Annual reports

Australia's notifiable disease status, 2010: Annual report of the National Notifiable Diseases Surveillance System

NNDSS Annual Report Writing Group

Abstract

In 2010, 65 diseases and conditions were nationally notifiable in Australia. States and territories reported a total of 209,079 notifications of communicable diseases to the National Notifiable Diseases Surveillance System, a decrease of 12% on the number of notifications in 2009. This decrease was largely due to a reduction of influenza compared with the influenza A(H1N1) pandemic 2009. In 2010, the most frequently notified diseases were sexually transmissible infections (86,620 notifications, 41.4% of total notifications), vaccine preventable diseases (61,964 notifications, 29.6% of total notifications), and gastrointestinal diseases (31,548 notifications, 15.1% of total notifications). There were 18,302 notifications of bloodborne diseases; 8,244 notifications of vectorborne diseases; 1,866 notifications of other bacterial infections; 532 notifications of zoonoses and 3 notifications of quarantinable diseases. *Commun Dis Intell* 2012;35(1):1–69.

Keywords: Australia, communicable diseases, epidemiology, surveillance

Introduction

Australia's notifiable diseases status, 2010, 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 respective 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. Under the Agreement, in 2010 states and territories forwarded de-identified data on the nationally agreed set of 65 communicable diseases to the Department of Health and Ageing for the purposes of national communicable disease surveillance, although not all 65 diseases were notifiable in each jurisdiction. Data were renewed electronically from states and territories, daily or several times a week.

In 2010, the National Notifiable Diseases Surveillance System (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 central agency in the jurisdiction was notified (notification receive date). In addition, the following core but non-mandatory data fields were supplied where possible: date of birth;

age at onset; sex; Indigenous status; postcode of residence; disease onset date; date when the medical practitioner signed the notification form (notification date), death status, date of specimen collection and outbreak reference number (to identify cases linked to an outbreak). Where relevant, information on the species, serogroups/subtypes and phage types of organisms isolated, and on the vaccination status of the case were collected and reported to NNDSS. Data quality was monitored by the Office of Health Protection and the National Surveillance Committee (NSC) and there was a continual process of improving the national consistency of communicable disease surveillance through the daily, fortnightly and quarterly review of these data.

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

Newly diagnosed HIV infection and AIDS were notifiable conditions in each state or territory health jurisdiction in 2010 and were forwarded to the Kirby Institute for infection and immunity in society. Further information can be found in the Kirby Institute'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.

Notification rates for each notifiable disease were calculated using the estimated 2010 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 the direct method of standardisation. for gastrointestinal diseases, or indirect method for sexually transmissible infections, with 2006 census data as the standard population. All rates are represented as the rate per 100,000 population unless stated otherwise.

The 2 maps produced for this report (chlamydia and pertussis) were created with ArcGIS mapping software (ESRI, Redlands, CA) and based on the NNDSS notifications' residential postcode. Notifications were summed by the postcode weighting calculated by the ABS Postcode Concordance.[8] These ABS concordance data were used to proportionally allocate notifications into SDs/SSDs according to the percentage of the population of the postcode living in the region. The total notifications per region are displayed in the relevant area.

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

Disease rates were calculated per 100,000 population for the relevant areas using ABS population data.[7] Rates were mapped for different SDs and ordered into 5 groups using the Jenks Natural Breaks method whereby the largest breaks between natural clusters of ordered data were identified and used as class boundaries. A class '0' was added to account for areas with no notifications, for a total of 6 rate classes per map. Note that the classification is data dependent and changes from map to map.

Notes on interpretation

The present report is based on 2010 'finalised' data from each state or territory agreed upon in June 2011 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. For the purposes of NNDSS, 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.

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] has been established, some diseases are not yet notifiable in all 8 jurisdictions (Table 2).

Changes in surveillance practices may have been introduced in some jurisdictions and not in others, which 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 2010 data.

Postcode information usually reflects the residential location of the case, but this does not necessarily represent the place where the disease was acquired.

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 of data completeness was defined as:

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

The Indigenous status was defined by the following nationally accepted values:[9]

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

Figure 1: Communicable diseases notifiable fraction

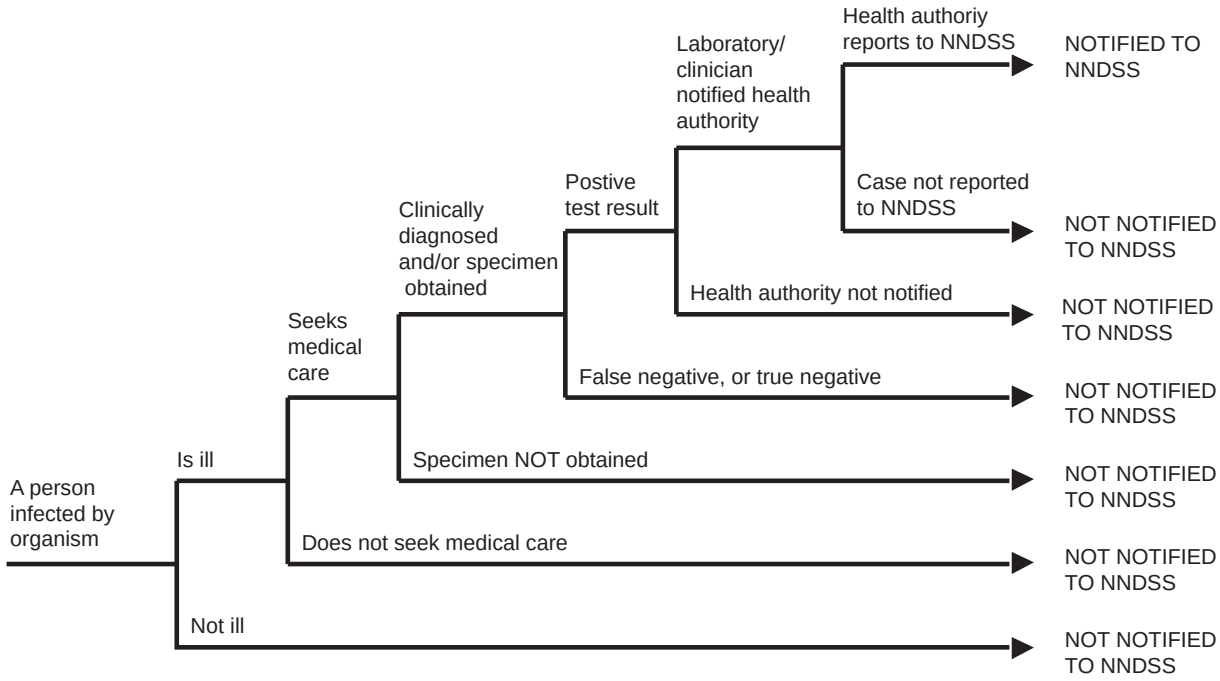
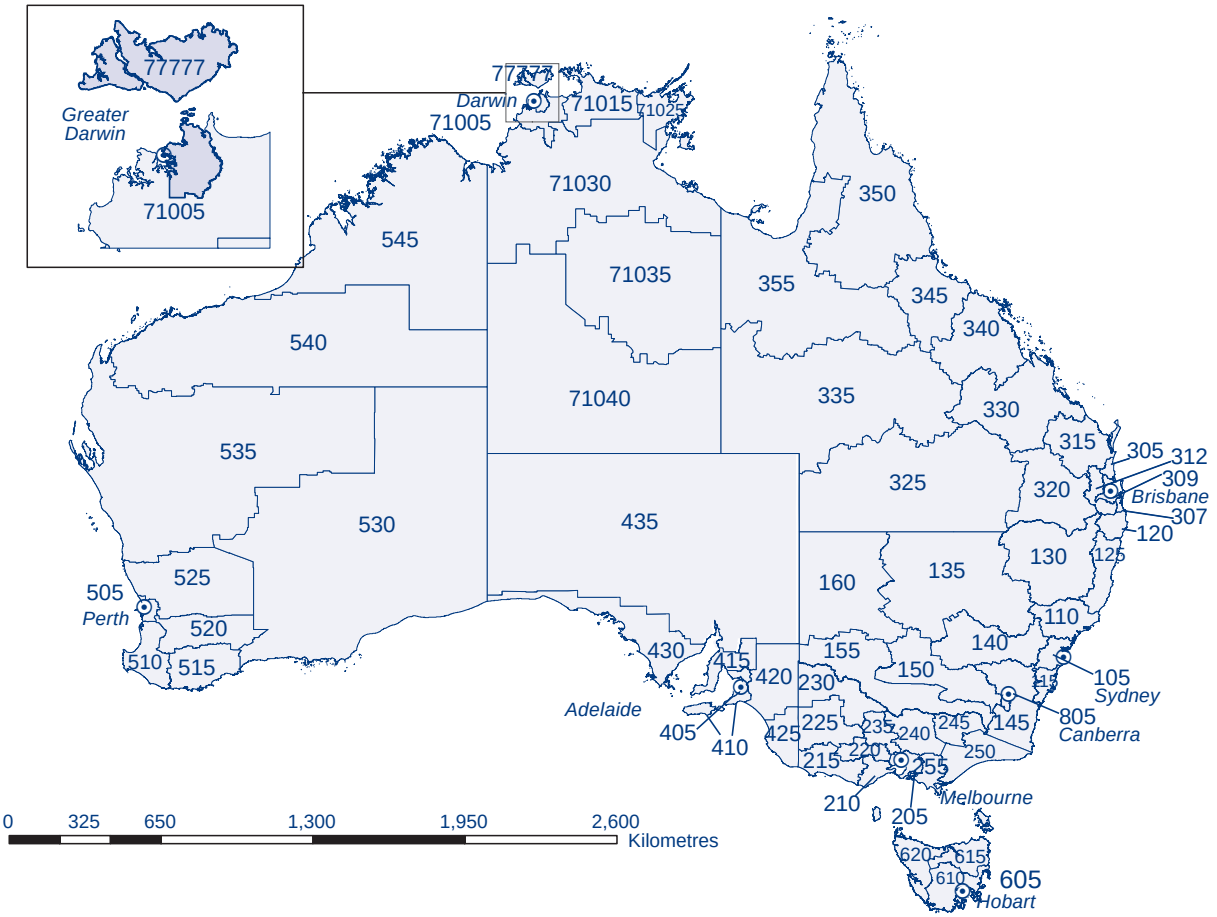


Table 1: Australian population by Statistical Division and Statistical Subdivision for the Northern Territory, 2009

SD code	Statistical Division	Population
Australian Capital Territory		
805	Canberra	351,868
810	ACT balance	Included above
New South Wales		
105	Sydney	4,575,532
110	Hunter	651,622
115	Illawarra	436,117
120	Richmond–Tweed	244,085
125	Mid-North Coast	313,322
130	Northern	186,496
135	North Western	119,329
140	Central West	184,921
145	South Eastern	219,655
150	Murrumbidgee	159,624
155	Murray	119,302
160	Far West	22,584
Northern Territory (Subdivisions)		
71005	Finniss	2,906
71015	Alligator	6,908
71025	East Arnhem	16,252
71030	Lower Top End NT	24,170
71035	Barkly	8,137
71040	Central NT	41,272
77777	Greater Darwin	130,066
Queensland		
305	Brisbane	2,043,185
307	Gold Coast	527,828
309	Sunshine Coast	330,934
312	West Moreton	97,414
315	Wide Bay–Burnett	293,455
320	Darling Downs	241,537
325	South West	26,489
330	Fitzroy	223,516
335	Central West	12,387
340	Mackay	176,236
345	Northern	231,628
350	Far North	275,058
355	North West	34,183
South Australia		
405	Adelaide	1,203,186
410	Outer Adelaide	139,489
415	Yorke and Lower North	47,585
420	Murray Lands	70,705
425	South East	66,724
430	Eyre	35,892
435	Northern	81,001
Tasmania		
605	Greater Hobart	214,705
610	Southern	37,838
615	Northern	142,311
620	Mersey–Lyell	112,789
Victoria		
205	Melbourne	4,077,036
210	Barwon	290,277
215	Western District	107,072
220	Central Highlands	158,627
225	Wimmera	50,903
230	Mallee	95,213
235	Loddon	186,201
240	Goulburn	212,799
245	Ovens–Murray	101,086
250	East Gippsland	87,872
255	Gippsland	178,846
Western Australia		
505	Perth	1,696,065
510	South West	253,512
515	Lower Great Southern	59,412
520	Upper Great Southern	19,100
525	Midlands	56,435
530	South Eastern	59,070
535	Central	65,600
540	Pilbara	48,610
545	Kimberley	35,706
Other territories		–
Australia	**Total**	22,326,388

Source: ABS 3235.0 Regional Population Growth, Australia, 4 August 2011.[8]

Map 1: Australian Bureau of Statistics Statistical Division codes, Australia, and Statistical Subdivision codes, Northern Territory, 2010



Notes on case definitions

Each notifiable disease is governed by a national surveillance case definition for reporting to the 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. These case definitions are reviewed by the Case Definitions Working Group* (CDWG) on a regular basis, or earlier if the PHLN laboratory case definitions change, relevant new evidence or guidelines emerge, or other significant issues are identified.

The national surveillance case definitions and their review status are available from http://www.health.gov.au/casedefinitions

* The CDWG is a working group of the CDNA.

Results

There were 209,079 communicable disease notifications received by NNDSS in 2010 (Table 3).

In 2010, the most frequently notified diseases were sexually transmissible infections (n = 86,620, 41.4%), vaccine preventable diseases (n = 61,964, 29.6%), and gastrointestinal diseases (n = 31,548, 15.1%) (Table 3).

There were 18,302 notified cases of bloodborne diseases; 8,244 notified cases of vectorborne diseases; 1,866 notified cases of other bacterial infections; 532 notified cases of zoonoses and 3 notified cases of quarantinable diseases. There was a decrease of 12% compared with the total number of notifications in 2009 (Figure 2). This decrease was largely due to the number of cases of influenza A(H1N1) pandemic 2009 in 2009.

Table 2: Diseases notified to the National Notifiable Diseases Surveillance System, Australia 2010

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

Table 2 *cont'd*: Diseases notified to the National Notifiable Diseases Surveillance System, Australia 2010

Disease	Data received from
Vectorborne diseases	
Arbovirus infection (NEC)	All jurisdictions
Barmah Forest virus infection	All jurisdictions
Dengue virus infection	All jurisdictions
Japanese encephalitis virus infection	All jurisdictions
Kunjin virus infection	All jurisdictions
Malaria	All jurisdictions
Murray Valley encephalitis virus infection	All jurisdictions
Ross River virus infection	All jurisdictions
Zoonoses	
Anthrax	All jurisdictions
Australian bat lyssavirus	All jurisdictions
Brucellosis	All jurisdictions
Leptospirosis	All jurisdictions
Lyssavirus (NEC)	All jurisdictions
Ornithosis	All jurisdictions
Q fever	All jurisdictions
Tularaemia	All jurisdictions
Other bacterial infections	
Legionellosis	All jurisdictions
Leprosy	All jurisdictions
Meningococcal disease (invasive)	All jurisdictions
Tuberculosis	All jurisdictions

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

NEC Not elsewhere classified.

Notifications and notification rates per 100,000 population for each disease by state or territory, in 2010, are shown in Table 4 and Table 5 respectively. Trends in notifications and rates per 100,000 population for the period 2005 to 2010 are shown in Table 6.

The year in which diseases became notifiable to NNDSS in each jurisdiction is shown in Table 7.

Table 3: Notifications to the National Notifiable Diseases Surveillance System, Australia, 2010, by disease category rank order

Disease category	Number	%
Sexually transmitted infections	86,620	41.4
Vaccine preventable diseases	61,964	29.6
Gastrointestinal diseases	31,548	15.1
Bloodborne diseases	18,302	8.8
Vectorborne diseases	8,244	3.9
Other bacterial diseases	1,866	0.9
Zoonoses	532	0.3
Quarantinable diseases	3	0.0
Total	209,079	100.0

The major changes in communicable disease notifications in 2010 are shown in Figure 3 as the ratio of notifications in 2009 to the mean number of notifications for the previous 5 years. Pertussis, gonococcal infection, chlamydial infection and salmonellosis all exceeded the expected range (5-year mean plus 2 standard deviations).

Figure 2: Trends in notifications received by the National Notifiable Diseases Surveillance System, Australia, 1991 to 2010, by year

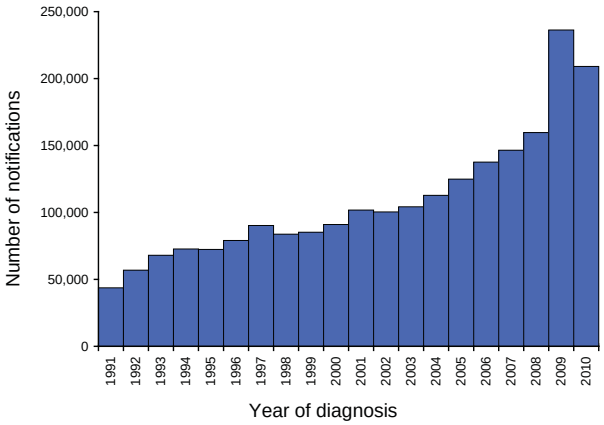


Table 4: Notifications of communicable diseases, Australia, 2010, by state or territory

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 (newly acquired)*	3	34	3	59	21	6	69	33	228
Hepatitis B (unspecified)†	93	2,432	157	1,070	409	51	1,891	775	6,878
Hepatitis C (newly acquired)*	12	36	0	NN	46	22	162	80	358
Hepatitis C (unspecified)†,‡	211	3,517	172	2,742	485	241	2,441	994	10,803
Hepatitis D	0	9	0	20	0	0	6	0	35
Gastrointestinal diseases									
Botulism	0	0	0	0	0	0	0	0	0
Campylobacteriosis§	552	NN	165	4,788	1,768	726	6,644	2,323	16,966
Cryptosporidiosis	12	349	97	302	47	100	431	142	1,480
Haemolytic uraemic syndrome	0	3	0	2	0	0	3	0	8
Hepatitis A	5	83	3	41	4	4	91	32	263
Hepatitis E	2	15	0	7	0	0	11	3	38
Listeriosis	2	26	0	9	1	3	27	3	71
Salmonellosis	212	3,822	559	2,940	665	235	2,283	1,277	11,993
Shigellosis	7	117	75	93	54	5	87	114	552
STEC,VTEC‖	0	10	0	18	33	0	12	8	81
Typhoid fever	2	31	2	20	5	1	24	11	96
Quarantinable diseases									
Cholera	0	2	0	0	0	0	0	1	3
HPAIH	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¶,**	1,157	18,278	2,662	19,216	4,330	2,008	16,474	10,180	74,305
Donovanosis	0	0	0	1	0	0	0	0	1
Gonococcal infection**	56	2,322	1,932	2,028	468	21	1,748	1,396	9,971
Syphilis – all**,††	29	746	141	404	45	21	823	155	2,364
Syphilis <2 years duration**	14	416	43	221	21	7	291	86	1,123
Syphilis >2 years or unspecified duration†,**	15	330	98	183	NDP	14	532	69	1,241
Syphilis – congenital**	0	0	0	2	0	0	0	1	3
Vaccine preventable diseases									
Diphtheria	0	0	0	0	0	0	0	0	0
Haemophilus influenzae type b	0	6	2	7	2	0	5	2	24
Influenza (laboratory confirmed)	95	1,592	479	3,202	4,247	103	2,076	1,625	13,419
Measles	1	25	2	14	2	0	15	11	70
Mumps	1	38	2	26	1	0	12	15	95
Pertussis	712	9,288	329	8,216	7,388	281	7,131	1,448	34,793
Pneumococcal disease (invasive)	24	503	56	271	140	46	406	198	1,644
Poliomyelitis	0	0	0	0	0	0	0	0	0
Rubella	1	13	0	5	0	0	22	3	44
Rubella – congenital	0	0	0	0	0	0	0	0	0

Table 4 *cont'd*: Notifications of communicable diseases, Australia, 2010, by state or territory

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Vaccine preventable diseases, *cont'd*									
Tetanus	0	1	0	0	0	0	1	0	2
Varicella zoster (chickenpox)	4	NN	84	351	379	19	506	400	1,743
Varicella zoster (shingles)	31	NN	130	99	1,166	184	650	718	2,978
Varicella zoster (unspecified)	87	NN	3	3,894	298	81	1,912	877	7,152
Vectorborne diseases									
Arbovirus infection (NEC)	0	1	10	1	0	0	12	0	24
Barmah Forest virus infection	4	265	82	908	57	2	76	77	1,471
Dengue virus infection	15	211	42	281	23	7	119	503	1,201
Japanese encephalitis virus infection	0	0	0	0	0	0	0	0	0
Kunjin virus infection¶¶	0	0	1	1	0	0	0	0	2
Malaria	2	124	11	126	8	5	67	56	399
Murray Valley encephalitis virus infection¶¶	0	0	0	0	0	0	0	0	0
Ross River virus infection	22	1,073	336	2,383	450	39	422	422	5,147
Zoonoses									
Anthrax	0	1	0	0	0	0	0	0	1
Australia bat lyssavirus	0	0	0	0	0	0	0	0	0
Brucellosis	0	2	2	16	1	0	0	0	21
Leptospirosis	1	21	2	84	2	1	14	6	131
Lyssavirus (NEC)	0	0	0	0	0	0	0	0	0
Ornithosis	0	13	0	0	1	3	36	3	56
Q fever	1	136	1	151	10	0	16	8	323
Tularaemia	0	0	0	0	0	0	0	0	0
Other bacterial infections									
Legionellosis	4	93	3	42	29	6	67	54	298
Leprosy	0	1	1	2	0	0	4	3	11
Meningococcal infection***	1	76	3	53	25	6	44	22	230
Tuberculosis	10	478	31	188	72	10	431	107	1,327
Total	**3,371**	**45,793**	**7,580**	**54,083**	**22,658**	**4,237**	**47,271**	**24,086**	**209,079**

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

† Unspecified hepatitis and syphilis includes cases where the duration of infection could not be determined or is greater than 24 months.

‡ In Queensland, includes incident hepatitis C cases.

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

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

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

** The national case definitions for chlamydial, gonococcal and syphilis diagnoses include infections that may be acquired through a non-sexual mode (especially in children – e.g. perinatal infections, epidemic gonococcal conjunctivitis).

†† Does not include congenital syphilis.

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

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

NEC Not elsewhere classified.

NN Not notifiable.

NDP No data provided.

