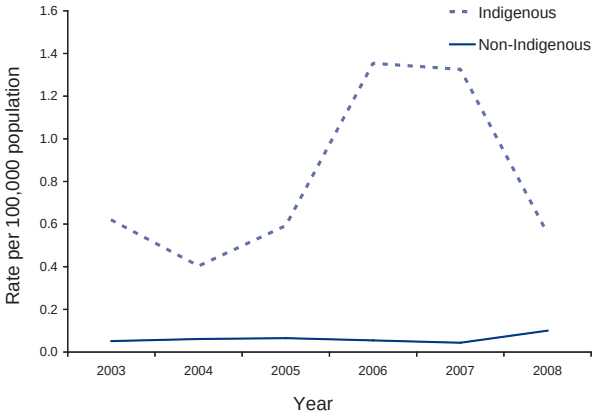


Figure 36: Notification rate for *Haemophilus influenzae* type b infection, Australia, 2003 to 2008, by indigenous status



Children under the age of 16 years were eligible for Hib vaccination in infancy in 2008, as Hib vaccines were introduced to the NIP for all children born after February 1993. Of the 9 notifications aged less than 16 years in 2008, five were vaccinated and four were unvaccinated. Of the five that were vaccinated, two had received their age appropriate vaccinations and three had not been fully vaccinated for age. Vaccination status for a total of 3 notifications across all ages was unknown or not supplied.

After nearly 2 decades of Hib vaccination, Australia now has one of the lowest rates of Hib in the world.[41] A recent study on the trends of invasive Hib in Australia between 1995 and 2005 concluded that almost 60% of invasive Hib cases in children are preventable.[42]

Influenza

The Australian 2008 influenza season was less severe than the 2007 season, but the number of notifications was higher than in each of the years 2004 to 2006 (Figure 37). Notifications were 1.9 times greater than the 5-year mean and peaked in the first week of September. There were 9,137 notifications of laboratory-confirmed influenza in 2008, corresponding to a rate of 43 per 100,000 population. Queensland accounted for 41% of all confirmed influenza notifications to the NNDSS (Figure 38), but this proportion may in part reflect different testing and laboratory practices rather than real differences in the incidence of infection.[43] Notifications in the non-seasonal period were higher than in previous years.

The highest notification rates occurred in the Northern Territory with 91 per 100,000 population, followed by Queensland (86 per 100,000 population), Tasmania (78 per 100,000 population) and the Australian Capital Territory (71 per 100,000 population) (Table 5).

There were 1,351 notifications of laboratory-confirmed influenza in children aged less than 5 years (14.8% of all notifications). As in previous years, influenza notification rates were markedly higher in children aged under 5 years (98 per 100,000 population) compared with those aged 5 years or over (39 per 100,000 population) (Figure 39). Within this age group, the highest rate was in children under 1 year of age (162 per 100,000 population).

In 2008, 8,906 (98.5%) influenza notifications in the NNDSS included typing data. Influenza B was predominant in the 2008 season; the first year this has been observed since influenza became nationally notifiable in 2001. Of typed notifications, 55% (4,924) were influenza B, 44% (3,894) were influenza A and 1% of notifications were

Figure 37: Notifications of laboratory-confirmed influenza, Australia, 2008, by month of diagnosis

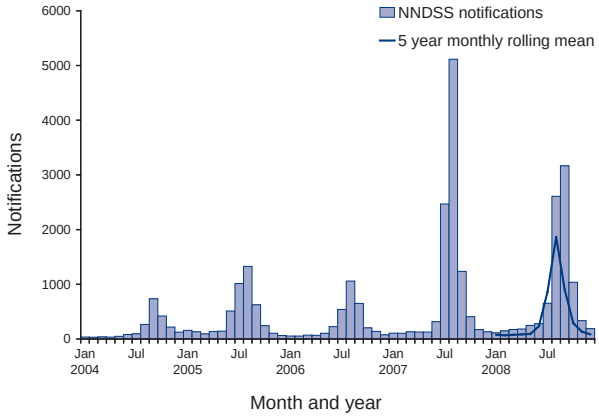
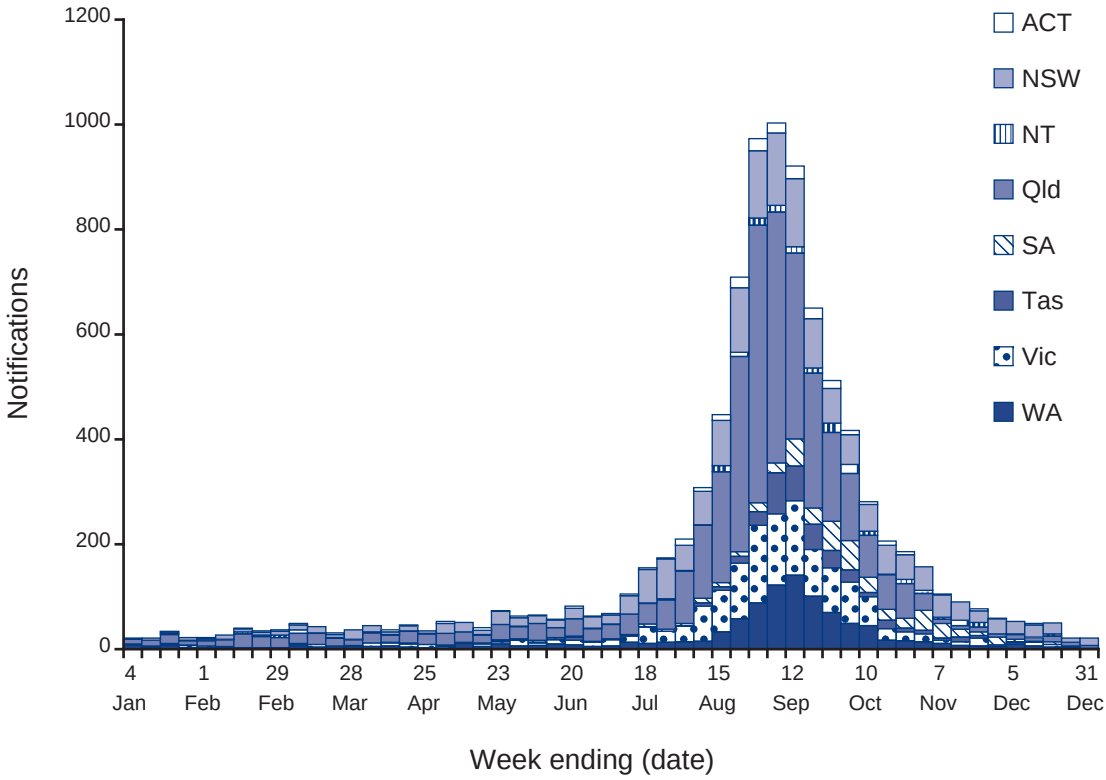


Figure 38: Notifications of laboratory-confirmed influenza, Australia, 2008, by state or territory and week of diagnosis

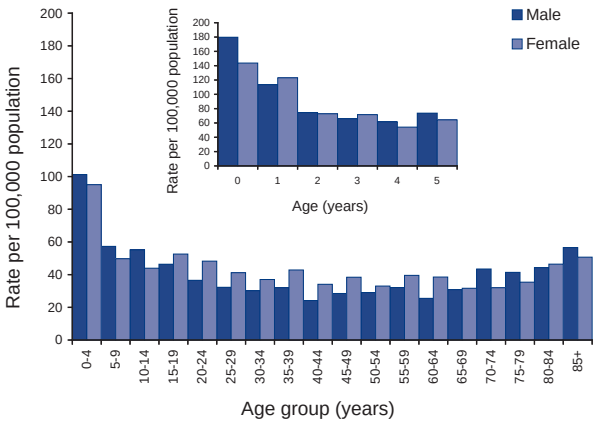


notified as 'A&B' (86) or type C (2). Prior to the start of the season, influenza notifications were predominantly influenza A, however influenza B predominated during the peak of the season (Figure 40).

In 2008, 1,224 influenza virus isolates were analysed at the WHO Collaborating Centre for Reference and Research on Influenza. There were approximately equal proportions of viruses from the 2 influenza B lineages (B/Victoria and B/Yamagata), however B/Yamagata viruses (B/Florida/4/2006-like included in the 2008 influenza vaccine) were predominant at the start of the season, while B/Victoria (B/Malaysia/2506/2004-like) viruses predominated at the end of the season. Of circulating A(H3) viruses, most were antigenically similar to A/Brisbane/10/2007; the 2008 A(H3) vaccine strain. Circulating A(H1) strains showed significant drift away from the 2008 vaccine strain A/Solomon Islands/3/2006 to the A/Brisbane/59/2007-like viruses.

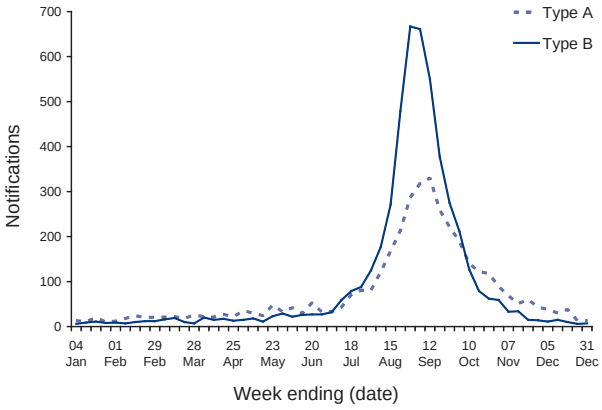
The recommendation for the 2009 Southern Hemisphere vaccine had only one change compared with the 2008 Southern Hemisphere vaccine: a change to the A(H1) virus from a A/Solomon Islands/3/2006-like virus to A/Brisbane/59/2007-like virus. The other 2 recommended strains: A/Brisbane/10/2007-like virus (H3N2) and B/Florida/4/2006-like virus, were left unchanged.

Figure 39: Notification rate for laboratory-confirmed influenza, Australia, 2008, by age group and sex*



* Excludes 14 notifications whose age or sex was not reported.

Figure 40: Notifications of laboratory-confirmed influenza, Australia, 2008, by type and week of diagnosis*



* Notifications of influenza type 'A&B' (n=86), 'C' (n=2) and 'untyped' (n=231) were excluded from analysis.

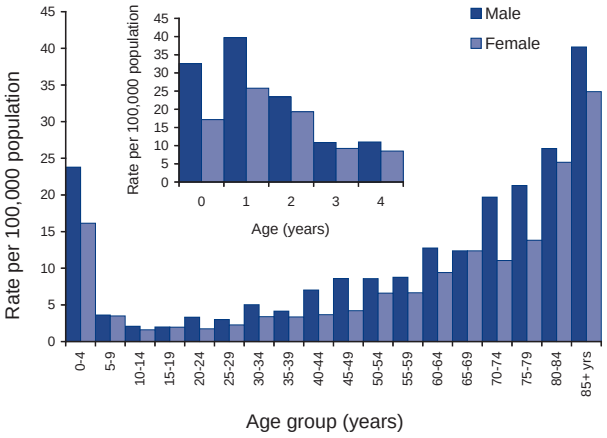
Invasive pneumococcal disease

There were 1,629 notifications of invasive pneumococcal disease (IPD) in Australia in 2008, a rate of 7.6 notifications per 100,000 population. This was a small increase of 10% from the 1,483 notifications reported in 2007 (7.0 notifications per 100,000 population). An increase in notification rates between 2007 and 2008 was seen in New South Wales (547 notifications, 7.8 per 100,000 population), South Australia (120 notifications, 7.5 per 100,000 population), Tasmania (39 notifications, 7.8 per 100,000 population), Victoria (355 notifications, 6.7 per 100,000 population) and Western Australia (162 notifications, 7.5 per population). The lowest notification rate in 2008 was seen in the Australian Capital Territory (20 notifications, 5.8 per 100,000 population).

In 2008, males accounted for 913 (56%) of the 1,629 notifications of IPD. In most age groups there were more male than female notifications, resulting in a male to female ratio of 1.3:1. Figure 41 shows that the highest rates of IPD in 2008 were notified in persons aged 85 years or over (36.1 notifications per 100,000 population) and in children aged 1 year (32.9 notifications per 100,000 population).

The 7 valent pneumococcal conjugate vaccine (7vPCV) became available for infants and children at high risk of IPD in 2001. In 2005 it was added to the NIP for all children up to 2 years of age.[11] Notification rates of IPD disease caused by 7vPCV serotypes in the Indigenous population have declined over the past 5 years, from 7.8 to 3.2 notifications per 100,000 population (38 to 17 notifications) between 2003 and 2008. In the non-Indigenous population, notification rates of 7vPCV serotype disease have also declined from 5.8 to 1.2 notifications per 100,000 population (1,132 to 235 notifications) between 2004 and 2008.

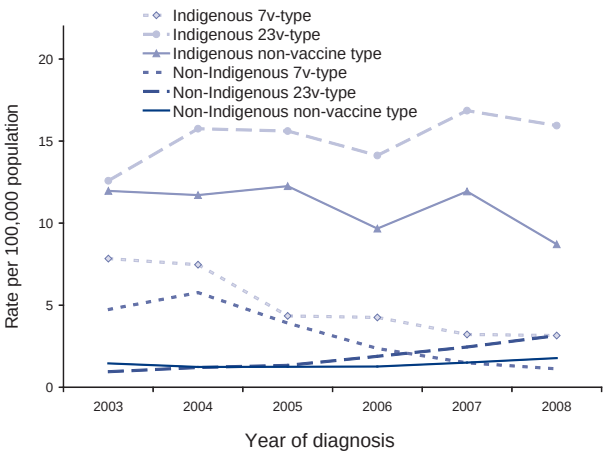
Figure 41: Notification rate for invasive pneumococcal disease, Australia, 2008, by age group and sex



The 23 valent pneumococcal polysaccharide vaccine (23vPPV) has been on the NIP since 1999 for all Indigenous Australians over 50 years of age and for those 15 to 49 years of age with high risk conditions. Since 2005, 23vPPV has also been on the NIP for all Australians over the age of 65 years. The number of notifications of IPD in both Indigenous and non-Indigenous populations due to 23vPPV serotypes increased between 2003 and 2008 from 61 to 86 notifications (12.6 to 15.9 notifications per 100,000 population) and 184 to 658 notifications (0.9 to 3.1 notifications per 100,000 population) respectively (Figure 42).

