Annual reports

Australia's notifiable disease status, 2007: Annual report of the National Notifiable Diseases Surveillance System

NNDSS Annual Report Writing Group

Abstract

In 2007, 69 diseases and conditions were nationally notifiable in Australia. States and territories reported a total of 146,991 notifications of communicable diseases to the National Notifiable Diseases Surveillance System, an increase of 5% on the number of notifications in 2006. In 2007, the most frequently notified diseases were sexually transmissible infections (62,474 notifications, 43% of total notifications), gastrointestinal diseases (30,325 notifications, 21% of total notifications) and vaccine preventable diseases (25,347 notifications, 17% of total notifications). There were 19,570 notifications of bloodborne diseases; 6,823 notifications of vectorborne diseases; 1,762 notifications of other bacterial infections; 687 notifications of zoonoses and 3 notifications of quarantinable diseases. *Commun Dis Intell* 2009;33:89–154.

Keywords: Australia, communicable diseases, epidemiology, surveillance

Introduction

Australia's notifiable diseases status, 2007, is an annual surveillance report of nationally notifiable communicable diseases. Communicable disease surveillance in Australia operates at the national, jurisdictional 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 September 2007, the *National Health Security Act 2007*[1] received royal assent. This Act provides a legislative basis for and authorises the exchange of health information, including personal information, between jurisdictions and the Commonwealth. The Act provides for the establishment of the National Notifiable Diseases List,[2] which specifies the diseases about which personal information can be provided. The National Health Security Agreement,[3] which was drafted in 2007 and signed by Health Ministers in April 2008, establishes operational arrangements to formalise and enhance existing surveillance and reporting systems, an important objective of the Act. In 2007, states and territories voluntarily forwarded de-identified data on 65 nationally agreed communicable diseases to the Department of Health and Ageing for the purposes of national communicable disease surveillance, although not all 65 were notifiable in each jurisdiction. Data were electronically renewed daily or several times a week from states and territories. The system was complemented by other surveillance systems, which provided information on various diseases, including four that are not reported to the National Notifiable Diseases Surveillance System (NNDSS) (HIV, AIDS and the classical and variant forms of Creutzfeldt-Jakob disease).

In 2007, the NNDSS core dataset included the following 5 mandatory data fields: unique record reference number; notifying state or territory; disease code; confirmation status and the date when the public health unit was notified (notification receive date). In addition,

the following core but non-mandatory data fields were supplied where possible: date of birth; age at onset; sex; indigenous status; postcode of residence; disease onset date; date when the medical practitioner signed the notification form (notification date), death status, date of specimen collection and outbreak reference number (to identify cases linked to an outbreak). Where relevant, information on the species, serogroups/subtypes and phage types of organisms isolated, and on the vaccination status of the case were collected and reported to NNDSS. Data quality was monitored by the Office of Health Protection and the National Surveillance Committee (NSC), a jurisdictional committee comprised of surveillance and data managers. There was a continual process of improving the national consistency of communicable disease surveillance through the daily, fortnightly and quarterly review of these data.

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

Newly diagnosed HIV infection and AIDS were notifiable conditions in each state or territory health jurisdiction in 2007 and were forwarded to the National HIV Registry and National AIDS Registry at the National Centre in HIV Epidemiology and Clinical Research (NCHECR). Further information can be found in NCHECR's annual surveillance report.[4]

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

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

Notification rates for each notifiable disease were calculated using the estimated 2007 mid-year resident population supplied by the Australian Bureau of Statistics[7] (ABS) (Appendix 1 and Appendix 2). Where diseases were not notifiable in a state or territory, national rates were adjusted by excluding the population of that jurisdiction from the denominator. For some diseases, age adjusted rates were calculated using either the direct method of standardisation for gastrointestinal diseases, or indirect method for sexually transmissible infections, with 2001 census data as the standard population.

The geographical distribution of selected diseases was mapped using ArcGIS (ESRI, Redlands, CA) software in conjunction with the Australian Standard Geographical Classification.[8] Maps were based on the postcode of residence of each notification aggregated to the appropriate Statistical Division[9] (SD) (Map 1, Table 1). The Northern Territory was represented by Statistical Subdivisions.[9] Some individual postcodes were used for a multitude of disparate localities. These postcodes were generally in close proximity to each other and contained within the same Statistical Division (95.5% of all postcodes). However a small number of postcodes (n=113) were scattered throughout neighbouring Statistical Divisions. ABS concordance files were used to proportionally allocate notifications into SDs according to the percentage of the population of that postcode unit living in the SD.[10] For instance, the postcode 2406 can be found in 2 distinct SDs, Northern (130) and South West (325). Almost 81% of the population live in Northern so this SD will get 81% of the notifications that have a postcode of 2406.

Rates for the different SDs were ordered into 5 groups using the Jenks Natural Breaks method which is the default multi-class numerical classification method used in ArcGIS. This classification method finds the largest breaks between natural clusters of ordered data by iteratively comparing the sum of the squared differences within the clusters and by adjusting class boundaries to minimise these differences. Another class '0' was added to account for areas with no notifications, for a total of 6 rate classes per map. Note that the classification is data dependent and changes from map to map. The 2 Statistical Divisions in the Australian Capital Territory were combined to calculate rates for the Territory as a whole.

There were 135 NNDSS postcodes which did not exist in the 2006 ABS concordance files (2006 being the latest available at time of publication) and consequently could not be mapped. These postcodes consisted of post office box numbers, special NNDSS postcode formats (3999/4999/6999/8888/9999 etc), fictitious postcodes (6444), missing postcodes and 2007 postcodes. These 135 notifications were omitted from the maps.

Notes on interpretation

The present report is based on 2007 'finalised' data from each state or territory agreed upon in September 2008 and represents a snap shot of the year after duplicate records and incorrect or incomplete data were removed. Therefore, totals in this report may vary slightly from the totals reported in *CDI* quarterly publications.

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

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.

A survey of jurisdictional public health departments was conducted in 2005 to ascertain the source of each notification.[11] Notifications from Queensland were almost entirely supplied by laboratories (Table 2). In 3 other jurisdictions more than 90% of notifications originated from the laboratory. In 3 states almost half of the notifications were reported by both the doctor and laboratory. Only New South Wales, South Australia and Western Australia reported that greater than 15% of notifications in their jurisdictions originated from doctors only.

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

Changes in surveillance practices may have been introduced in some jurisdictions and not in others, and makes the comparison of data across jurisdictions difficult. In this report, some information was obtained from states and territories, including changes in surveillance practices, screening practices, laboratory practices, and major disease control or prevention initiatives to assist in the interpretation of the 2007 data.

Postcode information usually reflects the residential location of the case, but this does not necessarily represent the place where the disease was acquired. In December 2008, the CDNA endorsed the NNDSS cross-border notification protocol, which determines that the jurisdiction of residence of a case has the responsibility of reporting the notification to NNDSS. This was implemented from 1 January 2009, and may also affect some retrospective notifications, including those reported in 2007, by removing duplicates and preventing the loss of notification data in NNDSS.

Figure 1. Communicable diseases notifiable fraction

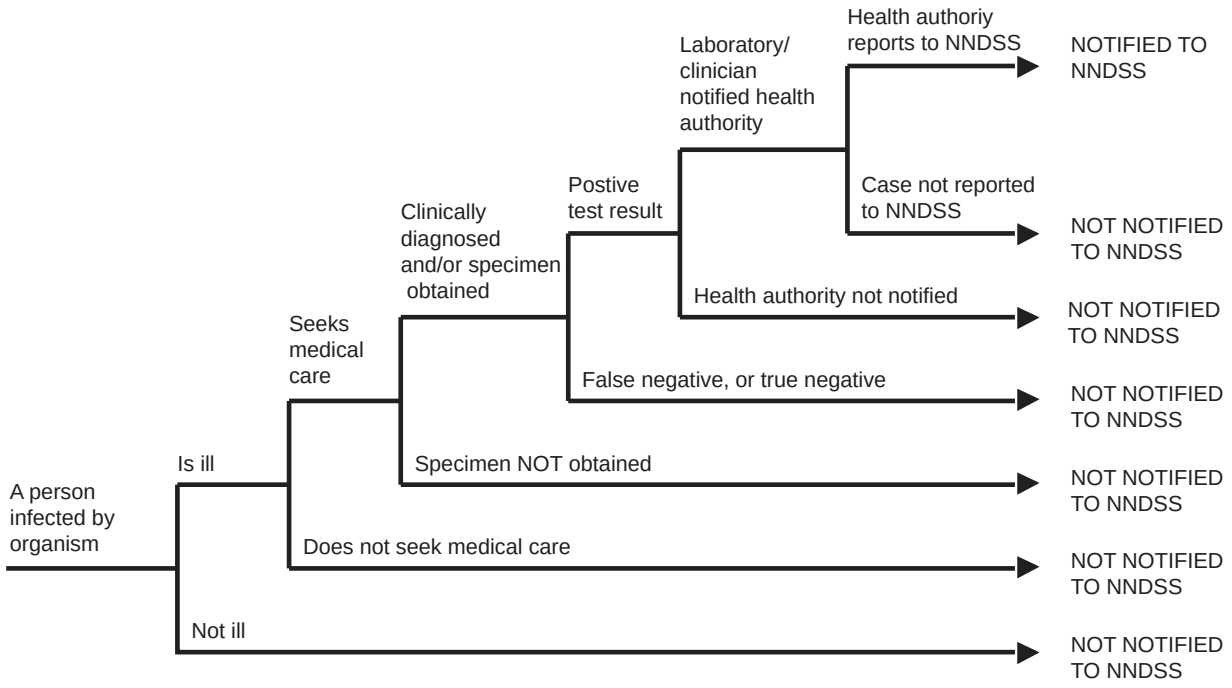
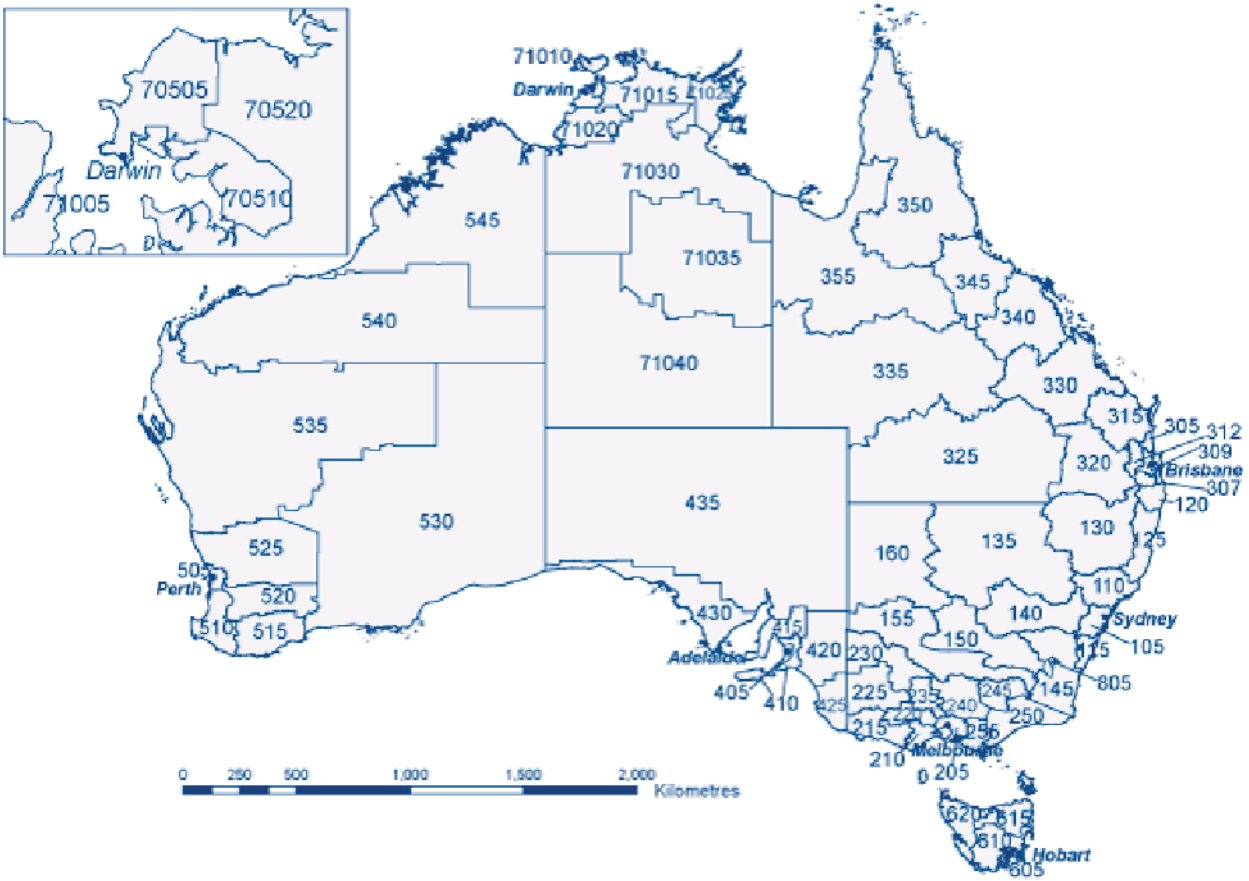


Table 1: Australian population by Statistical Division and Statistical Subdivision for the Northern Territory, 2007

SD code	Statistical Division	Population
Australian Capital Territory		
805	Canberra*	341,968
New South Wales		
105	Sydney	4,336,374
110	Hunter	624,296
115	Illawarra	417,901
120	Richmond-Tweed	232,948
125	Mid-North Coast	300,006
130	Northern	180,067
135	North Western	115,419
140	Central West	178,840
145	South Eastern	209,270
150	Murrumbidgee	154,663
155	Murray	116,471
160	Far West	22,817
Northern Territory (Subdivisions)		
70505	Darwin City	72,859
70510	Palmerston-East Arm	27,145
70520	Litchfield Shire	17,395
71005	Finniss	2,214
71010	Bathurst-Melville	2,501
71015	Alligator	6,913
71020	Daly	4,353
71025	East Arnhem	16,077
71030	Lower Top End NT	18,894
71035	Barkly	6,279
71040	Central NT	40,299
Queensland		
305	Brisbane	1,857,594
307	Gold Coast	535,528
309	Sunshine Coast	303,050
312	West Moreton	74,328
315	Wide Bay-Burnett	275,734
320	Darling Downs	229,254
325	South West	26,161
330	Fitzroy	204,537
335	Central West	11,397
340	Mackay	163,127
345	Northern	214,295
350	Far North	253,721
355	North West	33,336
South Australia		
405	Adelaide	158,259
410	Outer Adelaide	131,465
415	Yorke and Lower North	45,979
420	Murray Lands	69,763
425	South East	64,956
430	Eyre	34,893
435	Northern	79,198
Tasmania		
605	Greater Hobart	207,484
610	Southern	36,374
615	Northern	139,466
620	Mersey-Lyell	110,017
Victoria		
205	Melbourne	3,806,092
210	Barwon	273,619
215	Western District	103,307
220	Central Highlands	149,231
225	Wimmera	50,050
230	Mallee	92,707
235	Loddon	177,340
240	Goulburn	204,254
245	Ovens-Murray	97,069
250	East Gippsland	83,952
255	Gippsland	167,595
Western Australia		
505	Perth	1,554,769
510	South West	224,137
515	Lower Great Southern	55,946
520	Upper Great Southern	18,800
525	Midlands	53,593
530	South Eastern	56,858
535	Central	62,133
540	Pilbara	45,277
545	Kimberley	34,270
Other territories		–
Total		21,016,884

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

Map 1: Australian Bureau of Statistics Statistical Division codes, Australia, and Statistical Subdivision codes, the Northern Territory, 2007



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

The per cent data completeness was defined as:

Per cent data completeness = (total notifications – missing or unknown) / total notifications x 100

The indigenous status was defined by the following nationally accepted values:[12]

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, unknown

Table 2: Percentage of notifications from different sources, Australia, 2005, by state or territory

State or territory	Source of notifications		
	Laboratory only	Doctor only	Laboratory and doctor
ACT	98	1	1
NSW	70–80	20–30	<1
NT	95	5	<1
Qld	99	1	<1
SA	24	17	59
Tas	95	5	<1
Vic	50	7	43
WA	27	15	58

Source: Oxenford, Chapter 3 Current practices surrounding reporting of notifiable diseases by laboratories to state and territory health departments.[11]

Table 3: Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2007

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 New South Wales
Cryptosporidiosis	All jurisdictions
Haemolytic uraemic syndrome	All jurisdictions
Hepatitis A	All jurisdictions
Hepatitis E	All jurisdictions
Listeriosis	All jurisdictions
Salmonellosis	All jurisdictions
Shigellosis	All jurisdictions
STEC,VTEC§	All jurisdictions
Typhoid	All jurisdictions
Quarantinable diseases	
Cholera	All jurisdictions
Highly pathogenic avian influenza in humans	All jurisdictions
Plague	All jurisdictions
Rabies	All jurisdictions
Severe acute respiratory syndrome	All jurisdictions
Smallpox	All jurisdictions
Viral haemorrhagic fever	All jurisdictions
Yellow fever	All jurisdictions
Sexually transmissible infections	
Chlamydial infections‖	All jurisdictions
Donovanosis	All jurisdictions
Gonococcal infection	All jurisdictions
Syphilis – < 2 years duration*	All jurisdictions
Syphilis – > 2 years or unspecified duration*	All jurisdictions except South Australia
Syphilis – congenital	All jurisdictions
Vaccine preventable diseases	
Diphtheria	All jurisdictions
Haemophilus influenzae type b	All jurisdictions
Influenza (laboratory confirmed)¶	All jurisdictions
Measles	All jurisdictions
Mumps	All jurisdictions
Pertussis	All jurisdictions
Pneumococcal disease (invasive)	All jurisdictions
Poliomyelitis	All jurisdictions
Rubella	All jurisdictions
Rubella – congenital	All jurisdictions
Tetanus	All jurisdictions
Varicella zoster (chickenpox)**	All jurisdictions except New South Wales and Victoria
Varicella zoster (shingles)**	All jurisdictions except New South Wales and Victoria
Varicella zoster (unspecified)**	All jurisdictions except New South Wales and Victoria

Table 3: Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2007, 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 and syphilis includes cases in whom the duration of infection could not be determined.

† In Queensland, includes incident hepatitis C cases.

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

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

|| Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; Northern Territory, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Laboratory confirmed influenza was not a notifiable disease in South Australia but reports were forwarded to the National Notifiable Diseases Surveillance System.

** Nationally notifiable from 2006 and first full year of national reporting from 2007.

†† 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 and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

Notes on cases definitions

Each notifiable disease is governed by a national surveillance case definition for reporting to NNDSS. These case definitions were agreed by CDNA and implemented nationally from January 2004 and were used by all jurisdictions for the first time in 2005. The national surveillance case definitions and their status are available from http://www.health.gov.au/casedefinitions

Results

There were 146,991 communicable disease notifications received by NNDSS in 2007 (Table 4).

In 2007, the most frequently notified diseases were sexually transmissible infections (62,474 notifications, 42.5% of total notifications), gastrointestinal diseases (30,325 notifications, 20.6% of total notifications) and vaccine preventable diseases (25,347 notifications, 17.2% of total notifications).

There were 19,570 notifications of bloodborne diseases; 6,823 notifications of vectorborne diseases; 1,762 notifications of other bacterial infections; 687 notifications of zoonoses and 3 quarantinable diseases (Table 4).

In 2007, the total number of notifications was the highest recorded in NNDSS since the surveillance system commenced data collection in 1991. There was an increase of 5% compared with the total number of notifications in 2006 (Figure 2). This was a small increase compared with increases observed in previous years and most likely related to the introduction of varicella as a new nationally notifiable disease.

Notifications and notification rates per 100,000 population for each disease by state or territory are shown in Table 5 and Table 6 respectively. Trends in notifications and rates per 100,000 population for the period 2002 to 2006 are shown in Table 7.

The major changes in communicable disease notifications in 2007 are shown in Figure 3 as the ratio of notifications in 2007 to the mean number of notifications for the previous 5 years, or in the case of infectious syphilis, 3 years. Notifications of mumps, laboratory-confirmed influenza, infectious syphilis < 2 years, leprosy, Shiga toxin/verotoxin-producing *Escherichia coli* (STEC/VTEC), Barmah Forest virus infection, salmonellosis, and campylobacteriosis were above the historical mean. Notifications below the 5 year mean were *Haemophilus influenzae* type b, meningococcal infection, pertussis and measles. Notifications for the remaining diseases were within the historical range. The notification of a poliomyelitis case in 2007 was significant as it was the first case in 30 years, classified by WHO as an imported case as it was acquired in Pakistan.

Table 4: Notifications to the National Notifiable Diseases Surveillance System, Australia, 2007, by disease category rank order

Disease category	Number	%
Sexually transmissible infections	62,474	42.5
Gastrointestinal diseases	30,325	20.6
Vaccine preventable diseases	25,347	17.2
Bloodborne diseases	19,570	13.3
Vectorborne diseases	6,823	4.6
Other bacterial infections	1,762	1.2
Zoonoses	687	0.5
Quarantinable diseases	3	<0.1
Total	146,991	100

Figure 2: Trends in notifications received by the National Notifiable Diseases Surveillance System, Australia, 1991 to 2007

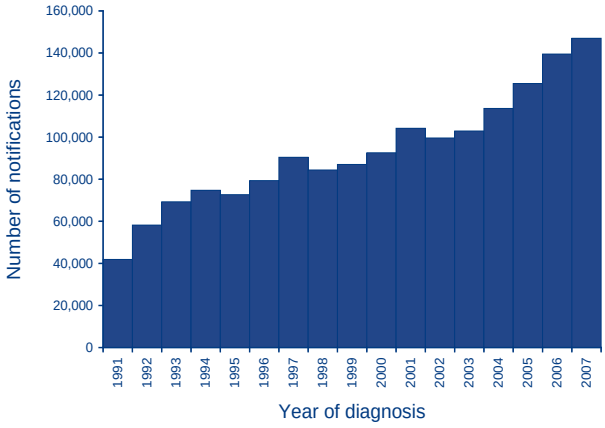
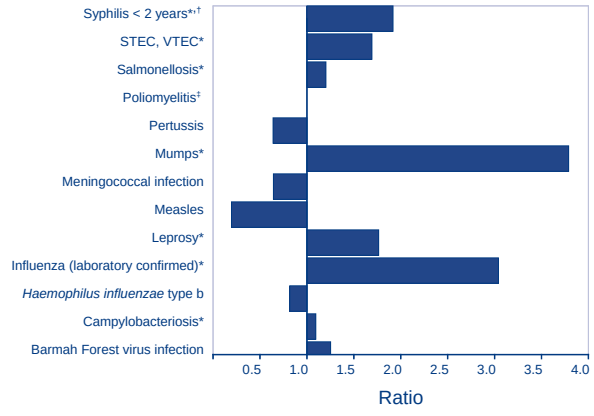


Figure 3: Comparison of total notifications of selected diseases reported to the National Notifiable Diseases Surveillance System in 2007, with the previous 5-year mean



* Exceeded 2 standard deviations above the 5-year mean.

† Syphilis < 2 years was based on a 3-year mean.

‡ Significant: 1st case in 30 years.

Table 5: Notifications of communicable diseases, Australia, 2007, by state or territory

Disease	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Bloodborne diseases									
Hepatitis (NEC)	0	0	0	0	0	0	0	0	0
Hepatitis B (incident)	13	56	9	63	11	9	84	42	287
Hepatitis B (unspecified)*	55	2,601	241	983	506	38	1,864	629	6,917
Hepatitis C (incident)	9	53	4	NN	48	20	145	76	355
Hepatitis C (unspecified)*,†	191	4,190	223	2,726	574	254	2,621	1,198	11,977
Hepatitis D	0	11	0	9	0	0	10	4	34
Gastrointestinal diseases									
Botulism	0	0	0	0	0	0	1	0	1
Campylobacteriosis‡	418	NN	289	4,438	2,675	712	6,352	2,100	16,984
Cryptosporidiosis	9	544	111	432	449	37	620	608	2,810
Haemolytic uraemic syndrome	1	13	0	1	1	0	3	0	19
Hepatitis A	2	65	5	28	5	3	36	21	165
Hepatitis E	1	8	0	3	0	0	6	0	18
Listeriosis	0	22	0	7	7	2	10	2	50
Salmonellosis	110	2,555	524	2,371	854	225	1,856	989	9,484
Shigellosis	0	71	173	88	62	3	96	104	597
STEC, VTEC§	1	23	3	24	41	0	13	2	107
Typhoid	0	34	3	6	5	3	30	9	90
Quarantinable diseases									
Cholera	0	2	0	1	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 infection‖	905	12,435	2,180	12,875	3,467	1,126	11,127	7,744	51,859
Donovanosis	0	0	1	2	0	0	0	0	3
Gonococcal infection	45	1,379	1,600	1,338	457	38	988	1,760	7,605
Syphilis (all)¶	28	1,106	281	440	51	36	843	214	2,999
Syphilis < 2 years duration*	9	434	119	232	51	8	427	101	1,381
Syphilis – > 2 years or unspecified duration*	19	672	162	208	NDP	28	416	113	1,618
Syphilis – congenital	0	6	2	0	0	0	0	0	8
Vaccine preventable diseases									
Diphtheria	0	0	0	0	0	0	0	0	0
Haemophilus influenzae type b	0	7	2	3	1	0	2	2	17
Influenza (laboratory confirmed)**	390	1,918	183	4,590	280	415	1,589	1,038	10,403
Measles	0	4	0	4	1	0	2	1	12
Mumps	4	323	58	46	22	2	18	106	579
Pertussis	95	2,090	25	1,535	373	25	1,049	131	5,323
Pneumococcal disease (invasive)	34	522	66	323	91	30	278	131	1,475
Poliomyelitis	0	0	0	0	0	0	1	0	1
Rubella	2	8	0	14	1	0	7	4	36
Rubella – congenital	0	1	0	0	0	0	1	0	2

Table 5: Notifications of communicable diseases, Australia, 2007, by state or territory, *continued*

Disease	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Vaccine preventable diseases, *continued*									
Tetanus	0	2	0	0	0	1	0	0	3
Varicella zoster (chickenpox)††	9	NN	197	375	732	16	NN	322	1,651
Varicella zoster (shingles) ††	6	NN	89	387	587	92	NN	386	1,547
Varicella zoster (unspecified) ††	102	NN	3	3,072	437	25	NN	659	4,298
Vectorborne diseases									
Barmah Forest virus infection	6	572	91	826	58	0	26	137	1,716
Dengue virus infection	3	81	15	120	22	3	16	54	314
Flavivirus infection (NEC)‡‡	0	0	0	18	0	0	4	0	22
Japanese encephalitis virus infection	0	0	0	0	0	0	0	0	0
Kunjin virus infection§§	0	0	0	0	0	0	1	0	1
Malaria	12	97	29	193	24	14	113	85	567
Murray Valley encephalitis virus infection§§	0	0	0	0	0	0	0	0	0
Ross River virus infection	12	840	300	2,137	211	7	95	601	4,203
Zoonoses									
Anthrax	0	0	0	0	0	0	1	0	1
Australia bat lyssavirus	0	0	0	0	0	0	0	0	0
Brucellosis	0	4	0	30	1	1	1	1	38
Leptospirosis	0	8	1	75	1	0	16	5	106
Lyssavirus (NEC)	0	0	0	0	0	0	0	0	0
Ornithosis	0	34	0	2	2	1	50	3	92
Q fever	0	215	2	171	24	0	31	7	450
Tularaemia	0	0	0	0	0	0	0	0	0
Other bacterial infections									
Legionellosis	4	105	3	52	17	3	42	81	307
Leprosy	0	4	0	1	2	1	2	2	12
Meningococcal infection||||	3	112	6	75	15	5	68	20	304
Tuberculosis	10	446	53	144	59	6	356	65	1,139
Total	2,480	32,567	6,772	40,028	12,174	3,153	30,474	19,343	146,991

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

† In Queensland, includes incident hepatitis C cases.

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

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

|| Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; Northern Territory, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Laboratory confirmed influenza was not a notifiable disease in South Australia but reports were forwarded to the National Notifiable Diseases Surveillance System.

†† Nationally notifiable from 2006 and first full year of national reporting from 2007.

‡‡ 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 and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

NN Not notifiable.

NDP No data provided.

Table 6: Notification rates for nationally notifiable communicable diseases, Australia, 2007, by state or territory

Disease	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
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)	3.8	0.8	4.2	1.5	0.7	1.8	1.6	2.0	1.4
Hepatitis B (unspecified)*	16.2	37.8	112.1	23.5	31.9	7.7	35.8	29.9	32.9
Hepatitis C (incident)	2.6	0.8	1.9	NN	3.0	4.1	2.8	3.6	2.1
Hepatitis C (unspecified)*,†	56.2	60.8	103.8	65.2	36.2	51.5	50.4	56.9	57.0
Hepatitis D	0.0	0.2	0.0	0.2	0.0	0.0	0.2	0.2	0.2
Gastrointestinal diseases									
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	<0.1
Campylobacteriosis‡	123.0	NN	134.5	106.1	168.9	144.3	122.0	99.7	120.2
Cryptosporidiosis	2.6	7.9	51.6	10.3	28.3	7.5	11.9	28.9	13.4
Haemolytic uraemic syndrome	0.3	0.2	0.0	<0.1	0.1	0.0	0.1	0.0	0.1
Hepatitis A	0.6	0.9	2.3	0.7	0.3	0.6	0.7	1.0	0.8
Hepatitis E	0.3	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.1
Listeriosis	0.0	0.3	0.0	0.2	0.4	0.4	0.2	0.1	0.2
Salmonellosis	32.4	37.1	243.8	56.7	53.9	45.6	35.7	47.0	45.1
Shigellosis	0.0	1.0	80.5	2.1	3.9	0.6	1.8	4.9	2.8
STEC, VTEC§	0.3	0.3	1.4	0.6	2.6	0.0	0.2	0.1	0.5
Typhoid	0.0	0.5	1.4	0.1	0.3	0.6	0.6	0.4	0.4
Quarantinable diseases									
Cholera	0.0	<0.1	0.0	<0.1	0.0	0.0	0.0	0.0	<0.1
Highly pathogenic avian influenza in humans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plague	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smallpox	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sexually transmitted infections									
Chlamydial infection‖	266.4	180.5	1014.3	307.9	218.8	228.2	213.8	367.7	246.8
Donovanosis	0.0	0.0	0.5	<0.1	0.0	0.0	0.0	0.0	<0.1
Gonococcal infection	13.2	20.0	744.4	32.0	28.8	7.7	19.0	83.6	36.2
Syphilis (all)¶	8.2	16.1	130.7	10.5	3.2	7.3	16.2	10.2	14.3
Syphilis < 2 years duration*	2.6	6.3	55.4	5.5	3.2	1.6	8.2	4.8	6.6
Syphilis – > 2 years or unspecified duration*	5.6	9.8	75.4	5.0	NDP	5.7	8.0	5.4	8.3
Syphilis – congenital	0.0	0.1	0.9	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	0.1	0.9	0.1	0.1	0.0	<0.1	0.1	0.1
Influenza (laboratory confirmed)**	114.8	27.8	85.1	109.8	17.7	84.1	30.5	49.3	49.5
Measles	0.0	0.1	0.0	0.1	0.1	0.0	<0.1	<0.1	0.1
Mumps	1.2	4.7	27.0	1.1	1.4	0.4	0.3	5.0	2.8
Pertussis	28.0	30.3	11.6	36.7	23.5	5.1	20.2	6.2	25.3
Pneumococcal disease (invasive)	10.0	7.6	30.7	7.7	5.7	6.1	5.3	6.2	7.0
Poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	<0.1
Rubella	0.6	0.1	0.0	0.3	0.1	0.0	0.1	0.2	0.2
Rubella – congenital	<0.1	<0.1	0.0	0.0	0.0	0.0	<0.1	0.0	<0.1

Table 6: Notification rates for nationally notifiable communicable diseases, Australia, 2007, by state or territory, *continued*

Disease	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Vaccine preventable diseases, *continued*									
Tetanus	0.0	<0.1	0.0	0.0	0.0	0.2	0.0	0.0	<0.1
Varicella zoster (chickenpox)††	2.6	NN	91.7	9.0	46.2	3.2	NN	15.3	18.5
Varicella zoster (shingles)††	1.8	NN	41.4	9.3	37.1	18.6	NN	18.3	17.3
Varicella zoster (unspecified)††	30.0	NN	1.4	73.5	27.6	5.1	NN	31.3	48.2
Vectorborne diseases									
Barmah Forest virus infection	1.8	8.3	42.3	19.8	3.7	0.0	0.5	6.5	8.2
Dengue virus infection	0.9	1.2	7.0	2.9	1.4	0.6	0.3	2.6	1.5
Flavivirus infection (NEC)‡‡	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.1
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	<0.1	0.0	<0.1
Malaria	3.5	1.4	13.5	4.6	1.5	2.8	2.2	4.0	2.7
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	3.5	12.2	139.6	51.1	13.3	1.4	1.8	28.5	20.0
Zoonoses									
Anthrax	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	<0.1
Australia bat lyssavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.1	0.0	0.7	0.1	0.2	<0.1	<0.1	0.2
Leptospirosis	0.0	0.1	0.5	1.8	0.1	0.0	0.3	0.2	0.5
Lyssavirus (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ornithosis	0.0	0.5	0.0	<0.1	0.1	0.2	1.0	0.1	0.4
Q fever	0.0	3.1	0.9	4.1	1.5	0.0	0.6	0.3	2.1
Tularaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other bacterial infections									
Legionellosis	1.2	1.5	1.4	1.2	1.1	0.6	0.8	3.8	1.5
Leprosy	0.0	0.1	0.0	<0.1	0.1	0.2	<0.1	0.1	0.1
Meningococcal infection‖‖	0.9	1.6	2.8	1.8	0.9	1.0	1.3	0.9	1.4
Tuberculosis	2.9	6.5	24.7	3.4	3.7	1.2	6.8	3.1	5.4

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

† In Queensland, includes incident hepatitis C cases.