Table 5: Notification rates of nationally notifiable communicable diseases per 100,000 population, Australia, 2010, 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 (newly acquired)*	0.8	0.5	1.3	1.3	1.3	1.2	1.2	1.4	1.0
Hepatitis B (unspecified)†	25.9	33.6	68.4	23.7	24.9	10.0	34.1	33.7	95.0
Hepatitis C (newly acquired)*	3.3	0.5	0.0	NN	2.8	4.3	2.9	3.5	2.0
Hepatitis C (unspecified)†, ‡	58.8	48.6	74.9	60.7	29.5	47.5	44.0	43.3	149.2
Hepatitis D	0.0	0.1	0.0	0.4	0.0	0.0	0.1	0.0	0.2
Gastrointestinal diseases									
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis§	153.8	NN	71.8	106.0	107.5	143.0	119.8	101.2	112.3
Cryptosporidiosis	3.3	4.8	42.2	6.7	2.9	19.7	7.8	6.2	6.6
Haemolytic uraemic syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Hepatitis A	1.4	1.1	1.3	0.9	0.2	0.8	1.6	1.4	1.2
Hepatitis E	0.6	0.2	0.0	0.2	0.0	0.0	0.2	0.1	0.2
Listeriosis	0.6	0.4	0.0	0.2	0.1	0.6	0.5	0.1	0.3
Salmonellosis	59.1	52.8	243.4	65.1	40.4	46.3	41.2	55.6	53.7
Shigellosis	2.0	1.6	32.7	2.1	3.3	1.0	1.6	5.0	2.5
STEC,VTEC‖	0.0	0.1	0.0	0.4	2.0	0.0	0.2	0.3	0.4
Typhoid fever	0.6	0.4	0.9	0.4	0.3	0.2	0.4	0.5	0.4
Quarantinable diseases									
Cholera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HPAIH	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¶,**	322.4	252.5	1159.0	425.5	263.3	395.6	297.0	443.3	332.6
Donovanosis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gonococcal infection**	15.6	32.1	841.2	44.9	28.5	4.1	31.5	60.8	44.6
Syphilis – all**,††	8.1	10.3	61.4	8.9	2.7	4.1	14.8	6.7	10.6
Syphilis <2 years duration**	3.9	5.7	18.7	4.9	2.7	1.4	5.2	3.7	5.0
Syphilis >2 years or unspecified duration†,**	4.2	4.6	42.7	4.1	NDP	2.8	9.6	3.0	6.0
Syphilis – congenital**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vaccine preventable diseases									
Diphtheria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	0.0	0.1	0.9	0.2	0.1	0.0	0.1	0.1	0.1
Influenza (laboratory confirmed)	26.5	22.0	208.6	70.9	258.2	20.3	37.4	70.8	60.1
Measles	0.3	0.3	0.9	0.3	0.1	0.0	0.3	0.5	0.3
Mumps	0.3	0.5	0.9	0.6	0.1	0.0	0.2	0.7	0.4
Pertussis	198.4	128.3	143.2	181.9	449.2	55.4	128.5	63.1	155.7
Pneumococcal disease (invasive)	6.7	6.9	24.4	6.0	8.5	9.1	7.3	8.6	7.4
Poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella	0.3	0.2	0.0	0.1	0.0	0.0	0.4	0.1	0.2
Rubella – congenital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5 *cont'd*: Notification rates of nationally notifiable communicable diseases per 100,000 population, Australia, 2010, by state or territory

Disease	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Vaccine preventable diseases, *cont'd*									
Tetanus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Varicella zoster (chickenpox)	1.1	NN	36.6	7.8	23.0	3.7	9.1	17.4	11.5
Varicella zoster (shingles)	8.6	NN	56.6	2.2	70.9	36.2	11.7	31.3	19.7
Varicella zoster (unspecified)	24.2	NN	1.3	86.2	18.1	16.0	34.5	38.2	47.4
Vectorborne diseases									
Arbovirus infection (NEC)	0.0	0.0	4.4	0.0	0.0	0.0	0.2	0.0	0.1
Barmah Forest virus infection	1.1	3.7	35.7	20.1	3.5	0.4	1.4	3.4	6.6
Dengue virus infection	4.2	2.9	18.3	6.2	1.4	1.4	2.1	21.9	5.4
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	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Malaria	0.6	1.7	4.8	2.8	0.5	1.0	1.2	2.4	1.8
Murray Valley encephalitis virus infection¶¶	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ross River virus infection	6.1	14.8	146.3	52.8	27.4	7.7	7.6	18.4	23.0
Zoonoses									
Anthrax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australia bat lyssavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.0	0.9	0.4	0.1	0.0	0.0	0.0	0.1
Leptospirosis	0.3	0.3	0.9	1.9	0.1	0.2	0.3	0.3	0.6
Lyssavirus (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ornithosis	0.0	0.2	0.0	0.0	0.1	0.6	0.6	0.1	0.3
Q fever	0.3	1.9	0.4	3.3	0.6	0.0	0.3	0.3	1.4
Tularaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other bacterial diseases									
Legionellosis	1.1	1.3	1.3	0.9	1.8	1.2	1.2	2.4	1.3
Leprosy	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.1	0.0
Meningococcal infection***	0.3	1.0	1.3	1.2	1.5	1.2	0.8	1.0	1.0
Tuberculosis	2.8	6.6	13.5	4.2	4.4	2.0	7.8	4.7	5.9

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

† Unspecified hepatitis and syphilis includes cases where the duration of infection could not be determined or is greater than 24 months.

‡ In Queensland, includes incident hepatitis C cases.

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

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

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

** The national case definitions for chlamydial, gonococcal and syphilis diagnoses include infections that may be acquired through a non-sexual mode (especially in children – e.g. perinatal infections, epidemic gonococcal conjunctivitis).

†† Does not include congenital syphilis.

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

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

NEC Not elsewhere classified.

NN Not notifiable.

NDP No data provided.

Table 6: Notifications and notification rate for communicable diseases, Australia, 2005 to 2010, (per 100,000 population)

Disease	Number of notifications						5 year mean	Ratio	Notification rate per 100,000 population					
	2005	2006	2007	2008	2009	2010			2005	2006	2007	2008	2009	2010
Bloodborne diseases														
Hepatitis (NEC)	1	1	0	1	0	0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hepatitis B (newly acquired)*	251	292	294	256	241	228	312.4	0.7	1.2	1.4	1.4	1.2	1.1	1.0
Hepatitis B (unspecified)†	3,600	3,769	4,291	4,008	4,440	6,878	5,397.2	1.3	26.4	27.2	30.3	27.7	29.9	45.5
Hepatitis C (newly acquired)*	374	442	380	364	385	358	460.6	0.8	2.3	2.7	2.3	2.1	2.2	2.0
Hepatitis C (unspecified)†,‡	7,610	7,569	7,718	7,363	7,175	10,803	9,647.6	1.1	55.8	54.5	54.5	50.8	48.4	71.5
Hepatitis D	32	30	33	42	35	35	34.4	1.0	0.2	0.1	0.2	0.2	0.2	0.2
Gastrointestinal diseases														
Botulism	3	1	1	0	1	0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis§	16,498	15,423	16,990	15,543	16,081	16,966	16,107.0	1.1	121.0	111.1	119.9	107.3	108.4	112.3
Cryptosporidiosis	3,213	3,201	2,810	2,003	4,626	1,480	3,170.6	0.5	15.8	15.5	13.3	9.3	21.1	6.6
Haemolytic uraemic syndrome	20	14	19	31	13	8	19.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0
Hepatitis A	327	281	165	277	563	263	322.6	0.8	1.6	1.4	0.8	1.3	2.6	1.2
Hepatitis E	30	24	18	44	33	38	29.8	1.3	0.1	0.1	0.1	0.2	0.2	0.2
Listeriosis	54	61	50	68	92	71	65.0	1.1	0.3	0.3	0.2	0.3	0.4	0.3
Salmonellosis	8,422	8,251	9,534	8,333	9,586	11,993	8,825.2	1.4	41.3	39.9	45.2	38.8	43.6	53.7
Shigellosis	729	546	599	830	622	552	665.2	0.8	3.6	2.6	2.8	3.9	2.8	2.5
STEC, VTEC‖	86	70	106	107	130	81	99.8	0.8	0.4	0.3	0.5	0.5	0.6	0.4
Typhoid fever	52	77	90	105	116	96	88.0	1.1	0.3	0.4	0.4	0.5	0.5	0.4
Quarantinable diseases														
Cholera	3	3	4	4	5	3	3.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0
HPAIH	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plague	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabies	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smallpox	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 6 *cont'd*: Notifications and notification rate for communicable diseases, Australia, 2005 to 2010, (per 100,000 population)

Disease	Number of notifications						5 year mean	Ratio	Notification rate per 100,000 population					
	2005	2006	2007	2008	2009	2010			2005	2006	2007	2008	2009	2010
Sexually transmissible infections														
Chlamydial infection[¶, **]	41,290	47,434	51,971	58,435	62,632	74,305	52,352.4	1.4	202.5	229.2	246.6	271.8	285.1	332.6
Donovanosis	13	6	3	2	1	1	5.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Gonococcal infection**	8,055	8,597	7,635	7,642	7,963	9,971	7,978.4	1.2	39.5	41.5	36.2	35.5	36.3	44.6
Syphilis – all**,[††]	1,939	2,205	2,769	2,695	2,708	2,364	2,463.2	1.0	9.5	10.7	13.1	12.5	12.3	10.6
Syphilis <2 years duration**	656	890	1,418	1,325	1,310	1,099	1,119.8	1.0	3.2	4.3	6.7	6.2	6.0	5.0
Syphilis >2 years or unspecified duration**	1,283	1,315	1,351	1,370	1,398	1241	1,343.4	0.9	6.3	6.9	6.9	6.9	6.9	6.0
Syphilis – congenital**	17	11	7	6	3	3	8.8	0.3	0.1	0.1	0.0	0.0	0.0	0.0
Vaccine preventable diseases														
Diphtheria	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	17	22	17	25	19	24	20.0	1.2	0.1	0.1	0.1	0.1	0.1	0.1
Influenza (laboratory confirmed)[‡‡]	4,638	3,327	10,600	9,223	59,090	13,419	17,375.6	0.8	22.7	16.1	50.3	42.9	269.0	60.1
Measles	10	125	12	65	104	70	63.2	1.1	0.0	0.6	0.1	0.3	0.5	0.3
Mumps	240	275	582	285	165	95	309.4	0.3	1.2	1.3	2.8	1.3	0.8	0.4
Pertussis	11,167	9,764	4,864	14,292	29,794	34,793	13,976.2	2.5	54.8	47.2	23.1	66.5	135.6	155.7
Pneumococcal disease (invasive)	1,691	1,451	1,476	1,628	1,557	1,644	1,560.6	1.1	8.3	7.0	7.0	7.6	7.1	7.4
Poliomyelitis	0	0	1	0	0	0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella	29	59	34	36	27	44	37.0	1.2	0.1	0.3	0.2	0.2	0.1	0.2
Rubella – congenital	1	0	2	0	0	0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus	2	3	3	4	3	2	3.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Varicella zoster (chickenpox)	16	1,622	1,667	1,799	1,753	1,743	1,710.3	1.0	NN	18.5	18.6	19.6	11.8	11.5
Varicella zoster (shingles)	7	1,178	1,562	2,326	2,716	2,978	1,945.5	1.5	NN	13.5	17.5	25.4	18.3	19.7
Varicella zoster (unspecified)	141	3,764	4,284	4,413	6,775	7,152	4,809.0	1.5	NN	43.0	47.9	48.2	45.7	47.4
Vectorborne diseases														
Arbovirus infection (NEC)	27	30	17	12	8	24	18.8	1.3	0.1	0.1	0.1	0.1	0.0	0.1
Barmah Forest virus infection	1,317	2,130	1,712	2,087	1,480	1,471	1,745.2	0.8	6.5	10.3	8.1	9.7	6.7	6.6
Dengue virus infection	219	189	314	563	1,406	1,201	538.2	2.2	1.1	0.9	1.5	2.6	6.4	5.4
Japanese encephalitis virus infection	0	0	0	1	0	0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kunjin virus infection[¶¶]	1	3	1	1	2	2	1.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Malaria	816	770	565	524	508	399	636.6	0.6	4.0	3.7	2.7	2.4	2.3	1.8
Murray Valley encephalitis virus infection[¶¶]	2	1	0	2	4	0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ross River virus infection	2,538	5,529	4,180	5,663	4,796	5,147	4,541.2	1.1	12.4	26.7	19.8	26.3	21.8	23.0

Table 6 *cont'd*: Notifications and notification rate for communicable diseases, Australia, 2005 to 2010, (per 100,000 population)

Disease	Number of notifications						5 year mean	Ratio	Notification rate per 100,000 population					
	2005	2006	2007	2008	2009	2010			2005	2006	2007	2008	2009	2010
Zoonoses														
Anthrax	0	1	1	0	0	1	0.4	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Australian bat lyssavirus	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	41	50	37	45	32	21	41.0	0.5	0.2	0.2	0.2	0.2	0.2	0.1
Leptospirosis	129	145	108	112	146	131	128.0	1.0	0.6	0.7	0.5	0.5	0.7	0.6
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	164	165	93	102	65	56	117.8	0.5	0.8	0.8	0.4	0.5	0.3	0.3
Q fever	352	411	449	376	310	323	379.6	0.9	1.7	2.0	2.1	1.7	1.4	1.4
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	331	349	307	272	302	298	312.2	1.0	1.6	1.7	1.5	1.3	1.4	1.3
Leprosy	10	7	13	11	4	11	9.0	1.2	0.0	0.0	0.1	0.1	0.0	0.0
Meningococcal infection***	393	318	305	286	259	230	312.2	0.7	1.9	1.5	1.4	1.3	1.2	1.0
Tuberculosis	1,078	1,211	1,134	1,196	1,324	1,327	1,188.6	1.1	5.3	5.9	5.4	5.6	6.0	5.9
Total	**117,996**	**131,207**	**139,827**	**153,508**	**230,100**	**209,079**								

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

† Unspecified hepatitis and syphilis includes cases where the duration of infection could not be determined or is longer than 24 months.

‡ In Queensland, includes incident hepatitis C cases.

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

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

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

** The national case definitions for chlamydial, gonococcal and syphilis diagnoses include infections that may be acquired through a non-sexual mode (especially in children – e.g. perinatal infections, epidemic gonococcal conjunctivitis).

†† Does not include congenital syphilis.

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

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

NEC Not elsewhere classified.

NN Not notifiable.

Table 7: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Bloodborne diseases										
Hepatitis (NEC)	1991	1991	1991	1991	1991	1991	1991	NN	1991 to present	WA do not report
Hepatitis B (newly acquired)	1995	1993	1993	1994	1993	1993	1993	1994	1995 to present	ACT did not report 1994
Hepatitis B (unspecified)	1991	1991	2004	1994	1991	1991	1991	1991	1991 to present	
Hepatitis C (newly acquired)	1995	1993	2005	NN	1993	1995	1997	1995	1993 to present	All jurisdictions except Qld
Hepatitis C (unspecified)	1991	1991	1991	1991	1994	1991	1991	1993	1995 to present	Includes reports of incident hepatitis C, 1991 to 1994
Hepatitis D	1999	1999	1999	1997	1999	1999	1999	2001	1999 to present	WA did not report 1999–2000
Gastrointestinal diseases										
Botulism	1992	1998	1998	1997	1993	1992	1992	2001	1992 to present	State reporting started as shown
Campylobacteriosis	1991	NN	1991	1991	1991	1991	1991	1991	1991 to present	NSW do not report
Cryptosporidiosis	2001	2001	2001	1996	2001	2001	2001	2001	2001 to present	
Haemolytic uraemic syndrome	1999	1999	1999	1997	1999	1999	1999	1999	1999 to present	
Hepatitis A	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Hepatitis E	1999	1999	1999	1999	1999	1999	1999	2001	1999 to present	WA did not report 1999–2000
Listeriosis	1991	1991	1994	1991	1992	1991	1991	1991	1991 to present	SA did not report 1991 NT did not report 1991–1993
Salmonellosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Shigellosis	1991	2001	1991	1997	1991	1991	1991	1991	1991 to present	NSW did not report 1991–2000 Qld did not report 1991–2006
STEC, VTEC	1999	1999	1999	2002	1999	1999	1999	2001	1999 to present	Qld did not report 1991–2002 WA did not report 1999–2001
Typhoid†	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Quarantinable diseases										
Cholera	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Highly pathogenic avian influenza in humans	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Plague	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Rabies	1993	1997	1991	1991	1991	1991	1991	1991	1991 to present	

Table 7 *cont'd*: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Severe acute respiratory syndrome	2003	2003	2003	2003	2003	2003	2003	2003	2003 to present	
Smallpox	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Viral haemorrhagic fever	1993	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Yellow fever	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Sexually transmissible infections										
Chlamydial infection (NEC)	1993	1991	1991	1991	1993	1991	1991	1993	1994 to present	NSW did not report 1994–1998
Donovanosis	1991	2002	1991	1991	2002	1993	1991	1991	1991 to present	NSW and SA did not report 1991–2001 Tasmania did not report 1991–1992
Gonococcal infection‡	1991	1993	1991	1991	1991	1991	1991	1991	1991 to present	
Syphilis – all§	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Syphilis <2 years	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Syphilis >2 years or unspecified duration	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	
Syphilis – congenital	2003	2003	2003	2003	2003	2003	2003	2003	2003 to present	
Vaccine preventable diseases										
Diphtheria	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Haemophilus influenzae type b	1991	1991	1991	1991	1991	1991	1991	1994	1991 to present	WA did not report 1991–1993
Influenza (laboratory confirmed)	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Measles	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Mumps	1992	1992	1995	1997–1998; 2002	1994	1995	1992	1994	1995 to present	Qld did not report (1995–1996 & 1999–2000)
Pertussis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Pneumococcal disease (invasive)	2001	2001	2001	1997	2001	2001	2001	2001	2001 to present	
Poliomyelitis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Rubella‖	1991	1991	1993	1991	1993	1995	1992	1994	1993 to present	Tasmania did not report 1993–1994
Rubella – congenital	2003	2003	2003	1997	2003	2003	2003	2003	2003 to present	
Tetanus	1991	1991	1991	1985	1991	1991	1991	1991	1991 to present	Qld did not report 1991–1993

Table 7 *cont'd*: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Vaccine preventable diseases, *cont'd*										
Varicella zoster (chickenpox)	2006	NN	2006	2006	2006	2006	2008	2006	2006 to present	All jurisdictions except NSW Reported by Victoria in September 2008
Varicella zoster (shingles)	2006	NN	2006	2006	2006	2006	2008	2006	2006 to present	All jurisdictions except NSW Reported by Victoria in September 2008
Varicella zoster (unspecified)	2006	NN	2006	2006	2006	2006	2008	2006	2006 to present	All jurisdictions except NSW Reported by Victoria in September 2008
Vectorborne diseases										
Barmah Forest virus infection	1995	1995	1997	1995	1995	1995	1995	1995	1995 to present	
Dengue virus infection	1993	1991	1991	1991	1991	1991	1991	1995	1991 to present	ACT did not report 1991–1992
Arbovirus infection (NEC)¶,**	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	Includes JE, MVE and Kunjin 1991–2000
Japanese encephalitis virus infection	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Kunjin virus	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	Reported under MVE in ACT
Malaria	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Murray Valley encephalitis virus infection	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	Combined with Kunjin in ACT
Ross River virus infection	1993	1993	1991	1991	1993	1993	1991	1991	1993 to present	
Zoonoses										
Anthrax	2001	2001	2001	1991	2002	2001	2001	2001	2001 to present	
Australian bat lyssavirus	2001	2001	2001	1998	2001	2001	2001	2001	2001 to present	
Brucellosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Leptospirosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Lyssavirus (NEC)	2001	2001	2001	1998	2001	2001	2001	2001	2001 to present	
Ornithosis	1991	2001	1991	1992	1991	1991	1991	1991	1991 to present	NSW did not report 1991–2000 Qld did not report 1997–2001
Q fever	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Tularaemia	2004	2004	2004	2004	2004	2004	2004	2004	2004 to present	

Table 7 *cont'd*: Earliest notification year for which NNDSS contains disease data, Australia, by state or territory*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Other bacterial infections										
Legionellosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Leprosy	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Meningococcal infection	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Tuberculosis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	

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

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

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

§ Includes syphilis – congenital from 1991 to 2002.

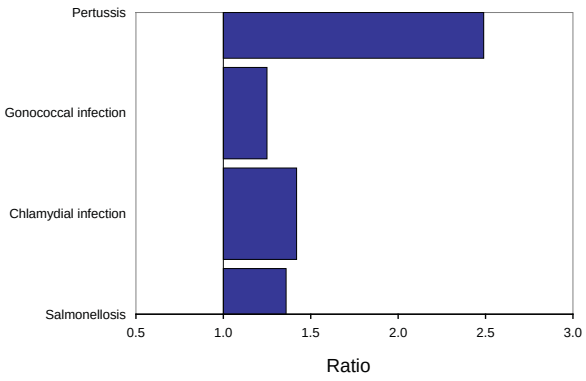
‖ Includes rubella – congenital from 1991 to 2002.

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

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

NN Not notifiable

Figure 3: Total notifications of selected diseases reported to the National Notifiable Diseases Surveillance System in 2010, compared with the previous 5-year mean



Data completeness

Data on the sex of cases was complete in 99.8% of notifications and age at onset in close to 100% of notifications (Table 8). In 2010, Indigenous status was complete in 54% of notifications, and varied by jurisdiction. Indigenous status was complete for 94% of data reported in the Northern Territory, 84% in South Australia and 90% in Western Australia. In the remaining jurisdictions, less than 60% of data were complete for Indigenous status.

Data completeness on Indigenous status also varied by disease as summarised in Appendix 3. There were 5 diseases for which notifications were 100% complete for Indigenous status.[9] A further 9 diseases equalled or exceeded 90% completeness for Indigenous status. Of the 18 priority diseases agreed to by CDNA and the NSC in 2010 for improving Indigenous identification, nine had an Indigenous completeness that exceeded 90% (donovanosis, *Haemophilus influenzae* type b, hepatitis A, meningococcal infection, congenital syphilis, syphilis < 2 years duration, leprosy, measles, and tuberculosis). The diseases for which there was less than 90% Indigenous completeness included hepatitis C (newly acquired), hepatitis B (newly acquired), dengue virus infection, gonococcal infection, pneumococcal disease (invasive), and shigellosis. In 2010, CDNA set target thresholds of 90% completeness for priority diseases and 80% completeness for the remainder of the notifiable diseases.

Bloodborne diseases

In 2010, the bloodborne viruses reported to the NNDSS were hepatitis B, C, and D. Both hepatitis B and C cases are notified to the NNDSS as either 'newly acquired', where evidence was available that the infection was acquired within 24 months prior to diagnosis; or 'greater than 2 years or unspecified' period of infection. These categories were reported from all states and territories except Queensland where all cases of hepatitis C, including newly acquired, were reported as 'greater than 2 years or unspecified'. The determination of a case as 'newly acquired' is heavily reliant on public health follow-up, with the method and intensity of follow-up varying by jurisdiction and over time.

In interpreting these data it is important to note that changes in notified cases over time may not solely reflect changes in disease prevalence or incidence. Testing policies such as the National

Table 8: Completeness of National Notifiable Diseases Surveillance System data received, Australia, 2010, by state or territory*

	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Total notifications	3,371	45,793	7,580	54,083	22,658	4,237	47,271	24,086	209,079
Sex									
Unknown/ missing	1	166	3	17	0	0	389	0	518
Per cent complete	99.9	99.6	99.9	99.9	100.0	100.0	99.2	100.0	99.8
Age at onset									
Unknown/ missing	0	74	0	0	0	1	139	0	200
Per cent complete	100.0	99.8	100.0	100.0	100.0	99.9	99.7	100.0	99.9
Indigenous status									
Unknown/ missing	2,335	33,368	450	30,905	3,747	1,783	22,437	2,386	95,933
Per cent complete	30.7	27.1	94.1	42.9	83.5	57.9	52.5	90.1	54.1

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

Hepatitis C Testing Policy[10] and screening programs, including the preferential testing of high risk populations such as persons in prison, injecting drug users and persons from countries with a high prevalence of hepatitis B or C, may contribute to these changes.

Information on exposure factors relating to the most likely source(s) or risk factors of infection for hepatitis B and C was reported in a subset of diagnoses of newly acquired infections. The collection of these enhanced data are also dependant on the level of public health follow-up, which is variable by jurisdiction and over time.

Further information regarding the surveillance of these infections is described within the hepatitis B and hepatitis C sections.

Hepatitis B

Hepatitis B notifications are classified as either 'newly acquired' or 'unspecified' as described above. The classification of hepatitis B cases is primarily based on serological evidence or evidence of a previously negative test within the 24 months prior to diagnosis. In 2010, there were 7,106 diagnoses of hepatitis B (both newly acquired and unspecified) reported, equating to a rate of 31.9 cases per 100,000 population (Figure 4). The Northern Territory recorded the highest hepatitis B diagnosis rate in 2010 (69.7), followed by Victoria (35.3) and Western Australia (35.2).

Since the introduction of the adolescent hepatitis B vaccination program for children aged between 10 and 13 years in 1997 and the universal infant program in 2000,[11] there has been a general decline in overall rates of hepatitis B. Between 2000 and 2010 unspecified hepatitis B rates decreased 22% from 39.5 to 30.8 and newly acquired hepatitis B rates decreased from a rate of 2.2 to 1.0 (Figure 4). Approximately 92% of the 2010 Australian birth cohort received the full primary course of the hepatitis B vaccine by 15 months of age.[12]

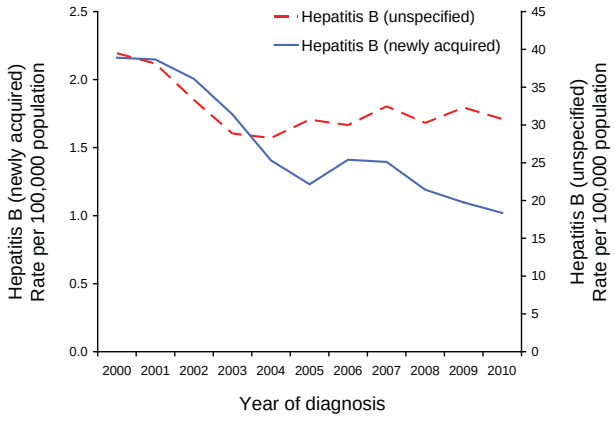
Newly acquired hepatitis B

In 2010, there were 228 notified cases of newly acquired hepatitis B (1.0 per 100,000 population) reported to the NNDSS; a 4% decrease compared with the 238 cases (rate of 1.1) reported in 2009 and a continuation of the downward trend in notified cases (Figure 4).