Additional data were collected on notifications of IPD in all Australian jurisdictions during 2008. Details can be found in the invasive pneumococcal disease annual report series published in *CDI*, at www.health.gov.au/cdi

Figure 42: Notification rate for invasive pneumococcal disease, Australia, 2003 to 2008, by serotype



Measles

There were 65 notifications of measles reported to NNDSS in 2008 corresponding to a rate of 0.3 notifications per 100,000 population. This was a large increase compared with the 12 notifications reported in 2007 (0.1 per 100,000 population) (Figure 43). In 2008, notifications were reported from New South Wales (39), Queensland (11), Western Australia (8), Northern Territory (3), Victoria (2), and South Australia (2).

In 2008, 55% (36/65) of measles notifications were male. The age at diagnosis ranged from 7 months to 48 years with the median age being 17 years. There was an increase in notifications in all age groups compared with 2007. This increase was highest in those 25–34 years of age (19 in 2008 compared with 0 in 2007) (Figure 44).

Of the 54 notifications with information on the place of acquisition, 26% (14/54) were reported as being acquired from overseas including the United Kingdom, Dubai, Thailand, Japan, China

Figure 43: Measles notifications, Australia, 2003 to 2008, by month of diagnosis

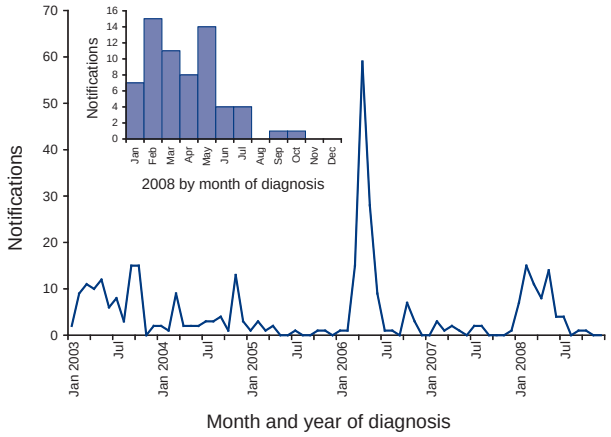
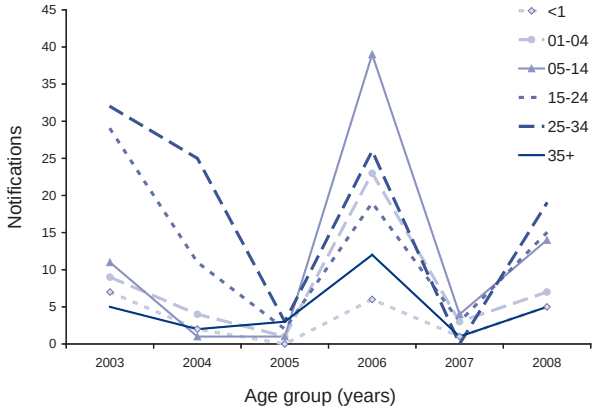


Figure 44: Trends in measles notifications, Australia, 2003 to 2008, by age group



and India. There were 2 outbreaks with more than 5 cases during 2008: one with 9 cases in Western Sydney associated with an emergency department and another in Queensland with 8 cases where the source of infection was not identified.

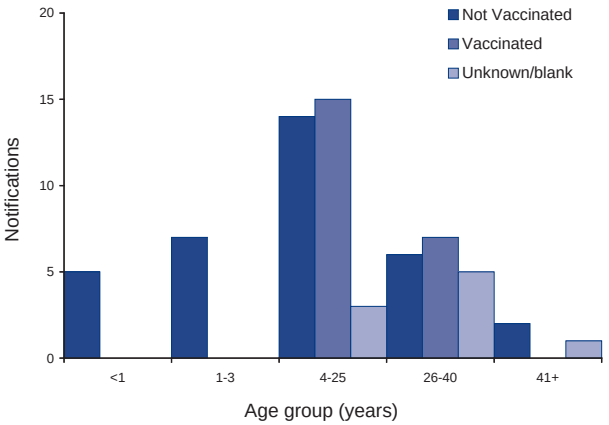
Two doses of MMR are funded for children and provided at 12 months and 4 years of age under the NIP. The MMR vaccine induces long-term measles immunity in 95% of recipients after a single dose and 99% of recipients after the second dose.[11]

Nationally, there was information on vaccination status for 86% (56/65) of notifications in 2008, of which 61% (34/56) were not vaccinated and 39% (22/56) had been vaccinated (7 with 2 doses, 10 with 1 dose of a measles-containing vaccine and the remaining 5 with no dose stated) (Figure 45). The 5 non-vaccinated infants aged less than 1 year of age at diagnosis were ineligible for routine vaccination. None of the 7 notifications for children aged 1–3 years and eligible for 1 dose of the measles-mumps-rubella vaccine (MMR) were vaccinated.

For the 29 notifications aged 4–25 years and eligible for 2 doses of MMR (with vaccine information available), 48% (14/29) were not vaccinated and 52% (15/29) had been vaccinated, seven of which had 2 doses and five of which had 1 dose of a measles-containing vaccine.

There were 13 notifications with information on vaccination status in those aged 26–40 years. These are considered to be a susceptible age cohort because many may have missed being vaccinated as infants when coverage was still low and the risk of natural immunity through exposure was declining. Of these, 46% (6/13) were not vaccinated and 54% (7/13) were vaccinated, five of these with 1 dose and two had no dose number stated.

Figure 45: Notifications for measles, Australia, 2008, by age group and vaccination status



The remaining 2 notifications with vaccine information provided were both 41 years or older and not vaccinated.

Mumps

In 2008, there were 286 notifications of mumps (1.3 per 100,000 population). This was approximately half of the 586 notifications of mumps (2.8 per 100,000 population) reported in 2007. In 2008, notifications were similar to the 5-year mean, with a ratio of 1.1.

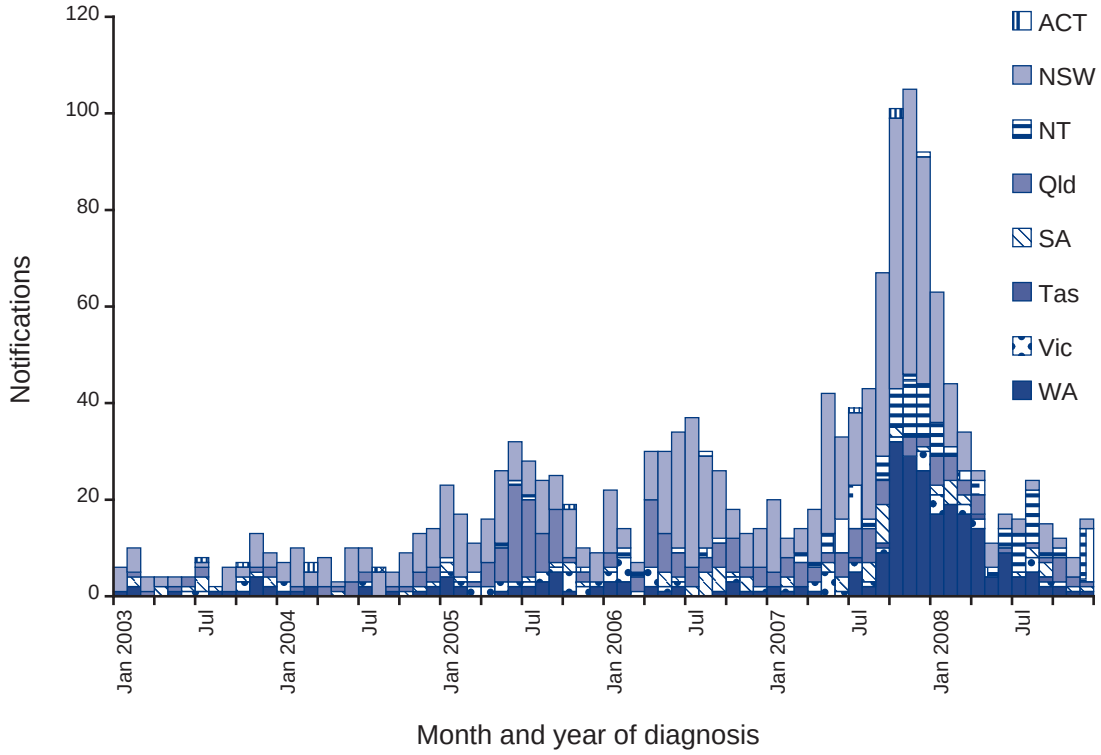
Notifications were reported from all jurisdictions except the Australian Capital Territory. The majority were reported from Western Australia with 33% (95/286), followed by 27% (77/286) from New South Wales and 18% (53/286) from the Northern Territory (Figure 46). The highest mumps notification rate was in the Northern Territory with 24 notifications per 100,000 population. Western Australia had the second highest notification rate in 2008 with 4.4 notifications per 100,000 population. New South Wales experienced the largest decrease in mumps notification rates from 2007 (4.7 per 100,000 population, 323 notifications) to 2008 (1.1 per 100,000 population, 77 notifications).

While the crude annual national mumps notification rate in Australia has been increasing since 2004, the rate in 2008 was the same as for 2006 (1.3 per 100,000 population) and close to that for 2005 (1.2 per 100,000 population), with rates in the less than 5 years and the 35 years or over age groups remaining relatively constant over the last 5 years (Figure 47).

In 2008, there were notifications of mumps in all age groups with the highest notification rates amongst adolescents and young adults. Rates in children aged less than 5 years (1.09 per 100,000 population, or 15 notifications) and adults greater than 40 years of age remained low (Figure 48). A decrease in the notification rates for both the 15–24 and 25–34 year age groups in 2008 compared with 2007 was apparent (Figure 47). In 2008, the highest notification rates for males were in the 10–14 and 15–19 year age groups (Figure 48), compared with 2007 where the highest rates occurred in the 25–29 year age group. The majority of notifications (55%, 156/286) were male, a similar proportion to the past 5 years.

Nationally, information on vaccination status was available for 85% (242/286) of the notifications of which 39% (94/242) were not vaccinated, 36% (89/242) were vaccinated, and the remaining 24% (59/242) were reported as not applicable or

Figure 46: Notifications of mumps, Australia, 2003 to 2008, by state or territory and month of diagnosis



unknown. Of the vaccinated notifications 2% (2/89) had 3 doses, the majority 68% (62/89) had 2 doses and 22% (20/89) had 1 dose of a mumps-containing vaccine, and the remaining five had missing or unknown dosage information.

Of the 69 Indigenous notifications with a known vaccination status, 96% (66/69), were vaccinated; of which 3% (2/66) had received 3 doses, 82% (54/66) had 2 doses and 15% (10/66) had 1 dose of a mumps-containing vaccine. Only 4% (3/69) of Indigenous notifications in 2008 were not vaccinated.

Indigenous status was reported for 77% (220/286) of mumps notifications, of which 50% (110/220) were reported as Indigenous and 50% as non-Indigenous. This represents a 15.5% increase in the proportion of Indigenous notifications in 2008 compared with the 23% (135/586) reported in 2007.

Of the cases notified from Western Australia and Northern Territory in 2008, 69% (66/95) and 75% (40/53) respectively were identified as Indigenous. In 2008, Western Australia experienced the end of a prolonged mumps outbreak in the Kimberly region that began in July 2007 and had peaked

Figure 47: Trends in notification rates for mumps, Australia, 2003 to 2008, by age group

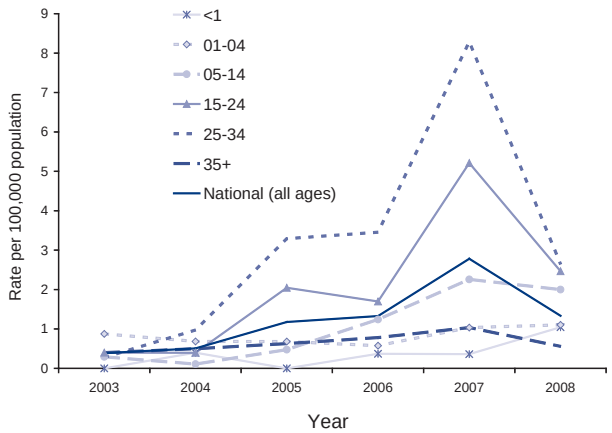
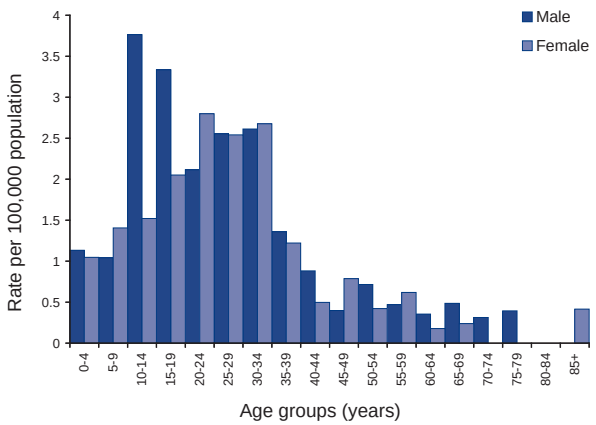


Figure 48: Notification rate for mumps, Australia, 2008, by age group



by the end of 2007.[28] The outbreak occurred predominantly amongst adolescent and young adult Aboriginal people (median age 18 years)[44] and had epidemiological links to an outbreak in Indigenous communities in the Northern Territory (personal communication, Gary Dowse, Communicable Disease Control, Directorate, Western Australian Department of Health). The affected population had a high rate of vaccination, with 52% (80/153) having received 2 doses and 14% (22/153) having received at least 1 dose of mumps containing-vaccine. Genotype J was identified in 20 mumps isolates and it remains unclear whether the outbreak was linked to the introduction of new genotypes from overseas outbreaks.[44]

The mumps component of the MMR vaccine is the least effective of the 3 components, providing 62%–85% and 85%–88% protection for the first and second dose respectively, compared with 95% for measles and 98% for rubella. Reduced effectiveness of the mumps vaccine component over time has been demonstrated to wane for 1 dose from 96% in 2-year-olds to 66% in 11–12-year-olds; and for 2 doses to wane from 99% in 5–6-year-olds to 86% in 11–12-year-olds.[45] This may at least partially account for the proportion of vaccinated mumps cases. Reduced efficacy has been suspected as a factor in recent mumps outbreaks in Israel and the United States of America in 2009 and 2010. Public health officials in New York are trialling a 3rd dose of vaccine in students in certain schools in Orange County as mumps transmission has continued despite a high rate of 2-dose vaccination coverage.[45,46]