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

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

‖ Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; Northern Territory, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Laboratory confirmed influenza was not a notifiable disease in South Australia but reports were forwarded to the National Notifiable Diseases Surveillance System.

†† Nationally notifiable from 2006 and first full year of national reporting from 2007.

‡‡ 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 and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

NN Not notifiable.

NDP No data provided.

Table 7: Notifications and notification rate for communicable diseases, Australia, 2002 to 2007, (per 100,000 population)

Disease	Number of notifications						5-year mean	Ratio	Notification rate per 100,000 population					
	2002	2003	2004	2005	2006	2007			2002	2003	2004	2005	2006	2007
Bloodborne diseases														
Hepatitis (NEC)	0	0	0	0	1	0	0.2	0.0	0.0	0.0	0.0	0.0	<0.1	0.0
Hepatitis B (incident)	392	348	282	251	294	287	313.4	0.9	2.0	1.7	1.4	1.2	1.4	1.4
Hepatitis B (unspecified)*	6,673	5,814	5,789	6,327	6,276	6,917	6,175.8	1.1	34.0	29.2	28.8	31.0	30.3	32.9
Hepatitis C (incident)	452	518	453	376	450	355	449.8	0.8	2.8	3.2	2.8	2.3	2.7	2.1
Hepatitis C (unspecified)*,†	15,615	13,661	12,694	11,992	11,972	11,977	13,186.8	0.9	79.5	68.7	63.1	58.8	57.8	57.0
Hepatitis D	22	27	29	30	31	34	27.8	1.2	0.1	0.1	0.1	0.1	0.1	0.2
Gastrointestinal diseases														
Botulism	0	1	1	3	1	1	1.5	0.7	0.0	<0.1	<0.1	<0.1	<0.1	<0.1
Campylobacteriosis‡	14,744	15,361	15,579	16,493	15,407	16,984	15,516.8	1.1	113.2	116.2	116.1	120.9	111.0	120.2
Cryptosporidiosis	3,273	1,223	1,685	3,212	3,206	2,810	2,519.8	1.1	16.7	6.1	8.4	15.7	15.5	13.4
Haemolytic uraemic syndrome	13	15	16	20	14	19	15.6	1.2	0.1	0.1	0.1	0.1	0.1	0.1
Hepatitis A	392	430	319	326	281	165	349.6	0.5	2.0	2.2	1.6	1.6	1.4	0.8
Hepatitis E	12	12	28	30	24	18	21.2	0.8	0.1	0.1	0.1	0.1	0.1	0.1
Listeriosis	63	69	67	54	61	50	62.8	0.8	0.3	0.3	0.3	0.3	0.3	0.2
Salmonellosis	7,880	7,011	7,841	8,426	8,258	9,484	7,883.2	1.2	40.1	35.2	39.0	41.3	39.9	45.1
Shigellosis	507	442	520	729	545	597	548.6	1.1	2.6	2.2	2.6	3.6	2.6	2.8
STEC, VTEC§	59	52	49	86	70	107	63.2	1.7	0.3	0.3	0.2	0.4	0.3	0.5
Typhoid	69	51	76	52	77	90	65.0	1.4	0.4	0.3	0.4	0.3	0.4	0.4
Quarantinable diseases														
Cholera	5	1	5	3	3	3	3.4	0.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Highly pathogenic avian influenza in humans	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0
Plague	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0
Rabies	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0
Smallpox	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0	0	0	0	0	0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0

Table 7: Notifications and notification rate for communicable diseases, Australia, 2002 to 2007, (per 100,000 population), *continued*

Disease	Number of notifications						5-year mean	Ratio	Notification rate per 100,000 population					
	2002	2003	2004	2005	2006	2007			2002	2003	2004	2005	2006	2007
Sexually transmissible infections														
Chlamydial infection‖	24,459	30,415	36,186	41,353	47,449	51,859	3,5972.4	1.4	124.5	152.9	179.8	202.8	229.2	246.8
Donovanosis	17	16	10	13	6	3	12.4	0.2	0.1	0.1	<0.1	0.1	<0.1	<0.1
Gonococcal infection	6,439	6,771	7,145	8,039	8,573	7,605	7,393.4	1.0	32.8	34.0	35.5	39.4	41.4	36.2
Syphilis (all)¶	2,169	2,139	2,341	2,241	2,691	2,999	2,316.2	1.3	11.0	10.8	11.6	11.0	13.0	14.3
Syphilis < 2 years duration*	NN	NN	636	653	871	1,381	720.0**	1.9	NN	NN	3.2	3.2	4.2	6.6
Syphilis > 2 years or unspecified duration*	NN	NN	1,705	1,588	1,820	1,618	1,704.3**	0.9	NN	NN	9.2	8.4	9.5	8.3
Syphilis – congenital	18	13	13	15	13	8	14.4	0.6	0.1	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	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	31	19	15	17	22	17	20.8	0.8	0.2	0.1	0.1	0.1	0.1	0.1
Influenza (laboratory confirmed)††	3,669	3,481	2,135	4,565	3,255	10,403	3,421.0	3.0	18.7	17.5	10.6	22.4	15.7	49.5
Measles	32	93	45	10	125	12	61.0	0.2	0.2	0.5	0.2	<0.1	0.6	0.1
Mumps	69	77	102	241	275	579	152.8	3.8	0.4	0.4	0.5	1.2	1.3	2.8
Pertussis	5,564	5,096	8,759	11,203	10,996	5,323	8,323.6	0.6	28.3	25.6	43.5	54.9	53.1	25.3
Pneumococcal disease (invasive)	2,441	2,233	2,369	1,745	1,455	1,475	2,048.6	0.7	12.4	11.2	11.8	8.6	7.0	7.0
Poliomyelitis	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella	253	54	31	31	59	36	85.6	0.4	1.3	0.3	0.2	0.2	0.3	0.2
Rubella – congenital	2	3	1	1	0	2	1.8	1.1	<0.1	<0.1	<0.1	<0.1	0.0	<0.1
Tetanus	4	4	5	2	3	3	3.6	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Varicella zoster (chickenpox)‡‡	NN	NN	NN	16	1,521	1,651	768.5§§	2.1	NN	NN	NN	0.2	17.4	18.5
Varicella zoster (shingles)‡‡	NN	NN	NN	7	1,079	1,547	543.0§§	2.8	NN	NN	NN	0.1	12.3	17.3
Varicella zoster (unspecified)‡‡	NN	NN	NN	141	3,664	4,298	1,902.5§§	2.3	NN	NN	NN	1.6	41.8	48.2
Vectorborne diseases														
Barmah Forest virus infection	910	1,367	1,105	1,324	2,142	1,716	1,369.6	1.3	4.6	6.9	5.5	6.5	10.3	8.2
Dengue virus infection	170	861	351	221	188	314	358.2	0.9	0.9	4.3	1.7	1.1	0.9	1.5
Flavivirus infection (NEC)‖‖	73	60	61	27	32	22	50.6	0.4	0.4	0.3	0.3	0.1	0.2	0.1
Japanese encephalitis virus infection	0	1	1	0	0	0	0.7	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0
Kunjin virus infection¶¶	0	7	6	1	3	1	3.4	0.3	0.0	<0.1	<0.1	<0.1	<0.1	<0.1
Malaria	468	592	557	822	772	567	642.2	0.9	2.4	3.0	2.8	4.0	3.7	2.7
Murray Valley encephalitis virus infection¶¶	2	0	1	2	1	0	1.5	0.0	<0.1	0.0	<0.1	<0.1	<0.1	0.0
Ross River virus infection	1,459	3,850	4,209	2,545	5,547	4,203	3,522.0	1.2	7.4	19.4	20.9	12.5	26.8	20.0

Table 7: Notifications and notification rate for communicable diseases, Australia, 2002 to 2007, (per 100,000 population), *continued*

Disease	Number of notifications						5-year mean	Ratio	Notification rate per 100,000 population					
	2002	2003	2004	2005	2006	2007			2002	2003	2004	2005	2006	2007
Zoonoses														
Anthrax	0	0	0	0	1	1	0.2	5.0	0.0	0.0	0.0	0.0	<0.1	<0.1
Australian bat lyssavirus	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	40	20	38	41	50	38	37.8	1.0	0.2	0.1	0.2	0.2	0.2	0.2
Leptospirosis	160	126	177	129	147	106	147.8	0.7	0.8	0.6	0.9	0.6	0.7	0.5
Lyssavirus (NEC)	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ornithosis	213	200	239	164	169	92	197.0	0.5	1.1	1.0	1.2	0.8	0.8	0.4
Q fever	795	560	464	353	407	450	515.8	0.9	4.0	2.8	2.3	1.7	2.0	2.1
Tularaemia	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other bacterial infections														
Legionellosis	315	333	312	331	350	307	328.2	0.9	1.6	1.7	1.6	1.6	1.7	1.5
Leprosy	6	5	7	10	6	12	6.8	1.8	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Meningococcal infection***	689	558	405	392	317	304	472.2	0.6	3.5	2.8	2.0	1.9	1.5	1.4
Tuberculosis	1,130	1,048	1,137	1,085	1,193	1,139	1,118.6	1.0	5.8	5.3	5.6	5.3	5.8	5.4
Total	99,599	102,910	113,666	125,497	139,482	146,991	11,6230.8	1.3						

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

† In Queensland, includes incident hepatitis C cases.

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

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

|| Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only genital tract specimens; Northern Territory, which excludes ocular specimens; and Western Australia, which excludes ocular and perinatal infections.

¶ Does not include congenital syphilis.

** Ratios for syphilis <2 years; syphilis >2 years or unspecified duration based on 3 years data.

†† Laboratory confirmed influenza was not a notifiable disease in South Australia but reports were forwarded to the National Notifiable Diseases Surveillance System.

‡‡ Nationally notifiable from 2006 and first full year of national reporting from 2007.

§§ Ratios for varicella (chickenpox), varicella (shingles) and varicella (unspecified) based on 2 years data.

|||| 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 and South Australia also report conjunctival cases.

NEC Not elsewhere classified.

NN Not notifiable.

Data completeness

The case's sex was complete in 99.8% of notifications and age at onset in close to 100% of notifications (Table 8). In 2007, indigenous status was complete in 47.5% of notifications, and varied by jurisdiction. Indigenous status was complete for 88.8% of data reported in the Northern Territory, 79.7% in South Australia and 70.1% 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 as summarised in Appendix 3. There were 6 diseases for which notifications were 100% complete for indigenous status.[12] A further 8 diseases equalled or exceeded 90% completeness for indigenous status. Of the 12 key diseases agreed to by CDNA and the NSC in 2007 for improving Indigenous identification, seven of these had an Indigenous completeness, which exceeded 90% (donovanosis, infectious syphilis, *Haemophilus influenzae* type b, tuberculosis, leprosy, meningococcal infection and measles). The diseases for which there was less than 90% Indigenous completeness included gonococcal infection, invasive pneumococcal disease, hepatitis A, dengue virus infection, and shigellosis. In 2008, CDNA set target thresholds of 95% completeness for key diseases and 85% completeness for the remainder of the notifiable diseases.

Bloodborne diseases

Bloodborne viruses reported to the NNDSS include hepatitis B, C, and D. HIV and AIDS diagnoses are reported directly to the National Centre in HIV Epidemiology and Clinical Research. Information on national HIV and AIDS surveillance can be obtained from the NCHECR website at http://www.nchecr.unsw.edu.au[4]

Hepatitis B

Hepatitis B notifications are classified as either newly acquired (incident) hepatitis B or hepatitis B with an unspecified period of infection. Classification of hepatitis B cases as newly acquired is based on serological evidence or evidence of a previously negative test within the last 24 months.

Incident hepatitis B notifications

In 2007, 287 cases of incident hepatitis B infection were reported to NNDSS, which was lower than in 2006 (n=294). Over the past 10 years, the notification rate for incident hepatitis B infection increased from 1.5 cases per 100,000 population in 1997 to 2.2 cases per 100,000 population in 2001, then declined to 1.2 cases per 100,000 population in 2005 and increased to 1.4 cases per 100,000 population in 2006 and 2007 (Figure 4).

The Northern Territory and the Australian Capital Territory recorded the highest notification rates in 2007 with 4.2 and 3.8 cases per 100,000 population respectively. At a regional level, incident hepatitis B rates were highest in the Barkly, Lower Top End and East Arnhem Statistical Subdivisions of the Northern Territory (range: 5.4–15.9 cases per 100,000 population, 5 cases total); and in the Far North and South West Statistical Divisions of Queensland, the Upper Great Southern Statistical Division in Western Australia, and in the East Gippsland, Central Highlands and Barwon Statistical Divisions of Victoria (range: 3.2–5.3 cases per 100,000 population) (Map 2).

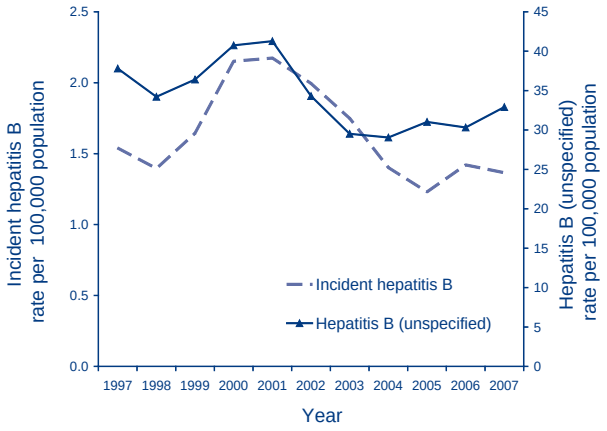
In 2007, the sex of cases was reported in 286 of the 287 cases. Figure 5 shows that the highest rate of incident hepatitis B infection was in the 25–29 years age group among both males and females (4.4 and 3.4 cases per 100,000 population, respectively). Notifications of incident hepatitis B infection in males exceeded those in females, with a male to female ratio of 1.8:1.

Table 8: Completeness of the National Notifiable Diseases Surveillance System data received, Australia, 2007, by state or territory

	State or territory								Australia
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Total notifications	2,480	32,575	6,772	41,219	12,179	3,153	30,478	20,047	148,903
Sex									
Unknown/missing	6	125	1	0	6	0	201	0	339
Per cent complete	99.8	99.6	100.0	100.0	100.0	100.0	99.3	100.0	99.8
Age at onset									
Unknown/missing	0	1	1	0	1	1	35	1	40
Per cent complete	100.0	100.0	100.0	100.0	100.0	99.9	99.9	100.0	99.9
Indigenous status									
Unknown/missing	2,099	25,797	757	24,728	2,470	1,195	15,106	6,004	78,156
Per cent complete	15.4	20.8	88.8	40.0	79.7	62.1	50.4	70.1	47.5

Trends in incident hepatitis B infection by year and age group are shown in Figure 6. Since the introduction of the adolescent hepatitis B vaccination program for children aged 10–13 years in 1997[13] there has been a general decline in hepatitis B among the 15–19 years and 20–29 years age groups. Between 2000 and 2007, the notification rate for incident hepatitis B fell by 75% among cases in the 15–19 years age group. In the 20–29 years age group, the notification rate fell by 55% between 2000 and 2005 and has remained stable at around 3.2 cases per 100,000 population from 2005 to 2007.

Figure 4: Notification rate for incident hepatitis B* and hepatitis B (unspecified),† Australia, 1997 to 2007, by year‡

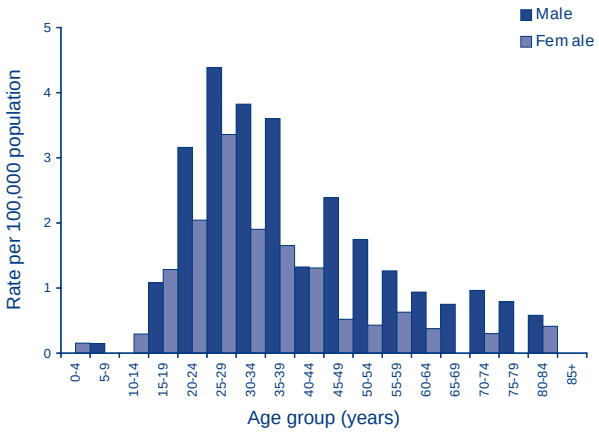


* Data for incident hepatitis B from all states except the Northern Territory between 1997 and 2004.

† Data provided from the Northern Territory (1997–2004) includes both incident and unspecified hepatitis B cases.

‡ Year of onset for incident hepatitis B and year of notification for hepatitis B (unspecified) notifications.

Figure 5: Notification rate for incident hepatitis B infections, Australia, 2007, by age group and sex*



* Excludes one case whose sex was not reported.

Map 2: Notification rates for incident hepatitis B, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory

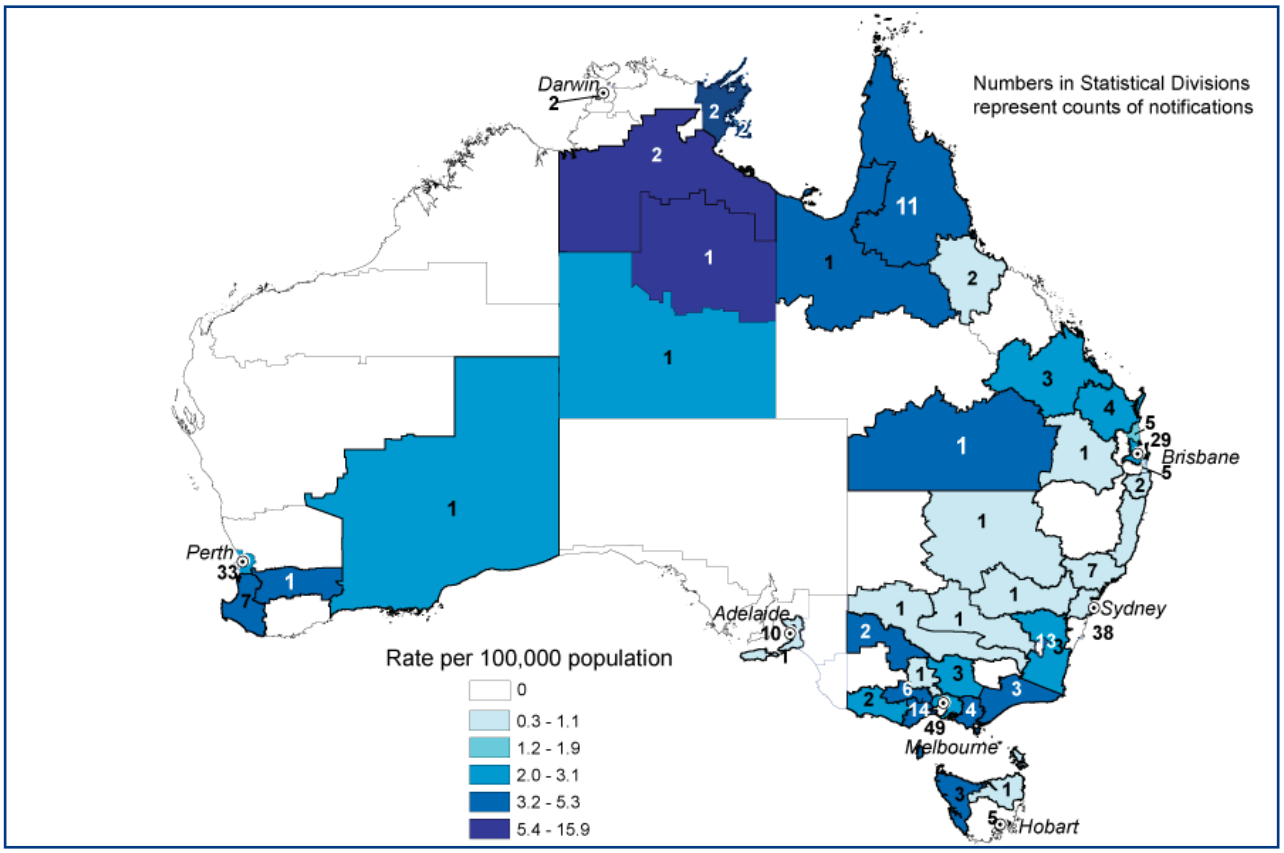
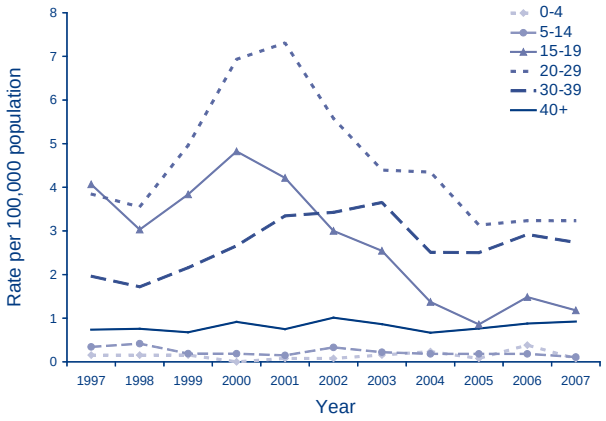


Figure 6: Notification rate for incident hepatitis B infections, Australia, 1997 to 2007, by year and age group



* Data provided from the Northern Territory (1997–2004) includes both incident and unspecified hepatitis B cases.

The source of exposure for cases of incident hepatitis B infection in 2007 was reported through health authorities in South Australia, Tasmania and Victoria (Table 9). From 2003 to 2007, the proportion of notifications of incident hepatitis B infection associated with injecting drug use remained relatively stable at around 49%. The proportion of diagnoses attributed to heterosexual contact decreased from 21% in 2003 to 16% in 2007. The source of exposure to hepatitis B was undetermined in around 21% of cases.[4]

Table 9: Incident hepatitis B infection,* 2007, by exposure category†

Exposure category	Number	Percentage (%)
Injecting drug use	49	47.6
Sexual contact	20	19.4
Male homosexual contact	*3*	*2.9*
Heterosexual contact	*17*	*16.5*
Not specified	*0*	*0*
Blood/tissue recipient	0	0
Skin penetration procedure	4	3.9
Healthcare exposure	1	0.9
Household contact	5	4.9
Other	20	19.4
Undetermined	4	3.9
Total exposures	103	100

* Includes diagnoses in South Australia, Tasmania and Victoria.

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

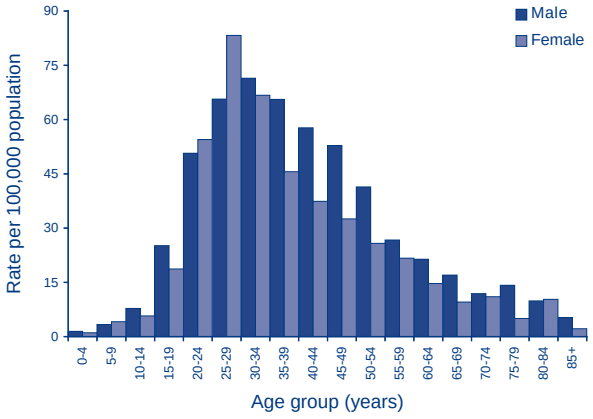
Source: National Centre in HIV Epidemiology and Clinical Research.[4]

Hepatitis B (unspecified) notifications

In 2007, a total of 6,917 cases of hepatitis B (unspecified) infection were notified to the NNDSS, compared with 6,276 in 2006. The Northern Territory recorded the highest notification rate (112.1 cases per 100,000 population), followed by New South Wales (37.8 cases per 100,000 population) and Victoria (35.8 cases per 100,000 population).

In 2007, the sex of cases was recorded in 6,848 of 6,917 cases (99%). Of these cases, the male to female ratio of notifications was 1.2:1. Among males, the highest notification rate was in the 30–34 years age group (71.4 cases per 100,000 population), followed by the 25–29 and 35–39 years age groups at 65.6 cases per 100,000 population in both age groups. Among females, the highest notification rate was in the 25–29 years age group (83.3 cases per 100,000 population), followed by 66.7 cases per 100,000 population in the 30–34 years age group (Figure 7).

Figure 7: Notification rate for hepatitis B (unspecified) infection, Australia, 2007, by age group and sex*

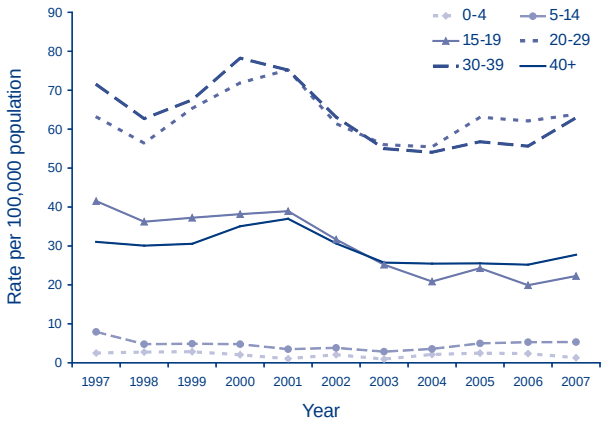


* Excludes 69 cases whose sex was not reported.

Notification rates for hepatitis B infection (unspecified) increased from 37.8 cases per 100,000 population in 1997 to 41.3 in 2001 and then declined to around 30.3 cases per 100,000 population in 2006 (Figure 4). In 2007, the rate of hepatitis B (unspecified) notifications (32.9 cases per 100,000 population) remained consistent with the range of rates seen between 2003 and 2006 (29.2–31.0 cases per 100,000 population). Trends in hepatitis B (unspecified) infection by age group, sex and year are shown in Figure 8. Rates in the 15–19 years age group increased in 2007 by 12.1% compared with 2006 (22.3 and 19.9 cases per 100,000 population respectively), however, the 2007 rate in this age group is consistent with rates between 2003 and 2005 (range 20.9–25.2 cases per 100,000 population).

In 2007, 1 case of incident hepatitis B and 17 cases of hepatitis B (unspecified) infection were notified in children in the 0–4 years age group and represented 0.4% and 0.3% of hepatitis cases notified in these specific categories respectively. Approximately 95% of infants born in Australia in 2007 received the full-course of the hepatitis B vaccine.[4]

Figure 8: Notification rate for hepatitis B (unspecified) infection, Australia,* 1997 to 2007, by year and age group



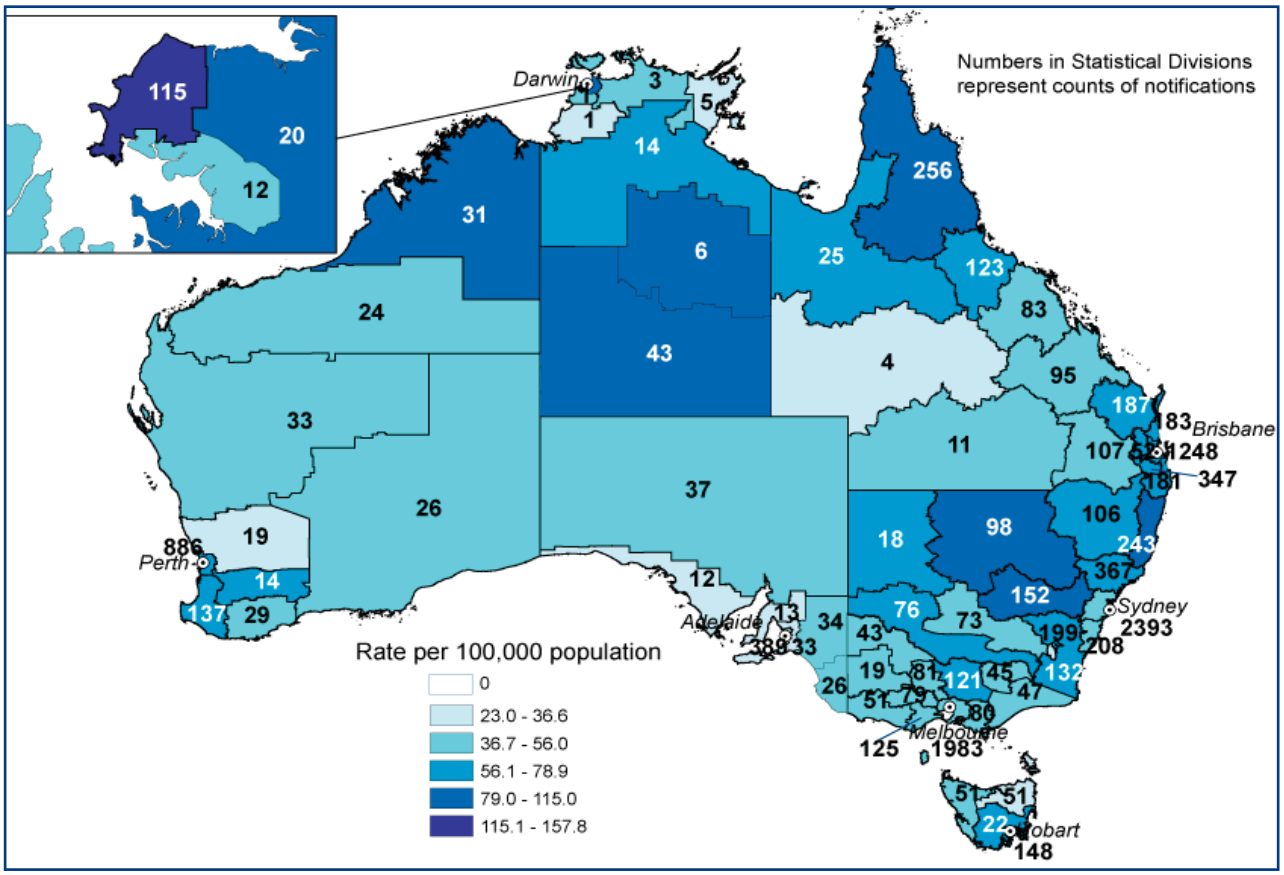
* Data for hepatitis B (unspecified) from all states except the Northern Territory between 1997 and 2004.

Hepatitis C

Hepatitis C notifications are classified as either newly acquired (incident) hepatitis C or hepatitis C with a period of infection greater than 2 years or unspecified. The categorising of hepatitis C cases is complex as current testing methods cannot distinguish between incident and chronic infections (greater than 2 years or unspecified). Cases are essentially categorised based on evidence of a previously negative test result within 2 years of their diagnosis. In most instances this requires active follow-up by public health units.