Nationally, the proportion of all hepatitis B cases in 2010 that were documented as newly acquired continued to trend downward and was 3.2%, compared with 3.3% in 2009 and 5.2% in 2000. The proportion of newly acquired infections compared to total hepatitis B infections varied substantially: Tasmania (11%); Queensland (5.2%), South Australia (4.9%); Western Australia (4.1%); Victoria (3.5%); the Australian Capital Territory (3.1%); the Northern Territory (1.9%) and New South Wales (1.4%). The highest rates were reported from Western Australia (1.4), closely followed by the Northern Territory, Queensland and South Australia (all 1.3) and Tasmania and Victoria (1.2).

Overall, cases were more common amongst males, with a male to female ratio of 1.9:1. In 2010, the highest rate of newly acquired hepatitis B infection was observed amongst males 35–39 and 40–44 years (3.0 and 3.1 respectively) (Figure 5).

Figure 4: Rate for newly acquired hepatitis B* and unspecified hepatitis B,† Australia, 2000 to 2010, by year‡

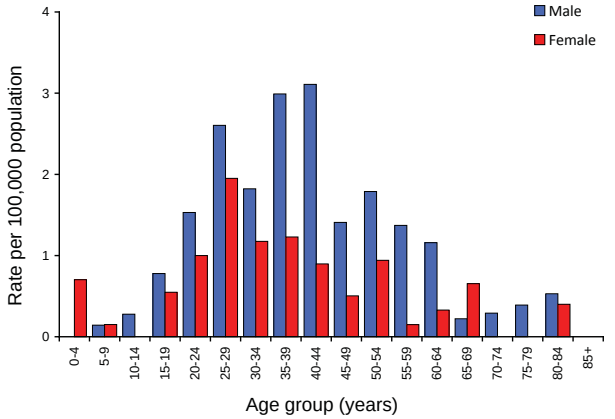


* Data for newly acquired hepatitis B for the Northern Territory (2000–2004) includes some unspecified hepatitis B cases.

† Data for unspecified hepatitis B for all jurisdictions except the Northern Territory between 2000 and 2004.

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

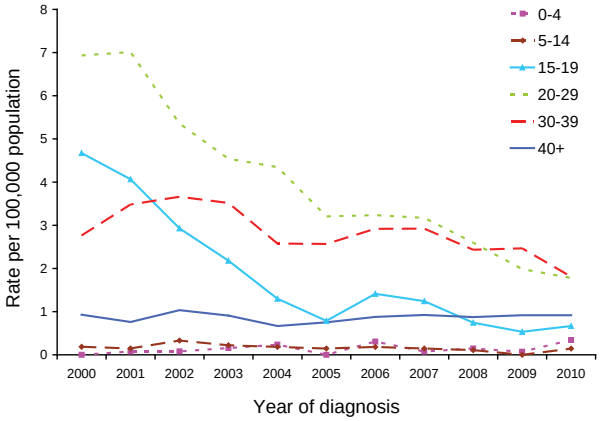
Figure 5: Rate for newly acquired hepatitis B,* Australia, 2010, by age group and sex



Trends in newly acquired hepatitis B infection by year and age group are shown in Figure 6. Between 2000 and 2010, most age group rates have been trending down with the most marked decreases occurring among the 15–19 year and 20–29 year age groups. There were 5 cases, all female, in the 0–4 year age group in 2010, the highest number since 4 cases were reported in 2006 and well above the average of 1.6 for the previous 5 years.

Of the 228 cases reported in 2010, the exposure history of 120 cases from New South Wales, Victoria, South Australia and the Northern Territory were assessed† (Table 9). In 2010, 73% (n = 87) of these

Figure 6: Rate for newly acquired hepatitis B,* Australia, 2000 to 2010, by year and age group



† Prior to 2009 enhanced hepatitis B surveillance data were reported to Kirby from health authorities in the states and territories.

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

Table 9: Notified cases of newly acquired hepatitis B cases,* selected jurisdictions, 2010, by sex and exposure category†

Exposure category	Number of exposure factors reported†			Percentage of cases* (n=120)
	Male	Female	Total	
Injecting drug use	29	18	47	39.2
Imprisonment	9	1	10	8.3
Skin penetration procedure	10	8	18	15.0
Tattoos	8	4	12	10.0
Ear or body piercing	2	3	5	4.2
Acupuncture	0	1	1	0.8
Healthcare exposure	9	2	11	9.2
Surgical work	6	1	7	5.8
Major dental surgery work	1	1	2	1.7
Blood/tissue recipient	0	0	0	0.0
Haemodialysis	2	0	2	1.7
Sexual contact – hepatitis B positive partner	5	7	12	10.0
Opposite sex	4	6	10	8.3
Same sex	1	1	2	1.7
Household contact	4	5	9	7.5
Needlestick/biohazardous injury§	2	0	2	1.7
Perinatal transmission	1	1	2	1.7
Other	10	7	17	14.2
Sexual contact – unknown HBV status‖	6	4	10	8.3
Cases with at least one risk factor	56	31	87	72.5
Undetermined	11	6	17	14.2
Unknown (not recorded)	10	6	16	13.3
Total exposure factors reported†	100	61	161	–
Total number of cases*	77	43	120	–

* Cases from New South Wales, the Northern Territory, South Australia, and Victoria.

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

‡ The denominator used to calculate the percentage is based on the total number of cases from all jurisdictions (New South Wales, the Northern Territory, South Australia, and Victoria). As more than one exposure category for each notification could be recorded, the total percentage does not equate to 100%.

§ Includes both occupational and non-occupational exposures.

‖ Established through analysis of free text field.

cases had at least one risk factor recorded, with the source of exposure not recorded or unable to be determined for the remainder. Injecting drug use remains the most frequently reported source of infection in 2010 but has declined as a proportion of reported cases from 52% in 2006 to 39% in 2010. Skin penetration procedures were the next most frequently reported source of infection (15%), the majority of which were reported as tattoos.

Additional information was also collected on the country of birth (COB) from all jurisdictions except Queensland. Of the 137 cases in which COB was reported, the majority occurred amongst Australian born persons (66%, n = 90) with the remaining 47 cases amongst those born overseas. The proportion of overseas-born people with hepatitis B was similar to the proportion of overseas born people in the Australian population for Europe and the Americas and higher for those born in North Africa and the Middle East and Asia.[13]

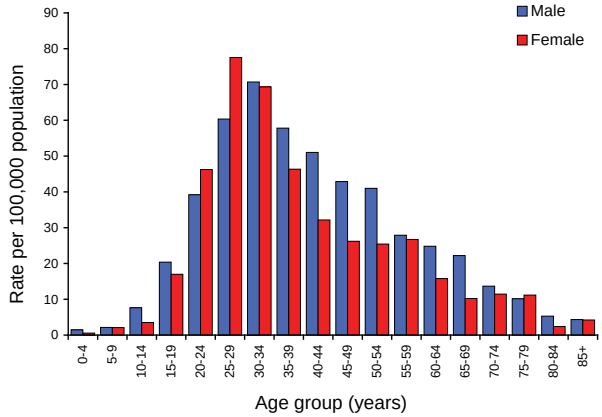
Unspecified hepatitis B notifications

In 2010, there were 6,878 notified cases of unspecified hepatitis B infection reported to the NNDSS, a rate of 31 per 100,000 population, compared with 7,094 cases (and a rate of 32) in 2009.

The overall rate of hepatitis B (unspecified) has been trending downward over the past 11 years with the majority of this decrease occurring between 2000 and 2004. Between 2005 and 2010 the rate has remained relatively stable with an average annual rate of 31 during this time (Figure 4).

In 2010, the overall male rate (33) was higher than for females (28), a rate ratio of 1.2:1, but females had the highest age specific rate amongst those in the 25–29 year age group (78) compared with the highest age specific rate amongst males of 71 in the 30–34 year age group (Figure 7).

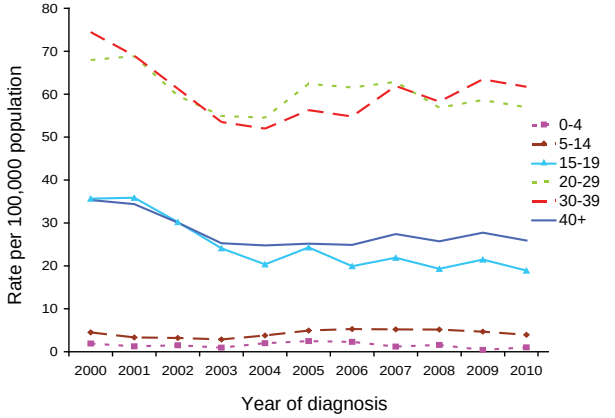
Figure 7: Rate for unspecified hepatitis B, Australia, 2010, by age group and sex



Trends in hepatitis B (unspecified) infection by year and age group are shown in Figure 8. Rates across all age groups have declined since 2000 with the majority of this decrease occurring in the first 3 years, before stabilising. The biggest decrease (47%) has occurred amongst the 15–19 year age group declining from a rate of 36 in 2000 to 19 in 2010.

The Northern Territory recorded the highest rate (68), followed by Victoria, New South Wales and Western Australia (all 34).

Figure 8: Rate for unspecified hepatitis B,* Australia, 2000 to 2010, by year and age group



* Data for hepatitis B (unspecified) from all states and territories except the Northern Territory between 2000 and 2004.

Hepatitis C

Hepatitis C notifications are classified as either 'newly acquired' (infection acquired within 24 months prior to diagnosis) or 'unspecified' (infection acquired more than 24 months prior to diagnosis or not able to be specified). Current testing methods cannot distinguish between newly acquired (incident) and chronic infections (greater than 2 years or unspecified). The identification of newly acquired cases is therefore dependent on evidence of a negative test result within 24 months prior to laboratory diagnosis or clinical hepatitis within the 24 months prior to a positive diagnostic test where other causes of acute hepatitis have been excluded. Ascertainment of a person's hepatitis C testing and clinical history usually requires active follow-up by public health units.

Between 2000 and 2010, total hepatitis C notification rates declined by 50% (101 to 50 per 100,000), with the greatest reductions observed in the earlier years, (a 16% decline between 2001 and 2002) (Figure 9). These reductions followed a peak in notified cases associated with the detection and

notification of prevalent cases that occurred in the late 1990s through the expansion of testing in high risk groups.[14] The continuing decline in the notification rate may be attributable to reductions in risk behaviours related to injecting drug use, especially amongst young people, and the implementation of needle exchange programs.[14,15]

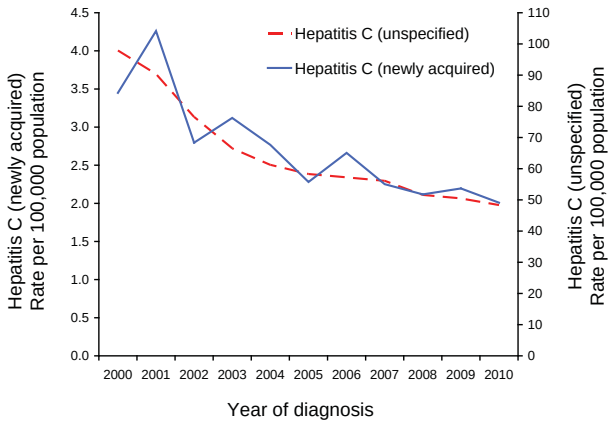
Although initial infection with the hepatitis C virus is asymptomatic or mildly symptomatic in more than 90% of cases, approximately 50%–80% of cases will go on to develop a chronic infection. Of these, half will eventually develop cirrhosis or cancer of the liver.[16] In 2010, it was estimated that 297,000 people living in Australia had been infected with the hepatitis C virus. Of these, approximately 168,000 had chronic hepatitis C infection and early liver disease, 48,000 had chronic hepatitis C infection with moderate liver disease, 6,100 were living with hepatitis C related cirrhosis and 76,000 had cleared their infection.[13]

Newly acquired hepatitis C notifications

Cases of newly acquired hepatitis C were reported from all states and territories except Queensland, where all cases of hepatitis C are reported as unspecified. There were 358 notified cases reported in 2010 compared with 401 notified cases in 2009, giving a rate of 2.0 per 100,000 population (Figure 9).

Of all hepatitis C cases in 2010, 3% were identified as newly acquired infections, which is comparable to previous years. The proportion of newly acquired infections compared with total hepatitis C diagnoses

Figure 9: Rates for newly acquired hepatitis C* and unspecified hepatitis C,† Australia, 2000 to 2010, by year



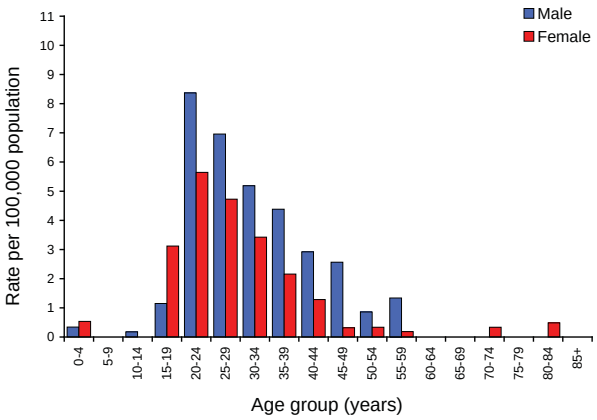
* Data for newly acquired hepatitis C from all states and territories except Queensland 2000–2010 and the Northern Territory 2000–2002.

† Data for unspecified hepatitis C provided from Queensland (2000–2010) and the Northern Territory (2000–2002) includes both newly acquired and unspecified hepatitis C cases.

varied substantially amongst the states and territories with 9% in South Australia; 8% in Tasmania; 7% in Western Australia; 6% in Victoria; 5% in the Australian Capital Territory; and 1% in New South Wales. No newly acquired cases were recorded for the Northern Territory or Queensland. The highest rates of newly acquired hepatitis C infection were reported in Tasmania (4.3 per 100,000), followed by Western Australia (3.5) and the Australian Capital Territory (3.3 per 100,000). The identification and classification of newly acquired hepatitis C is reliant upon public health follow-up to identify testing and clinical histories. The method and extent of case follow-up, and the population groups targeted, vary amongst states and territories, with newly acquired infection more likely to be detected in population groups that are tested frequently, such as those in prison settings.

The male to female ratio was 1.6:1 with the highest rate amongst males in the 20–24 year age group followed by the 25–29 year age group and the 30–34 year age group (8.4, 7.0 and 5.2 respectively). The highest age group rates for females were consistent with males, occurring in the 20–24 year age group followed by the 25–29 and 30–34 year age groups (5.6, 4.7 and 3.4 respectively) (Figure 10).

Figure 10: Rate for newly acquired hepatitis C, Australia,* 2010, by age group and sex

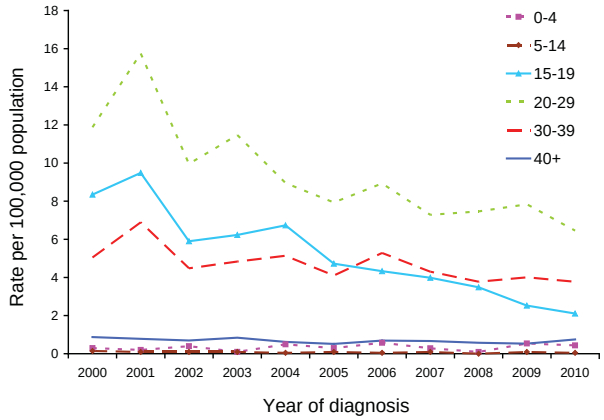


* Data from all states and territories except Queensland.

Trends in the age distribution of newly acquired hepatitis C infection are shown in Figure 11. While rates for individual age groups vary from year to year, declines continue to be observed in the 15–19 and 20–29 year age groups. Annual rates in the other age groups continued to be relatively stable over the 2000 to 2010 period.

Exposure history surveillance data for 91% of newly acquired hepatitis C cases reported in 2010 were

Figure 11: Rate for newly acquired hepatitis C, Australia* 2000 to 2010, by year and age group



* Data from all states and territories except Queensland (2000–2010) and the Northern Territory (2000–2002).

assessed from all jurisdictions except Queensland (Table 10). In 2010, 75% of these cases had at least one risk factor recorded, with the source of exposure not recorded or unable to be determined for the remainder of these cases. Seventy-nine per cent of notifications had a history of injecting drug use (57% of which reported injecting drug use in the 24 months prior to diagnosis). Skin penetration procedures and imprisonment accounted for 26% and 22% of reported risk factors respectively, noting that screening rates are generally higher in the prison entry population than the general population. A screening survey of prison entrants conducted over a 2-week period in 2007 found that the prevalence of hepatitis C, based on hepatitis C antibody detection, was 35%.[17]

Table 10: Notified cases of newly acquired hepatitis C, selected jurisdictions,* 2010, by sex and exposure category†

Exposure category	Number of exposure factors reported†			Percentage‡ of cases* (n=325)
	Male	Female	Total	
Injecting drug use	156	102	258	79.4
Imprisonment	64	7	71	21.8
Skin penetration procedure	56	28	84	25.8
Tattoos	34	15	49	15.1
Ear or body piercing	21	12	33	10.2
Acupuncture	1	1	2	0.6
Healthcare exposure	12	13	25	7.7
Surgical Work	5	10	15	4.6
Major dental surgery work	4	2	6	1.8
Blood/tissue recipient	3	0	3	0.9
Haemodialysis	0	1	1	0.3
Sexual contact – hepatitis B positive partner	27	15	42	12.9
Opposite sex	22	14	36	11.1
Same sex	5	1	6	1.8
Household contact	12	8	20	6.2
Perinatal transmission	22	7	29	8.9
Needlestick/biohazardous injury§	3	0	3	0.9
Other	8	9	17	5.2
Notifications with at least one risk factor	138	107	245	75.4
Undetermined	46	14	60	18.5
Unknown or missing (not recorded)	11	9	20	6.2
Total exposure factors reported†	417	212	629	–
Total cases*	195	130	325	–

* Includes diagnoses in all states and territories except Queensland.

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

‡ The denominator used to calculate the percentage is based on the total number of notifications from all jurisdictions, except Queensland. As more than one exposure category for each case could be recorded, the total percentage does not equate to 100%.

§ Includes both occupational and non-occupational exposures.

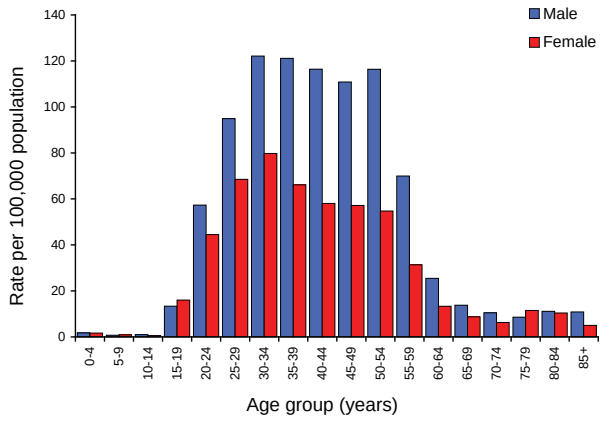
Unspecified hepatitis C notifications

In 2010, there were 10,803 notified cases of unspecified hepatitis C infections (48 per 100,000 population) compared with 11,081 notified cases in 2009 and a rate of 51 per 100,000 population. This continues the downward trend and represents a 51% decline compared with 2000, when the rate was 98 per 100,000 population.

Several factors may account for the decrease: changes in surveillance practices, including duplicate notification checking; a gradual decline in the prevalent group of hepatitis C cases accumulated prior to the introduction of hepatitis C testing in the early 1990s; and general reductions in risk behaviours related to injecting drug use, including the implementation of needle exchange programs.[14,15,18]

The male to female ratio remained consistent with historical trends at 1.7:1 in 2010. Amongst males, rates were highest across age groups between 30 and 54 years ranging from 111 to 122. Females rates were similarly highest amongst adults in the 30–34 year age group (80 per 100,000) followed by the 25–29 year (67 per 100,000) and 35–39 year age groups (66 per 100,000) (Figure 12).

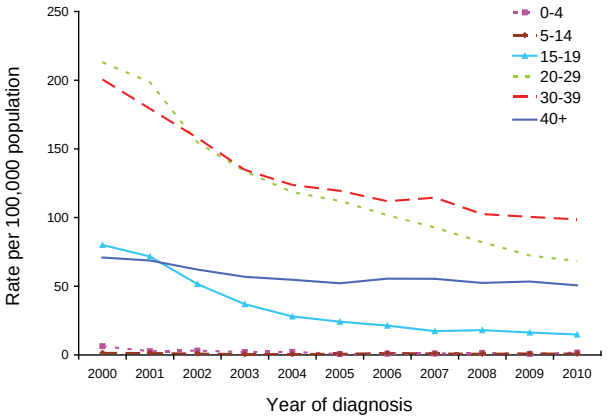
Figure 12: Rate for unspecified hepatitis C,* Australia, 2010 by age group and sex



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

The rate of unspecified hepatitis C declined in all age groups with the biggest decreases occurring amongst the 15–19 year age group (82%), the 20–29 year (68%) and the 30–39 year age groups (51%). The majority of this decline occurred in the early part of the decade. Trends in the 0–4, 5–14 and the 40 years or over age groups have remained relatively stable over this time (Figure 13).

Figure 13: Rate for unspecified hepatitis C,* Australia, 2000 to 2010, by year and age group



* Data provided from Queensland (2000–2010) and the Northern Territory (2000–2002) includes both newly acquired and unspecified hepatitis C cases.

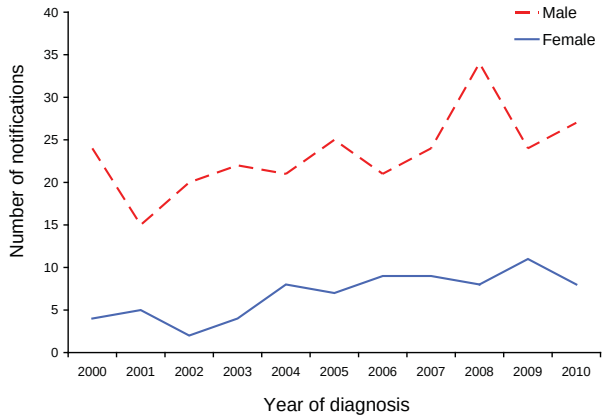
In 2010, the Northern Territory continued to have the highest rate (75 per 100,000) followed by Queensland (61 per 100,000) and the Australian Capital Territory (59 per 100,000), noting that Queensland's rate includes both newly acquired and unspecified cases. The lowest rate was in South Australia (30 per 100,000) (Table 5).

Hepatitis D

Hepatitis D is a defective single-stranded RNA virus that replicates in the presence of the hepatitis B virus. Hepatitis D infection can occur either as a co-infection with hepatitis B or as a super-infection with chronic hepatitis B infection.[16] The modes of hepatitis D transmission are similar to those for hepatitis B, and in countries with low hepatitis B prevalence such as Australia, injecting drug users are therefore likely to be the main group at risk for hepatitis D.

In Australia, the rate of hepatitis D remains low. In 2010, there were 35 notified cases of hepatitis D, a rate of 0.2 per 100,000 population, reported from Queensland (n = 20), New South Wales (n = 9) and Victoria (n = 6). Reported cases of hepatitis D have had a slight increasing trend with case numbers in 2010 above the average of 30 cases notified per year (range: 20–42) between 2000 and 2009. The male female ratio in 2010 was 3.4:1 consistent with the average ratio of 3:1 in the preceding 5 years (Figure 14).

Figure 14: Notified cases of hepatitis D, Australia, 2000 to 2010, by year and sex



Gastrointestinal diseases

In 2010, gastrointestinal diseases notified to NNDSS were: botulism, campylobacteriosis, cryptosporidiosis, haemolytic uraemic syndrome (HUS), hepatitis A, hepatitis E, listeriosis, salmonellosis, shigellosis, Shiga toxin-producing *Escherichia coli* (STEC) infections and typhoid.

Overall notifications of gastrointestinal diseases decreased slightly from 31,695 in 2009 to 31,548 in 2010. Only notifications of salmonellosis were notably increased compared with the 5-year mean (exceeding the mean by more than 2 standard deviations).