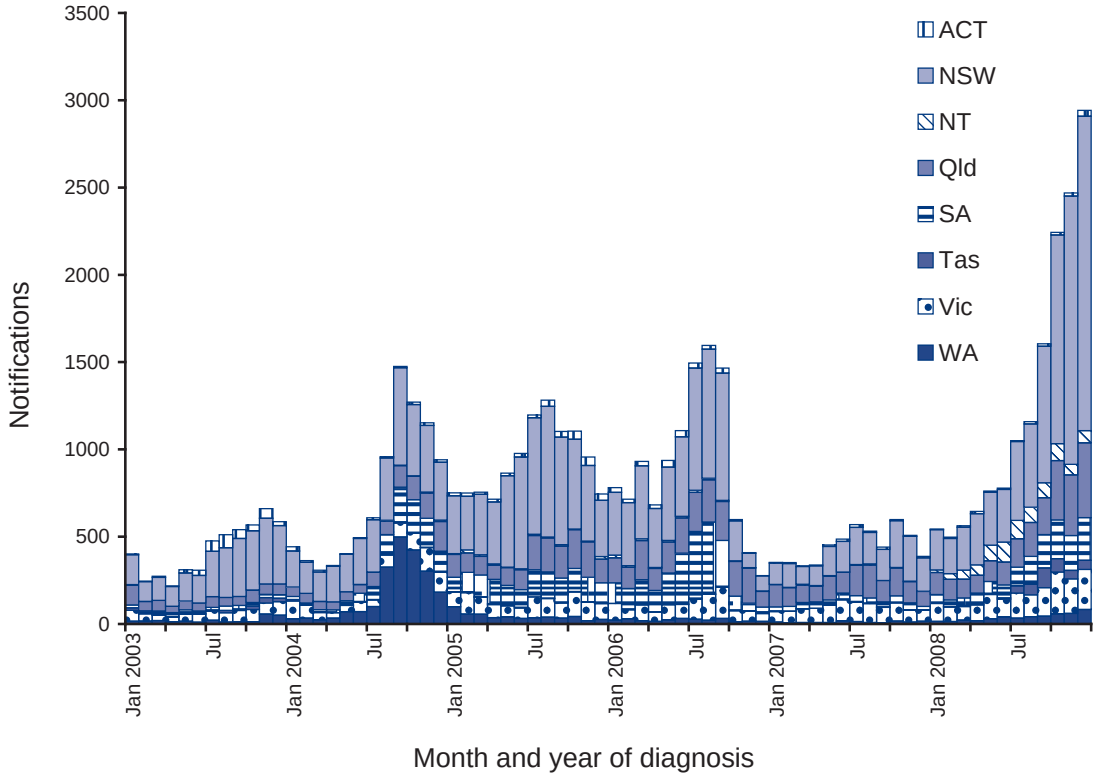
Pertussis

Pertussis is the most common vaccine preventable illness in Australia, with periodic epidemics occurring at intervals of three to 5 years on a background of endemic circulation. Notifications are normally higher in late winter and spring, however from 2004 to 2006, non-seasonal activity remained elevated compared with previous years (Figure 49). This may have been partially due to errors in diagnosis as discussed in the 2007 NNDSS annual report.[28]

In 2008, 14,516 notifications of pertussis were reported to NNDSS representing a notification rate of 67.7 per 100,000 population and was higher than in 2007 (5,345; 25.4 per 100,000 population). There was a large increase in the number of notifications from mid-2008, particularly in New South Wales, marking the beginning of an epidemic period which peaked in March 2009. In 2008, uptake of nucleic acid testing overtook serological methods for diagnosing new cases in New South Wales.

Notification rates in 2008 varied with age, with the highest notification rates in those aged less

Figure 49: Notifications of pertussis, Australia, 2003 to 2008, by month of diagnosis



than 15 years (114.2 per 100,000 population). This contrasted with 2006 where those aged 20–59 years and 60 years or over had the highest notification rate (Figure 50). Rates in these older age groups increased between 2003 and 2006, however by 2007 rates in these age groups had decreased. These older age groups were seen to have increasing rates since 2003, however by 2007 their notification rates had returned to a lower level. The notification rates of all groups less than 15 years increased more rapidly between 2007 and 2008 than those aged greater than 15 years.

There were more notifications amongst females (8,167; 56.3%) than males (6,333; 43.7%) in 2008, with 16 notifications for which sex was not specified (Figure 51). The highest notification rate amongst females was in the 0–4 year age group (126.9 per 100,000 population) with the highest rate in males being in the 10–14 year age group (122.5 per 100,000 population). While the greatest notification rates in 2008 were in those aged less than 15 years, the pattern of predominance of female notification rates compared with male notification rates for all age groups was similar to 2007 except for those aged 10 years, 70–74 years and those aged 85 years or over.

Nationally, information on vaccination was available for 71% (10,257/14,516) of notifications of which 65% (6,670/10,257) were not vaccinated and 35% (3,587/10,257) were vaccinated. No data were entered or vaccination status was unknown for 29% (4,259/14,516) of notifications. Information on the number of vaccine doses was less than 35% complete, thereby restricting further analysis of this field.

The newer nationally agreed vaccine type field used by Queensland and the Northern Territory was complete or status known for 91% (2,478/2,737) of notifications of which the majority (91%; 2,264/2,478) reported no vaccine given. Of those reporting no vaccine given, 89% (2,004/2,264) were aged 15 years or more, 8% (175/2,264) were between five and 15 years and 4% (85/2,264) were aged less than 5 years. All notifications aged more than 4 years would have been eligible for at least 4 doses of pertussis containing vaccine. Thirty-nine notifications would have been eligible for 1 dose at age of diagnosis and 15 notifications were less than 8 weeks of age and thus not eligible for their 1st dose of pertussis containing vaccine. Vaccine effectiveness is estimated to be 68% after receiving 1 dose of vaccine, increasing to 92% and greater after the 2nd dose[47] increasing to 99% following subsequent doses.[48] Immunity to disease decreases over time post vaccination with estimates of protection remaining for 4–12 years.[47] For this reason, current vaccine schedules for pertussis under the NIP are at 2, 4 and 6 months followed by a booster at aged 4 years and again at 15–17 years of age.

Notification rates of pertussis varied considerably by residential location. This was particularly noticeable in the 2nd half of 2008. By jurisdiction, the highest rates were in the Northern Territory (217.0 per 100,000 population) and New South Wales (111.9 per 100,000 population). When comparing rates by Statistical Divisions in Australia in the 1st half of 2008 with the 2nd half (Map 3), Northern Tasmania had the highest notification rate of 11.8 per 100,000 population. Loddon and the Central Highlands in Victoria had the next highest notification rates (10.0 and 8.1 respectively), and Central West New South Wales, South Eastern New South Wales and Murrumbidgee in New South Wales also demonstrated marked increases in the 2nd half compared with the 1st half of 2008 with rates of 9.3, 7.2 and 7.0 per 100,000 population respectively.

Figure 50: Trends in the notification rates of pertussis, Australia, 2003 to 2008, by age group

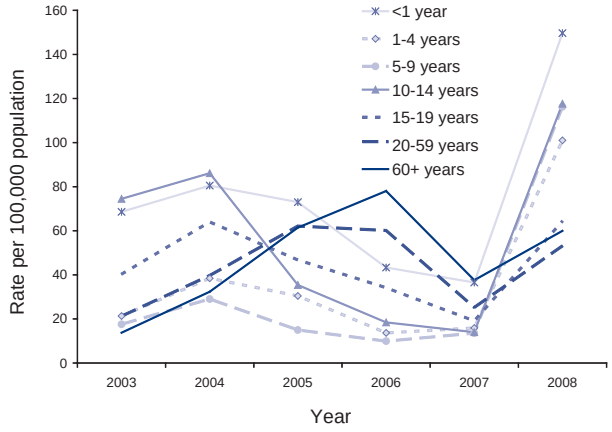
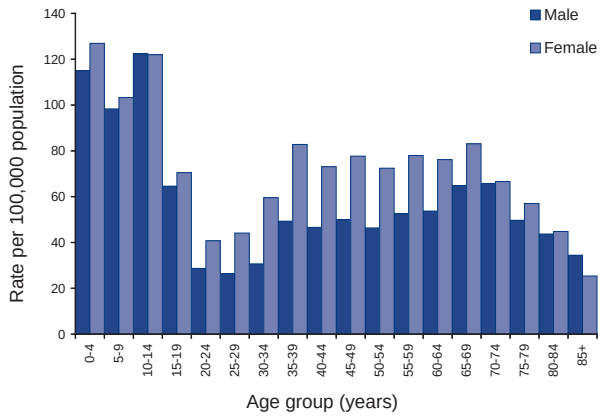
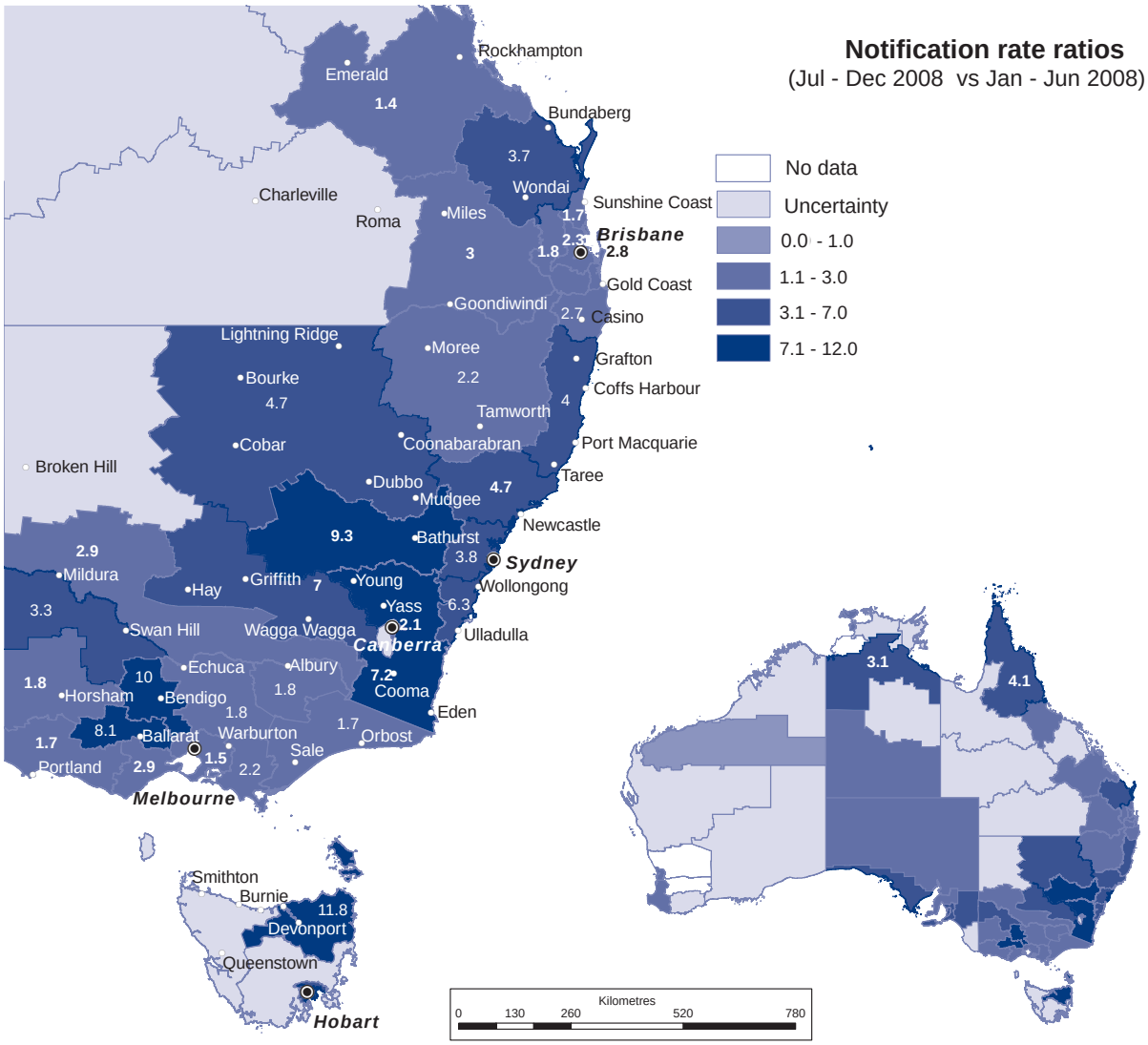


Figure 51: Notification rate for pertussis, Australia, 2008, by age and sex



Map 3: Notification rate ratio for pertussis comparing January to June with July to December 2008, by Statistical Division of residence



* Numbers shown in the Statistical Divisions represent the count of notifications.

Notification rates in geographic areas where estimated residential population and case numbers are small should be interpreted with caution.

Poliomyelitis

In 2008 there were no notifications of poliomyelitis in Australia, which along with the Western Pacific Region (WPR), remained poliomyelitis free. Poliomyelitis is a notifiable disease in Australia with clinical and laboratory investigation conducted for cases involving patients of any age with a clinical suspicion of poliomyelitis. Australia follows the WHO protocol for poliomyelitis surveillance and focuses on investigating cases of acute flaccid paralysis (AFP) in children under 15 years of age. Since 2000, the surveillance for AFP has been co-ordinated by the Victorian Infectious Diseases Reference Laboratory (VIDRL) in collaboration with the Australian Paediatric Surveillance Unit (APSU). The WHO target for AFP surveillance in a polio non-endemic country is 1 case of AFP per 100,000 children aged less than 15 years. Between 1 January and 31 December 2008 there were 60 eligible AFP cases notified to the National Polio Reference Laboratory (NPRL) all of which were classified as non-poliomyelitis. The 2008 non-poliomyelitis AFP rate was 1.5 hence meeting the WHO AFP surveillance indicator for the fifth time since 1995. Details of the 2008 notifications are provided in the 2008 annual report of the Australian NPRL.[49]

During 2008, Australia finalised *An Acute Flaccid Paralysis and Poliomyelitis Response Plan for Australia*. The plan was endorsed by the Australian Health Protection Committee at their meeting on 4 December 2008 and is now available on the Australian Government's website at http://www.health.gov.au/internet/main/publishing.nsf/Content/polio-plan.htm

Rubella

In 2008, there were 37 notifications of rubella (0.2 per 100,000 population), a slight increase compared with the 34 notifications in 2007. Notifications were reported from New South Wales (17), Victoria (8), Western Australia (7), Queensland (4), and South Australia (1). There were small numbers of notifications reported across the age groups with no notifications for infants less than 1 year of age or for those adults between 50 and 80 years of age. The majority of notifications (29; 78%) were adults between 20 and 49 years of age (Figure 52). The median age was 32 years. The overall male to female ratio of notifications in 2008 was 1.1:1, with 19 males and 18 females. Of the 18 notifications that were female 15 (83%) were notified in women of child bearing age (17–47 years). Despite this, there were no notifications of congenital rubella reported in 2008.