Since 2001, there has been a steady decline in cases of hepatitis C nationally (Figure 9). Map 3 shows the distribution of both incident hepatitis C and hepatitis C of greater than 2 years or unspecified duration diagnosed during 2007. The highest rates of hepatitis C were seen in the Darwin and Darwin City Statistical Subdivisions (125.2 and 157.8 cases per 100,000 population respectively). Notification rates were also substantially above the national notification rate in the Kimberley Statistical Division of Western Australia; the Central and Barkly Statistical Subdivisions of the Northern Territory; the Far North Statistical Division of Queensland; and the

Map 3: Notification rates for incident hepatitis C and hepatitis C (unspecified), Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory

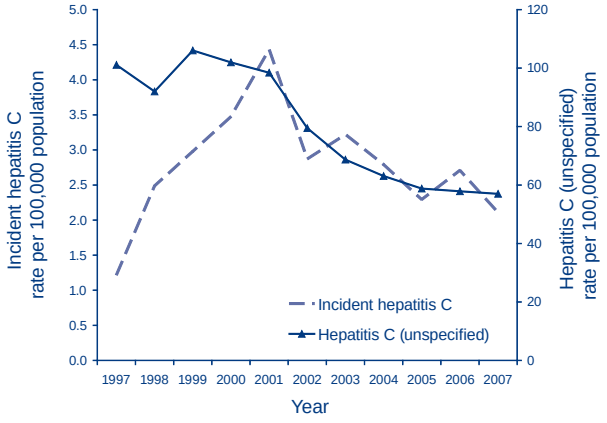


Mid-North Coast, North Western and Central West Statistical Divisions of New South Wales (79.0–115.0 cases per 100,000 population).

Incident hepatitis C notifications

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 355 cases of incident hepatitis C were notified in 2007 (450 cases in 2006), giving a notification rate of 2.1 cases per 100,000 population (Figure 9).

Figure 9: Notification rates for incident hepatitis C infection* and hepatitis C (unspecified),† Australia, 1997 to 2007



* Data from all states and territories except Queensland 1997–2007 and the Northern Territory 1997–2002.

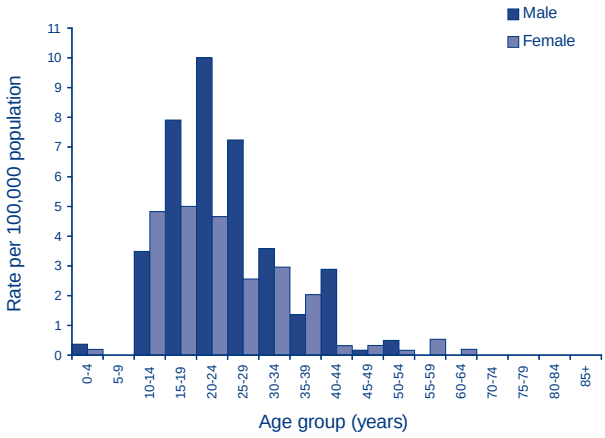
† Data provided from Queensland (1997–2007) and the Northern Territory (1997–2002) includes both incident and unspecified hepatitis C cases.

The proportion of all hepatitis C notifications in 2007, excluding Queensland, that were documented as incident cases was 3.6%, compared with 4.5% in 2006. The highest rates of incident hepatitis C infection were reported from Tasmania (4.1 cases per 100,000 population) and Western Australia (3.6 cases per 100,000 population). The number of incident hepatitis C notifications in 2007, both nationally and for each jurisdiction, is influenced by the level of case follow-up. One possible explanation for the highest rate observed in Tasmania is the opportunity to detect additional cases through follow-up and repeated surveys.

In 2007, the sex of cases was reported in 354 of the 355 cases notified. Figure 10 shows that in 2007 the highest incident hepatitis C notification rates were in the 25–29 years age group in males (9.7 cases per 100,000 population). In females, notification rates were highest in the 15–19 years age group (4.8 cases per 100,000 population) followed by the 10–14 and 20–24 years age groups (4.6 and 4.4 cases per 100,000 population respectively).

Trends in the age distribution of incident hepatitis C infection are shown in Figure 11. Notification rates from 2001 to 2007 declined by 62% in the 15–19 years age group; 59% in the 20–29 years age group; and by 44% in the 30–39 years age group. In 2006 to 2007, notification rates decreased by 26% in the 20–29 years age group and by 23% in the 30–39 years age group.

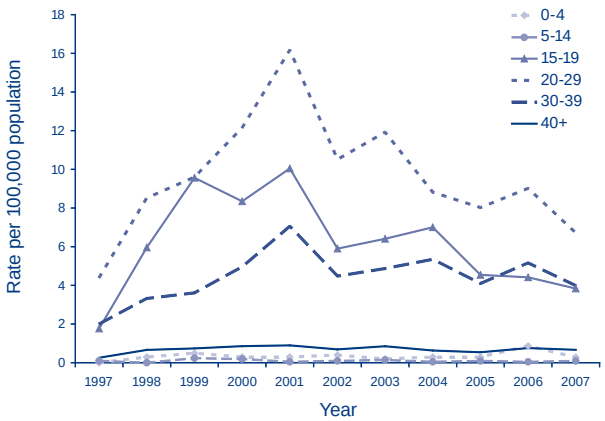
Figure 10: Notification rate for incident hepatitis C infection, Australia,* 2007, by age group and sex†



* Data from all states and territories except Queensland.

† Excludes 1 case whose sex was not reported.

Figure 11: Notification rate for incident hepatitis C infection, Australia,* 1997 to 2007, by age group and year



* Data from all states and territories except Queensland (1997–2007) and the Northern Territory (1997–2002).

The exposure history of cases of incident hepatitis C were collected in New South Wales, the Northern Territory, South Australia, Tasmania, Victoria and Western Australia in 2007 (Table 10). Approximately 77% of these hepatitis cases were among people with a history of injecting drug use. In eight of the cases the only reported risk factor was having been born to a woman with hepatitis C infection.

Table 10: Incident hepatitis C infection, Australia,* 2007, by exposure category†

Exposure category	Number	Percentage
Injecting drug use	207	77.5
Sexual contact	7	2.6
Blood/tissue recipient	3	1.1
Skin penetration procedure	4	1.5
Healthcare exposure	2	0.8
Household contact	0	0
Other‡	14	5.2
Undetermined	30	11.3
Total exposures	267	100.0

Source: National Centre in HIV Epidemiology and Clinical Research.4

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

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

‡ Includes 8 cases for which the only reported risk factor was having been born to a woman with hepatitis C infection.

Hepatitis C (unspecified) notifications

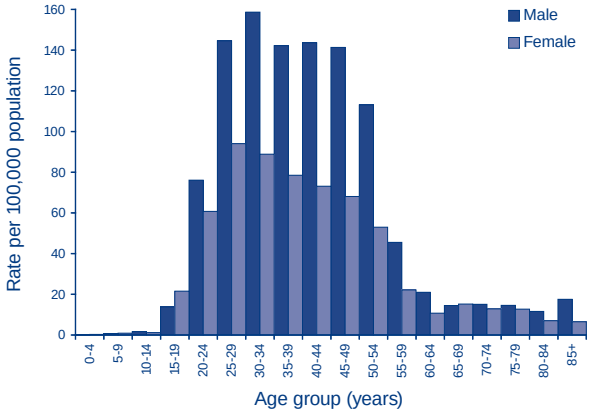
In 2007, 11,977 hepatitis C (unspecified) infections were notified to the NNDSS, representing 57.0 cases per 100,000 population (11,972 cases and 57.8 cases per 100,000 population in 2006).

The national notification rate for hepatitis C (unspecified) infection declined from 106.0 cases per 100,000 population in 1999 to 58.8 cases per 100,000 population in 2005 and has remained stable between 2005 and 2007 (range 57.0–58.8 cases per 100,000 population) (Figure 9). Improved surveillance practices, such as more complete follow-up and classification of incident cases; increased duplicate notification checks; and the Northern Territory separately reporting incident hepatitis C notifications from 2003, may account for some of the decrease in hepatitis C (unspecified) notifications since 2000.

In 2007, the Northern Territory continued to have the highest notification rate (103.8 cases per 100,000 population), followed by Queensland (65.2 cases per 100,000 population), which includes both incident and unspecified cases; and New South Wales (60.8 cases per 100,000 population).

The sex of cases was reported in 11,923 of the 11,977 cases in 2007. Of these cases nationally, the male to female ratio was 1.7:1. The highest notification rate occurred in the 30–34 years age group (158.7 cases per 100,000 population) among males and in the 25–29 and 30–34 years age groups (94.0 and 88.9 cases per 100,000 population respectively) among females (Figure 12).

Figure 12: Notification rate for hepatitis C (unspecified) infection,* Australia, 2007, by age group and sex†

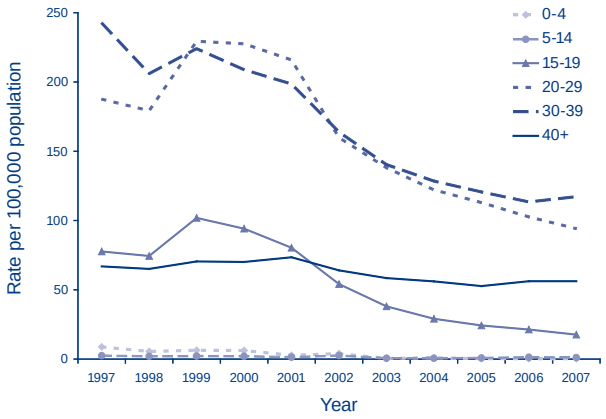


* Data provided from Queensland includes both incident and unspecified hepatitis C cases.

† Excludes 54 cases whose sex was not reported.

Trends in the age distribution of hepatitis C (unspecified) infection are shown in Figure 13. From 2003 to 2007, the notification rate for hepatitis C (unspecified) among the 15–19 years age group decreased by 67%. Between 2003 and 2007, notification rates fell on average by 9.1% per year among cases in the 20–29 years age group. In the 30–39 years age group, notification rates have also been declining, on average by 4.3% per year since 2003. The decline in the population rate of notifications of hepatitis C infection may be attributable to a reduction in the prevalence of risk behaviours related to injecting drug use, especially among young people, however, changes in the rates of testing and percentage classified as incident cases may also have contributed to the decline.

Figure 13: Notification rates for hepatitis C (unspecified) infection,* Australia, 1997 to 2007, by age group



* Data provided from Queensland (1997 to 2007) and the Northern Territory (1995 to 2002) includes both incident and unspecified hepatitis C cases.

Although initial infection with the hepatitis C virus may be asymptomatic (more than 90% of cases) or mildly symptomatic, a high percentage (50%–80%) of cases will develop a chronic infection. Of chronically infected persons, approximately 50% will eventually develop cirrhosis or cancer of the liver.[4] In 2007, it is estimated that 278,000 people living in Australia, had been exposed to the hepatitis C virus. Of these people approximately 160,000 had chronic hepatitis C infection and early liver disease (stage F0/1), and 42,000 had chronic hepatitis C infection and moderate liver disease (stage F2/3) associated with chronic hepatitis C infection; 5,600 were living with hepatitis C related cirrhosis; and 68,500 had cleared their infection.[4]

Hepatitis D

Hepatitis D is a defective single-stranded RNA virus that requires the presence of the hepatitis B virus to replicate. Hepatitis D infection can occur either as a co-infection with hepatitis B or as a super-infection with chronic hepatitis B infection.[4] People co-infected with hepatitis B and hepatitis D may have more severe acute disease and a higher risk of fulminant hepatitis compared to 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 group at risk for hepatitis D infection.

There were 34 notifications of hepatitis D to the NNDSS in 2007, compared with 31 notifications in 2006, giving a notification rate of 0.2 cases per 100,000 population. The male to female ratio was 2.4:1. Of the 34 notifications, 11 were reported from New South Wales, 10 from Victoria, 9 from Queensland and 4 from Western Australia.

Gastrointestinal diseases

In 2007, gastrointestinal diseases notified to NNDSS were: botulism, campylobacteriosis, cryptosporidiosis, haemolytic uraemic syndrome (HUS), hepatitis A, hepatitis E, listeriosis, salmonellosis, shigellosis, STEC infections and typhoid.

Notifications of gastrointestinal diseases in 2007 increased 9% to 30,325 from 27,947 in 2006 (Table 7).

Campylobacteriosis, salmonellosis and STEC exceeded the 5-year mean by more than 2 standard deviations, while typhoid, HUS and cryptosporidiosis were increased but did not exceed 2 standard deviations (Figure 3).

OzFoodNet, Australia's enhanced foodborne disease surveillance network monitors the incidence of diseases caused by pathogens commonly transmitted by food through population-based passive and enhanced surveillance for notifiable gastrointestinal diseases and for outbreaks of gastroenteritis and enteric diseases. In 2007, OzFoodNet aggregated and analysed data from NNDSS and enhanced surveillance data from OzFoodNet sites on the following 8 diseases or conditions, a proportion of which may be transmitted by food: non-typhoidal salmonellosis; campylobacteriosis infections (except in New South Wales); listeriosis; shigellosis; typhoid; STEC infections; botulism; and HUS. These data are reported in detail elsewhere.[14]

Botulism

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

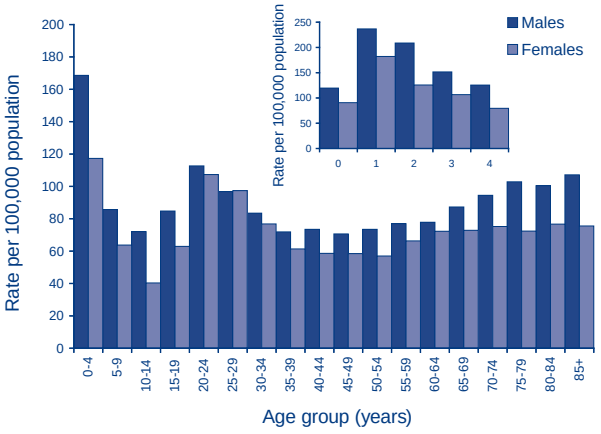
In 2007, there was 1 case of botulism, reported from Victoria. The Department of Human Services (DHS) was notified of a case of suspected botulism in a 25-year-old male. The notifying clinician gave a history of onset of dizziness, lethargy, blurred vision and respiratory distress followed by a rapid decline, which included respiratory failure requiring intubation and ventilation in an intensive care unit. A provisional diagnosis of stroke or multiple sclerosis was made but initial investigations were negative. The day following notification to DHS, the case became completely paralysed. A faecal enema specimen was forwarded to the University of Melbourne, Microbiological Diagnostic Unit for confirmation of the diagnosis. *Clostridium botulinum* toxin was detected in the faecal specimen, which was later identified as A2. An extensive investigation of a possible food source was conducted by DHS.[14]

Campylobacteriosis

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

In 2007, there were 16,984 notifications of campylobacteriosis, a 10.2% increase over the 15,407 notifications reported in 2006. The national rate of campylobacteriosis notifications in 2007 was 120.2 cases per 100,000 population, with the highest age and sex specific notification rates amongst males and females aged 0–4 years[14] (Figure 14). Amongst children aged under 5 years, the highest notification rates were in boys aged 1 year (236.8 notifications per 100,000 population) (Figure 14, inset). Prevention measures should be targeted towards more regular cleaning of hands and dummies of young children, particularly when contact with animals and outdoor environments has taken place, as a recent study conducted by OzFoodNet has shown that these are risk factor for *Campylobacter* infection in children aged 0–4 years.[15]

Figure 14: Notification rate for campylobacteriosis, Australia, 2007, by age group and sex, and inset: age and sex in children aged under 5 years



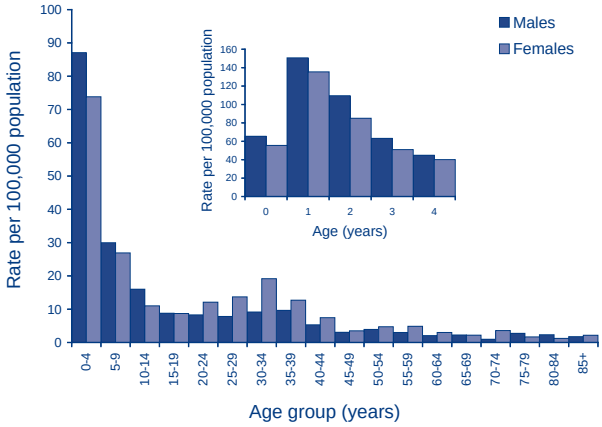
Cryptosporidiosis

In 2007, 2,810 notifications of cryptosporidiosis were reported to NNDSS representing a national rate of 13.4 cases per 100,000 population. This represents a 12% decrease over the number of notifications reported in 2006.

The highest rates of cryptosporidiosis were reported in the Northern Territory (51.6 cases per 100,000 population), Western Australia (28.9 cases per 100,000 population) and South Australia (28.3 cases per 100,000 population).

The majority of cryptosporidiosis cases in 2007 were in children aged under 10 years (52%). The highest age and sex specific notification rate was in boys aged 1 year, with 150.7 cases per 100,000 population (Figure 15).

Figure 15: Notification rate for cryptosporidiosis, Australia, 2007, by age group and sex, and inset: age and sex in children aged under 5 years



Haemolytic uraemic syndrome

During 2007, there were 19 cases of haemolytic uraemic syndrome; a rate of 0.1 cases per 100,000 population, the same as the mean of 0.1 cases per 100,000 population between 2002 and 2006. The majority of these were reported from New South Wales (n=13). The median age of notifications was 6 years, with a range of 1–44 years. Similar to previous years, the highest notification rate was in children aged 0–4 years, with eight of the 19 notifications in this age group (0.6 notifications per 100,000 population).[14]

Hepatitis A

The marked decline in notifications of hepatitis A in recent years is continuing (Figure 16).[13] In 2007, there were 165 cases of hepatitis A, compared with a mean of 349 cases per year between 2002 and 2006. This decline is likely to be due to increased uptake of vaccine amongst high risk groups such as travellers, and targeted vaccination programs for Indigenous children.[13] The proportion of cases who are known to be Indigenous is also decreasing. Between 2002 and 2006, an average of 11% of cases (39/349 cases per year) were Indigenous, while in 2007, no cases were known to have been Indigenous, with indigenous status known for 82% of cases (Table 11).

Figure 16: Trends in notifications of hepatitis A, Australia, 1991 to 2007, by month of diagnosis[13]

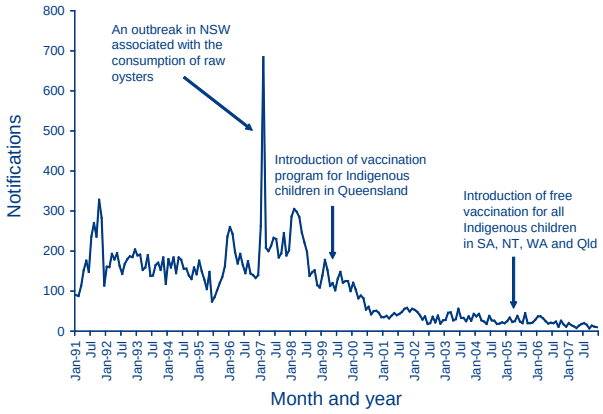


Table 11: Hepatitis A notifications, Australia, 2002 to 2007, by indigenous status

Year	Indigenous		Non-Indigenous		Unknown	
	n	%	n	%	n	%
2002	32	8	270	69	88	23
2003	52	12	322	75	56	13
2004	37	12	251	79	31	10
2005	48	15	232	71	46	14
2006	28	10	218	78	35	12
2007	0	0	136	82	29	18

In 2007, the majority of hepatitis A cases were acquired overseas (60%, 99/165), with Indonesia (16 cases) and India (14 cases) the most frequently reported place of acquisition for overseas acquired cases (Table 12).

Table 12: Notifications of hepatitis A, Australia, 2007, by state or territory

State	Number of cases	Number acquired overseas	Per cent overseas acquired
Australian Capital Territory	2	2	100
New South Wales	65	42	65
Northern Territory	5	4	80
Queensland	28	12	43
South Australia	5	4	80
Tasmania	3	0	0
Victoria	36	26	72
Western Australia	21	9	43
Total	165	99	60

Hepatitis E

In 2007, there 18 notifications of hepatitis E, compared with 24 notifications in 2006 and an average of 21 cases per year between 2002 and 2006. One case was reported from the Australian Capital Territory, eight from New South Wales, three from Queensland and six from Victoria.

In 2007, 89% (16/18) of cases were known to have been acquired overseas, of which 22% (4/18) were female. The median age of cases was 30 years (range 18–57 years), reflecting high rates of overseas travel in younger adults.

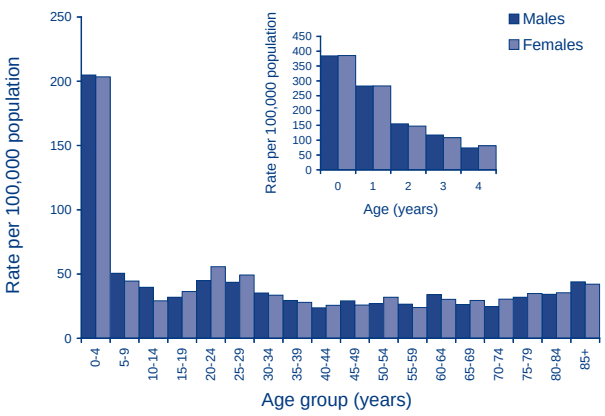
Listeriosis

In 2007, 50 cases of *Listeria monocytogenes* infection were reported to NNDSS, a crude rate of 0.2 per 100,000 population. The 2007 notification rate was similar to the 5-year historical mean (0.3 cases per 100,000 population). Seventy-six per cent (38/50) of notifications were in people aged 60 years or over. The highest age specific notification rate was in the 80–84 years age group, with a notification rate of 2.9 cases per 100,000 population. In 2007, 52% of cases were female. Four of the 50 cases were pregnancy-associated, occurring either in infants or pregnant women.[14]

Salmonellosis (non-typhoidal)

In 2007, there were 9,484 cases of *Salmonella* infection, a rate of 45 cases per 100,000 population, which is a 15% increase over the mean of the previous 5 years. Notification rates ranged from 32 cases per 100,000 population in the Australian Capital Territory to 244 cases per 100,000 population in the Northern Territory. The highest age specific rate of *Salmonella* infection was in children in the 0–4 years age group (202 cases per 100,000 population),[14] with 28% of all cases in this age group. Figure 17 shows

Figure 17: Notification rate for *Salmonella* infection, Australia, 2007, by age and sex



that in this age group, the highest rates were in those aged under 1 year (384 per 100,000 population for males and 385 per 100,000 population for females).

In 2007, the most commonly notified *Salmonella* serotype was *S.* Typhimurium. The most commonly notified phage type was *S.* Typhimurium 135, with 722 notifications in 2007. *S.* Typhimurium 9 was the second most common phage type notified in Australia in 2007. Western Australia ceased routine phage typing of *S.* Typhimurium, *S.* Enteritidis and *S.* Virchow in July 2007.[14]

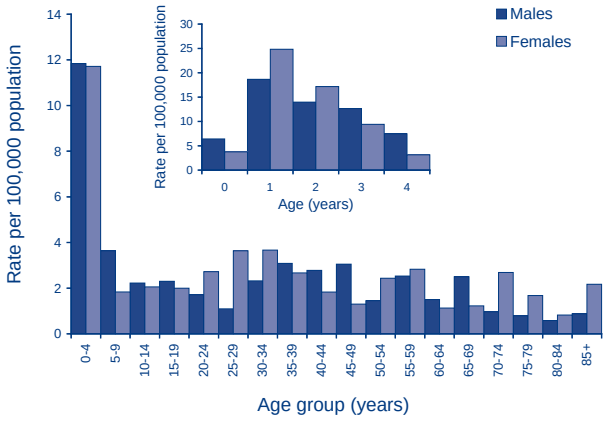
Risk factors for salmonellosis in children aged 0–4 years are currently under investigation through OzFoodNet. Most salmonellosis in Australia is transmitted through contaminated food.

Shigellosis

In 2007, there were 597 cases of shigellosis reported to NNDSS compared with 543 in 2006. The 2007 notification rate was 2.8 cases per 100,000 population compared with a mean of 2.7 cases per 100,000 population between 2002 and 2006. As in previous years, the highest notification rate was in the Northern Territory, with 80.5 cases per 100,000 population.[14]

The highest age specific notification rates were amongst males and females in the 0–4 years age group, with age specific rates of 11.8 and 11.7 notifications per 100,000 population (Figure 18). In 2007, 50% (301/597) of cases were female.

Figure 18: Notification rate for shigellosis, Australia, 2007, by age and sex



The highest burden of shigellosis continues to be in Indigenous populations. Indigenous people make up 2% of the Australian population,[16] however, 45% (269/596) of all shigellosis cases in 2007 were known to be Indigenous (indigenous status was known for 77% of cases). In the Northern Territory, 84% (146/173) of shigellosis cases were Indigenous (indigenous status was known for 97% of cases in the Northern Territory) and in South Australia 48% (30/62) were Indigenous (indigenous status was known for 79% of cases in South Australia).

The most common biotypes in 2007 were *Shigella sonnei* biotype a (21%) and *Shigella sonnei* biotype g (16%). In 2007, these 2 biotypes increased in number and proportion of notified cases compared with 2006.[14] In 2006, the most common biotype was *Shigella flexneri* 4a mannitol negative.[14]

Faecal-oral transmission is known to be a common source of infection for shigellosis.[17] Foodborne outbreaks of shigellosis are rare, and in 2007 there was only 1 foodborne outbreak of shigellosis, affecting 55 people. This outbreak was associated with imported fresh produce.[14, 18]

Shiga toxin-producing *Escherichia coli*

In 2007, there were 107 cases of STEC, a crude rate of 0.5 notifications per 100,000 population and an increase of 65% compared with an annual mean of 0.3 notifications per 100,000 population per year between 2002 and 2006.[14]

STEC rates were highest in South Australia (2.2 cases per 100,000 population) and the Northern Territory (1.4 cases per 100,000 population). South Australia reported 38% (41/107) of all STEC notifications, followed by Queensland (22%, 24/107), New South Wales (22%, 23/107), Victoria (12%, 13/107), the Northern Territory (2.8%, 3/107), Western Australia (2%, 2/107) and the Australian Capital Territory (1%, 1/107).

Jurisdictions use different methods in their screening of stools for STEC diagnosis, which can affect notification rates. As in previous years, in 2007 South Australia routinely tested all bloody stools by polymerase chain reaction (PCR) for genes coding for Shiga toxin. Queensland conducts routine culture on bloody stools. If there is no growth in culture, PCR is not performed, instead, ELISA for Shiga toxin is conducted on the specimen. Other jurisdictions do not routinely screen for STEC.

The highest age specific notification rate for STEC was amongst children in the 0–4 years age group (1.5 cases per 100,000 population), with peaks in older ages as well, with 1.0 cases per 100,000 population amongst the 60–65 years age group and 0.8 notifications per 100,000 population amongst the 70–74 years age group.[14]

Typhoid

There were 90 cases of *Salmonella* Typhi infection (typhoid) during 2007 compared with a mean of 65 cases per year between 2002 and 2006. Overseas travel is a significant risk factor for typhoid infection in Australia; in 2007, 92% (83/90) of cases reported overseas travel (Table 13).

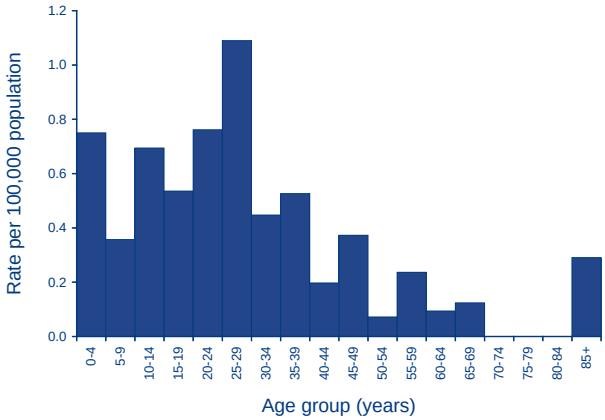
Table 13: Travel status for notified cases of typhoid, Australia, 2007

State or territory	History of overseas travel			Total
	Yes	No	Unknown	
Australian Capital Territory	0	0	0	0
New South Wales	32	1	1	34
Northern Territory	2	1	0	3
Queensland	4	1	1	6
South Australia	5	0	0	5
Tasmania	3	0	0	3
Victoria	30	0	0	30
Western Australia	7	2	0	9
Total	83	5	2	90

More than half of all overseas-acquired cases reporting overseas travel had travelled to India (51%, 42/83), with Bangladesh the second most frequently reported country or region with 13% (11/83) of cases. The predominant phage types isolated from cases returning from travel to India were E1 (19 cases) and E9 (9 cases). Similarly in cases returning from travel to Bangladesh, the most common infecting phage type was E9 (4 cases).

The highest typhoid notification rates were in the 20–24 years age group, with 0.8 cases per 100,000 population and in the 25–29 years age group with 1.1 cases per 100,000 population (Figure 19), compared with the overall notification rate of 0.4 cases per 100,000 population. This is likely to be due to high rates of overseas travel in these age groups.

Figure 19: Notifications of typhoid, Australia, 2007, by age group



Quarantinable diseases

Human diseases covered by the *Quarantine Act 1908,* and notifiable in Australia and to the WHO in 2007 were cholera, plague, rabies, yellow fever, smallpox, highly pathogenic avian influenza in humans (HPAIH), severe acute respiratory syndrome (SARS) and 4 viral haemorrhagic fevers (Ebola, Marburg, Lassa and Crimean-Congo).

Cholera, plague, rabies, smallpox, yellow fever, SARS, HPAIH and viral haemorrhagic fevers are of international public health importance as they continue to occur around the world. Travellers are advised to seek information on the risk of contracting these diseases at their destinations and to take appropriate measures. More information on quarantinable diseases and travel health can be found at the Australian Government Department of Health and Ageing's web site: http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-quaranti-index.htm, and the Australian Government's travel advisory and consular assistance service http://www.smartraveller.gov.au/

There were no cases of plague, rabies, smallpox, yellow fever, SARS, HPAIH or viral haemorrhagic fevers reported in Australia in 2007. Table 14 provides information on the historical occurrence of these diseases in Australia.

Cholera

In 2007, there were 3 cases cholera notified in Australia, two from New South Wales and one from Queensland. All of them were acquired in India.

All cases of cholera reported since the commencement of the NNDSS in 1991 have been acquired outside Australia except 1 case of laboratory-acquired cholera in 1996 and 3 cases in 2006. There have been 20 cases of cholera notified between 2002 and 2007.[19]

Sexually transmissible infections

In 2007, the sexually transmissible infections (STIs) reported to NNDSS were chlamydial infection, donovanosis, gonococcal infection and syphilis.

Since 2004, 2 categories of non-congenital syphilis have been reported: infectious syphilis (primary, secondary and early latent) of less than 2 years duration; and syphilis of greater than 2 years or

Table 14: Australia's status for human quarantinable diseases, 2007

Disease	Status	Date of last record and notes
Cholera	Free	Small number of cases are reported annually[19]
Plague	Free	Last case recorded in Australia in 1923[20]
Rabies	Free	Last case (overseas acquired) recorded in Australia in 1990[21]
Smallpox	Free	Last case recorded in Australia in 1938[22]
Yellow fever	Free	No cases recorded on shore in Australia – 5 occasions in which vessels arrived in Australian ports 1892–1915[20]
Severe acute respiratory syndrome	Free	Last case recorded in Australia in 2003[23]
Human pathogenic avian influenza in humans	Free	No cases recorded[24]
Viral haemorrhagic fevers		
Ebola	Free	No cases recorded[25]
Marburg	Free	No cases recorded[25]
Lassa	Free	No cases recorded[25]
Crimean–Congo	Free	No cases recorded[25]

unknown duration. Reports were also received by NNDSS on congenital syphilis. These conditions were notified in all states and territories, except in South Australia where cases of syphilis of greater than 2 years or unknown duration were not reported to the NNDSS.

Other national surveillance systems that monitor STIs in Australia include the Australian Gonococcal Surveillance Programme (AGSP); a network of specialist laboratories monitoring the laboratory based indices of infections; and NCHECR.

The national trends in the number and rates of STI notifications reported to the NNDSS between 2002 and 2007 are shown in Table 7. In interpreting these data it is important to note that changes in notifications over time may not solely reflect changes in disease prevalence. Increases in screening rates,[26, 27] more targeted screening, the use of less invasive and more sensitive diagnostic tests, as well as periodic public awareness campaigns, may contribute to changes in the number of notifications over time.