Australia's enhanced foodborne disease surveillance network, OzFoodNet, monitors the incidence of diseases caused by pathogens commonly transmitted by food, using population-based passive and enhanced surveillance for notifiable gastrointestinal diseases and for outbreaks of gastroenteritis and enteric disease. OzFoodNet aggregated and analysed data from NNDSS, supplemented by enhanced surveillance data, on the following 9 diseases or conditions, a proportion of which may be transmitted by food; botulism, campylobacteriosis, HUS, hepatitis A, listeriosis, non-typhoidal salmonellosis, STEC infection, shigellosis, and typhoid. The data and results from these analyses are summarised in the following sections and are reported in more detail in the OzFoodNet annual report 2010.

Botulism

Botulism is a rare but extremely serious intoxication resulting from toxins produced by *Clostridium botulinum* (commonly toxin types A, B and E). Three forms of botulism are recognised; infant, foodborne and wound.[16] Infant botulism occurs when *C. botulinum* spores are ingested, germinate in the infant's intestine and the organism produces botulinum toxin. It does not include cases where the preformed toxin is ingested, these are considered foodborne.

There were no cases of botulism reported to NNDSS in 2010. There was 1 notified case reported in 2009 and no cases reported in 2008.

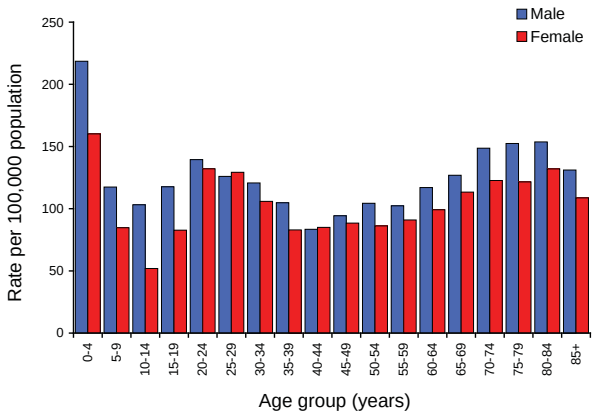
Campylobacteriosis

The bacterium *Campylobacter* is a common cause of foodborne illness (campylobacteriosis) in humans. The severity of this illness varies and is characterised by diarrhoea (often bloody stools), abdominal pain, fever, nausea and or vomiting. Campylobacteriosis is notifiable in all Australian jurisdictions, except New South Wales.

In 2010, there were 16,966 notified cases of campylobacteriosis, a rate of 112 per 100,000, similar to the 16,081 notifications in 2009. Notification rates ranged from 71.8 per 100,000 in the Northern Territory to 153.8 per 100,000 in the Australian Capital Territory.

Notification rates were highest amongst males in nearly all age groups. The highest age-specific rate for both males and females was in the 0–4 age group (218.5 and 160.2 per 100,000, respectively) with additional peaks in the 20–24 and 80–84 year age groups (Figure 15).

Figure 15: Rate for campylobacteriosis, Australia, 2010, by age group and sex



Cryptosporidiosis

Cryptosporidiosis is a parasitic infection of the lower intestine, characterised by abdominal cramping and usually large-volume watery diarrhoea. Ingesting contaminated water is a major risk factor for infection.

In 2010, there were 1,480 notified cases of cryptosporidiosis reported to NNDSS; a rate of 7 cases per 100,000. This represents a 68% decrease over the 4,625 notifications in 2009, which was the largest number reported since the disease became nationally notifiable in 2001.

Cryptosporidiosis notifications fluctuate from year to year, and notifications are most numerous in autumn and summer, with some regional variation.

Haemolytic uraemic syndrome

Haemolytic uraemic syndrome is a rare but serious clinically diagnosed disease, that is characterised by acute renal impairment, and results in chronic complications in 40% of cases.[19] Not all diagnoses of HUS are related to enteric pathogens, but in Australia cases are commonly associated with STEC infection.

In 2010, there were 8 notified cases of HUS (rate 0.05 per 100,000 population) (Table 11), compared with 13 in 2009 and a mean of 19 notifications per year (0.1 per 100,000 population) between 2005 and 2009.

The median age of HUS cases between 2005 and 2010 was 6 years (range 0–89 years) and cases were most frequently reported amongst children in the 0–4 year age group (Table 11).

Hepatitis A

Hepatitis A is a viral disease primarily of the liver that can develop into chronic liver disease including liver failure. Infection is usually spread via the faecal-oral route but can be foodborne or waterborne.

In 2010 there were 263 notified cases of hepatitis A in Australia, a rate of 1.2 notifications per 100,000 population. This was a 53% decrease compared with the 563 notifications in 2009 (Table 6). The increase in 2009 was largely attributable to an outbreak of locally-acquired infections between 1 March 2009 and 18 March 2010, associated with the consumption of semi-dried tomatoes.[20,21]

In 2010, 40% (106/263) of notified cases were locally-acquired with most of these being part of the 2009–2010 outbreak, and with a 5-year average (2005–2009) of 166 locally-acquired cases per year (Table 12).

Hepatitis A was most frequently notified amongst young adults and in 2010, the median age of notified cases was 27 years (range 0–97 years), and 51% (133/263) were male.

Indigenous status was known for 91% of notifications and of these no cases identified as being Indigenous.

Table 11: Notified cases of haemolytic uraemic syndrome, Australia, 2005 to 2010, by age group

Age group	2005	2006	2007	2008	2009	2010
0–4	12	5	8	11	5	6
5–9	2	3	2	4	2	0
10–14	1	2	0	2	2	1
15–19	0	0	3	2	0	0
20–24	0	1	0	0	0	1
25–29	0	2	0	1	1	0
30–34	0	0	0	2	0	0
35–39	0	0	1	0	0	0
40–44	0	0	2	0	0	0
45–49	0	0	0	3	0	0
50–54	2	0	1	1	0	0
55–59	0	0	0	1	0	0
60–64	1	1	1	0	1	0
65–69	1	0	0	0	0	0
70–74	0	0	1	2	0	0
75–79	0	0	0	1	1	0
80–84	1	0	0	1	0	0
85+	0	0	0	0	1	0
Total	20	14	19	31	13	8

Table 12: Hepatitis A notifications, Australia, 2005 to 2010, by place of acquisition

	Locally acquired		Overseas acquired		Unknown	
Year	n	%	n	%	n	%
2005	140	42.8	151	46.2	36	11.0
2006	101	35.9	69	24.6	111	39.5
2007	74	44.8	35	21.2	56	33.9
2008	99	35.7	52	18.8	126	45.5
2009	416	73.9	68	12.1	79	14.0
2010	106	40.3	131	49.8	26	9.9

Hepatitis E

Hepatitis E is a viral disease primarily of the liver that is transmitted by the faecal-oral route.

In 2010, there were 38 notified cases of hepatitis E; a rate of 0.2 per 100,000, compared with 33 notifications in 2009. Hepatitis E in Australia is associated with overseas travel, with 58% (n = 22) known to have been acquired overseas.

Listeriosis

Invasive listeriosis commonly affects the elderly or immunocompromised, and is most common amongst people with serious or terminal underlying illnesses. Listeriosis can also affect pregnant women and infect their unborn baby. Laboratory-confirmed infections in a mother and unborn child or a neonate are notified separately in the NNDSS. However, OzFoodNet counts such pairs as 1 case, with the mother reported as the primary case, which explains the differences in numbers from those reported in OzFoodNet annual reports.

In 2010, there were 71 notified cases of invasive *Listeria monocytogenes* infection; a rate of 0.3 per 100,000, compared with a 5-year historical mean of 65 notifications. This was a decrease from the 92 notified cases in 2009, when an outbreak associated with chicken wraps was reported.[22]

Salmonellosis (non-typhoidal)

Salmonellosis is a bacterial disease caused by *Salmonella enterica*. The disease is characterised by rapid development of symptoms including abdominal pain, fever, diarrhoea, muscle pain, nausea and/or vomiting. People can become infected via faecal-oral transmission, ingesting contaminated food, through animal contact and from environmental exposures.

There were 11,993 notified cases of salmonellosis in Australia in 2010; a rate of 53.7 per 100,000, compared with the 5-year mean of 8,825 notifications. In 2010, salmonellosis notifications continued to increase, with notifications exceeding the 5-year mean by more than 2 standard deviations.

Notification rates ranged from 40.4 per 100,000 in South Australia to 243.4 per 100,000 in the Northern Territory. In 2010, 51% (n = 6,111) of cases were in females, with the greatest proportion of cases in the 0–4 year age group (26%, n = 3,090).

Shigellosis

Shigellosis is bacterial disease characterised by acute abdominal pain and fever, small-volume loose stools, vomiting and tenesmus. *Shigella* is transmitted via the faecal-oral route, either directly (such as male-to-male sexual contact) or indirectly and can be foodborne.

In 2010, there were 552 notified cases of shigellosis; a rate of 2.5 per 100,000, with notifications being less than the 5-year mean of 665 notifications. As in previous years, the highest notification rate was in the Northern Territory (32.7 per 100,000).

Notifications for shigellosis were highest in the 0–4 year age group (21%, n = 115), and 53% (n = 293) of notified cases were female.

Information on Indigenous status was available for 82% (n = 451) of notifications, and this proportion varied by state or territory, with New South Wales, Queensland, South Australia and Tasmania being less than 85% complete. Amongst jurisdictions with greater than 85% completeness, the proportion of notified cases who identified as being of Aboriginal or Torres Strait Island origin was 35% (99/283).

Twenty-five per cent (n = 140) of notified cases were reported as being acquired overseas. The most frequently reported countries of acquisition for imported cases were Indonesia (34%, n = 48) and India (11%, n = 15).

Shiga toxin-producing *Escherichia coli* infections

Shiga toxin-producing *E. coli* are species of toxin-producing *E. coli* that cause diarrhoeal illness in humans. Severe cases can progress to HUS.[23]

There were 81 notifications of STEC in Australia in 2010; a rate of 0.4 per 100,000 population.

Rates of STEC infection are strongly influenced by jurisdictional practices regarding the screening of stool specimens.[23] In particular, South Australia routinely tests all bloody stools by polymerase chain reaction (PCR) for genes coding for Shiga toxins and other virulence factors, making rates for this state the highest in the country at 2.0 per 100,000.

In 2010, 62% (n = 50) of notified cases were female. The median age of notified cases was 43 years (range 1–98 years).

Typhoid

Typhoid is a disease caused by *S. enterica* serotype Typhi. Transmission is the same as for salmonellosis, however typhoid differs in that humans are the reservoir for the bacterium.

There were 96 notified cases of typhoid during 2010 (rate 0.4 per 100,000), which was slightly higher than the 5-year mean of 88.

Similar to previous years, overseas travel was the primary risk factor for notified cases in 2010, with 76% (n = 73) of notified cases known to have been acquired overseas, compared with 89% (102/115) in 2009. India continues to be the most frequently reported country of acquisition, accounting for 43% (n = 41) of overseas-acquired cases in 2010, with a range of other countries in South and South East Asia reported as the place of acquisition, each by less than 1% of cases.

Quarantinable diseases

Human diseases covered by the *Quarantine Act 1908,* and notifiable in Australia and to the WHO in 2010 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. Travellers are advised to seek information on the risk of contracting these diseases at their destinations and to take appropriate measures. More information on quarantinable diseases and travel health can be found on the following web sites:

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

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

There were no cases of plague, rabies, smallpox, yellow fever, SARS, HPAIH or viral haemorrhagic fevers reported in Australia in 2010. Table 13 provides information on the occurrence of quarantinable diseases in Australia.

Table 13: Australia's status for human quarantinable diseases, 2010

Disease	Status	Date of last record and notes
Cholera	Free	Small number of cases are reported annually and related to overseas travel or imported food products[24]
Plague	Free	Last case recorded in Australia in 1923[25]
Rabies	Free	Last case (overseas acquired) recorded in Australia in 1990 [26]
Smallpox	Free	Last case recorded in Australia in 1938[27]
Yellow fever	Free	No cases recorded on shore in Australia – 5 occasions on which vessels arrived in Australian ports 1892–1915[25]
SARS	Free	Last case recorded in Australia in 2003[28]
HPAIH	Free	No cases recorded[29]
Viral haemorrhagic fevers		
Ebola	Free	No cases recorded
Marburg	Free	No cases recorded
Lassa	Free	No cases recorded
Crimean–Congo	Free	No cases recorded

Cholera

There were 3 notified cases of cholera in Australia in 2010, two from New South Wales and one from Western Australia. All were acquired overseas. There were 19 cases of cholera in Australia between 2005 and 2009 (Table 7).

All cases of cholera reported since the commencement of the NNDSS in 1991 have been acquired outside Australia except for 1 case of laboratory-acquired cholera in 1996 and 3 cases in 2006.[24]

Sexually transmissible infections

In 2010, the sexually transmissible infections (STIs) reported to the NNDSS were chlamydial infection, donovanosis, gonococcal infection and syphilis. Other national surveillance systems that monitor STIs in Australia include the Australian Gonococcal Surveillance Programme (AGSP), which is a network of specialist laboratories monitoring antimicrobial susceptibility patterns of gonococcal infection, and the Kirby Institute, which maintains the National HIV Registry and the National AIDS Registry.

The national trends in the number and rates of STI notifications reported to the NNDSS between 2005 and 2010 are shown in Table 6. In interpreting these data it is important to note that changes in notifications over time may not solely reflect changes in disease prevalence as changes in screening programs,[30,31] the use of less invasive and more sensitive diagnostic tests and periodic public awareness campaigns may influence the number of notifications that occur over time. Rates for STIs, are particularly susceptible to overall rates of testing as well as targeted testing in certain high risk population sub-groups.[32] For some diseases, changes in surveillance practices may also need to be taken into account when interpreting national trends.

Direct age standardised notification rates, using the method described by the Australian Institute of Health and Welfare[33] were calculated for Indigenous and non-Indigenous notifications for jurisdictions that had Indigenous status data completed for more than 50% of notifications over the period 2005 to 2010. Where the Indigenous status of a notification was not completed, these notifications were counted as non-Indigenous in the analyses. These data, however, should be interpreted with caution, as STI screening occurs predominately in specific high-risk groups, including in Indigenous populations. Previous research into high rates of STIs amongst the Indigenous population in the Northern Territory suggested that the disparity in rates could be attributed to more targeted screening programs and poorer access to primary health care services, rather than to increased levels of transmission amongst Indigenous people.[34,35] Similarly, the differences in rates between females and males should be interpreted with caution, as rates of testing for STIs, symptom status, health care-seeking behaviours, and partner notification differ between the sexes.[32]

In the national case definitions for chlamydial, gonococcal and syphilis infections the mode of transmission cannot be inferred from the site of infection. Infections in children may be acquired perinatally (e.g. gonococcal conjunctivitis).[36] Notifications of chlamydial, gonococcal and non-congenital syphilis infections were excluded from analysis where the case was aged less than 13 years and the infection was able to be determined as non-sexually acquired.

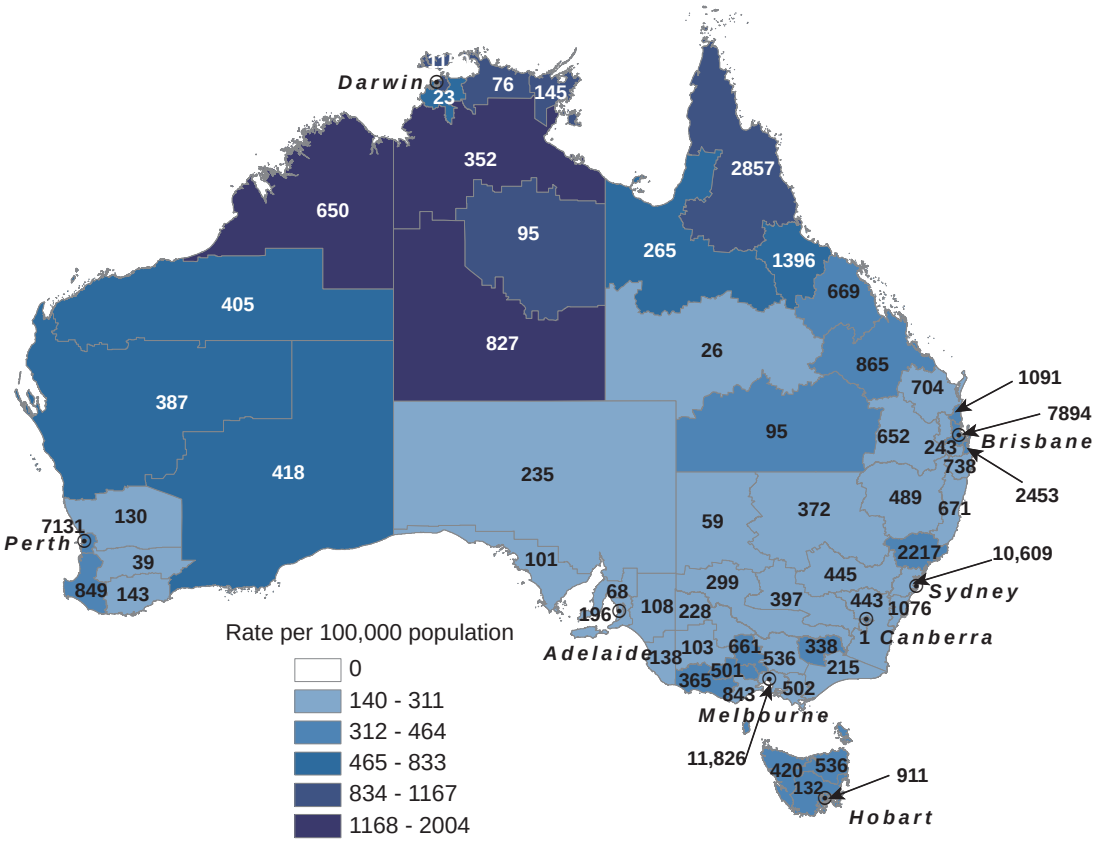
Chlamydial infection

Chlamydial infection continued to be the most commonly notified disease in 2010. Since chlamydial infection became a nationally notifiable disease in 1991 (1997 in New South Wales), the rate has increased in each consecutive year. In 2010, there were 74,305 notified cases of chlamydial infection, equating to a rate of 333 per 100,000 population. This represents an increase of 17% compared with the rate reported in 2009 (285). Between 2005 and 2010, chlamydial infection rates increased by 64%, from 203 to 333 per 100,000 population (Table 6).

Increasing rates of chlamydia were reported from all states and territories with the Northern Territory (1,159 per 100,000), Western Australia (443 per 100,000) and Queensland (426 per 100,000) substantially higher than the national rate (Table 5). At a regional level, chlamydial rates were highest in the Central NT SSD of the Northern Territory (2,004 per 100,000; n = 827) followed by the Kimberley SD of Western Australia (1820 per 100,000; n = 650). However, rates in geographic areas where the estimated residential population and case numbers are small, should be interpreted with caution. Rates were substantially higher than the national rate in the remaining SSDs of the Northern Territory, the North and North West SDs in Queensland and the Pilbara, Central and South Eastern SDs in Western Australia (Map 2).

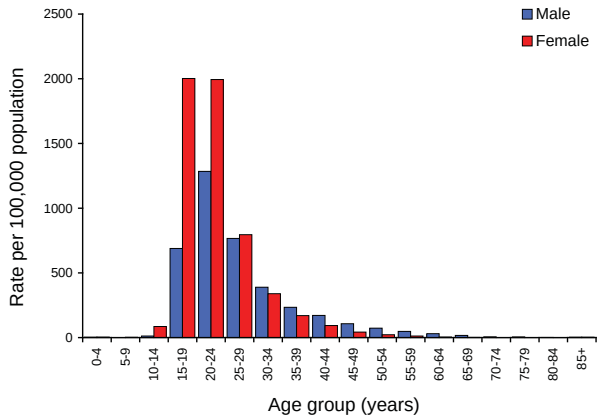
In 2010, rates of chlamydial infection in males and females were 279 and 384 per 100,000 population respectively. When compared with 2009, rates increased by 19% in males and 15% in females. The male to female rate ratio in 2010 was 0.7:1, which was similar to previous years. Rates for females exceeded those for males in the under 30 age range, especially in the 10–14 year age group with a ratio of 0.1:1, while males had higher rates in the older age groups (Figure 16).

Map 2: Rates and counts* for chlamydial infection, Australia, 2010, by Statistical Division and Statistical Subdivision of residence in the Northern Territory



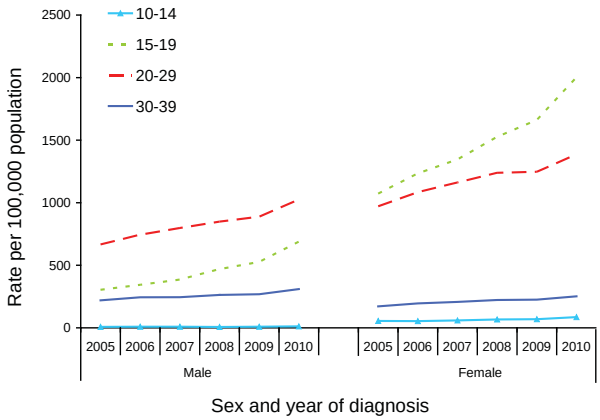
* Numbers in the shaded Statistical Divisions and Statistical Subdivisions represent the count of notifications.

Figure 16: Rate for chlamydial infection, Australia, 2010, by age group and sex*



* Excludes 246 notifications for whom age and or sex were not reported.

Figure 17: Rate for chlamydial infection in persons aged 10–39 years, Australia, 2005 to 2010, by sex, year and age group



Between 2005 and 2010, there was an increasing trend in chlamydia notification rates across both sexes and in all age groups (Figure 17). The greatest increase in rates amongst those aged 15–39 years occurred in both males and females in the 15–19 age group (114% and 75% respectively). Those aged 15–29 years accounted for approximately 80% of the annual number of notified cases during the period 2005 to 2010.

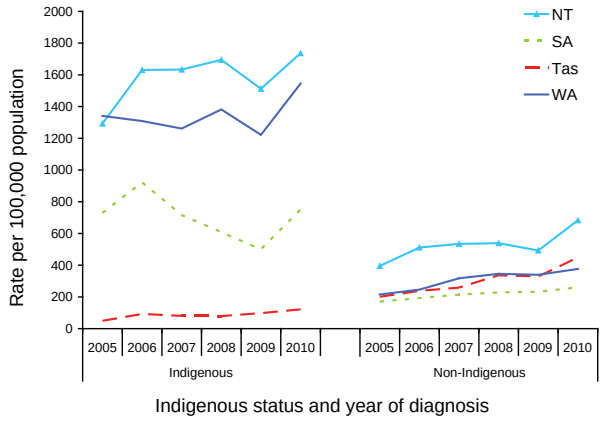
Nationally in 2010, data on Indigenous status were complete for 50% of notifications, which was higher than the preceding 5-year mean of 45% (range:

40%–49%). It should be noted that the completeness of Indigenous status identification in the notification data varies by year and by jurisdiction. Four jurisdictions had greater than 50% completeness of the Indigenous status field across the 2005 to 2010 period. These were the Northern Territory, South Australia, Tasmania and Western Australia. Amongst these jurisdictions, the combined age standardised notification rate ratio between Indigenous and non-Indigenous populations in 2010 was 3.8:1, with the disparity in notification rates improving substantially since 2000.

After a 40% increase between 2005 and 2006, rates amongst the Indigenous population remained fairly consistent between 2006 and 2009, with an average rate during this period of 1,193, but in 2010 there was a 12% increase to 1,342 compared with this average. In contrast, rates amongst the non-Indigenous population have been trending upwards from a rate of 205 in 2005 to 356 in 2010, representing a 74% increase over this period.

In 2010, chlamydia rates increased compared with 2009 in all 4 states and territories in which Indigenous status was more than 50% complete, ranging from 14% (Tasmania) to 49% (South Australia) amongst the Indigenous population and 11% (Western Australia) to 39% (Northern Territory) amongst the non-Indigenous population (Figure 18). The overall high Indigenous population rates observed in the Northern Territory, Western Australia and South Australia may be partly explained by the high level of screening, which take place in remote Indigenous communities.