Figure 52: Notifications of rubella, Australia, 2008, by age group and sex

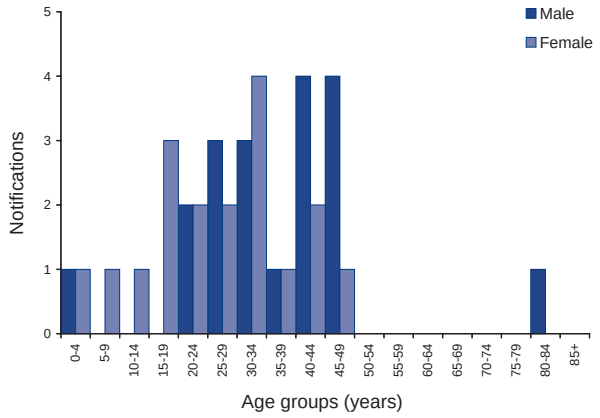
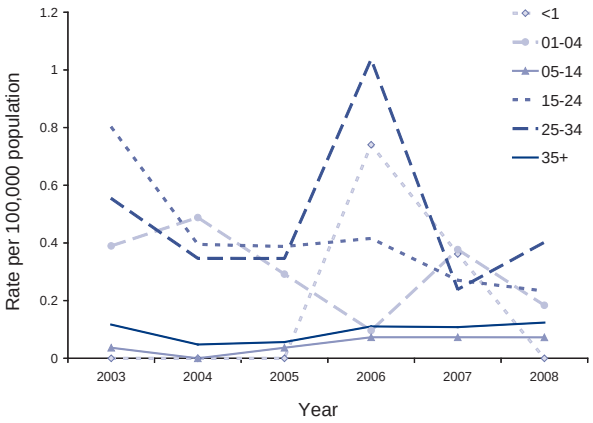


Figure 53 shows that trends in rubella notifications in different age groups have continued at low levels since 2003, except for a spike amongst those aged 25–34 in 2006. This spike was primarily due to an increase of notifications from South Eastern and Central Sydney, New South Wales. It was concentrated in those aged 15–44 years, however there was no single identifiable source for the increase in notifications.[50]

In Australia, populations at risk of rubella have previously been identified as including young men who did not receive the rubella immunisation in school based programs,[51] migrant women who did not receive rubella vaccines in their countries of birth,[52,53] and Indigenous women from rural and remote communities in the Top End of the Northern Territory.[54]

Figure 53: Trends in notification rates of rubella, Australia, 2003 to 2008, by age group



Nationally, information on vaccination status was available for 59% (22/37) of rubella notifications of which the majority, (82%; 18/22), were not vaccinated and 18% (4/22) were vaccinated. The remaining 41% (15/37) were stated as either unknown or blank. Of the 12 male notifications with information on vaccination reported, 83% (10/12) were not vaccinated, all of whom were adults ranging from 21 to 80 years of age and two had received 1 dose of a rubella-containing vaccine. Of the 10 female notifications in 2008 with vaccination information reported, 80% (8/10) were not vaccinated (all except one were women of child-bearing age between 19 and 43 years) and two had received 1 dose of a rubella containing vaccine (aged 9 years and 35 years).

Two doses of MMR are funded for children and provided at 12 months and 4 years of age under the NIP. A single dose of rubella vaccine produces an antibody response in more than 95% of recipients. Vaccine-induced antibodies have been shown to persist for at least 16 years in the absence of endemic disease, providing long-term protection against clinical rubella for those who seroconvert.[11]

None of the rubella notifications in 2008 were identified as Indigenous, although of the 37 notifications, 12 were reported as unknown indigenous status.

Tetanus

In 2008, there were 4 notifications of tetanus, one each reported from New South Wales, Victoria, Western Australia and Queensland and were all aged greater than 70 years. Of the 4 notifications, three were female and one was male.

Varicella-zoster infections

In November 2005, the varicella zoster vaccine was added to the NIP schedule as a single dose due at 18 months (for children born on or after 1 May 2004), or as a catch-up dose at 10–13 years of age. In 2006, CDNA agreed to make varicella infections notifiable in Australian jurisdictions. Three categories of varicella infection are notifiable: chickenpox, shingles and varicella infection (unspecified).

By the end of 2008, all jurisdictions except New South Wales were sending data to NNDSS, however because varicella only became notifiable in Victoria on 21 September 2008, the reported notifications for 2008 are incomplete and may underestimate actual disease incidence.

New South Wales decided in 2006 not to make varicella infections notifiable however varicella surveillance occurs in this state through monitoring of emergency department presentations available from http://www.health.nsw.gov.au/data/diseases/chickenpox.asp

In 2008, there were 8,526 varicella notifications from the 7 notifying jurisdictions, with 21% (1,790/8,526) reported as chickenpox, 27% (2,309/8,526) as shingles and 52% (4,427/8,526) as unspecified varicella infection.

Varicella zoster infection (chickenpox)

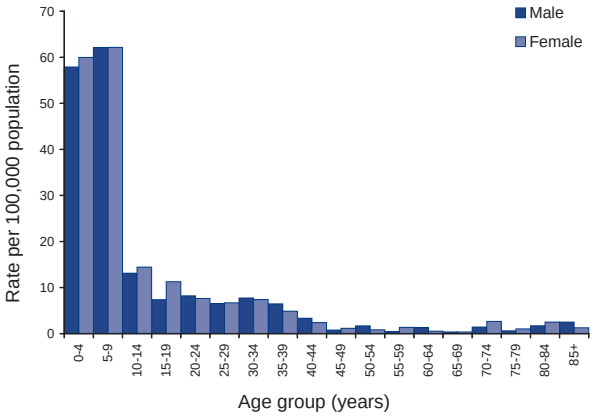
In 2008, there were a total of 1,790 notifications of chickenpox reported from all jurisdictions except New South Wales, corresponding to a rate of 12.4 notifications per 100,000 population. The highest rates were reported from the Northern Territory (52.3 per 100,000 population; 115 notifications) and South Australia (38.7 per 100,000 population; 620 notifications).

A total of 1,203 notifications (67.2 %) occurred in children aged less than 10 years. The highest rates were in the 5–9 year age group (62.2 per 100,000 population; 651 notifications) (Figure 54).

Indigenous status was recorded for 87% (1,554/1,790) of notifications, the majority (91%; 1,418/1,554) of which were non-Indigenous.

Of the 1,790 notifications for chickenpox, information on vaccination was available for 30% (543/1,790), 80% (432/543) of these were unvaccinated.

Figure 54: Notification rate for chickenpox, Australia,* 2008, by age group and sex



* Excluding New South Wales.

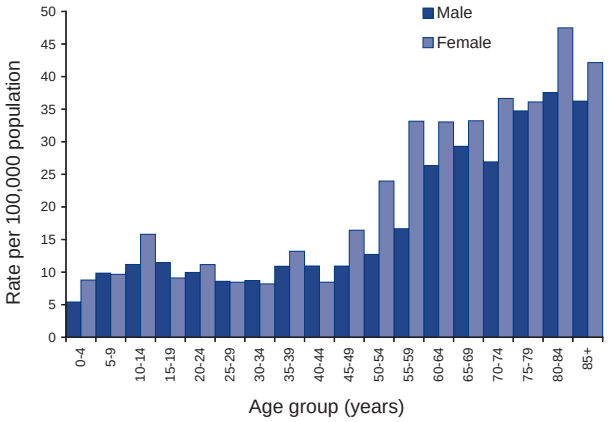
Varicella zoster infection (shingles)

There were 2,309 notifications of shingles reported to NNDSS in 2008 from 7 jurisdictions, corresponding to a rate of 16 notifications per 100,000 population. The highest rates were in South Australia (58.1 per 100,000 population, 931 notifications) and the Northern Territory (48.2 per 100,000 population, 106 notifications).

There were more female notifications (852; 55.1%) than males (695; 44.9%). The highest rates were in the 80–84 year age group (43.7 per 100,000 population; 121 notifications. (Figure 55).

Indigenous status was recorded for 81% (1,881/2,309) of notifications with the majority (96%; 1,803/1,881) reported as non-Indigenous.

Figure 55: Notification rate for shingles, Australia,* 2008, by age group and sex



* Excluding New South Wales.

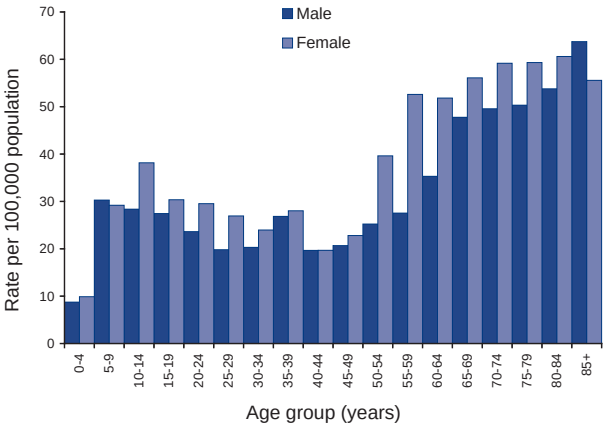
Varicella zoster infection (unspecified)

There were 4,427 notifications of varicella infections (unspecified) based on laboratory diagnoses from 7 jurisdictions in 2008, corresponding to a rate of 30.6 notifications per 100,000 population. The high proportion of unspecified varicella zoster virus infection compared with varicella zoster chickenpox or shingles is directly attributable to the varying capacity of jurisdictions to follow-up on laboratory notifications to determine the clinical presentation of each case. The highest rates were reported from Queensland (73.1 per 100,000 population; 3,138 notifications), Western Australia (34.7 per 100,000 population; 754 notifications) and the Australian Capital Territory (29.5 per 100,000 population; 102 notifications).

There were more notifications in females (2,477; 56%) than males (1,949; 46%). The age distribution of unspecified varicella infections is shown in Figure 56.

Indigenous status was recorded for 29% (1,295/4,427) of notifications, with the majority (94%; 1,219/1,295) reported as non-Indigenous.

Figure 56: Notification rate for varicella zoster infection (unspecified), Australia,* 2008, by age group and sex



* Excluding New South Wales and Victoria.

Vectorborne diseases

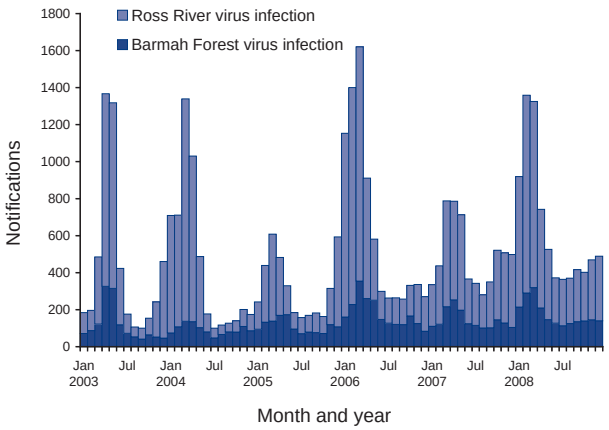
A disease that is transmitted to humans or other animals by an insect or other arthropod is called a vectorborne disease. Vectors of human disease of most concern in Australia are typically mosquitoes that are able to transmit viruses or parasites to humans.

During 2008, there were 8,876 notifications of mosquito-borne diseases reported to NNDSS (5.5% of total notifications). This was a 30% increase in the number of notifications compared with 2007 (6,828). The notifiable mosquito-borne diseases include those caused by the alphaviruses (Barmah Forest virus and Ross River virus), flaviviruses (the viruses causing dengue, Murray Valley encephalitis, Kunjin, Japanese encephalitis and yellow fever—which is reported under quarantinable diseases) and malaria. Geographical location rates for vectorborne disease notifications represent the place of residence rather than the place of acquisition of infection, although in many instances this may be the same. Further information about these vectorborne diseases can be found in the National Arbovirus and Malaria Advisory Committee annual (NAMAC) 07–08 annual report.[55]

Alphaviruses

Alphaviruses are single-stranded RNA viruses that cause disease epidemics characterised by fever, rash and polyarthritis. There is a variety of mosquito vectors for Barmah Forest virus (BFV) infection and Ross River virus (RRV) infection, which facilitates the transmission of these viruses in diverse environments (freshwater habitats, coastal regions, salt marshes, floodwaters, established wetlands and urban areas).[56] In Australia, BFV and RRV are the alphaviruses of major public health significance, accounting for 87% (7,753 cases) of the total mosquito-borne disease notifications for 2008. Between 2003 and 2008 notifications ranged annually for BFV from 1,367 (2003) to 2,140 (2006), and for RRV from 2,540 (2005) to 5,651 (2008) (Figure 57).

Figure 57: Notifications of Barmah Forest and Ross River virus infections, Australia, 2003 to 2008, by month and year of diagnosis



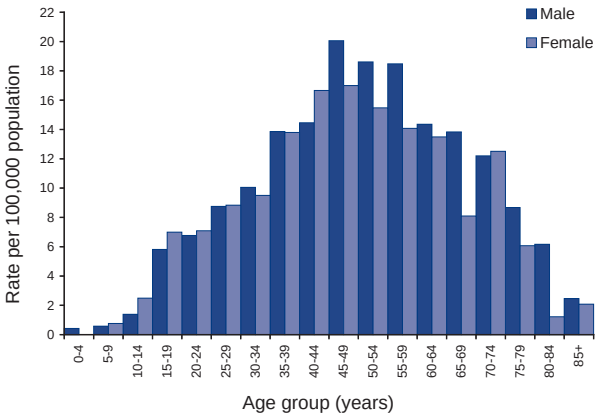
Barmah Forest virus infection

There were 2,102 notifications of BFV infections notified to NNDSS in 2008, which accounted for 24% of total mosquito-borne disease notifications for the reporting period. Fifty-nine per cent of BFV notifications were reported from Queensland (1,242 notifications) and 25% from New South Wales (533 notifications). BFV notifications during 2008 were 1.4 times the mean for the previous 5 years.