Indirect age standardised notification rates, using the method described by the Australian Institute of Health and Welfare,[28] were calculated for Indigenous and non-Indigenous populations for jurisdictions that had indigenous status data completeness in more than 50% of notifications. Incomplete notifications were counted as non-Indigenous cases when analysing these jurisdictions. These data however, need to be interpreted cautiously as STI screening occurs disproportionately among Indigenous populations and high rates in Indigenous populations may be attributed to poorer access to primary health care services and not necessarily associated with increased levels of sexual activity among Indigenous persons.[29,30] Similarly, rates between females and males need to be interpreted with caution as rates of testing for STIs differs between the sexes.

Cases were excluded for chlamydial, gonococcal and non-congenital syphilis infections in cases aged less than 15 years where mode of transmission was available and the infection was deemed to be non-sexually acquired, e.g. perinatally acquired infections.

Chlamydial infection

Chlamydial infection continues to be the most commonly notified disease in 2007. A total of 51,859 notifications of chlamydial infection were received; a notification rate of 246.8 cases per 100,000 population. This represents an increase of 8% on the rate reported in 2006 (229.2 cases per 100,000 population). The rate of chlamydial notifications has continued to increase since surveillance of the condition commenced in 1991 in all jurisdictions, except New South Wales where it became notifiable in 1997. Between 2002 and 2007, chlamydial infection notification rates increased from 124.5 to 246.8 cases per 100,000 population, an increase of 97% (Table 7). This ongoing increase provided the impetus for the launch of Australia's first National STI Strategy in July 2005.[31] While the prevalence of chalmydial infection varies by age group and other demographic and behavioural factors, no major section of the population is spared.[32]

Chlamydial infection notification rates were higher than the national average (246.8 cases per 100,000 population) in the Northern Territory (1,014 cases per 100,000 population), Western Australia (367.7 cases per 100,000 population),

Queensland (307.9 cases per 100,000 population) and the Australian Capital Territory (266.4 cases per 100,000 population) (Table 3).

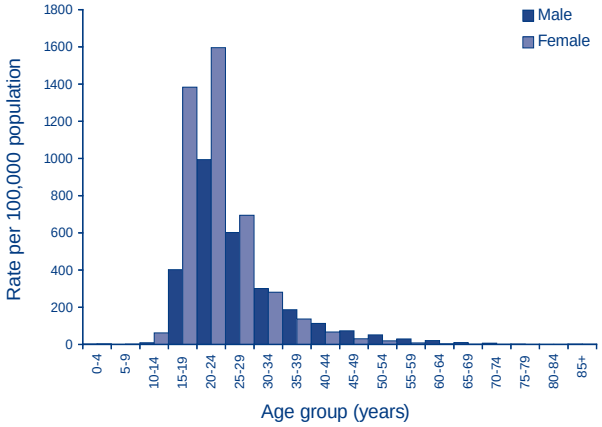
In 2007, sex was reported for 51,747 (99.8%) of the 51,859 cases of chlamydial infection. Of these cases, notification rates in males and females were 199.1 and 292.8 cases per 100,000 population respectively. In 2007, notification rates increased by 8% in both males and females when compared with 2006. The male to female ratio in 2007 was 0.7:1, 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 20).

Trends in age and sex notification rates between 2002 and 2007 show increases in all age ranges, especially between 15 and 29 years in both males and females (Figure 21). Between 2002 and 2007, the notification rate in males in the 20–24 years age group increased by 531.5 cases per 100,000 population (115%); and for female cases, in the 15–19 years and 20–24 years age groups, the notification rate increased by 704.8 and 802.7 cases per 100,000 population or 104% and 101%, respectively.

In 2007, data on indigenous status were complete in 43% of cases of chlamydia infection, which was the same as the preceding 5–year average of 43% (range: 40%–44%).

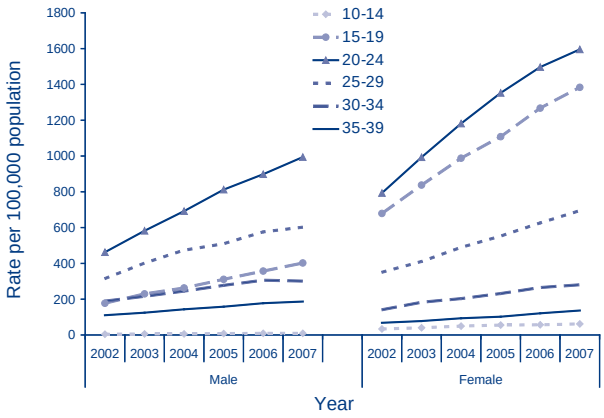
From 2002–2007 the rates of chlamydial infection diagnosis increased in both Indigenous and non-Indigenous populations as part of the overall increasing trend. In 2007, 5 jurisdictions had greater than 50% completeness of the indigenous status field: the Northern Territory, South Australia, Victoria, Tasmania and Western Australia. Among these jurisdictions, the age adjusted notification rate for the Indigenous population ranged from 64.5 to 1,782.2 cases per 100,000 population (Tasmania and the Northern Territory, respectively) with a median of 641.1 cases per 100,000 population. In comparison, for the non-Indigenous population, the age standardised notification rate ranged from 206.8 to 600.6 cases per 100,000 population (South Australian and the Northern Territory respectively) with a median of 237.9 cases per 100,000 population. During 2007, the age standardised ratio of Indigenous to non-Indigenous chlamydial infection notifications ranged between 0.27:1 and 3.5:1 (Tasmania and Western Australia respectively), median 3.0:1 (South Australia). This notification gap has improved substantially since 2000. It should be noted that indigenous status identification in the notification data is inconsistent and varies by jurisdiction. Research into high rates of STIs among the Indigenous population in the Northern Territory established that the disparity in notifications rates could be attributed to more targeted screening programs and to poorer access to primary health care services, rather than increased levels of sexual activity among Indigenous people.[29,30]

Figure 20: Notification rate for chlamydial infection, Australia, 2007, by age group and sex*



* Excludes 112 cases whose sex was not reported.

Figure 21: Trends in notification rates of chlamydial infection in persons aged 10–39 years, Australia, 2002 to 2007, by age group and sex



Donovanosis

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 and has been identified as a potential co-factor in HIV transmission. Donovanosis has been targeted for elimination from Australia through the National Donovanosis Elimination Project.[33] In 2007, 3 cases of donovanosis (2 male and 1 female) were reported to the NNDSS. Cases were reported from Queensland (2) and the Northern Territory (1) and

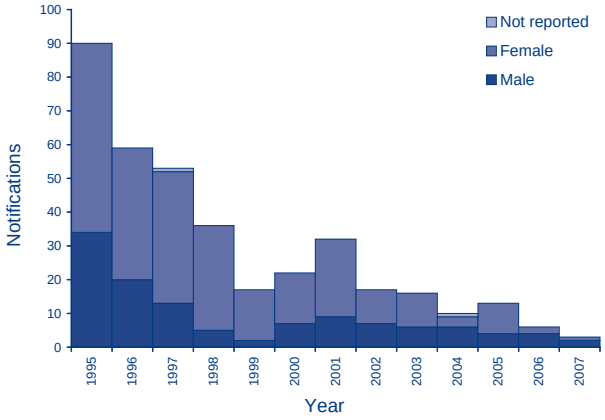
were aged 24, 41 and 58 years. Two of the cases were reported as Indigenous. In 2006, a total of 6 cases, 4 male and 2 female, with four of the cases reported as Indigenous, were notified (Figure 22).

Gonococcal infections

In 2007, 7,605 notifications of gonococcal infection were received by the NNDSS. This represents a notification rate of 36.2 cases per 100,000 population, a decrease of 12% from the rate reported in 2006 (41.4 cases per 100,000 population). The male to female ratio in 2007 was 1.9:1, similar to the previous 5 years (2002 to 2006).

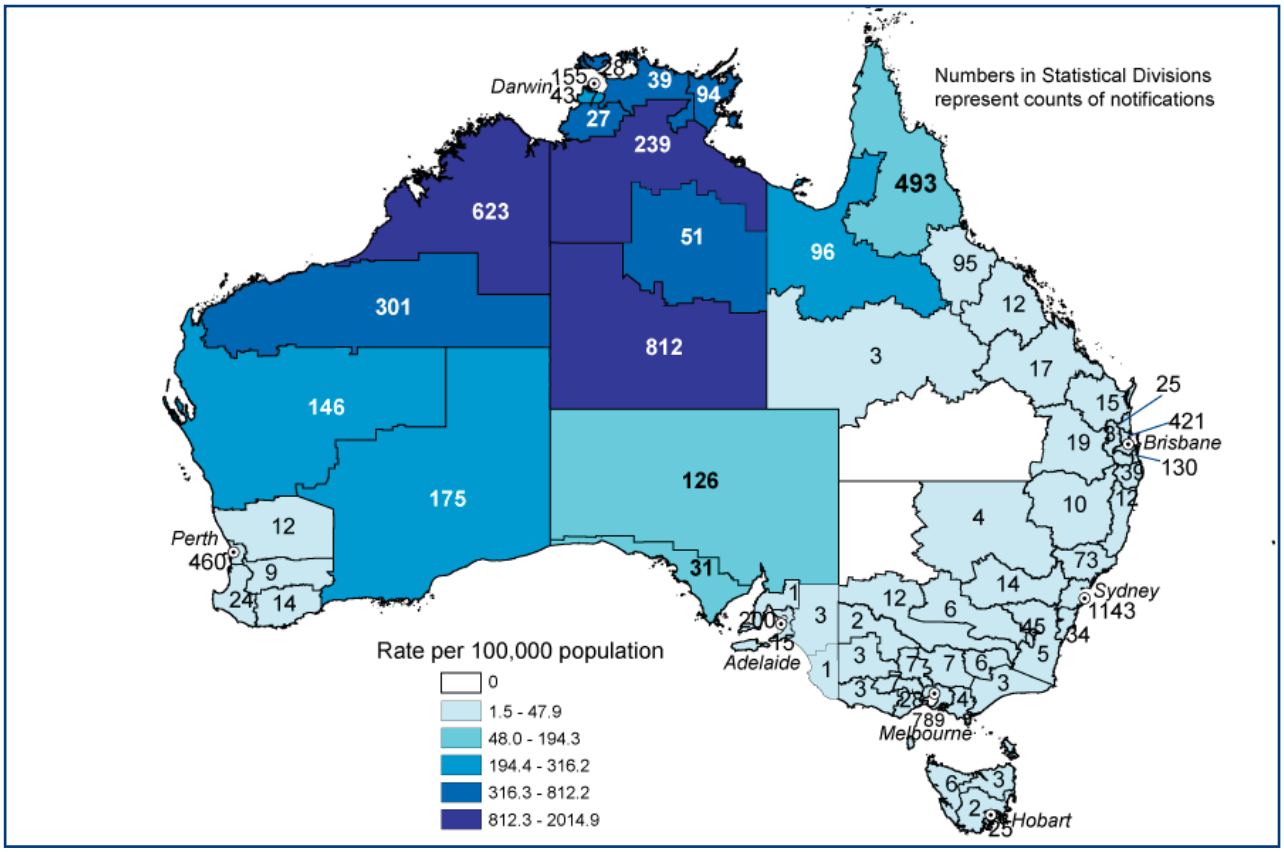
The highest notification rate in 2007 was in the Northern Territory at 744.4 cases per 100,000 population, compared with Western Australia, Queensland and South Australia (83.6, 32.0 and 28.8 cases per 100,000 population respectively) (Table 6). Considerable declines in the notification rate in 2007 compared with 2006, occurred in Victoria (24.9%), New South Wales (21.2%) and Queensland (15.2%). Notification rates in the Australian Capital Territory and Tasmania increased substantially compared with 2006 (34.1% and 109.6% respectively). At a regional level, gonococcal infection rates were highest in the Kimberley Statistical Division of Western Australia, and in the Central and Lower Top End

Figure 22: Notifications of donovanosis, Australia, 1995 to 2007, by sex



Statistical Subdivisions of the Northern Territory (range: 812.3–2,014.9 cases per 100,000 population). In the Pilbara Statistical Division of Western Australia and the Barkly, Daly, Alligator and East Arnhem Statistical Subdivisions of the Northern Territory rates were also substantially higher than the national rate (316.3–812.2 cases per 100,000 population) (Map 4).

Map 4: Notification rates for gonococcal infection, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory



The sex of cases was reported in 7,599 of 7,605 cases in 2007. Nationally, gonococcal infection rates for males and females were 47.9 and 24.5 cases per 100,000 population, respectively. The exception to this national pattern was the Northern Territory, where females had an overall higher notification rate than males (804.9 versus 688.4 cases per 100,000 population). Nationally, notification rates for gonococcal infection in males exceeded those in females in all age groups except in the 10–14 and 15–19 years age groups (Figure 23).

Trends in sex specific notification rates show that in 2007 there has been a decrease in the rates in males in the 20–44 years age range compared with the general upward trend seen in previous years. In females, trends for all age groups appeared to remain relatively stable with a slight decrease occurring in the 15–19 and 20–24 years age groups (Figure 24).

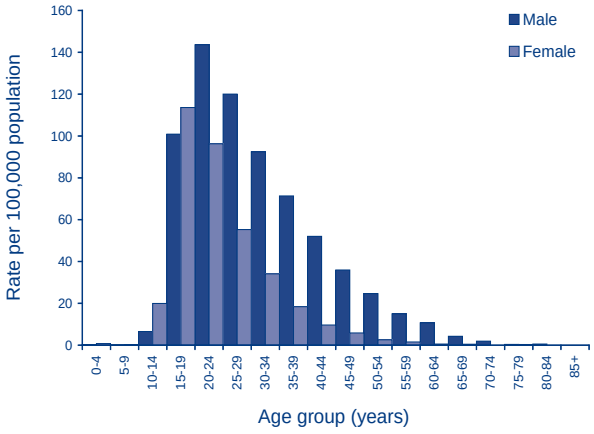
In 2007, the data completeness of indigenous status of gonococcal infection notifications was 70%, which is similar to previous years. In 2007, 6 jurisdictions had greater than 50% completeness of the indigenous status field: the Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia. Among these jurisdictions the age standardised notification rates for gonococcal infection in the Indigenous population ranged from 10.0 to 1,923.1 cases per 100,000 population (Victoria and the Northern Territory, respectively) with a median of 445.4 cases per 100,000 population. Whereas age standardised notification rates in the non-Indigenous population ranged from 7.4 to 131.9 cases per 100,000 population (Tasmania and the Northern Territory respectively) with a median of 19.5 cases per 100,000 population. During 2007, the age standardised ratio of Indigenous to non-Indigenous gonococcal infection notifications ranged between 0.5:1 and 63.4:1 (Victoria and Western Australia respectively), median 13.8:1.

Other surveillance of gonococcal infections

The Australian Gonococcal Surveillance Programme is the national surveillance system for monitoring antimicrobial resistance of *Neisseria gonorrhoeae* isolates. The monitoring is undertaken via a network of reference laboratories located in each jurisdiction to determine the susceptibility of gonococcal isolates, from both the public and private sectors, to a core group of antibiotics using a standard methodology. The core group of antibiotics are penicillin, ceftriaxone, spectinomycin, quinolone and tetracycline. The following is a summary of the AGSP 2007 report.[34]

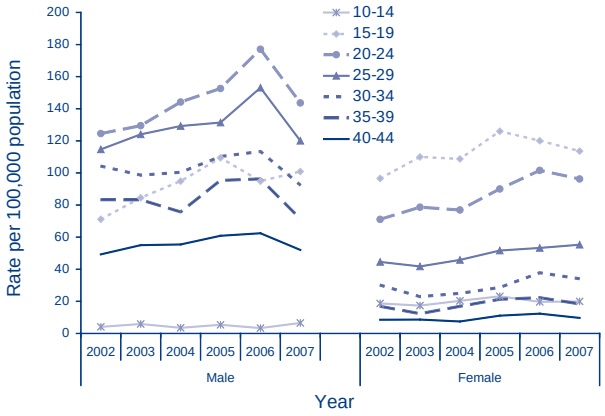
In 2007, a total of 3,103 gonococcal isolates were tested for antibiotic susceptibility, approximately 20% fewer than the 3,937 examined in 2006. The decline in the number of gonococcal isolates available for susceptibility testing is noted as a consequence of the increasing use of non-culture based diagnosis methods.

Figure 23: Notification rate for gonococcal infections, Australia, 2007, by age group and sex*



* Excludes 7 cases whose sex was not reported.

Figure 24: Trends in notification rates of gonococcal infection in persons aged 10–44 years , Australia, 2002 to 2007, by age group and sex



There were 2,560 isolates from males, 541 isolates from females (male to female ratio 4.7:1) and there were 2 isolates where the sex was not reported. In males, 75% of isolates were obtained from the urethra, 14% from the rectum and 9% from the pharynx. In females, the majority of isolates (90%) were obtained from the cervix.

Data on the place of acquisition were available for 23% (n=96) of isolates with 'penicillinase-producing' *N. gonorrhoeae* (PPNG) and for 33% (n=495) of isolates with quinolone resistance to *N. gonorrhoeae* (QRNG). This showed that half of the infections with PPNG (48/96, 50%) were acquired overseas,

principally from Western Pacific or South East Asian countries. Eighty-four per cent of QRNG (422/495) infections were locally acquired with the remainder from overseas sources similar to PPNG.

Trends in the proportion of isolates resistant to penicillin and quinolone were 40% and 50%, respectively, of all isolates and similar to previous years. There was also a historically high rate of gonococcal isolates with high-level tetracycline resistance. As in previous years, the pattern of gonococcal antibiotic susceptibility differed between states and territories, and rural and urban areas within each jurisdiction,[35] highlighting the need to continue the monitoring of treatment regime suitability on a regional basis.

Syphilis (all categories)

In 2004, all jurisdictions except South Australia, began reporting to the NNDSS non-congenital 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 these 2 categories, as well as for syphilis of these categories combined (syphilis – all categories) for the purpose of showing trends in previous years.

In 2007, a total of 2,999 cases of syphilis infection of all categories was reported, representing a notification rate of 14.3 cases per 100,000 population, an increase of 10.0% on the 13.0 cases per 100,000 population reported in 2006 (Figure 25). The Northern Territory continued to have the highest notification rate for syphilis (130.7 cases per 100,000 population), compared with Victoria and New South Wales (16.3 and 16.1 cases per 100,000 population respectively). The Australian Capital Territory reported an increase in the notification rate for syphilis of 129.5% compared with 2006 (28 cases 2007; 12 cases 2006). There were also increases in notification rates in Tasmania (62.5%), Victoria (39.8%) and Western Australia (13.7%). As in other developed countries, syphilis infection rates have continued to rise in Australia among men who have sex with men.[36, 37]

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

In 2007, a total of 1,381 cases of infectious syphilis (less than 2 years duration) were reported. This represents a notification rate of 6.6 cases per 100,000 population, an increase of 56.2% compared with 2006 (4.2 cases per 100,000 population) (Table 7). The Northern Territory had the highest notification rate at 55.4 cases per 100,000 population in 2007, a decrease of 22.3% compared with 2006. The Australian Capital Territory reported a substantial increase in their notification rate from 0.6 (in 2006, 2 cases) to 2.6 (in 2007, 9 cases) cases per 100,000 population. Increases in notification rates also occurred in Western Australia (101.5%), New South Wales (93.5%), Victoria (82.9%), Tasmania (58.9%) and Queensland (35.1%) (Table 7).

At a regional level, infectious syphilis rates were highest in the Central Statistical Subdivision of the Northern Territory (191.1 cases per 100,000 population, 77 cases). In the Kimberley and South Eastern Statistical Divisions of Western Australia; and in the Barkly, Lower Top End, Daly, Alligator and East Arnhem Statistical Subdivisions of the Northern Territory, notification rates of infectious syphilis (16.6–63.7 cases per 100,000 population) were also substantially above the national rate[8] (Map 5).

The notification rates for infectious syphilis for males and females were 11.8 and 1.4 cases per 100,000 population respectively (Table 15). Nationally,

Figure 25: Notification rate for syphilis infection (all categories), Australia, 2002 to 2007

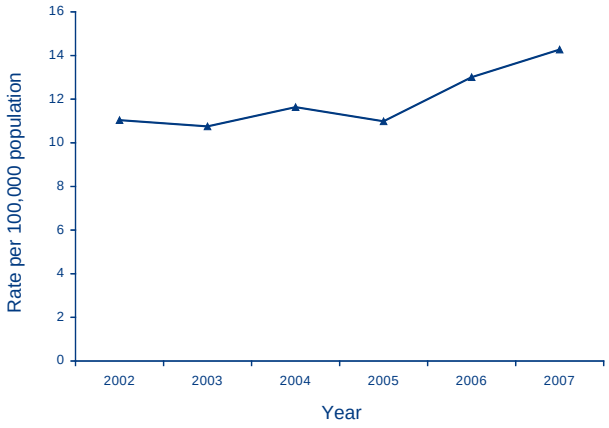
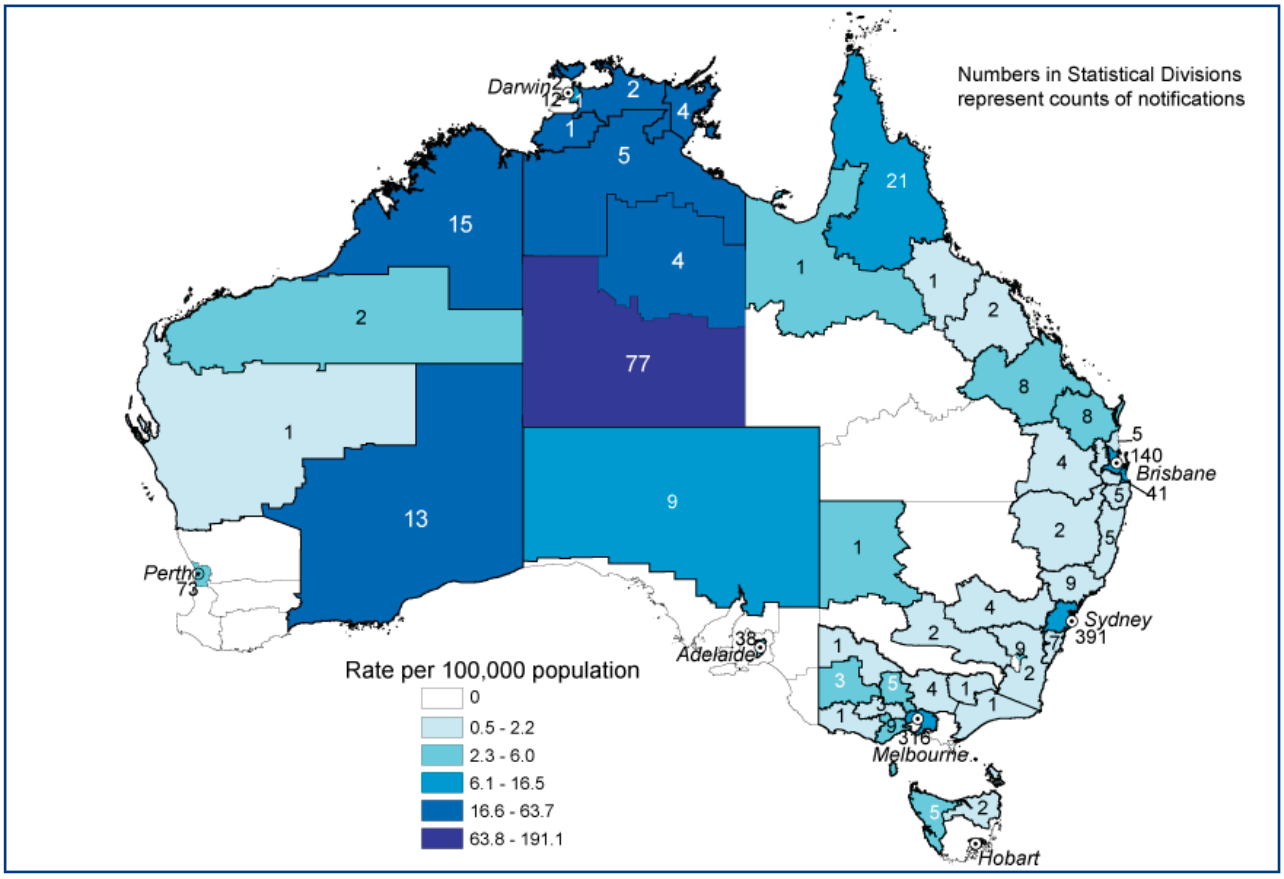


Table 15: Number and rate of notifications of infectious syphilis (less than 2 years duration), Australia, 2007, by sex and state or territory

State or territory	Male		Female		Total	
	n	Rate	n	Rate	n	Rate
ACT/ NSW	416	11.6	27	0.7	443	6.1
NT	72	64.5	47	45.5	119	55.4
Qld	204	9.8	28	1.3	232	5.5
SA	43	5.5	8	1.0	51	3.2
Tas	7	2.9	1	0.4	8	1.6
Vic	408	15.8	19	0.7	427	8.2
WA	81	7.6	20	1.9	101	1.9
Total	1,231	11.8	150	1.4	1,381	6.6

Map 5: Notification rates for infectious syphilis, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory



the male to female ratio was 8.2:1. Notification rates in males peaked in the 35–39 years age group (29.6 cases per 100,000 population) and in females in the 15–19 years age group (4.1 cases per 100,000 population). Notification rates were higher in males than in females in all jurisdictions, and across all age groups, except the 10–14 years age group where the rate was slightly higher in females (0.6 cases per 100,000 population) than in males (0.4 cases per 100,000 population) (Figure 26).

Over the period 2004 to 2007 notification rates have increased substantially in most age groups for males. Increases ranged between 59%–126% in the 20–50 years or over age groups in males compared with 2006. In females, rates remained steady except in the 10–14 and 15–19 years age groups where they decreased by 66.6% and 53.2%, respectively, compared with 2006 (Figure 27). Increases in notifications of infectious syphilis occurred mainly in populations of men who have sex with men.[4]

Figure 26: Notification rate for infectious syphilis (less than 2 years duration), Australia, 2007, by age group and sex

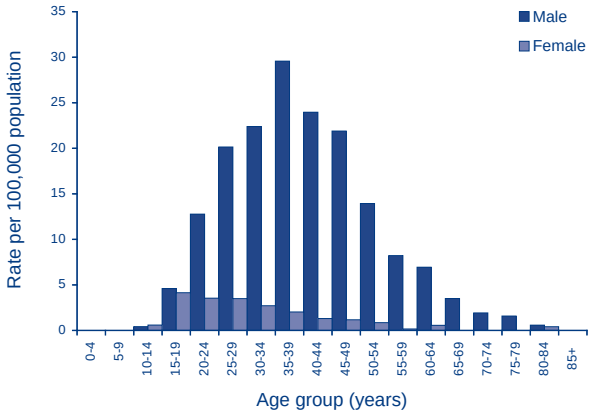
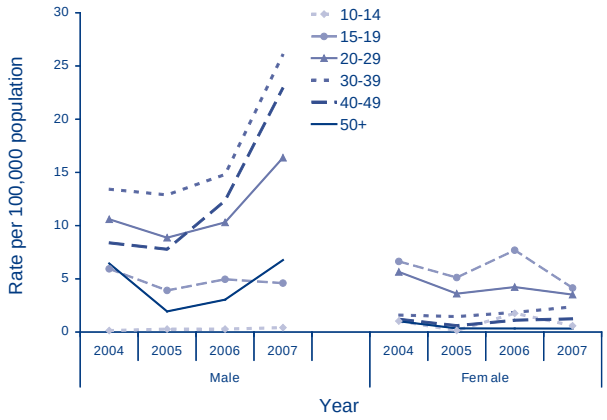


Figure 27: Trends in notification rates of infectious syphilis (less than 2 years duration) in persons aged 10 years or over, Australia, 2004 to 2007, by age group and sex



Data on indigenous status were complete in 94% of cases of infectious syphilis. In 2007, all jurisdictions except the Australian Capital Territory had greater than 50% completeness of the indigenous status field. Across these jurisdictions, the age standardised notification rate was 30.7 cases per 100,000 Indigenous population and 5.8 cases per 100,000 non-Indigenous population. These age adjusted notification rates ranged substantially across jurisdictions. For the Indigenous population the age standardised notification rate ranged from 0.0 to 146.0 cases per 100,000 population (Tasmania and the Northern Territory respectively). Whereas in the non-Indigenous population, the age standardised notification rate ranged from 1.7 to 9.9 cases per 100,000 population (Tasmania and the Northern Territory respectively). Across these jurisdictions the ratio of Indigenous to non-Indigenous age standardised rates were 5.3:1. Again this ratio varied between the individual jurisdictions from 0.0:1 to 14.7:1 (Tasmania and the Northern Territory respectively). This notification gap has decreased compared with previous years. Analysis of age specific notification rates show that compared with the non-Indigenous population, rates of infectious syphilis in the Indigenous population are higher and peak in a younger age group, 15–34 years age range compared with 34–49 years age range. Caution should be applied when interpreting these figures due to the wide variation in Indigenous and non-Indigenous population distributions for each jurisdiction, the completeness of the indigenous status field, and as noted in the methods section, where there are unknown indigenous status cases these have been counted as non-Indigenous.

Syphilis of more than 2 years or unknown duration

In 2007, a total of 1,618 cases of syphilis of more than 2 years or unknown duration were reported, a notification rate of 8.3 cases per 100,000 population. This rate represents a decrease by 12.6% compared with 2006 (9.5 cases per 100,000 population). The Northern Territory again had the highest notification rate at 75.4 cases per 100,000 population in 2007, which was an increase of 32.3% compared with 2006 (57.0 cases per 100,000 population).

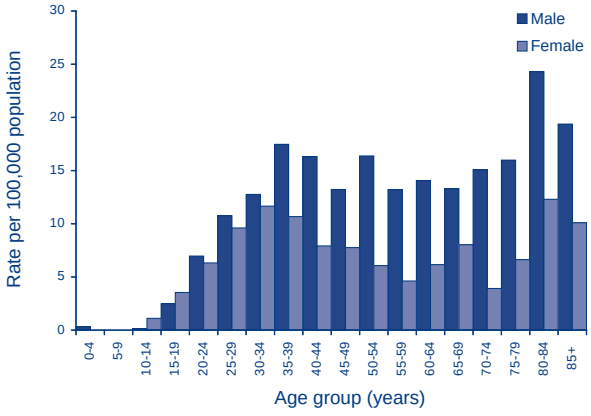
In 2007, the sex of cases was reported in 1,608 of the 1,618 cases. Notification rates for syphilis of more than 2 years or unknown duration in males and females were 10.3 and 6.2 cases per 100,000 population, respectively (Table 16). Notification rates were higher in males than in females in all jurisdictions except Queensland, where males had a slightly lower rate than females (4.9 and 5.0 cases per 100,000 population, respectively). Nationally, the male to female ratio was 1.6:1. Notification rates in males and females were similar in the younger age groups up to 34 years. In females the rate peaked in the 30–34 years age group while in males it remained high from 35 years, with a peak in the 80–84 years age group (Figure 28).

Table 16: Number and rates of notifications of syphilis of more than 2 years or unknown duration, Australia, 2007, by state or territory and sex

State or territory	Male		Female		Total*	
	n	Rate	n	Rate	n	Rate
ACT	12	7.1	7	4.1	19	5.6
NSW	451	13.2	218	6.3	672	9.8
NT	91	81.6	71	68.7	162	75.4
Qld	103	4.9	105	5.0	208	5.0
Tas	20	8.2	8	3.2	28	5.7
Vic	263	10.2	146	5.6	416	8.0
WA	58	5.5	55	5.3	113	2.2
Total	998	10.3	610	6.2	1,618	8.3

* Sex was not reported for 10 cases.

Figure 28: Notification rate for syphilis of more than 2 years or unspecified duration, Australia, 2007, by age group and sex*



* Excludes 10 cases where sex was not reported.

Over the period 2004 to 2007, notification rates increased substantially between 2005 and 2006 and then decreased to 2005 rates in 2007 for males aged over 30 years. In females, rates have remained relatively stable, except in females aged 10–14 years where the rates have increased between 2004 and 2007 from 0.5 to 1.1 cases per 100,000 population (Figure 29).