Figure 18: Age standardised rate for chlamydial infection, selected states and territories,* 2005 to 2010, by Indigenous status, year and state or territory



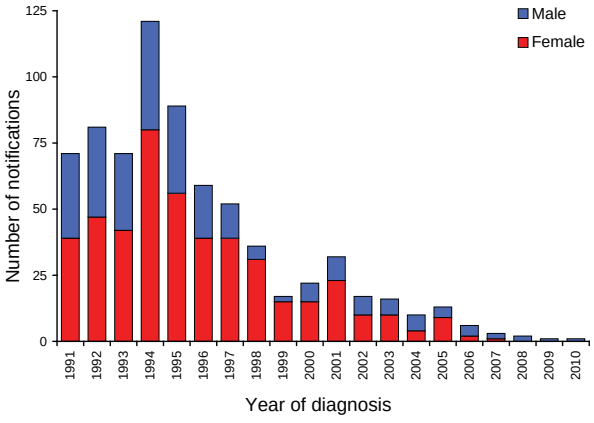
* Includes notifications in the Northern Territory, South Australia, Tasmania and Western Australia where Indigenous status was reported for more than 50% of cases over a 5-year period.

Between May 2007 and June 2010, the Australian Government Department of Health and Ageing funded a pilot program called the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS). The aim of the program was to monitor the uptake and outcome of chlamydia testing in Australia through a range of sentinel sites including sexual health services, general practices and laboratories. In 2010, ACCESS identified that chlamydia positivity amongst people who accessed the sentinel sites, was 11% amongst males and 10% amongst females, with positivity highest in the 16–19 year age group across most of the sentinel sites.[13] The chlamydia positivity rate increased between 2% and 3% amongst young heterosexual men and women and amongst men who have sex with men between 2006 and 2010. Between 2007 and 2010, the number of people who accessed these sentinel sites and were tested increased by 21%. Notification rates for chlamydia and other STIs are particularly susceptible to overall rates of testing as well as targeted testing in high-risk groups.

Donovanosis

Donovanosis was targeted for elimination in Australia through the National Donovanosis Elimination Project.[37] The disease predominantly occurred in rural and remote Indigenous communities in central and northern Australia and is now relatively uncommon. In 2010, 1 notified case was reported to the NNDSS of a male from Queensland (Figure 19).

Figure 19: Notified cases of donovanosis, Australia, 1991 to 2010, by year and sex



Gonococcal infection

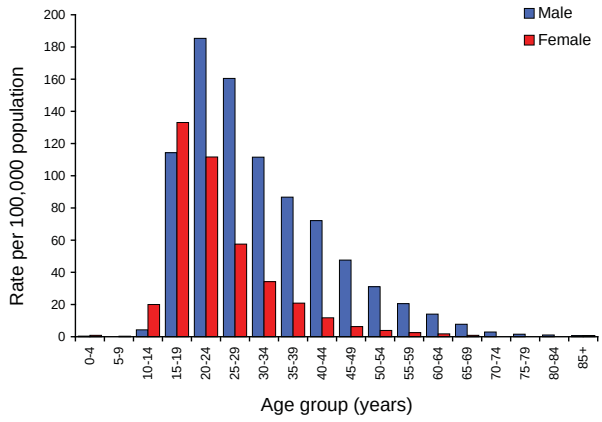
In 2010, there were 9,971 notified cases of gonococcal infection reported to the NNDSS; a rate of 45 per 100,000 population. This was a 23% increase compared with 2009. Due to a technical processing

error, gonococcal data for Queensland were under-reported in 2009 and 2010 and therefore should be interpreted with caution.

The highest rate in 2010 was in the Northern Territory (841 per 100,000 population), which was almost 19 times higher than the national rate (Table 5). Between 2008 and 2009 considerable declines in rates were observed in Western Australia (23%), South Australia (25%) and Tasmania (17%) with increases for the same period reported in Victoria (64%), New South Wales (22%), and the Australian Capital Territory (157%). In 2010, all states and territories except Tasmania and the Australian Capital Territory reported increases ranging from 2% in Western Australia to 38% in New South Wales when compared with 2009.

Nationally, there was an increase in the gonococcal infection rates in both males (26%) and females (17%) compared with 2009. The male to female rate ratio in 2010 was 2.2:1 (61 and 28 respectively), which is similar to the previous 5 years. Nationally, the rate of gonococcal infection in males exceeded those in females in all age groups except those aged less than 20 years (Figure 20). As in previous years, the exception to this pattern was the Northern Territory, where females had an overall higher notification rate than males (889 compared with 797 per 100,000).

Figure 20: Rate for gonococcal infections, Australia, 2010, by age group and sex*



* Excludes 20 notifications for whom age or sex were not reported.

Age specific rates amongst males increased in all age groups except the 10–14 year age group in contrast to females for which rates increased in the 15–19 and 20–29 year age groups but otherwise remained relatively stable (Figure 21).

In 2010, the data completeness of the Indigenous status field for gonococcal infection notifications was 65%, the same as in 2009 but a decrease compared with the previous few years (around 70%). All jurisdictions except New South Wales and the Australian Capital Territory had greater than 50% completeness of the Indigenous status field. Amongst these jurisdictions the combined age standardised notification rate for gonococcal infection in the Indigenous population had been steadily declining from 919 per 100,000 in 2006 to 629 per 100,000 in 2009 before increasing to 878 per 100,000 in 2010. In the non-Indigenous population, rates have been stable at around 22 to 23 per 100,000 between 2005 and 2009 before also increasing by 40% to 32 per 100,000 in 2010. Between 2005 and 2010 the Indigenous to non-Indigenous rate ratio has decreased 31% from 40:1 to 27:1. In

Figure 21: Rate for gonococcal infection in persons aged 10–49, Australia, 2005 to 2010, by and sex, year and age group

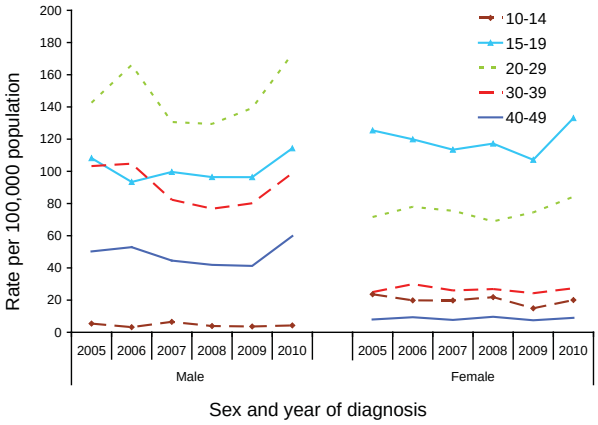
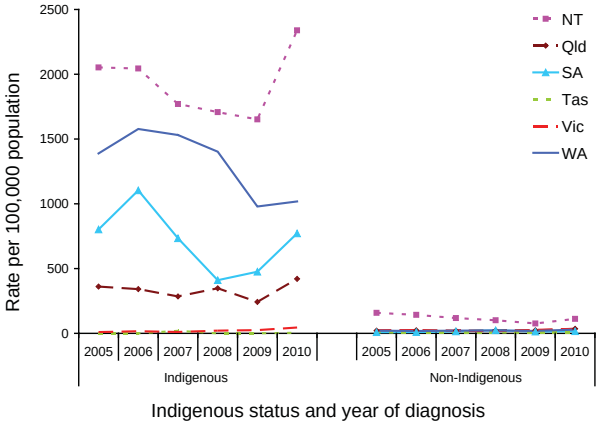


Figure 22: Age standardised rate for gonococcal infection, selected states and territories,* 2005 to 2010, by Indigenous status, year and state or territory



* Includes notifications in the Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia where Indigenous status was reported for more than 50% of cases over a 5-year period.

2010, rates of gonococcal infection in the Indigenous and non-Indigenous populations increased compared with 2009 in all jurisdictions except Tasmania (Figure 22). The overall high Indigenous population rates observed in the Northern Territory may be partly explained by the high level of screening which take place in remote Indigenous communities.

Other surveillance of gonococcal infections

The AGSP is the national surveillance system for monitoring the antimicrobial resistance of *Neisseria gonorrhoeae* isolates, via a network of public and private reference laboratories located in each jurisdiction. Susceptibility testing using a standardised methodology is performed on gonococcal isolates to a core group of antibiotics: penicillin, ceftriaxone, spectinomycin, quinolone and tetracycline.

In 2010, the AGSP[38] reported that 4,101 gonococcal isolates were tested for antibiotic susceptibility, representing approximately 41% of notified cases of gonococcal infection and a similar proportion to 2009 (40%) and 2008 (42%).

Of the isolates collected through the AGSP in 2010, the majority (n = 3,381) were from males with the remaining 720 from females (ratio 4.7:1). In males, 65% of isolates were obtained from the urethra, 20% from the rectum and 12% from the pharynx. In females, the majority of isolates (89%) were obtained from the cervix.

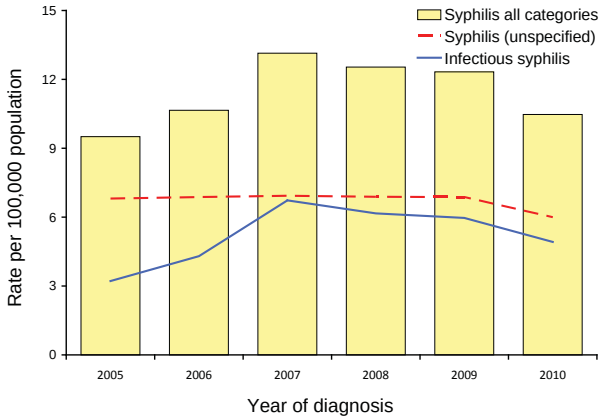
In 2010, approximately 29% of gonococcal isolates had some level of resistance to the penicillins, a decrease from the 36% identified in 2009. In addition, 35% had some level of resistance to quinolones, representing a further decrease in the proportion of quinolone resistance from 43% in 2009 and 54% detected in 2008. Since 2001, low but increasing numbers of isolates with decreased susceptibility to ceftriaxone have been identified in Australia with 4.8% observed nationally in 2010. There were no resistant ceftriaxone isolates reported in 2010. For more details see the AGSP annual report series published in CDI.

Syphilis (non-congenital categories)

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

In 2010, there were 2,364 notified cases of syphilis infection of all non-congenital categories reported to NNDSS, representing a rate of 10.6 per 100,000 population; a 14% decrease compared with 2009 (12.3 per 100,000 population) (Table 6, Figure 23). The Northern Territory continued to have the highest rate of syphilis (61 per 100,000 population), consistent with the rate in 2009. In 2010, there were decreases in rates from Tasmania (26%), New South Wales (21%), Queensland (19%), Western Australia (17%), South Australia (16%), and Victoria (5%). While national rates have declined since 2007, overall between 2005 and 2010 there has been an 11% increase, and as in other developed countries, predominantly affecting men who have sex with men.[39,40]

Figure 23: Rate for non-congenital syphilis infection (all categories), Australia, 2005 to 2010, by year



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

In 2010, there were 1,099 notified cases of infectious syphilis (primary, secondary and early latent), less than 2 years duration reported to NNDSS. This represents a notification rate of 4.9 per 100,000, a decrease of 18% compared with 2009 (6.0 per 100,000 population) (Table 5). The rate of infectious syphilis notifications increased from 3.2 per 100,000 in 2005 to a peak of 6.7 per 100,000 in 2007 and has been gradually declining since then (Figure 23). The Northern Territory had the highest notification rate at 19 per 100,000 population in 2010, an 11% increase compared with 2009, but an overall 59% decrease compared with 2005.

Nationally, the rates of infectious syphilis for males and females were 8.9 and 1.0 per 100,000 population respectively, representing a male to female ratio of 9:1 (Table 14). Rates in males were highest in the 40–44 year age group (19 per 100,000), closely followed

Table 14: Notified cases and rates* for infectious syphilis (less than 2 years duration), Australia, 2010, by state or territory†

State or territory	Male		Female		Total	
	Count	Rate*	Count	Rate*	Count	Rate*
ACT/NSW	410	10.9	19	0.5	430	5.7
NT	29	24.4	14	12.7	43	18.7
Qld	192	8.5	29	1.3	221	4.9
SA	16	2.0	5	0.6	21	1.3
Tas	6	2.4	1	0.4	7	1.4
Vic	264	9.6	26	0.9	291	5.2
WA	71	6.1	15	1.3	86	3.7
Total	988	8.9	109	1.0	1,099	4.9

* Notification rate per 100,000 population.

by the 30–34 and 35–39 year age groups (18 and 17 per 100,000 respectively), whereas in females the highest notification rates were observed in the 20–24 year age group followed by the 25–29 and 30–34 year age groups (2.8, 2.2 and 2.1 per 100,000) (Figure 24).

Over the period 2005 to 2007, notification rates amongst males increased substantially, in the 20–29, 30–39 and 40–49 year age groups but since then have either decreased or remained relatively stable. The overall increases observed during this period were mainly attributed to men who have sex with men.[18] In females, for the 2005 to 2010 period, rates remained relatively steady, except in the 15–19 year age group where they decreased from a peak of 7.5 per 100,000 in 2006 to 1.6 per 100,000 in 2010 (Figure 25).

In 2010, data on Indigenous status were complete for 95% of cases. All jurisdictions except the Australian Capital Territory had greater than 50% completeness of the Indigenous status field between 2005 and 2010. The age standardised notification rate was 23 per 100,000 in the Indigenous population and 5.2 in the non-Indigenous population, representing a rate ratio of 5:1. Nationally, there was a 29% decrease in rates for the Indigenous population (from 32.6 per 100,000 to 23.2 per 100,000) between 2005 and 2010 in contrast to the 80% increase (2.5 to 4.5 per 100,000) in the non-Indigenous population during the same period. However, rates varied widely across jurisdictions. In 2010, Indigenous rates in Queensland increased by 34% compared with 2009 but were 20% lower than in 2005, while in the remaining states and territories rates either stayed relatively stable or decreased when compared with 2009. The increase evident in Indigenous rates in Western Australia in 2008 was largely attributable to an outbreak that occurred in 2008 in the Pilbara region amongst Indigenous people (Figure 26).[41] In 2010, rates of

Figure 24: Rate for infectious syphilis (primary, secondary and early latent), less than 2 years duration, Australia, 2010, by age group and sex

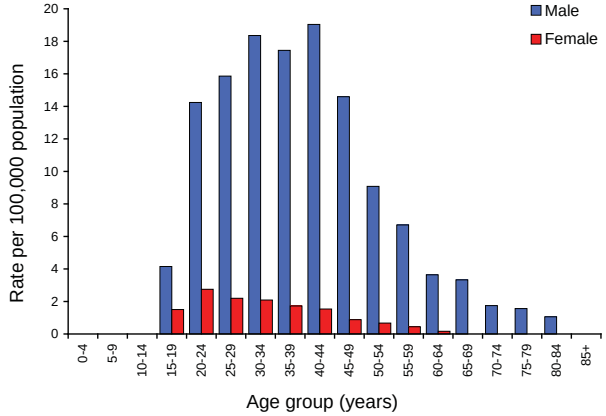
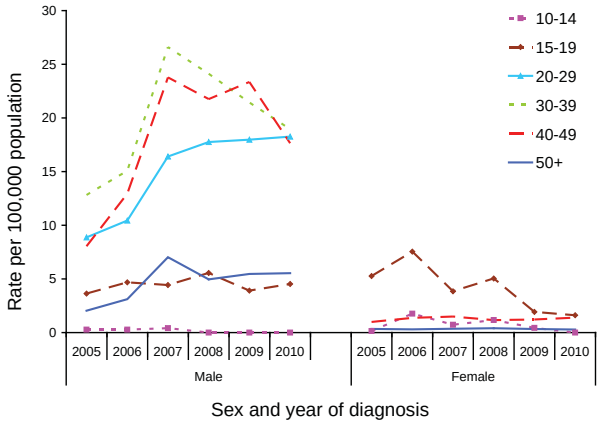
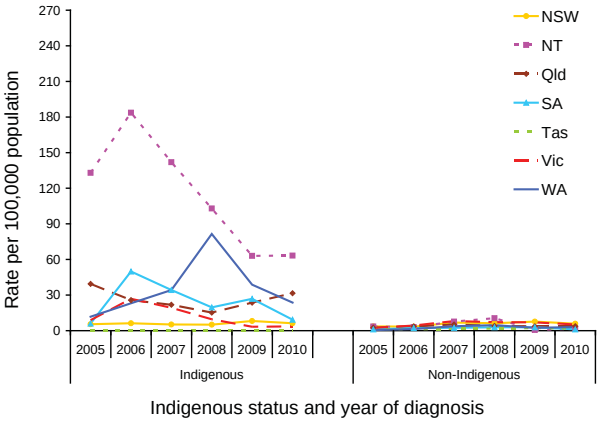


Figure 25: Rate for infectious syphilis (primary, secondary and early latent), less than 2 years duration, in persons aged 10 years or over, Australia, 2005 to 2010, by sex, year and age group



infectious syphilis in the Indigenous population were highest in the 20–24 year age group, while in the non-Indigenous population the highest rates were amongst the 30–34 and 40–44 year age groups.

Figure 26: Age standardised rate for infectious syphilis, selected states and territories,* 2005 to 2010, by Indigenous status, year and state or territory



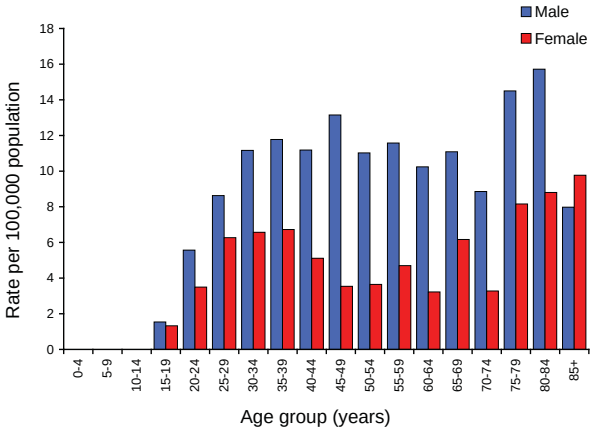
* Includes notifications in the Northern Territory, Queensland, South Australia, Tasmania, Victoria, Western Australia and New South Wales where Indigenous status was reported for more than 50% of cases over a 5-year period.

Syphilis of more than 2 years or unknown duration

In 2010, there were 1,241 notified cases of syphilis of more than 2 years or unknown duration reported to the NNDSS, giving a rate of 6.0 per 100,000 population, which was similar to the rate in 2009 (6.8 per 100,000). The Northern Territory continued to have the highest notification rate (42.7 per 100,000), consistent with 2009 but was a 43% decrease compared with 2008.

In 2010, notification rates of syphilis of more than 2 years or unknown duration in males and females were 7.9 and 4.0 per 100,000, respectively (Table 15), representing a male to female ratio of 1.9:1 (Figure 27). Rates in males were higher than in females across all ages, except in the 85 years or over age group, and were 3 times higher amongst those in the 45–54 and 60–64 year age groups. The distribution of notification rates across age groups in females was bimodal, with the highest rate (9.8 per 100,000) in the 85 years or over age group, followed by those in the 30–34 year age group (6.7 per 100,000). In males, rates remained high in those aged 30 years or over and peaks occurred in the 45–49 and 80–84 year age groups at 13.0 and 16.0 respectively.

Figure 27: Rate for syphilis of more than 2 years or unknown duration, Australia,* 2010, by age group and sex



* Data from all states and territories except South Australia.

Table 15: Notified cases and rates* for syphilis of more than 2 years or unknown duration, Australia,† 2009, by state or territory and sex

State or territory	Male		Female		Total	
	n	Rate	n	Rate	n	Rate
ACT/NSW	223	5.9	119	1.6	345	4.5
NT	57	47.9	41	17.9	98	42.7
Qld	114	5.1	69	1.5	183	4.1
SA	NDP	NDP	NDP	NDP	NDP	NDP
Tas	9	3.6	5	1.0	14	2.8
Vic	365	13.3	163	2.9	532	9.6
WA	45	3.9	24	1.0	69	3.0
Total	813	7.9	421	4.1	1,241	6.0

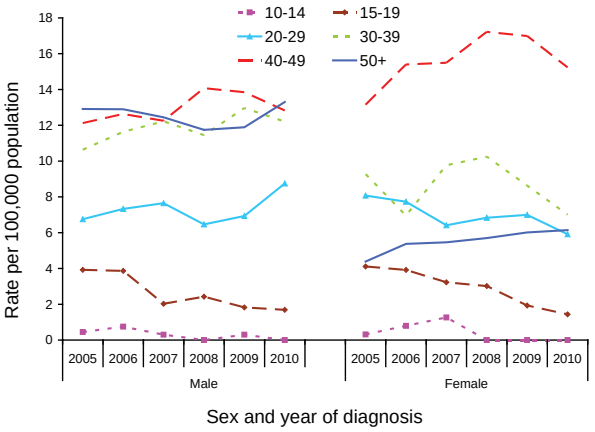
* Notification rate per 100,000 population.

† Data from all states and territories except South Australia.

NDP No data provided.

Over the period 2005 to 2010, rates increased amongst males in all age groups over 19 years but particularly in the 20–29 year age group, which increased by 30% during this time. During this same period a substantial decrease of 57% was observed amongst males in the 15–19 year age group. In contrast, rates for females during this period decreased in all age groups less than 40 years but had a 40% increase amongst those 50 years or older (Figure 28).

Figure 28: Rate for syphilis of more than 2 years or unknown duration, Australia,* 2005 to 2010, by sex, year and age group

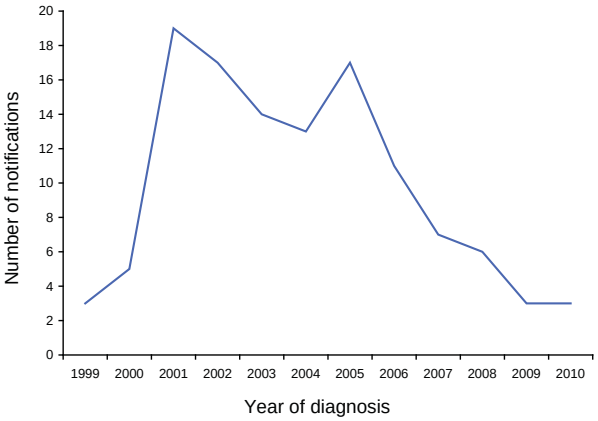


* Data from all states and territories except South Australia.

Congenital syphilis

Following a peak of 19 notified cases in 2001, notifications of congenital syphilis have continued to decline (Figure 29). There were 3 notified cases of congenital syphilis reported in 2010, 2 males from Queensland and 1 female from Western Australia. Two of the cases were reported as Indigenous and one was non-Indigenous.

Figure 29: Trends in notifications of congenital syphilis, Australia, 1999 to 2010, by year



Vaccine preventable diseases

Introduction

This section summarises the national notification surveillance data for notifiable diseases targeted by the National Immunisation Program (NIP) in 2010. These include diphtheria, invasive *Haemophilus influenzae* type b infection, laboratory-confirmed influenza, measles, mumps, pertussis, invasive pneumococcal disease, poliomyelitis, rubella, tetanus and varicella zoster infections (chickenpox, shingles and unspecified). Data on hepatitis B and invasive meningococcal disease, which are also targeted by the NIP, can be found in this report under 'Bloodborne diseases' and 'Other bacterial infections' respectively. Other vaccine preventable diseases (VPDs) presented in this report include hepatitis A and Q fever under the 'Gastrointestinal' and 'Zoonoses' sections respectively. For more comprehensive reports on historical data, including notifications, hospitalisations and deaths, readers are referred to the regular CDI supplements 'Vaccine Preventable Diseases in Australia', the latest of which was published as the December 2010 supplement issue of CDI. [42]

In 2010, there were 61,964 notified cases of VPDs, representing 30% of all notified cases to NNDSS and a 39% decrease compared with 2009 (n = 102,003). Pertussis was the most commonly notified VPD (n = 34,793, 56% of the total), reflecting the ongoing epidemic of this disease in 2010, followed by influenza (n = 13,419, 22%). The number of notifications and notification rates for VPDs in Australia are shown in Tables 2 and 3.

Whilst there were no new vaccines added to the NIP in 2010, eligibility for the seasonal trivalent influenza vaccine, which included the pandemic (H1N1) 2009 strain was extended to protect a wider range of vulnerable people. Those eligible for the seasonal influenza vaccine under the NIP in 2010 included individuals with medical conditions predisposing them to severe influenza, Aboriginal and Torres Strait Islander people aged 15 years and over, pregnant women, and persons aged 65 years or over. The seasonal influenza vaccine was also available to the rest of the population if they wished to pay for a prescription or were able to obtain the vaccine through workplace or other programs. In addition, the monovalent vaccine developed in response to the 2009 influenza pandemic continued to be available for free to everyone not eligible for the free seasonal vaccine and was distributed through the national Pandemic (H1N1) 2009 Vaccination Program.