The highest rates of BFV notifications were reported by the Northern Territory (34.6 per 100,000 population compared with 42.3 per 100,000 population in 2007), Queensland (28.9 per 100,000 population compared with 19.8 per 100,000 population in 2007), and New South Wales (7.6 per 100,000 population compared with 8.3 per 100,000 population in 2007). Cases were reported in all jurisdictions. The national BFV notification rate in 2008 was 9.8 per 100,000 population, compared with 8.1 per 100,000 population in 2007. Notification rates for BFV varied by geographic location.

Figure 58 shows the age and sex distribution of BFV notifications. The BFV notification rate was highest amongst the 45–49 year age group (18.5 per 100,000 population). Overall, 52% of notifications reported to NNDSS were males.

Figure 58: Notification rate for Barmah Forest virus infections, Australia, 2008, by age group and sex



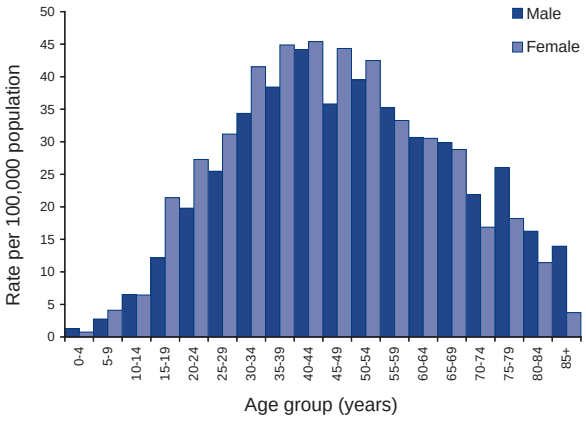
Ross River virus infection

There were 5,651 notifications of RRV infections reported to NNDSS in 2008, which accounted for 63% of the total mosquito-borne disease notifications received during this period.

Notification rates varied by geographic region, but the majority of notifications in 2008 were from Queensland (50%, 2,838 notifications) and New South Wales (20%, 1,152 notifications). The national RRV notification rate for 2008 was 26.4 per 100,000 population compared with 20.0 per 100,000 population in 2007.

The age and sex distribution of RRV notifications is shown in Figure 59. The RRV national notification rate was highest in the 40–44 year age group (44.9 per 100,000 population). Overall, 47% of notifications reported to NNDSS were males.

Figure 59: Notification rate for Ross River virus infections, Australia, 2008, by age group and sex



Flaviviruses

Flaviviruses are single-stranded RNA viruses, some of which are associated with epidemic encephalitis in various regions of the world. In Australia, the flaviviruses of public health importance are Murray Valley encephalitis virus (MVEV), Kunjin virus (KUNV), Japanese encephalitis virus (JEV) and dengue viruses (DENV).

The Sentinel Chicken Program is a surveillance scheme involving New South Wales, the Northern Territory, Victoria and Western Australia. Chicken flocks are located in strategic locations and are regularly tested for antibodies to MVEV and KUNV. This program is designed to provide early warning of flavivirus activity (excluding dengue and JEV).[57] A sentinel chicken surveillance report was published as part of the NAMAC annual report 2007–08.55

Murray Valley encephalitis virus infection

There were 2 cases of MVEV reported to NNDSS in 2008 compared to no cases in 2007. One case

was a 60-year-old male from New South Wales who recovered and the other case was a 49-year-old male from Western Australia, who died from the infection.[58]

Kunjin virus infection

During 2008, 1 case of KUNV was reported to NNDSS from Queensland compared with 1 notification in 2007 from Victoria.

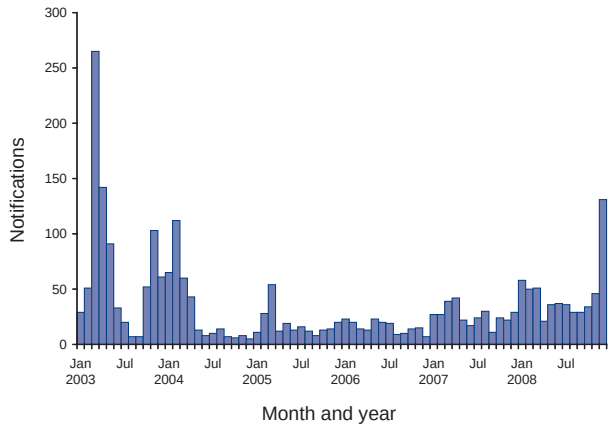
Dengue virus infection

There were 558 notifications of DENV reported to NNDSS in 2008 (Figure 60), of which 75% were acquired overseas. The number of cases reported in 2008 was a 78% increase in the number of cases reported in 2007 (314).

Local transmission in Australia is restricted to areas of northern Queensland where the key mosquito vector, *Aedes aegypti*, is present. Dengue is not endemic to Queensland, but outbreaks can occur when the virus is introduced via international travellers or residents returning home from overseas. Queensland reported 232 notifications of DENV in 2008 (41% of all DENV notifications). Locally-acquired cases represented 25% (137/558 cases) of the total number of dengue notifications for Queensland in 2008, which were mainly attributable to an outbreak of locally-acquired dengue serotype 3 in Cairns that occurred between November and December 2008.

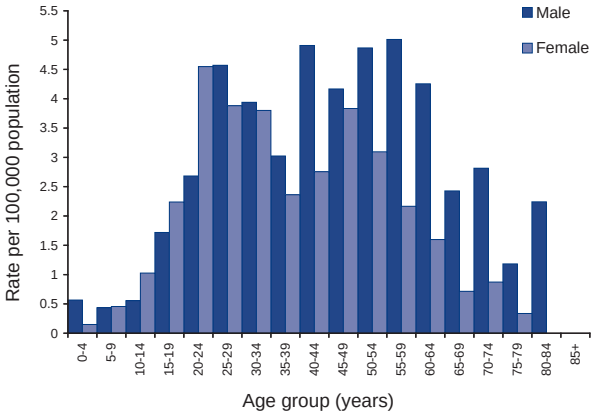
In early 2004, 2 deaths due to dengue fever were reported in Australia. These were the first deaths attributed to dengue in over 100 years and there have been no other deaths reported since.[59]

Figure 60: Notifications of dengue, Australia, 2003 to 2008, by month and year of diagnosis



In 2008, 57% of DENV notifications were male (318 notifications) and 90% of notifications were aged between 15 and 64 years (503 notifications). The highest notification rate for males was in the 55–59 year age group (4.2 per 100,000 population) and in females was in the 20–24 year age group (4.5 per 100,000 population) (Figure 61).

Figure 61. Notification rate for locally-acquired and imported cases of dengue, Australia, 2008, by age group and sex



Japanese encephalitis virus infections

There was 1 case of JEV notified in New South Wales in 2008 in a man who had recently travelled to Japan. This was the first JEV case notified in Australia since 2004.

Arbovirus infections (NEC)

In 2008, there were 28 notifications of arbovirus infection (not elsewhere classified or NEC). Twenty-one notifications in Queensland, 6 notifications in Victoria and 1 notification in New South Wales.

Of the Queensland notifications, 4 cases were further identified as Kokobera virus infection.

Malaria

There were 533 notifications of malaria in Australia in 2008, compared with 568 notifications in 2007 (Figure 62). There were no locally-acquired infections in 2008. Since Australia was declared malaria free in 1981 there have been two reported locally acquired outbreaks in 1986 and 2002 respectively, with a total of 15 cases. The majority of cases were reported by Queensland (31%; 167), New South Wales (22%; 116), Victoria (20%;

105), and Western Australia (16%; 85). Queensland reported that 79 (47%) of 167 notifications were acquired in Papua New Guinea, which was similar to 2007.

The largest number (70) of malaria notifications was in the 20–24 year age group and 69% of malaria notifications were for males (Figure 63).

The infecting *Plasmodium* species was reported for 98% of malaria notifications in 2008 (Table 16). Of these 533 notifications, *P. falciparum* (43%) and *P. vivax* (50%) were the predominant species.

Zoonoses

Zoonoses are 'those diseases and infections which are naturally transmitted between vertebrate animals and man'.[60] Approximately 60%–70% of emerging human infectious diseases are zoonoses[61,62] and more than 70% of emerging zoonoses originate from wildlife.[61] An emerging zoonosis is defined by WHO as 'a zoonosis that is newly recognised or newly evolved, or that has occurred previously but shows an increase in incidence or expansion in geographical, host or vector range'.[63]

The zoonoses notifiable to the NNDSS included in this chapter are anthrax, Australian bat lyssavirus (ABL) or lyssavirus (NEC) infection, brucellosis, leptospirosis, ornithosis, Q fever, and tularaemia. During 2008, the zoonotic diseases notified to NNDSS were for brucellosis, leptospirosis, ornithosis, and Q fever with a total of 633 notifications to NNDSS. Notifications were generally higher in males (72%, 453 notifications). There were only 20 notifications (3%) in cases aged less than 15 years and 27 notifications (4%) in cases over the age of 70 years.

Figure 62. Notifications of imported cases of malaria, Australia, 2003 to 2008, by month and year of diagnosis

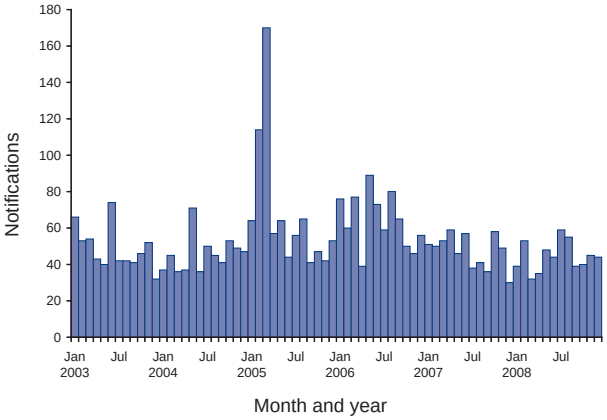


Figure 63: Notifications of malaria, Australia, 2008, by age group and sex

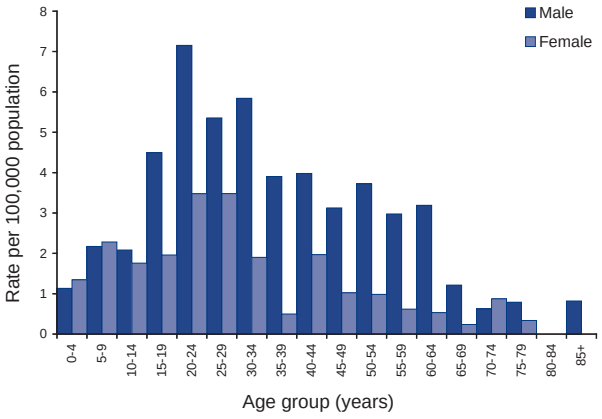


Table 16. Notifications of malaria, Australia, 2008, by parasite type and state or territory

Parasite type	State or territory									Type (%)
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust	
Plasmodium falciparum	2	42	13	71	11	4	26	57	226	43
Plasmodium malariae	1	2	0	2	0	1	0	3	9	2
Plasmodium ovale	0	6	0	3	0	0	0	0	9	2
Plasmodium vivax	12	65	5	82	5	3	73	20	265	50
Plasmodium species	0	1	0	9	1	0	0	2	13	2
Mixed *P. falciparum* and other species*	0	0	1	0	0	0	5	1	7	1
Mixed other species*	0	0	0	0	0	0	0	2	2	1
Total	15	116	19	167	17	8	104	85	531	

* New South Wales, South Australia, Tasmania, Victoria, Western Australia and the Northern Territory report mixed species infections per notified case. Queensland and the Australian Capital Territory report 1 notification for each species in a mixed infection.

Several zoonoses notifiable to the NNDSS are included under other headings in this report. A zoonotic infection can be acquired directly from an animal or indirectly via an insect vector, the environment or contaminated food. For example, *Salmonella* and *Campylobacter* infections are typically acquired from contaminated food and are listed under the gastrointestinal diseases section.

Anthrax

Anthrax is primarily a disease of herbivores; humans and carnivores are incidental hosts.[17] Anthrax has a low incidence in animals, and occurs only sporadically in Australia.[64] It can be an occupational hazard for veterinarians, and agriculture, wildlife and industry livestock workers who handle infected animals or by-products.

No cases of anthrax were reported to NNDSS in 2008. Over the previous 10 years, only 3 human cases of anthrax have been reported in Australia, all which were the cutaneous form, in 1998, 2006 and 2007.[65–67] Australia has never recorded a human case of inhalational or gastrointestinal anthrax.

In 2008, 12 outbreaks of anthrax were reported in livestock. Ten outbreaks occurred in New South Wales, where cases have been known to occur in the past, and two in northern Victoria. In all instances, properties were subject to the recommended protocol of quarantine, carcass incineration, site disinfection and vaccination of in-contact animals. All movements from affected properties were traced to ensure that relevant product did not enter the export and domestic food chains. During 2008, an 'animal side' immunochromatographic test was used as a rapid anthrax screening test to investigate sudden ruminant deaths. The results of this testing were consistent with confirmatory blood cultures and will continued to be used in Victoria.[64]

Australian bat lyssavirus and lyssavirus (NEC) infections

No cases of either ABL or lyssavirus (NEC) infections were notified during 2008. Only 2 known cases of ABL infection in humans have been reported in Australia, in 1996 and 1998. Both cases occurred after close contact with an infected bat and both cases were fatal.[21]

Surveillance indicates ABL is and may have been present in Australian bats for at least 15 years prior to its first detection. Sick and injured bats (opportunistic specimens) and change in seasonality and bat ecology pose an increased public health risk.[68] However, bat testing conducted by the Australian Wildlife Health Network between January and December 2008 yielded no ABL detections compared with 8 detections in bats during 2007.[69]

Brucellosis

Brucellosis is mainly an occupational disease for farm workers, veterinarians, and abattoir workers who work with infected animals or their tissues.[70] However, the most common source of human infection in Australia is from infected feral pigs and inadequate measures by feral pig hunters to prevent brucellosis infection.[71]

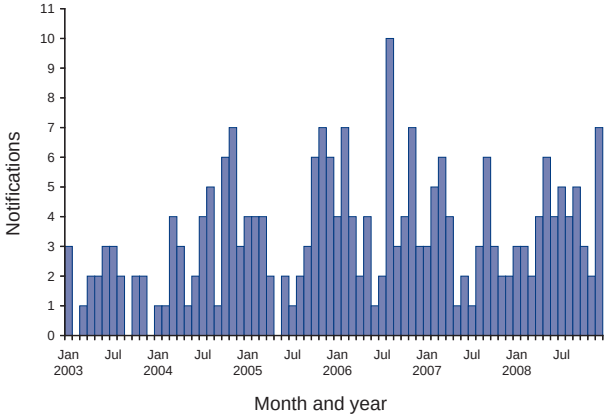
Several *Brucella* species can infect both animals and humans. Infections that can cause illness in humans include *Brucella melitensis* from sheep and goats, *Brucella suis* from pigs and *Brucella abortus* from cattle.

