Annual reports

Australia's notifiable diseases status, 2006: Annual report of the National Notifiable Diseases Surveillance System

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Australian Childhood Immunisation Register

Australian Gonococcal Surveillance Programme

Australian Meningococcal Surveillance Programme

Australian Sentinel Practice Research Network

Australian Quarantine Inspection Service

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Abstract

In 2006, 66 diseases and conditions were nationally notifiable in Australia. States and territories reported a total of 138,511 cases of communicable diseases to the National Notifiable Diseases Surveillance System: an increase of 10.4% on the number of notifications in 2005. In 2006, the most frequently notified diseases were sexually transmissible infections (57,941 notifications, 42% of total notifications), gastrointestinal diseases (27,931 notifications, 20% of total notifications) and vaccine preventable diseases (22,240 notifications, 16% of total notifications). There were 19,111 notifications of blood-borne diseases; 8,606 notifications of vectorborne diseases; 1,900 notifications of other bacterial infections; 767 notifications of zoonoses and 3 notifications of quarantinable diseases. *Commun Dis Intell* 2008;32:139–207.

Keywords: Australia, communicable diseases, epidemiology, surveillance

Introduction

Australia's notifiable diseases status 2006, is an annual surveillance report of nationally notifiable communicable diseases. Communicable disease surveillance in Australia operates at the national, state and local levels. Primary responsibility for public health action lies with the state and territory health departments. The role of communicable disease surveillance at a national level includes:

- identifying national trends;
- guidance for policy development and resource allocation at a national level;
- monitoring the need for and impact of national disease control programs;
- coordination of response to national or multi-jurisdictional outbreaks;
- description of the epidemiology of rare diseases, that occur infrequently at state and territory levels;

- meeting various international reporting requirements, such as providing disease statistics to the World Health Organization (WHO), and;
- support for 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 2006, the Australian Government Department of Health and Ageing (DoHA) did not have any legislated responsibility for public health apart from human quarantine. States and territories voluntarily forwarded data on a nationally agreed set of communicable diseases to DoHA for the purposes of national communicable disease surveillance.

Sixty-six communicable diseases (Table 1) agreed upon nationally through the Communicable Diseases Network Australia (CDNA) were reported to the National Notifiable Diseases Surveillance System (NNDSS). The system was complemented by other surveillance systems, which provided information on various diseases, including some that are not reported to NNDSS.

The national dataset included fields for unique record reference number; notifying state or territory; disease code; age; sex; indigenous status; postcode of residence; date of onset of the disease; death, date of report to the state or territory health department and outbreak reference (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 was collected. While not included in the national dataset, additional information concerning mortality and specific health risk factors for some diseases was obtained from states and territories.

Notification rates for each notifiable disease were calculated using 2006 mid-year resident population supplied by the Australian Bureau of Statistics (Appendixes 1 and 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 the indirect method of standardisation, with 2001 census data as the standard population.

The geographical distribution of selected diseases was mapped using ARCGIS software. Maps were based on the postcode of residence of each patient, aggregated to the appropriate Statistical Division (Map 1). Rates for the different Statistical Divisions were ordered into 6 groups — the highest value, the lowest value above zero, those equal to zero, and the intermediate values sorted into 3 equal-sized groups. The Statistical Divisions in the Australian Capital Territory were combined to calculate rates for the territory as a whole.

Information from communicable disease surveillance is disseminated through several avenues of communication. At the fortnightly teleconferences of the CDNA the most up-to-date information on topics of interest to the network is provided. The *Communicable Diseases Intelligence* (*CDI*) quarterly journal publishes surveillance data and reports of research studies on the epidemiology and control of various communicable diseases. Disease surveillance summaries from the NNDSS are published on the Communicable Diseases Surveillance section of DoHA's web site.

Notes on interpretation

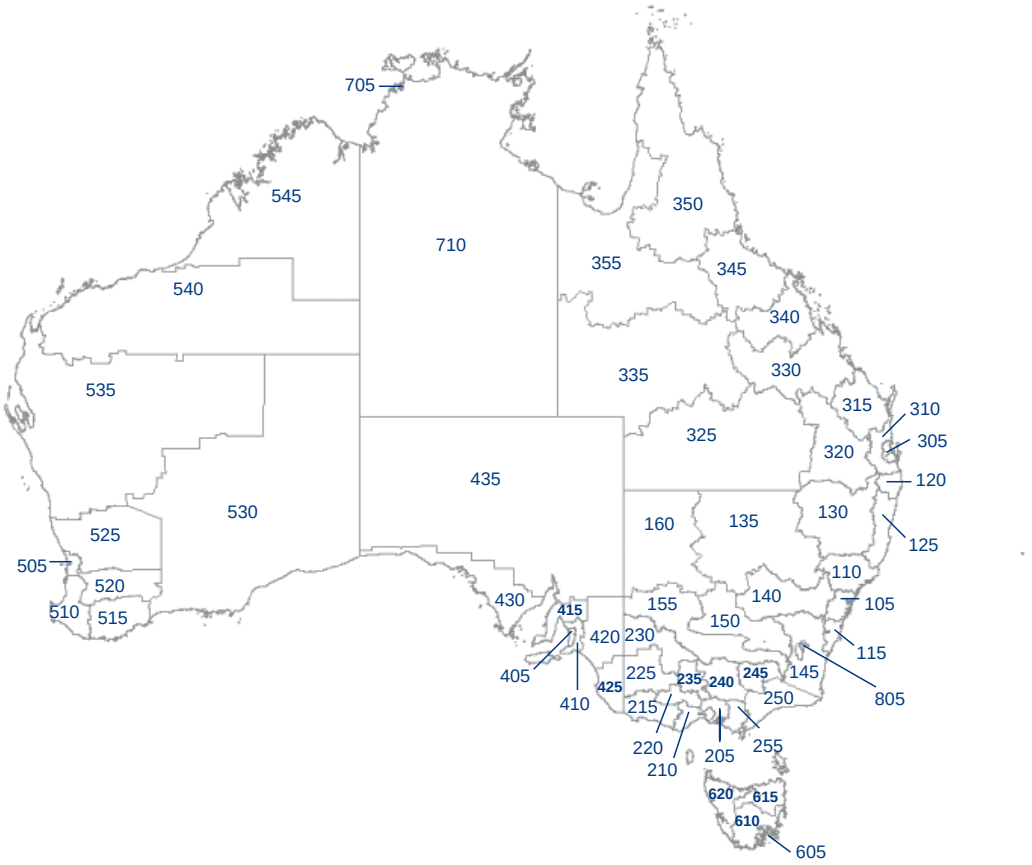
The present report is based on 2006 'finalised' data from each state and territory. States and territories transmitted data to NNDSS on average every other day, and the final dataset for the year was agreed upon in June 2007. The finalised annual dataset represents a snap shot of the year after duplicate records and incorrect or incomplete data have been 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 onset in an attempt to estimate disease activity within the reporting period. Where the date of onset was not known however, the date of specimen collection or date of notification, whichever was earliest, was used. As considerable time may have lapsed between onset and diagnosis dates for hepatitis B (unspecified) and hepatitis C (unspecified), for these conditions the date of diagnosis, which is the earliest of specimen, notification or notification received dates supplied, was used.

Notified cases can 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.

Methods of surveillance vary between states and territories, each having different requirements for notification by medical practitioners, laboratories and hospitals. Although there is a list of national notifiable diseases, some diseases are not yet notifiable in some jurisdictions (Table 1).

Map 1. Australian Bureau of Statistics Statistical Divisions and population, Australia, by Statistical Division, 2006



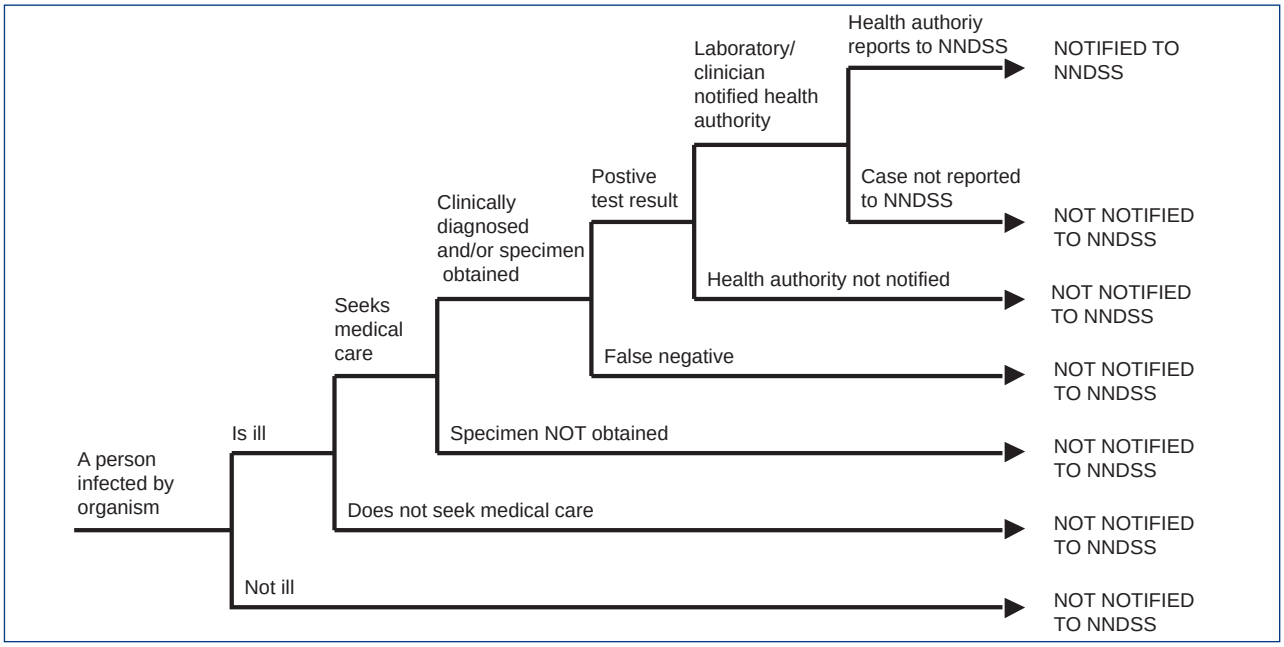
Statistical Division		Population
Australian Capital Territory		
805	Canberra*	328,817
New South Wales		
105	Sydney	4,293,105
110	Hunter	611,935
115	Illawarra	415,248
120	Richmond-Tweed	227,815
125	Mid-North Coast	297,409
130	Northern	181,078
135	North Western	119,276
140	Central West	181,374
145	South Eastern	204,854
150	Murrumbidgee	155,281
155	Murray	116,870
160	Far West	23,449
Northern Territory		
705	Darwin	113,955
710	NT – balance	92,733
Queensland		
305	Brisbane	1,820,375
310	Moreton	868,985
315	Wide Bay-Burnett	264,201

Statistical Division		Population
*Queensland, **continued***		
320	Darling Downs	226,430
325	South West	27,095
330	Fitzroy	193,182
335	Central West	12,155
340	Mackay	151,572
345	Northern	210,943
350	Far North	243,948
355	North West	34,558
South Australia		
405	Adelaide	1,138,833
410	Outer Adelaide	125,903
415	Yorke and Lower North	45,190
420	Murray Lands	69,066
425	South East	63,580
430	Eyre	34,979
435	Northern	77,105
Tasmania		
605	Greater Hobart	205,510
610	Southern	36,176
615	Northern	138,562
620	Mersey-Lyell	108,700
910	**Other territories**	**2,691**

Statistical Division		Population
Victoria		
205	Melbourne	3,684,461
210	Barwon	273,997
215	Western District	102,141
220	Central Highlands	150,412
225	Wimmera	50,920
230	Mallee	93,415
235	Loddon	178,091
240	Goulburn	207,377
245	Ovens-Murray	97,497
250	East Gippsland	84,222
255	Gippsland	169,133
Western Australia		
505	Perth	1,507,949
510	South West	227,981
515	Lower Great Southern	55,259
520	Upper Great Southern	17,609
525	Midlands	52,214
530	South Eastern	53,708
535	Central	60,167
540	Pilbara	40,132
545	Kimberley	35,865
Total Australia		20,605,488

* Includes Statistical Division 810 ‘Australian Capital Territory – balance’.

Figure 1. Communicable diseases notification fraction



Changes in surveillance practices introduced in some jurisdictions and not in others are additional factors that make comparison of data across jurisdictions difficult. In this report, information obtained from states and territories on any changes in surveillance practices including screening practices, laboratory practices, and major disease control or prevention initiatives undertaken in 2006, was used to interpret data.

Postcode information usually reflects the residential location of the case, but this does not necessarily represent the place where the disease was acquired. As no personal identifiers are collected in NNDSS, duplication in reporting may occur if patients move from one jurisdiction to another and were notified in both.

The completeness* of data in this report is summarised in Appendix 3. The case's sex was complete in 99.8% of notifications and date of birth in 100% of notifications. In 2006, indigenous status was complete in 45.8% of notifications, and varied by jurisdiction. Indigenous status† was complete for 91.4% of data reported in the Northern Territory, 84.1% in South Australia and 71.6% in Western Australia. In the remaining jurisdictions, less than 54% of data were complete for indigenous status.

Data completeness on indigenous status also varied by disease; in notifications of cholera, donovanosis, leprosy, tetanus, hepatitis (NEC) and Murray Valley encephalitis virus infection, reporting on indigenous status was 100% complete. Notifications for tuberculosis (TB), syphilis less than 2 years duration, meningococcal infection and haemolytic uraemic syndrome was more than 90% complete for indigenous status, while in notifications of other diseases such as pertussis, influenza (laboratory confirmed), Barmah Forest virus infection, hepatitis C (unspecified) and Ross River virus infection, data completeness was below 40%.

Notes on case definitions

In this report, each notifiable disease is introduced with a case definition, the 'CDNA case definition'. These case definitions were agreed upon by CDNA to be implemented nationally by January 2004.

CDNA case definitions are only intended for reporting to NNDSS. These definitions have been used by all jurisdictions from 2005 onwards. States and territories may also have case definitions which reflect their local public health needs. These may be the same as or more comprehensive than the CDNA case definitions.

* Data completeness = (total notifications – missing or unknown) / total notifications x 100

† Indigenous status' is a variable defined by the following values:

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

Table 1. Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2006

Disease	Data received from
Bloodborne diseases	
Hepatitis (NEC)	All jurisdictions
Hepatitis B (incident)	All jurisdictions
Hepatitis B (unspecified)*	All jurisdictions
Hepatitis C (incident)	All jurisdictions, except Queensland
Hepatitis C (unspecified)*,†	All jurisdictions
Hepatitis D	All jurisdictions
Gastrointestinal diseases	
Botulism	All jurisdictions
Campylobacteriosis‡	All jurisdictions, except NSW
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	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 (NEC)‖	All jurisdictions
Donovanosis	All jurisdictions
Gonococcal infection	All jurisdictions
Syphilis (all)¶	All jurisdictions
Syphilis – <2 years duration	All jurisdictions
Syphilis – >2 years or unspecified duration	All jurisdictions
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
Varicella zoster (chickenpox)	All jurisdictions, except ACT, NSW and Victoria
Varicella zoster (shingles)	All jurisdictions, except ACT, NSW and Victoria
Varicella zoster (unspecified)	All jurisdictions, except ACT, NSW and Victoria

Table 1. Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2006, *continued*

Disease	Data received from
Vectorborne diseases	
Barmah Forest virus infection	All jurisdictions
Dengue virus infection	All jurisdictions
Flavivirus infection (NEC)‡‡	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

* Unspecified hepatitis includes cases in whom the duration of infection could not be determined.

† In Queensland, includes incident hepatitis 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, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Laboratory confirmed influenza is not a notifiable disease in South Australia but reports are forwarded to NNDSS.

‡‡ Flavivirus (NEC) replaced Arbovirus (NEC) from 1 January 2004.

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

¶¶ 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

Results

Summary of 2006 data

There were 138,511 communicable diseases notifications received by NNDSS in 2006 (Table 2). Notifications rates per 100,000 population for each disease by state or territory are shown in Table 3. Trends in notifications and rates per 100,000 population for the period 2002 to 2006 are shown in Table 4a. The year in which diseases became notifiable to NNDSS in each jurisdiction is shown in Table 4b.

Table 2. Notifications of communicable diseases, Australia, 2006, by state or territory

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Bloodborne diseases									
Hepatitis (NEC)	0	1	0	0	0	0	0	0	1
Hepatitis B (incident)*	7	54	11	50	7	9	107	50	295
Hepatitis B (unspecified)*,†	70	2,489	236	1,009	316	46	1,564	566	6,296
Hepatitis C (incident)	16	40	3	NN	54	10	200	108	431
Hepatitis C (unspecified)*	175	4,415	229	2,877	517	260	2,542	1,042	12,057
Hepatitis D	0	15	0	8	0	0	7	1	31
Gastrointestinal diseases									
Botulism	0	0	0	1	0	0	0	0	1
Campylobacteriosis‡	403	NN	263	3,967	2,514	596	5,718	1,937	15,398
Cryptosporidiosis	79	780	72	700	202	28	1,090	250	3,201
Haemolytic uraemic syndrome	0	11	0	0	1	0	1	0	13
Hepatitis A	1	95	30	31	8	4	44	67	280
Hepatitis E	2	10	0	2	0	0	8	1	23
Listeriosis	1	26		3	5		13	13	61
Salmonellosis	134	2,059	404	2,711	570	192	1,391	800	8,261
Shigellosis	2	75	125	97	37	3	76	128	543
STEC, VTEC§	0	10	2	15	36	0	4	3	70
Typhoid	0	35	3	6	3	1	19	11	78
Quarantinable diseases									
Cholera	0	3	0	0	0	0	0	0	3
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 infections (NEC)‖	821	11,819	2,056	12,223	3,128	1,044	9,966	5,897	46,954
Donovanosis	0	0	2	2	0	0	0	0	4
Gonococcal infection	33	1,695	1,777	1,559	499	18	1,300	1,666	8,547
Syphilis (all)¶	14	876	269	436	43	22	598	179	2,436
Syphilis – <2 years duration	2	210	150	165	2	5	231	48	813
Syphilis – >2 years or unspecified duration	12	666	119	271	41	17	366	131	1,623
Syphilis – congenital	0	5	8	1	0	0	0	0	14
Vaccine preventable diseases									
Diphtheria	0	0	0	0	0	0	0	0	0
Haemophilus influenzae type b	0	11	2	7	0	0	2	0	22
Influenza (laboratory confirmed)**	80	614	40	1660	89	47	421	208	3,159
Measles	1	60	0	2	9	11	12	30	125
Mumps	1	154	7	58	22	0	16	17	275

Table 2. Notifications of communicable diseases, Australia, 2006, by state or territory, *continued*

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Vaccine preventable diseases, *continued*									
Pertussis	258	4,916	96	2,178	2,179	41	1,066	264	10,998
Pneumococcal disease (invasive)	18	564	56	253	107	40	274	131	1,443
Poliomyelitis	0	0	0	0	0	0	0	0	0
Rubella	0	37	0	12	2	0	6	2	59
Rubella – congenital	0	0	0	0	0	0	0	0	0
Tetanus	0	2	0	0	0	0	1	0	3
Varicella zoster (chickenpox)	NDP	NN	193	380	760	16	NN	165	1,514
Varicella zoster (shingles)	NDP	NN	80	247	625	55	NN	70	1,077
Varicella zoster (unspecified)	NDP	NN	1	3,167	328	14	NN	55	3,565
Vectorborne diseases									
Barmah Forest virus infection	8	644	130	957	186	0	30	165	2,120
Dengue virus infection	6	50	21	78	11		5	16	187
Flavivirus infection (NEC)‡‡	0	0	0	23	0	0	10	0	33
Japanese encephalitis virus infection	0	0	0	0	0	0	0	0	0
Kunjin virus infection	0	0	0	1	0	0	0	2	3
Malaria	11	140	66	268	34	26	115	115	775
Murray Valley encephalitis virus infection	0	0	0	0	0	0	0	1	1
Ross River virus infection	10	1,225	279	2,615	317	14	209	818	5,487
Zoonoses									
Anthrax	0	1	0	0	0	0	0	0	1
Australian bat lyssavirus	0	0	0	0	0	0	0	0	0
Brucellosis	0	8	0	40	0	0	0	1	49
Leptospirosis	0	17	2	117	1	1	6	3	147
Lyssavirus (NEC)	0	0	0	0	0	0	0	0	0
Ornithosis	2	94	0	2	0	1	65	4	168
Q fever	0	174	5	164	18	0	36	5	402
Tularaemia	0	0	0	0	0	0	0	0	0
Other bacterial infections									
Legionellosis	1	77	3	39	65	3	69	91	348
Leprosy	0	1	1		1	0	0	2	5
Meningococcal infection¶¶	5	107	6	71	18	5	85	21	318
Tuberculosis	14	472	32	149	72	9	367	114	1,229
Total	2,173	33,881	6,510	38,186	12,784	2,516	27,442	15,019	138,511

* Unspecified hepatitis includes cases in whom the duration of infection could not be determined.

† In Queensland, includes incident hepatitis 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, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Laboratory-confirmed influenza is not a notifiable disease in South Australia but reports are forwarded to NNDSS.

‡‡ Flavivirus (NEC) replaced Arbovirus (NEC) from 1 January 2004.

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

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

NN Not notifiable.

NEC Not elsewhere classified.

NDP No data provided.

Table 3. Notifications rate for communicable diseases, Australia, 2006, by state and territory (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 (incident)*	2.1	0.8	5.3	1.2	0.5	1.8	2.1	2.4	1.4
Hepatitis B (unspecified)*,†	21.3	36.5	114.2	24.9	20.3	9.4	30.7	27.6	30.6
Hepatitis C (incident)	4.9	0.6	1.5	NN	3.5	2.0	3.9	5.3	2.6
Hepatitis C (unspecified)*	53.2	64.7	110.8	71.0	33.3	53.2	49.9	50.8	58.5
Hepatitis D	0.0	0.2	0.0	0.2	0.0	0.0	0.1	0.0	0.2
Gastrointestinal diseases									
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis‡	122.6	NN	127.2	97.9	161.7	121.9	112.3	94.4	111.8
Cryptosporidiosis	24.0	11.4	34.8	17.3	13.0	5.7	21.4	12.2	15.5
Haemolytic uraemic syndrome	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Hepatitis A	0.3	1.4	14.5	0.8	0.5	0.8	0.9	3.3	1.4
Hepatitis E	0.6	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1
Listeriosis	0.3	0.4	0.0	0.1	0.3	0.0	0.3	0.6	0.3
Salmonellosis	40.8	30.2	195.5	66.9	36.7	39.3	27.3	39.0	40.1
Shigellosis	0.6	1.1	60.5	2.4	2.4	0.6	1.5	6.2	2.6
STEC, VTEC	0.0	0.1	1.0	0.4	2.3	0.0	0.1	0.1	0.3
Typhoid	0.0	0.5	1.5	0.1	0.2	0.2	0.4	0.5	0.4
Quarantinable diseases									
Cholera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highly pathogenic avian influenza	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 infections (NEC)‖	249.7	173.1	994.7	301.5	201.2	213.5	195.7	287.5	227.9
Donovanosis	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Gonococcal infection	10.0	24.8	859.7	38.5	32.1	3.7	25.5	81.2	41.5
Syphilis (all)¶	4.3	12.8	130.1	10.8	2.8	4.5	11.7	8.7	11.8
Syphilis – <2 years duration	0.6	3.1	72.6	4.1	0.1	1.0	4.5	2.3	3.9
Syphilis – >2 years or unspecified duration	3.6	9.8	57.6	6.7	2.6	3.5	7.2	6.4	7.9
Syphilis – congenital	0.0	0.1	3.9	0.0	0.0	0.0	0.0	0.0	0.1
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	0.2	1.0	0.2	0.0	0.0	0.0	0.0	0.1
Influenza (laboratory confirmed)**	24.3	9.0	19.4	41.0	5.7	9.6	8.3	10.1	15.3
Measles	0.3	0.9	0.0	0.0	0.6	2.2	0.2	1.5	0.6
Mumps	0.3	2.3	3.4	1.4	1.4	0.0	0.3	0.8	1.3
Pertussis	78.5	72.0	46.4	53.7	140.2	8.4	20.9	12.9	53.4
Pneumococcal disease (invasive)	5.5	8.3	27.1	6.2	6.9	8.2	5.4	6.4	7.0
Poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella	0.0	0.5	0.0	0.3	0.1	0.0	0.1	0.1	0.3
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 3. Notifications rate for communicable diseases, Australia, 2006, by state and territory (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)	NDP	NN	93.4	9.4	48.9	3.3	NN	8.0	18.1
Varicella zoster (shingles)	NDP	NN	38.7	6.1	40.2	11.2	NN	3.4	5.2
Varicella zoster (unspecified)	NDP	NN	0.5	78.1	21.1	2.9	NN	2.7	17.3
Vectorborne diseases									
Barmah Forest virus infection	2.4	9.4	62.9	23.6	12.0	0.0	0.6	8.0	10.3
Dengue virus infection	1.8	0.7	10.2	1.9	0.7		0.1	0.8	0.9
Flavivirus infection (NEC)‡‡	0.0	0.0	0.0	0.6	0.0	0.0	0.2	0.0	0.2
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	0.1	0.0
Malaria	3.3	2.1	31.9	6.6	2.2	5.3	2.3	5.6	3.8
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	3.0	17.9	135.0	64.5	20.4	2.9	4.1	39.9	26.6
Zoonoses									
Anthrax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australian bat lyssavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.1	0.0	1.0	0.0	0.0	0.0	0.0	0.2
Leptospirosis	0.0	0.2	1.0	2.9	0.1	0.2	0.1	0.1	0.7
Lyssavirus (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ornithosis	0.6	1.4	0.0	0.0	0.0	0.2	1.3	0.2	0.8
Q fever	0.0	2.5	2.4	4.0	1.2	0.0	0.7	0.2	2.0
Tularaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other bacterial infections									
Legionellosis	0.3	1.1	1.5	1.0	4.2	0.6	1.4	4.4	1.7
Leprosy	0.0	0.0	0.5	0.0	0.1	0.0	0.0	0.1	0.0
Meningococcal infection¶¶	1.5	1.6	2.9	1.8	1.2	1.0	1.7	1.0	1.5
Tuberculosis	4.3	6.9	15.5	3.7	4.6	1.8	7.2	5.6	6.0

* Unspecified hepatitis includes cases in whom the duration of infection could not be determined.

† In Queensland, includes incident hepatitis 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, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Laboratory-confirmed influenza is not a notifiable disease in South Australia but reports are forwarded to NNDSS.

‡‡ Flavivirus (NEC) replaced Arbovirus (NEC) from 1 January 2004.

§§ 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.

NN Not notifiable.

NEC Not elsewhere classified.

NDP No data provided.

Table 4a. Notifications and notification rate for communicable diseases, Australia, 2002 to 2006, (per 100,000 population)

Disease	Notifications					Rates				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Bloodborne diseases										
Hepatitis (NEC)	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0
Hepatitis B (incident)*	391	347	283	251	295	2.0	1.7	1.4	1.2	1.4
Hepatitis B (unspecified)*,†	6,684	5,812	5,786	6,336	6,296	34.0	29.2	28.8	31.2	30.6
Hepatitis C (incident)	452	519	453	374	431	2.8	3.2	2.8	2.3	2.6
Hepatitis C (unspecified)*	15,618	13,674	12,760	12,023	12,057	79.5	68.8	63.4	59.1	58.5
Hepatitis D	22	27	29	30	31	0.1	0.1	0.1	0.1	0.2
Gastrointestinal diseases										
Botulism	0	1	1	3	1	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis	14,732	15,361	15,579	16,488	15,398	113.3	116.4	116.4	121.6	111.8
Cryptosporidiosis‡	3,273	1,223	1,684	3,211	3,201	16.7	6.2	8.4	15.8	15.5
Haemolytic uraemic syndrome	13	15	16	20	13	0.1	0.1	0.1	0.1	0.1
Hepatitis A	392	431	319	326	280	2.0	2.2	1.6	1.6	1.4
Hepatitis E	12	12	28	30	23	0.1	0.1	0.1	0.1	0.1
Listeriosis	62	69	67	54	61	0.3	0.3	0.3	0.3	0.3
Salmonellosis	7,880	7,008	7,838	8,425	8,261	40.1	35.2	39.0	41.4	40.1
Shigellosis	507	442	520	729	543	2.6	2.2	2.6	3.6	2.6
STEC, VTEC	59	52	49	86	70	0.3	0.3	0.2	0.4	0.3
Typhoid	69	51	76	52	78	0.4	0.3	0.4	0.3	0.4
Quarantinable diseases										
Cholera	5	1	5	3	3	0.0	0.0	0.0	0.0	0.0
Highly pathogenic avian influenza	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
Rabies	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	NN	NN	0	0	0	NN	NN	0.0	0.0	0.0
Smallpox	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
Yellow fever	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Sexually transmissible diseases										
Chlamydial infections (NEC)‖	24,437	30,441	36,221	41,376	46,954	124.4	153.1	180.1	203.5	227.9
Donovanosis	17	16	10	13	4	0.1	0.1	0.0	0.1	0.0
Gonococcal infection	6,433	6,790	7,184	8,083	8,547	32.8	34.2	35.7	39.8	41.5
Syphilis (all)¶	2,010	2,017	2,341	2,222	2,436	10.2	10.1	11.6	10.9	11.8
Syphilis – <2 years duration	NN	NN	618	632	813	NN	NN	3.1	3.1	3.9
Syphilis – >2 years or unspecified duration	NN	NN	1723	1590	1,623	NN	NN	8.6	7.8	7.9
Syphilis – congenital	18	13	13	15	14	0.1	0.1	0.1	0.1	0.1
Vaccine preventable diseases										
Diphtheria	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	31	19	15	17	22	0.2	0.1	0.1	0.1	0.1
Influenza (laboratory confirmed)**	3,669	3,479	2,134	4,565	3,159	18.7	17.5	10.6	22.5	15.3
Measles	32	93	45	10	125	0.2	0.5	0.2	0.0	0.6
Mumps	69	77	102	241	275	0.4	0.4	0.5	1.2	1.3
Pertussis	5,564	5,096	8,755	11,197	10,998	28.3	25.6	43.5	55.1	53.4
Pneumococcal disease (invasive)	2,415	2,233	2,370	1,749	1,443	12.3	11.2	11.8	8.6	7.0
Poliomyelitis	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Rubella	253	54	31	31	59	1.3	0.3	0.2	0.2	0.3
Rubella – congenital	2	3	1	1	0	0.0	0.0	0.0	0.0	0.0
Tetanus	4	4	5	2	3	0.0	0.0	0.0	0.0	0.0

Table 4a. Notifications and notification rate for communicable diseases, Australia, 2002 to 2006, (per 100,000 population), *continued*

Disease	Notifications					Rates				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Vaccine preventable diseases, *continued*										
Varicella zoster (chickenpox)	NN	NN	NN	NN	1,514	NN	NN	NN	NN	18.1
Varicella zoster (shingles)	NN	NN	NN	NN	1,077	NN	NN	NN	NN	12.9
Varicella zoster (unspecified)	NN	NN	NN	NN	3,565	NN	NN	NN	NN	42.7
Vectorborne diseases										
Barmah Forest virus infection	910	1,367	1,106	1,322	2,120	4.6	6.9	5.5	6.5	10.3
Dengue virus infection	171	860	351	221	187	0.9	4.3	1.7	1.1	0.9
Flavivirus infection (NEC)‡‡	73	60	61	29	33	0.4	0.3	0.3	0.1	0.2
Japanese encephalitis virus infection	0	1	1	0	0	0.0	0.0	0.0	0.0	0.0
Kunjin virus infection	0	18	12	1	3	0.0	0.1	0.1	0.0	0.0
Malaria	468	592	556	823	775	2.4	3.0	2.8	4.0	3.8
Murray Valley encephalitis virus infection	2	0	1	2	1	0.0	0.0	0.0	0.0	0.0
Ross River virus infection	1,458	3,850	4,209	2,546	5,487	7.4	19.4	20.9	12.5	26.6
Zoonoses										
Anthrax	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0
Australian bat lyssavirus	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Brucellosis	40	20	38	41	49	0.2	0.1	0.2	0.2	0.2
Leptospirosis	160	126	177	129	147	0.8	0.6	0.9	0.6	0.7
Lyssavirus (NEC)	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Ornithosis	213	200	239	164	168	1.1	1.0	1.2	0.8	0.8
Q fever	796	563	464	355	402	4.1	2.8	2.3	1.7	2.0
Tularaemia	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Other bacterial infections										
Legionellosis	315	333	312	334	348	1.6	1.7	1.6	1.6	1.7
Leprosy	6	5	7	10	5	0.0	0.0	0.0	0.0	0.0
Meningococcal infection¶¶	690	558	405	392	318	3.5	2.8	2.0	1.9	1.5
Tuberculosis	1,128	1,035	1,127	1,083	1,229	5.7	5.2	5.6	5.3	6.0
Total	101,555	104,968	113,786	125,415	138,511					

* Unspecified hepatitis includes cases in whom the duration of infection could not be determined.

† In Queensland, includes incident hepatitis 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, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Laboratory-confirmed influenza is not a notifiable disease in South Australia but reports are forwarded to NNDSS.

‡‡ Flavivirus (NEC) replaced Arbovirus (NEC) from 1 January 2004.

§§ 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.

NN Not notifiable.

NEC Not elsewhere classified.