Vaccination coverage is an important factor influencing the incidence of vaccine preventable dis-

eases. Since the commencement of the Australian Childhood Immunisation Register in 1996, immunisation coverage in children has been high by international standards, although geographical pockets of lower coverage remain, in which there is an increased potential for VPDs to occur and circulate. These areas mainly coincide with high levels of conscientious objectors to immunisation, including coastal areas of South East Queensland, northern New South Wales, Adelaide and south-western Western Australia. On average, just 3% of children in Australia are not fully vaccinated for age, but in the above areas this proportion can be much higher.[43]

Information on receipt of vaccines has historically been recorded on NNDSS using the 'vaccination status' field (full, partial or unvaccinated), plus a field capturing the number of doses. In January 2008, new, more detailed fields were added for recording 'vaccine type' and 'vaccination date' for each dose. The new fields were intended to replace the old fields, with a transition period allowing either field to be utilised. In 2010, four jurisdictions were using the new fields (Northern Territory, Queensland, Tasmania and New South Wales for selected diseases), while the remaining jurisdictions continued to use the old fields. In this report, data on receipt of vaccines is presented for each disease, combining data provided by the states and territories from the two different formats. No vaccine is 100% effective, and therefore infections sometimes do occur in fully vaccinated people, and some are reported later in this section. However, effective vaccines do provide a substantially lower chance of becoming infected, and/or reduced severity of disease.

Diphtheria

Diphtheria is an acute toxin-mediated systemic disease caused by the bacterium *Corynebacterium diphtheriae*. Infection is usually localised to the skin (cutaneous diphtheria) or to the throat (pharyngeal diphtheria), in which a membranous inflammation of the upper respiratory tract can cause airway obstruction. Systemic complications caused by the bacteria's exotoxin can occur in both pharyngeal and cutaneous diphtheria. Diphtheria is spread by respiratory droplets or by direct contact with skin lesions or articles soiled by infected individuals.[16] While there are non-toxigenic strains of *C. diphtheriae,* they usually only cause mild throat or skin infection and are not nationally notifiable. In Australia, serosurveillance data indicate that childhood immunity to diphtheria is greater than 99% however, waning immunity amongst adults may result in this population being susceptible with the most likely source of exposure being through overseas travel to countries where diphtheria remains endemic.[44]

There were no notified cases of diphtheria reported to NNDSS in 2010. The last case of diphtheria reported in Australia was a case of cutaneous diphtheria in 2001, the only case reported since 1992.

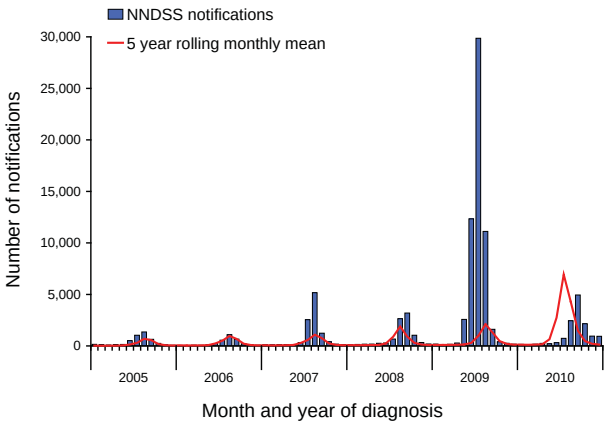
Influenza

Influenza is a viral respiratory infection that causes annual epidemics of respiratory disease. In temperate climates there is usually an increase in influenza transmission during the winter months, from May to October, with the intensity and severity of a season varying from year to year. As only laboratory confirmed cases of influenza are notifiable, it can be difficult to draw conclusions about the true level of influenza activity in the community, due to an unknown proportion of cases where no health care was sought, or no testing performed.

Notifications of influenza decreased substantially in 2010 following the 2009 pandemic year. The 2010 influenza season in Australia was relatively mild, with notification levels comparable to pre-pandemic years. There were 13,419 notified cases of laboratory-confirmed influenza reported to NNDSS in 2010, which was less than a quarter of the number of cases from the previous year. The season peaked in September with 4,944 cases for the month, which was later than in previous years (Figure 30). Higher than usual levels of influenza activity continued across the summer months following the end of the influenza season, and into the following year.

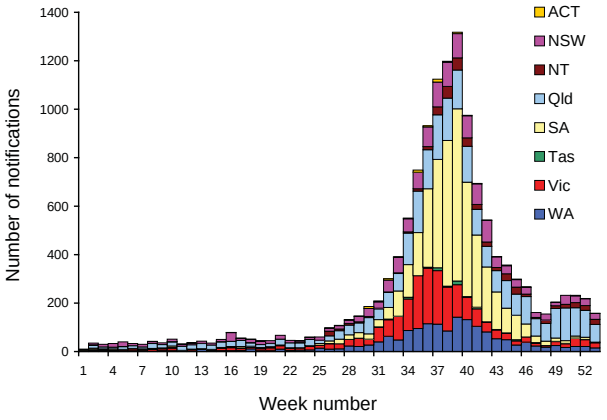
Notification rates were highest in South Australia (258 per 100,000), followed by the Northern Territory (209 per 100,000), with a large gap to the next highest notification rates in Queensland and Western Australian (both 71 per 100,000). Notifications in these jurisdictions were all higher than the national notification rate of 60 per 100,000. Queensland consistently had the highest number of notifications

Figure 30: Notified cases of laboratory-confirmed influenza, Australia, 2005 to 2010, by month and year



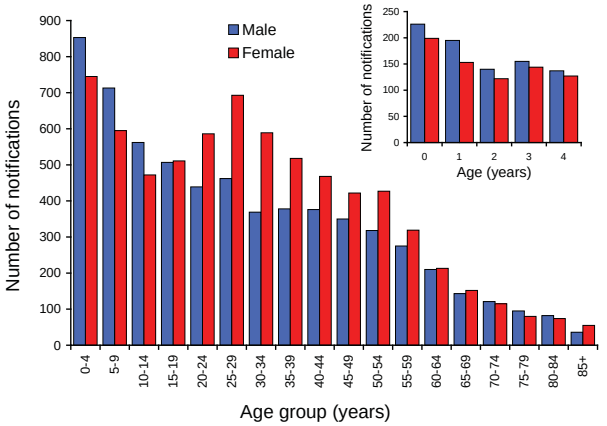
in previous years. In 2010, South Australia replaced Queensland as the jurisdiction with the highest proportion of influenza cases notified (32%), it is thought this increase was due to an actual increase in influenza activity and not an artefact of testing practices (Figure 31).

Figure 31: Notified cases of laboratory-confirmed influenza, Australia, 2010, by week and state or territory



Females accounted for 7,034 (52%) of the 13,419 influenza notifications in 2010. Notifications were higher amongst females than males in most age groups except in the age groups less than 15 years where this was reversed (Figure 32). This likely reflects the health seeking behaviour of adult females, as they tend to account for a greater proportion of encounters in general practice.[45] The highest number of influenza notifications occurred in the 0–4 year age group in both males and females; together they accounted for 12% of all notifications. Over half of the notifications were in people aged less than 30 years.

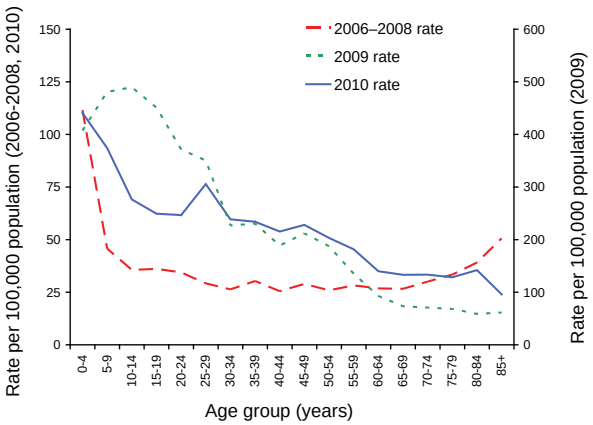
Figure 32: Notified cases of laboratory-confirmed influenza, Australia, 2010, by age group* and sex



* Excludes 96 notifications for whom age or sex were not reported.

Notification rates were highest in the 0–4 year age group (109 notifications per 100,000) with a secondary peak seen in those aged 25–29 years (75 per 100,000), however overall notification rates of influenza decreased with increasing age (Figure 33). Although notifications in 2010 were predominantly the pandemic (H1N1) 2009 strain, the age distribution profile was quite different in the younger age groups in 2010 compared with 2009. In 2009 the highest rates were seen in the 5–9, 10–14 and 15–19 year age groups, with rates in those over 30 years substantially declining relative to the younger age groups. In pre-pandemic seasons, there was typically an increase of notification rates in those aged 70 years and over compared with other adults, this pattern was not observed in 2009 or in 2010 (Figure 33).

Figure 33: Rate for laboratory-confirmed influenza, Australia, 2006 to 2010, by age and year

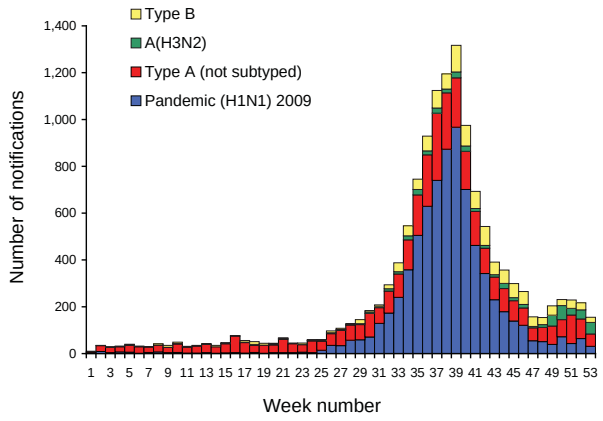


In 2010, almost all (n = 13,402) of the influenza notifications in NNDSS had some level of influenza typing reported. Of those with type information, 90% (n = 12,050) were type A (56% were pandemic (H1N1) 2009, 30% were A (not subtyped) and 4% were A(H3N2)) and 10% (n = 1,301) were type B. Mixed influenza type A and B infections accounted for less than 1% of notifications and typing data were not available for 17 cases (Figure 34).

In 2010, 1,908 Australian influenza viruses were typed and subtyped by the WHO Collaborating Centre for Reference and Research on Influenza (WHOCC). This represented 14% of laboratory-confirmed cases reported to the NNDSS. Pandemic (H1N1) 2009 represented the majority (75%) of viruses, followed by influenza B (14%) and influenza A(H3N2) (11%). Pandemic (H1N1) 2009 replaced previous seasonal A(H1N1) viruses in 2010.

The WHOCC conducted antigenic characterisation on 1,543 of the influenza virus isolates. The vast majority of pandemic (H1N1) 2009 isolates were

Figure 34: Notified cases of laboratory-confirmed influenza, Australia, 2010, by week* and subtype



* Notifications of influenza 'untyped' (n=17) and type A and B (n= 51) were excluded from analysis.

characterised as A/California/7/2009-like. Of the circulating influenza A(H3N2) viruses analysed, most were antigenically similar to the A/Perth/16/2009 virus. Most influenza B viruses detected, were closely related to the B/Brisbane/60/2008 virus.

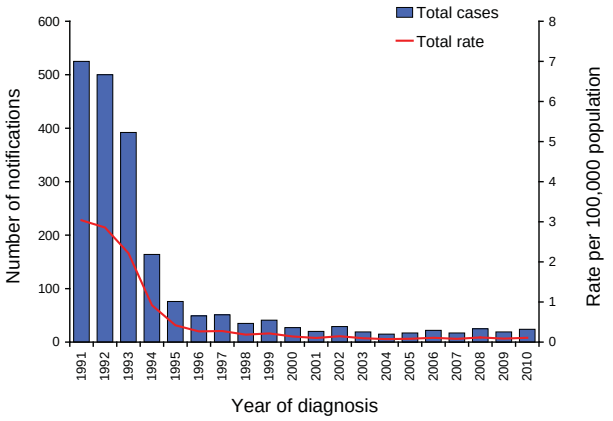
All 3 strains of the 2010 Southern Hemisphere influenza vaccine were different to those previously recommended in the 2009 Southern Hemisphere vaccine. The 2010 vaccine contained A/California/7/2009 (H1N1), an A/Perth/16/2009 (H3N2)-like virus and B/Brisbane/60/2008 (a representative of the B/Victoria/2/87 lineage). Almost all the circulating viruses that were isolated in 2010 were antigenically similar to the 2010 vaccine viruses.[46]

In 2010, the WHOCC conducted antiviral susceptibility testing on 1,320 influenza viruses for resistance to the antiviral drugs oseltamivir and zanamivir. Neuraminidase inhibition assay was performed on 1,277 viral isolates. Four of the pandemic (H1N1) 2009 isolates tested showed resistance to oseltamirvir due to the H275Y neuraminidase mutation. Pyrosequencing of 43 pandemic (H1N1) 2009 clinical specimens found 2 specimens with the same H275Y mutation, which is known to confer oseltamivir resistance. Therefore a total of 6 influenza viruses showed oseltamivir resistance but none were resistant to zanamivir. No oseltamivir or zanamivir resistance was detected in any of the A(H3N2) or influenza B viruses.

Invasive *Haemophilus influenzae* type b disease

Invasive *Haemophilus influenzae* type b (Hib) bacteria causes disease with symptoms dependant on which part of the body is infected. These include: septicaemia (infection of the blood stream); meningitis (infection of the membranes around the brain and spinal cord); epiglottitis (severe swelling of the epiglottis at the back of the throat); pneumonia (infection of the lungs); osteomyelitis (infection of the bones and joints) and cellulitis (infection of the tissue under the skin, usually on the face). Since the introduction of the Hib vaccine in 1993, there has been a marked reduction in total Hib notified cases in Australia (Figure 35), which now has one of the lowest rates of Hib in the world.[42]

Figure 35: Notified cases and rate for invasive *Haemophilus influenzae* type b infection, Australia, 1991 to 2010, by year



There were 24 notified cases of Hib disease in 2010; a rate of 0.1 per 100,000 population and five more than reported in 2009. The majority of cases (n = 10) were in children aged less than 5 years who had the highest rate of notification (0.7 per 100,000 population), and 60% (n = 6) of which were infants less than one year including 1 case in an infant less than 6 months of age. There were no cases in persons between the ages of 6 and 22 years. The remaining 13 cases ranged in age between 23 and 100 years, and included 4 cases in the 50–54 year age group (Figure 36). The majority, 63% (n = 15) of cases were female, predominately in age groups over 4 years.

Indigenous status was complete for 92% (n = 22) of Hib cases in 2010. Thirty-six per cent (8/22) were reported as Indigenous. The rate for Hib in 2010 was 1.4 in Indigenous people and 0.07 in non-Indigenous people, giving a rate ratio of 20:1. Rates of Hib infection in the Indigenous population fluctuated between 2005 and 2010 from 0.6 to 1.4 and represented a 5– to 27-fold increase compared with rates in the non-Indigenous population. The wide variation in rates was due to the low number of cases. Indigenous status recorded as unknown or missing represented an average of 1.5 cases between 2005 and 2010 and were included in the non-Indigenous category for the purpose of this analysis.

Figure 36: Rate for invasive *Haemophilus influenzae* type b infection, Australia, 2010, by age group and sex

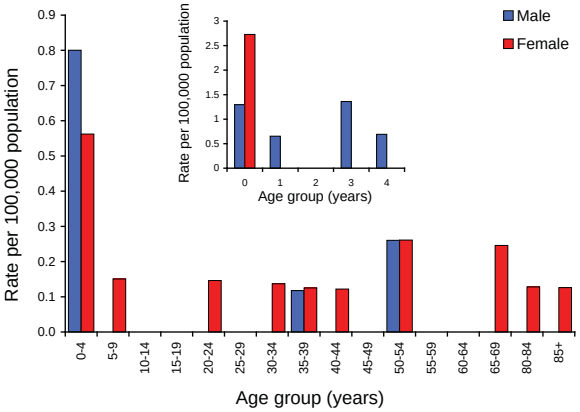
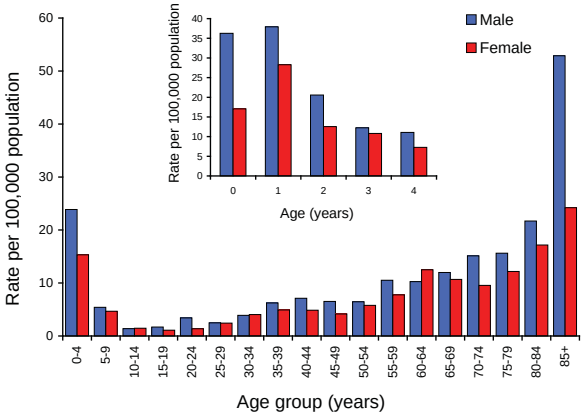


Figure 37: Rate for invasive pneumococcal disease, Australia, 2010, by age group and sex



In 2010, all children under the age of 18 years were eligible for Hib vaccination in infancy. Hib vaccine was introduced to the NIP in April 1993 for all children born after February 1993.

Vaccination status was known for all 10 cases in children aged less than 5 years of which 9 were fully vaccinated for age and 1 was unvaccinated. Of the 9 vaccinated cases, 5 had received all recommended doses of Hib containing vaccine under the NIP.

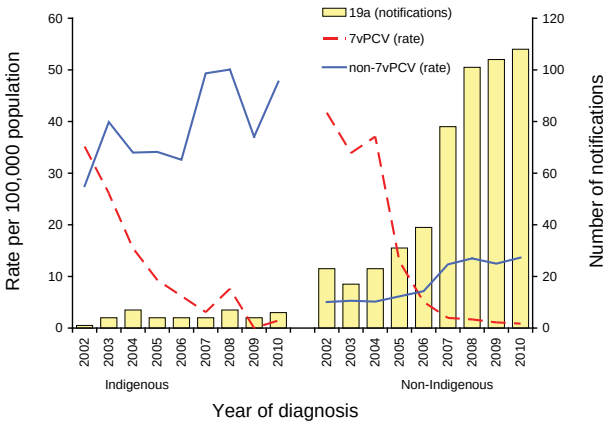
Invasive pneumococcal disease

There were 1,644 notified cases of invasive pneumococcal disease (IPD) in Australia in 2010; a rate of 7.4 per 100,000 population. This was an increase of 6% from the 1,557 reported in 2009 (7.1 per 100,000). An increase in rates in 2010, compared with 2009, was seen in New South Wales (6.9 per 100,000, n = 503) Queensland (6.0 per 100,000, n = 271), Tasmania (9.1 per 100,000, n = 46), Victoria (7.3 per 100,000, 406 cases) and Western Australia (8.6 per 100,000, 198 cases). A decrease in rates was noted in the Australian Capital Territory (6.7 per 100,000, n = 24), the Northern Territory (24 per 100,000, n = 56) and South Australia (8.5 per 100,000, n = 140).

In 2010, males accounted for 56% (914 per 100,000) of the 1,644 notified cases of IPD. In most age groups there were more males than females, resulting in a male to female ratio of 1.3:1. Figure 37 shows that the highest rates of IPD in 2010 were for persons aged 85 years or over (34 per 100,000) and in children aged 1 year (33 per 100,000).

In Australia, pneumococcal vaccination is recommended as part of routine immunisation for children, older Australians and Aboriginal and Torres Strait Islander people. The 7vPCV vaccine was added to the NIP schedule for Indigenous and medically at-risk children in 2001 and for all children up to 2 years of age from January 2005.[11] National pre-vaccination data are not available for the Indigenous population, however since surveillance began in 2002 the rate of disease due to disease caused by serotypes covered by 7vPCV in Indigenous children, aged less than 5 years, decreased from 35 per 100,000 to 1.4 per 100,000 in 2010 (Figure 38). In non-Indigenous children aged less than 5 years, the rates of IPD disease caused by serotypes covered by 7vPCV decreased since the introduction of the vaccine on the NIP in 2005, with a rate of 0.9 per 100,000 reported in 2010. Rates of disease caused by non-7vPCV serotypes over the same period increased for both Indigenous and non-Indigenous children, this included a 5-fold increase in the number of cases due to serotype 19A in non-Indigenous children over the period.

Figure 38: Rate for invasive pneumococcal disease in children aged less than 5 years, 2002 to 2010, by Indigenous status and year



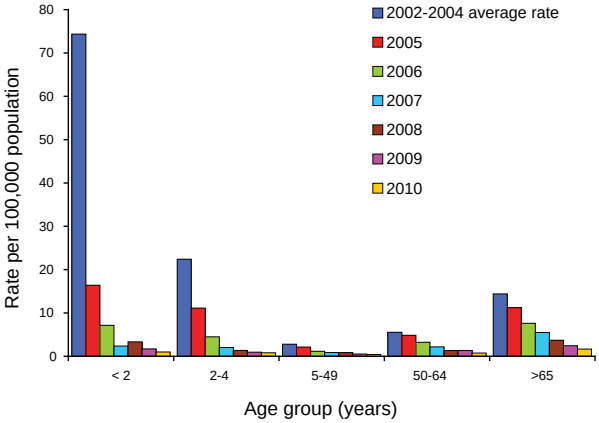
7vPCV	Disease caused by serotypes not covered by the vaccine.
Non-7vPCV	Disease cause by serotypes not covered by the vaccine.

The substantial increases in 19A serotype disease seen in non-Indigenous children were not evident in Indigenous children.

Overall, rates of IPD disease caused serotypes covered by 7vPCV declined between 2004 and 2010 from 7.7 per 100,000 to 0.7 per 100,000 (1,549 to 149 cases). The decline is seen across all age groups (Figure 39).

Enhanced data were collected on cases of IPD in all Australian jurisdictions during 2010. More detailed analyses can be found in the IPD annual report series published in CDI.

Figure 39: Rate for invasive pneumococcal disease caused by 7vPCV serotypes, Australia, 2002 to 2010, by age group and year



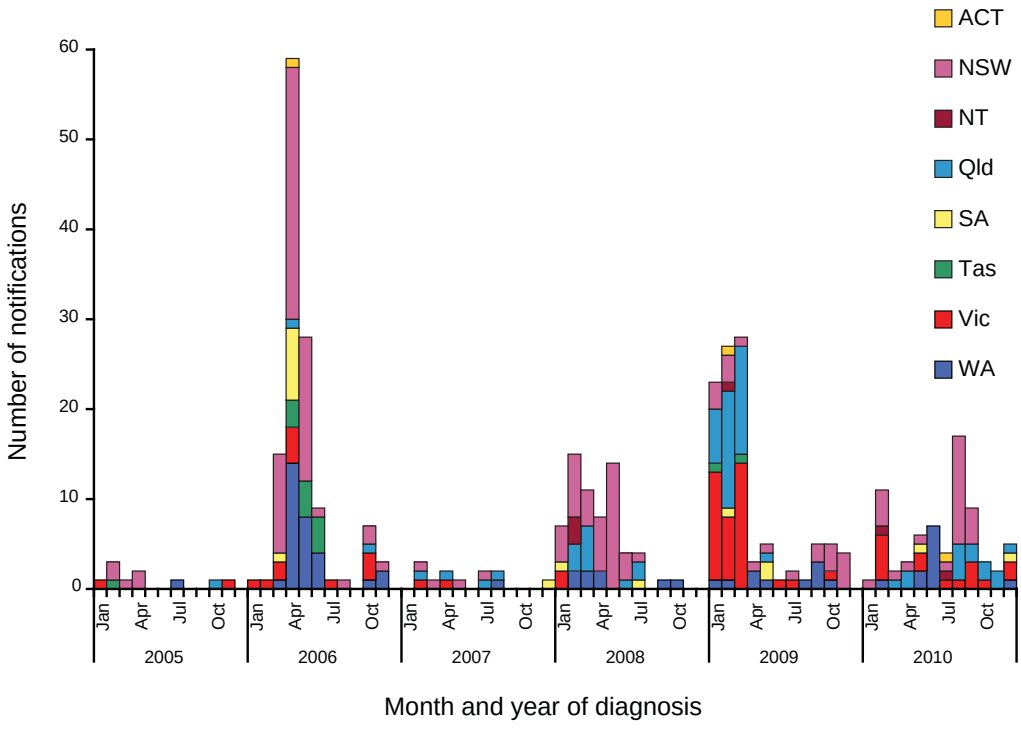
Measles

Measles is a highly infectious, acute viral illness spread by respiratory secretions, including air-borne transmission via aerosolised droplets. The prodrome, lasting 2–4 days, is characterised by fever and malaise followed by a cough, coryza and conjunctivitis. It is usually followed by a maculopapular rash, which typically begins on the face, and then becomes generalised. Measles can be a severe disease, with complications such as otitis media, pneumonia, and acute encephalitis. Subacute sclerosing panencephalitis (SSPE) is a late, rare (approximately 1 in 100,000 cases) complication of measles,[16] which is always fatal.[11] Evidence suggests that endemic measles has been eliminated from Australia, since at least 2005.[47]

There were 70 notified cases of measles reported to NNDSS in 2010 representing a rate of 0.3 per 100,000 population. Cases were reported from all states and territories with the exclusion of Tasmania. The majority of cases (n = 25) occurred in New South Wales, followed by Victoria (n = 15), Queensland (n = 14), Western Australia (n = 11), the Northern Territory (n = 2), South Australia (n = 2) and the Australian Capital Territory (n = 1). There were no cases in Tasmania (Figure 40).