Figure 29: Notification rate for syphilis of more than 2 years or unspecified duration, Australia, 2004 to 2007, by age group and sex

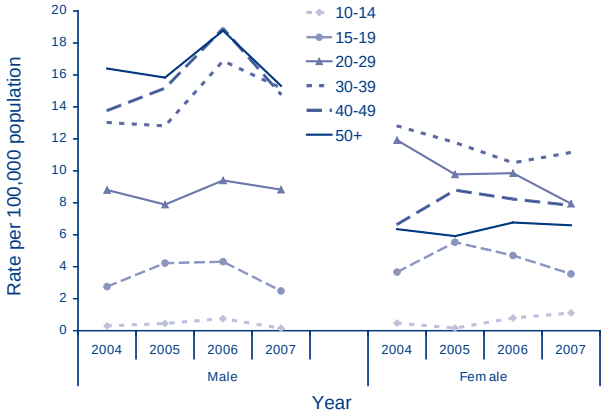
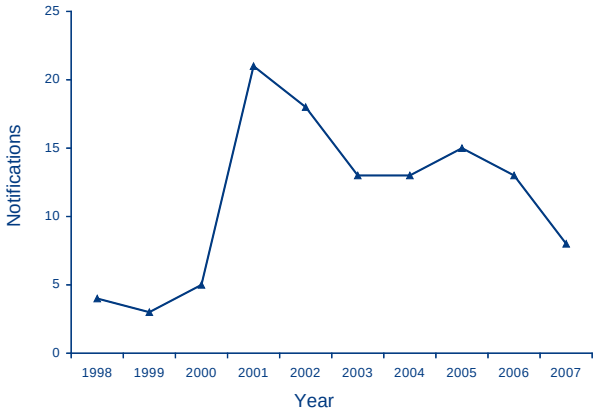


Figure 30: Trends in notifications of congenital syphilis, Australia, 1998 to 2007



Congenital syphilis

There were 8 cases of congenital syphilis notified in 2007, 5 males, 2 females and 1 case where the sex was not reported. Six of the cases were reported in New South Wales and three in the Northern Territory. Three were Indigenous, 2 non-indigenous and three were reported as unknown indigenous status. Notifications of congenital syphilis reached a plateau between 2003 and 2006 following a decline from a peak in 2001. In 2007 the number of cases decreased by 38% compared with 2006 (Figure 30).

Vaccine preventable diseases

Introduction

This section summarises the national notification surveillance data for laboratory-confirmed influenza and notifiable diseases targeted by the National Immunisation Program (NIP) in 2007. 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 invasive meningococcal disease, which are also targeted by the NIP, can be found in this report under 'Bloodborne diseases' and 'Other bacterial infections' respectively. Other vaccine preventable diseases (VPDs) presented in this report include hepatitis A under 'Gastrointestinal' and Q fever under 'Zoonoses'.

As of 1 July 2007, vaccines for human papilloma virus (HPV) and rotavirus were added to the funded NIP Schedule. In the lead up to this decision, the vaccines for HPV and rotavirus were registered by the Therapeutic Goods Administration and became available in the private market throughout Australia in 2006. In October 2006, the Northern Territory commenced a funded rotavirus immunisation program for infants born on or after 1 August 2006.

In 2007, the National HPV Vaccination Program was implemented for 12–13-year-old females, with a catch-up program for 13–26-year-old females. Currently there is no routine national surveillance system for monitoring HPV genotype infections in the general female population.

From 1 July 2007, all Australian children born on or after 1 May 2007 became eligible to receive a rotavirus vaccine. The rotavirus immunisation program aims to reduce the large social and economic burden of this disease in Australia where it is responsible for as many as 10,000 (50%) of all childhood hospital admissions for diarrhoea each year.[38] Two rotavirus vaccines are currently licensed for use in Australia: Rotarix® (GlaxoSmithKline), a monovalent vaccine containing 1 strain of live attenuated human rotavirus which protects against non-G1 serotypes; and Rotateq® (CSL Biotherapies/Merck & Co Inc), a pentavalent vaccine containing rotavirus reassortants of human serotypes G1, G2, G3, G4, and P1. Both vaccines have been demonstrated in large-scale phase 3 trials worldwide to be safe and highly effective in the prevention of severe diarrhoea and hospitalisation due to rotavirus infections. Immunisation is recommended in the routine schedule as 2 doses at 2 and 4 months of age using the Rotarix® vaccine or 3 doses at 2, 4 and 6 months using the Rotateq® vaccine.[13]

Rotavirus is currently not on the National Notifiable Disease List.[2] Although data were provided to the NNDSS by Western Australia and Queensland in 2007, it has not been analysed as part of this report. More details of rotavirus surveillance in Australia are provided in the Australian Rotavirus Surveillance Program annual report, 2007/2008.[38]

In 2007, there were 25,348 notifications of VPDs (17% of total notifications). This is 14% more than the 22,240 notifications of VPDs reported in 2006. Laboratory confirmed influenza was the most commonly notified VPD (10,403, 41% of all VPD notifications). The number of notifications and notification rates for VPDs in Australia are shown in Tables 5 and 6.

Diphtheria

There were no cases of diphtheria reported to NNDSS in 2007. 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.[39] As there is now little opportunity to acquire natural immunity or to boost declining immunity with subclinical infection, it is therefore important for Australians to retain high levels of immunity through high vaccination coverage. This is particularly important to protect Australians against diphtheria when travelling in the 21 countries where the disease is still prevalent.[40]

Haemophilus influenzae type b disease

There were 17 notifications of *Haemophilus influenzae* type b (Hib) disease in 2007, a rate of 0.1 cases per 100,000 population. This was 5 less cases than reported in 2006. Eleven cases (65% of total) were in children aged less than 5 years and seven were infants aged less than 1 year. There were 8 cases in males and 9 cases in females, (male to female ratio 0.9:1), unlike 2006 when the ratio was 0.5:1 (Figure 31).

Indigenous status was recorded for 16 of the 17 cases; seven were Indigenous and nine were non-Indigenous. The Hib notification rate was 1.4 cases per 100,000 in Indigenous people and 0.05 cases per 100,000 in non-Indigenous people—a ratio of 28:1. Between 2002 and 2006, Hib notification rates in Indigenous people have been between 6.2 and 18.8 times the rates in non-Indigenous people, except in 2002 when the Indigenous rate was 26 times that of the non-Indigenous rate (Figure 32).

Cases under the age of 15 years were eligible for Hib vaccination in infancy. Of the 12 cases aged less than 15 years in 2007, five were unvaccinated, one partially vaccinated for age and three were fully vaccinated for age. Vaccination status for 3 cases was unknown or not supplied. One of the fully vaccinated cases aged 3 years had received 3 validated doses of vaccine and met the case definition for vaccine failure.

Figure 31: Notifications of *Haemophilus influenzae* type b infection, Australia, 2007, by age group and sex

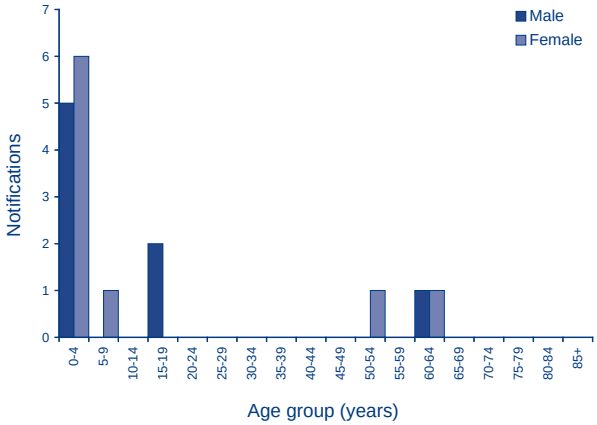
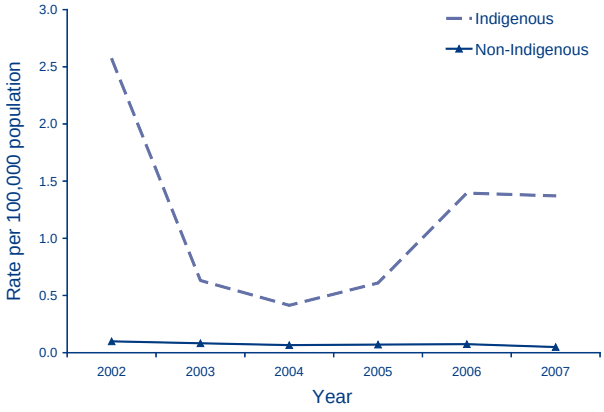


Figure 32: Notification rate for *Haemophilus influenzae* type b infection, Australia, 2002 to 2007 by indigenous status



After nearly 20 years of Hib vaccination, Australia now has one of the lowest rates of Hib in the world.[41] A recent study on the trends of invasive Hib in Australia between 1995 and 2005 concluded that almost 60% of invasive Hib cases in children are preventable.[42]

Influenza

The Australian 2007 influenza season was the highest season seen since influenza became nationally notifiable in 2001 (Figure 33). Notifications were 3.1 times the 5-year weekly rolling mean and peaked in August. As influenza only became nationally notifiable in 2001, a 5-year rolling mean cannot be calculated for years prior to 2006. There were 10,403 reports of laboratory-confirmed influenza in 2007, a rate of 49.5 cases per 100,000 population. Queensland notifications accounted for 44% of all influenza cases in Australia notified to NNDSS (Figure 34). Media coverage following the deaths of

Figure 33: Notifications of laboratory confirmed influenza, Australia, 2007, by week of diagnosis

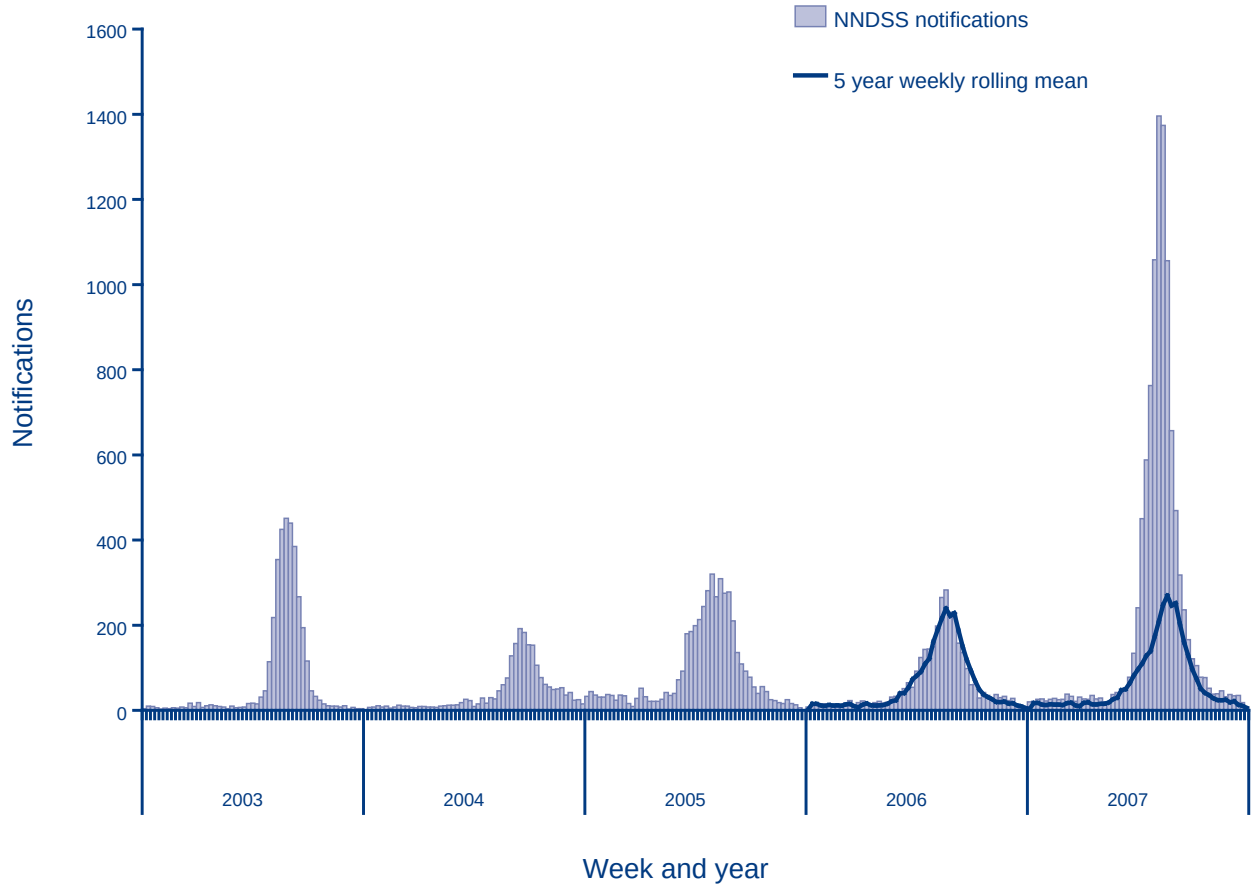
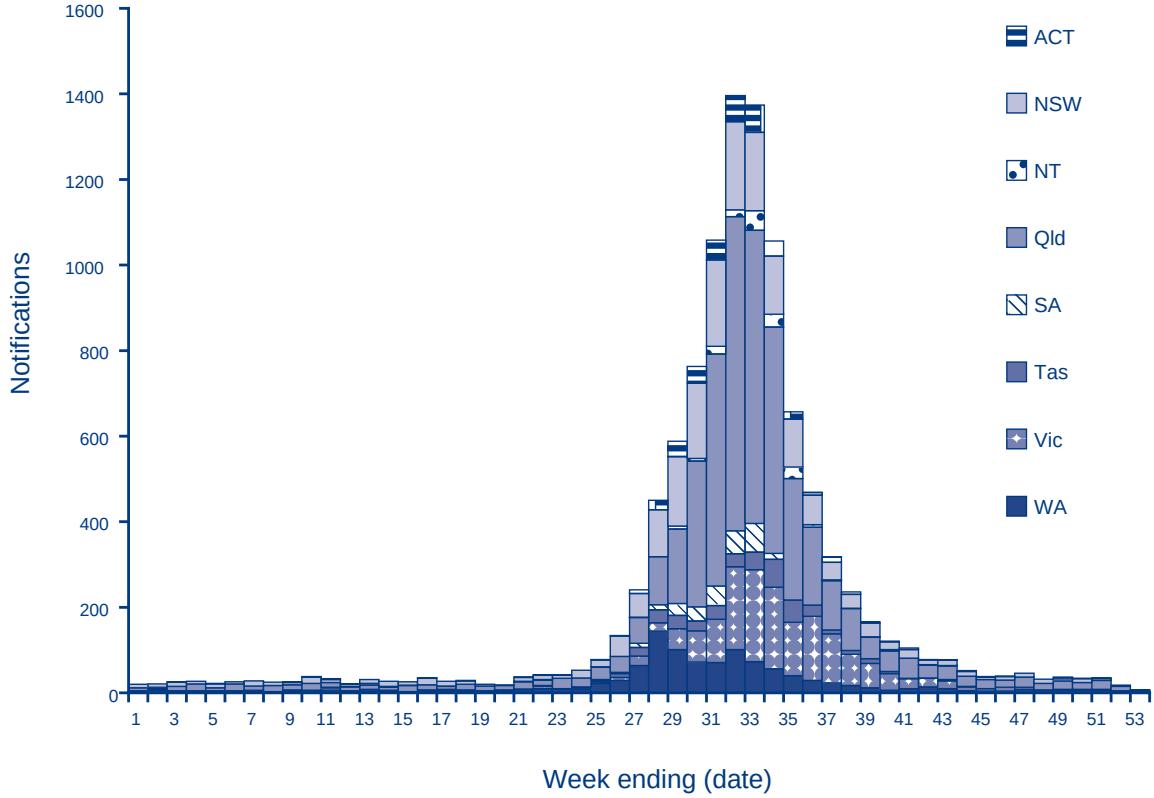


Figure 34: Notifications of laboratory confirmed influenza, Australia, 2007, by state or territory and week of diagnosis

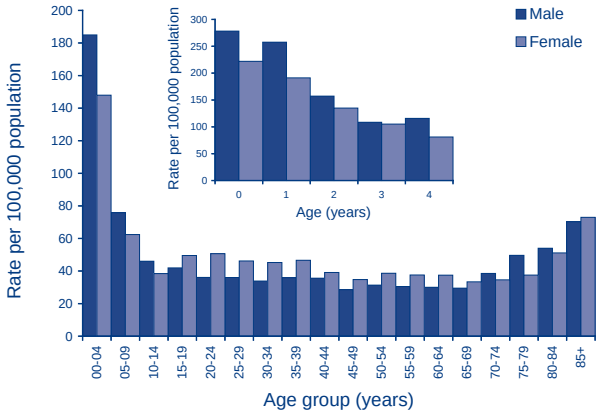


children due to influenza may have increased the rate of presentations for health care and testing for influenza in children and thus laboratory diagnosis and notification.[43]

The highest notification rates occurred in the Australian Capital Territory with 115 cases per 100,000 population, followed by Queensland (110 cases per 100,000 population), the Northern Territory (85 cases per 100,000 population) and Tasmania (84 cases per 100,000 population) (Table 6).

There were 2,240 notifications in children aged less than 5 years (22% of all notifications). As in previous years, influenza notification rates were markedly higher in children under 5 years (notification rate of 168 cases per 100,000 population) compared with older age groups (43 cases per 100,000 population) (Figure 35). The rate was highest in those under 1 year of age (271 cases per 100,000 population). The overall male to female ratio was 1:1.03.

Figure 35: Notification rate for laboratory-confirmed influenza, Australia, 2007, by age group and sex



In 2007, 9,901 (95%) influenza notifications in NNDSS had viral type data. Of cases including type data, 90% (8,942) were influenza A, 9% (914) were influenza B and 0.5% (45) were mixed infections. A breakdown of influenza notification by virus type and jurisdiction is shown in Table 17.

Of 1,406 influenza virus isolates analysed at the WHO Collaborating Centre for Reference and Research on Influenza (WHOCC) in 2007, 826 (58.7%) were A(H3N2) strains, 483 (34.4%) were A(H1N1) strains and 97 (6.9%) were influenza B. The WHOCC reported that early testing showed a difference in the proportion of H1 and H3 strains across jurisdictions. Western Australian and Victorian isolates were mainly type A(H3) while Queensland and New South Wales isolates were a mixture of type A(H1) and A(H3).[43]

Antigenic analysis of the Australian 2007 strains showed a genetic drift away from the 2007 vaccine strains for both A(H1) and A(H3).

Circulating strains were:

A(H1): A/New Caledonia/20/99-like and drift strain A/Solomon Islands/3/2006-like;

A(H3): A/Wisconsin/67/2005-like and newly emergent variant A/Brisbane/10/2007-like; and

B: B/Malaysia/2506/2004-like (21% – Victoria lineage) and B/Florida/7/2004-like (79% – Yamagata lineage).

The 2007 vaccine included:

A//New Caledonia/20/99(H1N1) – like strain.

A/Wisconsin/67/2005(H3N2) – like strain.

B/Malaysia/2506/2004 – like strain.

Table 17: Notification of laboratory confirmed influenza, Australia, 2007, by state or territory and type

Influenza type	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Influenza A	346	1,487	179	4,384	262	388	1,266	630	8,942
Influenza B	44	180	3	200	18	27	309	133	914
Influenza A&B	0	43	0	0	0	0	2	0	45
Influenza type unknown	0	208	1	6	0	0	12	275	502
Total	390	1,918	183	4,590	280	415	1,589	1,038	10,403

Invasive pneumococcal disease

There were 1,474 notifications of invasive pneumococcal disease (IPD) in Australia in 2007, a rate of 7.0 cases per 100,000 population. This was a small increase from the 1,445 cases reported in 2006 (7.0 cases per 100,000 population). An increase in notification rate between 2006 and 2007 was seen in the Australian Capital Territory (34 cases, 10.0 cases per 100,000 population), the Northern Territory (66 cases, 30.7 cases per 100,000 population) and Queensland (322 cases, 7.7 cases per 100,000 population). The lowest notification rate in 2007 was seen in Victoria (278 cases, 5.3 cases per 100,000 population).

In 2007, males accounted for 827 of the 1,474 notified cases of IPD. In all age groups there were more male than female cases, resulting in a male to female ratio of 1.3:1. Figure 36 shows that the highest rates of IPD in 2007 were among the elderly aged 85 years or over (34.3 cases per 100,000 population) and in children aged 1 year (33.4 cases per 100,000 population).

Additional data were collected on cases of invasive pneumococcal disease in all Australian jurisdictions during 2007. Details can be found in the invasive pneumococcal disease annual report published in the next edition of *CDI*.

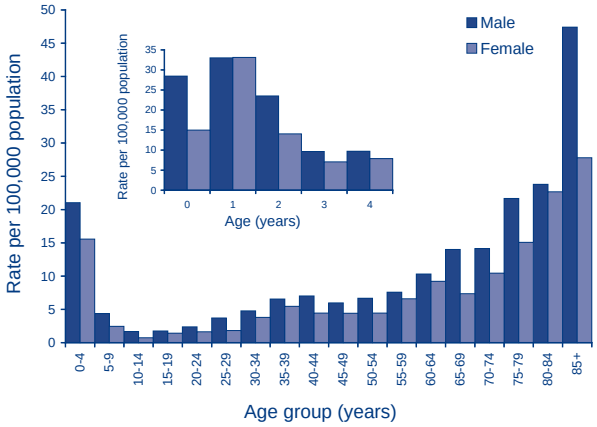
Measles

There were 12 cases of measles notified to NNDSS in 2007 representing a rate of 0.1 cases per 100,000 population. This was a significant reduction compared with the 125 cases notified in 2006 (0.6 cases per 100,000 population) associated with a large multi-state outbreak (Figure 37). Figure 38 shows that since national surveillance began in 1991, the measles annual rate for Australia has only been lower in 2005 (0.05 cases per 100,000 population).

In 2007, notifications were reported from New South Wales (4), Queensland (4), Victoria (2), South Australia (1), and Western Australia (1).

In 2007, there was a substantial decrease in the notification rate in all age groups compared with 2006 (Figure 38). There was 1 case in an 11 month-old infant, three in children aged between one and 4 years, one in the 5–14 years age group, four in the 15–24 years age group and three in the 25–34 years age group. Of the 12 cases, five (42%) were not vaccinated, one (8%) was partially vaccinated for age and the vaccination status for the remaining 6 cases (50%) was either unknown, missing or coded as not applicable. Overseas acquired measles infection accounted for seven (58%) of the 12 cases in 2007, four of which were not vaccinated, 1 case was partially vaccinated and in 2 cases the vaccination status was either unknown or not stated. The NIP recommends

Figure 36: Notification rate for invasive pneumococcal disease, Australia, 2007, by age group and sex



that children are vaccinated for measles with the combined measles, mumps, rubella vaccine (MMR), at 12 months and 4 years of age.[13] Data on serogroup type was available for 2 cases and was identified as D4 and D5 respectively. The majority of the measles cases in 2007 (8; 67%) were male.

Figure 37: Measles notifications, Australia, 2002 to 2007, by month of diagnosis

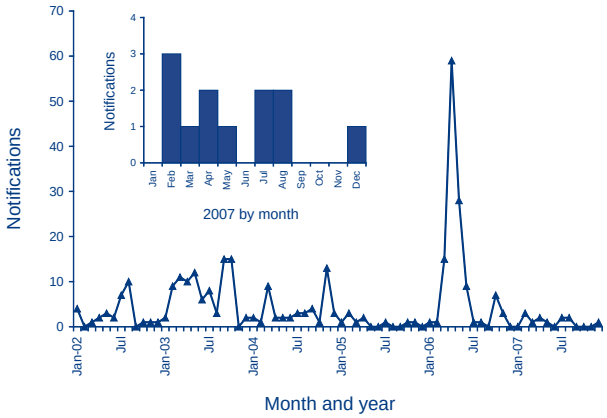
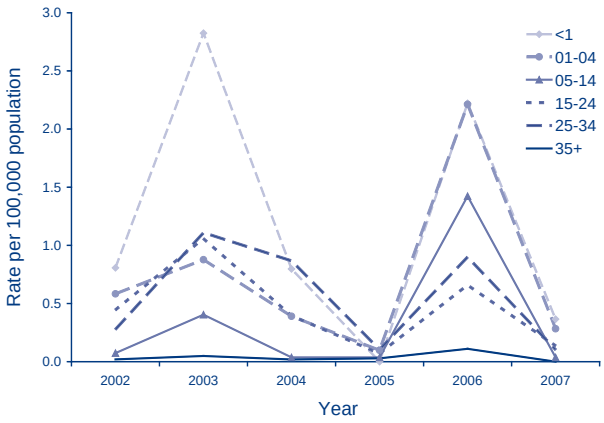


Figure 38: Trends in measles notification rates, Australia, 2002 to 2007, by age group



Mumps

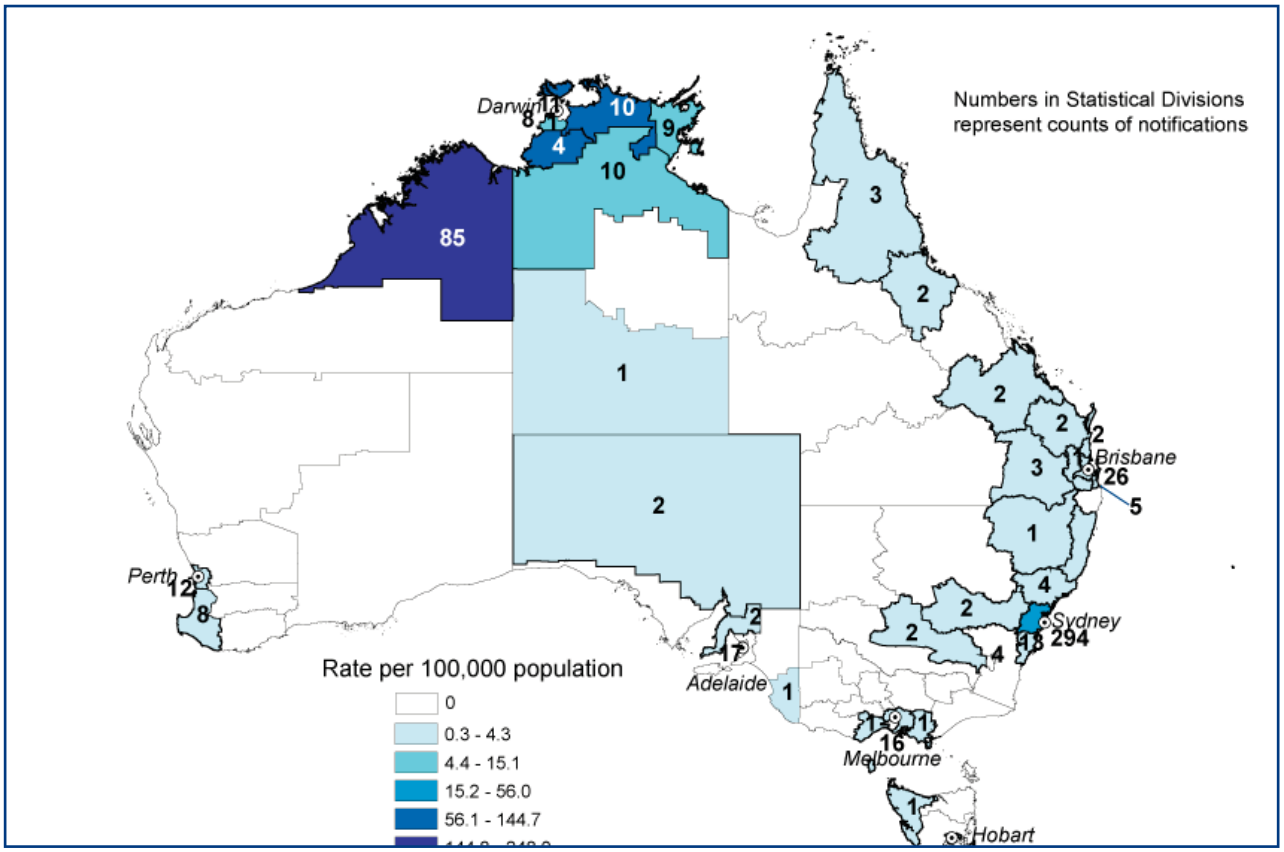
In 2007, there were 579 notifications of mumps (2.8 cases per 100,000 population), a twofold increase on the 275 notifications of mumps (1.2 cases per 100,000 population), reported in 2006 and a ratio of 3.8 compared with the 5-year mean. Cases were reported from all jurisdictions, with the majority (323) from New South Wales but also including large numbers from Western Australia (106 cases), the Northern Territory (58 cases) and Queensland (46 cases). However, the highest mumps notification rate was in the Northern Territory with 27 cases per 100,000 population, followed by Western Australia and New South Wales, each with 5 cases per 100,000 population.

Indigenous status was recorded for 396 of the 579 cases and of these, 126 (32%) were reported as Indigenous and 270 as non-Indigenous. The relatively large proportion of the total number of mumps cases in 2007 identified as Indigenous was a significant increase from the absence of Indigenous cases in 2006 and the 5-year mean of 1.2 Indigenous cases.

Of the Western Australian and Northern Territory cases in 2007, 75% (80 cases) and 78% (45 cases) respectively were identified as Indigenous and were associated with outbreaks in the Kimberley region of Western Australia and Indigenous communities in the Northern Territory (Map 6).

A clinical audit of immunisation status in a remote Indigenous community in the Northern Territory affected by the mumps outbreak identified low vaccination coverage rates in those over 20 years of age. More than 50% of mumps cases in the 10–49 year age range showed no record of vaccination (although this is based on case notes and may not have been complete for individual patients).[44] Ten of the cases reported in the Northern Territory occurred in students at a boarding school. Public health investigation at the time noted that these cases likely received an early dose of the MMR vaccine at 9–10 months of age, which was consistent with historical recommendations in the Northern Territory and now no longer apply.[45] The current NIP Schedule recommends 2 doses of MMR given at 12 months and 4 years of age, unless there is a contraindication. The efficacy following immunisation at less than 12 months of age may be reduced compared with those immunised at 12 months of age due to circulating maternal antibodies. *The Australian Immunisation Handbook* recommends that when MMR is given under 12 months of age, this dose should be repeated at 12 months of age or 4 weeks after the first dose, whichever is later.[13]

Map 6: Notification rates for mumps, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory



The Kimberley outbreak, in which genotype J was identified, began in early July and peaked by the end of 2007. This outbreak had epidemiological links to cases in the Northern Territory (personal communication, Gary Dowse, Communicable Disease Control, Directorate, Western Australia Department of Health).