Table 4b. Earliest notification year for which NNDSS contains disease data, Australia, by state or territory*

Disease†	Earliest year for which NNDSS contains data*								Year from which NNDSS reporting commenced in annual reports	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA		
Bloodborne diseases										
Hepatitis (NEC)	1991	1991	–	–	1990	–	1991	–	1991 to present	Includes reports of hepatitis D and E 1991–1998 WA did not report 1991–2000
Hepatitis B (incident)	1992	1992	1991	1991	1996	1995	1993	1993	1993 to present	
Hepatitis B (unspecified)	1991	1990	2005	1985	1996	1991	1991	1990	1991 to present	Includes reports of incident hepatitis B 1991, 1992, 1994, 1995
Hepatitis C (incident)	1991	1992	2003	NN	1995	1995	1997	1993	1993 to present	Not notifiable in Qld
Hepatitis C (unspecified)	1991	1991	1991	1990	1995	1991	1991	1993	1991 to present	Includes reports of incident hepatitis C 1991–1994 SA did not report 1991–1994 WA did not report 1991–1992
Hepatitis D	–	1992	1997	1992	1998	–	1995	2002	1999 to present	WA did not report 1991–2000
Gastrointestinal diseases										
Botulism	–	1999	2000	2001	1998	–	2000	–	1992 to present	
Campylobacteriosis	1991	NN	1991	1991	1990	1991	1991	1991	1991 to present	Not notifiable in NSW
Cryptosporidiosis	1995	1996	1998	1996	1993	1998	1998	2000	2001 to present	
Haemolytic uraemic syndrome	2007	1997	2002	1997	1995	1996	1998	1996	1999 to present	
Hepatitis A	1991	1990	1990	1991	1990	1991	1991	1991	1991 to present	
Hepatitis E	1999	1993	1993	1991	1997	1997	1995	2001	1999 to present	WA did not report 1991–2000
Listeriosis	1993	1991	1995	1991	1992	1991	1991	1991	1991 to present	ACT and SA did not report 1991 NT did not report 1991–1992
Salmonellosis	1991	1990	1991	1991	1990	1991	1991	1991	1991 to present	
Shigellosis	1991	2001	1991	1991	1990	1991	1991	1991	1991 to present	NSW reported only as 'foodborne disease' or 'gastroenteritis in an institution' 1991–2000
STEC, VTEC	2007	1998	1999	1996	1996	2005	1997	2001	1999 to present	WA did not report 1999–2000
Typhoid‡	1992	1991	1992	1991	1990	1994	1991	1991	1991 to present	
Quarantinable diseases										
Cholera	1995	1993	–	1992	1992	–	1994	1992	1991 to present	
Highly pathogenic avian influenza	–	–	–	–	–	–	–	–	2004 to present	
Plague	–	–	–	–	–	–	–	–	1991 to present	Tas did not report 1991–1995
Rabies	–	–	–	–	–	–	–	–	1991 to present	ACT did not report 1991 NSW did not report 1991–1998
Severe acute respiratory syndrome	–	–	–	–	–	–	–	–	2003 to present	
Smallpox	–	–	–	–	–	–	–	–	2004 to present	
Viral haemorrhagic fever	–	–	–	–	–	–	–	–	1991 to present	ACT did not report 1991
Yellow fever	–	–	–	–	–	–	–	–	1991 to present	
Sexually transmissible infections										
Chlamydial infection	1991	1991	1990	1991	1991	1991	1991	1993	1991 to present	
Donovanosis	–	–	1991	1991	–	–	–	1991	1991 to present	NSW and SA did not report 1991–2001 Tas did not report 1991–1992
Gonococcal infection§	1991	1991	1990	1991	1991	1991	1991	1991	1991 to present	

Table 4b. Earliest notification year for which NNDSS contains disease data, Australia, by state or territory, *continued*

Disease[†]	Earliest year for which NNDSS contains data*								Year from which NNDSS reporting commenced in annual reports	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA		
Sexually transmissible diseases, *continued*										
Syphilis – all[‖]	1991	1991	1990	–	1991	–	1991	1991	1991 to present	
Syphilis < 2 years	1995	1992	2003	1991	1990	2004	1997	1995	2004 to present	
Syphilis > 2 years or unspecified duration	2004	1991	2001	1988	2004	1991	1997	1992	2004 to present	
Syphilis – congenital	–	1992	1995	1991	–	–	1995	1990	2003 to present	
Vaccine preventable diseases										
Diphtheria	–	–	1992	–	1993	–	1991	–	1991 to present	
Haemophilus influenzae type b	1991	1991	1992	1991	1990	1991	1991	1993	1991 to present	WA did not report 1991–1992
Influenza (laboratory confirmed)	1993	2001	1999	2001	2001	2002	2000	2000	2001 to present	Not notifiable in SA 2001–2007 however data has been provided since 2001
Measles	1991	1990	1991	1988	1990	1991	1991	1991	1991 to present	
Mumps	1992	1992	1994	1996	1993	1995	1994	1993	1992 to present	Qld did not report 1992–1995 and 2000 NT did not report 1992–1993 WA and SA did not report 1992 Tas did not report 1992–1994
Pertussis	1991	1990	1992	1991	1990	1991	1991	1990	1991 to present	
Pneumococcal disease (invasive)	1993	2001	1995	1991	2001	1991	2000	2000	2001 to present	
Poliomyelitis	–	–	–	–	–	–	2007	–	1991 to present	
Rubella[¶]	1991	1991	1991	1991	1990	1991	1991	1993	1991 to present	Tas did not report 1992–1994
Rubella – congenital	–	1993	–	2002	1990	–	2005	2002	2003 to present	
Tetanus	–	1991	1991	1997	1990	1992	1992	1991	1991 to present	Qld did not report 1991–1993
Varicella zoster (chickenpox)**	1993	NN	2006	2006	2006	2004	NN	2006	2006 to present	Not notifiable in NSW or Vic.
Varicella zoster (shingles)**	1997	NN	2006	2006	2006	2006	NN	2006	2006 to present	Not notifiable in NSW or Vic.
Varicella zoster (unspecified)**	2006	NN	2006	2005	2006	2006	NN	2006	2006 to present	Not notifiable in NSW or Vic.
Vectorborne diseases										
Barmah Forest virus infection	1995	1992	1992	1992	1993	1999	1995	1994	1995 to present	
Dengue virus infection	1993	1992	1992	1991	1992	1995	1991	1994	1991 to present	ACT did not report 1991–1992
Flavivirus infection (NEC)[††,‡‡]	2001	1991	1992	1991	1990	–	1991	–	1991 to present	Includes Japanese encephalitis, Murray Valley encephalitis and Kunjin 1991–2000
Japanese encephalitis virus infection	–	–	–	1995	–	–	–	1998	2001 to present	
Kunjin virus infection	–	1996	1992	1996	–	–	2001	1997	2001 to present	Reported under Murray Valley encephalitis in the ACT
Malaria	1991	1991	1991	1991	1990	1989	1991	1990	1991 to present	
Murray Valley encephalitis virus infection	–	2008	1991	1991	2001	–	–	1991	2001 to present	Combined with Kunjin in the ACT
Ross River virus infection	1992	1991	1991	1991	1992	1991	1991	1991	1991 to present	

Table 4b. Earliest notification year for which NNDSS contains disease data, Australia, by state or territory, *continued*

Disease†	Earliest year for which NNDSS contains data*								Year from which NNDSS reporting commenced in annual reports	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA		
Zoonoses										
Anthrax	–	2006	–	1998	–	–	2007	–	2001 to present	
Australian bat lyssavirus	–	–	–	1998	–	–	–	–	2001 to present	
Brucellosis	1998	1991	–	1991	1995	2007	1991	1996	1991 to present	
Leptospirosis	1994	1990	1992	1991	1990	1991	1991	1991	1991 to present	
Lyssavirus (NEC)	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Ornithosis	1991	2001	1991	1992	1990	1993	1991	1991	1991 to present	NSW did not report 1991–2000 Qld did not report 1997–2001
Q fever	1991	1991	2002	1991	1990	2000	1991	1991	1991 to present	
Tularaemia	–	–	–	–	–	–	–	–	2004 to present	
Other bacterial infections										
Legionellosis	1991	1991	1992	1991	1990	1992	1991	1991	1991 to present	
Leprosy	1992	1992	1991	1997	1991	2007	1991	1991	1991 to present	
Meningococcal infection	1991	1991	1991	1991	1990	1991	1991	1990	1991 to present	
Tuberculosis	1991	1990	1991	1991	1991	1987	1992	1991	1991 to present	

* Data from NNDSS annual reports from 1991. First full year of reporting to the Commonwealth is shown. Some diseases may have been notifiable to state or territory health departments before the dates shown here.

† Prior to the implementation of the national case definitions in 2001, jurisdictions notified diseases according to their own case definition

‡ 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.

** Varicella data from the Australian Capital Territory were provided in 2008 and were not provided at the time data for the 2006 report were finalised.

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

‡‡ Flavivirus (NEC) replaced arbovirus (NEC) 1 January 2004.

NN Not notifiable.

– No cases reported to NNDSS.

In 2006, the total number of notifications was the highest recorded in NNDSS since the system began in 1991. There was an increase of 10.4% compared with the total number of notifications in 2005 (Figure 2).

In 2006, the most frequently notified diseases were sexually transmissible infection (57,941 notifications, 42% of total notifications), gastrointestinal diseases (27,931 notifications, 20% of total notifications) and vaccine preventable diseases (22,240 notifications, 16% of total notifications).

There were 19,111 notifications of bloodborne diseases; 8,606 notifications of vectorborne diseases; 1,900 notifications of other bacterial infections; 767 notifications of zoonoses and 3 notifications of quarantinable diseases (Figure 3).

Figure 2. Trends in notifications received by the National Notifiable Diseases Surveillance System, Australia, 1991 to 2006

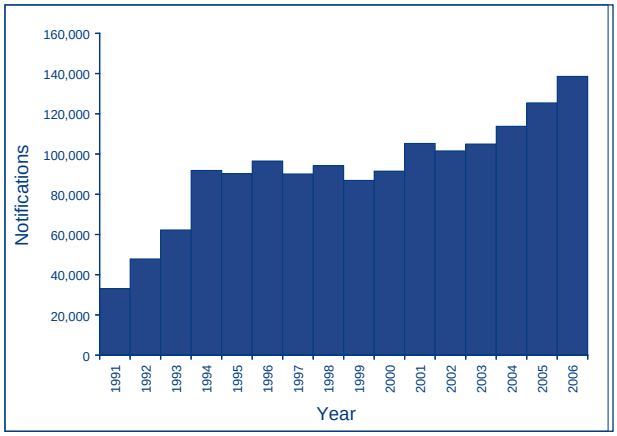
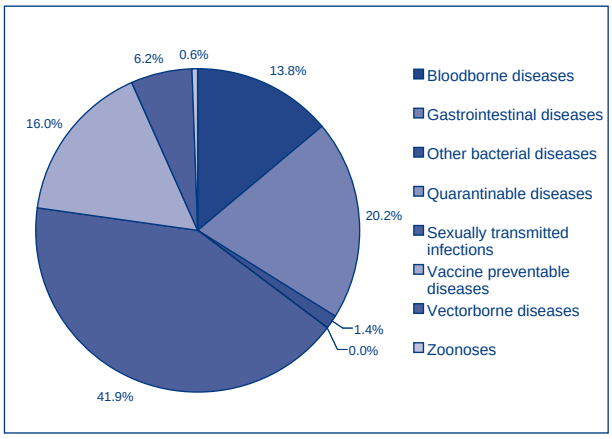
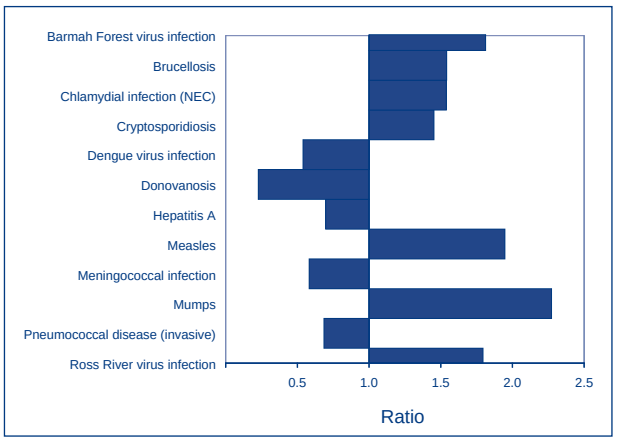


Figure 3. Notifications to the National Notifiable Disease Surveillance System, Australia, 2006, by disease category



The major changes in communicable disease notifications in 2006 are shown in Figure 4 as the ratio of notifications in 2006 to the mean number of notifications for the previous 5 years. Notifications of Barmah Forest virus infection, brucellosis, chlamydial infections, cryptosporidiosis, measles, mumps and Ross River virus infection were above the 5-year mean. Notifications below the 5-year mean were dengue virus infection, donovanosis, hepatitis A, meningococcal infection and pneumococcal disease (invasive). Notifications for the remaining diseases were within the historical range.

Figure 4. Comparison of total notifications of selected diseases reported to the National Notifiable Diseases System in 2006, with the previous 5-year mean



Bloodborne diseases

Bloodborne viruses reported to the NNDSS include hepatitis B, C and D. HIV and AIDS diagnoses are reported directly to the National Centre in HIV Epidemiology and Clinical Research (NCHECR). Information on national HIV/AIDS surveillance can be obtained through the NCHECR website at www.nchecr.unsw.edu.au

Hepatitis B

Incident hepatitis B notifications

Case definition – Incident hepatitis B

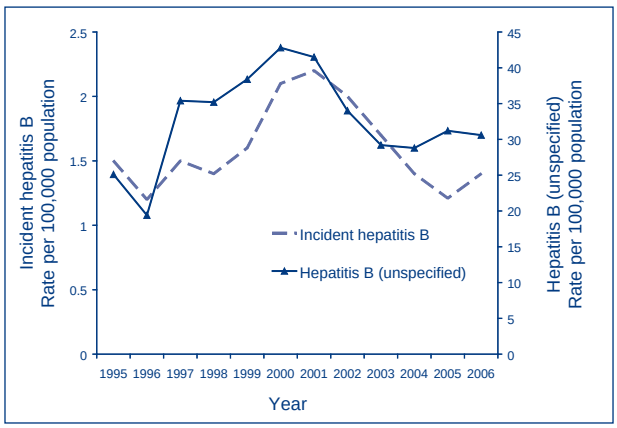
*Only **confirmed cases** are reported.*

***Confirmed case:** Detection of hepatitis B surface antigen (HBsAg) in a case shown to be negative within the last 24 months, OR detection of hepatitis HBsAg and IgM to hepatitis B core antigen in the absence of prior evidence of hepatitis B infection OR detection of hepatitis B virus by nucleic acid testing and IgM to hepatitis B core antigen in the absence of evidence of prior hepatitis B infection.*

In 2006, 295 cases of incident hepatitis B infection were reported to NNDSS, which was higher than in 2005 (251). The Northern Territory recorded the highest notification rate in 2006 with 5.3 cases per 100,000 population. Over the past 10 years, the rate of notification of incident hepatitis B infection increased from 1.5 cases per 100,000 population in 1996 to 2.2 cases per 100,000 population in 2001, and then declined to 1.2 cases per 100,000 population in 2005 and increased to 1.4 cases per 100,000 population in 2006 (Figure 5).

The increase in the number of incident hepatitis B notifications in 2006 may be a result of more complete case follow-up, as there was a corresponding decrease in hepatitis B (unspecified) notifications for the period.

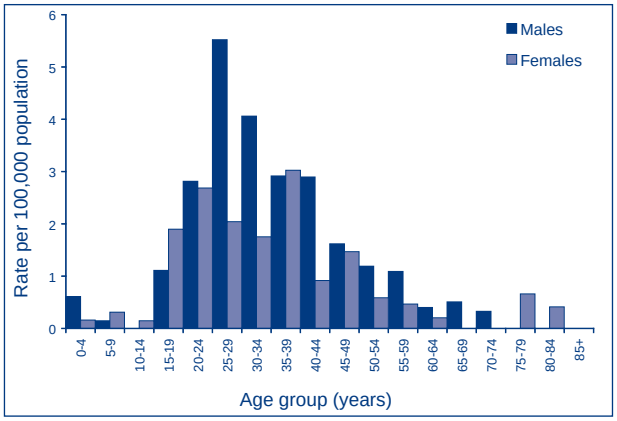
Figure 5. Notification rate of incident hepatitis B and hepatitis B (unspecified), Australia, 1995 to 2006, by year*



* Year of onset for incident hepatitis B and year of report for hepatitis B (unspecified) notifications.

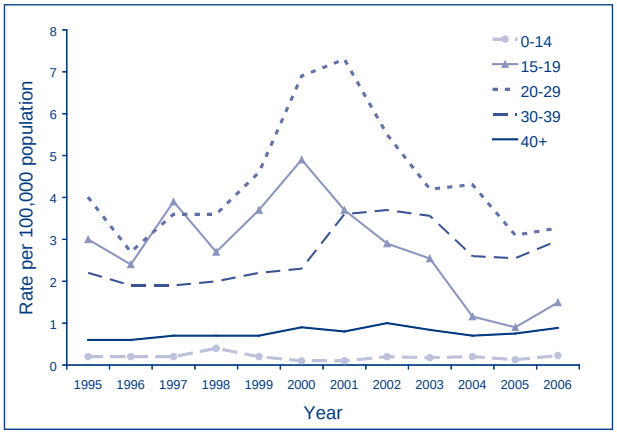
In 2006, the 25–29 years age group among males had the highest rate of incident hepatitis B infection (5.5 cases per 100,000 population), whereas the 35–39 years age group had the highest notification rate among females (3.0 cases per 100,000 population; Figure 6). Notifications of incident hepatitis B infection in males exceeded those in females, with a male to female ratio of 1.6:1 in 2006.

Figure 6. Notification rate for incident hepatitis B infections, Australia, 2006, by age group and sex



Trends in incident hepatitis B infection by year and age group are shown in Figure 7. In 2000–2006, the notification rate of incident hepatitis B fell by 69% among cases in the 15–19 years age group, and by 52% among cases in the 20–29 years age group. The adolescent hepatitis B vaccination program for children aged 10–13 years that was introduced in 1997,[1] may have played a role in this reduction for these age groups.

Figure 7. Notification rate of incident hepatitis B infections, Australia, 1995 to 2006, by year and age group



The source of exposure for cases of incident hepatitis B infection in 2006 was reported through health authorities in the Australian Capital Territory, South Australia, Tasmania and Victoria (Table 5). From 2002 to 2006, the proportion of notifications of incident hepatitis B infection associated with injecting drug use, remained relatively stable at approximately 51.0%. The proportion of diagnoses attributed to heterosexual contact decreased from about 21.0% between 2002 to 2005, to 11.4% in 2006. The source of exposure to hepatitis B was undetermined in approximately 26.0% of cases.

Table 5. Incident hepatitis B infection, Australia,* 2006, by exposure category†

Exposure category	Number	Percentage
Injecting drug use	68	51.5
Sexual contact	19	14.4
Male homosexual contact	3	2.3
Heterosexual contact	15	11.4
Not specified	1	0.8
Blood/tissue recipient	0	0.0
Skin penetration procedure	1	0.8
Healthcare exposure	0	0.0
Household contact	4	3.0
Other	5	3.8
Undetermined	35	26.5
Total exposures	132	100

Source: National Centre in HIV Epidemiology and Clinical Research 2007.

* Data include diagnosis in South Australia, Tasmania, Victoria and the Australian Capital Territory.

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

Hepatitis B (unspecified) notifications

Case definition – Hepatitis B (unspecified)

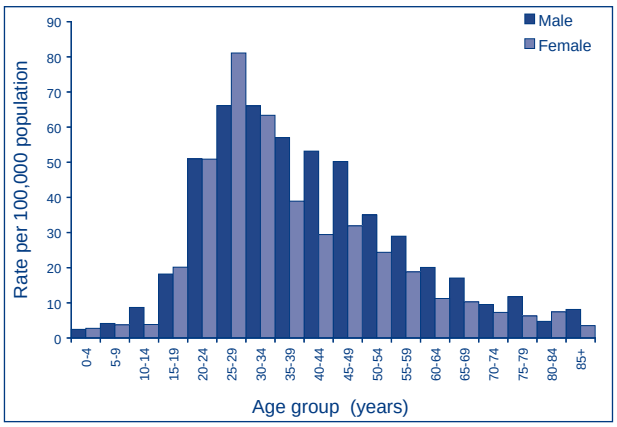
*Only **confirmed cases** are reported.*

***Confirmed case:** Detection of hepatitis B surface antigen or hepatitis B virus by nucleic acid testing in a case who does not meet any of the criteria for a newly acquired case.*

In 2006, a total of 6,296 cases of hepatitis B (unspecified) infection were notified to the NNDSS, compared with 6,336 in 2005. The Northern Territory recorded the highest notification rate (114.2 cases per 100 000 population), compared with other jurisdictions such as New South Wales (36.5 cases per 100,000 population) and Victoria (30.7 cases per

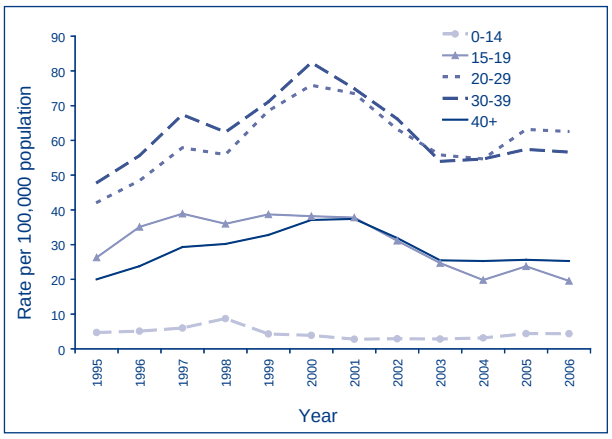
100,000 population). For 2006, the male to female ratio of notifications was 1.2:1. Among males, the highest notification rate was in the 25–29 and the 30–34 years age groups (66.1 and 66.0 cases per 100,000 population, respectively), whereas among females, the highest notification rate was in the 25–29 years age group (81.1 cases per 100,000 population), (Figure 8).

Figure 8. Notification rate for hepatitis B (unspecified) infection, Australia, 2006, by age group and sex



Notification rates of hepatitis B (unspecified) infection increased from 19.4 in 1996 to 42.8 in 2000 then declined to 30.6 cases per 100,000 population in 2006 (Figure 9). In 2006, rates of hepatitis B (unspecified) notifications continued to remain in the range of rates seen in 2003 to 2005 (29.2–31.2 cases per 100,000 population). Trends in hepatitis B (unspecified) infection by age group, and year are shown in Figure 9. Rates in the 15–19 years age group decreased in 2006 by 17.6% compared with 2005 (19.6 and 23.8 cases per 100,000 population, respectively).

Figure 9. Notification rate for hepatitis B (unspecified) infection, Australia, 1995 to 2006, by year and age group



In 2006, 5 cases of hepatitis B (incident) and 33 cases of hepatitis B (unspecified) infection were notified in children in the 0–4 years age group and represented 1.6% and 0.5% of all hepatitis cases notified respectively. Approximately 94% of infants born in Australia in 2006 received the hepatitis B vaccination.

Hepatitis C

Incident hepatitis C notifications

Case definition – Incident hepatitis C

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires detection of anti-hepatitis C antibody or detection of hepatitis C virus in a case with a negative test recorded in the last 24 months OR detection of anti-hepatitis C antibody in a case aged 18 to 24 months or detection of hepatitis C virus in a case aged 1 to 24 months OR detection of anti-hepatitis C antibody or hepatitis C virus AND clinical hepatitis within the last 24 months (defined as jaundice, urine bilirubin or ALT seven times the upper limit of normal) where other causes of acute hepatitis have been excluded.*

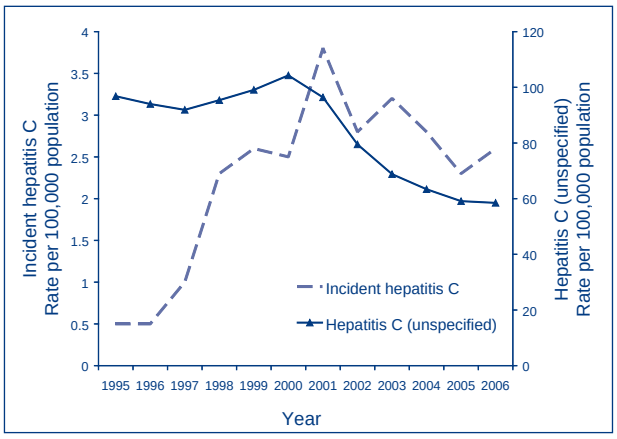
Notifications of incident hepatitis C were received from all jurisdictions except Queensland, where all cases of hepatitis C are reported as hepatitis C (unspecified). A total of 431 cases of incident hepatitis C were notified in 2006 (374 cases in 2005), giving a rate of notification of 2.6 cases per 100,000 population (Figure 10). The proportion of all hepatitis C notifications in 2006 that were documented as incident cases was 3.5%, compared with 3% in 2005. The highest rates of incident hepatitis C infection were reported from Western Australia (5.3 cases per 100,000 population) and the Australian Capital Territory (4.9 cases per 100,000 population).

The increase in the number of incident hepatitis C notifications in 2006 may be a result of more complete case follow-up, as there was a corresponding decrease in hepatitis C (unspecified) notifications for the period.

In 2006, as in 2005, the highest rates of incident hepatitis C notifications were in the 25–29 years age group in males (11.6 cases per 100,000 population) and in the 20–24 and 25–29 years age groups in females (6.5 cases per 100,000 population) (Figure 11).

Trends in the age distribution of incident hepatitis C infection are shown in Figure 12. From 2001 to 2006, notification rates declined by 56% in the

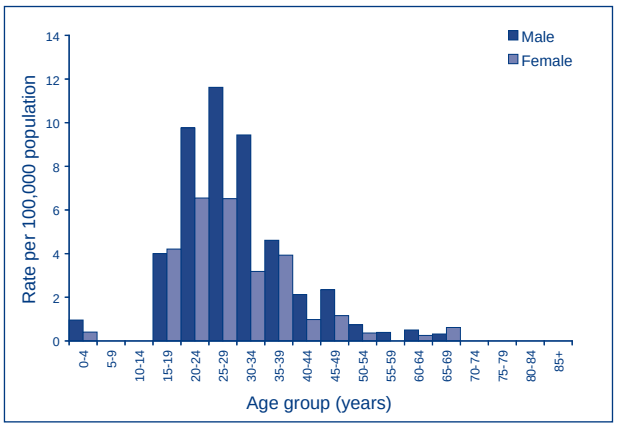
Figure 10. Notification rate of hepatitis C infection (incident* and unspecified†), Australia, 1995 to 2006



* Data from all states and territories except Queensland.

† Data provided from Queensland includes both incident and unspecified hepatitis C cases.

Figure 11. Notification rate of incident hepatitis C infection,* Australia, 2006, by age group and sex

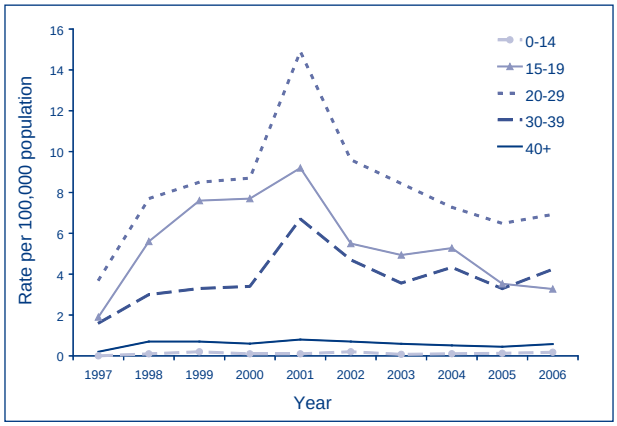


* Data from all states and territories except Queensland.

15–19 years age group, by 42% in the 20–29 years age range and by 21% in the 30–39 years age range. In 2005 to 2006, notification rates increased by 8.8% in the 20–29 years age range and by 29.6% in the 30–39 years age range.

The exposure history of cases of incident hepatitis C were collected in the Australian Capital Territory, New South Wales, South Australia, Tasmania, Victoria and Western Australia in 2006 (Table 6). At least 62% of incident hepatitis C infections were among people with a history of injecting drug use.

Figure 12. Notification rate of incident hepatitis C infection,* Australia, 1997 to 2006, by age group and year



* Data from all states and territories except Queensland.

Table 6. Incident hepatitis C infection, Australia,* 2006, by exposure category†

Exposure category	Number	Percentage
Injecting drug use	295	62.2
Sexual contact	26	5.5
Blood/tissue recipient	2	0.4
Skin penetration procedure	37	7.8
Healthcare exposure	12	2.5
Household contact	2	0.4
Other‡	30	6.3
Undetermined	70	14.8
Total exposures	474	100

Source: National Centre in HIV Epidemiology and Clinical Research 2007.

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

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

‡ Includes cases for which the only reported risk factor was having been born to a woman with hepatitis C infection.

Hepatitis C (unspecified) notifications

Case definition – Hepatitis C (unspecified)

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires detection of anti-hepatitis C antibody or detection of hepatitis C virus in a case who does not meet any of the criteria for a newly acquired case and is aged more than 24 months.*

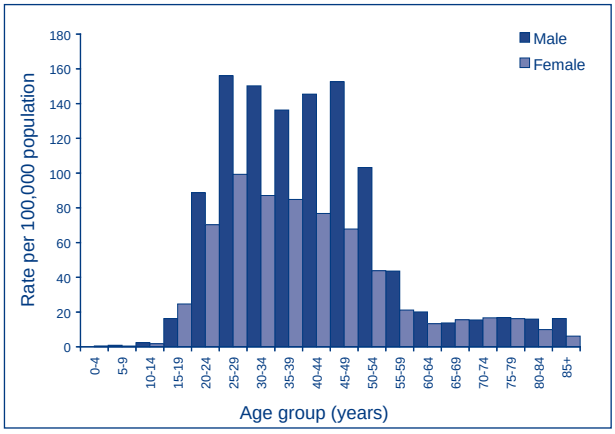
In 2006, 12,057 hepatitis C (unspecified) infections were notified to NNDSS (12,023 in 2005). This figure differs slightly from figures reported in the

National Centre in HIV Epidemiology and Clinical Research National Surveillance Report 2007[2] due to the late exclusion of 38 cases that did not meet the national case definition.

The national notification rate for hepatitis C (unspecified) infection declined from 104.0 cases per 100,000 population in 2001 to 58.5 cases per 100,000 population in 2006 (Figure 10). Improved surveillance practices, such as more complete follow-up and classification of incident cases and increased duplicate notification checks may account for some of the decrease in hepatitis C (unspecified) notifications.

In 2006, the Northern Territory continued to have the highest notification rate (110.8 cases per 100,000 population). Nationally, the male to female ratio was 1.7:1. The highest notification rates occurred in the 25–29, 30–34 and 45–49 years age groups (156.0, 150.2 and 152.6 cases per 100,000 population, respectively) among males and in the 25–29 years age group (99.3 cases per 100,000 population) among females (Figure 13).

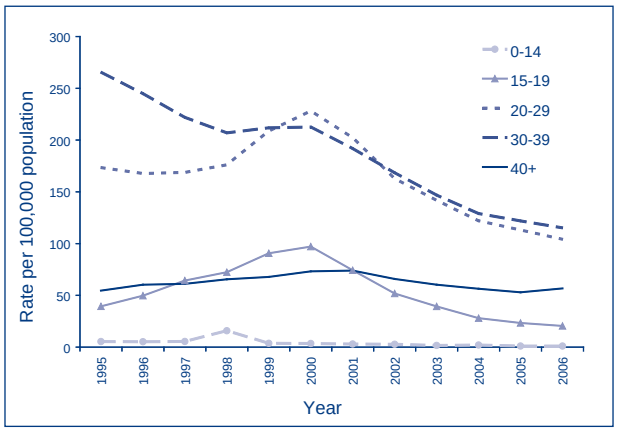
Figure 13. Notification rate for hepatitis C (unspecified) infection* Australia, 2006, by age group and sex



* Data provided from Queensland includes both incident and unspecified hepatitis C cases.

Trends in the age distribution of hepatitis C (unspecified) infection are shown in Figure 14. From 2000 to 2006, the notification rates of hepatitis C (unspecified) among the 15–19 years age group decreased by 78.8%. Notification rates also fell on average by 12% per year for the same period among cases in the 20–29 years age group and by 8.0% compared with 2005. In the 30–39 years age group, notification rates have also been declining on average by 9.7% per year since 2000. The decline in the population rate of notification of hepatitis C infection may be attributable to a reduction in risk behaviour related to injecting drug use, but changes in the rates of testing and percentage classified as incident cases may also have contributed to the decline.

Figure 14. Notification rate of hepatitis C (unspecified) infection,* Australia, 1995 to 2006, by age group



* Data provided from Queensland includes both incident and unspecified hepatitis C cases.