In 2010, cases were evenly distributed by sex. Age at diagnosis ranged from 1 to 62 years with a median of 23 years and there were no cases amongst infants less than 1 year. The majority of cases (n = 50) were

Figure 40: Notified cases of measles, Australia, 2005 to 2010, by month and year and state or territory



between 10 and 34 years of age. However, 4 cases were amongst those born before 1968, a cohort that is considered to have high levels of natural immunity[48] (Figure 41).

Between 2005 and 2010 there were 386 notified cases, 93% (n = 369) of which were less than 40 years of age. During this 5-year period, rates were highest amongst those less than 5 years of age (0.8 per 100,000 population) followed closely by those in the 10–14 (0.7) and the 25–29 (0.6) year age groups (Figure 42).

In 2010, 46% (n = 32) of notified cases were reported as being acquired from overseas including: South Africa (n = 6), Indonesia (n = 4), France (n = 3), Vietnam (n = 3), Cambodia (n = 2) and 1 importation each from China, Germany, Italy, Malawi, Malaysia, New Zealand, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, the United Kingdom, France and South Africa. Of the 38 locally-acquired cases, 36 were epidemiologically linked to an imported case in 8 separate clusters and the remaining two were part of a locally-acquired cluster in Victoria, for which the original source of infection could not be determined. There were 9 clusters during 2010, the largest of which occurred in the Tweed River region of New South Wales (n = 14), in an area of low vaccination coverage. Genotyping was available for each cluster with D9 the most common serotype (Figure 43).

Figure 41: Rate for measles, Australia, 2010, by age group and sex

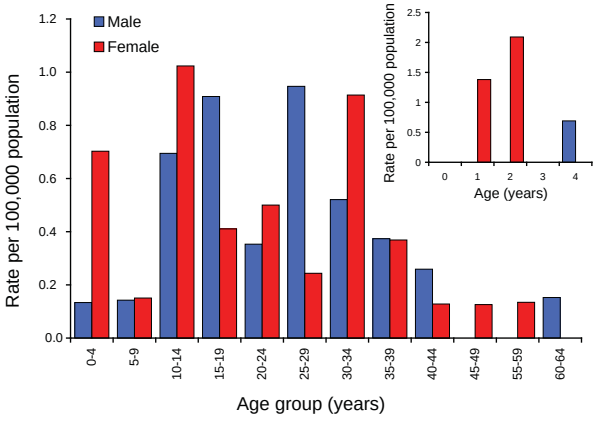


Figure 42: Rate for measles, Australia, 2005 to 2010 combined, by age group

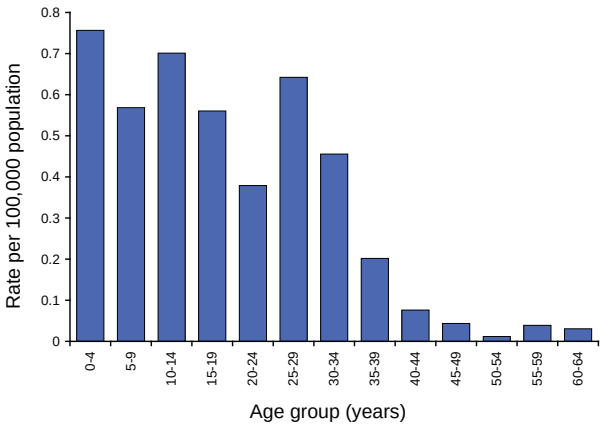
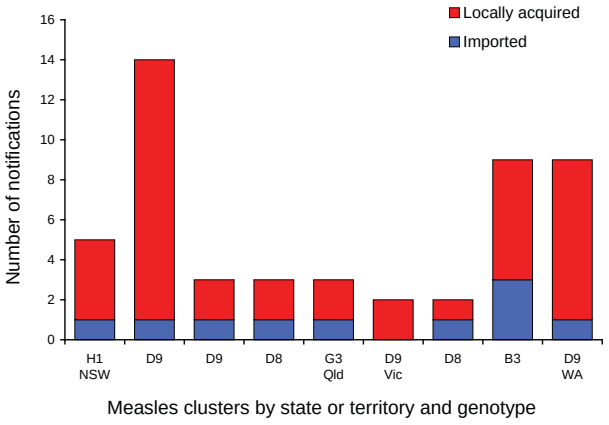


Figure 43: Measles clusters, Australia, 2010, by state or territory, genotype and importation status



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

Sixty-four of the 70 cases notified in 2010 were born after 31 December 1969 and therefore eligible for a publicly funded measles-containing vaccine. Of the 5 cases aged between 1 and 3 years of age who were eligible for 1 dose of a measles-containing vaccine, one was fully vaccinated for age, three were not vaccinated and one was of unknown vaccination status. Of the remaining 59 cases, who were aged 4 years or older and eligible for 2 doses, the majority (n = 31) were not vaccinated, nine were partially vaccinated for age, 5 were fully vaccinated for age and 14 were of unknown vaccination status.

Mumps

Mumps is an acute viral illness transmitted by the respiratory route in the form of air-borne droplets or by direct contact with saliva of an infected person. The characteristic bilateral, or occasionally unilateral, parotid swelling occurs in 60%–70% of clinical cases, however a high proportion have non-specific symptoms including fever, headache, malaise, myalgia and anorexia, with approximately one-third of

infections being asymptomatic.[16] Mumps is a multi-system infection, with 30% of post-pubertal males experiencing epididymo-orchitis.[49]

In 2010, there were 95 notified cases of mumps; a rate of 0.4 per 100,000 population, compared with the 165 cases and a rate of 0.7 per 100,000 reported in 2009. The number of notified cases has continued to decrease nationally since reaching a peak in 2007. Cases in 2010 were reported from all jurisdictions except Tasmania, with 40% (n = 38) occurring in New South Wales followed by 27% (n = 26) in Queensland (Figure 44). The highest rate was in the Northern Territory with 2 reported cases (0.9 per 100,000) followed by Western Australia (0.7 per 100,000) with 15 cases reported in 2010.

In 2010, cases of mumps were notified across all age groups with the majority (n = 45) occurring amongst young adults between the ages of 25 and 44 years, reflecting historical vaccination schedules (Figure 45). Sixty-two per cent of cases were in females; a higher proportion than in the past 5 years and giving a male to female rate ratio of 0.6:1. The highest rates for females occurred in the 25–29, 30–34 and 40–44 year age groups respectively, while for males rates were highest in the 40–44 year age group followed by the 35–39 year age group.

Rates in all age groups have continued to decline in 2010 (Figure 46).

Indigenous status was reported for 50% of mumps cases, of which 4% (n = 2) were reported as Indigenous. In 2009, 10% (n = 11) of cases were reported as Indigenous.

The mumps component of the MMR vaccine has been estimated to be the least effective of the 3 components, ranging from providing 62%–88% and 85%–95% protection for the first and second dose respectively.[50,51] Reduced effectiveness of the mumps vaccine has been demonstrated over time such that waning immunity may at least partially account for the proportion of vaccinated mumps cases and contribute to mumps outbreaks in older vaccinated populations.[51]

Figure 45: Rate for mumps, Australia, 2010, by age group and sex

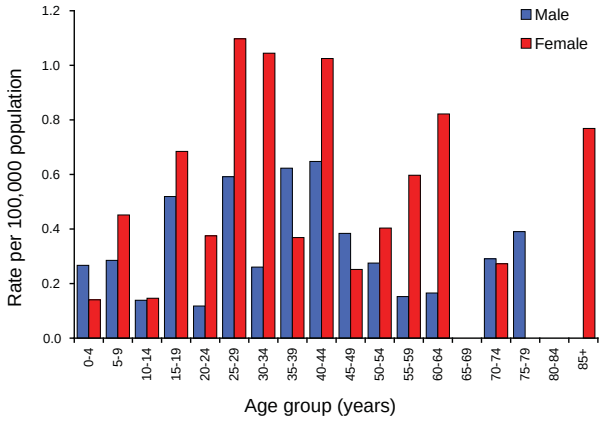
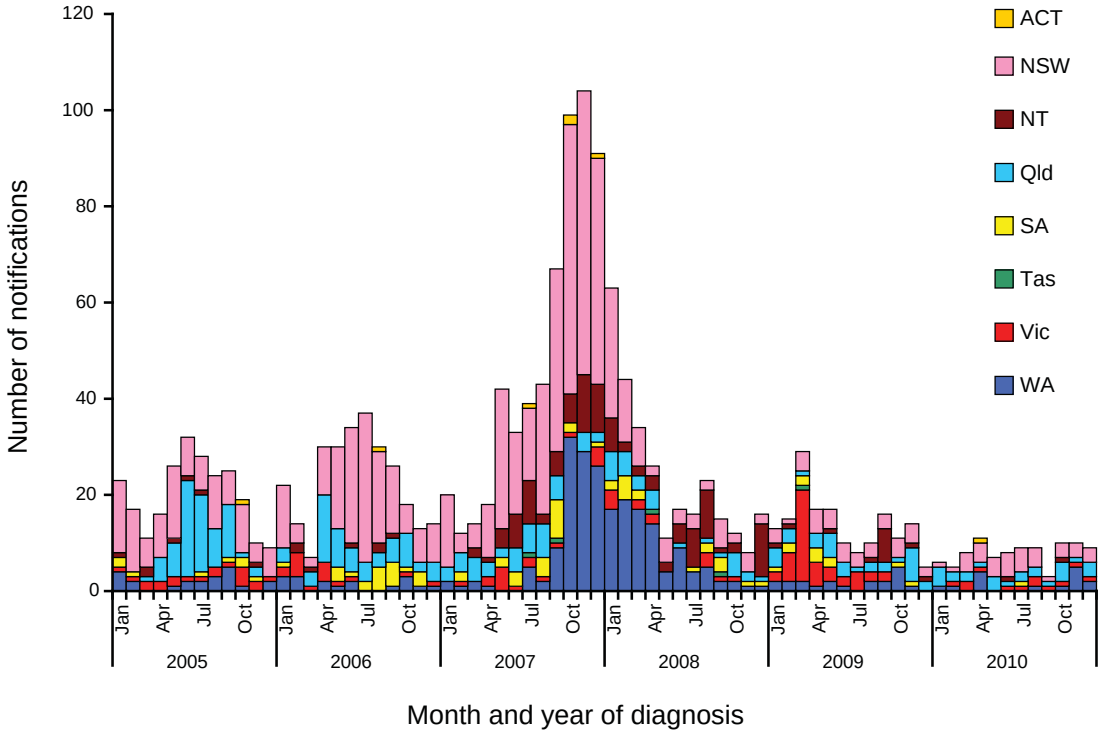
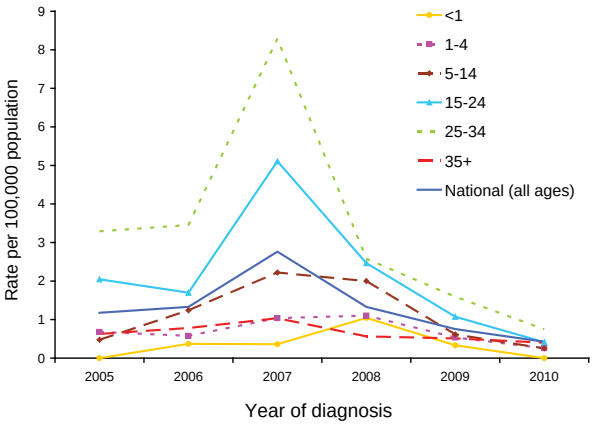


Figure 44: Notified cases of mumps, Australia, 2005 to 2010, by month and year and state or territory



The mumps vaccine was first available in Australia in 1981 with people born after that eligible for 2 doses of a mumps-containing vaccine.[52] In 2010, there were 37 notified cases in individuals born after 31 December 1980. Of these, none were less than 1 year of age, two were aged between 1 and 3 years and eligible for 1 dose and were fully vaccinated for age. The majority of cases (35/37) were aged 4 years or older. Of these, 17% (n = 6) were fully vaccinated for age, 6% (n = 2) were partially vaccinated for age, 11% (n = 4) unvaccinated and the majority, (66%) were of unknown vaccination status.

Figure 46: Rate for mumps, Australia, 2005 to 2010, by year and age group



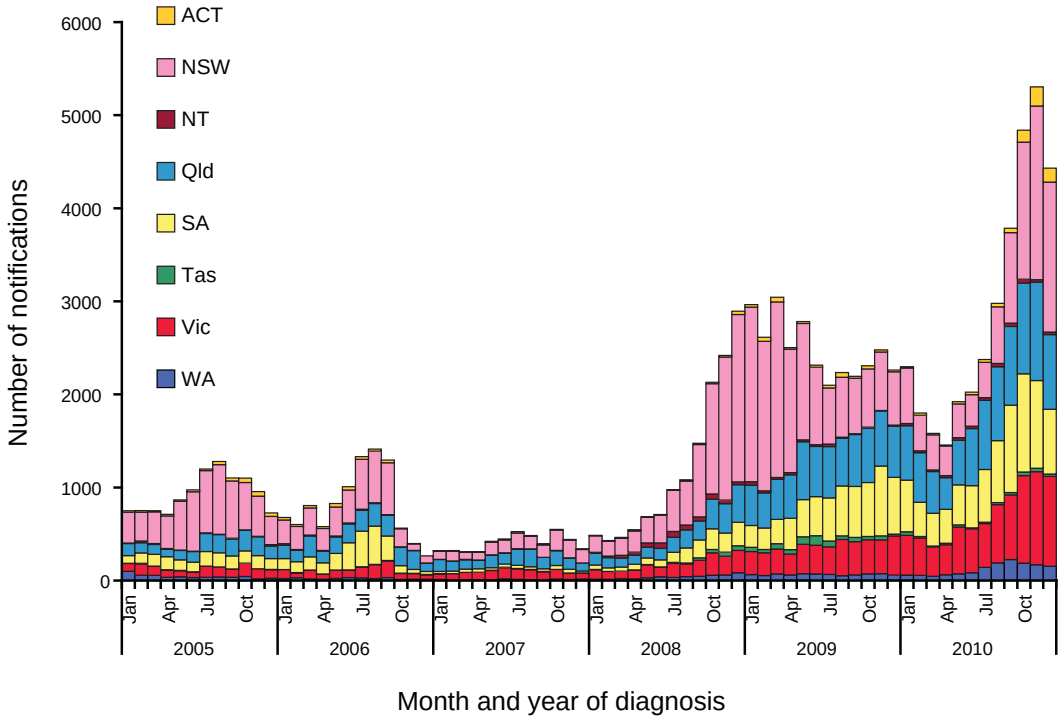
Pertussis

Pertussis was the most commonly notified vaccine preventable illness in Australia in 2010. It is a highly infectious disease caused by *Bordetella pertussis* and is spread by respiratory droplets. Epidemics occur at regular intervals of approximately 3 to 4 years, which can vary from region to region, on a background of endemic circulation.[53] In vaccinated populations these outbreaks tend to be smaller with less mortality and morbidity than in unvaccinated populations.[16] While pertussis can affect people of any age, infants are at highest risk of more severe disease as maternal antibody does not provide reliable protection, and adequate immunity is not achieved through vaccination until receiving at least the second vaccine dose at 4 months of age.[54] The majority of notifications usually occur in the spring and summer months.

In 2010 there continued to be large numbers of notified cases of pertussis associated with the Australia-wide epidemic which began in mid-2008 (Figure 47). The causes of this epidemic are likely to be multi-factorial with contributing factors including waning immunity levels in the vaccinated population in addition to improved testing methods and better case ascertainment.

In 2009, the Australian Technical Advisory Group on Immunisation (ATAGI) convened a Pertussis Working Party to consider the use of the combined

Figure 47: Notified cases of pertussis, Australia, 2005 to 2010, by month and year and state or territory



diphtheria-tetanus-pertussis (DTPa) vaccine in young children, and the duration of effectiveness of the diphtheria-tetanus-pertussis (dTpa) vaccine in adolescents/adults. On the basis of evidence provided by the working party, ATAGI endorsed recommendations that the first dose of the pertussis-containing vaccine could be brought forward from 8 weeks to 6 weeks,[55] the scheduled fourth dose of vaccine could be administered from the age of 3 years and 6 months, and that the adolescent booster dose could be given from 11 to 13 years of age to better protect siblings, especially newborns.[56] States and territories continued to provide ongoing public awareness campaigns and most extended funding during 2010 for booster vaccination programs for parents and carers of infants, as part of a cocooning strategy to protect vulnerable infants from infection.

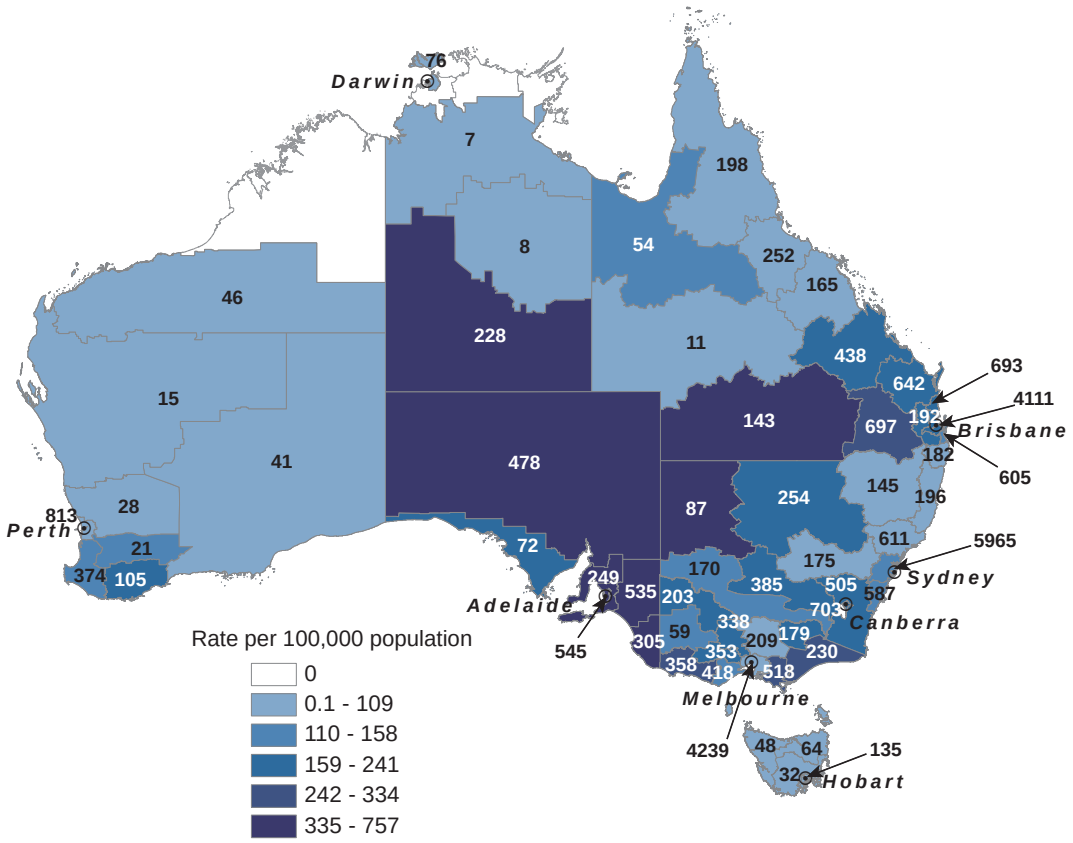
There were 34,793 notified cases of pertussis; a rate of 156 per 100,000 and 2.5 times the 5-year mean. Notifications included 3 pertussis related deaths Two of the deaths were recorded amongst infants less than 2 months of age and too young to be protected by vaccination, while the third death was a person 70 years of age.

In 2010, pertussis rates varied considerably by state or territory and residential location. Rates were highest in South Australia (449 per 100,000; n = 7,388) followed by the Australian Capital Territory (198 per 100,000; n = 712) and Queensland (182 per 100,000; n = 8,216) (Figure 48). Rates by SD varied widely across most jurisdictions except for South Australia where they were uniformly high (Map 3).

The timing of epidemic activity has varied across states and territories with the Northern Territory experiencing its peak rate in 2008 (217 per 100,000; n = 478), New South Wales (175 per 100,000; n = 12,448) and Tasmania (123 per 100,000; n = 618) in 2009 and Australian Capital Territory, Queensland, South Australia, Victoria and Western Australia in 2010 (Figure 48).

In 2010, females accounted for 57% (n = 19,950) of notifications, resulting in a male to female ratio of 0.7:1. Sixty cases had no sex specified. Females had higher rates in all age groups compared with males, except in the 85 years or over age group. Notification rates in 2010 varied widely with age. Children aged less than 15 years had a higher rate (321 per 100,000)

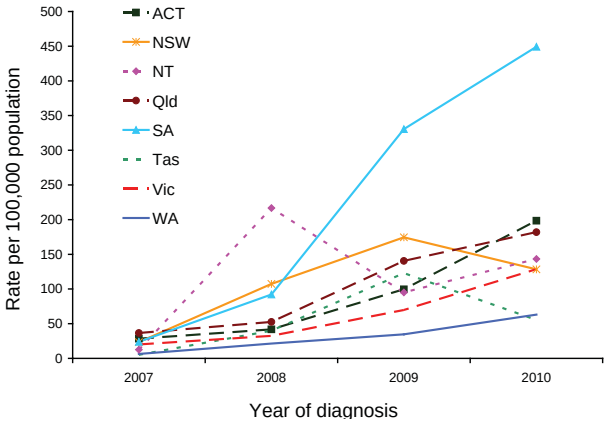
Map 3: Rates and counts* for pertussis, Australia, 2010, by Statistical Division and Statistical Subdivision of residence in the Northern Territory



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

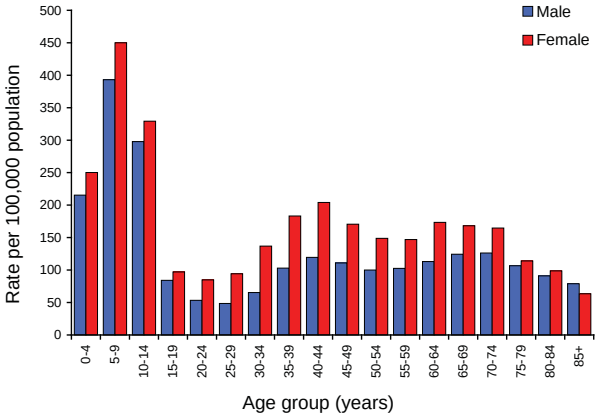
Note that rates by Statistical Division should be interpreted with caution as they can be high or low depending on the size of the population.

Figure 48: Rate for pertussis, Australia, 2007 to 2010, by year and state or territory



than those adolescents and adults 15 years of age or over (117 per 100,000), with a rate ratio of 2.7 and consistent with the rate ratios in 2008 (2.2) and 2009 (2.6). The current epidemic trend of higher rates in children compared with adults is in contrast to the pre-epidemic years in which adults had a higher rate relative to children (rate ratios of 0.7, 0.3 and 0.5 respectively for 2005, 2006 and 2007). The highest rate amongst both males and females occurred in the 5–9 year age group (393 and 450 per 100,000 respectively) (Figure 49).