In 2008, 48 cases of brucellosis were reported to the NNDSS; a national notification rate of 0.2 per 100,000 population. Queensland reported 46 cases, with New South Wales reporting the remaining 2 cases. There has been little change in the number of notifications of brucellosis over the last 6 years (Figure 64). The national notification rate for brucellosis was the same in 2008 as in 2007. The majority of cases were male (38) and aged between 15 and 49 years (40).

Species data were available for 14% of notifications (7) and all of these were *B. suis* (all from Queensland).

Bovine brucellosis (*B. abortus*) was eradicated from the Australian cattle herd in 1989 and is presently considered an exotic animal disease in Australia.[64]

Figure 64: Notifications of brucellosis, Australia, 2003 to 2008, by month and year of diagnosis



Caprine and ovine brucellosis (caused by *B. melitensis*) have never been reported in Australian sheep or goats. [64] Swine brucellosis (caused by *B. suis*) is confined to small areas of Queensland, where it occurs in feral pigs, with human cases predominantly seen in recreational feral pig hunters.[64,71] Swine brucellosis was not detected in any of Queensland's domestic piggeries during 2008.[64]

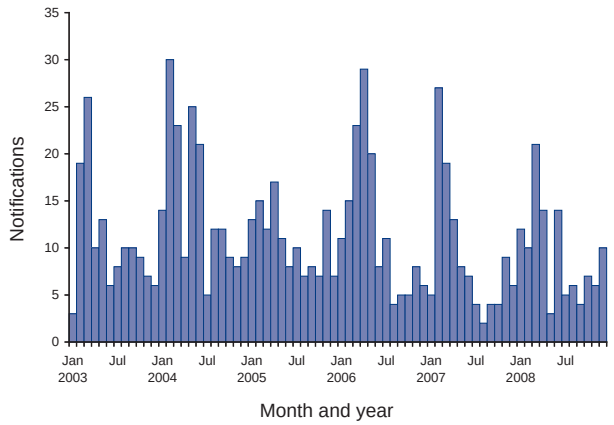
Leptospirosis

Leptospirosis is caused by spirochaetes of the genus, *Leptospira,* which are found in the renal tubules of wild and domestic animals. In affected areas, where there is exposure to infected urine of domestic and wild animals, this disease can be an occupational and recreational hazard (such as swimming or wading in contaminated water).[17]

Between 2003 and 2008 leptospirosis notifications ranged annually from 108 (2007) to 177 (2004), with 112 notifications in 2008 (0.5 per 100,000 population). Cases were reported in all jurisdictions except for the Australian Capital Territory, South Australia and Tasmania (Figure 65). In 2008, the majority of notifications were from Queensland (89 notifications, 2.1 per 100,000 population). Ninety-two per cent of leptospirosis cases were male (103 notifications) and 58% of all cases were aged between 20 and 39 years (65 notifications).

The WHO/FAO/OIE Collaborating centre for reference and research on leptospirosis provides an annual surveillance report of leptospirosis cases in 2008. The most frequently identified leptospirosis serovars in 2008 were Arborea, Zanoni and Hardjo. Serovar Arborea was the most frequently reported during 2008, accounting for 24 (21%) of all notifications and was an increase from 8 (8%) notifications in 2007.[72]

Figure 65: Notifications of leptospirosis, Australia, 2003 to 2008, by month and year of onset

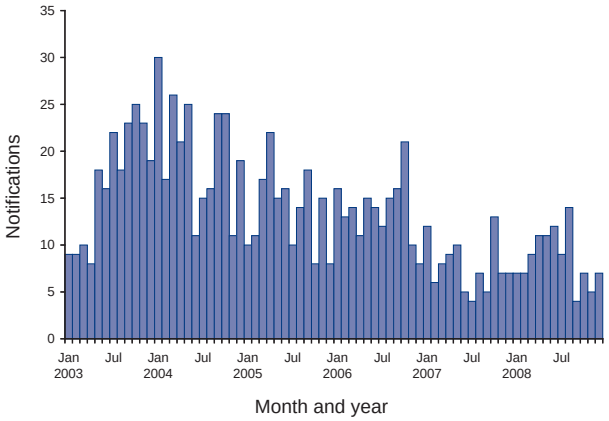


Ornithosis

Ornithosis is caused by infection with the bacteria *Chlamydia psittaci* and is transmitted to humans by exposure to waterfowl, seabirds, shore birds, pigeons and doves and many psittacine birds. Birds can become carriers of the disease without becoming infected. The mode of transmission to humans is by inhaling bacteria usually from contaminated dried faeces, nasal or eye secretions and dust from infected birds.[17] Person-to-person transmission is rare.

In 2008, there were 103 ornithosis infections notified to NNDSS, corresponding to a national rate of 0.5 per 100,000 population. This was similar to the 2007 rate of 0.4 per 100.000 population. Between 2003 and 2008, the annual number of ornithosis notifications ranged from 239 (2004) to 93 (2007) (Figure 66).

Figure 66: Notifications of ornithosis, Australia, 2003 to 2008, by month and year of diagnosis



Victoria had the highest number of notifications (53 notifications, 1.0 per 100,000 population). Notifications were also received from New South Wales (41 cases), Western Australia (6 cases) and Queensland (3 cases). Forty-seven per cent of the notifications in 2008 were male (48 notifications) compared to 2007 where the majority of cases were male (64%). All cases were aged 10 years or over and 83% of cases were aged 40 years or over (Figure 67).

People at risk of contracting ornithosis include bird owners, pet shop employees, veterinarians, poultry processing workers, zoo workers and taxidermists. Older adults and pregnant women may have a more severe illness.[73]

Figure 67: Notifications of ornithosis, Australia 2008, by age group and sex

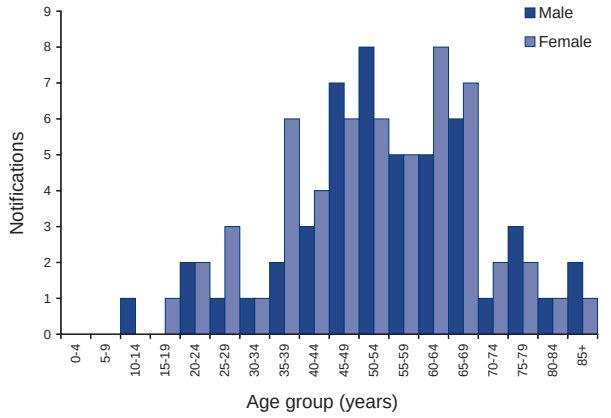
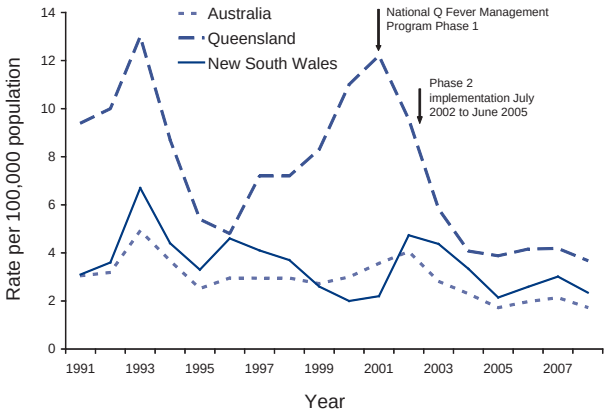


Figure 68: Notification rate for Q fever, Australia, New South Wales and Queensland, 1991 to 2008



Q fever

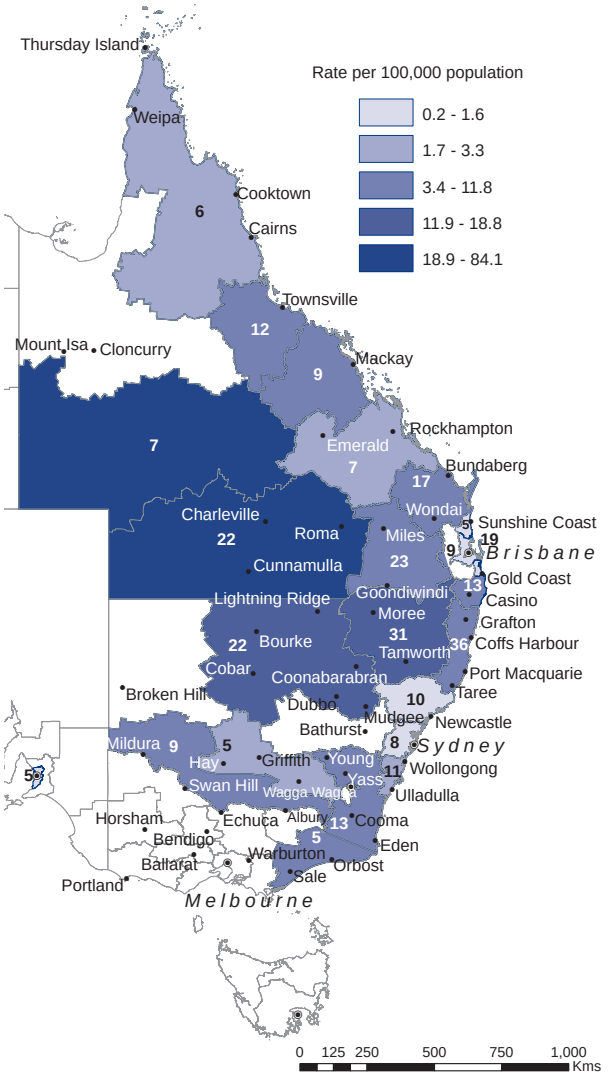
Q fever is caused by infection with the bacteria, *Coxiella burnetii*. Primary reservoirs of these bacteria are cattle, sheep and goats. These organisms are resistant to heat, drying and many common disinfectants, which enables the bacteria to survive for long periods in the environment. The mode of transmission to humans is most commonly by the airborne route through inhalation of contaminated dust, but it can also occur though direct contact with infected animals and other contaminated material. Humans are often very susceptible to the disease, and very few organisms may be required to cause infection. Person to person transmission is rare.[17]

In 2008, 370 cases of Q fever were notified to the NNDSS, corresponding to a national rate of 1.7 per 100,000 population (Figure 68). Between 1991 and 2001, and prior to the introduction of the National Q Fever Management Program, Q fever notification rates ranged between 2.5 per 100,000 population and 4.9 per 100,000 population. The national notification rate for Q fever was lower in 2008 than in 2007 (1.7 and 2.1, respectively). Between 2003 and 2008, the annual number of Q fever notifications ranged from 560 (2003) to 351 (2005).

The highest notification rates were from Queensland (158 notifications, 3.7 per 100,000 population) and New South Wales (164 notifications, 2.3 per 100,000 population). On a regional basis, the South West Statistical Division of Queensland had the highest notification rate of 84 per 100,000 population (Map 4).

The highest age specific rates of Q fever for males was in the 55–59 year age group (32 notifications, 5.0 per 100,000 population), and for females in the 60–64 year age group (2.1 per 100,000

Map 4: Notification rates for Q fever in Queensland, New South Wales and Victoria, by Statistical Division of residence



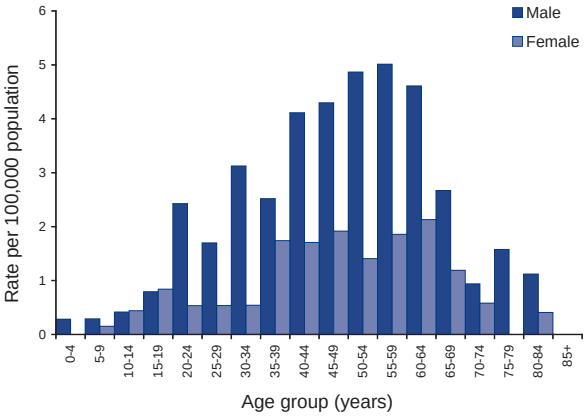
* Numbers shown in the Statistical Divisions represent the count of notifications.

Notification rates in geographic areas where estimated residential population and case numbers are small should be interpreted with caution.

population) (Figure 69). There were 11 notifications aged less than 15 years and 71% of notifications were male (264 cases).

Adults at risk of Q fever infection, including abattoir workers, farmers, veterinarians, stockyard workers, shearers and animal transporters should be considered for vaccination. The administration of the Q fever vaccine requires a pre-vaccination screening test to exclude those recipients with a previous (unrecognised) exposure to the organism. A Q fever vaccine may cause an adverse reaction in a person who has already been exposed to the bacterium. Vaccine is not recommended for children under 15 years of age.[11]

Figure 69: Notification rate for Q fever, Australia, 2008, by age group and sex



Tularaemia

Tularaemia is caused by infection with the bacteria *Francisella tularaensis.* The most common modes of transmission are through arthropod bites, handling infected animals, inhalation of infectious aerosols or exposure to contaminated food or water. Small mammals such as rodents, rabbits and hares are often the reservoir host.[74]

There were no notifications of tularaemia in 2008, and there has never been a case notified in Australia.

Other bacterial infections

Legionellosis, leprosy, meningococcal infection and tuberculosis were notifiable in all states and territories in 2008 and classified as 'other bacterial infections' in the NNDSS. A total of 1,795 notifications were included in this group in 2008, which accounted for 1.1% of all the notifications to NNDSS, a similar total and proportion as in 2007 (1,799 notifications and 1.2% of total).

Legionellosis

Legionellosis includes notifications of infections caused by all *Legionella* species that meet the national surveillance case definition. There were 271 notifications of legionellosis reported in 2008, corresponding to a national rate of 1.3 notifications per 100,000 population. This was an 11% decrease from the 306 notifications reported in 2007 (1.5 per 100,000 population). State and territory notification rates ranged from 0.2 notifications per 100,000 population in Tasmania to 3.2 notifications per 100,000 population in Western Australia.