Although initial hepatitis C infection may be asymptomatic (more than 90% of cases) or mildly symptomatic, a high percentage (50%–80%) of cases develop a chronic infection. Of chronically infected persons, approximately 50% will eventually develop cirrhosis or cancer of the liver.[3] In 2006, it is estimated that 271,000 people, living in Australia, had been exposed to the hepatitis C infection. Of these cases approximately 157,000 had early liver disease (stage F0/1), and 40,000 had moderate liver disease (stage F2/3) associated with chronic hepatitis C infection; 5,400 were living with hepatitis C related cirrhosis; and 68,500 had cleared their infection.[2]

Hepatitis D

Case definition – Hepatitis D

*Only **confirmed cases** are reported.*

***Confirmed case:** Detection of IgM or IgG antibodies to hepatitis D virus or detection of hepatitis D on liver biopsy in a case known to be hepatitis B surface antigen positive.*

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.[3] People co-infected with hepatitis B and hepatitis D may have more

severe acute disease and a higher risk of fulminant hepatitis compared with those with hepatitis B alone. 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 risk group for hepatitis D.

There were 31 notifications of hepatitis D to the NNDSS in 2006, compared with 30 notifications in 2005, giving a notification rate of 0.15 cases per 100,000 population. The male to female ratio was 2.4:1. Of the 31 notifications, 15 were reported from New South Wales, 8 from Queensland, 7 from Victoria and 1 from Western Australia.

Gastrointestinal diseases

In 2006, 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*/verotoxigenic *E. coli* (STEC/VTEC) infections and typhoid.

Notifications of gastrointestinal diseases in 2006 decreased to 27,924 from 29,424 in 2005 (Table 4a).

Compared with 2005, there was a decrease in the number of notifications of all gastrointestinal diseases except for listeriosis (an increase from 54 to 61 cases) and typhoid (an increase from 52 to 78 cases). Declines in the number of notifications in other diseases ranged from 1% in cryptosporidiosis to a 26% decline in shigellosis notifications (Table 4a).

The reported changes in the number of notifications were within the expected range (the 5-year mean plus or minus 2 standard deviations).

Botulism

Case definition – Botulism

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of* Clostridium botulinum *OR detection of* Clostridium botulinum *toxin in blood or faeces AND a clinically compatible illness (e.g. diplopia, blurred vision, muscle weakness, paralysis, death).*

In 2006, a single case of intestinal botulism that was not foodborne, was reported in 2006 in a 2-year-old child from Queensland. Intestinal botulism arises from the ingestion of *Clostridium botulinum* spores, which then germinate to produce and release toxin in the colon. Sources of intestinal botulism are poorly understood, but honey and dust have been suspected in the past.Cases of foodborne botulism are extremely rare. Since NNDSS commenced in 1991, there has only been 1 case of foodborne botulism, which was reported in 1999.

Campylobacteriosis

Case definition – Campylobacteriosis

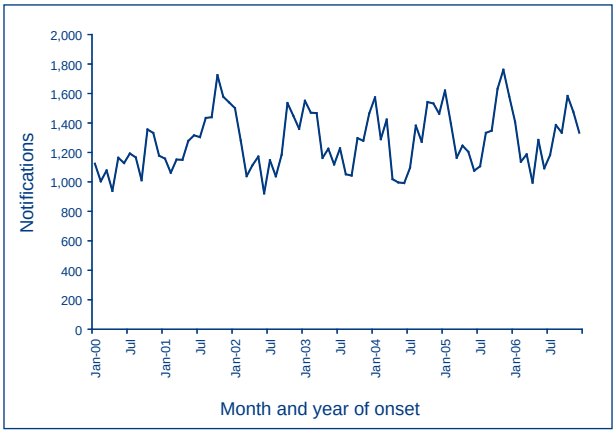
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation or detection of* Campylobacter *species.*

There were 15,398 notifications of campylobacteriosis in 2006, a 7% decline on the 16,488 notifications reported in 2005. Campylobacteriosis is notifiable in all jurisdictions except New South Wales. The national rate of notifications in 2006 was 111 cases per 100,000 population. The highest rate was reported in South Australia (161.7) and the lowest in Western Australia (94.4, Table 3).

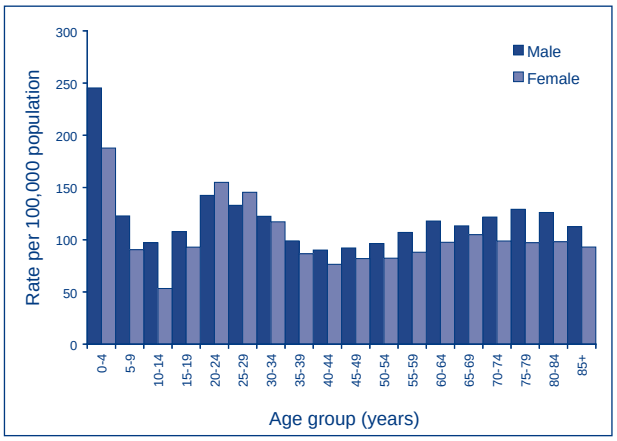
There was an increase in campylobacteriosis notifications in spring and summer, consistent with previous years (Figure 15).

Figure 15. Trends in notifications of campylobacteriosis, Australia, 2000 to 2006, by month of onset



Children aged 0–4 years had the highest notification rate of *Campylobacter* infection (218 cases per 100,000 population) with a secondary peak in the 20–24 years age group (148 cases per 100,000 population, Figure 16). In the 0–4 years age group notification rates were higher in males (245 cases per 100,000 population) than in females (188 cases per 100,000 population). The overall male to female ratio, as in previous years, was 1.15:1.

Figure 16. Notification rate of campylobacteriosis, Australia, 2006, by age group and sex



Cryptosporidiosis

Case definitions – Cryptosporidiosis

*Only **confirmed cases** are reported.*

Confirmed case: *Requires detection of* Cryptosporidium oocytes.

Laboratory definitive evidence: detection of Cryptosporidium oocytes.

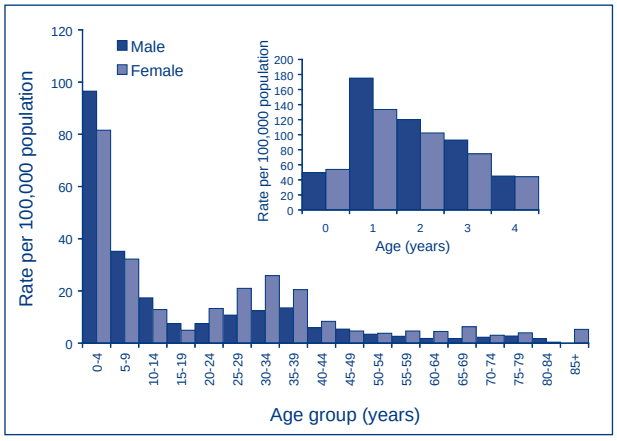
In 2006, a total of 3,201 cases of cryptosporidiosis were reported to NNDSS (15.5 cases per 100,000 population), a similar number and rate to 2005 (3,211 cases, 15.8 cases per 100,000 population).

The highest rates of cryptosporidiosis were reported in the Northern Territory (34.8 cases per 100,000 population) and the Australian Capital Territory (24 cases per 100,000 population).

Of the 3,201 cases of cryptosporidiosis notified to NNDSS in 2006, 1,142 (35%) were under the age of 5 years. Within this age group, boys aged 1 year had the highest notification rate at 175 cases per 100,000 population (Figure 17).

There was a prolonged increase in cryptosporidiosis notifications from New South Wales, Queensland and Victoria from November 2005 to May 2006. Rates of cryptosporidiosis were also elevated in the Australian Capital Territory and the Northern Territory. Interviews with Victorian cryptosporidiosis cases notified between January and May 2006 identified 36 swimming pools as a probable source for 2 or more cases and 2 outbreaks at a special-needs school associated with person to person spread. Hyperchlorination of the swimming pools and infection control procedures at the school brought these outbreaks under control.[4]

Figure 17. Notification rate of cryptosporidiosis, Australia, 2006, by age group and sex



Hepatitis A

Case definition – Hepatitis A

*Both **confirmed cases** and **probable cases** are reported.*

Confirmed case: *Requires detection of anti-hepatitis A IgM, in the absence of recent vaccination, OR detection of hepatitis A virus by nucleic acid testing.*

Probable case: *Requires clinical hepatitis (jaundice and/or bilirubin in urine) without a non-infectious cause AND contact between 2 people involving a plausible mode of transmission at a time when: (a) one of them is likely to be infectious (from 2 weeks before the onset of jaundice to a week after onset of jaundice), AND (b) the other has an illness that starts within 15 to 50 (average 28–30) days after this contact, AND at least 1 case in the chain of epidemiologically-linked cases (which may involve many cases) is laboratory confirmed.*

There were 280 notifications of hepatitis A in 2006 (1.4 cases per 100,000 population) a decrease of 14% on the 326 cases of hepatitis A reported to NNDSS in 2005. The number of notifications of hepatitis A decreased between 1998 and 2001 and have remained stable since 2002 (Figure 18).

The Northern Territory had the highest notification rate (14.5 cases per 100,000 population) followed by Western Australia (3.3 cases per 100 000 population) and New South Wales (1.4 cases per 100,000 population). Rates in all other jurisdictions were less than 1 case per 100,000 population (Table 3).

There were more notifications from males than females with a ratio of 1.2:1. Rates were highest in the 5–9 years age group (2.8 cases per 100,000 population, Figure 19).

In 2006, Indigenous Australians had higher notification rates of hepatitis A infections (6 cases per 10,000 population) compared with non-Indigenous

Figure 18. Trends in notifications of hepatitis A, Australia, 1991 to 2006, by month of notification

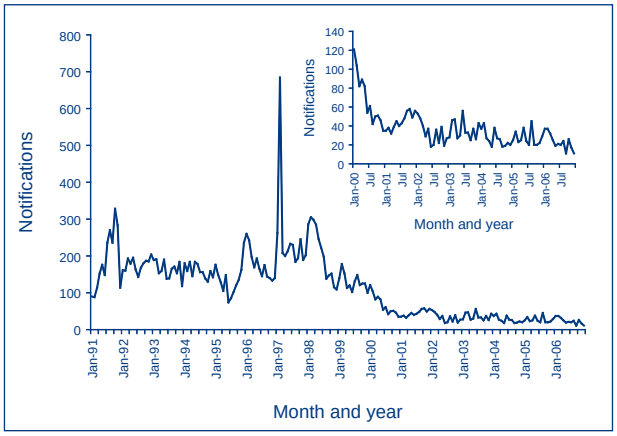
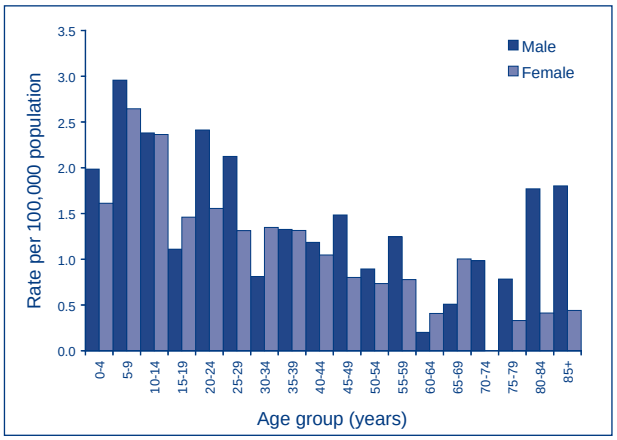


Figure 19. Notification rate of hepatitis A, Australia, 2006, by age group and sex



Australians (1.3 cases per 100,000 population). In 2006, indigenous status was complete in 86% of hepatitis A notifications and 10% overall were Indigenous (Table 7).

Hepatitis E

Case definition – Hepatitis E

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires detection of hepatitis E virus by nucleic acid testing OR, detection of hepatitis E virus in faeces by electron microscopy OR, detection of IgM or IgG to hepatitis E virus. If the person has not travelled outside Australia in the preceding 3 months, the antibody result must be confirmed by specific immunoblot.*

There were 23 cases of hepatitis E in 2006, a decrease of 23% on the 30 cases reported to NNDSS in 2005. Ten cases were reported from New South Wales, 8 from Victoria, 2 each in the Australian Capital Territory and Queensland and 1 from Western Australia.

There were 13 male and 10 female cases (male to female ratio 1.3:1). Cases were aged 16–61 years. Eleven of the cases acquired their infections overseas.

Listeriosis

Case definitions – Listeriosis

*Only **confirmed cases** are reported. Where a mother and foetus/neonate are both confirmed, both cases are reported.*

***Confirmed case:** Requires isolation or detection of* Listeria monocytogenes *from a site that is normally sterile, including foetal gastrointestinal contents.*

In 2006, 61 cases of listeriosis were notified to NNDSS, a 13% increase on the 54 cases reported to NNDSS in 2005.

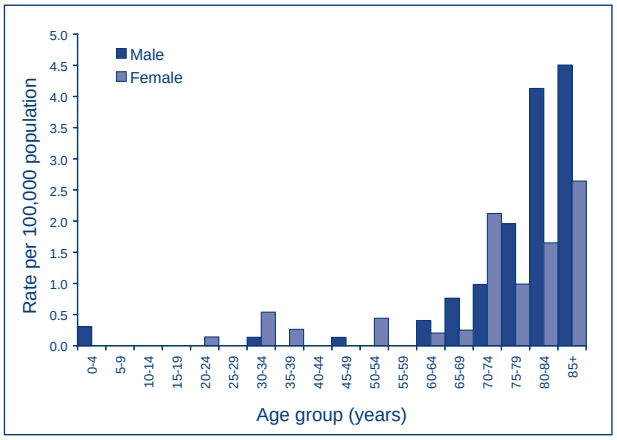
Table 7. Hepatitis A notifications, Australia, 2006, by indigenous status

State or territory	Indigenous		Non-Indigenous*		Total	
	Notifications	Rate	Notifications	Rate	Notifications	Rate
Australian Capital Territory	0	0.0	1	0.3	1	0.3
New South Wales	2	1.5	93	1.4	95	1.4
Northern Territory	10	16.5	20	13.7	30	14.5
Queensland	0	0.0	31	0.8	31	0.8
South Australia	3	11.3	5	0.3	8	0.5
Tasmania	0	0.0	4	0.8	4	0.8
Victoria	0	0.0	44	0.9	44	0.9
Western Australia	13	19.4	54	2.7	67	3.3
Total	28	6.0	252	1.3	280	1.4

* Notifications in non-Indigenous persons include diagnoses in persons whose indigenous status was not reported.

In 2006, 50 (82%) listeriosis cases were aged over 50 years, with the highest notification rate in the 85 years or over age group in males and females (Figure 20). Six cases (4 women and 2 men) aged between 76 and 87 years died. Eight cases of materno-foetal listeriosis were reported to OzFoodNet in 2006.[4] In 2 of these cases the infant died.

Figure 20. Notification rate of listeriosis, Australia, 2006, by age group and sex



Salmonellosis

Case definitions: – Salmonellosis

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation or detection of* Salmonella *species (excluding* Salmonella typhi *which is notified separately under typhoid).*

There were 8,261 notification of salmonellosis (40.1 cases per 100,000 population) to NNDSS in 2006, a 2% decline from the 8,425 notifications reported in 2005.

The highest notification rates were reported in the Northern Territory (196 cases per 100,000 population), Queensland (67 cases per 100,000 population) and the Australian Capital Territory (41 cases per 100,000 population, Table 3 and Map 2).

The highest rate of notification was in children aged between 0–4 years: 30% of salmonellosis notifications were in this age group (Figure 21). The male to female ratio was 1:1.

The 10 most frequently isolated serovars and phage types of *Salmonella,* which accounted for 39% of all isolates, are shown in Table 8. Nationally, *S.* Typhimurium 135 (including 135a), Saintpaul and Typhimurium 170/108 were the 3 most frequently isolated serovars/phage types.

Map 2. Notification rates of salmonellosis, Australia, 2006, by Statistical Division of residence

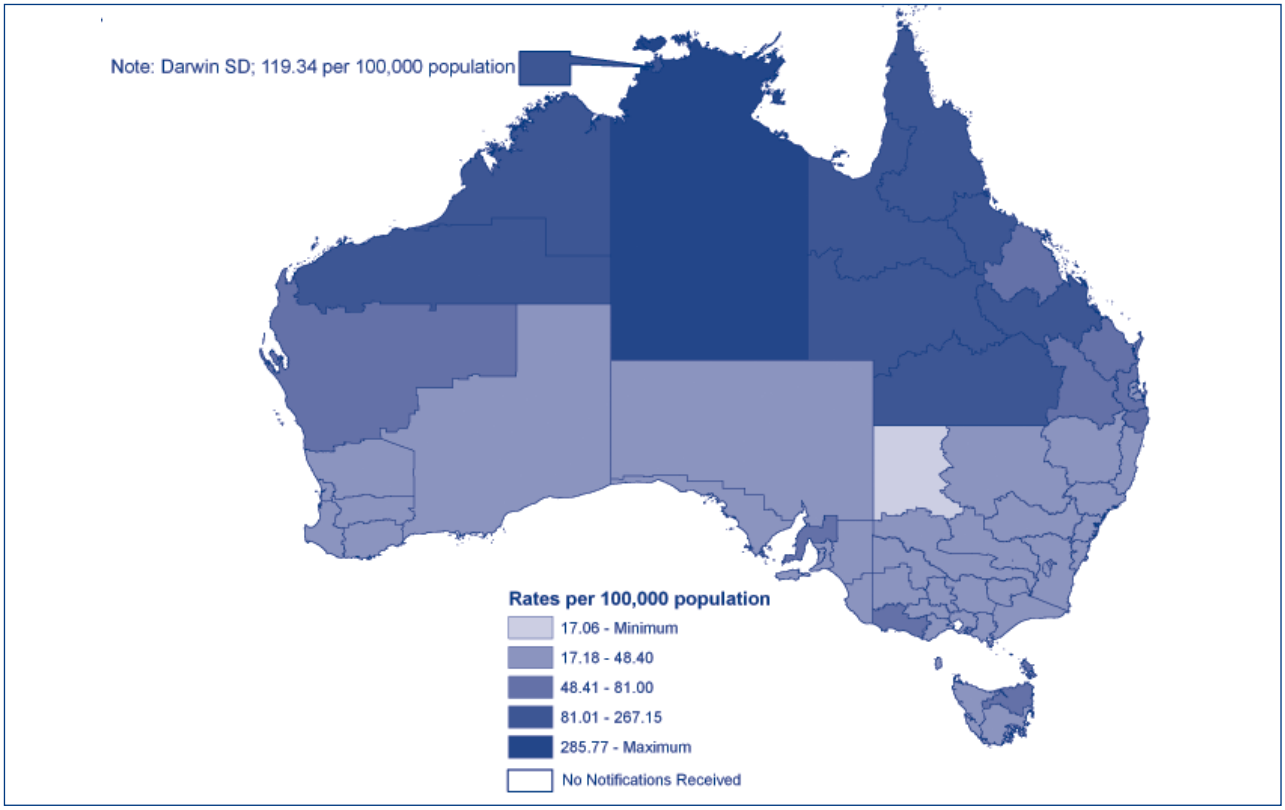
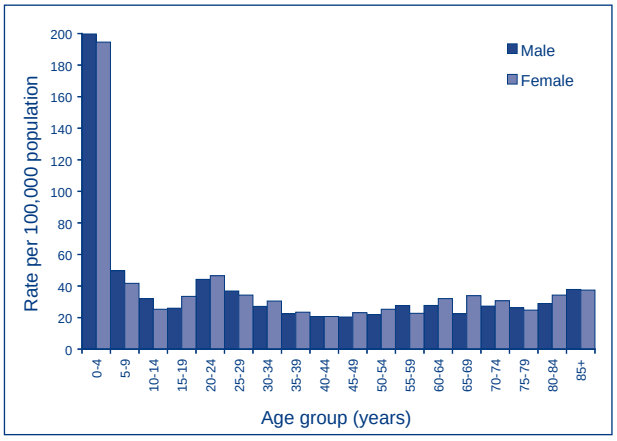


Figure 21. Notification rate of salmonellosis, Australia, 2006, by age group and sex



In 2006, OzFoodNet reported 41 outbreaks of foodborne salmonellosis. *S.* Typhimurium species were responsible for 25 of the 41 (61%) *Salmonella* outbreaks. Eggs and foods made with eggs were implicated in 16 outbreaks of salmonellosis.[4]

Shigellosis

Case definitions – Shigellosis

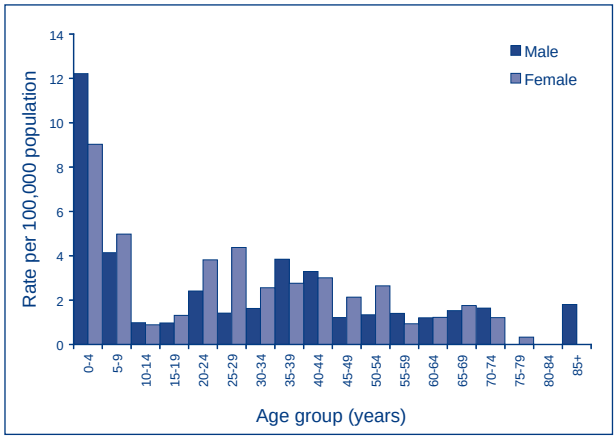
*Only **confirmed cases** are reported.*

***Confirmed case:** Isolation or detection of* Shigella *species.*

In 2006 there were 543 cases of shigellosis reported to NNDSS, a decrease of 26% on the 729 cases reported in 2005. The 2006 notification rate was 2.6 cases per 100,000 population. The Northern Territory had the highest notification rate (61 cases per 100,000 population).

Children under the age of 5 years represented 25% of shigellosis notifications (136 cases, 10.7 per 100,000 population, Figure 22). The male to female rate ratio was 0.9:1.

Figure 22. Notification rate of shigellosis, Australia, 2006, by age group and sex



The highest burden of shigellosis continues to be in Indigenous populations. In 2006, of the notifications of shigellosis where indigenous status of cases was complete (71% of all cases) 38% were identified as Indigenous. In the Northern Territory (where in 97% of notifications the indigenous status of cases was complete), 91% of shigellosis cases were Indigenous and in South Australia (97% complete), 46% were Indigenous.

Shigella flexneri and *Shigella sonnei* infections accounted for 58.2% and 34.8% of shigellosis, respectively in 2006 (Table 9). Ninety-three per cent of *Shigella flexneri* infections were further typed, of which (104, 35%) were type 4a and 55 (18%) were

Table 8. Top 10 isolates of *Salmonella*, Australia, 2006

Salmonella type (sero/phage type)	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Salmonella Typhimurium 135*	11	195	20	169	79	39	143	53	709
Salmonella Saintpaul	14	100	31	264	13	6	74	57	559
Salmonella Typhimurium 170/108	11	212	0	54	58	14	99	5	453
Salmonella Typhimurium 9	7	76	1	62	58	14	109	11	338
Salmonella Virchow 8	2	27	13	207	0	1	9	4	263
Salmonella Birkenhead	1	101	0	150	0	0	4	0	256
Salmonella Typhimurium 44	6	41	1	29	16	3	109	6	211
Salmonella Infantis	2	59	15	17	36	1	25	10	165
Salmonella Chester	0	28	17	64	6	1	13	25	154
Salmonella Muenchen	0	27	16	67	6	0	6	31	153
Total	54	866	114	1,083	272	79	591	202	3,261

* Includes *Salmonella* Typhimurium 135a.

Table 9. Shigella infections, Australia, 2006, by serogroups and state or territory

Organism	State or territory									Per cent
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.	
S. boydii	0	3	0	2	0	0	2	0	7	1.3
S. dysenteriae	0	1	0	2	0	0	1	2	6	1.1
S. flexneri	0	35	109	23	25	2	26	96	316	58.2
S. sonnei	0	34	13	59	11	1	46	25	189	34.8
Sub total	0	73	122	86	36	3	75	123	518	95.4
Unknown	2	2	3	11	1	0	1	5	25	4.6
Total	2	75	125	97	37	3	76	128	543	100.0

type 2A. Eighty-three per cent (158) of *Shigella sonnei* infections were further typed, of which 50% were type A.

Person to person transmission and acquisition of infection overseas are the major modes of *Shigella* infections. OzFoodNet did not identify any *Shigella* outbreaks associated with food in 2006.[4]

Shiga toxin producing/verotoxigenic *Escherichia coli*

Case definitions – Shiga toxin-producing/ verotoxin-producing Escherichia coli *(STEC/ VTEC)*

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Shiga-toxigenic/ verotoxigenic* Escherichia coli *from faeces, OR, isolation of Shiga toxin or verotoxin from a clinical isolate of* E. coli *OR, identification of the gene associated with the production of Shiga toxin or vero toxin in* E. coli *by nucleic acid testing on isolate or raw bloody diarrhoea.*

Note: Where STEC/VTEC is isolated in the context of haemolytic uraemic syndrome (HUS), it should be notified as STEC/VTEC and HUS.

There were 70 cases of STEC/VTEC notified to NNDSS in 2006 a reduction of 19% on the 86 cases reported in 2005.

As in previous years, South Australia routinely tested bloody stools by polymerase chain reaction (PCR) for genes coding for Shiga toxin. Consequently, 36 of the 70 cases (51%) were notified in South Australia, which also had the highest notification rate (2.3 cases per 100,000 population). There were no cases reported from the Australian Capital Territory or Tasmania.

Cases occurred in all age groups, with 11 (15%) cases in children aged less than 5 years. There were more cases reported among men (male to female ratio 1.4:1).

Typing information was available on only 18 cases. These included 7 cases of 0157, 4 of 011 and 3 of 026.

Haemolytic uraemic syndrome

Case definitions – Haemolytic uraemic syndrome (HUS)

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires acute microangiopathic anaemia on peripheral blood smear (schistocytes, burr cells or helmet cells) AND AT LEAST ONE OF THE FOLLOWING: acute renal impairment (haematuria, proteinuria or elevated creatinine level), OR, thrombocytopaenia, particularly during the first seven days of illness.*

Note: Where STEC/VTEC is isolated in the context of HUS, it should be notified as both STEC/VTEC and HUS.

In 2006, 13 cases of HUS were reported to NNDSS (a 35% decrease on the 20 cases reported in 2005). Cases were reported mainly from New South Wales (11 cases) with single cases reported from South Australia and Victoria.

Of the 13 cases of HUS notified in 2006, 6 were males and 7 females. The median age for both sexes was 5 years with an age range of 1 to 60 years. STEC was isolated in 3 cases of HUS and the serotype of 1 (an 055) was identified. In New South Wales, all cases of HUS were interviewed but no common risk factors or links between cases were identified.[4]

Typhoid

Case definitions – Typhoid fever

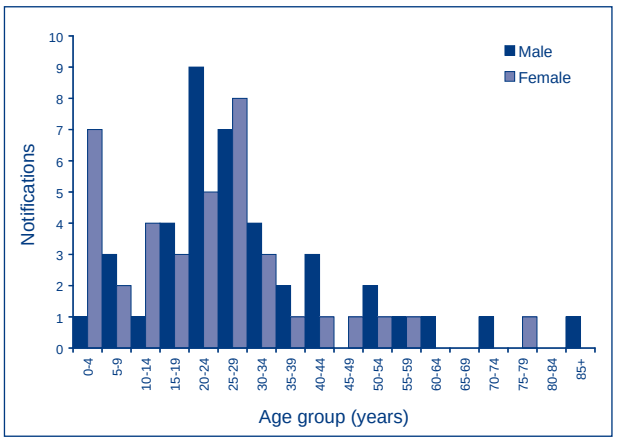
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation or detection of* Salmonella typhi.

There were 78 cases of typhoid reported in 2006, an increase of 50% on the 52 notifications in 2005. Nationally, the male to female ratio was 1.05:1, with the highest number of notifications in the 20–29 years age range (Figure 23).

OzFoodNet reported 74 cases of typhoid in 2006. Sixty-eight cases (93%) reported overseas travel; one-third of these travelled in India.[4]

Figure 23. Number of notifications of typhoid, Australia, 2006, by age group and sex



Quarantinable diseases

Human diseases covered by the *Quarantine Act 1908,* and nationally notifiable in Australia and to the World Health Organization in 2006 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). HPAIH was declared a quarantinable disease on 23 March 2004 and consequently became subject to the routine quarantine powers available under the *Quarantine Act 1908*. SARS was declared a quarantinable disease under the *Quarantine Act 1908* on 7 April 2003.

In 2005, Australia committed to the International Health Regulation (IHR). These are requirements that will contribute significantly to enhancing national, regional and international public health security. During 2006, Australia was preparing for the IHR, which came into force on 15 June 2007. Under the IHR a 'decision instrument' must be utilised in order to identify whether a health-related event may constitute a public health emergency of internal concern and therefore requires formal notification to WHO.

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 in their destinations and take appropriate measures. More information on quarantinable diseases and travel health can be found on DoHA's web site at: http://www.health.gov.au/internet/main/Publishing.nsf/Content/health-pubhlth-strateg-quaranti-index.htm

There were no cases of plague, rabies, smallpox, tularaemia, yellow fever, SARS, HPAIH or viral haemorrhagic fever reported in Australia in 2006.

Cholera

Case definition – Cholera

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of toxigenic* Vibrio cholerae *O1 or O139.*

In 2006, there were 3 cases of locally acquired cholera notified in Australia that were part of a local cluster in Sydney, New South Wales, in November. All cases were elderly women (aged 71, 71 and 84) infected with toxin-producing *Vibrio cholerae* O1 Ogawa El Tor. Investigations by the NSW Health Department found that the only common exposure among the 3 women was consumption of raw whitebait that was imported from Indonesia. As a result, a media release advising people to avoid eating raw whitebait was issued. No additional cases of cholera were discovered, and the 3 women all recovered.

Apart from 1 case of laboratory acquired cholera in 1996 and the 3 cases in 2006, all other cases of cholera reported since the commencement of the NNDSS in 1991 have been acquired outside Australia. There have been 17 cases notified over the last 5 years (ranging from 1 case in 2003 to 5 cases in both 2002 and 2004).

Sexually transmissible infections

In 2006, sexually transmissible infections (STIs) reported to NNDSS were chlamydial infection, donovanosis, gonococcal infections and syphilis. Two categories of adult syphilis have been reported since 2004: syphilis – infectious (primary, secondary and early latent) less than 2 years duration and syphilis – of greater than 2 years or unknown duration. Reports were also received by NNDSS on congenital syphilis. These conditions were notified in all states and territories.

Other national surveillance systems that monitor STI in Australia include the Australian Gonococcal Surveillance Programme, which is a network of specialist laboratories, and the National Centre in HIV Epidemiology and Clinical Research.

The national trends in the number and rates of STI notifications reported to NNDSS between 2001–2006 are shown in Table 4a. 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,[5,6] more targeted screening, the use of more sensitive diagnostic tests, as well as periodic public awareness campaigns may contribute to changes in the number of notifications over time.

Age standardised notification rates were calculated for Indigenous and non-Indigenous populations for jurisdictions that had indigenous status data completed in more than 50% of notifications. These data however, have to be interpreted cautiously as STI screening occurs disproportionately among Indigenous populations. Similarly, rates between females and males need to be interpreted cautiously as rates of testing for STI differ between the sexes.

Chlamydial infection

Case definition – Chlamydial infection

Only ***confirmed cases*** *are reported.*

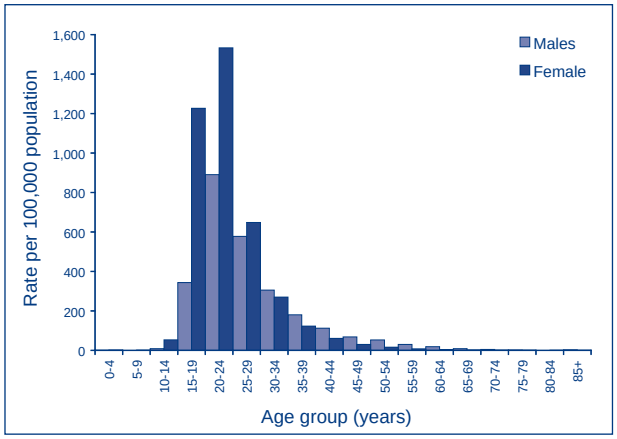
Confirmed case: *Isolation of* Chlamydia trachomatis *or detection of* Chlamydia trachomatis *by nucleic acid testing or detection of* Chlamydia trachomatis *antigen.*

In 2006, chlamydial infection continued to be the most commonly notified disease. A total of 46,954 notifications of chlamydial infection were received; a rate of 228 cases per 100,000 population. This represents an increase of 12% on the rate reported in 2005 (203 cases per 100,000 population). The rate of chlamydial infection notifications has continued to increase since surveillance of the condition commenced in 1991. Between 2002 and 2006, chlamydial infection notification rates increased from 124 to 228 cases per 100,000 population, an increase of 79% (Table 4a). This ongoing increase provided impetus for the launch of Australia's first National STI Strategy in July 2005.[7] While the prevalence of chlamydia varies by age group and other demographic and behavioural factors, no major section of the population is spared.[8]

Chlamydial infection notification rates were higher than the national average (228 cases per 100,000 population) in the Northern Territory (995 cases per 100,000 population), Queensland (302 cases per 100,000 population), Western Australia (288 cases per 100,000 population), and the Australian Capital Territory (250 cases per 100,000 population) (Table 3). At a regional level, the Northern Territory excluding Darwin had the highest chlamydial infection notification rate at 1,959 cases per 100,000 population (Map 3).

In 2006, notification rates of chlamydial infection in males and females were 185 and 270 cases per 100,000 population, respectively. In 2006, notification rates increased by 11% in males and by 12% in females when compared with 2005. The male to female ratio in 2006 was 1:1.5, which is similar to previous years. Rates in females exceeded those in males in the 0–29 years age range but were higher in males in the 30 years or more age range (Figure 24).