The number of mumps notifications in Australia has been increasing since 2004 (Figure 39). This increase in mumps notifications has meant that the rates in Australia in 2005, 2006 and 2007 (Figure 40) have exceeded the 1 case per 100,000 population threshold for disease elimination and are indicative of endemic mumps transmission in Australia.[41]

Figure 39: Notifications of mumps, Australia, 2002 to 2007, by month of diagnosis

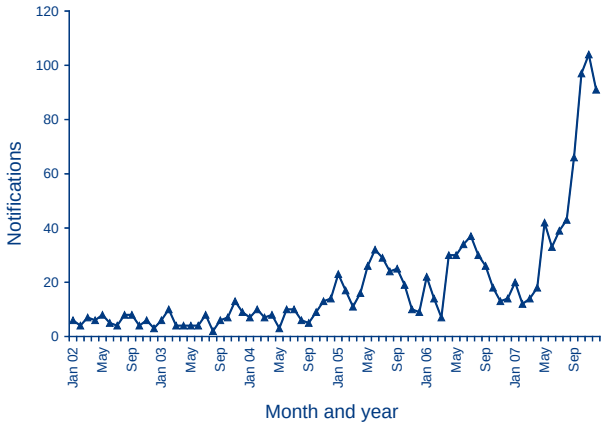
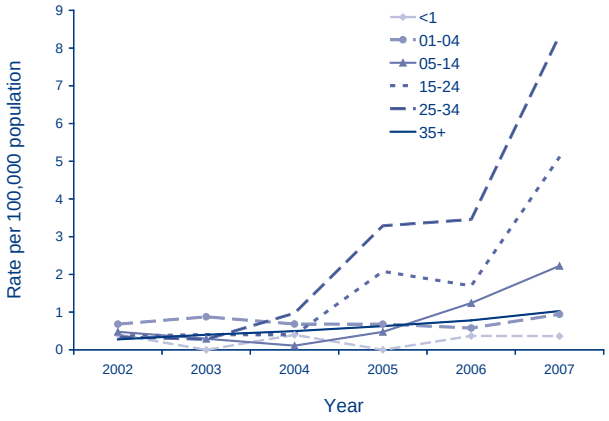


Figure 40: Notification rate for mumps, Australia, 2007, by age group

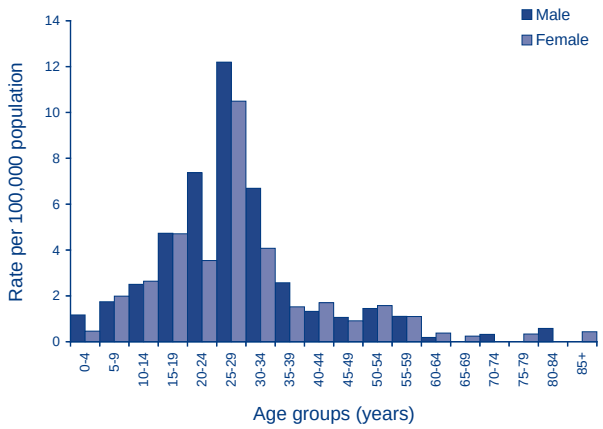


In 2007, there were cases of mumps in all age groups with the highest notification rates in the 25–29 years age group (11.4 cases per 100,000 population) while rates in young children aged less than 5 years remained low (0.8 per 100,000 population, or 11 cases) (Figure 41). In 2007, the majority of cases (325; 56%) were male.

Trends in notification rates by age group for mumps (Figure 40) show a sharp increase in the rates for the 25–34 and 15–24 years age groups, and a small decline in the less than 1 year age group compared with 2006.

Information on vaccination status was available for 330 cases (57%) of which the majority (60% or 197 cases) were not vaccinated, 7% (24 cases) were partially vaccinated for age and 33% (109 cases) were fully vaccinated for age. The high rate of mumps in the 25–34 years age group represents a susceptible cohort of individuals who may not have been immunised. In fact, 57% of those who were not vaccinated were in this age group. Of those with known vaccination status, males were 1.5 times less likely to be vaccinated than females. Mumps vaccine was made available in Australia in 1980 for use at 12–15 months of age and was combined with measles vaccine in 1982. Therefore, no childhood doses of mumps vaccine were available to most individuals in the 25–34 years age group (birth years 1973–1982). 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).

Figure 41: Trends in notification rates for mumps, Australia, 2002 to 2007, by age group



Pertussis

Pertussis is the most common vaccine preventable illness in Australia, with periodic epidemics occurring at intervals of three to 5 years on a background of endemic circulation. Rates are normally higher in late winter and spring, however from 2004 onward, non-seasonal activity remained elevated compared with previous years (Figure 42).

In 2007, 5,323 cases of pertussis were notified to NNDSS representing a rate of 25.3 cases per 100,000 population. This was lower compared with that reported in 2006 (10,996 cases; 53.1 cases per 100,000 population). The decrease in rate of pertussis notifications in Australia from 2006 to 2007 may be in part due to errors in diagnosis using serology identified in 2006. In October 2006, PanBio Ltd announced a major revision in the cut-off level for their pertussis serology tests. The original kits were withdrawn from the market towards the end of 2006 and a revised version released in October 2006. A decrease in notifications was observed in the last months of 2006.

Notification rates in 2007 increased with age, with the highest notification rate in the 65–69 years age group (45.9 cases per 100,000 population; Figure 43). There were more cases among females (3,079; 57.8%) than males (2,232; 42.0%), with 12 cases not having sex specified. The highest rates among females were in the 60–64 years age group (48.4 per 100,000 population) and the highest rates in males were in the 65–69 years age group (45.8 per 100,000 population). There were no recorded deaths for pertussis in 2007.

Trends in the pertussis notification rate in different age groups are shown in Figure 44. In 2007, pertussis notification rates declined in all age groups compared with 2006 with the exception of the 1–4 and the 5–9 years age groups, both of which experienced a small increase. In particular, the decline seen in

Figure 43: Notification rate for pertussis, Australia, 2007, by age and sex

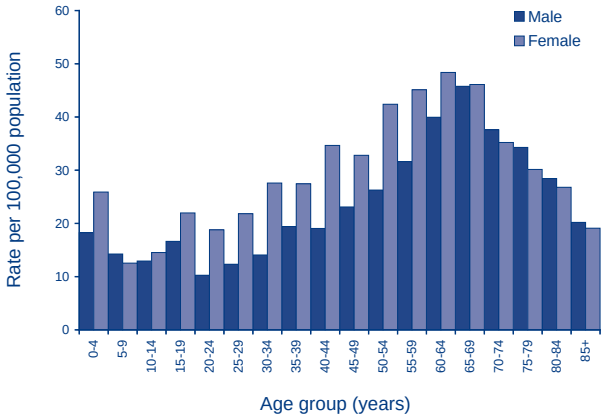
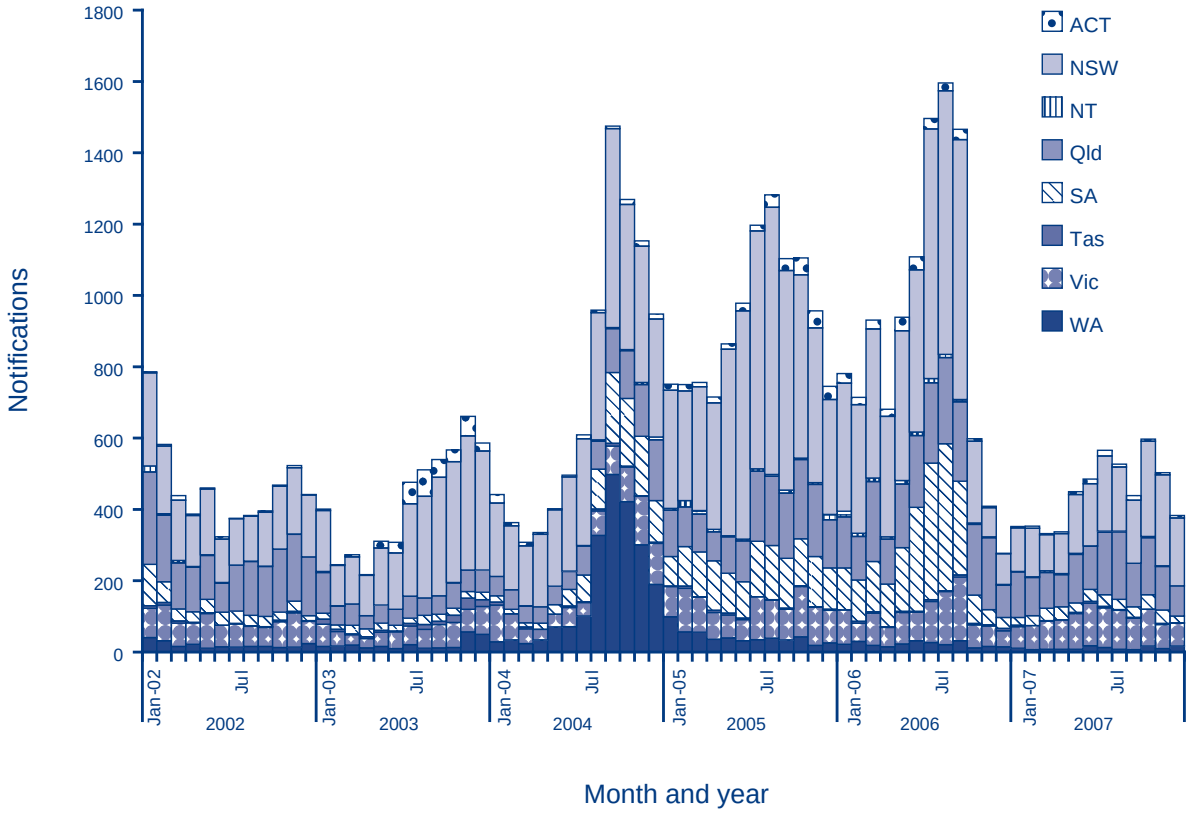


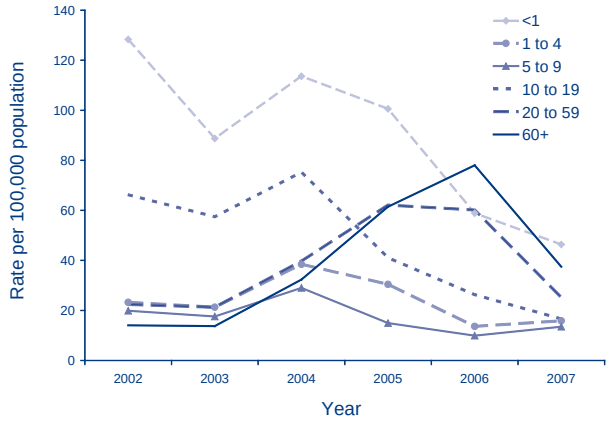
Figure 42: Notifications of pertussis, Australia, 2002 to 2007 by month of diagnosis



the 10–19 years age group following the introduction, of adolescent (15–17 years olds) vaccination to the NIP in January 2004, continued in 2007. In 2007, 82% of pertussis cases were aged 20 years or over, compared with 50% in 2000.

Notification rates for pertussis varied considerably by residential location (Map 7).

Figure 44: Trends in the notification rates of pertussis, Australia, 2002 to 2007, by age group

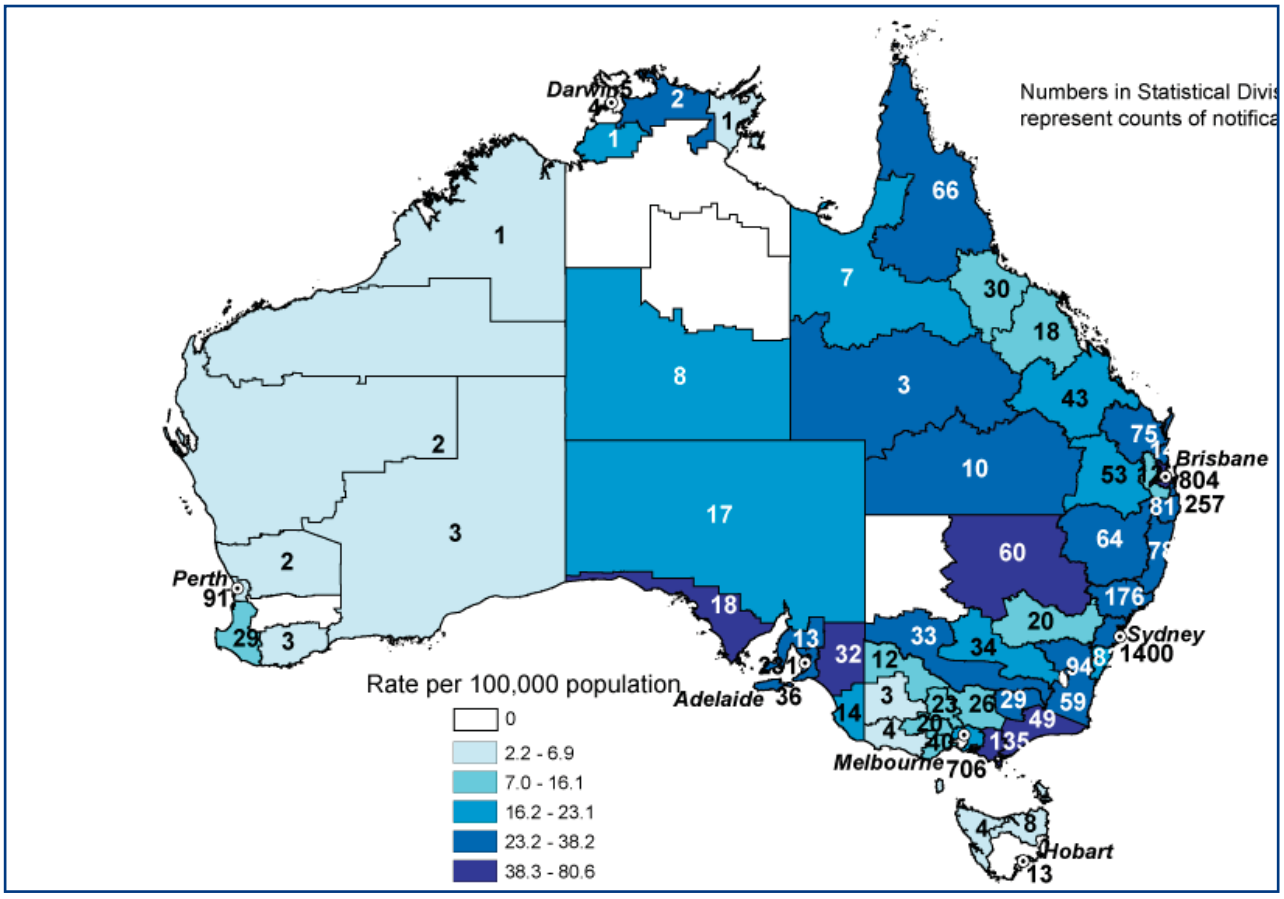


The highest rates were reported from the Darwin region of the Northern Territory, central northern New South Wales, parts of Victoria and the southern areas of South Australia, with rates in these locations being higher than the national rate. By jurisdiction, the highest rates were in Queensland (36.7 cases per 100,000 population) and New South Wales (30.0 cases per 100,000 population).

Poliomyelitis

In 2007, Australia had its first case of acute flaccid paralysis (AFP) due to wild poliovirus in 30 years. Although a major clinical presentation of the poliovirus infection, AFP occurs in less than 1% of poliovirus infections. The imported case of polio occurred in a 22-year-old male student arriving from Pakistan in July 2007. The poliovirus was detected by the National Poliovirus Reference Laboratory (NPRL) for Australia, which along with the Australian Paediatric Surveillance Unit (APSU), co-ordinates surveillance for AFP. This imported case highlights the importance of continued high quality AFP surveillance in Australia and the maintenance of high levels of polio vaccine coverage despite our current polio-free status.

Map 7: Notification rates for pertussis, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory



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. In Australia in 2007, a total of 27 eligible AFP cases were notified to the NPRL via the APSU between 1 January and 31 December, of which 26 had sufficient information for classification. The 2007 non-polio AFP rate, based on the 26 cases as classified by the Polio Expert Committee (PEC), was 0.65 per 100,000 children aged less than 15 years and hence below the performance indicator set by the WHO. Details of the 2007 notifications, including the imported case, are provided in the 2007 annual report of the Australian NPRL.[46]

Since the removal of oral polio vaccine from the immunisation schedule and its replacement with inactivated polio vaccine in November 2005, poliovirus should no longer be isolated from clinical specimens in Australia without overseas travel.

The imported polio case in 2007 highlighted the need for a comprehensive, coordinated and consistent response to such events with any poliovirus isolated in Australia fully investigated to determine the source of the virus and to prevent any local transmission. As a certified polio-free country, Australia is required by the WHO to have an action plan for responding rapidly to importations of wild poliovirus. The *Acute Flaccid Paralysis and Poliomyelitis Outbreak Response Plan for Australia* (Polio Response Plan) was initiated in late 2006 by the Department of Health and Ageing in consultation with CDNA and PEC, and refined following the experience gained during the control of the imported case in July 2007. This plan, based on a risk management approach to biological emergencies, is designed as a high level national response outlining potential scenarios for occurrence of a case of poliovirus infection in Australia, the importance of surveillance and notification procedures and to guide key stakeholders involved in detection, investigation and containment of a potential poliovirus infection in Australia. The Polio Response Plan was endorsed by Australian Health Protection Committee at their meeting in December 2008 and satisfies the WHO requirement that all member states have an action plan for rapid response to outbreaks of poliovirus.

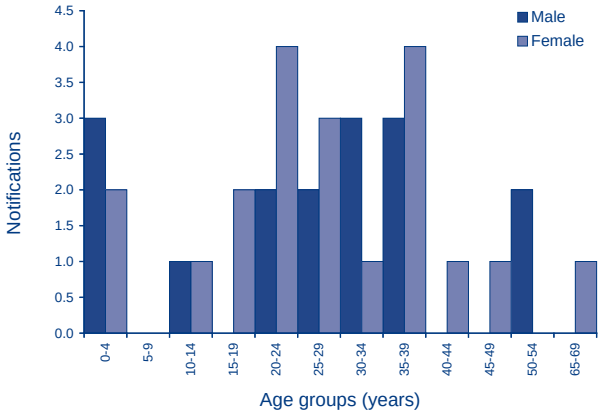
Renewed efforts in 2007 to eradicate polio worldwide saw an overall global decrease of 35% in case numbers between 2006 and 2007, including a significant 81% decrease in the number of wild poliovirus type 1 (WPV1) cases during this time. However, the risk of importation of WPV remains, with 1,304 confirmed cases reported globally to the WHO, the majority (92%) of which occurred in the 4 polio endemic countries of Nigeria, India, Pakistan and Afghanistan where the transmission of wild poliovirus continues.[47]

Rubella

In 2007, there were 36 notifications of rubella (0.2 cases per 100,000 population), a decrease compared with the 59 notifications in 2006. Cases were reported from Queensland (14), New South Wales (8), Victoria (7), Western Australia (4), the Australian Capital Territory (2) and South Australia (1).

Small case numbers were reported across the age groups between 0 and 69, except for the 5–9 years age group where no cases were reported. The majority (61%) occurred in cases aged between 20 and 39 years, with the next highest (14%) occurring in cases aged between 0 and 4.9 years (Figure 45). The mean age was 27.7 years.

Figure 45: Notification rate for rubella, Australia, 2007, by age group and sex



The overall male to female ratio of notified cases in 2007 was 0.8:1, with 16 males and 20 females. This contrasts with 2006 and some previous years (1999, 2002 and 2003) when there was an overall predominance of males notified.

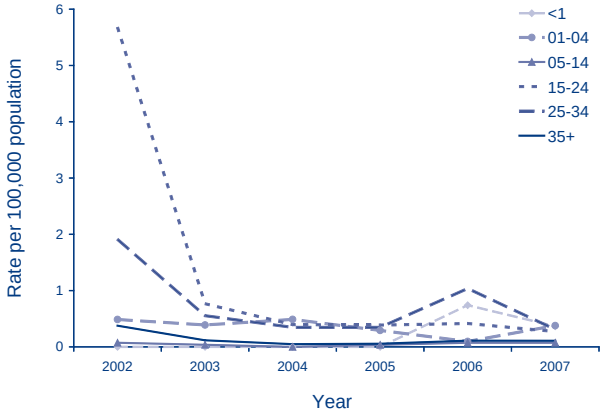
Information on vaccination status was available for 16 of the 36 cases of which six were fully vaccinated for age, three were partially vaccinated and the majority (7) were not vaccinated. Vaccination status in the remaining 20 cases was either unknown or missing.

In Australia, populations at risk of rubella include young males who did not receive the rubella immunisation in school based programs,[48] migrant women who did not receive rubella vaccines in their countries of birth,[49,50] and Indigenous women with inadequate immunity.[51] In 2007, of the 7 male cases where information on vaccination status was reported, five were not vaccinated (3 of which were between 20 and 30 years of age and 2 between 0 and 4 years of age) and two were partially vaccinated. Of the 9 female cases in 2007 with vaccination status

reported, seven were fully or partially vaccinated and two were not vaccinated (both of which were between 25 and 44 years of age). None of the rubella cases in 2007 was identified as Indigenous.

Figure 46 shows trends in rubella notification rates in different age groups, with a slight increase in rates in the 1–4 years age group in 2007 compared with 2006, but otherwise continuing at the low levels seen since 2003.

Figure 46: Trends in notification rates of rubella, Australia, 2002 to 2007, by age group



There were 2 cases of congenital rubella reported in 2007, one of which was fatal. The cases were reported from New South Wales and Victoria. While this is an increase compared with 2006 when there were no cases reported, and compared with the 5-year mean of 1.4 cases, it is consistent with notifications in earlier years including 2002 (2 cases), 2003 (3 cases), 2004 and 2005 (1 case each year). Altogether there were 16 cases of rubella notified in women of child bearing age (15–49 years) representing 80% of the total number of female cases in 2007.

Brotherton et al (2007)[41] 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

In 2007, there were 3 notifications of tetanus. One case occurred in an unimmunised 93-year-old male from Tasmania and resulted in his death. The other 2 cases were a male aged 76 years of unknown vaccination status and an unimmunised female aged 79 years.

Varicella infections

In November 2005, the 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 as a catch-up dose at 10–13 years of age. In 2006, CDNA agreed to make varicella infections notifiable in Australian jurisdictions. Three categories of varicella infection are notifiable: chickenpox, shingles and varicella infection (unspecified).

By the end of 2007, 6 jurisdictions were sending data to NNDSS, with NSW having decided in 2006 not to make varicella infections notifiable. The legal processes to make varicella notifiable in Victoria were still underway.

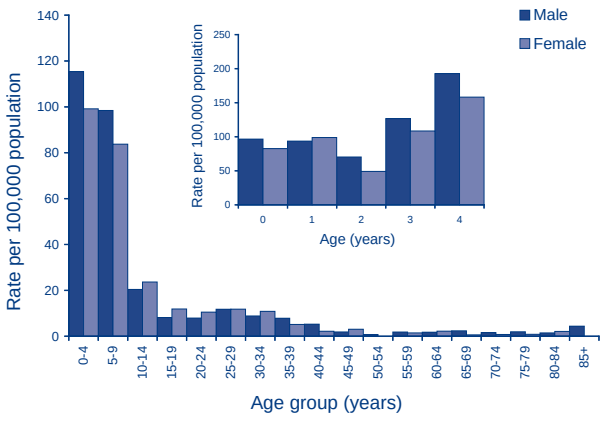
In 2007, there were 7,496 varicella notifications from the 6 notifying jurisdictions, with 1,651 (22%) reported as chickenpox, 1,547 (21%) as shingles and 4,298 (57%) as unspecified varicella infection.

Varicella zoster infection (chickenpox)

In 2007, there were 1,651 notifications of chickenpox reported from 6 jurisdictions, a rate of 18.5 cases per 100,000 population. The highest rates were reported from the Northern Territory (91.7 cases per 100,000 population; 197 cases) and South Australia (46.2 cases per 100,000 population; 732 cases).

A total of 1,145 cases (69.4 %) occurred in children aged less than 10 years. The highest rates were in the 0–4 years age group (107.5 cases per 100,000 population; 613 cases) and within this age group children aged 4 years had the highest notification rate (175.9 cases per 100,000 population; 196 cases; Figure 47).

Figure 47: Notification rate for chickenpox, Australia,* 2007, by age group and sex



* Excluding New South Wales and Victoria.

Of all notifications, there were slightly more male than female cases notified, with 881 males (53.4%) compared with 768 females (46.5%). Two cases did not have the sex specified.

Indigenous status was recorded for 85% of notifications, with the majority (1,224; 74.1%) being reported as non-Indigenous. A total of 172 notifications (10.4%) were Indigenous, with 255 (15.5%) being reported as not stated or blank.

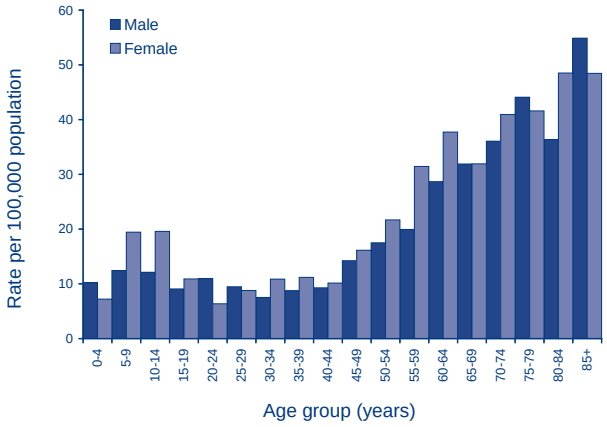
Ninety-two cases (5.6%) were recorded as fully vaccinated for age; three partially; and 458 unvaccinated. There was no vaccination status information on the remainder of the notified cases (1,098), and no recorded deaths from chickenpox in 2007.

Varicella zoster infection (shingles)

There were 1,547 notifications of shingles reported to NNDSS in 2007 from 6 jurisdictions, a rate of 17.3 cases per 100,000 population. The highest rates were in the Northern Territory (41.4 cases per 100,000 population, 89 cases) and South Australia (37.1 cases per 100,000 population, 587 cases).

There were more female cases (852; 55.1%) than males (695; 44.9%). The highest rates were in the over 85 years age group (50.6 cases per 100,000 population; 69 cases; Figure 48). There was 1 recorded death for cases of shingles.

Figure 48: Notification rate for shingles, Australia,* 2007, by age group and sex



* Excluding New South Wales and Victoria.

Indigenous status was recorded for 80.8% of notifications, with the majority (1,186; 76.7%) being reported as non-Indigenous. A total of 64 (4.1%) notifications were Indigenous, with 297 (19.2%) being reported as not stated or blank.

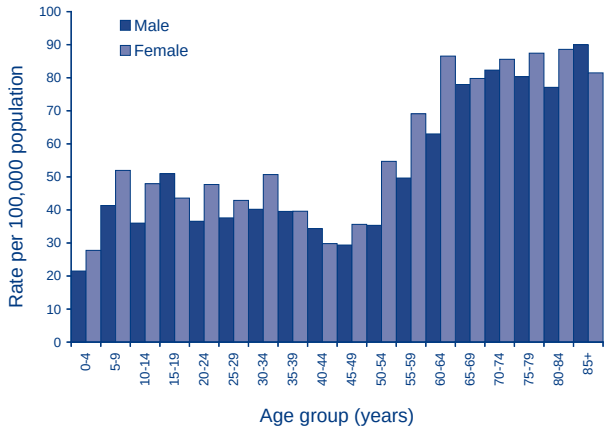
Varicella zoster infection (unspecified)

There were 4,298 cases of varicella infections (unspecified) based on laboratory diagnosis from 6 jurisdictions in 2007, a rate of 48.2 cases per 100,000 population. The highest rates were reported from Queensland (73.5 cases per 100,000 population; 3,072 cases), Western Australia (31.3 cases per 100,000 population; 659 cases) and the Australian Capital Territory (30.3 cases per 100,000 population; 102 cases).

There were more notifications in females (2,333; 54.3%) than males (1,957; 45.5%), with 2 deaths occurring due to unspecified varicella zoster infection. The age distribution of unspecified varicella infections is shown in Figure 49.

Indigenous status was recorded for 27.0% of notifications, with the majority (1,099; 25.6%) being reported as non-Indigenous. A total of 65 notifications (1.5%) were Indigenous, with 3,134 (73.0%) being reported as not stated or blank.

Figure 49: Notification rate for varicella zoster infection (unspecified), Australia,* 2007, by age group and sex



* Excluding New South Wales and Victoria.

Vectorborne diseases

Notifications

During 2007, there were 6,823 notifications of mosquito-borne diseases reported to NNDSS (4.6% of total notifications). This was a 20% decrease in the number of notifications for 2006 (8,606). The notifiable mosquito-borne diseases include those caused by the alphaviruses (Barmah Forest virus and Ross River virus), flaviviruses (the viruses causing dengue, Murray Valley encephalitis, Kunjin, Japanese encephalitis and yellow fever, which is discussed under quarantinable diseases) and malaria.

Alphaviruses

Alphaviruses are single-stranded RNA viruses that cause disease epidemics characterised by fever, rash and polyarthritis. 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).[52] In Australia, Barmah Forest virus (BFV) infection and Ross River virus (RRV) infection are the alphaviruses of major public health significance, accounting for 87% (5,919 cases) of the total mosquito-borne disease notifications for 2007. Between 2002 and 2006 (Figure 50), notifications ranged annually for BFV from 910 (2002) to 2,142 (2006), and for RRV from 1,459 (2002) and 5,547 (2006). In 2007, there were 1,716 notifications of BFV and 4,203 of RRV.

Chikungunya

Chikungunya virus is a member of the alphavirus genus in the family Togaviridae. It belongs to the Semliki Forest virus complex and is therefore closely related to Ross River and Barmah Forest. It is found epidemically in many parts of South East Asia and in Africa. Chikungunya causes illness characterised by an abrupt onset of fever, rash and severe joint pain (chikungunya is Bantu of the Makonde people of south-east Tanzania for 'that which bends up', reflecting the bent over appearance of those with severe joint pain). The acute disease lasts 3–10 days, but convalescence may include prolonged joint swelling and pain lasting weeks or months. It has clinical similarities to dengue, including occasional cases with haemorrhagic manifestations. Deaths are rare.[53]

In Australia, the known competent vectors for chikungunya virus *Aedes aegypti* occur in northern Queensland and *Aedes albopictus* are found on Cocos, Christmas and the Torres Strait Islands. Other Australian mosquitoes could be possible vectors, but there are no data on the competence of these at present.

There have been known imported cases of chikungunya virus into Australia from viraemic travellers during the recent epidemic in the Indian Ocean. Outbreaks in near neighbours such as Indonesia and Papua New Guinea, where we have more travel origins could feasibly increase the numbers of viraemic travellers and hence introduce the disease. Continued Australian military presence in South East Asia also provides a likely entry route.

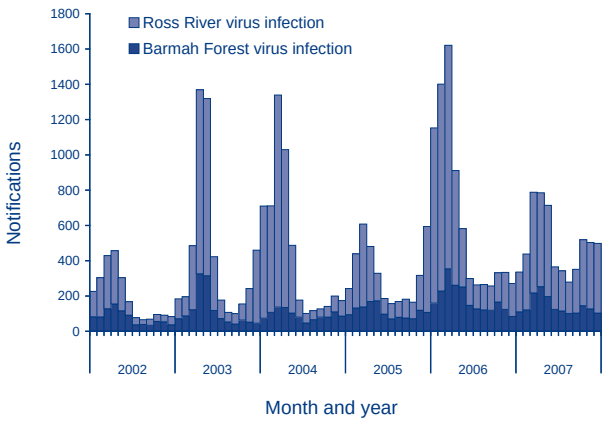
Northern Australia has suitable climate and environment parameters for the introduction of chikungunya. The National Arbovirus and Malaria Advisory Committee (NAMAC) considered and advised CDNA on 23 January 2008 that with the increased number of infected cases to Australia, and the possibility of local transmission, the number of cases of chikungunya in Australia will increase. NAMAC has initiated action, through the CDNA, to make chikungunya a nationally notifiable disease.

Barmah Forest virus infection

There were 1,716 notifications of BFV infections notified to NNDSS in 2007, which accounted for 25% of total mosquito-borne disease notifications for the reporting period. Forty-eight per cent of BFV notifications were reported from Queensland (n=826) and 33% from New South Wales (n=572). BFV notifications during 2007 were 1.3 times the mean for the previous 5 years.

The highest rates of BFV notifications were reported by the Northern Territory (42.3 cases per 100,000 population compared with 62.9 cases per 100,000 population in 2006), Queensland (19.8 cases per 100,000 population compared with 23.6 cases per 100,000 population in 2006), and New South Wales (8.3 cases per 100,000 population compared with 9.4 cases per 100,000 population in 2006). Cases were reported in all jurisdictions

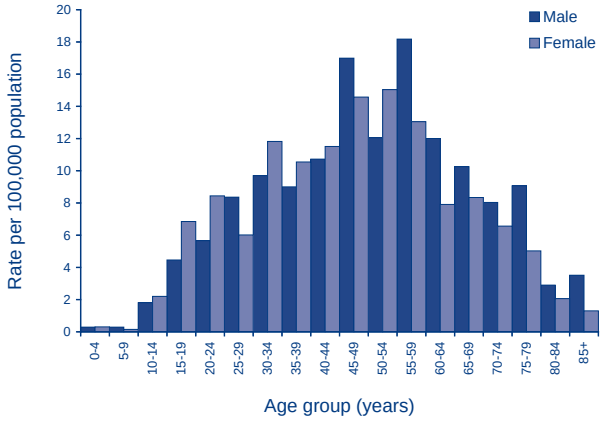
Figure 50. Notifications of Barmah Forest and Ross River virus infections, Australia, 2002 to 2007, by month and year of onset



except for Tasmania. The national BFV notification rate in 2007 was 8.2 cases per 100,000 population, compared with 10.3 cases per 100,000 population in 2006. Notification rates for BFV varied by geographic location (Map 8). These locations represent the place of residence of a notified case and not the place of acquisition of infection. For 2007, the highest regional BFV notification rate was reported in the Litchfield Shire of the Northern Territory (74.7 cases per 100,000 population).