In 2008, the largest number of legionellosis notifications were diagnosed in May (31 notifications, 11%) and December (27 notifications, 10%) (Figure 70). As observed in previous years, the largest number of notifications of *L. longbeachae* in 2008 occurred in the spring months (Figure 71). In previous years *L. pneumophila* notifications have peaked in autumn and spring, however, in 2007 and 2008 these peaks have occurred slightly later, in late autumn and summer.[75, 76]

In 2008, males accounted for 184 (68%) of the 271 notifications of legionellosis resulting in a male to female ratio of 2.1:1. There were no notifications in people under the age of 19 years. Overall, the age group with the highest notification rate was the 75–79 year age group (4.9 per 100,000 population, 27 notifications). The highest age and sex specific rates were observed in men aged 70–74 years (7.5 per 100,000 population, 24 notifications) and women aged 75–79 years (3.4 per 100,000 population, 10 notifications) (Figure 72). An infecting species analysis by age group shows that 92% of *L. longbeachae* notifications were reported in persons 45 years or older and is most predominant in the 75–79 year age group with 19 notifications (3.5 per 100,000 population). The proportion of *L. pneumophila* infections in persons aged 45 years or older was 82% and is most predominant in the 70–74 year age group with 12 notifications (1.8 per 100,000 population).

Data on the causative species were available for 260 (96%) of the legionellosis notifications: 158 (58%) were *L. longbeachae,* 97 (36%) were identified as *L. pneumophila* and 4 (1.5%) were *L. micdade*i or *L. bozemanii*. One notification was a co-infection of *L. longbeachae* and *L. bozemanii* (Table 17).

Figure 70: Notifications of legionellosis, Australia, 2004 to 2008, by month of diagnosis

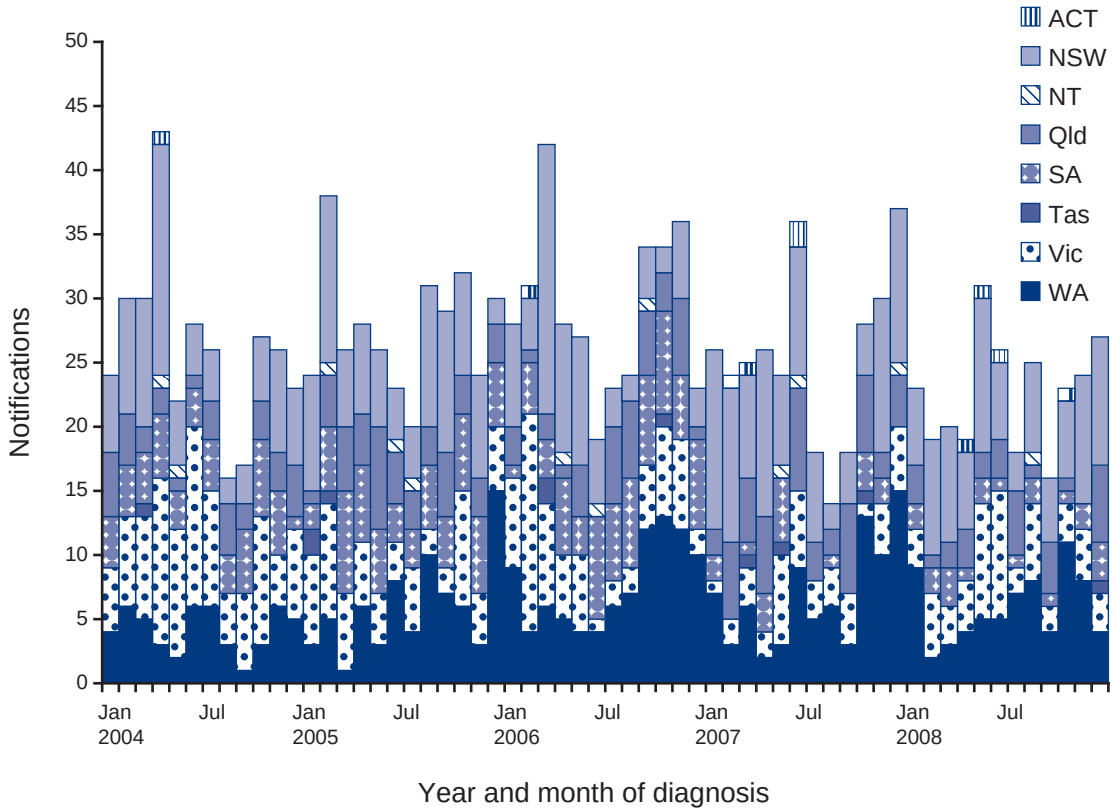


Figure 71: Notifications of legionellosis, Australia, 2004 to 2008, by month of diagnosis and species

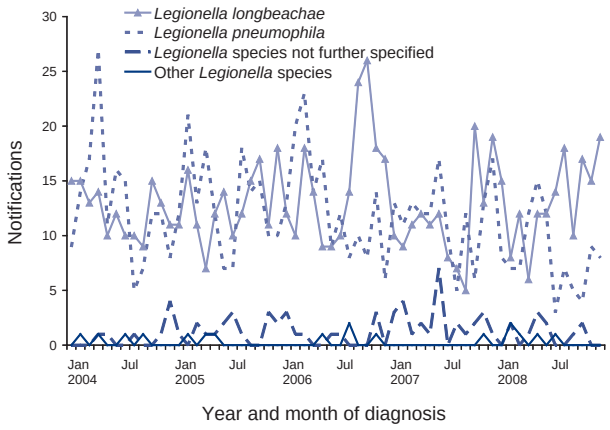
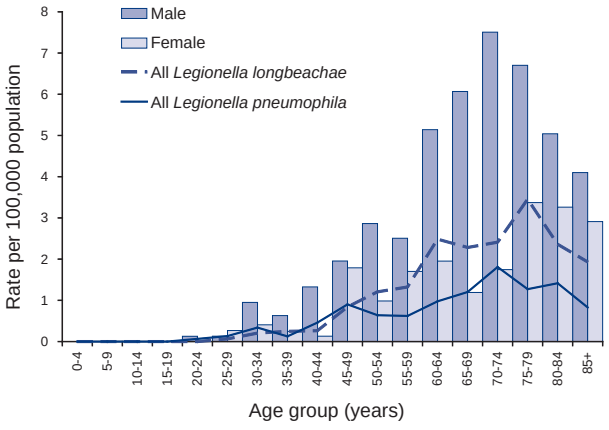


Figure 72: Notification rates of legionellosis, Australia, 2008, by age group and sex



Of the 97 *L. pneumophila* notifications, 56 (58%) were serogroup 1, 2 (2%) were serogroup 2 and 34 (35%) were reported without serogroup data.

Historically, there have been differences in the geographic distribution of *L. longbeachae* and *L. pneumophila*, with *L. longbeachae* making up the majority of species in notifications from South Australia and Western Australia, while *L. pneumophila* has been the most common infecting species in the eastern states (Queensland, New South Wales and Victoria). However, in 2008 *L. longbeachae* notifications were more common in the eastern states of Queensland and New South Wales than notifications of *L. pneumophila*.

Seven notifications of *L. pneumophila* serogroup 1 infection with disease onset dates between 11 April and 10 May 2008 were associated with an outbreak at a suburban car wash in Victoria. A molecular analysis indicated a microbiological link between isolates recovered from 2 patient

Table 17: Notifications of legionellosis, 2008, by species and state or territory

Species	State or territory								Total (%)
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust	
*Legionella longbeachae**	0	51	0	17	18	1	8	63	158	58.3
Legionella pneumophila	0	37	1	12	2	0	40	5	97	35.8
Legionella micdadei†	0	0	0	0	0	0	2	1	3	1.1
Legionella bozemanii	0	0	0	0	1	0	0	0	1	0.4
Legionella longbeachae and *bozemanii*	0	0	0	0	0	0	1	0	1	0.4
Unknown species	4	1	0	2	0	0	3	1	11	4.1
Total	4	89	1	31	21	1	54	70	271	100

* Four deaths.

† One death.

specimens and water samples from the car wash. A further 4 cases of *L. pneumophila* serogroup 1 notified during the period were residents of adjacent local government areas in Melbourne's southern suburbs although no definitive source for, or links between, these or any other cases notified in the 2nd quarter of 2008 were identified.[77]

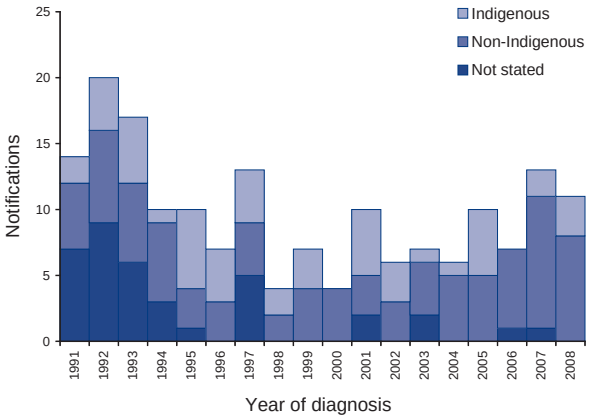
Mortality data were available for 134 (49%) notifications. There were 5 reported deaths due to legionellosis in Australia in 2008, which was similar to 2007. The age range for the deaths was between 59 and 92 years (median age being 79 years); all deaths were in males. There were 4 deaths associated with *L. longbeachae* infection and 1 death was associated with *L. micdadei* (Table 17). Mortality data should be interpreted with caution given the large proportion of cases without details of death outcomes, and the variability across jurisdictions to report legionellosis to the NNDSS as the primary and secondary cause of death.

Leprosy

Leprosy is a chronic infection of the skin and peripheral nerves caused by the bacterium *Mycobacterium leprae*. Leprosy is a rare disease in Australia, with the majority of cases occurring amongst migrants to Australia from leprosy-endemic countries and occasional locally-acquired cases from Indigenous communities. Trends in the numbers of leprosy notifications in Indigenous and non-Indigenous Australians are shown in Figure 73.

In 2008, 11 leprosy notifications were received compared with 13 in 2007. There were 4 notifications in New South Wales, 2 notifications each in Queensland, Victoria and Western Australia and 1 notification in the Northern Territory.

Figure 73: Notifications of leprosy in Indigenous and non-Indigenous Australians, 1991 to 2008



Eight notifications occurred in men and three in women. Three notifications were identified as Indigenous Australians. The age range of notified cases was 25–79 years (median 41 years).

Invasive meningococcal disease

Historically, in Australia, *Neisseria meningitidis* serogroups B and C have been the major cause of invasive meningococcal disease (IMD). There has been a marked decrease in rates for IMD due to *N. meningitidis* serogroup C infections following the introduction of the National Meningococcal C Vaccination Program by the Australian Government in 2003. In 2008, coverage of children aged 12 months immunised with meningococcal serogroup C vaccine reached 92.6% (data provided by the National Centre for Immunisation Research and Surveillance).

In 2008, there were 286 notifications of IMD, a 7% decrease from the 306 notifications in 2007,

and the lowest number of notifications since 1996. Since 2003, the notification rates have decreased from 2.8 notifications per 100,000 populations to 1.3 notifications per 100,000 population in 2008.

In 2008, males accounted for 53% of IMD notifications (153 notifications), giving a male to female ratio of 1.1:1. The largest number of notifications was diagnosed in July (Figure 74). The majority of notifications (275 notifications, 96%) were laboratory confirmed, through the isolation of *Neisseria meningitidis or* detection of specific meningococcal DNA sequences through nucleic acid amplification. There were an additional 11 notifications (4%) reported as probable diagnosis, based on clinical symptoms only.

Of the 286 IMD notifications in 2008, 221 (77%) were caused by serogroup B organisms, 21 (7%) were serogroup C, 8 (3%) were serogroup W135, 7 (2%) were serogroup Y, and 29 (10%) were reported with an unknown serogroup (Table 18). Serogroup C infections were confined to the eastern seaboard states; New South Wales, Queensland and Victoria. In comparison, in 2007 of 306 notifications, 212 (69%) were serogroup B, 20 (7%) were serogroup C and 43 (14%) were reported with an unknown serogroup.

The highest age specific IMD notification rate in 2008 was in children aged 0–4 years (7.2 notifications per 100,000 population). Of the notifications reported in this age group, 85% were serogroup B, this was also the age group with the highest age specific rate for serogroup B infection (6.1 notifications per 100,000 population).

Although there is no vaccine available to protect against serogroup B infections in Australia, the notification rates for IMD due to serogroup B infections has declined in most age groups over the period 2003 to 2008 (Figure 75). The highest notification rate for serogroup B infections was 6.1 notifications per 100,000 population in the 0–4 year age group (84 notifications) in 2008. This represents a 34% decline from the rate in 2003 (9.5 per 100,000 population, 121 notifications). The serogroup B notification rate in the 5–9 year age group saw a 54% decline in the notification

Figure 74: Trends in notification rates of invasive meningococcal disease, Australia, 2003 to 2008, by month of diagnosis and serogroups B and C

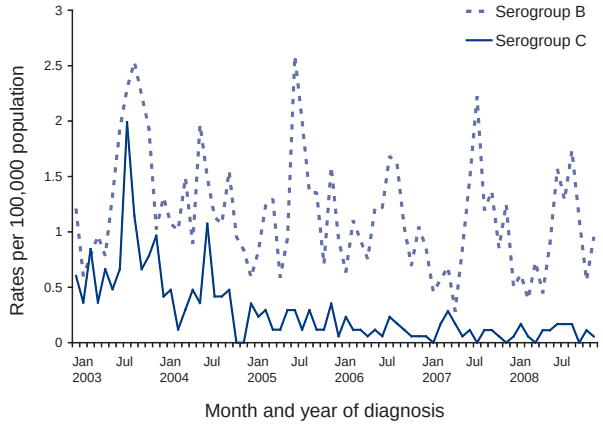


Figure 75: Notification rate for serogroup B invasive meningococcal disease, Australia, 2003 – 2008, by select age group

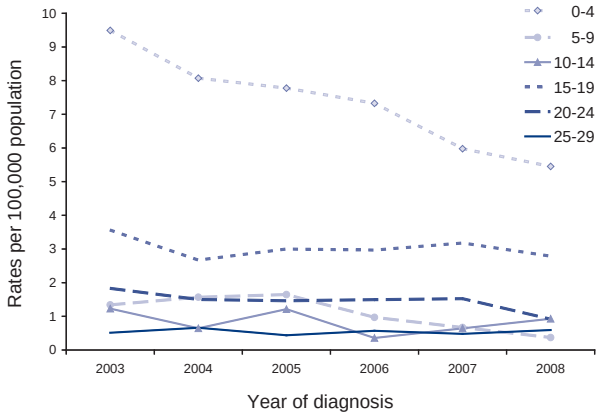


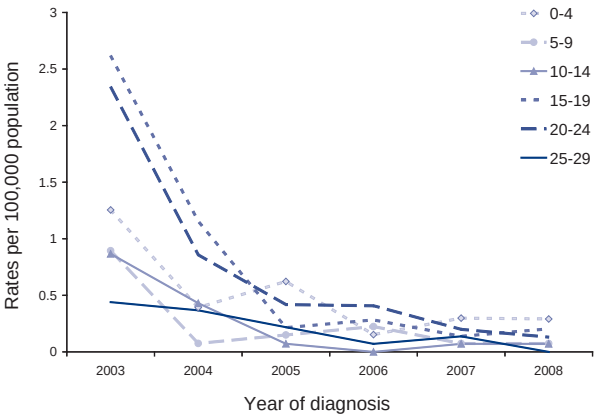
Table 18: Notifications of invasive meningococcal disease, Australia, 2008, by serogroup and state or territory

Serogroup	State or territory									Total (%)
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust	
Serogroup B	2	50	4	72	19	1	50	23	221	77.3
Serogroup C	1	9	4	5	0	0	2	0	21	7.3
Serogroup W135	0	5	0	2	1	0	0	0	8	2.8
Serogroup Y	0	3	0	1	0	0	3	0	7	2.4
Unknown serogroup	0	14	0	5	0	0	9	1	29	10.1
Total	3	81	8	85	20	1	64	24	286	100.0

rate from 1.3 per 100,000 population (18 notifications) in 2003 to 0.6 per 100,000 population (8 notifications) in 2008.