Figure 24. Notification rate of chlamydial infections, Australia, 2006, by age group and sex



Trends in age and sex notification rates between 2002 and 2006 show increases in all age groups between 10 and 39 years in both males and females (Figure 25). Between 2002 and 2006, the notification rate in males in the 20–24 years age group increased by 433.5 cases per 100,000 population. In females of the same age, the notification rate increased by 732.2 cases per 100,000 population.

In 2006, data on indigenous status was complete in 43% of cases of chlamydia infection and this is comparable to the preceding 5-year indigenous status completeness average of 43% (range: 40%–44%). The combined chlamydial infection notifications in 5 jurisdictions with greater than 50% completeness of indigenous status (Northern Territory, South Australia, Victoria, Tasmania and Western Australia) showed that in 2006, the age adjusted notification rate was 1,250 cases per 100,000 population, and 223 cases per 100,000 non-Indigenous population (Figure 26). During 2006, the age standardised ratio

Map 3. Notification rates of chlamydial infection, Australia, 2006, by Statistical Division

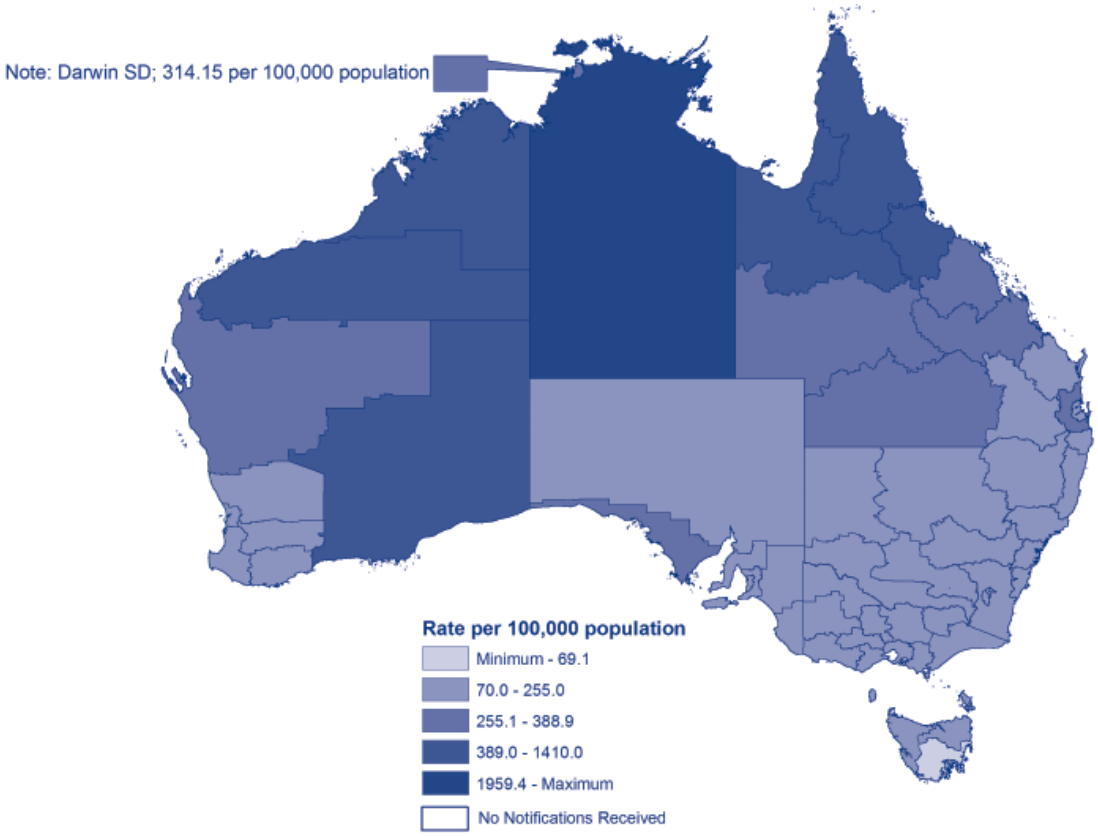


Figure 25. Trends in notification rates of chlamydial infection in persons aged 10–39 years, Australia, 2002 to 2006, by age group and sex

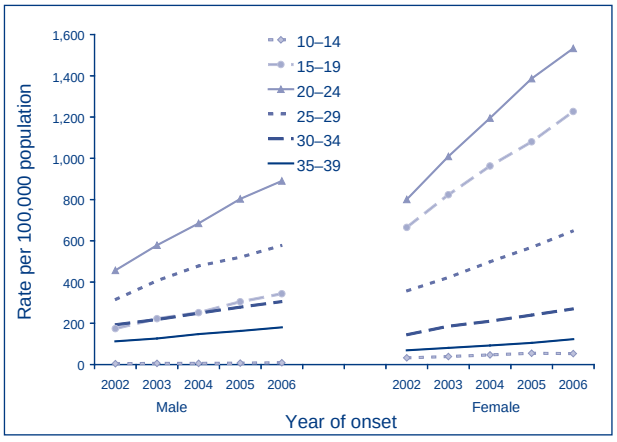
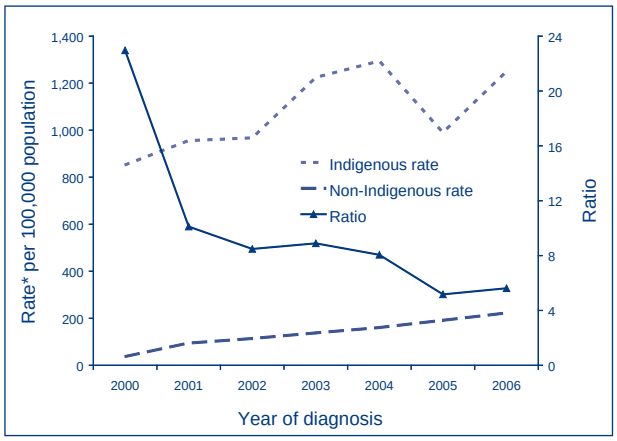


Figure 26. Trends in age standardised notification rate of chlamydial infections, the Northern Territory, South Australia, Tasmania, Western Australia, and Victoria, 2000 to 2006, by indigenous status



* The rates in non-Indigenous peoples include diagnoses in people whose Indigenous status was not reported.

of Indigenous to non-Indigenous chlamydial infection was 5.6:1 and this gap has increased slightly from 2005 (5.2:1), but since 2000, has improved significantly (ratio range: 8–23).

Donovanosis

Case definition – Donovanosis

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires demonstration of intracellular Donovan bodies on smears or biopsy specimens taken from a lesion or detection of* Calymmatobacterium granulomatis *by nucleic acid testing of a specimen taken from a lesion AND clinically compatible illness involving genital ulceration.*

***Probable case:** Requires compatible sexual risk history in a person from an endemic area or a compatible sexual risk history involving sexual contact with someone from an endemic area.*

Donovanosis is a sexually transmissible infection characterised by a chronic ulcerative genital disease. Although uncommon, it is a disease of public health importance in Australia because it predominantly occurs in Indigenous communities. It has been identified as a potential co-factor in HIV transmission, and it is preventable.[9] Donovanosis is targeted for elimination from Australia through the donovanosis elimination project. In 2006, 4 cases of donovanosis (3 male and 1 female) were reported to NNDSS. Cases were reported from the Northern Territory (2) and Queensland (2). All 4 cases were among Indigenous people. In 2005, a total of 13 cases, 11 Indigenous, 4 male and 9 female, were notified (Figure 27). Cases in 2006 were aged 30, 31, 37 and 58 years.

Gonococcal infections

Case definition – Gonococcal infection

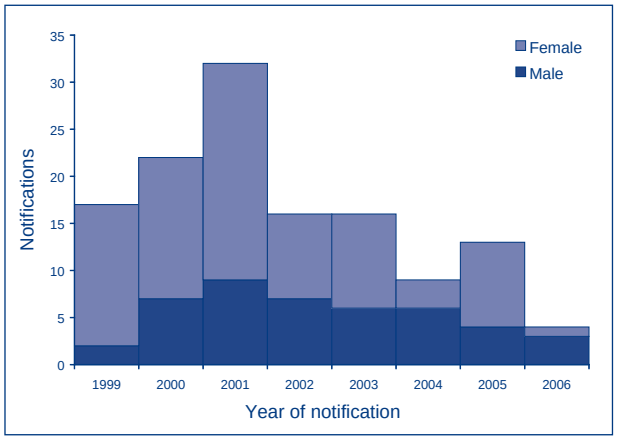
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of* Neisseria gonorrhoeae, *or detection of* Neisseria gonorrhoeae *by nucleic acid testing or detection of typical Gram-negative intracellular diplococci in a smear from a genital tract specimen.*

In 2006, 8,547 notifications of gonococcal infection were received by NNDSS. This represents a rate of 41.5 cases per 100,000 population, an increase of 4% from the rate reported in 2005 (39.8 cases per 100,000 population). The male to female ratio in 2006 was 2:1, unchanged in the previous 5 years (2001 to 2005) and reflecting ongoing transmission among men who have sex with men (MSM) in Australia's larger cities.[2]

The highest notification rate in 2006 was in the Northern Territory at 860 cases per 100,000 population (Table 3). The largest increase in the notification rate in 2006 (compared with 2005) occurred in South Australia, where a 24% overall increase in notification rates was reported. Notification rates in Tasmania decreased by 49% compared with 2005. In 2006 nationally, gonococcal infection rates for males and females were 57 and 26 cases per 100,000 population respectively. The exception to this pattern was the Northern Territory, where females had higher notification rates than males (929 versus 796 cases per 100,000 population). The regional distribution of gonococcal infection notification shows that the highest rate occurred in the Northern Territory excluding Darwin at 75 per 100,000 population.

Figure 27. Number of notifications of donovanosis, Australia, 1999 to 2006, by sex



Notification rates of gonococcal infection in males exceeded those in females in all age groups except in the 10–14 and 15–19 years age groups (Figure 28).

Trends in sex specific notification rates show that an increase in the rates in males in the 20–24 and 25–29 years age groups has continued. However, in 2006 the sex specific notification rates for the males in the 15–19 years age group decreased. In females, an increase occurred in the 20–24 and 30–34 years age groups, and there was a slight decrease in the 15–19 years age group (Figure 29).

In 2006, the data completeness of indigenous status of gonococcal infection notifications was 68%; the same as in 2005. The combined gonococcal infection notifications of 6 jurisdictions with more than 50% data completeness of indigenous status (Northern Territory, Queensland, South Australia, Western Australia, Tasmania and Victoria) shows that in 2006, the age adjusted notification rate in the Indigenous population was 1,206.1 cases per 100,000 population and 24.1 cases per 100,000 non-Indigenous population: a ratio of Indigenous to non-Indigenous of 50:1.

Figure 28. Notification rate of gonococcal infection, Australia, 2006, by age group and sex

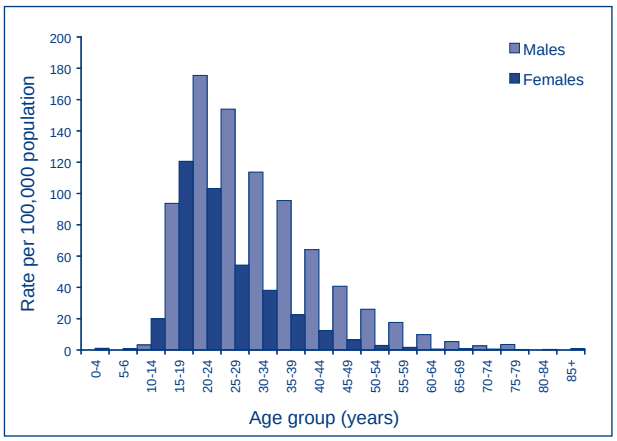
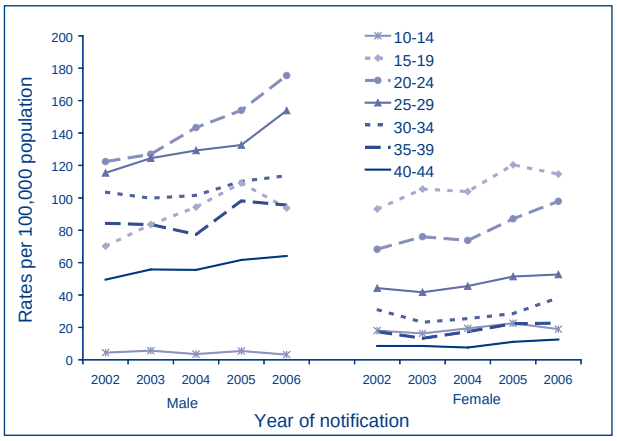


Figure 29. Trends in notification rates of gonococcal infection in persons aged 10–44 years, Australia, 2002 to 2006, by age group and sex



Other surveillance of gonococcal infections

The Australian Gonococcal Surveillance Programme (AGSP) is the national surveillance system of antibiotic susceptibility of gonococcal isolates. In each state and territory, a network of reference laboratories determines the susceptibility of isolates to a core group of antibiotics using a standard methodology. The following is the summary of their 2006 report.

In 2006, a total of 3,850 isolates of gonococci were tested for antibiotic susceptibility. Eighty-four per cent of isolates were from men (mainly MSM), of which 75% were obtained from the urethra, 15% from the rectum and 9% from the pharynx. In females, 93% of isolates were obtained from the cervix. Proportions for site of infection were similar to those reported in 2005.

Trends in the proportion of isolates resistant to penicillin, quinolones and tetracycline are shown in Table 10.

In 2006, the proportion of isolates resistant to penicillin by plasmid mediated resistance decreased by 5% and the proportion of isolates resistant to penicillin by chromosomally mediated increased by 24% compared with 2005. Quinolone resistance also increased by 23% to 37.8% from 30.6% in 2005 (Figure 30).

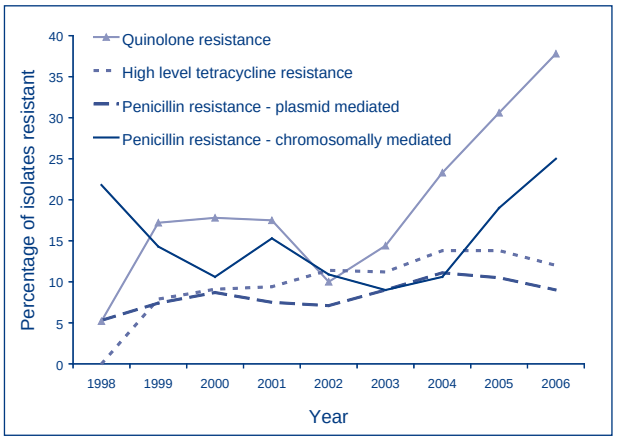
Information on the country where resistant strains were acquired were available in 23% of infections by strains with plasmid mediated resistance to penicillin and 22% of infections by strains resistant to quinolone. This showed that 43% (34/80) of plasmid mediated resistance were locally acquired with the rest acquired from Western Pacific countries and South East Asia. Eighty-one per cent of quinolone resistant strains were acquired locally and the remaining from overseas.

Table 10. Proportion of gonococcal isolates showing antibiotic resistance, Australia, 1998 to 2006

Year	Penicillin resistance (% resistant)		Quinolone resistance (% resistant)	High level tetracycline resistance (% resistant)
	Plasmid mediated	Chromosomally mediated		
1998	5.3	21.8	5.2	NR
1999	7.4	14.3	17.2	7.9
2000	8.7	10.6	17.8	9.1
2001	7.5	15.3	17.5	9.4
2002	7.1	10.9	10.0	11.4
2003	9.0	9.0	14.4	11.2
2004	11.1	10.6	23.3	13.8
2005	10.5	19.0	30.6	13.8
2006	9.0	25.0	37.8	12.0

NR Not resistant

Figure 30. Trend in percentage of gonococcal isolates showing antibiotic resistance, Australia, 1998 to 2006



Resistance to both the penicillin and quinolone groups of antibiotics has reached historical highs. Nationally, one third of gonococci were penicillin resistant by at least one mechanism, and a slightly higher proportion was quinolone resistant.

The distribution of infections with strains resistant to different antibiotic agents varies from jurisdiction to jurisdiction and urban to rural areas within each jurisdiction. The AGSP recommends that treatment regimes should be tailored to the local patterns of susceptibility.

Syphilis (all categories)

In 2004, all jurisdictions began reporting to NNDSS adult syphilis infections categorised as: infectious syphilis of less than 2 years duration, and syphilis of more than 2 years or unknown duration. Detailed analyses are reported for the 2 categories, as well as for syphilis of *all categories* for the purpose of showing trends in keeping with reports in previous years.

In 2006, a total of 2,436 cases of syphilis infection of all categories was reported, representing a notification rate of 11.8 cases per 100,000 population, an increase of 8.2% on the 10.9 cases per 100,000 population reported in 2005 (Table 4a, Figure 31). The Northern Territory continued to have the highest notification rate of syphilis (130 cases per 100,000 population), an increase of 14.7% from the previous year. South Australia reported an increase in the notification rate of syphilis of 133.0% compared with 2005. There were also increases in notification rates in Victoria (19.4%), Queensland (9.0%) and New South Wales (2.4%) and decreases in notification rates in Tasmania (27.2%) and Western Australia (by 11.2%) and the Australian Capital Territory (1.1%). At the regional level, the highest notification rate was in the Northern Territory excluding Darwin at 284 cases per 100,000 population (Map 4). As in other developed countries syphilis infection rates are rising in Australia among men who have sex with men.[10,11]

Map 4. Notification rates of syphilis infection, Australia, 2006, by Statistical Division of residence

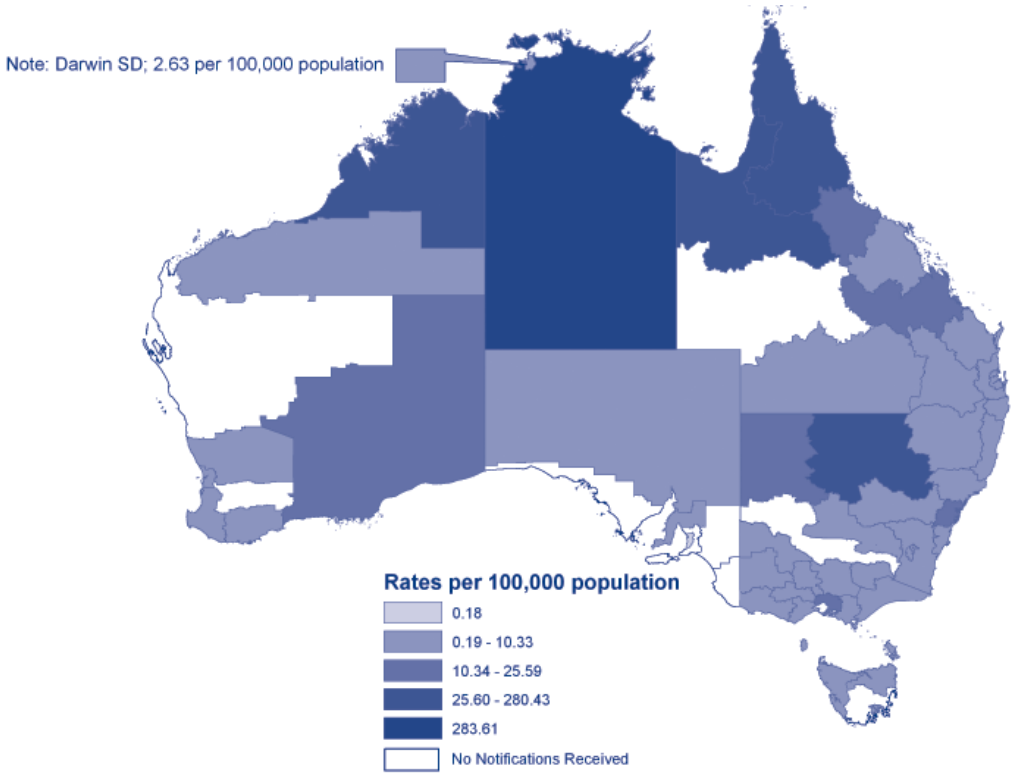
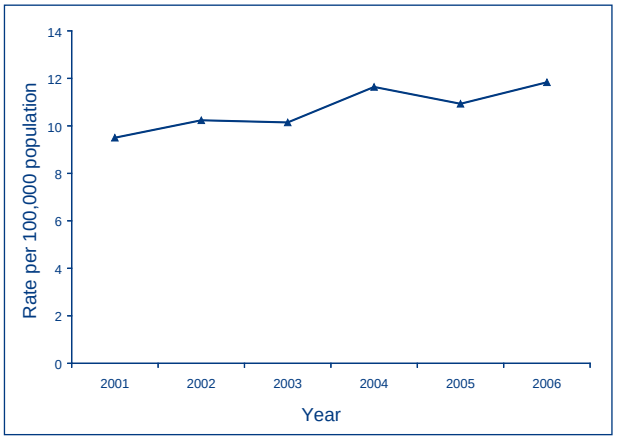


Figure 31. Notification rate of syphilis infection, Australia, 2001 to 2006



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

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

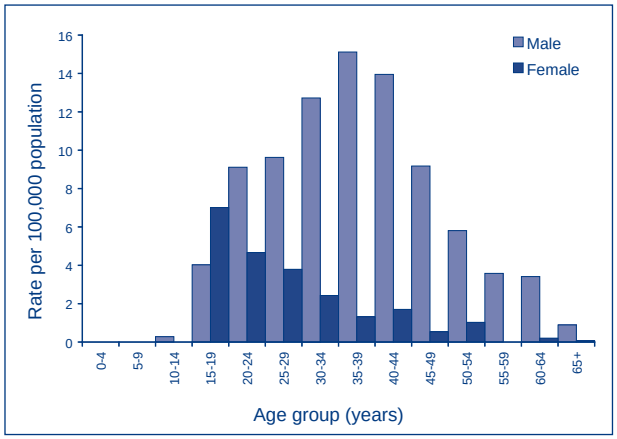
Only ***confirmed cases*** *are reported.*

Confirmed case: *Requires seroconversion in past 2 years (specific treponemal test (e.g. IgG enzyme immunoassay,* Treponema pallidum *haemagglutination assay,* Treponema palladium *particle agglutination,* Treponema pallidum *immobilisation assay), or fluorescent treponemal antibody absorption reactive when previous treponemal test non-reactive within past 2 years OR a fourfold or greater rise in non-specific treponemal antibody titre (e.g. Venereal Diseases Research Laboratory, Rapid Plasma Reagin) in the past 2 years, and a reactive specific treponemal test (e.g. IgG enzyme immunoassay,* Treponema pallidum *haemagglutination assay,* Treponema pallidum *particle agglutination,* Treponema pallidum *immobilisation assay, or fluorescent treponemal antibody absorption) OR demonstration of* Treponema pallidum *by darkfield microscopy (not oral lesions), direct fluorescent antibody tests, equivalent microscopic methods (e.g. silver stains), or nucleic acid testing or non-specific treponemal test (e.g. Venereal Diseases Research Laboratory, Rapid Plasma Reagin) reagin titre of greater than or equal to 1:8 AND presence of a primary chancre (or ulcer) or clinical signs of secondary syphilis.*

In 2006, a total of 813 cases of syphilis of less than 2 years duration were reported. This represents a notification rate of 3.9 cases per 100,000 population, an increase of 25.8% compared with 2005 (Table 4a). The Northern Territory had the highest notification rate at 72.6 cases per 100,000 population in 2006, an increase of 56.5% compared with 2005. Western Australia reported an increase in the notification rate for infectious syphilis of 142% compared with 2005. Increases in notifications also occurred in Victoria (88.3%), and Queensland (16.9%) and decreases occurred in South Australia (77.8%), the Australian Capital Territory (50.5%), Tasmania (17.3%) and New South Wales (14.2%) (Table 3).

The notification rates of syphilis of less than 2 years duration for males and females were 6.2 and 1.7 cases per 100,000 population respectively (Table 11). Notification rates were higher in males than in females in all jurisdictions, except in the Northern Territory where rates were higher in females (89.3 versus 57.7 cases per 100,000 population). Nationally, the male to female ratio was 3.6:1. Notification rates in males peaked in the 35–39 years age group (15.1 cases per 100,000 population) and in females in the 15–19 years age group (7 cases per 100,000 population) (Figure 32).

Figure 32. Rates of notification of syphilis of less than 2 years duration, Australia, 2006, by age group and sex



Over the period 2004 to 2006 notification rates have increased in most age groups for both males and females. In 2006, the largest increase in males occurred in the 40–49 years age group and in females in the 10–19 years age group (Figure 33). Increases in notifications of infectious syphilis occurred mainly in homosexual men.[2]

Data on indigenous status was complete in 95% of cases of syphilis of less than 2 years duration. The age adjusted notification rate was 47.9 cases per 100,000 Indigenous population, and 3.1 cases per 100,000 non-Indigenous population, a ratio of Indigenous to non-Indigenous of 15:1. Age specific notification rates show that compared with the non-Indigenous population, rates of syphilis of less than 2 years duration in the Indigenous population are in an order of magnitude higher and peak in a younger age group (Figure 34).

Table 11. Number and rates of notifications of syphilis of less than 2 years duration Australia, 2006, by state or territory and sex

	Male		Female		Total	
	n	Rate	n	Rate	n	Rate
ACT	1	0.6	1	0.6	2	0.6
NSW	190	5.6	19	0.6	210	3.1
NT	63	57.7	87	89.3	150	72.6
Qld	137	6.8	28	1.4	165	4.1
SA	2	0.3	0	0.0	4	0.3
Tas.	4	1.7	1	0.4	5	1.0
Vic.	208	8.3	23	0.9	231	4.5
WA	34	3.3	14	1.4	48	2.3
Total	639	6.2	173	1.7	813*	3.9

* Sex unknown for one case.

Figure 33. Rates of notification of syphilis of less than 2 years duration, Australia, 2004 to 2006, by age group and sex

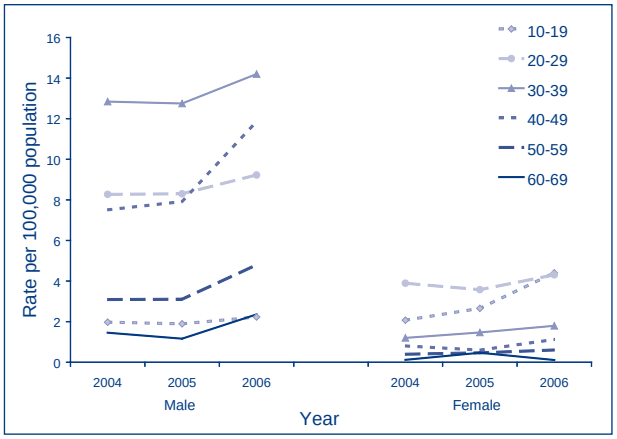
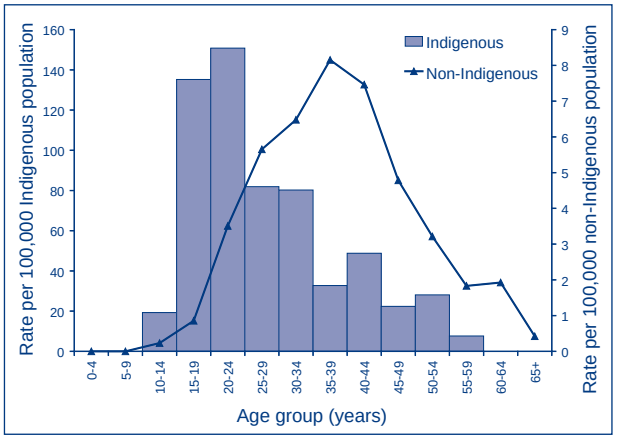


Figure 34. Notification rate of syphilis of less than 2 years duration, Australia, 2006, by indigenous status



Syphilis of more than 2 years or unknown duration

Case definition – Syphilis of more than two years or unknown duration

*Only **confirmed cases** are reported.*

***Confirmed case:** Does not meet the criteria for a case of less than 2 years duration AND either a reactive specific treponemal test (e.g. IgG enzyme immuno-assay,* Treponema pallidum *haemagglutination assay,* Treponema pallidum *particle agglutination,* Treponema pallidum *immobilisation assay, or fluorescent treponemal antibody absorption) which is confirmed either by a reactive non-specific treponemal test (e.g. Venereal Diseases Research Laboratory, Rapid Plasma Reagin) OR a different specific treponemal test if the non-specific treponemal test is non-reactive AND the absence of a history of documented previous adequate treatment of syphilis, or endemic treponemal disease (e.g. Yaws).*

In 2006, a total of 1,623 cases of syphilis of more than 2 years or unknown duration were reported: a notification rate of 7.9 cases per 100,000 population. The Northern Territory had the highest notification rate at 57.6 cases per 100,000 population.

In 2006, notification rates of syphilis of more than 2 years or unknown duration in males and females were 10.1 and 5.6 cases per 100,000 population, respectively (Table 12). Notification rates were higher in males than in females in all jurisdictions, except in the Northern Territory, where males had a higher rate than females (53.1 and 57.6 cases per 100,000 population, respectively). Nationally, the male to female ratio was 1.8:1. Notification rates in males and females were similar in the younger age groups up to 30–34 years. In females, the rate peaked in the 30–34 years age group while in males it remained high from 35 years (Figure 35).

Figure 35. Notification rate of syphilis of more than 2 years or unknown duration, Australia, 2006, by age group and sex

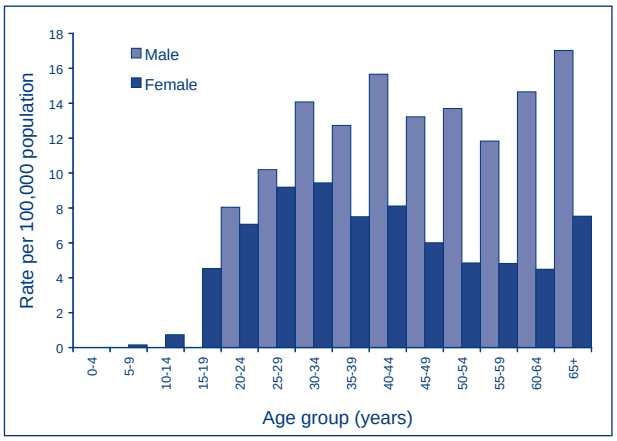
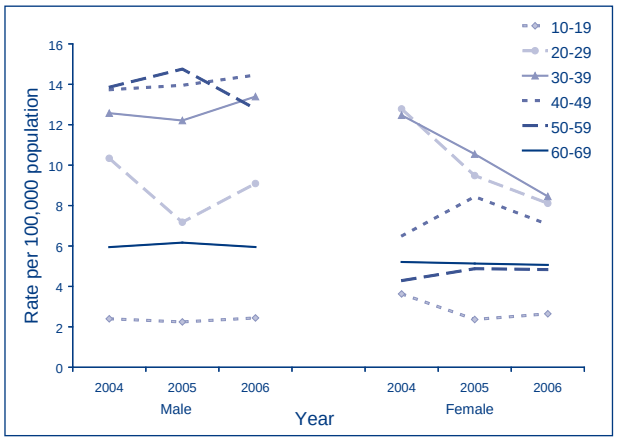


Figure 36. Rates of notification of syphilis of more than 2 years or unknown duration, Australia, 2004–2006, by age group and sex



Over the period 2004 to 2006 notification rates have remained stable in most age groups for both males and females, except in females aged 20 to 39 years, which have shown a large decrease. In 2006, the largest increase in rates occurred in males in the 20–29 and 30–39 years age groups (Figure 36).

Data on indigenous status were complete in 69.2% of cases of syphilis of more than 2 years or unknown duration. The combined age adjusted rate for the jurisdictions with greater than 50% data completeness of indigenous status (all jurisdictions except the Australian Capital Territory) was 78 cases per 100,000 Indigenous population, and 7 cases per 100,000 non-Indigenous population: a ratio of Indigenous to non-Indigenous of 12:1. Age specific notification rates showed a similar pattern with age and no single distinct peak for either Indigenous or non-Indigenous groups. Overall, rates in the Indigenous population were higher than those in the non-Indigenous by an order of magnitude (Figure 37).

Figure 37. Notification rate of syphilis of more than 2 years or unknown duration, Australia, 2006, by indigenous status

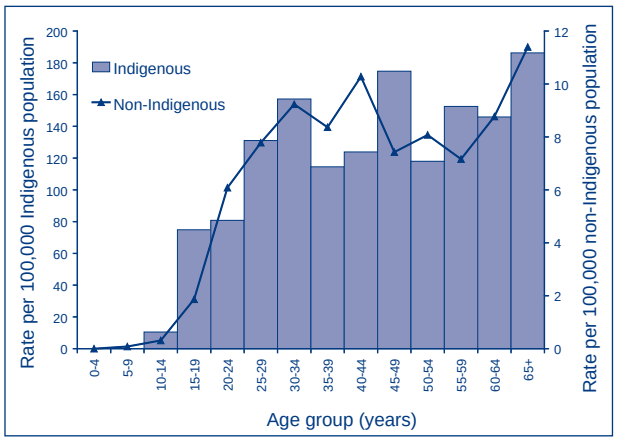


Table 12. Number and rates of notifications of syphilis of more than 2 years or unknown duration, Australia, 2006, by state or territory and sex

	Male		Female		Total	
	n	Rate	n	Rate	n	Rate
ACT	8	4.9	4	2.4	12	3.6
NSW	439	12.9	225	6.6	666	9.8
NT	58	53.1	61	62.6	119	57.6
Qld	166	8.2	105	5.2	271	6.7
SA	33	4.3	8	1.0	41	2.6
Tas.	11	4.6	6	2.4	17	3.5
Vic.	246	9.8	117	4.5	366	7.2
WA	74	7.2	57	5.6	131	6.4
Total	1,035	10.1	583	5.6	1,623*	7.9

* Sex unknown for 5 cases.