Figure 51 shows the age and sex distribution of BFV notifications. The BFV notification rate was highest amongst the 45–49 year age group (15.8 cases per 100,000 population). A similar number of males and females were notified to NNDSS with BFV.

Figure 51: Notification rate for Barmah Forest virus infections, Australia, 2007, by age group and sex

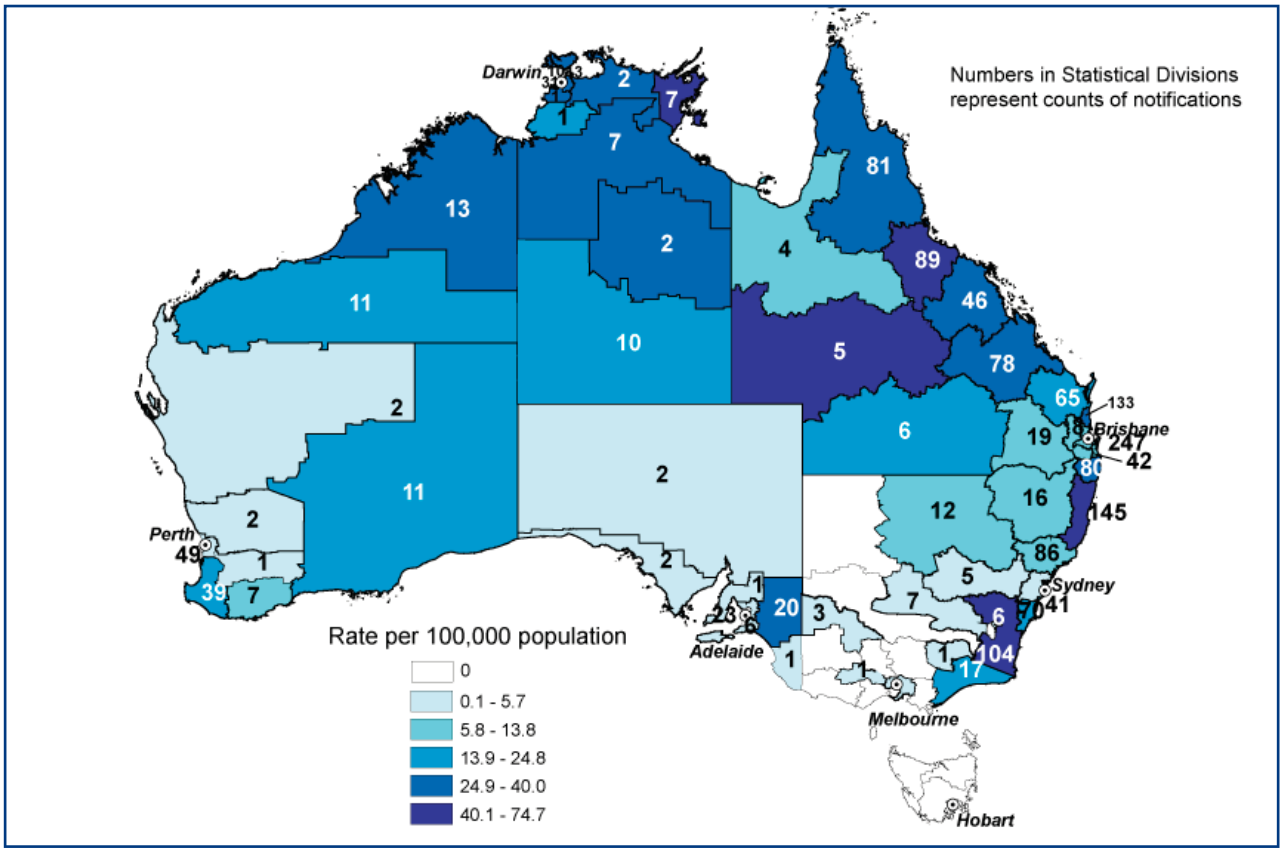


Ross River virus infection

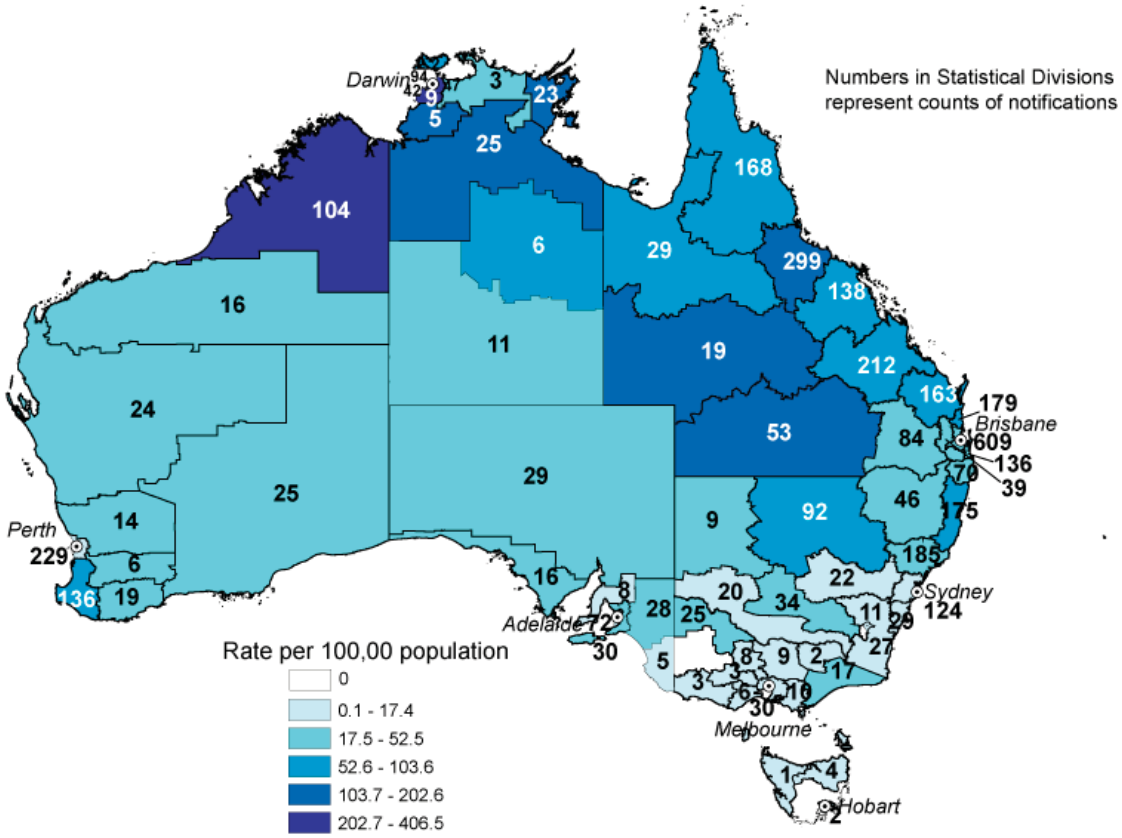
There were 4,203 notifications of RRV infections reported to NNDSS in 2007, which accounted for 62% of the total of mosquito-borne disease notifications received during this reporting period.

Cases of RRV infection reported to NNDSS varied by geographic region but the majority of notifications in 2007 were from Queensland (51%, n=2,137) and New South Wales (20%, n=841). These locations represent the place of residence of a notified case and not necessarily the place of acquisition of infection. Map 9 shows that the highest rates of notifications were reported in the Finniss area of the Northern Territory (406 cases per 100,000 population) and the Kimberley region of Western Australia (303 cases per 100,000 population). Five of the top 10 rates of RRV notification by region in Australia

Map 8: Notification rates for Barmah Forest virus infection, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for Northern Territory



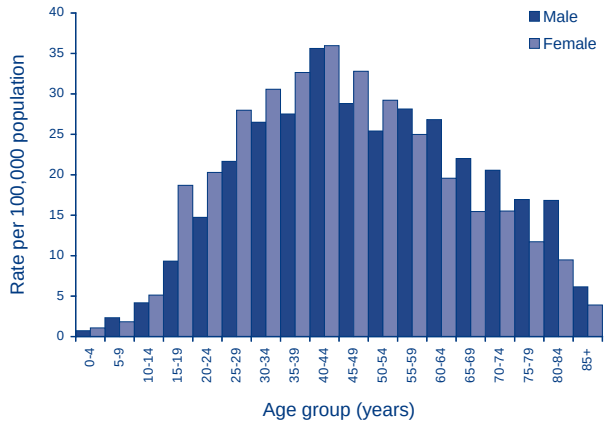
Map 9: Notification rates for Ross River virus infection, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory



occurred in the Northern Territory in 2007. The national RRV notification rate for 2007 was 20 cases per 100,000 population compared with 26.6 cases per 100,000 population in 2006.

The age and sex distribution of RRV notifications is shown in Figure 52. The RRV national notification rate was highest in the 40–44 years age group (35.8 cases per 100,000 population). Overall, 48% of notifications reported to NNDSS were males.

Figure 52: Notification rate for Ross River virus infections, Australia, 2007, by age group and sex



Flaviviruses

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

The Sentinel Chicken Program is a surveillance 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 and KUNV. This program is designed to provide early warning of flavivirus activity (excluding dengue and JEV).[54] A sentinel chicken surveillance report was published as part of the National Arbovirus and Malaria Advisory Committee Annual Report 2006–07.[55]

Murray Valley encephalitis virus infection

There were no cases of MVEV infection reported to NNDSS in 2007, compared with 1 case reported in 2006 in Western Australia.

Kunjin virus infection

In October 2007, 1 case of KUNV was reported to NNDSS in Victoria compared with 3 notifications of KUNV in 2006. Further investigations resulted in the reclassification of the diagnosis as West Nile virus. This is the first report of a laboratory confirmed West Nile virus (New York 99) infection imported into Australia.

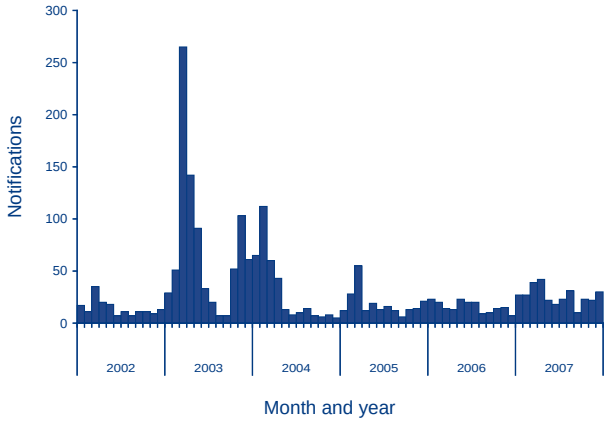
Dengue virus infection

There were 314 notifications of DENV infection reported to NNDSS in 2007 (Figure 53) including 268 notifications of overseas acquired dengue virus infection. In Australia, imported cases of DENV are reported each year with occasional local transmission. Local transmission is restricted to areas of northern Queensland where the key mosquito vector, *Aedes aegypti*, is present. The number of cases reported in 2007 was a 68% increase in the number of cases reported in 2006 (n=187).

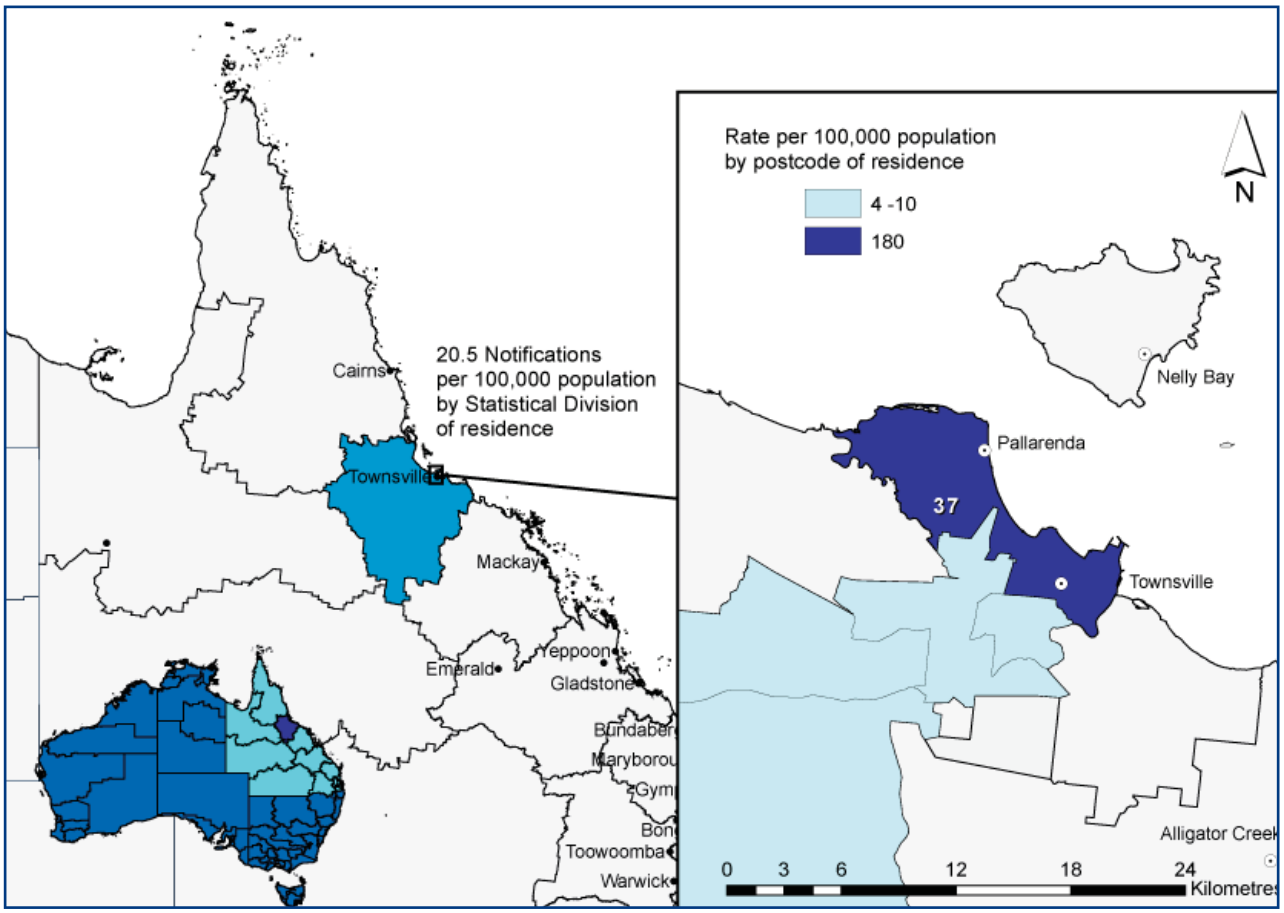
Queensland reported 120 (38%) notifications of DENV in 2007. An outbreak of locally-acquired dengue serotype 3 occurred in Townsville between February and April 2007. Locally-acquired cases represented 15% (46/314) of the total number of dengue notifications for 2007. Map 10 presents 44 of 46 notifications that were acquired locally and able to be represented geographically (2 cases, a resident of Brisbane and Darwin acquired their infection in Townsville).

In early 2004, 2 deaths were reported in Australia due to dengue fever. These were the first deaths attributed to dengue in over 100 years.[56]

Figure 53: Notifications of dengue (locally-acquired and imported cases), Australia, 2002 to 2007, by month and year of diagnosis

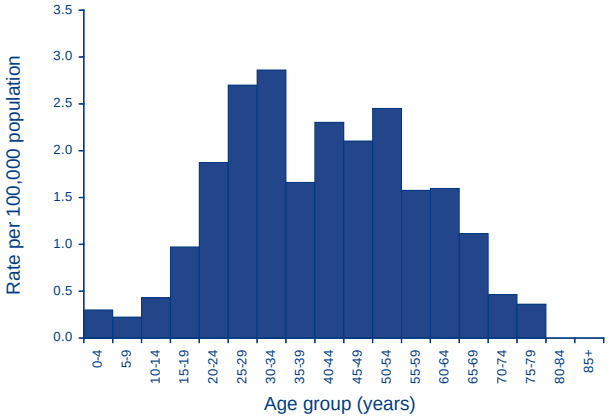


Map 10: Notification number and rate of locally-acquired dengue virus infection, Australia, 2007



In 2007, the highest notification rate for DENV occurred in the 25–34 years age range and the 50–54 years age group (Figure 54). The highest rate for males was in the 45–49 years age group (22 cases) and in females in the 25–29 years age group (22 cases). Fifty-two per cent of DENV cases were male (n=163) and 91% of cases were aged between 15 and 64 years (n=287).

Figure 54: Notification rate for dengue (locally-acquired and imported cases), Australia, 2007, by age group and sex



Japanese encephalitis virus infections

There were no human cases of JEV notified in Australia in 2007. The last JEV notification was reported by Queensland in February 2004 when a 66-year-old male acquired JEV in Papua New Guinea.[57] There have been 9 other cases of JEV reported to NNDSS since 1995, although JEV was not nationally notifiable until 2001.[57] Four of these 9 notifications were reported in Torres Strait Islanders from the Badu Island community.[57] The other locally acquired JEV case was reported in a resident from the Cape York Peninsula, Queensland.[57] The remaining 4 cases were reported as acquired from overseas countries.[57]

Flavivirus infections (NEC)

There were 22 flavivirus infection (not elsewhere classified) notifications during 2007; notified by Queensland (n=18) and Victoria (n=4).

There were 3 Kokobera virus notifications from Queensland in this category.

Malaria

There were 567 notifications of overseas acquired malaria in Australia in 2007, compared with 772 notifications in 2006 (Figure 55). There were no reports of locally acquired malaria in 2007. The majority of cases were reported by Queensland (34%), Victoria (20%), New South Wales (17%) and Western Australia (15%). Queensland reported that 87 of 193 notifications were acquired in Papua New Guinea.

The largest number (n=70) of malaria notifications was in the 20–24 years age group (Figure 56). Sixty-five per cent of malaria notifications were for males.

The infecting *Plasmodium* species was reported for 97% of malaria notifications in 2007 (Table 18). Of these 567 notifications, *P. falciparum* and *P. vivax* were the predominant species.

Figure 55: Notifications of malaria, Australia, 2002 to 2007, by month and year of onset

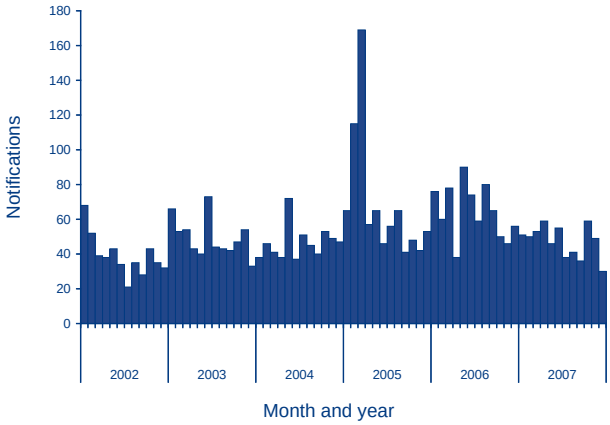


Figure 56: Notifications of malaria, Australia, 2007, by age group and sex

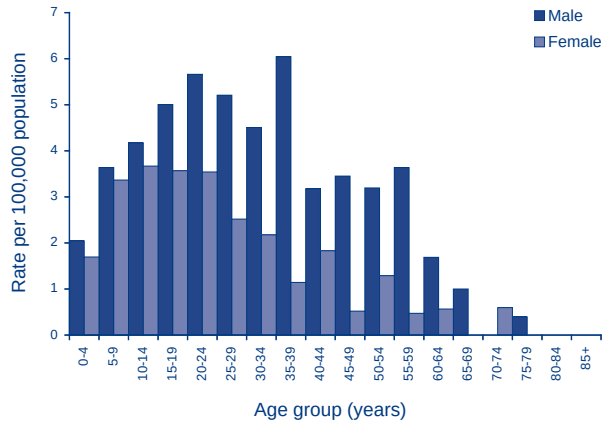


Table 18: Notifications of malaria, Australia, 2007, by parasite type and state or territory

Parasite type	State or territory								Aust	Type (%)
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Plasmodium falciparum	2	32	24	88	17	10	39	51	263	46
Plasmodium malariae	0	2	0	2	0	0	3	3	10	2
Plasmodium ovale	1	2	0	5	0	0	4	6	18	3
Plasmodium vivax	7	58	5	98	7	3	63	12	253	45
Plasmodium species	2	3	0	0	0	0	0	11	16	3
Mixed *P. falciparum* and other species*	0	0	0	0	0	1	4	0	5	1
Mixed other species*	0	0	0	0	0	0	0	2	2	0
Total	12	97	29	193	24	14	113	85	567	

* 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 1 notification for each species in a mixed infection.

Zoonoses

Zoonoses are 'those diseases and infection which are naturally transmitted between vertebrate animals and man'.[58] Approximately 60%–70% of emerging human infectious diseases are zoonoses[59,60] and more than 70% of emerging zoonoses originate from wildlife.[59] An emerging zoonosis is defined by WHO as 'a zoonosis that is newly recognised or newly evolved, or that has occurred previously but shows an increase in incidence or expansion in geographical, host or vector range'.[61]

In 2007, zoonotic diseases notifiable to NNDSS were anthrax, Australian bat lyssaviral or lyssaviral (unspecified) infection, brucellosis, leptospirosis, ornithosis, Q fever, and tularaemia. During 2007, 687 notifications of zoonotic disease (0.5% of total notifications) were made to NNDSS. Queensland accounted for 40% (278 cases) of the zoonotic diseases. Notification numbers were generally higher in males (72%, 497 cases). Notifications of cases aged less than 15 years accounted for 4%, (27 cases) of all notifications. There were no cases of tularaemia reported to NNDSS during 2007.

Anthrax

Anthrax is primarily a disease of herbivores; humans and carnivores are incidental hosts.[17] Anthrax has a low prevalence in animals, and occurs only sporadically in Australia.[62] It can be an occupational hazard for veterinarians, and agriculture and wildlife workers who handle infected animals.

One case of cutaneous anthrax was reported to NNDSS in 2007. The case was a male knackery worker from northern Victoria, and who had contact with 2 cattle that were subsequently confirmed to have died of anthrax.[63] Over the previous 10 years, only 2 other human cases of anthrax had been reported in Australia, both the cutaneous form, in 1998 and 2006 respectively.[19, 64] Australia has never recorded a human case of inhalational or gastrointestinal anthrax.

In 2007, 13 outbreaks of anthrax were reported in livestock. Twelve outbreaks occurred in New South Wales, where cases have been known to occur in the past, and one in Central Victoria. 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 food production chains.[62]

Australian bat lyssaviral and lyssaviral (unspecified) infections

No cases of either Australian bat lyssaviral or lyssaviral (unspecified) infections were notified during 2007. Previously, 2 known cases of human infection with Australian bat lyssavirus were fatal and occurred in 1996 and 1998 following close contact with an infected bat.[19]

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.[65]

Brucellosis

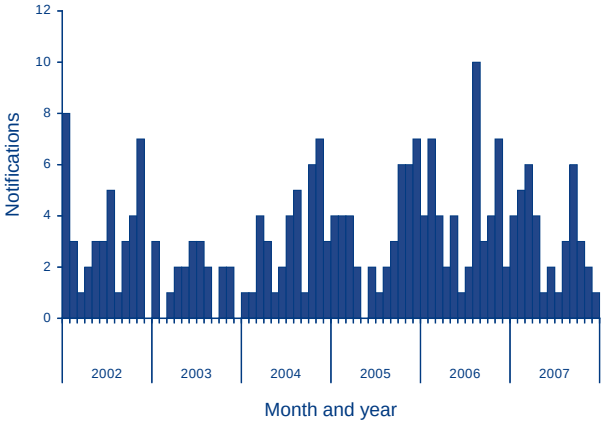
Brucellosis is mainly an occupational disease for farm workers, veterinarians, and abattoir workers who work with infected animals or their tissues.[17]

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

In 2007, 38 cases of brucellosis were reported to NNDSS; a national notification rate of 0.2 cases per 100,000 population. Cases were from Queensland (30 cases), New South Wales (4 cases) and 1 case each from South Australia, Victoria, Tasmania and Western Australia. There was little change in the number of notifications of brucellosis over the last 6 years (Figure 57). In Australia, the notification rate for brucellosis in 2007 was lower than in 2006 (0.28 and 0.24, respectively). The highest notification rate of 53 cases per 100,000 population was reported from the Central West Statistical Division of Queensland. The majority of cases were male (n=28) and aged between 20 and 54 years (n=34).

Species data were available for 39% of notifications (n=15). Of these, nine were *B. suis* (all from Queensland), and 4 cases were *B. melitensis* (a single case in Queensland, Tasmania, Victoria, Western Australia). Each of the notified cases of *B. melitensis* were reported to have had recent history of overseas travel. A single case of *B. abortus* (South Australia) was notified to NNDSS. This case had a recent history of overseas travel to Iraq and reported eating numerous unpasteurised milk products.

Figure 57: Notifications of brucellosis, Australia, 2002 to 2007, by month and year of onset



Bovine brucellosis (*B. abortus*) was eradicated from the Australian cattle herd in 1989 and is presently considered an exotic animal disease in Australia.[62] Caprine and ovine brucellosis (caused by *B. melitensis*) has never been reported in Australian sheep or goats.[62] 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.[62,66]

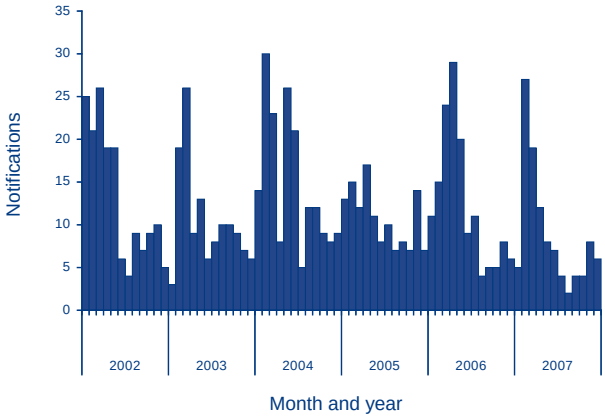
Leptospirosis

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.[17]

Between 2002 and 2006 (Figure 58), annual leptospirosis notifications ranged from 126 (2003) to 177 (2004), with 106 notifications in 2007 (0.5 cases per 100,000 population). Cases were reported in all jurisdictions except the Australian Capital Territory.

In 2007, the majority of notifications were from Queensland (75 notifications, 1.8 cases per 100,000 population). Ninety per cent of leptospirosis cases were male (n=95) and the majority of cases were aged between 15 and 54 years (n=84). The highest notification rate of 21 cases per 100,000 population was reported from the Far North Statistical Division of Queensland.

Figure 58: Notifications of leptospirosis, Australia, 2002 to 2007, by month and year of onset



Ornithosis

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

In 2007, there were 92 ornithosis infections notified to NNDSS, giving a national rate of 0.4 cases per 100,000 population. In Australia, the notification rate for ornithosis in 2007 was lower than in 2006 (0.4 and 0.8, respectively). Between 2002 and 2006, the annual number of ornithosis notifications ranged from 239 (2004) to 164 (2005) (Figure 59).

Victoria had the highest number of notifications (50 notifications, 1.4 cases per 100,000 population). Notifications were also received from New South Wales (34 cases), Western Australia (3 cases), South Australia (2 cases), Queensland (2 cases), and Tasmania (1 case). The majority of cases were male (n=59, 64%). All cases were aged 15 years or older and 78% of cases were 40 years or over (Figure 60).

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.[67] An outbreak in the Blue Mountains in June 2002 was novel in that infections were predominantly associated with wild birds, rather than with pet birds and aviaries as generally reported in the scientific literature.[68] The risk factors for the cases of ornithosis notified in 2007 is unknown.

Figure 59: Notifications of ornithosis, Australia, 2002 to 2007, by month and year of diagnosis

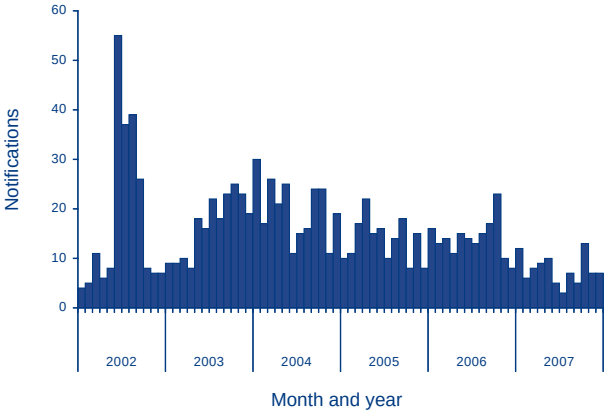
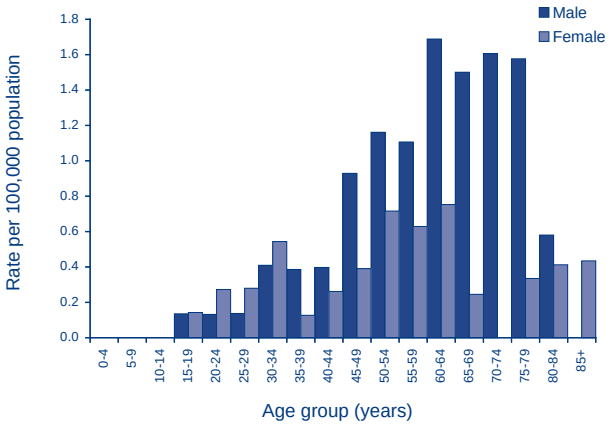


Figure 60: Notification rate for ornithosis, Australia, 2007, by age group and sex

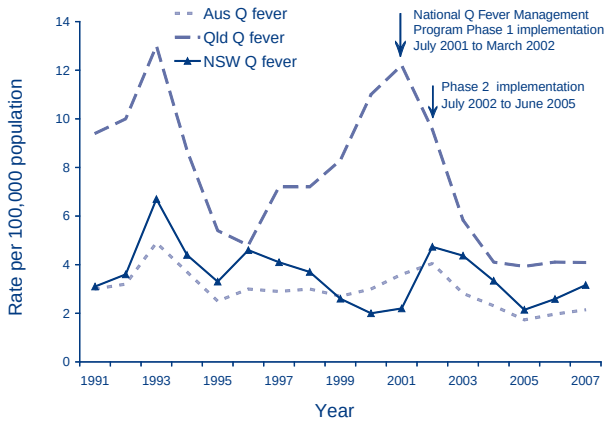


Q fever

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, which 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.[17]

In 2007, 450 cases of Q fever were notified to NNDSS, representing a national rate of 2.1 cases per 100,000 population (Figure 61). Between 1991 and 2001, and prior to the introduction of the National Q Fever Management Program, Q fever notification rates ranged between 2.5 cases per 100,000 population and 4.9 cases per 100,000 population. In Australia, the notification rate for Q fever in 2007 was similar to 2006 (2.1 and 2.10, respectively). Between 2002 and 2006, the annual number of Q fever notifications ranged from 795 (2002) to 353 (2005).

Figure 61: Notification rate for Q fever, Australia, New South Wales and Queensland, 1991 to 2007

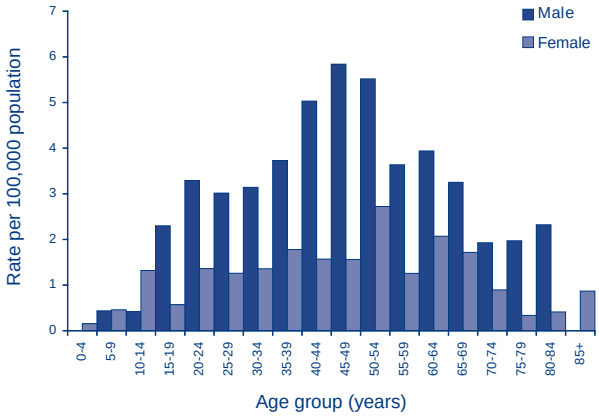


The highest rates of notifications were from Queensland (171 notifications, 4.1 cases per 100,000 population) and New South Wales (215 notifications, 3.2 cases per 100,000 population). The highest notification rate of 88 cases per 100,000 population was reported from the South West Statistical Division of Queensland (Map 11).