Notification rates for IMD due to serogroup C infections remained low in all age groups in 2008 (Figure 76). Since 2003, the largest decline has been in the 20–24 year age group with 0.1 notifications per 100,000 population (2 notifications) in 2008 compared with 2.3 notifications per 100,000 population (32 notifications) in 2003; an overall decline of 94.4%. The notification rate in the 15–19 year age group fell from 2.6 notifications per 100,000 population (36 notifications) to 0.2 notifications per 100,000 populations (3 notifications) over the same period; a 92.2% decline. Rates in the 0–4 year age group fell from 1.3 notifications per 100,000 population in 2003 (16 notifications) to 0.3 notifications per 100,000 population (4 notifications) in 2008.

Figure 76: Notification rate for serogroup C invasive meningococcal disease, Australia, 2003 to 2008, by select age group



Mortality data for IMD were available for 145 notifications (51%). Of these notifications, there were 7 deaths (6 serogroup B and 1 serogroup C) due to IMD in 2008. This was a decrease from 9 deaths in 2007 (mortality data were provided for 40% of notifications in 2007). Mortality data should be interpreted with caution given the large proportion of cases without details of death outcomes, and the variability across jurisdictions to report meningococcal to the NNDSS as the primary and secondary cause of death.

Laboratory based meningococcal disease surveillance

The Australian Meningococcal Surveillance Program (AMSP) was established in 1994 for the purpose of monitoring and analysing isolates of *Neisseria meningitidis* from cases of IMD in Australia. The program is undertaken by a network of reference laboratories in each state and territory, using agreed standard methodology to determine the phenotype (serogroup, serotype and serosubtype) and the susceptibility of *N. meningitidis* to a core group of antibiotics. The results of laboratory surveillance in 2008 have recently been published.[78]

In 2008, there were 260 laboratory confirmed cases of IMD. Consistent with the NNDSS data, the AMSP reported that 85% were identified as serogroup B (223 notifications) and 6.5% (17 notifications) were serogroup C. No evidence of meningococcal capsular 'switching' was detected. About three-quarters of all isolates showed decreased susceptibility to the penicillin group of antibiotics (MIC 0.06 to 0.5 mg/L). All isolates remained susceptible to ceftriaxone. One isolate had reduced susceptibility to rifampicin and two had reduced susceptibility to ciprofloxacin.

Tuberculosis

While Australia has one of the lowest rates of tuberculosis in the world, the disease remains a public health problem in the overseas-born and Indigenous communities. In 2008, 1,228 TB notifications were received by the NNDSS, corresponding to a rate of 5.7 notifications per 100,000 population. In 2007 there were 1,174 notifications (5.6 per 100,000 population). The notification rate of TB was higher than the national average in the Northern Territory (14.6 notifications per 100, 000 population), New South Wales (7.2 per 100,000 population), and Victoria (7.1 per 100,000 population. The lowest rate occurred in Tasmania (1.6 per 100,000 population).

Further details and analysis of TB notifications can be found in the tuberculosis annual report series to be published in *CDI.*

Acknowledgements

The authors wish to thank the following people for their contribution to this report.

Alison Milton, Office of Health Protection

Timothy Sloan-Gardner, Office of Health Protection

Katrina Choi, Department of Health and Ageing

Alice Knight, Department of Health and Ageing

Rebecca Hundy, ACT Health

Andrew Marich, NSW Department of Health

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Stacey Rowe, Department of Health Victoria

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Appendices

Appendix 1: Mid-year estimate of Australian population, 2008, by state or territory

	State or territory								Aus
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Male	171,348	3,460,125	113,997	2,145,760	791,597	245,374	2,631,983	1,099,406	10,660,917
Female	174,203	3,524,047	105,821	2,148,155	811,764	252,155	2,681,840	1,071,791	10,770,864
Total	345,551	6,984,172	219,818	4,293,915	1,603,361	497,529	5,313,823	2,171,197	21,431,781

Source: ABS 3201.0 Population by Age and Sex, Australian States and Territories. June 2008 population (http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3201.0Jun%202006)

Appendix 2: Mid-year estimate of Australian population, 2008, by state or territory and age group

Age group	State or territory								Aus
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
0–4	22,447	439,634	18,093	287,674	94,284	32,096	337,862	143,035	1,375,267
5–9	20,442	439,831	17,498	282,088	94,738	31,288	323,326	138,804	1,348,195
10–14	21,266	452,389	16,708	294,786	100,898	33,735	336,313	146,014	1,402,314
15–19	24,329	474,627	16,448	301,727	107,266	34,434	359,433	152,736	1,471,149
20–24	29,997	486,691	17,841	307,406	111,205	30,867	388,120	158,314	1,530,590
25–29	29,628	495,230	19,335	301,693	102,800	28,143	382,295	153,672	1,512,964
30–34	26,479	485,117	18,303	292,684	99,902	28,486	372,839	149,033	1,472,985
35–39	26,904	515,115	18,247	321,871	112,778	33,788	404,328	165,120	1,598,345
40–44	24,527	485,845	16,266	303,718	113,083	33,626	379,466	159,104	1,515,862
45–49	25,037	504,069	15,867	309,680	117,724	37,455	380,389	159,968	1,550,374
50–54	22,655	457,946	14,012	278,797	109,699	35,316	344,862	145,943	1,409,430
55–59	20,670	415,275	11,766	257,900	102,509	33,367	311,919	131,309	1,284,914
60–64	16,712	369,600	8,260	227,457	90,800	30,228	274,503	109,724	1,127,395
65–69	11,075	275,791	5,070	164,403	67,560	22,420	205,834	79,854	832,096
70–74	8,167	225,166	2,803	124,075	55,671	17,666	167,956	61,904	663,447
75–79	6,253	189,367	1,654	99,347	48,373	14,358	141,332	49,443	550,149
80–84	4,923	146,665	984	74,418	39,642	10,929	109,915	36,381	423,860
85+	4,040	125,814	663	64,191	34,429	9,327	93,131	30,839	362,445
Total	345,551	6,984,172	219,818	4,293,915	1,603,361	497,529	5,313,823	2,171,197	21,431,781

Source: ABS 3201.0 Population by Age and Sex, Australian States and Territories. June 2008 population (http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3201.0Jun%202006)

Appendix 3: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2008, by notifiable disease*

Disease	Aboriginal but not TSI origin	TSI but not Aboriginal origin	Aboriginal and TSI origin	Not Indigenous	Not stated	Blank/ missing	Total	% complete	Number complete	Number incomplete
Donovanosis	2	0	0	0	0	0	2	100.0	2	0
Leprosy	3	0	0	8	0	0	11	100.0	11	0
Measles	0	0	0	65	0	0	65	100.0	65	0
Tetanus	0	0	0	4	0	0	4	100.0	4	0
Kunjin virus infection	0	0	0	1	0	0	1	100.0	1	0
Tuberculosis	32	2	1	1,170	23	0	1,228	98.1	1,205	23
Meningococcal infection	18	3	1	254	10	0	286	96.5	276	10
Haemophilus influenzae type b	3	0	0	21	1	0	25	96.0	24	1
Syphilis < than 2 years duration	180	0	3	1059	57	1	1,300	95.5	1,242	58
Typhoid	0	1	0	98	6	0	105	94.3	99	6
Hepatitis A	3	0	0	242	30	1	276	88.8	245	31
Hepatitis C (incident)	37	0	0	298	42	4	381	87.9	335	46
Haemolytic uraemic syndrome	1	1	0	25	4	0	31	87.1	27	4
Varicella zoster (chickenpox)	124	6	6	1,418	190	46	1,790	86.8	1,554	236
Legionellosis	3	0	0	231	37	0	271	86.3	234	37
Syphilis – congenital	2	0	0	4	1	0	7	85.7	6	1
Pneumococcal disease (invasive)	141	4	3	1,201	279	1	1,629	82.8	1,349	280
Shigellosis	310	2	2	361	149	4	828	81.5	675	153
Varicella zoster (shingles)	68	4	6	1,803	365	63	2,309	81.5	1,881	428
Hepatitis B (incident)	19	1	0	179	46	0	245	81.2	199	46
Malaria	3	6	1	421	102	0	533	80.9	431	102
Listeriosis	0	0	1	53	14	0	68	79.4	54	14
Mumps	110	0	0	110	66	0	286	76.9	220	66
Hepatitis E	0	0	0	33	11	0	44	75.0	33	11
STEC / VTEC	2	1	0	75	28	0	106	73.6	78	28
Gonococcal infection	3,281	133	56	2,057	2,193	3	7,723	71.6	5,527	2,196
Ornithosis	0	0	0	73	30	0	103	70.9	73	30
Rubella	0	0	0	25	12	0	37	67.6	25	12
Dengue	9	4	0	361	181	3	558	67.0	374	184

Appendix 3: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2008, by notifiable disease,* *continued*

Disease	Aboriginal but not TSI origin	TSI but not Aboriginal origin	Aboriginal and TSI origin	Not Indigenous	Not stated	Blank/ missing	Total	% complete	Number complete	Number incomplete
Q fever	8	0	1	237	124	0	370	66.5	246	124
Leptospirosis	4	1	1	65	41	0	112	63.4	71	41
Syphilis > 2 years or unspecified duration	322	8	7	794	809	0	1,940	58.3	1,131	809
Hepatitis D	6	0	0	17	19	0	42	54.8	23	19
Pertussis	435	10	13	7,292	6,757	9	14,516	53.4	7,750	6,766
Cholera	0	0	0	2	1	1	4	50.0	2	2
Salmonellosis	377	13	12	3,713	4,069	126	8,310	49.5	4,115	4,195
Chlamydial infection	4,763	581	199	22,624	27,821	2496	58,484	48.2	28,167	30,317
Cryptosporidiosis	163	0	4	797	1,017	24	2,005	48.1	964	1,041
Campylobacteriosis	190	4	6	6,979	7,870	486	15,535	46.2	7,179	8,356
Hepatitis B (unspecified)	262	36	10	2,357	3,918	17	6,600	40.4	2,665	3,935
Hepatitis C (unspecified)	561	8	21	3,823	6,404	121	10,938	40.3	4,413	6,525
Brucellosis	2	0	0	17	29	0	48	39.6	19	29
Influenza (laboratory confirmed)	237	8	7	3,181	5,432	272	9,137	37.6	3,433	5,704
Arbovirus infection (NEC)	0	0	0	10	18	0	28	35.7	10	18
Ross River virus infection	86	9	5	1,776	3,518	257	5,651	33.2	1,876	3,775
Varicella zoster (unspecified)	64	4	8	1,219	2,967	165	4,427	29.3	1,295	3,132
Barmah Forest virus infection	35	2	2	449	1,545	69	2,102	23.2	488	1,614

* Indigenous status is usually obtained from medical notification and completeness varies by disease and by state and territory. This reflects differences in notification requirements (i.e. depending on the jurisdiction, some diseases are primarily or completely notified by pathology laboratories rather than clinicians) and the fact that it is not possible to follow-up all cases for diseases with a large volume of notifications and/or not requiring specific case-based public health action.

TSI Torres Strait Islander

Abbreviations

7vPCV	7 valent pneumococcal conjugate vaccine
23vPPV	23 valent pneumococcal polysaccharide vaccine
ABL	Australian bat lyssavirus
ABS	Australian Bureau of Statistics
AFP	acute flaccid paralysis
AGSP	Australian Gonococcal Surveillance Programme
AIDS	acquired immunodeficiency syndrome
AMSP	Australian Meningococcal Surveillance Programme
ANCJDR	Australian National Creutzfeldt-Jakob Disease Registry
BFV	Barmah Forest virus
CDI	Communicable Diseases Intelligence
CDNA	Communicable Diseases Network Australia
CJD	Creutzfeldt-Jakob disease
DENV	dengue virus
Hib	*Haemophilus influenzae* type b
HIV	human immunodeficiency virus
HPAIH	highly pathogenic avian influenza in humans
HUS	haemolytic uraemic syndrome
IMD	invasive meningococcal disease
IPD	invasive pneumococcal disease
JEV	Japanese encephalitis virus
KUNV	Kunjin virus
MMR	measles-mumps-rubella
MVEV	Murray Valley encephalitis virus
NAMAC	National Arbovirus and Malaria Advisory Committee
NCHECR	National Centre in HIV Epidemiology and Clinical Research
NEC	not elsewhere classified
NIP	National Immunisation Program
NN	not notifiable
NNDSS	National Notifiable Diseases System
NPRL	National Polio Reference Laboratory
NSC	National Surveillance Committee
PCR	polymerase chain reaction
RRV	Ross River virus
SARS	severe acute respiratory syndrome
SD	Statistical Division
SSD	Statistical Subdivision
STEC	Shiga toxin-producing *Escherichia coli*
STI(s)	sexually transmissible infections(s)
TB	tuberculosis
VPD(s)	vaccine preventable disease(s)
VTEC	verotoxigenic *Escherichia coli*
WHO	World Health Organization
WPR	Western Pacific Region
WPV	wild-type polio virus

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Communicable Diseases Network Australia and subcommittees
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Australian Gonococcal Surveillance Programme
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Australian Sentinel Practice Research Network
Australian Quarantine Inspection Service
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