Syphilis – congenital

Case definition – Congenital syphilis

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires treponemal-specific antibody titres (e.g.* Treponema pallidum *haemagglutination assay, pallidum particle agglutination, fluorescent treponemal antibody absorption in infant serum greater than fourfold higher than in maternal serum OR treponemal specific antibody titres in infant serum comparable with those in maternal serum and specific treponemal IgM enzyme-linked immunosorbent assay or immunofluorescence assay positive OR* T. pallidum *DNA in normally sterile specimen from infant (CSF, tissue) by nucleic acid testing.*

OR dark field microscopy of infant lesion exudate or node aspirate smears (not oral lesions) to demonstrate characteristic morphology and motility of T. pallidum *OR demonstration of* T. pallidum *in infant tissues by special (e.g. silver) stains OR detection of* T. pallidum *DNA from an infant non-sterile site by nucleic acid testing OR reactive fluorescent treponemal absorbed-19S-IgM antibody test or IgM enzyme linked immunosorbent assay and Treponemal non-specific antibody titre (e.g. RPR) in infant serum greater than fourfold higher than in maternal serum AND asymptomatic infection (in the infant of an infected mother) OR foetal death in utero OR stillbirth, which is a foetal death that occurs after a 20-week gestation or in which the foetus weighs greater than 500 g and the mother is untreated or inadequately treated for syphilis at delivery. Inadequate treatment is a non-penicillin regimen or penicillin treatment given less than 30 days prior to delivery OR clinical evidence of congenital syphilis on examination on:*

a. age <2years: Hepatosplenomegaly, rash, condyloma lata, snuffles, jaundice (non-viral hepatitis), pseudoparalysis, anaemia, oedema

b. age >2 years: Interstitial keratitis, nerve deafness, anterior bowing of shins, frontal bossing, mulberry molar, Hutchinson teeth, saddle nose, rhagades or Clutton joints

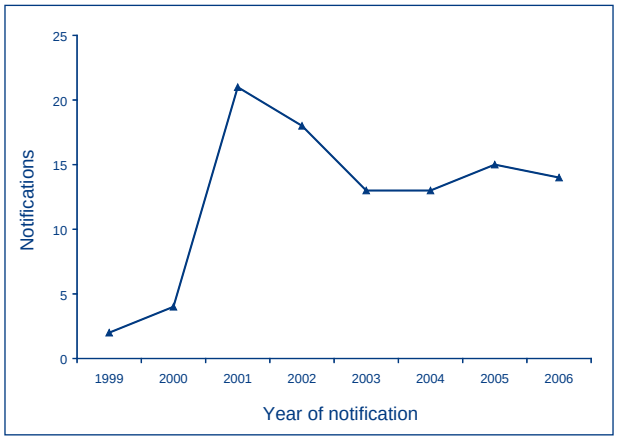
c. evidence of congenital syphilis on long bone X-ray

d. evidence of congenital syphilis on cerebrospinal fluid (CSF) examination

***Probable case:** An infant (regardless of clinical signs) whose mother has been inadequately treated for syphilis during pregnancy or an infant or child who has a reactive treponemal antibody test for syphilis and any one of the following: (1) any evidence of congenital syphilis on physical examination, (2) any evidence of congenital syphilis on radiographs of long bones, (3) a reactive cerebrospinal fluid Venereal Disease Research Laboratory Titre, (4) an elevated CSF cell count or protein (without other cause), (5) reactive fluorescent treponemal antibody absorbed assay –19S-IgM antibody test or IgM enzyme-linked immunosorbent assay.*

There were 14 cases of congenital syphilis notified in 2006, 6 males, 7 females and 1 unknown. Eight of the cases were reported in the Northern Territory, 5 in New South Wales, and 1 in Queensland. Six were Indigenous, 4 non-Indigenous and 4 were unknown. Notifications of congenital syphilis have plateaued over the last 4 years following a decline from a peak in 2001 (Figure 38). In the Northern Territory where rates of infectious syphilis of less than 2 years duration are highest, the highest number of cases of congenital syphilis continue to be reported.

Figure 38. Trends in notifications of congenital syphilis, Australia, 1999 to 2006



Vaccine preventable diseases

Introduction

This section summarises the national notification data for influenza and diseases targeted by the National Immunisation Program (NIP) in 2006. These include diphtheria, *Haemophilus influenzae* type b infection, measles, mumps, pertussis, invasive pneumococcal disease, poliomyelitis, rubella, tetanus and varicella (chickenpox, shingles and unspecified). Data on hepatitis B and meningococcal disease, which are also targeted by the NIP, can be found in this report under 'Bloodborne diseases' and 'Other bacterial infections'. Other vaccine preventable diseases (VPDs) presented in this report include hepatitis A and Q fever.

Major changes to the funded Australian NIP Schedule in November 2005 included:

- inactivated poliovirus vaccine (IPV) replaced oral poliovirus vaccine (OPV) for all age groups. All IPV-containing combination vaccines include diphtheria-tetanus-acellular pertussis (DTPa) antigens (i.e. quadrivalent vaccines) and some also include hepatitis B and/or Hib antigens

(i.e. pentavalent and hexavalent vaccines). The specific combination vaccines administered at 2, 4, and 6 months of age vary between states and territories but all provide DTPa-IPV quadrivalent vaccine at 4 years of age.

- varicella vaccine was added to the NIPS as a single dose due at 18 months (for children born on or after 1 May 2004) or at 12–13 years of age.

In 2006, rotavirus (Rotateq® and Rotarix®) and human papilloma virus (HPV) (Gardasil®) vaccines were registered by the TGA and became available in the private market throughout Australia. In October 2006, the Northern Territory commenced a funded rotavirus immunisation program for infants. Both rotavirus and HPV vaccines were added to the funded NIP Schedule during 2007.

There were 22,240 notifications of vaccine preventable diseases in 2006 (16% of total notifications. This was significantly more than the 17,775 notifications of vaccine preventable diseases (VPDs) reported in 2005 due to the addition of varicella infections as notifiable diseases in 2006. Pertussis was the most commonly notified VPD (10,998, 49% of all VPD notifications). Numbers of notifications and notification rates for VPDs in Australia are shown in Tables 2 and 3.

Diphtheria

Case definition – Diphtheria

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires isolations of toxigenic* Corynebacterium diphtheriae *or toxigenic* C. ulcerans.

***Probable case:** Requires isolation of* Corynebacterium diphtheriae *or* C. ulcerans *(toxin production unknown) and pharyngitis/laryngitis or toxic symptoms OR clinical symptoms and epidemiological links with laboratory confirmed case.*

There were no cases of diphtheria reported in 2006. The last case of diphtheria reported in Australia was a case of cutaneous diphtheria in 2001, which was the only case reported since 1992. Immunity to diphtheria measured in a national serosurvey in the late 1990s in Australia, showed high levels in people aged less than 30 years and declining immunity with increasing age.[12] High levels of immunisation are needed to protect Australians against diphtheria when travelling in the 21 countries where the disease is still prevalent (http://www.who.int/immunization_monitoring/en/globalsummary/timeseries/tsincidencedip.htm)

Haemophilus influenzae type b disease

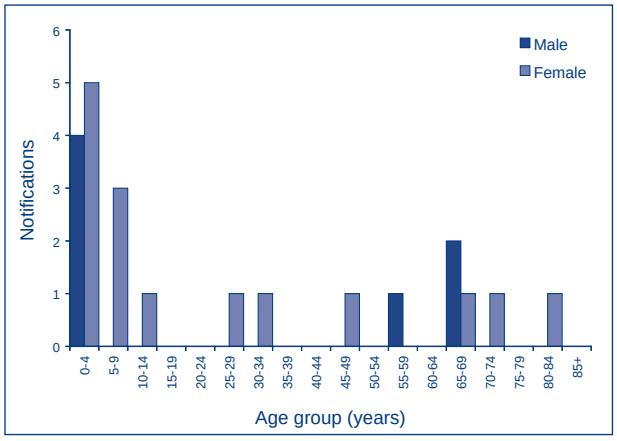
Case definition – Haemophilus influenzae type b

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of* Haemophilus influenzae *type b (Hib) from a sterile site OR detection of Hib antigen in cerebrospinal fluid consistent with meningitis.*

There were 22 notifications of *Haemophilus influenzae* type b (Hib) disease in 2006, a rate of 0.1 case per 100,000 population. This was 5 more cases than reported in 2005. Nine cases (41% of total) were in children aged less than 5 years and 3 were infants aged less than 1 year. There were 7 cases in males and 15 cases in females, (male:female ratio 0.46:1), unlike in 2005 when the ratio was 1.8:1 (Figure 39).

Figure 39. Number of notifications of *Haemophilus influenzae* type b infection, Australia, 2006, by age group and sex



Indigenous status was recorded for 18 of the 22 cases; 7 were Indigenous and 11 were non-Indigenous. The Hib notification rate was 1.4 cases per 100,000 in Indigenous people and 0.07 cases per 100,000 in non-Indigenous people; a ratio of 20:1. Between 2001 and 2005, Hib notification rates in Indigenous people have been between 4.6 and 8.6 times the rates in non-Indigenous people except in 2002 when the Indigenous rate was 25 times that of the non-Indigenous rate (Figure 40).

Cases under the age of 15 years were eligible for Hib vaccination in infancy. Of the 13 cases in 2006, 4 were unvaccinated, 1 partially vaccinated and 8 were fully vaccinated. Four of the fully vaccinated cases aged 5 years or less had received 2 or 3 validated doses of vaccine and met the case definition for vaccine failure.

Australia now has one of the lowest rates of Hib in the world after nearly 20 years of Hib vaccination.[13]

Figure 40. Notification rate of *Haemophilus influenzae* type b infection, Australia, 2001 to 2006, by indigenous status

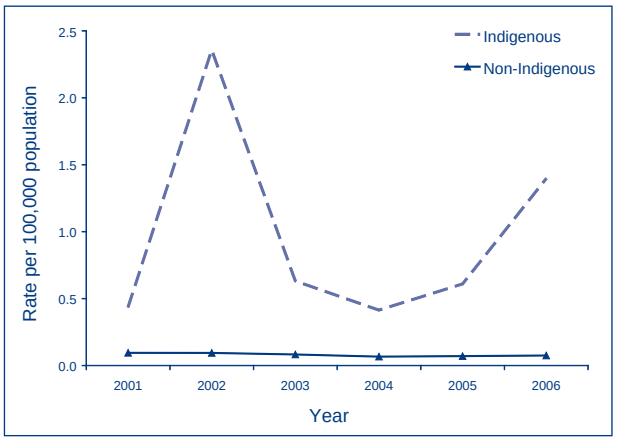
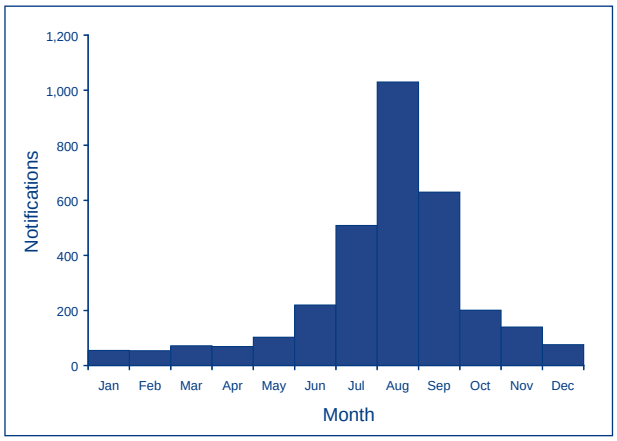


Figure 41. Number of notifications of laboratory confirmed influenza, Australia, 2006, by month of onset



Influenza (laboratory confirmed)

Case definition – Influenza

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of influenza virus by culture OR detection of influenza virus by nucleic acid testing OR detection of influenza virus antigen from an appropriate respiratory tract specimen OR a significant increase in antibody levels, or IgG sero-conversion or fourfold or greater rise in antibody titre or a single high titre antibody.*

Influenza notifications in 2006 were approximately one third lower than in 2005, and have been reported in detail separately.[14] There were 3,159 reports of laboratory-confirmed influenza in 2006, a rate of 15.3 cases per 100,000 population. Notifications of influenza showed a peak in August (Figure 41).

Peak rates in Queensland were substantially higher in August than in other states (174 cases per 100,000 population against 60 cases per 100,000 population for all Australia, Figure 42). Higher reporting rates in Queensland may be a product of the active promotion of influenza laboratory testing requests from general practitioners by public health authorities (Amy Sweeny, personal communication). There was an outbreak of influenza in an aged care facility in the Australian Capital Territory in November 2006[14] which accounts for the peak in notification rates (Figure 42).

There were 654 notifications in children aged less than 5 years (21% of all notifications). As in previous years, influenza notification rates were remarkably higher in children under 5 years compared with older age groups (notification rate of 51.3 cases per 100,000 population) (Figure 43). The rate was highest in those under 1 year of age (264 cases per 100,000 population) and declined progressively after that. The overall male to female ratio was 0.9:1.

Figure 42. Number of notifications of laboratory confirmed influenza, Australian Capital Territory, Queensland and Australia, 2006, by month of onset

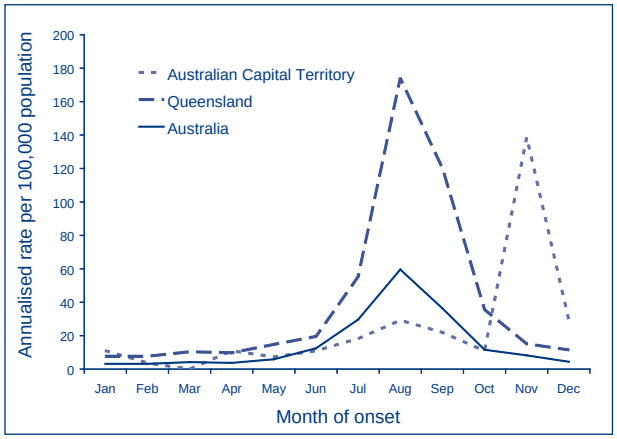


Figure 43. Notification rate of laboratory-confirmed influenza, Australia, 2006, by age group and sex

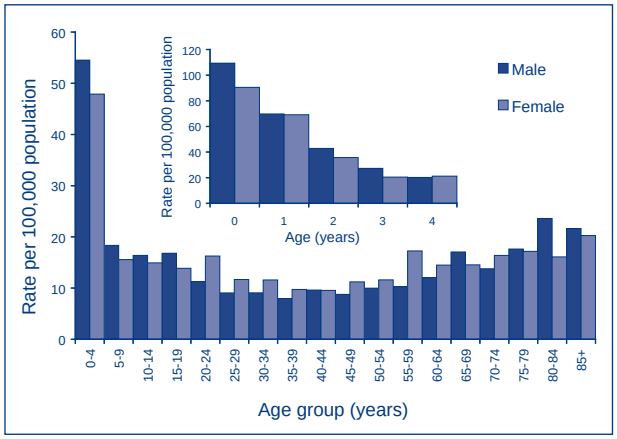


Table 13. Notification of laboratory confirmed influenza, Australia 2006, by state or territory and type

Influenza type	State or territory								Australia
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	
Influenza A	72	420	28	1,223	34	36	354	71	2,238
Influenza B	8	150	12	406	55	10	66	102	809
Influenza A & B	0	35	0	5	0	0	1	0	41
Influenza type unknown	0	9	0	26	0	1	0	35	71
Total	80	614	40	1,660	89	47	421	208	3,159

In 2006, 3,088 (98%) influenza notifications had viral serotype data. Of these 72% (2,238) were influenza A, 26% (809) were influenza B and 1% (41) were mixed infections. A breakdown of influenza notification by virus type and jurisdiction is shown in Table 13.

Of 657 influenza virus isolates analysed at the WHO Collaborating Centre for Reference and Research on Influenza in 2006, 402 were A(H3N2), 24 were A(H1N1) strains and 231 were influenza B. Continued antigenic drift was seen within the A(H3N2) viruses from the previous reference strains (A/California/7/2004 and A/New York/55/2004) and drift was also noted in some of the A(H1N1)viruses from the reference strain A/New Caledonia/20/99. The influenza B viruses isolated were predominately of the B/Victoria lineage and similar to the reference vaccine strain B/Malaysia/2506/2004.[14]

Vaccination history was recorded in 405 cases; 50 were reported as vaccinated (31 of these were aged 65 years or older) and 355 were unvaccinated. Over 77% of Australians aged 65 years or older were vaccinated against influenza in 2006.[14]

Measles

Case definition – Measles

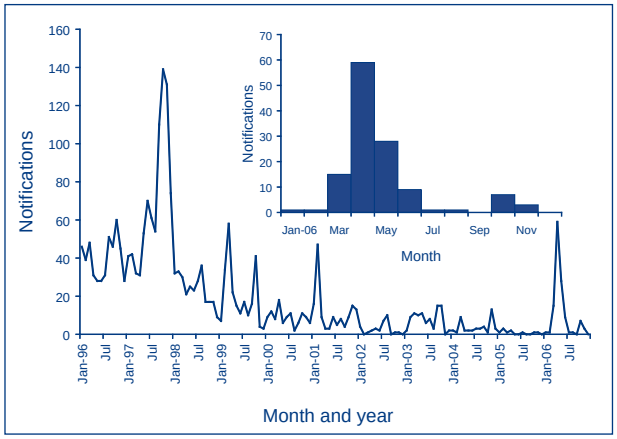
*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires isolation of measles virus or detection of measles virus by nucleic acid testing OR detection of measles virus antigen OR IgG seroconversion or significant increase in antibody level or fourfold or greater rise in titre or detection of measles specific IgM antibody in a reference laboratory (except when vaccinated 8 days to 8 weeks prior to testing) OR clinical illness characterised by a maculopapular rash and fever and cough, coryza, conjunctivitis or koplik spots and epidemiological link to a laboratory confirmed case.*

***Probable case:** Requires detection of measles IgM antibody in other than an approved reference laboratory and clinical illness.*

There were 125 cases of measles (0.6 cases per 100,000 population) notified in 2006; a dramatic increase on the 10 cases notified in 2005 (<0.1 cases per 100.000 population), which was the lowest annual rate for Australia since national surveillance began in 1991 (Figure 44). The increase was largely due to a multi-state outbreak in April 2006.

Figure 44. Number of notifications of measles, Australia, 1996 to 2006, by month of onset



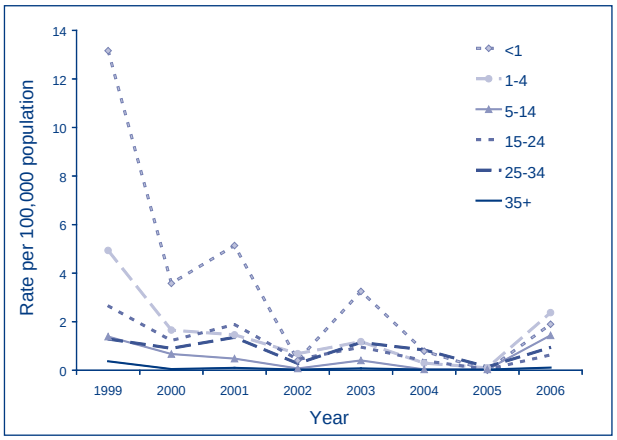
Cases were reported from all states and territories except the Northern Territory. There were 112 confirmed and 13 probable cases.

In 2006, there was a substantial increase in the number of cases in all age groups (Figure 45). There were 5 cases in children aged less than 1 year, 24 in those aged 1–4 years; 39 in the 5–14 years age group, 18 in the 15–24 years age group, 27 in the 25–34 years age group and 12 in those aged more than 35 years.

A multi-state outbreak of measles occurred in April 2006, and was associated with a touring Indian spiritual leader who visited Western Australia, New South Wales and Queensland. The index case(s) occurred in the unimmunised visitors and resulted in 82 cases, two-thirds of whom were unimmunised

and only 7% of whom were fully immunised against measles.[15] Measles virus genotyping indicated that the outbreak cases were all D8.

Figure 45. Trends in notification rates of measles, Australia, 1999 to 2006, by age group



The World Health Organization Western Pacific Region has set the year 2012 as the target for the elimination of measles. Researchers at the National Centre for Immunisation of Vaccine Preventable Diseases report that by a number of criteria, Australia is close to, or has, achieved endemic measles elimination.[16] These criteria include a low incidence of confirmed measles cases; a high proportion of the population receiving 2 doses of the measles-mumps-rubella (MMR) vaccine; serological evidence of high level immunity in the Australian population; absence of an endemic measles virus genotype; a high proportion of cases who acquired their infection outside Australia or linked to such cases; containment of outbreaks without re-establishing an endemic measles genotype and maintaining an effective reproductive number (Ro) of less than one.[16]

Case definition – Mumps

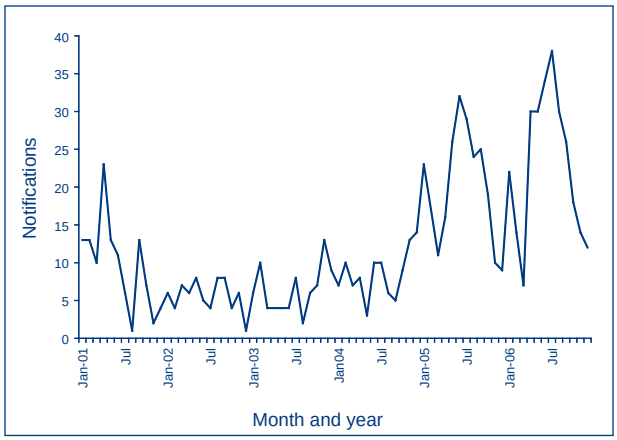
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of mumps virus or detection of mumps virus by nucleic acid testing or IgG seroconversion or significant increase in antibodies or a significant increase in antibody level, or a fourfold or greater rise in titre to mumps virus (except where there has been recent mumps vaccination) OR detection of mumps specific IgM antibody (in the absence of recent mumps vaccination) AND a clinically compatible illness characterised by swelling of the parotid or other salivary glands lasting 2 days or more without other apparent cause OR a clinically compatible illness AND an epidemiological link to a laboratory confirmed case.*

Mumps

In 2006, there were 275 notifications of mumps (1.2 cases per 100,000 population), a small increase on the 241 notifications of mumps (1.2 cases per 100,000 population), reported in 2005. The number

Figure 46. Number of notifications of mumps, Australia, 2001 to 2006, by month of onset

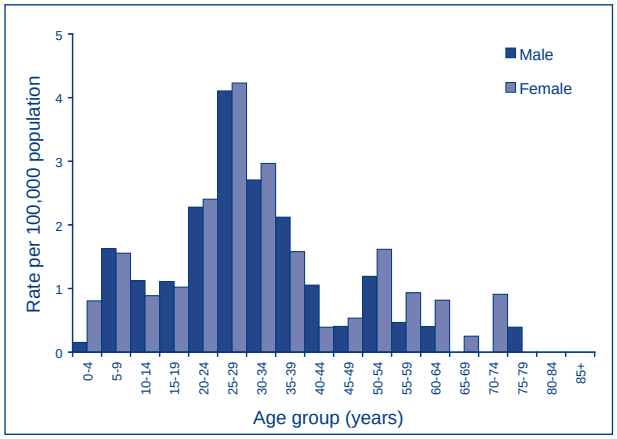


of mumps notifications has been increasing since 2004 (Figure 46).

Cases were reported from all jurisdictions except Tasmania, with the largest number of cases (154) in New South Wales. There were clusters of mumps cases reported in New South Wales in 2006.

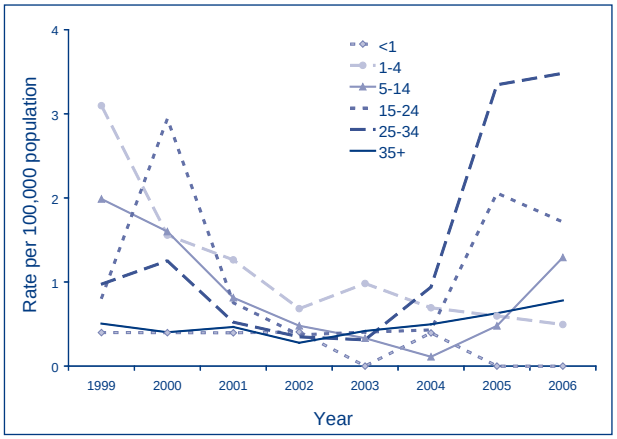
There were cases in all age groups with the highest rates in the 25–29 years age group (4.2 cases per 100,000 population). Rates in young children aged less than 5 years remained low (0.5 cases per 100,000 population, 6 cases). In 2006, the male to

Figure 47. Notification rate of mumps, Australia, 2006, by age group



female ratio of cases was 0.9:1 (Figure 47), which is a reversal of male preponderance seen in previous years, probably due to clustering of cases.

Figure 48. Trends in the notification rate of mumps, Australia, 1999 to 2006, by age group



Trends in notification rates by age group for mumps (Figure 48) show a continued increase in the rates for the 25–34 and 5–4 years age groups and a small decline in the 15–24 years age group.

Information on vaccination status was available for 177 (64%) cases; 32 were recorded as fully vaccinated; 13 as partially vaccinated; 132 as unvaccinated and there was no information on the vaccination status of the remaining 98 (36%) cases.

The high rate of mumps in the 25–34 years age group probably represents a susceptible cohort of individuals who have not been immunised. Mumps vaccine was made available in Australia in 1980 for use at 12–15 months of age and was combined with the measles vaccine in 1982. Therefore, no childhood doses of mumps vaccine were available to most individuals in the 25–34 years age group. This cohort was also not targeted in the Measles Control Campaign in 1998 where the 2nd dose of MMR was offered to primary school aged children (5–12 years). Uptake of vaccination in older individuals from the 15–24 years age group was likely to be poor.

A similar pattern is seen in the United Kingdom and the United States of America where under-immunised young adult populations led to outbreaks of mumps in the 18–24 years age group in 2004/05 and 2006, respectively.[17,18] The increase in notifications in 2005 and 2006 meant that the rates in Australia exceeded 1 cases per 100,000 population, a threshold for disease elimination and indicative of endemic mumps transmission in Australia.[13]

Pertussis

Case definition – Pertussis

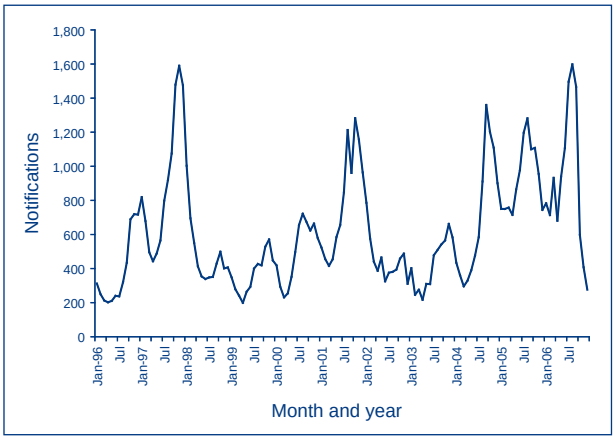
*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires isolation of* Bordetella pertussis *or detection of* B. pertussis *by nucleic acid testing OR seroconversion or significant increase in antibody level or fourfold or greater rise in titre (in the absence of pertussis vaccination) or a single high-titre IgA to whole cells or detection of B. pertussis by immunofluorescence AND **clinical evidence** (a coughing illness lasting 2 weeks or more or paroxysms of coughing or inspiratory whoop or post-tussive vomiting) OR **clinical evidence** AND epidemiological link to a confirmed case.*

***Probable case:** Requires clinically compatible illness.*

Pertussis is the most common vaccine preventable illness in Australia, with periodic epidemics occurring at intervals of 3 to 5 years on a background of endemic circulation. Rates are normally higher in late winter and spring, except from 2004 onward, when non-seasonal rates remained elevated compared with previous years (Figure 49).

Figure 49. Number of notifications of pertussis, Australia, 1996 to 2006, by month of onset



In 2006, 10,998 cases of pertussis were notified; a rate of 53.4 cases per 100,000 population. This was similar in number and rate to that reported in 2005 (11,197 cases, 55.1 cases per 100,000 population). In 2006, 10,559 (96%) were confirmed and 439 (4%) were probable cases.

Notification rates increased with age, with the highest notification rate in the 60–64 years age group (Figure 50). There were more cases among women

(6,624) than men (4,362) with a male to female ratio of 0.7:1. The highest rate among women was in the 60–64 years age group (114.9 cases per 100,000 population) and the highest rate in men was in the 65–69 years age group (83.2 cases per 100,000 population).

Trends in the pertussis notification rate in different age groups are shown in Figure 51. In 2006, pertussis notification rates declined in all age groups except for the 60 year and over age group, where rates increased from 61.2 cases in 2005 to 77.7 cases per 100,000 population. In particular, the decline seen in the 10–19 years age group following the introduction of adolescent vaccination in 2004, continued in 2006. In 2006, 89% of pertussis cases were aged 20 years or over compared with 50% in 2000.

Increases in rates of pertussis in Australia may be, in part, due to errors in diagnosis using serology. In October 2006, PanBio announced a major revision in the cut-off level for their pertussis serology tests. These kits were widely used in New South Wales. As a result, there was a sharp decline in pertussis notifications in the last months of 2006 (Figure 52).