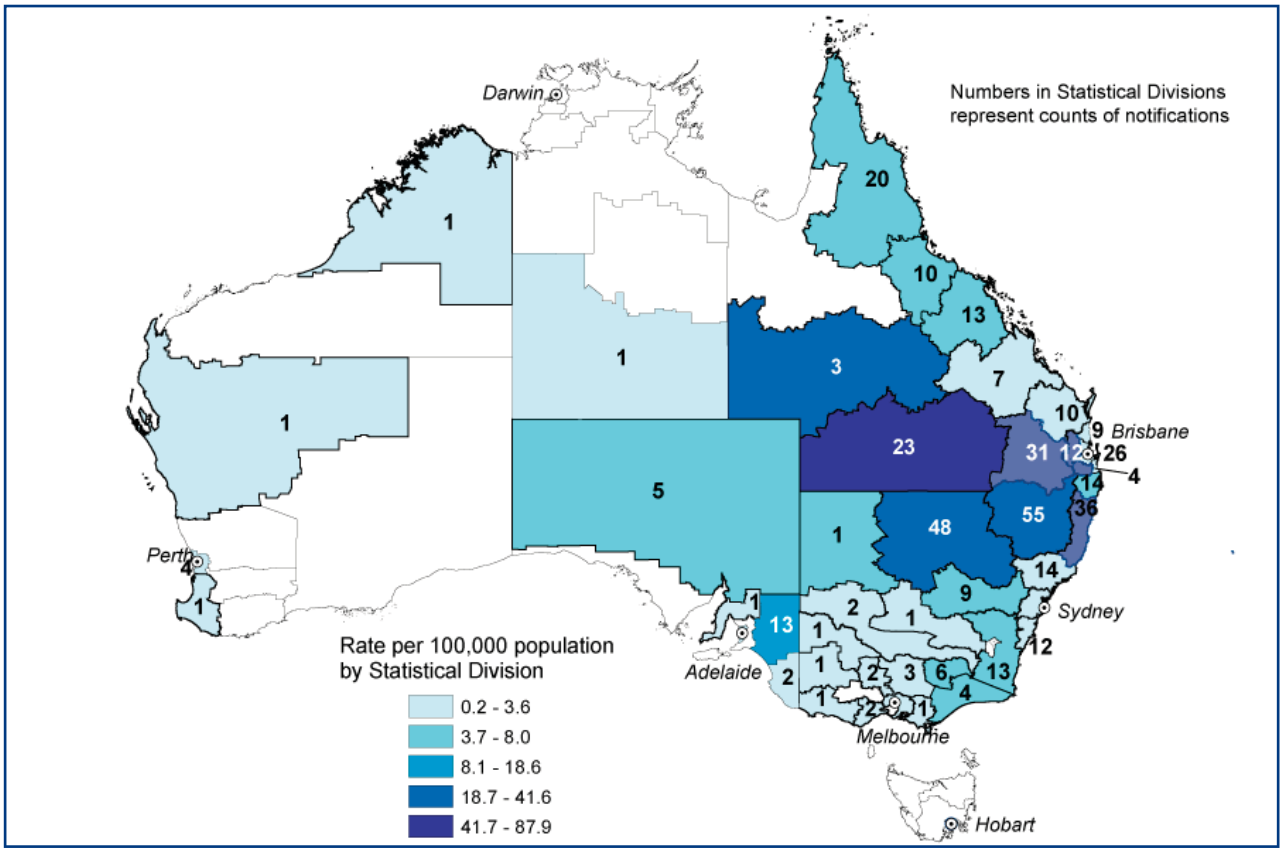
The highest age specific rates (Figure 62) of Q fever were in the 45–49 years age group for males (44 cases, 5.8 cases per 100,000 population), and in the 50–54 years age groups for females (1.8 cases per 100,000 population). There were 19 cases reported in people aged less than 15 years. Seventy per cent of cases were male (314 cases).

The National Q Fever Management Program commenced in July 2001. The program provided funding for free vaccine for people at risk of Q fever from their work environment.[69] Production of the Q fever vaccine in Australia ceased at the end of 2005.[70] 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.[70] Vaccine from the new facility will commence in 2009. 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. The vaccine is not recommended for children under 15 years of age.[13]

Figure 62: Notification rate for Q fever, Australia, 2007, by age group and sex



Map 11: Notification rates for Q fever, Australia, 2007, by Statistical Division of residence and Statistical Subdivision for the Northern Territory



Other bacterial infections

Legionellosis, leprosy, meningococcal infection and tuberculosis were notifiable in all states and territories in 2007 and classified as 'other bacterial infections' in the NNDSS. A total of 1,762 notifications were included in this group in 2007, which accounted for 1.2% of all the notifications to NNDSS, a similar total and proportion as in 2006 (1,866 notifications and 1.3% of total).

Legionellosis

Legionellosis includes notifications of infections caused by all *Legionella* species. There were 307 notifications of legionellosis diagnosed in 2007, giving a national rate of 1.5 cases per 100,000 population. This was a decrease from the 350 cases reported in 2006. State and territory notification rates ranged from 0.6 cases per 100,000 population in Tasmania to 3.8 cases per 100,000 population in Western Australia. Compared with 2006, notification rates in 2007 increased in the Australian Capital Territory (1.2 cases per 100,000 population; 293% increase), New South Wales (1.5 cases per 100,000 population; 33% increase) and Queensland (1.2 cases per 100,000 population, 27% increase). A decrease in notification rates for 2007 compared with 2006 was seen in South Australia (1.1 cases per 100,000 population; 74% decrease), Victoria (0.8 cases per 100,000 population; 40% decrease) and Western Australia (3.8 cases per 100,000 population; 13% decrease). There was a negligible change in the notification rates for the Northern Territory and Tasmania from 2006 to 2007 (1.4 and 0.6 cases per 100,000 population, respectively).

In 2007, the highest number of legionellosis cases was diagnosed in June (36 cases, 12%) of all legionellosis notifications received and December (38 cases, 12%). These peaks were slightly later compared with previous years in which the highest numbers of notifications have generally been observed in autumn and spring months (Figure 63). Notifications of legionellosis by month of diagnosis have ranged between 14 and 43 cases between 2002 and 2007.

In 2007, males accounted for 196 (64%) of the 307 notified cases of legionellosis. There was 1 case of legionellosis (identified as *L. pneumophila*) in a child under the age of 5 years. Overall, the highest age specific notification rate was in the 80–84 years age group, with 6.5 cases per 100,000 population. The highest age specific notification rate among males was for the 80–84 years age group (10.4 cases per 100,000 population, 18 cases) and in females for the 65–69 years age group (3.9 cases per 100,000 population, 16 cases) (Figure 64).

Figure 63: Notifications of legionellosis, Australia, 2002 to 2007, by month of diagnosis

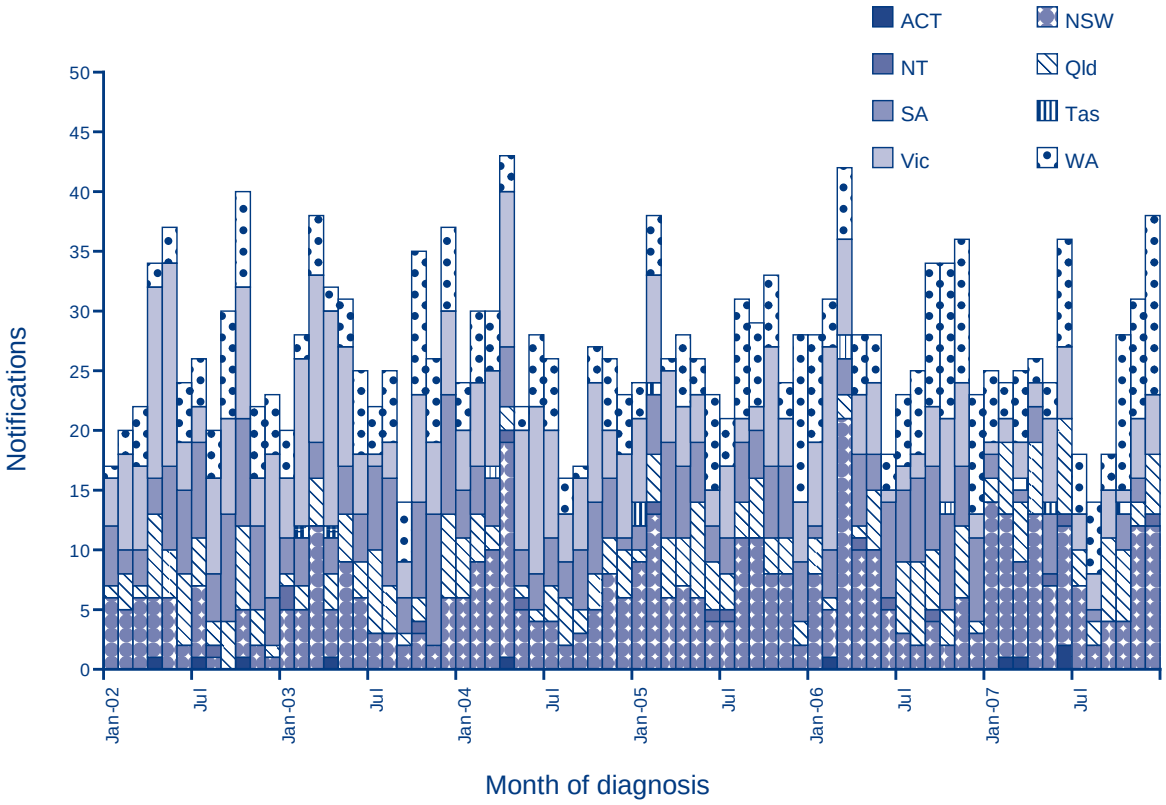
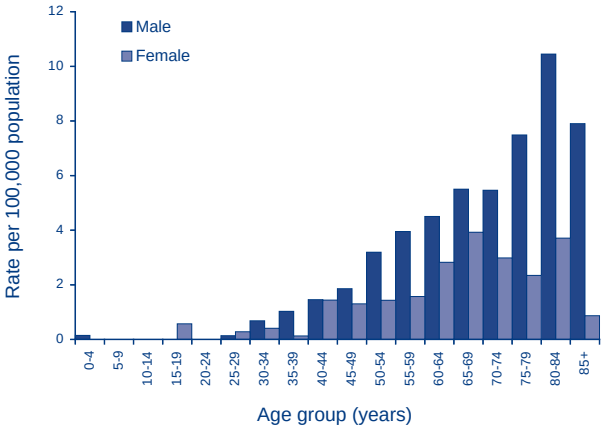


Figure 64: Notification rate for legionellosis, Australia, 2007, by age group and sex



Data on the causative species were available for 277 (90%) of the 307 legionellosis cases. Of these, 141 (51%) cases were identified as *L. pneumophila*, 134 (48%) were *L. longbeachae* and 2 (1%) cases were *L. micdadei* (Table 19).

Of the 141 *L. pneumophila* notifications, serogroup data were available for 75 cases (53%); 73 (97%) of those further typed were *L. pneumophila* serogroup 1.

There were significant differences in the geographic distribution of *L. longbeachae* and *L. pneumophila*, with *L. longbeachae* infections comprising the majority of legionellosis notifications from South Australia and Western Australia, while *L. pneumophila* were 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 144 (47%) notifications. There were 5 reported deaths due to legionellosis in Australia in 2007, giving a case fatality rate of 3.5%. The age range for the deaths was between 58 and 89 years. The break down of deaths by jurisdiction and infecting *Legionella* species is shown in Table 20. There were 2 deaths associated with *L. longbeachae* infection (both in Western Australia), giving a case fatality rate of 1.5%. Three patients with *L. pneumophila* infections died (all from New South Wales), giving a case fatality rate of 2.1%. Case fatality rates may be inaccurate given the large proportion of cases without details of death outcomes.

The number of deaths decreased in 2007, relative to 2006, when there were 9 deaths reported. In 2006, data of death outcomes was reported for 66% of cases, this may in part account for the decrease in reported deaths. The number of deaths associated with legionellosis fell or remained constant in all jurisdictions except New South Wales where there were three more deaths in 2007 than in 2006.

Table 19: Notifications of legionellosis, Australia, 2007, by species and state or territory

Species	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Legionella longbeachae	0	29	2	10	14	2	6	71	134
Legionella micdadei	0	1	0	0	0	0	1	0	2
Legionella pneumophila	0	73	1	28	3	1	34	1	141
Unknown species	4	2	0	14	0	0	1	9	30
Total	4	105	3	52	17	3	42	81	307

Table 20: Deaths due to legionellosis by species, Australia, 2007, by state or territory

Species	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Legionella longbeachae	0	0	0	0	0	0	0	2	2
Legionella micdadei	0	0	0	0	0	0	0	0	0
Legionella pneumophila	0	3	0	0	0	0	0	0	3
Unknown species	0	0	0	0	0	0	0	0	0
Total deaths	0	3	0	0	0	0	0	2	5
Total cases	4	105	3	52	17	3	42	81	307
Number of cases with death status reported	0 (0%)	4 (4%)	3 (100%)	0 (0%)	11 (65%)	3 (100%)	42 (100%)	81 (100%)	144 (47%)

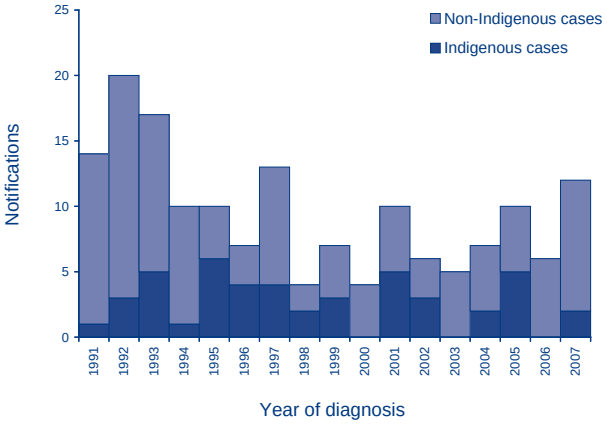
Two large outbreaks of *L. pneumophila* were reported in 2007. One was a cluster of 6 cases related to a contaminated cooling tower near Circular Quay in Sydney.[71] A second was a cluster of 9 cases linked to a cooling tower in the western suburbs in Melbourne.[72]

Leprosy

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 number of leprosy notifications in Indigenous and non-Indigenous Australians and the overall rate are shown in Figure 65.

In 2007, 12 cases of leprosy were notified compared with 6 cases in 2006. There were 4 cases in New South Wales; 2 cases in each of South Australia, Victoria and Western Australia; and a single case in both Queensland and Tasmania. Two of the cases were in Indigenous Australians. The notification from Tasmania was detected in a recent arrival from Africa, who had spent the previous 4 years in Uganda.

Figure 65: Notifications of leprosy, Australia, 1991 to 2007, by indigenous status

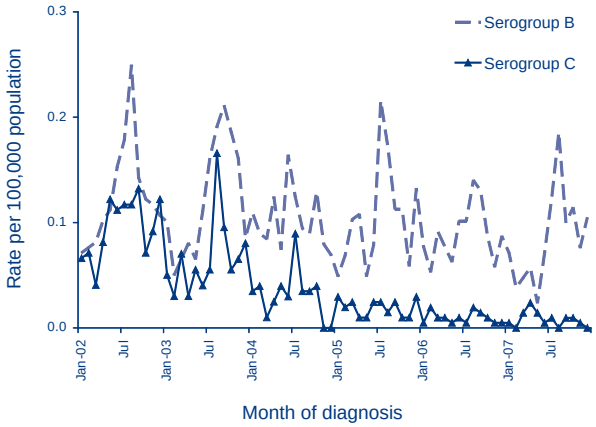


Invasive meningococcal disease

In 2007, there were 304 notifications of invasive meningococcal disease in Australia, a decrease from 317 in 2006. The total number of notifications in 2007 was the lowest since 1996. A decline or stabilisation in notifications was seen in all jurisdictions except New South Wales (112 cases, a 5% increase) and Queensland (75 cases, a 10% increase). The national notification rate in 2007 was 1.4 cases per 100,000 population. The highest rate of notification was reported from the Northern Territory (2.8 cases per 100,000 population; 6 cases).

In 2007, males accounted for 154 of the 304 notified cases of invasive meningococcal disease, giving a male to female ratio of 1:1. As observed in previous years, the largest number of cases, for serogroups B and C, were diagnosed in winter and spring (Figure 66). The majority of cases (285, 94%) were confirmed, through the isolation of *Neisseria meningitidis*, with an additional 19 cases (6%) notified by probable diagnosis, based on clinical symptoms only.

Figure 66: Trends in notification rates (annualised) of invasive meningococcal disease, Australia, 2002 to 2007, by serogroup and month of diagnosis



Of the 285 confirmed invasive meningococcal disease notifications in 2007, 255 (89%) were further typed. Of these, 213 (84%) were serogroup B, 20 (8%) were serogroup C and 22 (9%) were infections with serogroup W (9), serogroup X (1) and serogroup Y (12) (Table 21). In comparison, in 2006, 84% (265/317) of notified cases were serogrouped. Of these serogrouped notified cases 221 (83%) were serogroup B and 46 (15%) were serogroup C. Historically in Australia, serogroups B and C have been the major cause of invasive meningococcal disease.

Serogroup C infections were largely confined to Victoria, New South Wales and Queensland in 2007, similar to recent previous years when it has also been more predominant in the eastern states.

The highest age specific invasive meningococcal disease notification rate in 2007 was in children aged 0–4 years with a rate of 8.1 cases per 100,000 population (108 cases). Of the cases reported in this age group, 74% (80/108) were due to serogroup B infections, which represents the highest age specific

rate for serogroup B infection across all age groups, at a rate of 6.0 cases per 100,000 population. Figure 67 shows the decline in rates of serogroup B infections in most age groups over the period from 2002 to 2007, the greatest of which is in the 0–4 years age group, from 8.9 cases per 100,000 population in 2002.

There has been a marked decrease in notification rates for invasive meningococcal disease caused by serogroup C since 2003, when the National Meningococcal C Vaccination Program was introduced (Figure 68). Under the program, all children turning 12 months of age have been eligible to receive free meningococcal C vaccine since 2003. The program also provided free meningococcal C vaccine for all children and adolescents who were aged 1–19 years in 2003 until 30 June 2006.[13] The greatest decline in the rate of serogroup C disease since the introduction of the program is in the 15–19 years age group, from 4.9 cases per 100,000 population in 2002 (67 cases) to 0.1 cases per 100,000 population in 2007 (2 cases). The rates in the 20–24 years age group fell also from 2.5 cases per 100,000 population (33 cases) to 0.2 cases per 100,000 population (3 cases) over the same period. Rates in the 0–4 years age group fell from 2 cases per 100,000 population in 2002 (26 cases) to 0.3 cases per 100,000 population (4 cases) in 2007.

Death data for meningococcal cases were available for 123 (40%) notifications. There were 9 deaths due to meningococcal disease in 2007, corresponding to a case fatality rate of 30%. The break down of deaths by state or territory and serogroup is shown in Table 22. There were 5 deaths due to serogroup B (case fatality rate of 2.3%) and 3 deaths due to serogroup C disease (case fatality rate of 15.0%). Overall there was a decrease in deaths of meningococcal cases from 12 deaths in 2006 (death data was provided for 45% of cases in 2006).

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,

Figure 67: Notification rate for serogroup B invasive meningococcal disease, Australia, 2002 to 2007, by age group

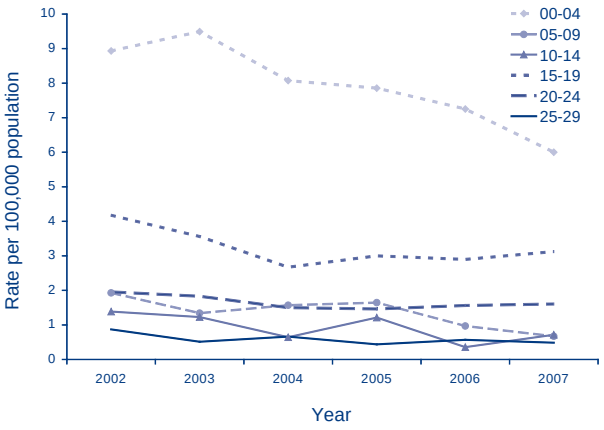


Figure 68: Notification rate for serogroup C invasive meningococcal disease infection, Australia, 2002 to 2007, by age group

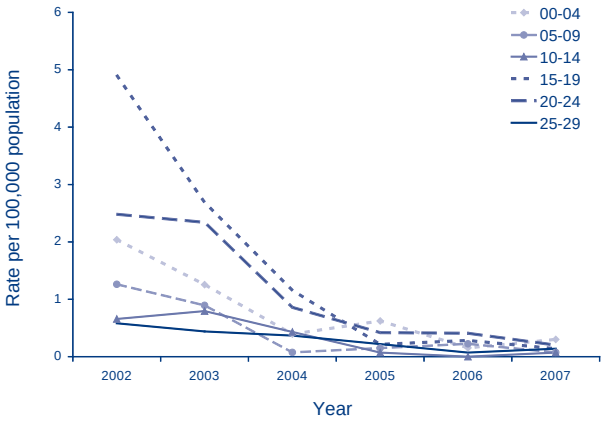


Table 21: Notifications of invasive meningococcal disease, Australia, 2007, by serogroup and state or territory

Species	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Serogroup B	3	77	4	59	0	3	48	19	213
Serogroup C	0	10	2	6	0	0	2	0	20
Other serogroups*	0	7	0	6	0	2	7	0	22
Unknown serogroup	0	18	0	4	15	0	11	1	49
Total	3	112	6	75	15	5	68	20	304

* Serogroup W (9), serogroup X (1) and serogroup Y (12).

Table 22: Deaths due to meningococcal infection, Australia, 2007, by serogroup and state or territory

Species	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Serogroup B	0	0	0	4	0	0	1	0	5
Serogroup C	0	3	0	0	0	0	0	0	3
Serogroup W135	0	0	0	0	0	0	0	0	0
Serogroup unknown	0	1	0	0	0	0	0	0	1
Total deaths	0	4	0	4	0	0	1	0	9
Total cases	3	112	6	75	15	5	68	20	304
Number of cases with death status reported	0 (0%)	4 (4%)	6 (100%)	5 (7%)	15 (100%)	5 (100%)	68 (100%)	20 (100%)	123 (40%)

Laboratory based meningococcal surveillance

serotype and serosubtype) and the susceptibility of *N. meningitidis* to a core group of antibiotics. The results of laboratory surveillance in 2007 have recently been published.[73]

In 2007, a total of 242 laboratory confirmed cases of invasive meningococcal disease were reported by the AMSP. Consistent with the NNDSS data, the AMSP reported that 85% (192 cases) were identified as serogroup B and 6.2% (14 cases) were serogroup C. 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. One serogroup B isolate had decreased susceptibility to ciprofloxacin.

Tuberculosis

While Australia has one of the lowest rates of tuberculosis (TB) in the world, the disease remains a public health problem in those born overseas and for Indigenous Australians. In 2007, 1,139 TB notifications were received by NNDSS, a rate of 5.4 cases per 100,000 population. In 2006, there were 1,193 cases notified nationally, a rate of 5.8 cases per 100,000 population. The notification rate for TB was higher than the national average in the Northern Territory (24.7 cases per 100,000 population; 53 cases), while the lowest rate occurred in Tasmania (1.2 cases per 100,000 population; 6 cases).

Further details and analysis of TB notifications in 2007 can be found in the TB annual report to be published in the next edition of *CDI*.

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Appendices

Appendix 1: Mid-year estimate of Australian population, 2007, by state or territory

	State or territory								Aus
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Male	168,286	3,411,349	111,564	2,087,631	782,397	243,329	2,574,901	1,063,849	10,443,306
Female	171,475	3,476,665	103,365	2,093,800	801,800	250,042	2,629,925	1,042,270	10,569,342
Total	339,761	6,888,014	214,929	4,181,431	1,584,197	493,371	5,204,826	2,106,119	21,012,648

Appendix 2: Mid-year estimate of Australian population, 2007, by state or territory and age group

Age group	State or territory								Aus
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
0-4	21,520	439,789	17,796	273,762	91,141	30,826	323,304	135,058	1,333,196
5-9	20,394	439,395	17,294	279,148	95,059	31,554	321,503	136,950	1,341,297
10-14	21,378	453,954	16,675	292,031	101,242	34,139	336,480	144,378	1,400,277
15-19	24,582	464,616	16,109	292,467	106,055	34,020	352,964	149,326	1,440,139
20-24	29,940	475,958	17,577	300,294	110,292	31,330	375,415	153,180	1,493,986
25-29	28,475	476,275	18,205	284,620	99,082	27,850	366,075	143,719	1,444,301
30-34	26,090	488,027	18,043	290,632	100,396	28,907	370,569	145,398	1,468,062
35-39	26,224	505,006	18,020	311,163	112,606	33,811	398,081	159,872	1,564,783
40-44	24,548	493,360	16,356	301,893	113,996	34,164	378,267	157,233	1,519,817
45-49	24,741	497,145	15,504	301,625	116,684	37,270	373,230	155,505	1,521,704
50-54	22,597	451,038	13,775	273,427	108,731	34,981	339,190	143,217	1,386,956
55-59	20,494	411,232	11,292	254,406	101,507	32,915	308,318	128,738	1,268,902
60-64	15,596	350,168	7,746	214,454	86,285	28,585	258,711	102,723	1,064,268
65-69	10,589	268,492	4,790	158,228	65,666	21,673	200,574	77,505	807,517
70-74	7,838	220,260	2,563	120,039	54,739	17,149	164,073	59,602	646,263
75-79	6,218	190,522	1,674	99,364	49,065	14,404	141,800	49,147	552,194
80-84	4,837	143,766	911	72,712	38,991	10,846	107,534	35,264	414,861
85+	3,700	119,011	599	61,166	32,660	8,947	88,738	29,304	344,125
Total	339,761	6,888,014	214,929	4,181,431	1,584,197	493,371	5,204,826	2,106,119	21,012,648

Appendix 3: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2007, by notifiable disease

Disease	Aboriginal but not Torres Strait Islander origin	Torres Strait Islander but not Aboriginal origin	Aboriginal and Torres Strait Islander origin	Not indigenous	Not stated (blank/ missing/null)	Total	Complete	Number complete	Number incomplete
Anthrax				1	-	1	100	1	-
Botulism				1	-	1	100	1	-
Donovanosis	2			1	-	3	100	3	-
Kunjin virus infection				1	-	1	100	1	-
Poliomyelitis				1	-	1	100	1	-
Rubella - congenital				2	-	2	100	2	-
Typhoid				87	3	90	97	87	3
Tuberculosis	23	7		1,066	43	1,139	96	1,096	43
Meningococcal infection	26	6		260	12	304	96	292	12
Haemophilus influenzae type b	7			9	1	17	94	16	1
Syphilis < 2 years duration	186	4	2	1,107	82	1,381	94	1,299	82
Leprosy	2			9	1	12	92	11	1
Measles	1			10	1	12	92	11	1
Haemolytic uraemic syndrome				17	2	19	89	17	2
Legionellosis	7			254	46	307	85	261	46
Varicella zoster (chickenpox)	157	12	3	1,224	255	1,651	85	1,396	255
Hepatitis E				15	3	18	83	15	3
Hepatitis C (incident)	27			268	60	355	83	295	60
Hepatitis A				136	29	165	82	136	29
Listeriosis				41	9	50	82	41	9
Varicella zoster (shingles)	53	9	2	1,186	297	1,547	81	1,250	297
Ornithosis				74	18	92	80	74	18
Pneumococcal disease (invasive)	146	8	4	1,004	313	1,475	79	1,162	313
Hepatitis B (incident)	14	2		207	64	287	78	223	64
Shigellosis	266	1	3	190	137	597	77	460	137
Malaria	2	1		430	134	567	76	433	134
Leptospirosis	6	1	1	72	26	106	75	80	26
Hepatitis D	2			23	9	34	74	25	9

Appendix 3: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2007, by notifiable disease, *continued*

Disease	Aboriginal but not Torres Strait Islander origin	Torres Strait Islander but not Aboriginal origin	Aboriginal and Torres Strait Islander origin	Not indigenous	Not stated (blank/ missing/null)	Total	Complete	Number complete	Number incomplete
STEC, VTEC	3			75	29	107	73	78	29
Rubella				26	10	36	72	26	10
Gonococcal infection	3,323	156	39	1,810	2,277	7,605	70	5,328	2,277
Brucellosis	1			25	12	38	68	26	12
Mumps	125		1	270	183	579	68	396	183
Dengue virus infection	3			210	101	314	68	213	101
Q fever	13	2		288	147	450	67	303	147
Cholera				2	1	3	67	2	1
Tetanus				2	1	3	67	2	1
Syphilis > 2 years or unspecified duration	319	18	3	712	566	1,618	65	1,052	566
Syphilis - congenital	3			2	3	8	63	5	3
Cryptosporidiosis	186	2	1	1,471	1,150	2,810	59	1,660	1,150
Arbovirus infection (NEC)				11	11	22	50	11	11
Salmonellosis	436	16	12	4,126	4,894	9,484	48	4,590	4,894
Campylobacteriosis	185	5	4	7,727	9,063	16,984	47	7,921	9,063
Hepatitis B (unspecified)	296	39	5	2,705	3,872	6,917	44	3,045	3,872
Chlamydial infection	4,339	562	146	17,720	29,092	51,859	44	22,767	29,092
Influenza (laboratory confirmed)	270	18	18	4,124	5,973	10,403	43	4,430	5,973
Hepatitis C (unspecified)	491	4	13	3,729	7,740	11,977	35	4,237	7,740
Pertussis	35	4	1	1,832	3,452	5,324	35	1,872	3,452
Ross River virus infection	64	6	3	1,252	2,878	4,203	32	1,325	2,878
Varicella zoster (unspecified)	57	6	2	1,099	3,134	4,298	27	1,164	3,134
Barmah Forest virus infection	18	4		413	1,281	1,716	25	435	1,281

Abbreviations

ABS	Australian Bureau of Statistics
AFP	acute flaccid paralysis
AGSP	Australian Gonococcal Surveillance Programme
AIDS	acquired immunodeficiency syndrome
AMSP	Australian Meningococcal Surveillance Programme
ANCJDR	Australian National Creutzfeldt-Jakob Disease Registry
APSU	Australian Paediatric Surveillance Unit
BFV	Barmah Forest virus
CDI	Communicable Diseases Intelligence
CDNA	Communicable Diseases Network Australia
CJD	Creutzfeldt-Jakob disease
DENV	dengue virus
DHS	Department of Human Services (Victoria)
Hib	*Haemophilus influenzae* type b
HIV	human immunodeficiency virus
HPAIH	highly pathogenic avian influenza in humans
HPV	human papilloma virus
HUS	haemolytic uraemic syndrome
IPD	invasive pneumococcal disease
JEV	Japanese encephalitis virus
KUNV	Kunjin virus
MMR	measles-mumps-rubella
MVEV	Murray Valley encephalitis virus
NAMAC	National Arbovirus and Malaria Advisory Committee
NCHECR	National Centre in HIV Epidemiology and Clinical Research
NEC	not elsewhere classified
NIP	National Immunisation Program
NN	not notifiable
NNDSS	National Notifiable Diseases System
NPRL	National Polio Reference Laboratory
NSC	National Surveillance Committee
PEC	Poliovirus Expert Committee
PCR	polymerase chain reaction
PPNG	penicillinase-producing' *Neisseria gonorrhoeae*
QRNG	quinolone resistant *Neisseria gonorrhoeae*
RRV	Ross River virus
SARS	severe acute respiratory syndrome
SD	Statistical Division
SSD	Statistical Subdivision
STEC	Shiga toxin-producing *Escherichia coli*
STI(s)	sexually transmissible infections(s)
TB	tuberculosis
VPD(s)	vaccine preventable disease(s)
VTEC	verotoxigenic *Escherichia coli*
WHO	World Health Organization
WPV	wild-type polio virus

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