Figure 50. Notification rate of pertussis, Australia, 2006, by age group and sex

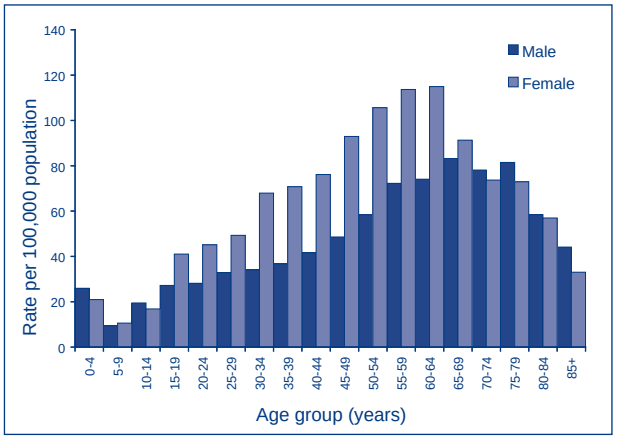
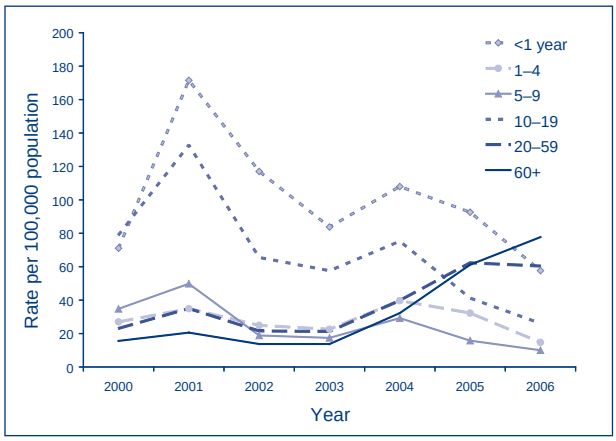


Figure 51. Trends in the notification rate of pertussis, Australia, 2000 to 2006, by age group



Map 5. Notification rates of pertussis, Australia, 2005, by Statistical Division of residence

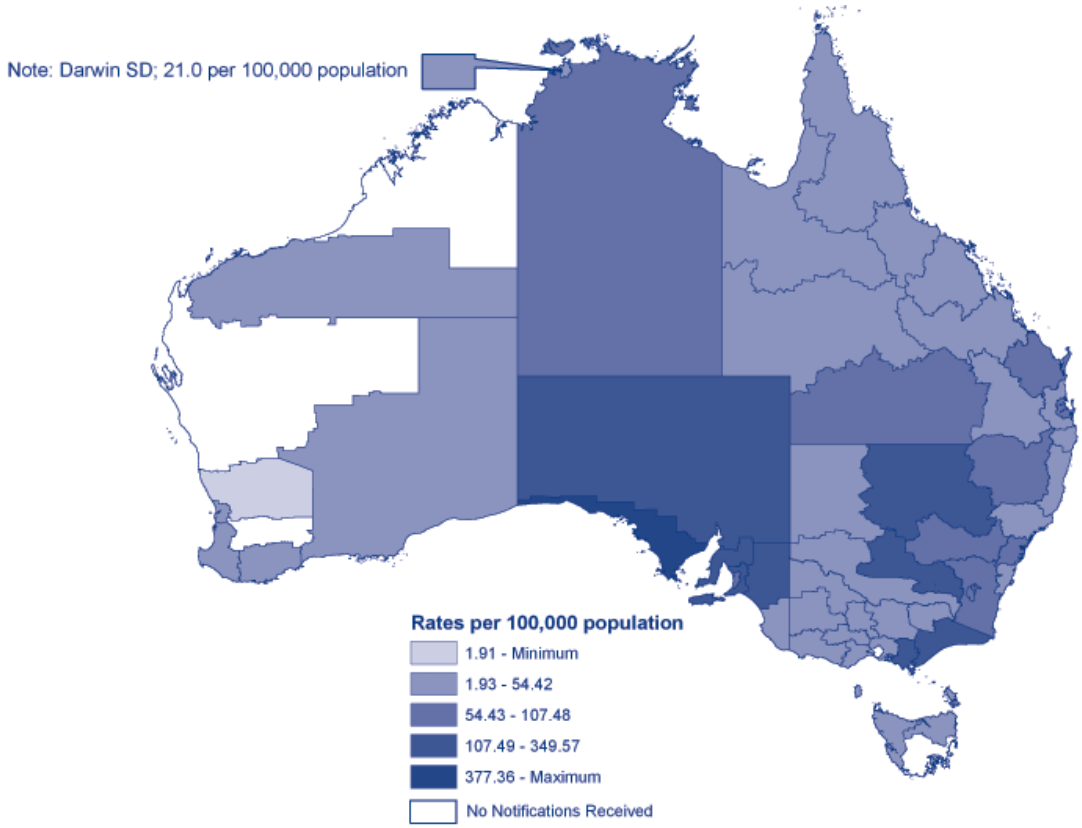
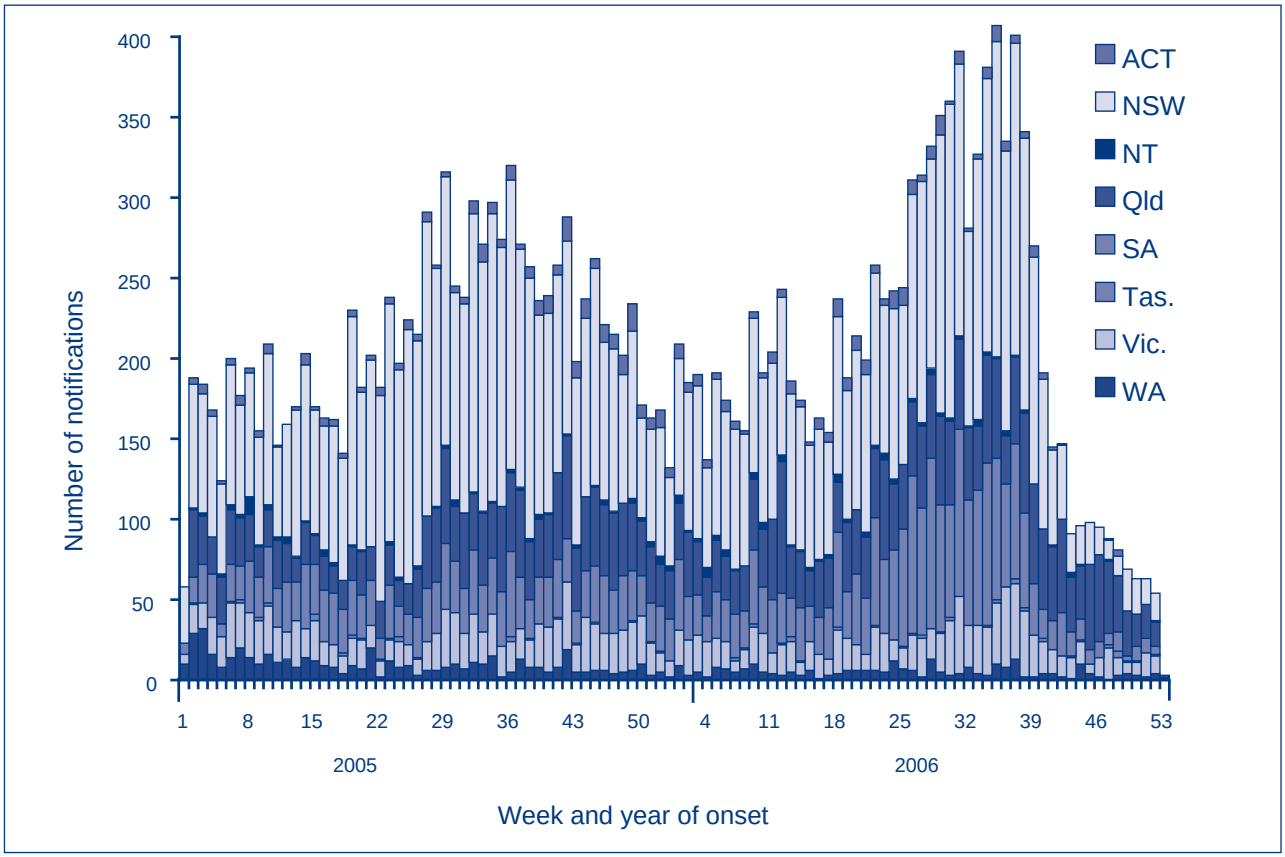
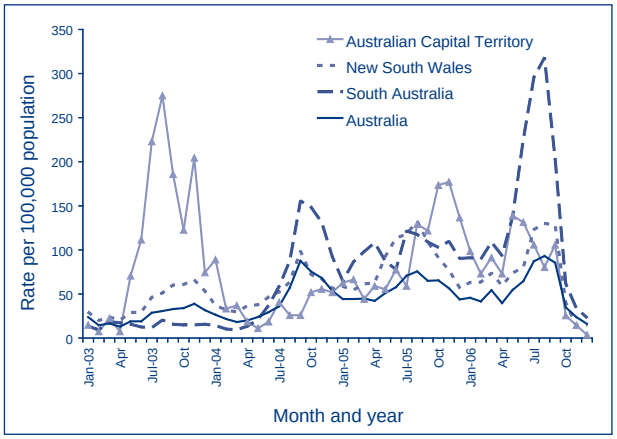


Figure 52. Number of notifications of pertussis, Australia, 2005 to 2006, by week of onset and state or territory



Notification rates of pertussis varied considerably by geographic location (Map 5). The highest rates were reported from South Australia, New South Wales and the Australian Capital Territory. The trends in pertussis notification rates by month of diagnosis are shown for these 3 states and for Australia in Figure 53.

Figure 53. Notification rate of pertussis, Australian Capital Territory, New South Wales, South Australia, and Australia, 2003 to 2006, by month of notification



Invasive pneumococcal disease

Case definition – Invasive pneumococcal disease

*Only **confirmed cases** are reported.*

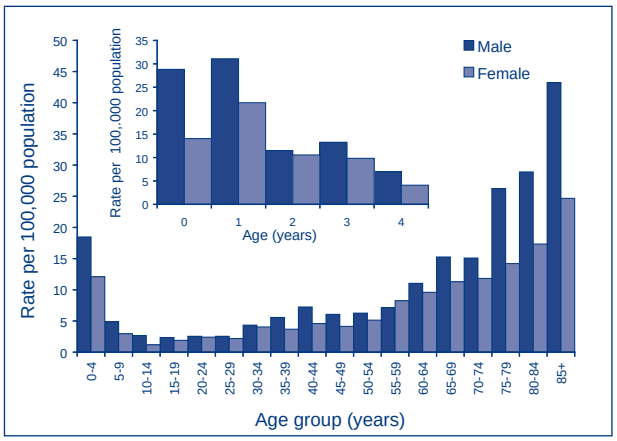
***Confirmed case:** Requires isolation of* Streptococcus pneumoniae *from a normally sterile site by culture or detection by nucleic acid testing.*

There were 1,443 notifications of invasive pneumococcal disease (IPD) in Australia in 2006, a rate of 7 cases per 100,000 population. Notification rates declined in 2006 by 14% nationally, with declines in all jurisdictions between 7% and 37%. The Northern Territory continued to have the highest notification rate (27 cases per 100,000 population) while Victoria had the lowest (5.4 cases per 100,000 population). The geographical distribution of IPD varied within states and territories, with the highest rates in central and northern Australia.

The highest rates of IPD notification in 2006 were in male adults aged 85 years or older (43.2 cases per 100,000 population, Figure 54). The male to female ratio of IPD cases was 1.3:1.

Additional data were collected on cases of invasive pneumococcal disease in all Australian states and territories during 2006. Analyses of these data are reported separately.[19]

Figure 54. Notification rate for invasive pneumococcal disease, Australia, 2006, by age group and sex



Poliomyelitis

Case definition – Poliomyelitis

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires isolation of wild-type poliovirus or detection of wild-type poliovirus by nucleic acid testing (confirmed in reference laboratory) and acute flaccid paralysis.*

***Probable case:** Requires acute flaccid paralysis not due to other causes as determined by the Polio Expert Committee.*

In 2006, no acute flaccid paralysis (AFP) cases due to wild poliovirus, vaccine-derived poliovirus (VDPV) or vaccine associated paralytic poliomyelitis (VAPP) were reported in Australia.

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. A total of 48 eligible AFP cases were notified in Australia between 1 January and 31 December 2006, giving an AFP rate of 1.2 cases per 100,000 population. The Polio Expert Committee (PEC) reviewed clinical and laboratory information on 43 of the 48 eligible AFP notifications. The PEC was unable to provide final classification for 5 AFP notifications due to insufficient clinical information. Hence the 2006 non-polio AFP rate, based on the 43 eligible cases classified by the PEC, was 1.1 per 100,000 children aged less than 15 years.

Since the inception of the Australian AFP surveillance system in 1995, the WHO AFP surveillance standard has only been achieved in 2000, 2001, 2004 and 2006. However, adequate faecal sampling remains well below the 80% target established by WHO with only 23% of eligible AFP notifications having 2 samples collected 24 to 48 hours apart and within 14 days of onset of paralysis.[20]

With the introduction of IPV into the standard immunisation schedule in Australia from November 2005, no further isolations of OPV strains of poliovirus are expected in Australian-born AFP cases without overseas travel. This was demonstrated in 2006, with the last reported laboratory isolations of a poliovirus occurring after 2 infants were vaccinated with OPV at the end of 2005.

In 2006, globally 2000 confirmed cases of wild poliovirus were reported to WHO.[21] Four countries: Nigeria, India, Pakistan and Afghanistan, were considered to be endemic. Imported wild poliovirus was detected in 10 countries and active transmission of imported poliovirus occurred in 4 of those (http://www.polioeradication.org/content/general/casecount.pdf). Australia is at risk of importation of polio through visitors and migrants from polio endemic areas and requires AFP and laboratory surveillance to be timely and comprehensive.[22]

Rubella

Case definition – Rubella

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires isolation of rubella virus OR detection of rubella virus by nucleic acid testing OR IgG seroconversion or significant increase in antibody level or fourfold or greater rise in titre to rubella virus in the absence of recent rubella vaccination, OR detection of rubella specific IgM in the absence of recent rubella vaccination and confirmed in a reference laboratory.*

Probable case:** Requires **clinical evidence** AND **laboratory suggestive evidence** OR **epidemiological evidence.

***Laboratory suggestive evidence:** In a pregnant patient, detection of rubella-specific IgM that has not been confirmed in a reference laboratory, in the absence of recent rubella vaccination.*

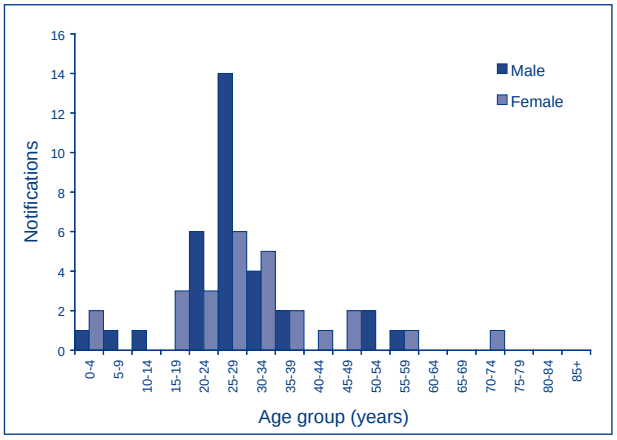
***Clinical evidence:** A generalised maculopapular rash AND fever AND arthralgia/arthritis OR lymphadenopathy OR conjunctivitis*

***Epidemiological evidence:** An epidemiological link is established when there is: 1. Contact between 2 people involving a plausible mode of transmission at a time when: a) one of them is likely to be infectious (about 1 week before to at least 4 days after appearance of rash) AND b) the other has an illness which starts within 14 and 23 days after this contact AND 2. At least 1 case in the chain of epidemiologically linked cases (which may involve many cases) is laboratory confirmed.*

In 2006, there were 59 notifications of rubella (0.3 cases per 100,000 population) an increase of 90% on the 31 notifications in 2005. In 2006, rubella cases were reported from New South Wales (37 cases), Queensland (12 cases), Victoria (6) and 2 cases each in South Australia and Western Australia. No cases were reported from other jurisdictions.

The overall male to female ratio of notified cases in 2006 was 1.2:1; but in the 25–29 years age group, the ratio was 2.3:1 (Figure 55). There was an overall predominance of males in notifications in 1999, 2002 and 2003.

Figure 55. Notification rate of rubella, Australia, 2006 by age group and sex



In Australia, populations at risk of rubella include young men who did not receive rubella immunisation in school based programs;[23] migrant women who did not receive rubella vaccines in their countries of birth;[24,25] and Indigenous women with inadequate immunity.[26]

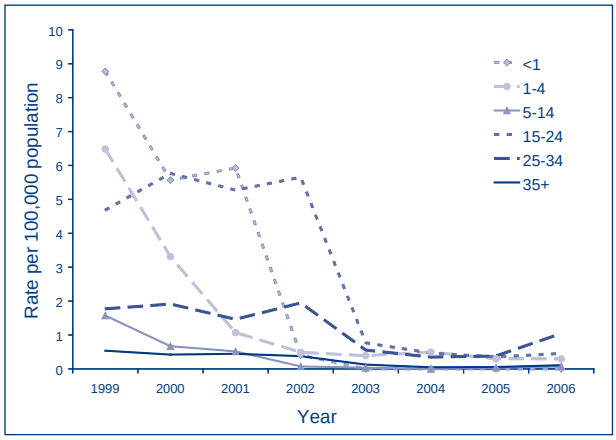
There were more than 28,000 cases of rubella reported to the WHO Western Pacific Region office in 2005, which implies that rubella infections could be acquired by Australian travellers to neighbouring rubella endemic countries.

Figure 56 shows trends in rubella notification rates in different age groups, with a slight increase in rates in young adults in 2006, but otherwise continuing at the low levels seen since 2003.

There were no cases of congenital rubella reported in 2006. Altogether there were 22 cases of rubella notified from women of child bearing age (15–49 years) in 2006.

As for measles and mumps, Australia is approaching the elimination of endemic rubella with rates of reported disease less than 1 case per 100,000 popu-

Figure 56. Trends in notification rates for rubella, Australia, 1999 to 2006, by age group



lation since 2002 (Table 4a). In 2004, the United States was declared free of endemic rubella based on epidemiological evidence; the absence of a circulating endemic rubella genotype; high rubella vaccine coverage; and serological evidence of high levels of population immunity and mass immunisation in the Pan American region.[27] The WHO Regional Committee for Europe agreed in 2005 to eliminate measles and rubella by 2010. http://www.euro.who.int/vaccine/20030808_4

Brotherton, et al[13] suggest that the achievement and confirmation of the elimination of locally acquired rubella circulation may require targeted immunisation of migrants from countries with low levels of rubella vaccination and the establishment of rubella genotyping in Australia.

Tetanus

Case definition – Tetanus

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of* Clostridium tetani *from a wound in a compatible clinical setting and prevention of positive tetanospasm in mouse test using a specific tetanus antitoxin OR a clinically compatible illness without other apparent cause.*

In 2006, there were 3 notifications of tetanus. One case occurred in an 18-year-old (partially immunised) female from Victoria. The other 2 cases were aged 66 and 74 years.

Varicella infections

In November 2005, varicella 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 at 12–13 years. In 2006, CDNA agreed to make varicella infections notifiable in Australian juris-

dictions. Three categories of varicella infection are notifiable: chickenpox, shingles and varicella infection (unspecified).

By the end of 2006, 5 jurisdictions, were sending data to NNDSS. New South Wales decided in 2006 not to make varicella infections notifiable. The legal processes to make varicella notifiable in the Australian Capital Territory and Victoria were still underway.

In 2006, there were 6,156 varicella notifications from those jurisdictions, 1,514 (25%) reported as chickenpox, 1,077 (17%) as shingles and 3,565 (58%) as unspecified varicella infection.

Varicella zoster infection (chickenpox)

Case definition – Varicella-zoster infection (chickenpox)

*Both **confirmed cases** and **probable cases** are reported.*

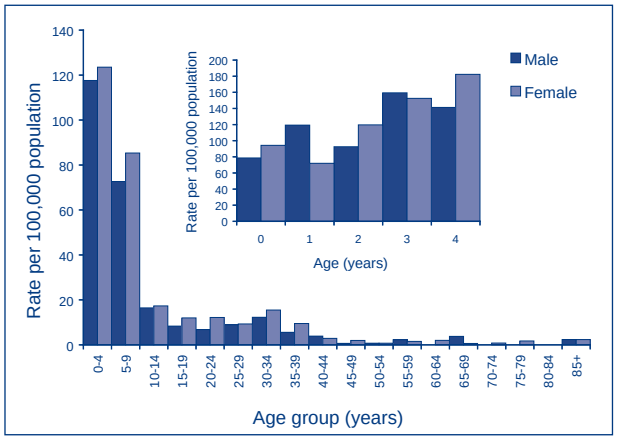
***Confirmed case:** Isolation of varicella-zoster virus from a skin or lesion swab OR detection of varicella-zoster virus from a skin or lesion swab by nucleic acid testing from a skin or lesion swab OR detection of varicella-zoster virus antigen from a skin or lesion swab by direct fluorescent antibody from a skin or lesion swab. If the case received varicella vaccine between 5 and 42 days prior to the onset of rash the virus must be confirmed to be a wild type strain OR detection of varicella-zoster virus-specific IgM in an unvaccinated person AND acute onset of a diffuse maculopapular rash developing into vesicles within 24–48 hours and forming crusts (or crusting over) within 5 days. OR acute onset of a diffuse maculopapular rash developing into vesicles within 24–48 hours and forming crusts (or crusting over) AND where an epidemiological link is established when there is: contact between 2 people involving a plausible mode of transmission at a time when one of them is likely to be infectious AND the other has illness 10 to 21 days after contact AND at least 1 case in the chain of epidemiologically-linked cases is laboratory confirmed.*

***Probable case:** Acute onset of a diffuse maculopapular rash developing into vesicles within 24–48 hours and forming crusts (or crusting over)*

In 2006, there were 1,514 notifications of chickenpox reported from 5 jurisdictions. The highest rates were reported from the Northern Territory (93.4 cases per 100,000, 193 cases) and South Australia (48.9 cases per 100,000 population, 760 cases). South Australia made varicella infections notifiable in 2002.

One thousand and sixty-four cases (70%) occurred in children aged less than 10 years. The highest rates were in the 0–4 years age group (120 cases per 100,000 population) and within this age group 3-year-olds had the highest rate (156 cases per 100,000 population, Figure 57) There were slightly more female than male cases notified (male:female ratio 0.9:1).

Figure 57. Notification rate of chickenpox, Australia,* 2006, by age group and sex



* Excluding the Australian Capital Territory, New South Wales and Victoria.

One thousand and sixty-two cases were confirmed and the remainder were probable cases.

Seventy-six were recorded as fully vaccinated for age; 7 partially vaccinated; 1,221 unvaccinated and there was no vaccination status information on the remainder of the notified cases.

Varicella zoster infection (shingles)

Case definition – Varicella-zoster infection shingles

*Both **confirmed cases** and **probable cases** are reported.*

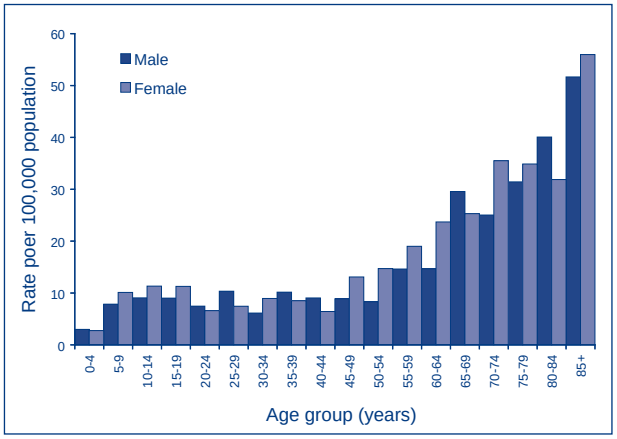
***Confirmed case:** Isolation of varicella-zoster virus from a skin or lesion swab OR detection of varicella-zoster virus from a skin or lesion swab by nucleic acid testing from a skin or lesion swab OR detection of varicella-zoster virus antigen from a skin or lesion swab by direct fluorescent antibody from a skin or lesion swab AND a vesicular skin rash with a dermatomal distribution that may be associated with pain in skin areas supplied by sensory nerves of the dorsal root ganglia.*

***Probable case:** A vesicular skin rash with a dermatomal distribution that may be associated with pain in skin areas supplied by sensory nerves of the dorsal root ganglia.*

There were 1,077 notifications of shingles reported to NNDSS in 2006 (a rate of 5.2 cases per 100,000 population). The highest rates were in South Australia (40.2 cases per 100,000 population, 625 cases) and the Northern Territory (38.7 cases per 100,000 population, 80 cases).

There was a predominance of female cases with a male to female ratio of 0.8:1. The highest rates were in the over 85 years age groups for both males and females (54.5 cases per 100,000 population, Figure 58).

Figure 58. Notification rate of shingles, Australia,* 2006, by age group and sex



* Excluding the Australian Capital Territory, New South Wales and Victoria.

Varicella zoster infection (unspecified)

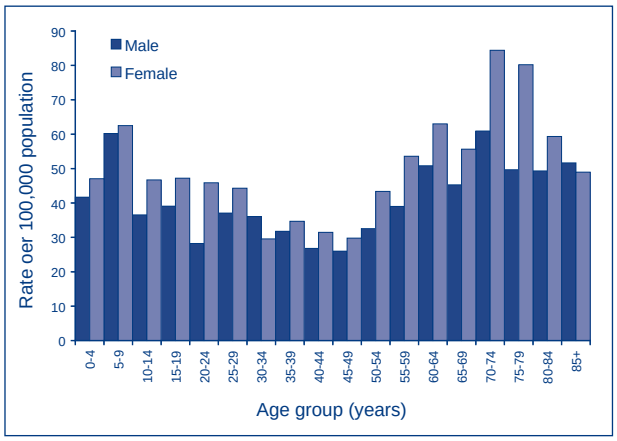
Case definition – Varicella-zoster infection unspecified

*Only **confirmed cases** are reported.*

***Confirmed case:** Isolation of varicella-zoster virus from a skin or lesion swab OR detection of varicella-zoster virus from a skin or lesion swab by nucleic acid testing from a skin or lesion swab OR detection of varicella-zoster virus antigen from a skin or lesion swab by direct fluorescent antibody from a skin or lesion swab OR detection of varicella-zoster virus-specific IgM in an unvaccinated person.*

There were 3,565 cases of varicella infections (unspecified) based on laboratory diagnosis, and largely from Queensland (3,167, 89%). There was a female predominance with a male to female ratio of 0.8:1. The age distribution of unspecified varicella infections is shown in Figure 59.

Figure 59. Notification rate of varicella zoster infection (unspecified), Australia,* 2006, by age group and sex



* Excluding the Australian Capital Territory, New South Wales and Victoria.

Childhood vaccination coverage reports

Estimates of vaccination coverage both overall and for individual vaccines for children at 1 year, 2 years and 6 years of age in 2006 are shown in Tables 14, 15 and 16 respectively. During 2006, there were no significant changes in coverage for children 'fully immunised' or individual vaccines for the 1 year and 2 year milestone ages. However, there was a significant change in coverage for children 'fully immunised' and individual vaccines for the 6 year milestone age. Coverage increased by 2 to 3.5 percentage points for all vaccines between the first and second quarter of 2006 and was maintained through the following 2 quarters. A possible factor in this increase in coverage at 6 years of age is the introduction of the multivalent combination vaccine Infanrix-IPV onto the schedule that occurred in November 2005, reducing the number of vaccines to be recorded from 3 to two. Other factors that may have had an impact at the local level include promotional campaigns centred around child care or school entry or data cleaning activities. Estimates at 6 years of age for all vaccines still remain significantly lower than estimates at the 1 year and 2 years milestones.

Vectorborne diseases

Notifications

During 2006, there were 8,606 notifications of mosquito-borne diseases reported to NNDSS. The notifiable mosquito-borne diseases include those caused by the alphaviruses (Barmah Forest virus

Table 14. Percentage of Australian children born in 2005 immunised according to data available on the Australian Childhood Immunisation Register, estimate at 1 year of age

Birth date Vaccine	1 Jan–31 Mar 2005 % immunised	1 Apr– 30 Jun 2005 % immunised	1 Jul–30 Sep 2005 % immunised	1 Oct–31 Dec 2005 % immunised
DTP	92.2	91.9	92.0	91.9
Polio	92.1	91.8	92.0	91.8
Hib	94.2	94.4	94.8	94.5
Hepatitis B	94.7	94.4	94.7	94.4
Fully immunised	90.7	90.8	91.2	91.0

Table 15. Percentage of Australian children born in 2004 immunised according to data available on the Australian Childhood Immunisation Register, estimate at 2 years of age

Birth date Vaccine	1 Jan–31 Mar 2004 % vaccinated	1 Apr–30 Jun 2004 % vaccinated	1 Jul–30 Sep 2004 % vaccinated	1 Oct–31 Dec 2004 % vaccinated
DTP	95.2	95.1	95.2	94.8
Polio	95.2	95.0	95.1	94.8
Hib	93.8	93.7	93.9	93.6
MMR	94.0	93.9	94.0	93.7
Hepatitis B	95.8	95.8	95.8	95.6
Fully immunised	92.4	92.2	92.4	92.0

Table 16. Percentage of Australian children born in 2000 immunised according to data available on the Australian Childhood Immunisation Register, estimate at 6 years of age

Birth date Vaccine	1 Jan–31 Mar 2000 % vaccinated	1 Apr–30 Jun 2000 % vaccinated	1 Jul–30 Sep 2000 % vaccinated	1 Oct–31 Dec 2000 % vaccinated
DTP	85.0	87.0	88.8	88.8
Polio	83.8	87.1	88.8	88.9
MMR	85.0	87.1	88.8	88.9
Fully immunised	82.7	86.2	88.0	88.0

and Ross River virus), flaviviruses (the viruses causing dengue, Murray Valley encephalitis, Kunjin and Japanese encephalitis) and malaria.

Alphaviruses

Alphaviruses are RNA viruses, which cause disease epidemics characterised by fever, rash and polyarthritis. In Australia, Barmah Forest virus and Ross River virus are the alphaviruses of major public health significance, accounting for 88% of the total mosquito-borne disease notifications for 2006. There are a variety of mosquito vectors for Barmah Forest virus and Ross River virus, which facilitate the transmission of these viruses in diverse environments (freshwater habitats, coastal regions, salt marshes, floodwaters, established wetlands and urban areas).[28]

Barmah Forest virus infection

Case definition – Barmah Forest virus infection

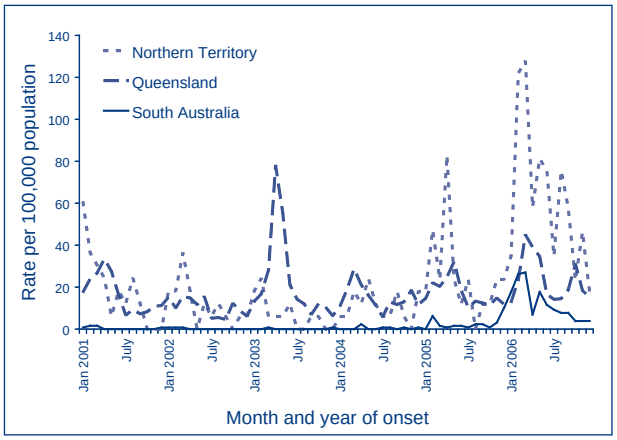
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Barmah Forest virus, OR detection of Barmah Forest virus by nucleic acid testing, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to Barmah Forest virus, OR detection of Barmah Forest virus-specific IgM.*

There were 2,120 notifications of Barmah Forest virus (BFV) infections notified to NNDSS in 2006, which accounted for 39% of total mosquito-borne disease notifications for the year. Forty-five per cent of BFV infection notifications were reported from Queensland (n=957) and 30% from New South Wales (644 cases). BFV infection notifications during 2006 were 1.8 times the mean for the previous 5 years.

The highest rates of BFV infection notifications were reported by the Northern Territory (62.9 cases per 100,000 population compared with 25.1 cases per 100,000 population in 2005), Queensland (23.6 cases per 100,000 compared with 17.2 cases per 100,000 in 2005), and South Australia (12 cases per 100,000 population compared with 2.6 cases per 100,000 in 2005), (Figure 60). The national BFV infection notification rate in 2006 was 10.3 cases per 100,000 population, compared with 6.5 cases per 100,000 population in 2005.

Figure 60. Notification rate of Barmah Forest virus infections, Northern Territory, Queensland, and South Australia, 2001 to 2006, by month and year of onset

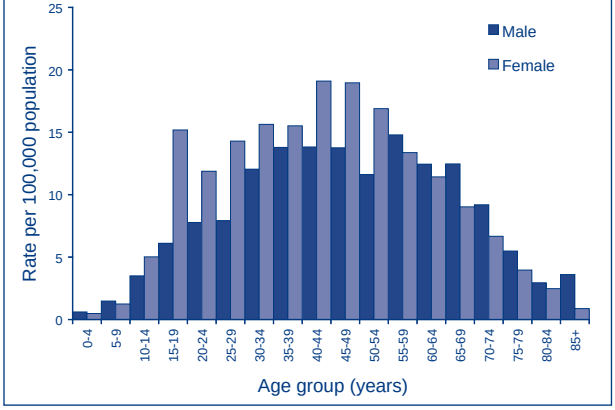


In the Northern Territory, the lowest BFV infection notification rate was 17.4 cases per 100,000 population during December and the peak occurred during March (127.7 cases per 100,000 population). Notification rates for the Northern Territory were significantly higher than the other states and territories from February through to November.

For 2006, the highest regional BFV infection notification rate was reported in South Australia's Murray Lands Statistical Division (86.8 cases per 100,000 population).

Figure 61 shows the age and sex distribution of BFV infection notifications. The BFV infection notification rate was highest amongst the 40–44 years age range (16.5 cases per 100,000 population), and the male to female ratio was 0.8:1. Males in the 35–39, 40–44 and 45–49 years age groups had the highest age-specific rate (13.8 cases per 100,000 population). The highest age specific BFV infection notification rate in females was in the 40–44 years age group (19.1 cases per 100,000 population). The notification rate in females for the 15–19 years age group was 2.5 times higher than males. The major contributing jurisdictions were the Northern Territory (154.3 cases per 100,000 population) and South Australia (40 cases per 100,000 population).

Figure 61. Notification rate of Barmah Forest virus infections, Australia, 2006, by age group and sex



Ross River virus infection

Case definition – Ross River virus infection

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Ross River virus, OR detection of Ross River virus by nucleic acid testing, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to Ross River virus, OR detection of Ross River virus-specific IgM.*

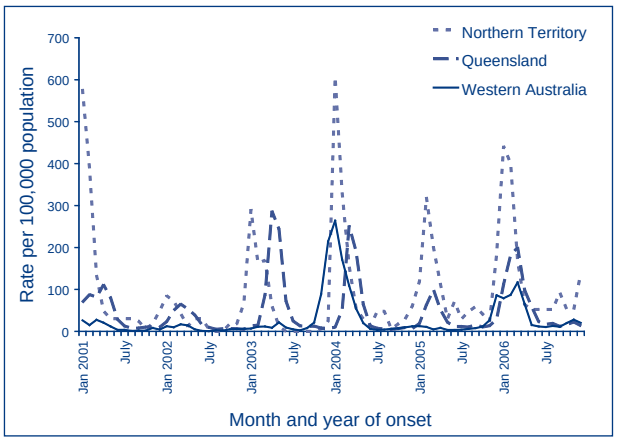
There were 5,487 notifications of Ross River virus (RRV) infections reported to NNDSS in 2006, which accounted for 63% of the total of mosquito-borne disease notifications received during this year.

The majority of RRV infection notifications in 2006 were from Queensland (48%, 2,615 cases) and New South Wales (22%, 1,225 cases). The highest rate of notifications was reported in the Kimberly Statistical Division of Western Australia (236.9 cases per 100,000 population). The national RRV infection notification rate for 2006 was 26.6 cases per 100,000 population.

RRV infection notifications in the Northern Territory peaked in January at 441.2 cases per 100,000 population (Figure 62). This was a 28% increase from the peak notification rate in 2005 (February, 319.5 cases per 100,000 population). Queensland reported a peak notification rate for RRV infection in March

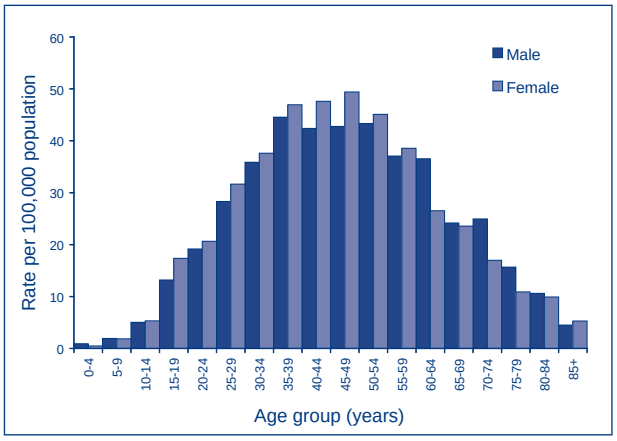
at 200.4 cases per 100,000 population, which was a 51% increase from the peak notification rate in 2005 (March, 99.6 cases per 100,000 population).

Figure 62. Notification rate of Ross River virus infections, Northern Territory, Queensland and Western Australia, 2001 to 2006, by month and season of onset



The age and sex distribution of RRV infection notifications is shown in Figure 63. The national notification rate was highest in the 45–49 years age group (46.1 cases per 100,000 population). The highest RRV infection notification rate in males (43.3 cases per 100,000 population) was observed in the 50–54 years age group and the highest notification rate in females was recorded in the 45–49 years age group (49.4 cases per 100,000 population).

Figure 63. Notification rate of Ross River virus infections, Australia, 2006, 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 (MVEV), Kunjin (KUNV), Japanese encephalitis virus (JEV) and dengue viruses (DENV).

The Sentinel Chicken Program is a surveillance network involving New South Wales, the Northern Territory, Victoria and Western Australia. The flocks are located in strategic locations and are regularly tested for antibodies to MVEV infection, JEV infection and KUNV infection. This program is designed to provide early warning of flavivirus activity (excluding dengue).[29] Sentinel chicken surveillance reports from previous seasons have been published,[30,31,32] and the latest report has been published as part of the National Arbovirus and Malaria Advisory Committee annual report 2006–07.[33]

Murray Valley encephalitis virus infection

Case definition – Murray Valley encephalitis virus infection

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Murray Valley encephalitis virus, OR detection of Murray Valley encephalitis virus by nucleic acid testing, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to Murray Valley encephalitis virus, OR detection of Murray Valley encephalitis virus-specific IgM in cerebrospinal fluid in the absence of IgM to Kunjin, Japanese encephalitis or dengue viruses, OR detection of Murray Valley encephalitis virus-specific IgM in serum in the absence of IgM to Kunjin, Japanese encephalitis or dengue viruses. This is only accepted as laboratory evidence for encephalitic illnesses, AND non-encephalitic disease: acute febrile illness with headache, myalgia and/or rash, OR encephalitic disease: acute febrile meningoencephalitis characterised by one or more of the following: 1. focal neurological disease or clearly impaired level of consciousness, 2. an abnormal computerised tomograph or magnetic resonance image or electrocardiograph, 3. presence of pleocytosis in cerebrospinal fluid, OR asymptomatic disease: Case detected as part of a serosurvey should not be notified.*

Confirmation of laboratory result by a second arbovirus reference laboratory is required if the case occurs in areas of Australia not known to have established enzootic/endemic activity or regular epidemic activity.

In 2006, Western Australia reported to NNDSS 1 case of Murray Valley encephalitis virus infection in an 8-year-old female, the case fully recovered.

Kunjin virus infection

Case definition – Kunjin virus infection

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Kunjin virus, OR detection of Kunjin virus by nucleic acid testing, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to Kunjin virus, OR detection of Kunjin virus-specific IgM in cerebrospinal fluid, OR detection of Kunjin virus-specific IgM in serum in the absence of IgM to Murray Valley encephalitis, Japanese encephalitis or dengue viruses. This is only accepted as laboratory evidence for encephalitic illnesses, AND non-encephalitic disease: acute febrile illness with headache, myalgia and/or rash, OR encephalitic disease: acute febrile meningoencephalitis characterised by one or more of the following: 1. focal neurological disease or clearly impaired level of consciousness, 2. an abnormal computerised tomograph or magnetic resonance image or electrocardiograph, 3. presence of pleocytosis in cerebrospinal fluid, OR asymptomatic disease: case detected as part of a serosurvey should not be notified.*

Confirmation of laboratory result by a second arbovirus reference laboratory is required if the case occurs in areas of Australia not known to have established enzootic/endemic activity or regular epidemic activity.

During 2006 there were 3 notifications of KUNV reported to NNDSS, of which Queensland reported 1 notification (male, 44 years) and Western Australia reported 2 notifications (both females 20 and 27 years).

Dengue virus infection

Case definition – Dengue virus infection

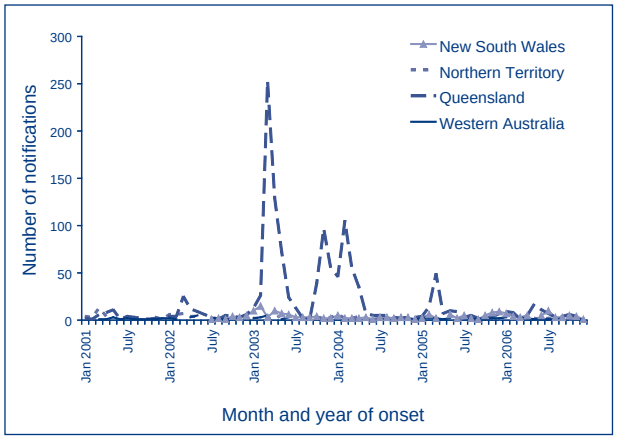
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of dengue virus, OR detection of dengue virus by nucleic acid testing, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to dengue virus, proven by neutralisation or another specific test, OR detection of dengue virus-specific IgM in cerebrospinal fluid, in the absence of IgM to Murray Valley encephalitis, Kunjin, or Japanese encephalitis viruses, OR detection of dengue virus-specific IgM in serum, except in North Queensland. In North Queensland, dengue virus-specific IgM in serum is acceptable evidence ONLY when this occurs during a proven outbreak, AND a clinically compatible illness (e.g. fever, headache, arthralgia, myalgia, rash, nausea, and vomiting, with a possible progression to dengue haemorrhagic fever, dengue shock syndrome or meningoencephalitis).*

Confirmation of laboratory result by a second arbovirus reference laboratory is required if the case occurs in previously unaffected areas of Australia. Currently North Queensland is the only area with the potential for indigenous (epidemic) dengue virus in Australia.

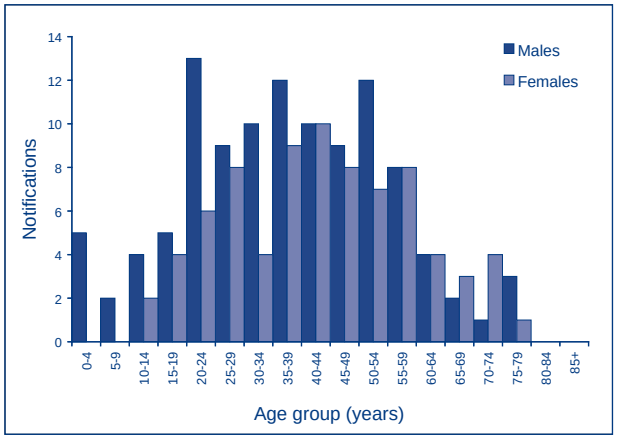
There were 187 notifications of dengue virus infection reported to NNDSS in 2006 (Figure 64), of which Queensland reported 78 notifications (42%). Of the 78 notifications, Queensland reported 28 notifications that were acquired locally.

Figure 64. Notifications of dengue virus infection (locally-acquired and imported cases), New South Wales, Northern Territory, Queensland and Western Australia, 2001 to 2006, by month and year of onset



The age and sex distribution of DENV notifications is shown in Figure 65. The highest rates occurred in the 20–24 years age group (13 cases) for males, and

Figure 65. Number of notifications of dengue virus infection (locally-acquired and imported cases), Australia, 2006, by age group and sex



in females in the 40–44 years age group (10 cases). The notification rate in males from the 20–24 years age group was 1.25 times higher than females, 8 of the 13 notifications in this group of males reported overseas acquisition.

Japanese encephalitis virus infections

Case definition – Japanese encephalitis virus infection

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Japanese encephalitis virus, OR detection of Japanese encephalitis virus by nucleic acid testing, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre of Japanese encephalitis virus-specific IgG proven by neutralisation or another specific test, with no history of recent Japanese encephalitis or yellow fever vaccination, OR detection of Japanese encephalitis virus-specific IgM in cerebrospinal fluid, in the absence of IgM to Murray Valley encephalitis, Kunjin and dengue viruses, OR detection of Japanese encephalitis virus-specific IgM in serum in the absence of IgM to Murray Valley encephalitis, Kunjin and dengue viruses, with no history of recent Japanese encephalitis or yellow fever vaccination.*

AND a clinically compatible febrile illness of variable severity associated with neurological symptoms ranging from headache to meningitis or encephalitis. Symptoms may include headache, fever, meningeal signs, stupor, disorientation, coma, tremors, generalised paresis, hypertonia, and loss of coordination. The encephalitis cannot be distinguished clinically from other central nervous system infections.

Confirmation of laboratory result by a second arbovirus reference laboratory is required if the case appears to have been acquired in Australia.

There were no human cases of JEV infection notified in 2006. The last JEV infection notification was reported by Queensland in February 2004 when a 66-year-old male acquired JEV infection in Papua New Guinea. There have been 9 other cases of JEV infection reported to NNDSS since 1995, although JEV infection was not nationally notifiable until 2001. Four of these 9 notifications were reported in Torres Strait Islanders from the Badu Island community. The other locally acquired JEV infection case was reported in a resident from the Cape York Peninsula, Queensland. The remaining 4 cases were reported as acquired from overseas countries.

Flavivirus infection (NEC)

Case definition – Flavivirus infection (NEC)

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of a flavivirus that cannot be identified in Australian reference laboratories or which is identified as one of the flaviviruses not otherwise classified, OR detection of a flavivirus, by nucleic acid testing, that cannot be identified in Australian reference laboratories or which is identified as one of the flaviviruses not otherwise classified, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre of flavivirus specific IgG that cannot be identified or which is identified as being specific for one of the flaviviruses not otherwise classified. There must be no history of recent Japanese encephalitis or yellow fever vaccination, OR detection of flavivirus IgM in cerebrospinal fluid, with reactivity to more than one flavivirus antigen (Murray Valley encephalitis, Kunjin, Japanese encephalitis and/or dengue) or with reactivity only to one or more of the flaviviruses not otherwise classified, OR detection of flavivirus IgM in the serum, with reactivity to more than one flavivirus antigen (Murray Valley encephalitis, Kunjin, Japanese encephalitis and/or dengue) or with reactivity only to one or more of the flaviviruses not otherwise classified. This is only accepted as laboratory evidence for encephalitic illnesses. There must be no history of recent Japanese encephalitis or yellow fever vaccination, AND non-encephalitic disease: acute febrile illness with headache, myalgia and/or rash, OR encephalitic disease: acute febrile meningoencephalitis characterised by one or more of the following: 1. focal neurological disease or clearly impaired level of consciousness, 2. an abnormal computerised tomograph or magnetic resonance image or electrocardiograph, 3. presence of pleocytosis in cerebrospinal fluid.*

Confirmation by a second arbovirus reference laboratory is required if the case cannot be attributed to known flaviviruses.

There were 33 flavivirus infection (NEC) notifications during 2006; notified by Queensland (23 cases) and Victoria (10 cases).

There were 6 Kokobera virus and 1 Stratford virus infection notifications from Queensland in this category.

Malaria

Case definition – Malaria

*Only **confirmed cases** are reported.*

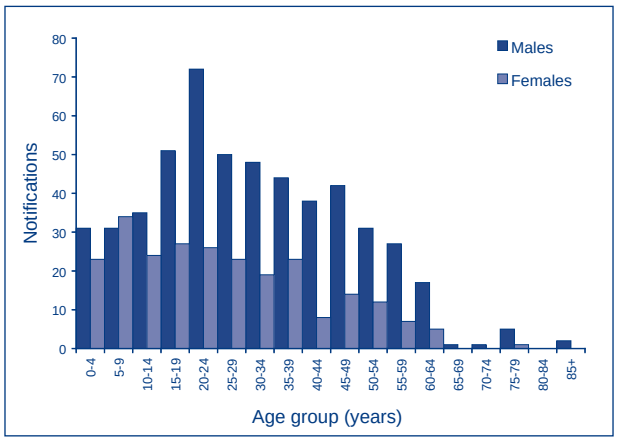
***Confirmed case:** Requires detection and specific identification of malaria parasites by microscopy on blood films with confirmation of species in a laboratory with appropriate expertise, OR detection of* Plasmodium *species by nucleic acid testing.*

There were 775 notifications of malaria in Australia in 2006. The majority of cases were reported by Queensland (35%, 268 cases), New South Wales (18%, 140 cases), Victoria (15%, 115 cases) and Western Australia (15%, 115 cases). Queensland reported that 135 of 268 notifications were acquired in Papua New Guinea.

The largest number (99 cases) of malaria notifications was in the 20–24 years age group (Figure 66). The male to female ratio was 1:0.5.

The infecting *Plasmodium* species was reported for 94% for malaria notifications in 2006 (Table 17). Of these 775 notifications, *P. falciparum* (46%, 354 cases) and *P. vivax* (42%, 324 cases) were the predominant species while untyped *Plasmodium* species accounted for 6% (48 cases). The remaining cases were *P. ovale* (2%, 17 cases), *P. malariae* (1%, 11 cases) and mixed *Plasmodium* species infections (3% 21 cases).

Figure 66. Number of notifications of malaria, Australia, 2006, by age group and sex



Zoonoses

A zoonosis is 'an infection or infectious disease transmissible under natural conditions from vertebrate animals to humans'.[34] Animal hosts play an essential role in maintaining the infection in nature, and humans are only incidental hosts.[35] Animals are thought to be the origin of approximately 75% of emerging human infectious diseases and wildlife contribute significantly to this threat.[3] The Australian Government, through the animal and human health agencies, is proactively addressing this threat by strengthening the link between animal and human health systems.

In 2006, zoonotic diseases notifiable to the NNDSS were anthrax, Australian bat lyssaviral or lyssaviral (unspecified) infection, brucellosis, leptospirosis,

Table 17. Malaria notifications in Australia, 2006, by parasite type and jurisdiction

Parasite type	Type (%)	State or territory								
		ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Plasmodium falciparum	46	4	47	46	115	21	18	37	68	354
Plasmodium malariae	1	0	5	0	6	0	0	0	0	11
Plasmodium ovale	2	0	2	0	4	1	1	8	1	17
Plasmodium vivax	42	7	78	19	126	8	6	62	18	324
Plasmodium species	6	0	5	0	16	1	1	0	23	48
Mixed *P. falciparum* and *P. vivax**	1	0	2	0	0	2	0	0	0	4
Mixed *P. falciparum* and other species*	2	0	0	1	0	1	0	8	4	14
Mixed *P. vivax* and other species*	0	0	1	0	1	0	0	0	1	3
Total	100	11	140	66	268	34	26	115	115	775

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

ornithosis and Q fever. During 2006, a total of 767 notifications of zoonotic disease (0.5% of total notifications) were made to the NNDSS.

Anthrax

Case definition – Anthrax

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of* Bacillus anthracis*-like organisms or spores confirmed by a reference laboratory OR detection of* Bacillus anthracis *by microscopic examination of stained smears, OR detection of* Bacillus anthracis *by nucleic acid testing AND cutaneous: skin lesion evolving over 1–6 days from a papular through a vesicular stage, to a depressed black eschar invariably accompanied by oedema that may be mild to extensive, OR gastrointestinal: abdominal distress characterised by nausea, vomiting, anorexia and followed by fever, OR rapid onset of hypoxia, dyspnoea and high temperature, with radiological evidence of mediastinal widening, OR meningeal: acute onset of high fever, convulsions, loss of consciousness and meningeal signs and symptoms.*

Anthrax is primarily a disease of herbivores; humans and carnivores are incidental hosts.[3] Anthrax has a low decreasing prevalence, and occurs only sporadically in Australia.[36] It can be an occupational hazard for veterinarians, agriculture and wildlife workers who handle infected animals.

One case of cutaneous anthrax in a 48-year-old man was reported to NNDSS in 2006. The case was from the western part of New South Wales and was associated with exposure to infected cattle in an area where anthrax was endemic.[37] Before this 2006 case, a human case of cutaneous anthrax had not been reported in Australia since 1998.

In 2006, 10 outbreaks of anthrax were reported in livestock. All cases occurred in central New South Wales, where cases have been known to occur in the past. In all cases, 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 chains.[36]

Australian bat lyssaviral and lyssaviral (unspecified) infections

Case definition – Australian bat lyssavirus

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of Australian bat lyssavirus confirmed by sequence analysis, OR detection of Australian bat lyssavirus by nucleic acid testing.*

Case definition – Lyssavirus (unspecified)

*Only **confirmed cases** are notified AND only where there is insufficient evidence to meet a case definition for Australian bat lyssavirus or rabies.*

***Confirmed case:** Requires positive fluorescent antibody test result for lyssaviral antigen on fresh brain smears, OR specific immunostaining for lyssaviral antigen on formalin fixed paraffin sections of central nervous system tissue, OR presence of antibody to serotype 1 lyssavirus in the cerebrospinal fluid, OR detection of lyssavirus-specific RNA (other than to Australian bat lyssavirus or rabies).*

AND acute encephalomyelitis with or without altered sensorium or focal neurological signs.

No cases of either Australian bat lyssaviral or lyssaviral (unspecified) infections were notified during 2006. Previously, 2 known cases of human infection with Australian bat lyssavirus were fatal and occurred in 1996 and 1998 following close contact between bat-handlers and infected bats. One case was associated with a sub-order Megachiroptera (from a frugivorous bat) and the other was associated with sub-order Microchiroptera (found in smaller, mainly insectivorous bats).

Surveillance indicates Australian bat lyssavirus infection is and may have been present in Australian bats 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.

Brucellosis

Case definition – Brucellosis

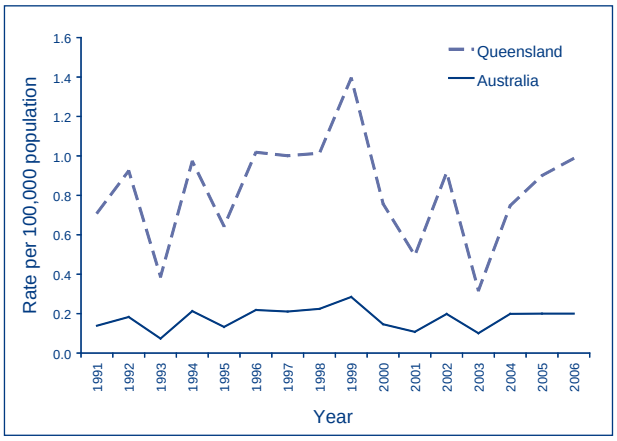
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of* Brucella *species, OR IgG seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre in* Brucella *agglutination titres or complement fixation titres between acute and convalescent phase serum samples. (Where possible both tests should be conducted at the same laboratory), OR a single high* Brucella *agglutination titre.*

Brucellosis is mainly an occupational disease for farm workers, veterinarians, and abattoir workers who work with infected animals or their tissue.[3]

In 2006, 49 cases of brucellosis were reported to the NNDSS, giving a national notification rate of 0.2 cases per 100,000 population. Cases were from Queensland (40 cases), New South Wales (8 cases) and Western Australia (1 case). The highest notification rate (74 cases per 100,000 population) was from the Central West region of Queensland. There is little evidence of change in the trend in the national or Queensland notification rates of brucellosis over the last 13 years (Figure 67). Most cases were male (43 cases, male to female ratio 7:1), and of these, 80% were aged between 20 and 64 years.

Figure 67. Trends in notifications rate for brucellosis, Australia and Queensland, 1991 to 2006



Species data was available for 31% of notifications (12 cases). Of these 6 were *Brucella suis*, 4 cases were *B. melitensis* (3 reported from New South Wales and 1 reported from Western Australia) and 2 cases were *B. abortus* (reported from New South Wales). All of these cases were acquired overseas.

Except for *B. suis*, cases are assumed to have had overseas exposure. Bovine brucellosis (*B. abortus*) was eradicated from the Australian cattle herd in 1989 and is presently considered an exotic animal disease in Australia.[38] Caprine and ovine brucellosis (caused by *B. melitensis*) has never been reported in Australian sheep or goats. Swine brucellosis (caused by *B. suis*) is confined to small areas of northern Australia, where it occurs in feral pigs, with human cases predominantly seen in recreational feral pig hunters.

Leptospirosis

Case definition – Leptospirosis

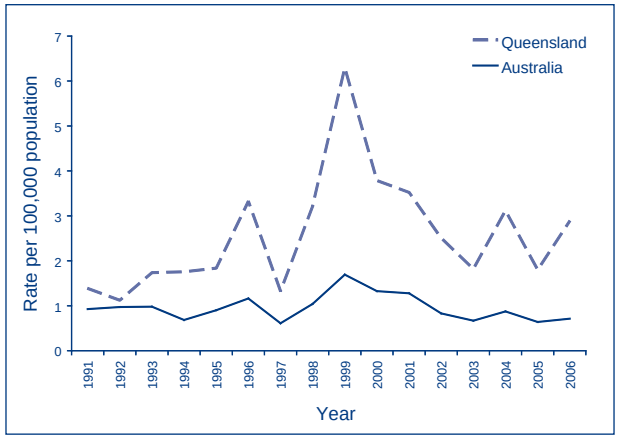
*Only **confirmed cases** are reported.*

***Confirmed case:** Requires isolation of pathogenic* Leptospira *species, OR a fourfold or greater rise in* Leptospira *agglutination titre between acute and convalescent phase sera obtained at least 2 weeks apart and preferably conducted at the same laboratory, OR a single* Leptospira *micro agglutination titre greater than or equal to 400 supported by a positive enzyme-linked immunosorbent assay IgM result.*

Leptospirosis is caused by spirochaetes of the genus, *Leptospira*, which is 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.[3]

Nationally, 147 notifications of leptospirosis were received during 2006 (0.7 cases per 100,000 population). During the last 13 years, notification rates peaked in 1999 and from 2000 onwards continued to decline (Figure 68).

Figure 68. Trends in notifications for leptospirosis, Australia and Queensland, 1991 to 2006



In 2006, the highest notification rate was in Queensland (117 notifications, 2.9 cases per 100,000 population). There were also notifications received from the Northern Territory (2 notifications, 1 case per 100,000 population), New South Wales (17 notifications, 0.2 cases per 100,000 population), Tasmania (1 notification, 0.2 cases per 100,000 population), Victoria (6 notifications, 0.1 cases per 100,000) and South Australia (1 notification 0.06 cases per 100,000 population). Sixty-six per cent of all notifications were from Far North Queensland; the notification rate in this region was 31 cases per 100,000 population.

Most leptospirosis cases were male (131 cases, male to female ratio 8.2:1), and the 20–24 years age group had the highest notification rate (1.7 cases per 100,000 population).

Ornithosis

Case definition – Ornithosis

*Both **confirmed cases** and **probable cases** are reported.*

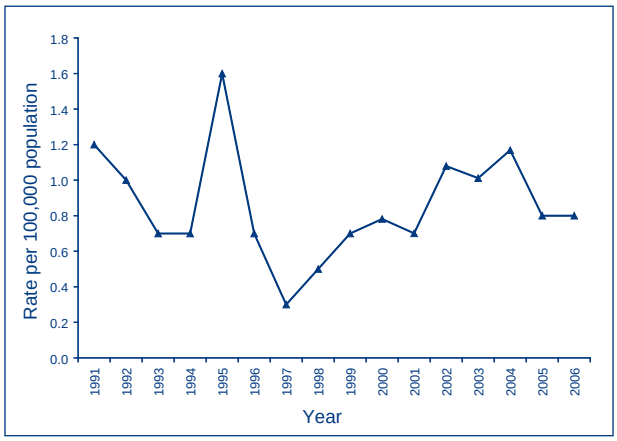
***Confirmed case:** Requires a fourfold rise or greater in antibody titre against* Chlamydia psittaci *as demonstrated by micro-immunofluorescence (MIF) on acute and convalescent sera (collected at least 2 weeks later) tested in parallel, OR detection of* C. psittaci *by nucleic acid testing or culture, AND pneumonia, OR AT LEAST TWO of the following: fever, headache, myalgia, rigours, dry cough or dyspnoea, AND exposure to birds or bird products, or proximity to an outbreak of ornithosis.*

***Probable case:** Requires a single high total antibody level or detection of IgM antibody to* C. psittaci *by MIF, OR a single high total antibody titre to* Chlamydia *species demonstrated by complement fixation (CF) in at least one sample obtained at least 2 weeks after onset of symptoms, OR a fourfold or greater rise in antibody titre against* Chlamydia *species as demonstrated by CF, AND pneumonia, OR AT LEAST TWO of the following: fever, headache, myalgia, rigours, dry cough or dyspnoea, AND exposure to birds or bird products, or proximity to an outbreak of ornithosis.*

Ornithosis is caused by *Chlamydophila 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.[3] Human-to-human transmission is rare.

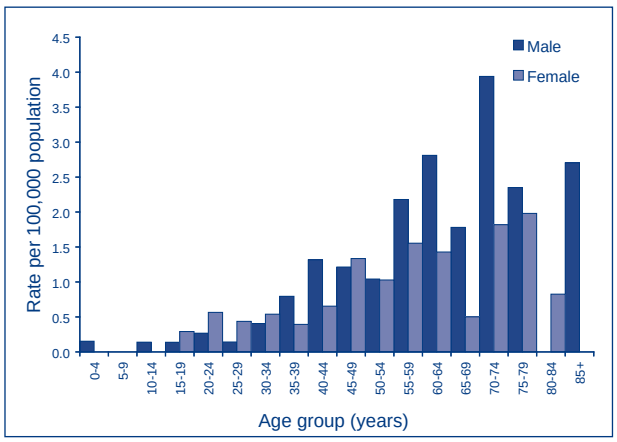
In 2006, there were 168 ornithosis infections notified to NNDSS, giving a national rate of 0.8 cases per 100,000 population. The national rate of notifications has steadily increased from 1997 to 2004, but in 2005 and 2006 decreased to 2001 levels (Figure 69).

Figure 69. Trends in notification rates for ornithosis, Australia, 1991 to 2006



New South Wales had the highest number of notifications (94 notifications, 1.4 cases per 100,000 population). Notifications were also received from Victoria (65 cases), Western Australia (4 cases), the Australian Capital Territory (2 cases), Queensland (2 cases), and Tasmania (1 case). The majority of cases were male (97 cases, male to female ratio 1.3:1). Eighty-one per cent of cases were aged 40 years or over, with the highest notification rate in males in the 70–74 years age group (12 notifications, 3.9 cases per 100,000 population) and in females in the 75–79 years age group (6 notifications, 2.0 cases per 100,000 population) (Figure 70).

Figure 70. Notification rate for ornithosis, Australia, 2006, by age group and sex



At risk groups of people 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.[39] An outbreak in the Blue Mountains in June 2002 reinforced that infections in humans can be associated with wild birds, rather than with pet birds and aviaries.[40]

Q fever

Case definition – Q fever

*Only **confirmed cases** are reported.*

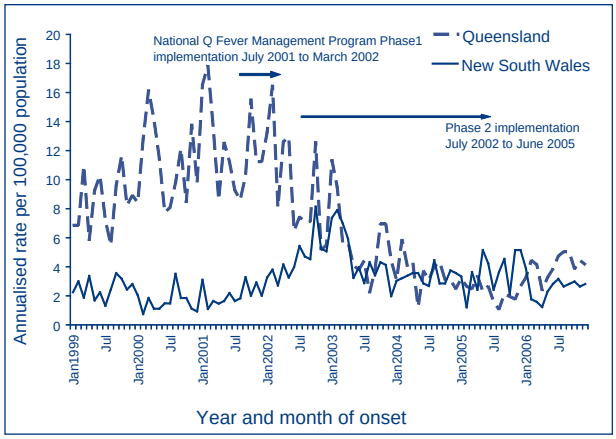
***Confirmed case:** Requires detection of* Coxiella burnetii *by nucleic acid testing, OR seroconversion or significant increase in antibody level to Phase II antigen in paired sera tested in parallel in absence of recent Q fever vaccination, OR detection of* C. burnetii *by culture (note this practice should be strongly discouraged except where appropriate facilities and training exist), OR detection of specific IgM in the absence of recent Q fever vaccination, AND a clinically compatible disease.*

Q fever is caused by *Coxiella burnetii*. Primary reservoirs of these bacteria are cattle, sheep and goats. The organisms are resistant to heat, drying and many common disinfectants, this enables the bacteria to survive for long periods in the environment. The mode of transmission to humans is commonly through the airborne route in 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.[3]

In 2006, 402 cases of Q fever were notified to the NNDSS. The highest rates of notifications were from Queensland (164 notifications, 4 cases per 100,000 population) and New South Wales (174 notifications, 2 cases per 100,000 population) (Figure 71). The highest rates were in the 45–49 years age group for males (5.4 cases per 100,000 population), and in the 60–64 years age groups for females (1.8 cases per 100,000 population). There were 14 cases reported in people aged less than 14 years and 6 cases reported in adults aged over 75 years. The male to female ratio was 3.8:1.

Production of the Q fever vaccine ceased at the end of 2005 because of the manufacturers' inability to meet new regulations and other product pressures.[41] At the end of 2006, the Australian Ministers for Health and Agriculture announced funding for CSL Limited to recommence production of the Q fever vaccine.[41] Adults at risk, including abattoir workers, farmers, veterinarians, stockyard workers, shearers, animal transporters and many others exposed to cattle, sheep or goats or their products should be considered for vaccination.

Figure 71. Notification rate for Q fever, Queensland and New South Wales, 1999 to 2006, by month of onset



Other bacterial infections

Legionellosis, leprosy, meningococcal infection and tuberculosis were notifiable in all states and territories in 2006 and classified as 'other bacterial infections' in NNDSS. A total of 1,900 notifications were included in this group in 2006, which accounted for 1.37% of all the notifications to NNDSS, a similar total and proportion as in 2005 (1,826 notifications and 1.4% of total).

Legionellosis

Case definition – Legionellosis

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Requires isolation of* Legionella, *OR the presence of* Legionella *urinary antigen OR seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to* Legionella, *AND fever or cough or pneumonia.*

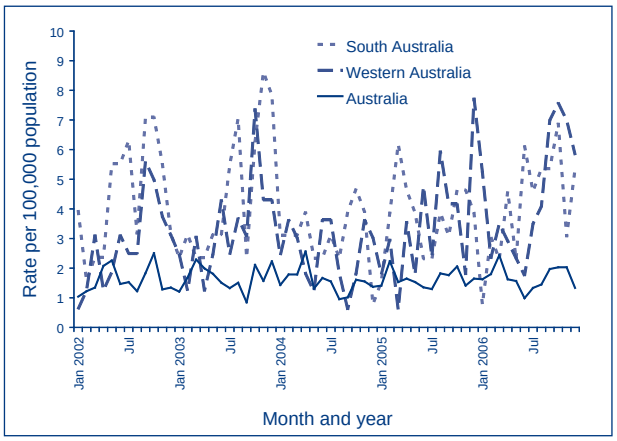
***Probable case:** Single high titre antibody titre to* Legionella, *OR detection of* Legionella *by nucleic acid testing, OR detection of* Legionella *by direct fluorescence assay, AND fever or cough or pneumonia.*

Legionellosis includes notifications of infections caused by all *Legionella* species. There were 348 notifications of legionellosis reported in 2006, giving a national rate of 1.7 cases per 100,000 population.

This was an increase over the 334 cases reported in 2005. In 2006, an increase in cases was seen in Western Australia (4.4 cases per 100,000 population, 91 cases) and South Australia (4.2 cases per 100,000 population, 65 cases).

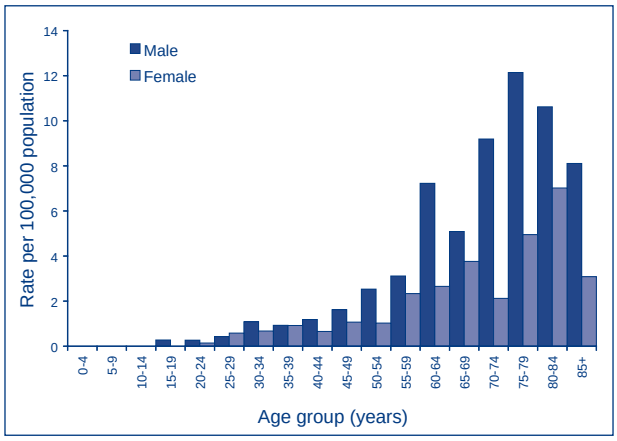
Legionellosis notifications showed a peak in autumn and spring, as in previous years (Figure 72). Rates of legionellosis have ranged between 0.8 and 2.6 cases per 100,000 population between 1999 and 2005, except in 2000, when rates reached 6.9 cases per 100,000 population as a result of the Melbourne aquarium outbreak with 125 cases.[42]

Figure 72. Trends in notification rates of legionellosis, South Australia, Western Australia and Australia, 2002 to 2006, by month of onset



In 2006, men accounted for 222 of the 348 notified cases of legionellosis resulting in a male to female ratio of 1.7:1. There were no cases in children under the age of 15 years. Overall, the highest rate of infection was 8.5 cases per 100,000 population in the 80–84 years age group. In men, the highest rate occurred in men in the 75–79 years age group (12.1 cases per 100,000 population, 31 cases) and women, in the 80–84 years age group (7 cases per 100,000 population, 17 cases, Figure 73).

Figure 73. Notification rate of legionellosis, Australia, 2006, by age group and sex



Data on the causative species were available for 336 (97%) of the 348 legionellosis cases. Of these, 178 (53%) were *Legionella longbeachae,* 154 (46%) cases were identified as *L. pneumophila* and 4 (1%) were *L. micdadei* or *L. bozemanii* (Table 18).

Of the 154 *L. pneumophila* notifications, serogroup data were available on 83 (54%) cases; 77 (92%) of serogrouped *L. pneumophila* were serogroup 1.

There are significant differences in the geographic distribution of *L. longbeachae* and *L. pneumophila*, with the *L. longbeachae* making up the majority of species in notifications from South Australia and Western Australia, while *L. pneumophila* are the most common infecting species in the eastern states (Queensland, New South Wales and Victoria).

Data on the death of legionellosis cases were available for 230 (66%) notifications. There were 9 reported deaths due to legionellosis in Australia in 2006, giving a case fatality rate of 3.9%. The break down of deaths by state or territory and infecting *Legionella* species is shown in Table 19. There were 6 deaths associated with *L. longbeachae* infection (all in Western Australia) giving a case fatality rate of 3.3%. Three patients with *L. pneumophila* infections

Table 18. Notifications of legionellosis, 2006, by state or territory and species

Species	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Legionella longbeachae	0	22	2	7	46	2	13	86	178
Legionella pneumophila	1	54	1	26	18	1	51	2	154
Other species*	0	0	0	0	1	0	3	0	4
Unknown species	0	1	0	6	0	0	2	3	12
Total	1	77	3	39	65	3	69	91	348

* *Legionella micdadei, Legionella bozemanii*

died, giving a case fatality rate of 1.9%. Case fatality rates may be overestimated given the large proportion of cases without details of death outcomes.

The number of deaths decreased in 2006 relative to 2005 when there were 14 deaths. Decreases in deaths associated with legionellosis fell in all states and territories except Western Australia where there were 3 more deaths in 2006 than in 2005.

There were 3 outbreaks of legionellosis was reported in 2006. A cluster of 10 cases (including 1 death) was linked to a Melbourne metropolitan shopping centre. In Sydney, 6 linked cases were reported, while in Queensland a cluster of cases associated with a coal mine was also reported.

A case control study of *L. longbeachae* cases in South Australia was recently published, which clarified risk factors associated with this infection.[43] The organism has been isolated from potting mix [44] and inhalation of dust from potting mix has been thought to be a major route of infection. The recent study by O'Connor[43] demonstrated that other risk factors such as exposure to aerosolised bacteria from dripping hanging pots and possible ingestion of organisms due to failure to wash hands after gardening may be more significant. Long-term smokers were also shown to be at increased risk of infection.[43]

Leprosy

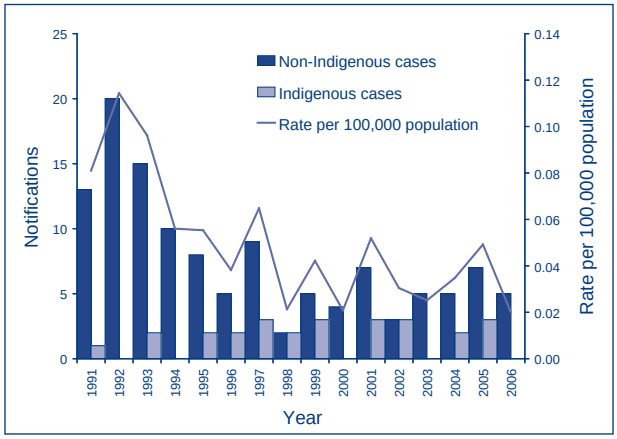
Case definition – Leprosy

*Only **confirmed cases** are reported.*

***Confirmed case:** Requires demonstration of acid fast bacilli in split skin smears and biopsies prepared from ear lobe or other relevant sites or histopathological report from skin or nerve biopsy compatible with leprosy (Hansen's disease) examined by an anatomical pathologist or specialist microbiologist AND compatible nerve conduction studies or peripheral nerve enlargement or loss of neurological function not attributable to trauma or other disease process, or hypopigmented or reddish skin lesions with definite loss of sensation.*

Leprosy is a chronic infection of the skin and peripheral nerves with the bacterium *Mycobacterium leprae*. Leprosy is a rare disease in Australia, with the majority of cases occurring among migrants to Australia from leprosy endemic countries and occasional cases from Indigenous communities. Trends in the numbers of leprosy notification in Indigenous and non-Indigenous Australians and the overall rate are shown in Figure 74.

Figure 74. Number of notifications of leprosy in Indigenous and non-Indigenous Australians and the overall notification rate, 1991 to 2006



In 2006, 5 leprosy cases were notified to NNDSS compared with 10 cases in 2005. There were 2 cases in Western Australia, and a single case in New South Wales, the Northern Territory and South Australia. Two cases occurred in men and 3 in women. None of the cases were Indigenous Australians. The age range of cases was 26–42 years. Four of the 5 cases had multi-bacillary leprosy.

Table 19. Deaths due to legionellosis, Australia, 2006, by state or territory and species

Species	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Legionella longbeachae	0	0	0	0	0	0	0	6	6
Legionella pneumophila	0	0	0	0	1	0	2	0	3
Other species*	0	0	0	0	0	0	0	0	0
Unknown species	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	2	6	9

* *Legionella micdadei, Legionella bozemanii*

Invasive meningococcal disease

Case definition – Invasive meningococcal disease

*Both **confirmed cases** and **probable cases** are reported.*

***Confirmed case:** Defined as isolation of* Neisseria meningitidis *from a normally sterile site. Alternatively, detection of meningococcus by nucleic acid testing, or Gram negative diplococci in Gram stain in specimens from a normally sterile site or from a suspicious skin lesion, OR high titre IgM or a significant rise in IgM or IgG titres to outer membrane protein antigens, OR positive polysaccharide antigen test in cerebrospinal fluid AND disease compatible with invasive meningococcal disease.*

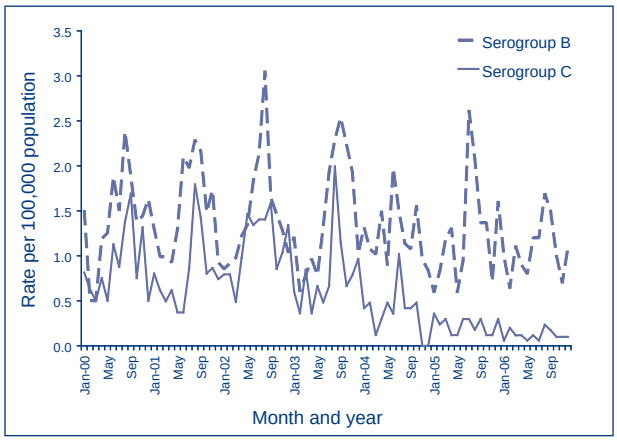
***Probable case:** Defined as the absence of evidence for other causes of clinical symptoms AND EITHER clinically compatible disease including haemorrhagic rash OR clinically compatible disease and close contact with a confirmed case within the previous 60 days.*

Historically in Australia, serogroups B and C have been the major cause of invasive meningococcal disease. The Australian Government commenced the National Meningococcal C Vaccination Program in January 2003.

In 2006, there were 318 notifications of invasive meningococcal disease in Australia, a decrease from 392 in 2005. A decline was seen in all states except South Australia and Victoria. The total in 2006 was the lowest since 1996. The national notification rate in 2006 was 1.5 cases per 100,000 population. The highest rate was reported from the Northern Territory (2.9 cases per 100,000 population, 6 cases).

Fifty-two per cent (165) of cases occurred in males, giving a male to female ratio of 1.1:1. As in previous years, the largest number of cases occurred in winter and spring (Figure 75). The majority of cases (294, 93%) were confirmed, and 24 (7%) had a probable diagnosis.

Figure 75. Trends in notification rates of meningococcal infection, Australia, 2002 to 2006, by month of onset and serogroup



Of the 318 meningococcal notifications in 2006, 267 (84%) were serogrouped. Of these, 223 (83.5%) were serogroup B, 24 (9%) were serogroup C and 20 (7.5%) were infections with serogroup Y (5), serogroup W-135 (14) or serogroup A (1) (Table 20). In comparison in 2005, 83% (326/393) of notified cases were serogrouped, 256 (79%) were serogroup B and 46 (14%) were serogroup C.

Serogroup C infections were largely confined to the eastern seaboard states; Victoria, New South Wales and Queensland, where serogroup C meningococcal disease has in previous years been more common than in other states.

The highest age specific meningococcal notification rate was in children aged 0–4 years with a rate of 8.8 cases per 100,000 population (112 cases). Eighty-four per cent of cases (94/112) were serogroup B infections, which is the highest age-specific rate for serogroup B infection, with 7.3 cases per 100,000 population.

In the 15–19 years age group, the overall rate of meningococcal infection was 3.9 cases per 100,000 population (55 cases), 42 (76%) of which were serogroup B (Figure 76).

Table 20. Notifications of meningococcal infection, 2006, by state or territory and serogroup

Species	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Serogroup B	4	57	6	58	14	4	62	18	223
Serogroup C	1	14	0	4	0	1	3	1	24
Other serogroups*	0	6	0	3	3	0	7	1	20
Unknown serogroup	0	30	0	6	1	0	13	1	51
Total	5	107	6	71	18	5	85	21	318

* Serogroup Y (5 cases); serogroup W-135 (14 cases) and serogroup A (1 case).

Figure 76. Notification rate of meningococcal C infection, Australia, 2000 to 2006, by age group

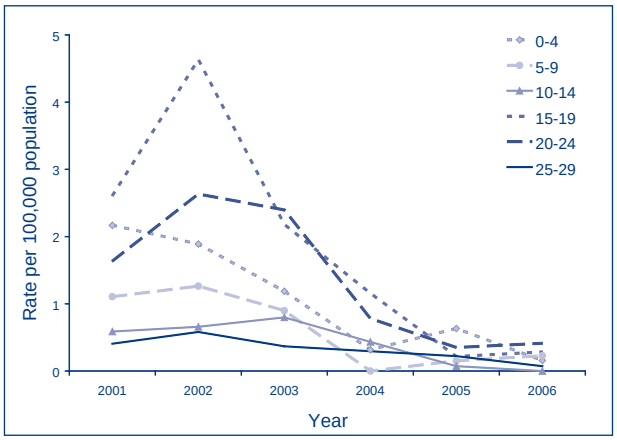
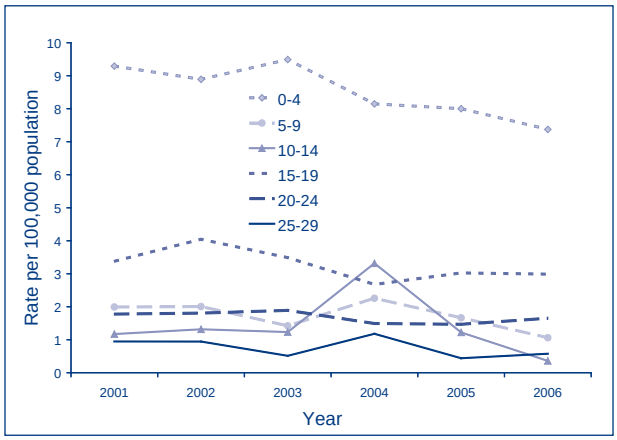


Figure 77. Notification rate of meningococcal B infection, Australia, 2001 to 2006, by age group



There has been a marked decrease in meningococcal C infection rates since 2003 when the National Meningococcal C Vaccination Program was introduced. In 2006, coverage meningococcal serogroup C vaccines in children aged 12 months reached 92.5% of Indigenous children and 93.4% of non-Indigenous children (data provided by the Australian Childhood Immunisation Register).

The greatest declines in the rate of serogroup C disease was in the 15–19 years age group from 6.6 cases per 100,000 population in 2002 (63 cases) to 0.3 cases per 100,000 population in 2006 (3 cases). The rate in the 20–24 years age group fell from 2.6 (35 cases) to 0.4 (6 cases) over the same period. Notification rates in the 0–4 years age group fell from 2.2 cases per 100,000 population in 2001 (28 cases) to 0.2 cases per 100,000 population (4 cases) in 2006.

Figure 77 shows that over the period 2001 to 2006 notification rates of serogroup B disease have declined in the 0–4 years age group by 21%; in the 5–9 years age group by 45%; and in the 10–14 years age group by 80%, while remaining stable in older age groups.

There were 12 deaths due to meningococcal disease in 2006 (a case fatality rate of 3.7%). Eight deaths were due to serogroup B (CFR= 3.6%), 3 due to W-135 (CFR = 21%) and only 1 death was due to serogroup C disease (CFR = 4.2%, Table 21). This was a decrease on the 20 deaths in 2005.

In contrast to previous years, there were only a few reports of small clusters of meningococcal disease (all serogroup B) in 2006. A case of meningococcal serogroup A on a passenger airline prompted a multi-state and international follow-up of potentially exposed fellow passengers. No secondary cases were reported.

Laboratory based meningococcal surveillance

The Australian Meningococcal Surveillance Programme (AMSP) was established in 1994 for the purpose of monitoring and analysing isolates of *Neisseria meningitidis* from cases of invasive meningococcal disease 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 2006 have recently been published.[45]

Table 21. Deaths due to meningococcal infection, Australia, 2006, by state or territory and serogroup

Species	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Serogroup B	0	3	0	2	1	0	2	0	8
Serogroup C	0	1	0	0	0	0	0	0	1
Serogroup W-135	0	1	0	0	0	0	2	0	3
Total	0	5	0	2	1	0	4	0	12

In 2006, a total of 271 laboratory confirmed cases of invasive meningococcal disease were examined by the AMSP. Consistent with the NNDSS data, the AMSP reported that 80% were identified as serogroup B (217) and 9.6% were serogroup C (26). No evidence of meningococcal capsular 'switching' was detected. About two-thirds of all isolates showed decreased susceptibility to penicillin (MIC 0.06–0.5 mg/L). All isolates remained susceptible to rifampicin and ciprofloxacin.

The changing ecology of meningococcal disease in Australia has been recently reviewed.[46] The 'hypersporadic' period since the 1980s when hyper-virulent serogroup B and serogroup C clones dominated and incidence remained above 2 cases per 100,000 population, may be changing as the impact of the conjugate serogroup C meningococcal vaccine reduces the incidence of serogroup C disease.[47]

Tuberculosis

Case definition – Tuberculosis

Only ***confirmed cases*** *are reported.*

Confirmed case: *Defined as of* Mycobacterium tuberculosis *complex by culture, OR detection of* M. tuberculosis *complex by nucleic acid testing except which it is likely to be due to previously treated or inactive disease OR clinical diagnosis of tuberculosis including clinical follow-up assessment to ensure a consistent clinical course.*

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 2006, 1,229 TB notifications were received by NNDSS, a rate of 6 cases per 100,000 population compared with 1,083 cases notified nationally 2005. The notification rate of TB was higher than the national average in the Northern Territory (15 cases per 100, 000 population), while the lowest rate occurred in Tasmania (1.8 cases per 100, 000 population). Further details of TB notifications in 2006 have already been published.[48]

Other communicable disease surveillance

Laboratory Virology and Serology Reporting Scheme

The Laboratory Virology and Serology Reporting Scheme (LabVISE) is a passive surveillance scheme based on voluntary reports of infectious agents from sentinel virology and serology laboratories around Australia. LabVISE provides data on diagnoses of a number of infectious viruses, parasites and fungi. Interpretation of data from LabVISE is limited by uncertainties regarding its representativeness, lack of denominator data to calculate positivity rates, variable reporting coverage over time, and lack of consistent case definitions. LabVISE has an important role in supplementing information of diseases under surveillance in NNDSS and in monitoring infectious agents that are not reported by other surveillance systems.

In 2006, a total of 11 laboratories reported 19,384 infectious agents to LabVISE. This represents a 13% decrease in the number of reports received in 2005 (Table 22). Most of the reports were from South Australia (30%), Queensland (27%) and New South Wales (20%) (Table 22).

Fifty-nine per cent (11,517) of all reports received by LabVISE were viral infectious agents, and the remaining 41% (7,867) were bacterial or other infectious agents. Among viruses, herpes viruses (17%; 3,348) (including herpes virus type 6, cytomegalovirus, varicella-zoster virus, Epstein-Barr virus), RNA viruses (15%; 2,830) (including HTLV-1, rotavirus, astrovirus and Norwalk agent) and ortho/paramyxoviruses (14%; 2,626) (including influenza, parainfluenza and respiratory syncytial viruses) were the most commonly reported pathogens (Figure 78). Among non-viral infectious agents, *Chlamydia trachomatis* (20%; 3,883), *Bordetella pertussis* (7%; 1,313) and *Mycoplasma pneumoniae* (5%; 1,035) were the most commonly reported pathogens.

Figure 78. Reports of viral infections to the Laboratory Virology and Serology Reporting Scheme, 2006, by viral group

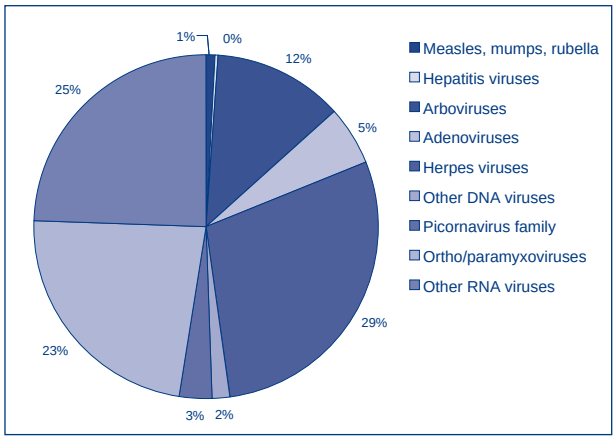


Table 22. Infectious agents reported to the Laboratory Virology and Serology Reporting Scheme (LabVISE) 2006, by state or territory

Organism	State or territory								Total 2006	Total 2005
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA		
Measles virus	–	27	–	4	10	6	10	–	57	8
Mumps virus	1	–	1	7	4	–	14	–	27	38
Rubella virus	–	2	–	4	1	–	4	2	13	12
Hepatitis A virus	–	4	3	9	7	–	1	7	31	53
Hepatitis D virus	–	–	–	1	4	–	2	–	7	14
Hepatitis E virus	–	–	–	1	–	–	5	–	6	12
Ross River virus	–	41	45	662	222	1	31	60	1,062	452
Barmah Forest virus	–	10	–	127	146	–	6	–	289	185
Flavivirus (unspecified)	–	1	–	37	–	–	9	–	47	37
Adenovirus type 1	–	–	–	–	–	–	3	–	3	7
Adenovirus not typed/pending	10	284	1	38	163	–	126	–	622	680
Herpes virus type 6	–	–	–	–	–	–	4	–	4	2
Cytomegalovirus	4	221	1	95	410	17	111	3	862	1,042
Varicella-zoster virus	3	137	1	583	266	7	40	–	1,037	1,499
Epstein-Barr virus	–	16	93	483	428	7	34	384	1,445	2,148
Molluscum contagiosum	–	–	–	–	–	–	1	–	1	–
Poxvirus group not typed	–	–	–	–	–	–	3	–	3	2
Parvovirus	–	5	–	77	78	1	25	–	186	202
Coxsackievirus A9	–	16	–	–	–	–	–	–	16	3
Coxsackievirus A16	–	2	–	–	–	–	–	–	2	6
Echovirus type 34	–	1	–	–	–	–	–	–	1	–
Echovirus type 3	–	3	–	–	–	–	–	–	3	–
Echovirus type 5	–	2	–	–	–	–	–	–	2	2
Echovirus type 8	–	1	–	–	–	–	–	–	1	–
Echovirus type 11	–	2	–	–	–	–	–	–	2	4
Echovirus type 18	–	2	–	–	–	–	–	–	2	14
Echovirus type 22	–	4	–	–	–	–	–	–	4	1
Echovirus type 30	–	16	–	–	–	–	–	–	16	36
Rhinovirus (all types)	1	182	–	–	20	1	1	1	206	329
Enterovirus not typed/pending	6	73	–	11	2	3	7	–	102	187
Picornavirus not typed	–	–	–	–	–	1	1	–	2	1
Influenza A virus	3	79	–	69	68	4	114	–	337	708
Influenza A virus H3N2	–	1	–	–	–	–	–	–	1	2
Influenza B virus	–	42	–	15	81	–	34	–	172	257
Parainfluenza virus type 1	–	25	–	–	26	–	23	–	74	64
Parainfluenza virus type 2	–	9	–	1	5	–	–	–	15	49
Parainfluenza virus type 3	1	103	–	15	54	–	46	–	219	390
Respiratory syncytial virus	–	846	1	186	375	28	372	–	1,808	1,679
HTLV-1	–	–	–	–	6	–	–	–	6	9
Rotavirus	3	579	–	–	323	77	301	2	1,285	1,270
Astrovirus	–	–	–	–	–	–	1	–	1	4
Norwalk agent	–	25	–	–	–	–	1,513	–	1,538	267
Chlamydia trachomatis not typed	22	874	1	1,558	1,322	54	50	2	3,883	5,049
Chlamydia pneumoniae	–	–	–	–	–	–	1	–	1	8
Chlamydia psittaci	–	7	–	–	1	–	57	–	65	53
Chlamydia spp typing pending	–	1	–	–	–	–	–	–	1	–

Table 22. Infectious agents reported to the Laboratory Virology and Serology Reporting Scheme (LabVISE) 2006, by state or territory, *continued*

Organism	State or territory								Total 2006	Total 2005
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA		
Chlamydia species	–	1	–	–	–	–	1	–	2	1
Mycoplasma pneumoniae	1	28	12	384	273	26	210	101	1,035	1,309
Mycoplasma hominis	–	23	–	–	–	–	–	–	23	7
Coxiella burnetii (Q fever)	–	4	3	32	44	1	20	–	104	162
Rickettsia prowazeki	–	–	–	–	24	–	–	–	24	161
Orentia tsutsugamushi	–	–	–	–	25	–	1	–	26	71
Rickettsia – spotted fever group	–	–	–	–	85	2	–	–	87	236
Streptococcus group A	–	6	–	294	–	–	77	–	377	609
Yersinia enterocolitica	–	4	–	1	–	–	–	–	5	6
Brucella species	–	2	–	3	–	–	–	–	5	14
Bordetella pertussis	2	45	3	157	1,003	1	102	–	1,313	1,573
Legionella pneumophila	–	7	–	–	13	–	8	–	28	23
Legionella longbeachae	1	–	–	–	10	–	10	–	21	51
Legionella species	–	–	–	–	–	–	1	–	1	1
Cryptococcus species	–	2	–	6	11	–	–	–	19	41
Leptospira species	–	2	–	9	7	–	–	–	18	33
Treponema pallidum	–	164	3	363	250	–	6	–	786	1,086
Entamoeba histolytica	–	–	–	1	–	–	–	–	1	14
Toxoplasma gondii	–	8	–	7	10	4	10	–	39	45
Echinococcus granulosus	–	–	–	–	3	–	–	–	3	10
Total	58	3,939	168	5,240	5,780	241	3,396	562	19,384	22,238

– No data received.

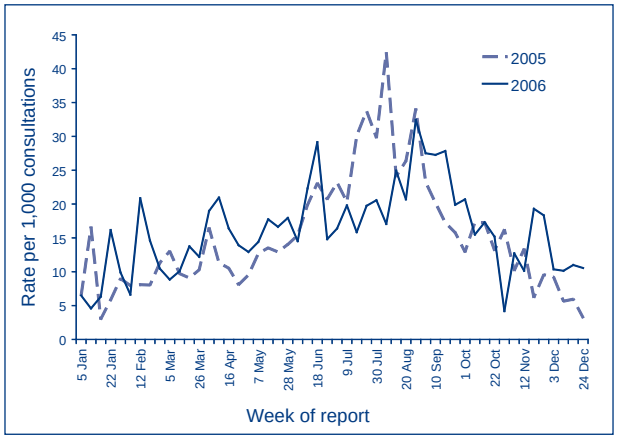
Australian Sentinel Practice Research Network

The Research and Health Promotion Unit of the Royal Australian College of General Practitioners operates the Australian Sentinel Practice Research Network (ASPREN). ASPREN is a national network of general practitioners that report each week on a number of conditions selected annually. Sentinel general practices contributing to the ASPREN scheme are mostly located in capital cities and larger regional centres on the east coast of Australia. The data provide an indicator of the burden of disease in the primary care setting and allow trends in consultation rates to be detected.

In 2006, influenza-like illnesses (ILI), gastroenteritis, and varicella infections (chickenpox and shingles) were the communicable diseases reported to ASPREN. Each week an average of 27 general practitioners (range 11–39) provided information from an average of 2,654 (range 934–3,999) consultations per week. The average number of participating practices and consultations has decreased since 2003.

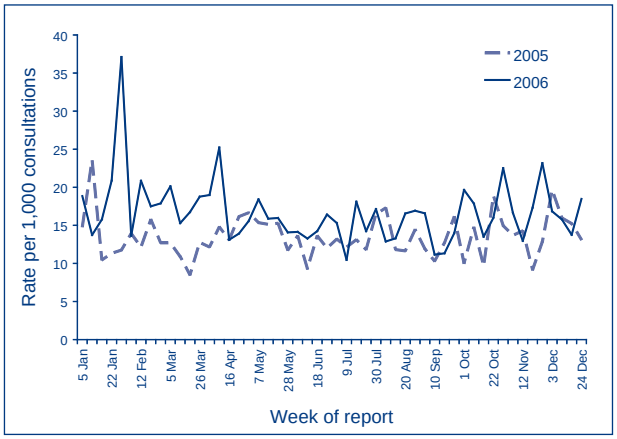
During 2006, influenza-like illness reports to ASPREN started increasing in week 24, with peaks in weeks 25 (29.2 cases per 1,000 consultations, mid-June) and 35 (32.4 cases per 1,000, late August). In 2005, ILI reports peaked in early August (42.4 cases per 1,000) (Figure 79).

Figure 79. Consultation rates for influenza-like illness, ASPREN 2006 compared with 2005, by week of report



Consultations for gastroenteritis fluctuated between 10.5 to 37.1 cases per 1,000 consultations. Rates reported for 2006 appeared to be slightly higher until April and then became very similar to 2005 (Figure 80).

Figure 80. Consultation rates for gastroenteritis, ASPREN, 2006 compared with 2005, by week of report



Consultations for varicella zoster (shingles) fluctuated between 0.4 to 6.2 cases per 1,000 consultations. Rates reported for 2006 appeared similar to 2005 from 16 April (Figure 81). Reports of varicella zoster (shingles) were available only from week 13 in 2005.

Consultations for varicella zoster (chickenpox) fluctuated between 0 to 3.3 cases per 1,000 consultations. Rates reported for 2006 appeared to be slightly less than 2005 from 16 April. Reports of varicella zoster (chickenpox) were available only from week 13 in 2005 (Figure 82).

Figure 81. Consultation rates for varicella zoster (shingles), ASPREN, 2006 compared with 2005, by week of report

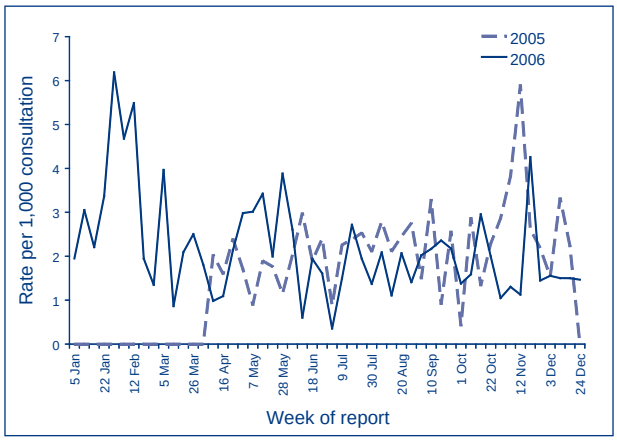
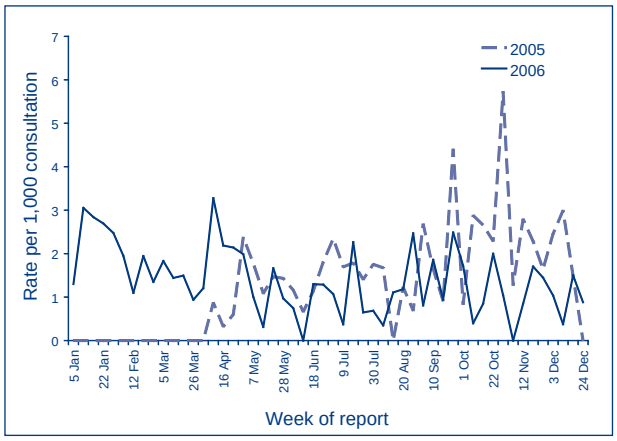


Figure 82. Consultation rates for varicella zoster (chickenpox), ASPREN, 2006 compared with 2005, by week of report



Appendices

Appendix 1. Mid-year estimate of Australian population, 2006, by state or territory

	State or territory								Aust.*
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	
Male	163,008	3,397,689	109,217	2,029,383	770,793	241,359	2,514,871	1,029,715	10,257,418
Female	165,809	3,430,005	97,471	2,024,061	783,863	247,589	2,576,795	1,021,169	10,348,070
Total	328,817	6,827,694	206,688	4,053,444	1,554,656	488,948	5,091,666	2,050,884	20,605,488

* Includes other territories.

Appendix 2. Mid-year estimate of Australian population, 2006, by state or territory and age group

Age	State or territory								Aust.*
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	
0–4	20,583	419,143	17,746	258,643	88,725	30,341	311,755	128,008	1,275,165
5–9	20,341	435,279	16,492	271,248	93,971	31,845	315,725	134,121	1,319,250
10–14	21,506	454,682	16,436	286,675	101,067	34,132	333,930	142,220	1,390,910
15–19	23,713	458,434	15,211	284,088	103,019	34,184	339,951	146,554	1,405,419
20–24	28,406	467,748	16,698	294,079	106,552	31,461	361,189	147,154	1,453,429
25–29	26,275	464,560	17,170	271,463	95,566	26,927	352,002	137,870	1,391,964
30–34	25,174	498,740	17,979	290,904	100,381	29,247	371,984	146,203	1,480,776
35–39	24,613	493,828	17,407	296,793	109,703	32,958	385,208	153,876	1,514,579
40–44	24,281	502,157	16,289	299,270	114,406	35,204	376,518	155,808	1,524,169
45–49	24,005	490,975	14,620	290,993	114,967	36,823	365,395	152,132	1,490,120
50–54	22,410	443,890	12,835	263,103	105,859	34,401	330,423	139,070	1,352,213
55–59	20,921	422,039	10,821	253,560	102,967	33,373	312,573	128,905	1,285,321
60–64	14,300	330,540	6,769	196,400	79,600	26,146	240,209	94,003	988,066
65–69	10,185	268,111	4,407	151,903	64,304	21,461	196,318	75,006	791,770
70–74	7,576	219,188	2,399	115,823	53,497	16,757	161,003	58,083	634,371
75–79	6,155	195,190	1,729	98,565	49,927	14,326	143,560	48,778	558,247
80–84	4,768	144,501	887	71,408	38,377	10,765	106,571	34,446	411,726
85+	3,605	118,689	793	58,526	31,768	8,597	87,352	28,647	337,993
Total	328,817	6,827,694	206,688	4,053,444	1,554,656	488,948	5,091,666	2,050,884	20,605,488

* Includes other territories

Appendix 3. Completeness of National Notifiable Diseases Surveillance System data received, Australia, 2006, by state or territory

	State or territory								Aust.
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	
Total notifications	2,173	33,926	6,512	38,201	12,786	2,520	27,456	15,019	138,593
Sex									
Unknown/missing	5	114	3	4	2	0	189	0	317
Per cent complete*	99.8	99.7	100.0	100.0	100.0	100.0	99.3	100.0	99.8
Age									
Unknown/missing	0	3	3	0	10	6	31	2	55
Per cent complete*	100.0	100.0	100.0	100.0	99.9	99.8	99.9	100.0	100.0
Indigenous status†									
Unknown/missing	2,011	26,932	557	25,233	2,030	1,210	12,840	4,264	75,077
Per cent complete*	7.5	20.6	91.4	33.9	84.1	52.0	53.2	71.6	45.8

* Data completeness = (Total – Unknown or missing)/Total x100

† 'Indigenous status' is a variable defined by the following values:

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.

Blank/missing/null=No information provided.

Abbreviations

AFP	acute flaccid paralysis
AGSP	Australian Gonococcal Surveillance Programme
AMSP	Australian Meningococcal Surveillance Programme
ASPREN	Australian Sentinel Practice and Research Network
CDI	Communicable Diseases Intelligence
CDNA	Communicable Diseases Network Australia
DoHA	Department of Health and Ageing
DTPa	diphtheria-tetanus-acellular pertussis
Hib	*Haemophilus influenzae* type b
HPAIH	highly pathogenic avian influenza in humans
HPV	human papilloma virus
HUS	haemolytic uraemic syndrome
IHR	International Health Regulations
ILI	influenza-like illness
IPD	invasive pneumococcal disease
IPV	inactivated poliovirus vaccine
LabVISE	Laboratory Virology and Serology Reporting Scheme
MMR	measles-mumps-rubella
MSM	men who have sex with men
NCHECR	National Centre in HIV Epidemiology and Clinical Research
NIP	National Immunisation Program
NNDSS	National Notifiable Diseases System
OPV	oral poliovirus vaccine
PEC	Poliovirus Expert Committee
SARS	severe acute respiratory syndrome
STEC	Shiga toxin-producing *Escherichia coli*
STI	sexually transmissible infections
TB	tuberculosis
VAPP	vaccine associated paralytic poliomyelitis
VDPV	vaccine-derived poliovirus
VPD(s)	vaccine preventable disease(s)
VTEC	verotoxigenic *Escherichia coli*
WHO	World Health Organization

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