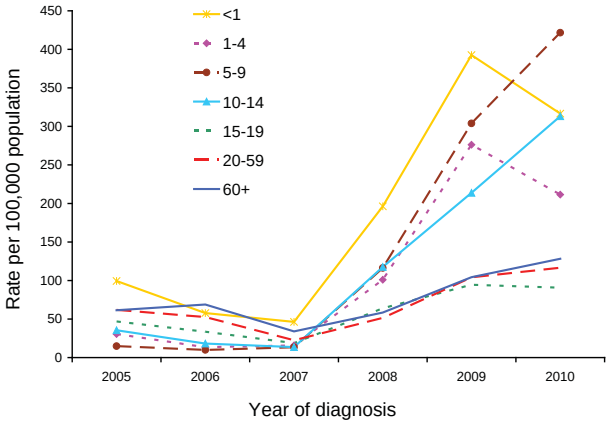
Figure 49: Rate for pertussis, Australia, 2010, by age group and sex



In 2010, rates amongst children in the 5–9 year age group (422 per 100,000) overtook infants aged less than 1 year (317 per 100,000) to have the highest rate for the first time since 2005 (except for 2006 in which adults 60 years or over had the highest rate and infants the second highest).

Between 2005 and 2007, a period inclusive of the last national epidemic in 2005/2006, age group rates either declined or remained relatively constant. Since 2007, rates have been increasing most markedly amongst those less than 15 years of age. In 2010 rates continued to increase all age groups, especially the 5–9 and 10–14 year age groups, compared with 2009, except those less than 5 years of age (Figure 50).

Figure 50: Rate for pertussis, Australia, 2005 to 2010, by year and age group



While the pertussis vaccine is not 100% effective and does not confer life-long immunity, vaccine effectiveness amongst Australian children has been estimated to range from 82% to 89% with the lower figure representing the cohort of children who would not have been eligible for the 18 month booster dose, which was removed from the NIP in 2003.[57] Immunity to the disease decreases over time post-vaccination with estimates of protection remaining for 4–12 years.[58] The current vaccine schedule for pertussis under the NIP includes a dose provided at 2, 4 and 6 months of age followed by a booster at 4 years of age and again at 12–17 years of age (the timing of this last booster dose varies by jurisdiction). In response to the ongoing epidemic in 2010, some infants were being provided their first vaccination at 6 weeks of age and their fourth from 3.5 years.

Follow-up is required in order to determine the vaccination status of individual cases. In a large outbreak follow-up of all cases is not possible and as per national guidelines jurisdictions prioritised follow-up for those less than 5 years of age. This age group made up 10% (n = 3,400) of all notified cases in 2010.

Information on vaccination status was available for 89% (3,030/3,400) of all cases in children less than 5 years of age of which 64% (1,944/3,030) were fully vaccinated for age, 15% (447 per 100,000) were partially vaccinated for age and 13% (379 per 100,000) were not vaccinated. Eight per cent (260 per 100,000) of cases were less than 6 weeks of age and therefore too young to be vaccinated.

Poliomyelitis

Poliomyelitis is a highly infectious disease caused by gastrointestinal infection by poliovirus. Transmission occurs primarily person-to-person via the faecal-oral route. In most cases poliovirus infection is not symptomatic however in less than 1% of cases the virus may invade the nervous system and cause acute flaccid paralysis (AFP).[16]

In 2010 there were no notified cases of poliomyelitis in Australia, which along with the Western Pacific Region remained poliomyelitis free. Poliomyelitis is a notifiable disease in Australia with clinical and laboratory investigation conducted for cases involving patients of any age with a clinical suspicion of poliomyelitis. Australia follows the WHO protocol for poliomyelitis surveillance and focuses on investigating cases of AFP in children under 15 years of age. 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, which in 2010, Australia achieved for the fourth consecutive year. More details can be found in the annual report of the Australian National Polio Reference Laboratory published in the CDI. A revised national polio case definition was endorsed by CDNA in 2010 and implemented on 1 July 2011. This revised definition is available on the Department of Health and Ageing's web site at http://www.health.gov.au/internet/main/publishing.nsf/Content/cda-surveil-nndss-casedefs-cd_polio.htm. The principal changes were:

- the WHO definition of AFP was adopted under clinical definitive evidence;
- the laboratory definitive evidence was updated to include vaccine derived poliovirus; and
- a new section was added to include non-paralytic cases of poliovirus infection.

Rubella

Rubella is generally a mild and self-limiting viral infectious disease. It is spread person-to-person through contact with respiratory secretions directly or via air-borne droplets. Clinically, rubella can be difficult to distinguish from other diseases which cause a febrile rash, such as measles, and is asymptomatic in up to 50% of cases. Rubella infection in pregnancy can result in foetal infection resulting in congenital rubella syndrome (CRS). CRS occurs in up to 90% of infants born to women who are infected during the first 10 weeks of pregnancy and may result in foetal malformations and death.[16]

In 2010, there were 44 notified cases of rubella; a rate of 0.2 per 100,000 population and an increase compared with the 27 notifications in 2009. The increase in cases in 2010 was not associated with any particular outbreak and was likely due to the sporadic nature and overall small number of cases reported annually. Notifications were reported from Victoria (n = 22), New South Wales (n = 13), Queensland (n = 5), Western Australia (n = 3) and the Australian Capital Territory (n = 1). The male to female ratio of notified cases in 2010 was 1.9:1, (29 males and 15 females). The majority (87%) of female cases were notified in women of childbearing age (15–44 years of age). The majority (86%) of cases were adults aged between 20 and 49 years with a median age of 29.5 years (Figure 51). There were no notified cases of CRS reported in 2010.

Rubella cases across the age groups have continued to trend at low levels since 2004, except for a spike amongst the 25–34 year age group in 2006 (Figure 52). This spike was primarily due to an increase in cases from South Eastern and Central Sydney, New South Wales for which no single source was identified.[59]

A single dose of rubella vaccine produces an antibody response in more than 95% of recipients and

Figure 51: Rate for rubella, Australia, 2010, by age group and sex

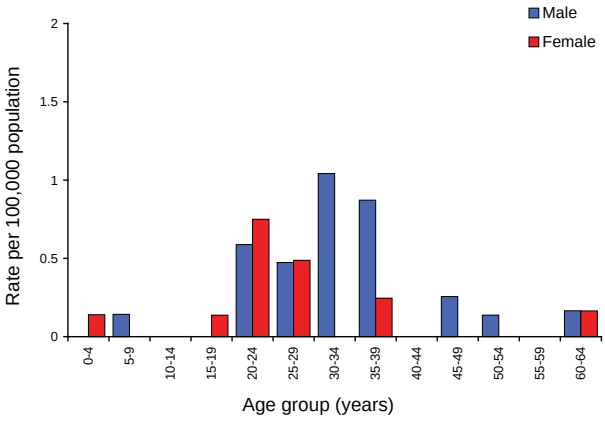
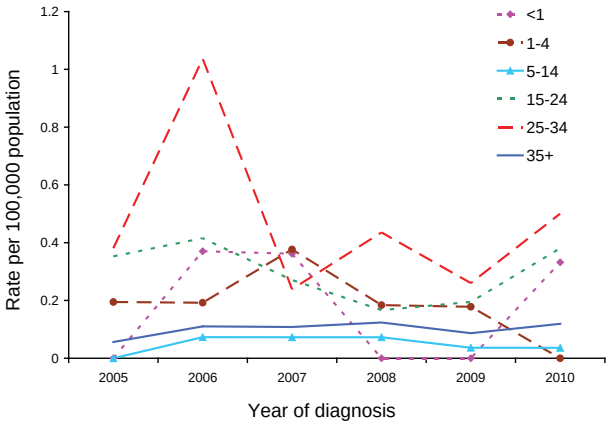


Figure 52: Rate of rubella, Australia, 2005 to 2010, by year and age group



while antibody levels are lower than after natural infection, they are shown to persist for at least 16 years in the absence of endemic disease.[11] Rubella vaccine is included in the combined MMR vaccine and provided under the NIP schedule at 12 months and 4 years of age.

Information on vaccination was available for 25% (n = 11) of rubella cases of which the majority, 73% (n = 8), were not vaccinated, two were reported as fully vaccinated for age and one was too young for routine vaccination.

Indigenous status was recorded for the majority (91%) of cases, all of whom were non-Indigenous.

Tetanus

Tetanus is an acute, often fatal, disease caused by the toxin produced by the bacterium *Clostridium tetani*. Tetanus spores usually enter the body through contamination of a wound with soil, street dust or animal or human faeces.[16] The neurotoxin acts on the central nervous system to cause muscle rigidity with painful spasms. Generalised tetanus, the most common form of the disease, is characterised by increased muscle tone and generalised spasms. Early symptoms and signs include increased tone in the jaw muscles, difficulty in swallowing, stiffness or pain in the neck, shoulder and back muscles. In Australia, tetanus is rare, occurring primarily in older adults who have never been vaccinated or were vaccinated in the remote past.[11]

Tetanus vaccination stimulates the production of antitoxin, which protects against the toxin produced by the organism. Complete immunisation (3 primary doses and 2 boosters included for children on the NIP) induces protective levels of antitoxin lasting throughout childhood but by middle age, about 50% of vaccinees have low or undetectable levels of immunity. It is recommended, though not funded under the NIP, that all adults who reach 50 years of age and have not received a booster of a tetanus-containing vaccine in the previous 10 years should have one.[11]

In 2010, there were 2 notified cases of tetanus, 1 male from New South Wales and 1 female from Victoria, both greater than 78 years of age. Neither case had vaccination status recorded.

Varicella zoster virus infections

The varicella zoster virus (VZV) is a highly contagious member of the herpesvirus family and causes two distinct illnesses: chickenpox (or varicella) following initial infection and shingles (or herpes zoster), which occurs following re-activation of latent virus in approximately 20%–30% of cases, most commonly after 50 years of age.[16]

In 2006, CDNA agreed to make 3 categories of VZV infection notifiable: chickenpox, shingles and varicella infection unspecified. With the exception of New South Wales, where VZV is not notifiable, 2010 was the second complete year in which all jurisdictions sent VZV data to NNDSS.

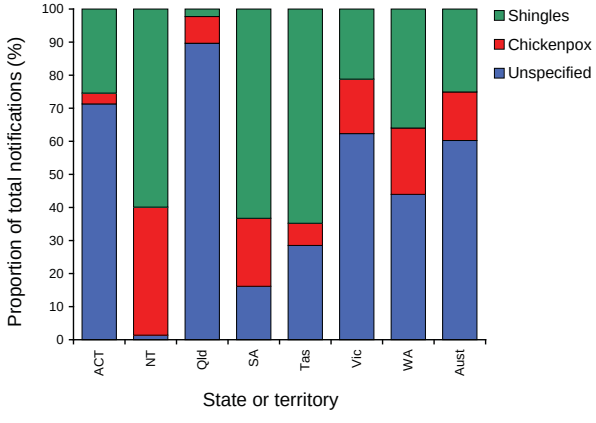
In 2010, there were 11,873 VZV notified cases from the 7 reporting jurisdictions. This was 6% more than in 2009. Sixty per cent (n = 7,152) were reported as unspecified varicella infection, 25% (n = 2,978) as shingles and 15% (n = 1,743) as chickenpox.

Varicella zoster virus infection (unspecified)

Notifications of unspecified VZV infections are laboratory specimens that are positive for VZV but have not been followed up by the local health authority and distinguished clinically as either chickenpox or shingles. Although varying by jurisdiction (Figure 53), VZV unspecified accounted for 60% of all VZV notified cases in 2010, a decrease compared with 62% of the total in 2009.

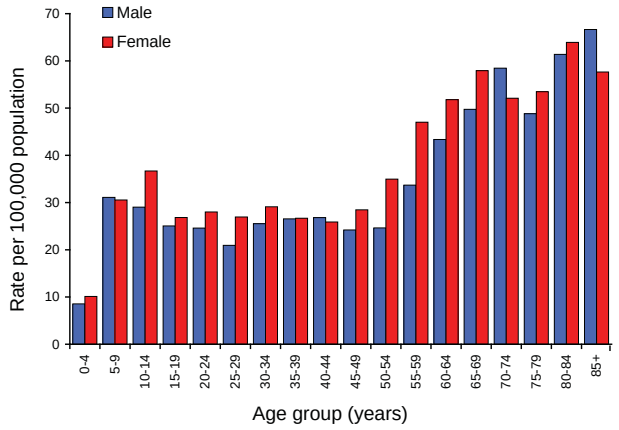
There were 7,152 notified cases of unspecified VZV infections based on laboratory diagnoses compared with 6,977 in 2009 and a rate of 47 per 100,000 population The high proportion of unspecified VZV infection compared to chickenpox or shingles is attributable to the varying capacity of jurisdictions to follow-up on laboratory notifications to determine the clinical presentation of each case. The highest rate was reported from Queensland (86 per 100,000; n = 3,894), followed by Western Australia (38 per 100,000; n = 877) and Victoria (34 per 100,000; n = 1,912).The age and sex distribution of unspecified VZV is shown in Figure 54.

Figure 53: Proportion of notified cases for varicella zoster virus unspecified, chickenpox and shingles, 2010, by state or territory*



* Excluding New South Wales

Figure 54: Rate for varicella zoster virus infection (unspecified), Australia,* 2010, by age group and sex



* Excluding New South Wales

Chickenpox

Chickenpox is a highly contagious infection spread by air-borne transmission of droplets from the upper respiratory tract or from the vesicle fluid of the skin lesions of chickenpox or shingles infections. Chickenpox is usually a mild disease of childhood, however complications occur in approximately 1% of cases. It is more severe in adults and in individuals of any age with impaired immunity, in whom complications, disseminated disease, and fatal illness can occur.[11]

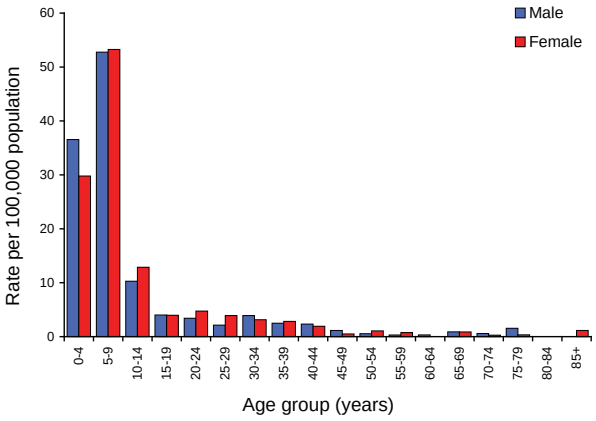
In 2010, there were a total of 1,743 notified cases of chickenpox reported to NNDSS; a rate of 12 per 100,000, compared with 1,599 in 2009. The highest rate was reported from the Northern Territory (37 per 100,000; n = 84) and South Australia (23 per 100,000; n = 379) reflecting the increased case ascertainment in these jurisdictions compared with others.

The male female ratio in 2010 was 1:1 with males and females being fairly consistently represented across the age groups. Seventy per cent of cases (n = 1,212) occurred in children aged less than 10 years. The highest notification rates amongst both sexes and all age groups were amongst the 5–9 year age group (53 per 100,000; n = 725) (Figure 55). Although higher rates amongst children compared with adults is expected, they are likely to be biased by the jurisdictional practice of not following up adult cases.

Indigenous status was recorded for 89% (n = 1,552) of cases. Of these, 93% (n = 1,447) were non-Indigenous.

In November 2005, the varicella zoster vaccine was added to the NIP Schedule as a single dose due at 18 months of age (for children born on or after 1 May 2004), or as a catch-up dose at 10–13 years of age. In 2010, children born in 2004 and eligible for the 18-month dose would be 6 years of age or younger and as follow-up of cases does not routinely occur in those older than 7 years, analysis of vaccination status is restricted to this cohort. Of the 823 children less than 7 years of age, vaccination information was available for 77% (636/823) of cases of whom 44% (n = 277) were vaccinated, 16% (n = 102) were unvaccinated and 40% (n = 257) were aged less than 18 months and therefore ineligible for vaccination.

Figure 55: Rate for chickenpox, Australia,* 2010, by age group and sex



* Excluding New South Wales.

Shingles

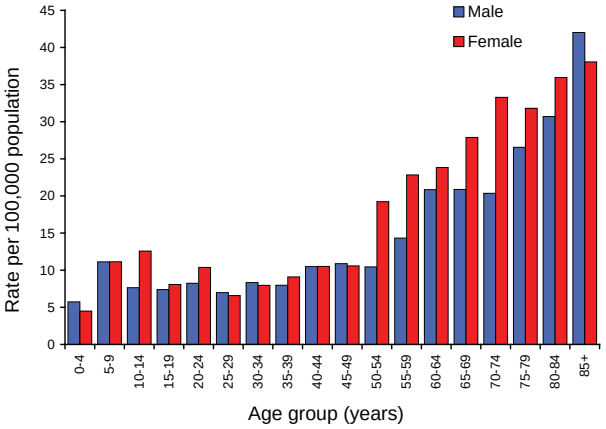
Shingles occurs most commonly with increasing age, impaired immunity, and a history of chickenpox in the first year of life. Reactivation of VZV causing shingles is thought to be due to a decline in cellular immunity to the virus, and in the majority of cases presents clinically as a unilateral vesicular rash in a dermatomal distribution. Associated symptoms may include headache, photophobia, malaise, and an itching, tingling, or severe pain in the affected dermatome. In the majority of patients, shingles is an acute and self-limiting disease however, complications develop in approximately 30% of cases, the most common of which is chronic severe pain or post-herpetic neuralgia.[16]

There were 2,978 notified cases of shingles reported in 2010, a rate of 20 per 100,000 and a 10% increase compared with 2009. The highest rate was in South Australia (71 per 100,000; n = 1,166) followed by the Northern Territory (57 per 100,000; n = 130), reflecting the increased case ascertainment in these jurisdictions compared with others.

There were more female cases (n = 1,670) than males (n = 1,305); a ratio of 0.8:1. As expected, rates

increased with age with the highest rate amongst those over 85 years of age or older (61 per 100,000; n = 159) (Figure 56).

Figure 56: Rate for shingles, Australia,* 2010, by age group and sex



* Excluding New South Wales.

Indigenous status was recorded for 87% (n = 2,579) of notified cases, of whom 97% (n = 2,489) were non-Indigenous.

Vectorborne diseases

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

There were 8,244 notified cases of mosquito-borne diseases (4% of total notifications), which was similar to the number of cases in 2009 (n = 8,232). Notifiable mosquito-borne diseases include those caused by the alphaviruses (Barmah Forest virus and Ross River virus), flaviviruses (dengue, Murray Valley encephalitis, Kunjin, Japanese encephalitis and yellow fever) and malaria (a parasitic disease caused by *Plasmodium* spp). Yellow fever is reported under quarantinable diseases.

Rates of infection for a geographical location for vectorborne disease notifications represent the place of residence rather than the place of acquisition of infection, although in many instances this may be the same. Further information about these vectorborne diseases can be found in the National Arbovirus and Malaria Advisory Committee (NAMAC) annual report 2009–10.[60]

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 (BFV) and Ross River virus (RRV), which facilitate the transmission of these viruses in diverse environments (freshwater habitats, coastal regions, salt marshes, floodwaters, established wetlands and urban areas).[61] The reservoirs of these viruses are mammals, particularly macropod marsupials. In Australia, BFV and RRV are the alphaviruses of major public health significance, accounting for 80% (n = 6,618) of vectorborne disease notifications.

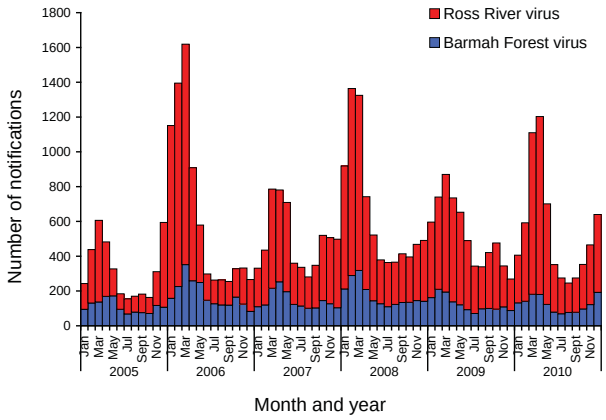
Barmah Forest virus infection

There were 1,471 notified cases of BFV in Australia in 2010; a rate of 6.6 per 100,000 population compared with the 5-year mean of 8.3 per 100,000 population (Figure 57). The highest rates of BFV notifications were reported by the Northern Territory (35.7 per 100,000), and Queensland (20.1 per 100,000). Cases were reported in all jurisdictions. The median age of cases was 47 and 51% of cases were in males.

Ross River virus infection

There were 5,147 notifications of RRV infection in Australia in 2010, a rate of 23 notifications per 100,000 population compared with a 5-year mean of 21.4 per 100,000 population (Figure 57). Nearly half of all cases were from Queensland (46%, n = 2,383), but the highest rate was in the Northern Territory (146.3). The median age of cases was 43 and 45% of notifications were in males.

Figure 57: Notified cases of Barmah Forest and Ross River virus infections, Australia, 2005 to 2010, by month and year



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 virus (DENV).

The Sentinel Chicken Program is a surveillance scheme involving New South Wales, the Northern Territory, Victoria and Western Australia. Chicken flocks are located in strategic locations and are regularly tested for antibodies to MVEV and KUNV. This program is designed to provide early warning of flavivirus activity (excluding DENV and JEV).[62] A sentinel chicken surveillance report was published as part of the NAMAC annual report 2009–10.[60]

Dengue virus infection

There were 1,201 notified cases of DENV infection reported in 2010, which was a 14% decrease from the 1,402 cases reported in 2009 (Figure 58). In 2010, the median age of dengue cases was 39 years and 52% of cases were in males.

Whilst the number of dengue cases overall decreased compared with previous years, the number of overseas-acquired cases was the highest on record (Figure 58) and most cases of dengue in 2010 were acquired overseas (93%, n = 1,119). Where the country of acquisition of overseas cases was provided (85%, n = 1,019), the most frequently reported country was Indonesia (66%, n = 673), followed by Thailand (11%; n = 109).

The increasing number of overseas-acquired dengue cases in Australia is likely to be due in part to the increasing frequency of travel to countries such as Indonesia, but also to the increasing incidence of dengue in the South East Asian region. In 2010, over 2.2 million cases of dengue were reported to the WHO from the Americas, South East Asia and Western Pacific.[63] Dengue is now endemic in more than 100 countries, compared with 40 years earlier, when only 9 countries had experienced severe epidemics.

Overseas acquired cases were most frequently reported amongst younger and middle-aged adults (Figure 59) particularly females in the 20–24 year age group (n = 75), reflecting the frequency of overseas travel for these age groups. Amongst older adults (aged 50+ years), overseas-acquired dengue was more common amongst males (62% of cases were male).

Figure 58: Notified cases of dengue virus infection, Australia, 2005 to 2010, by month and year and place of acquisition

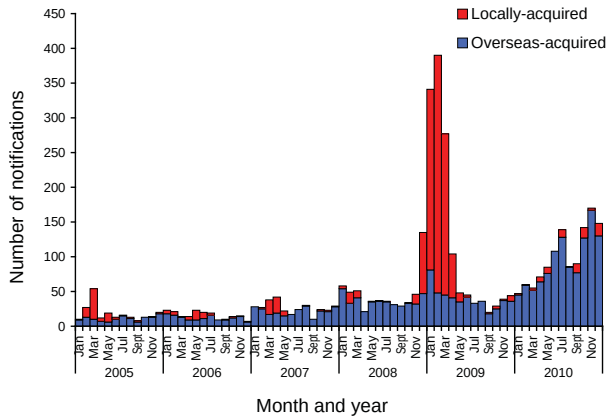
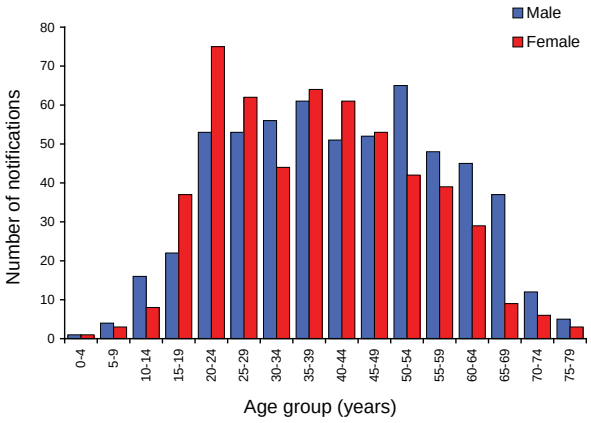


Figure 59: Notified cases of overseas-acquired dengue, Australia, 2010, by age group and sex



Local transmission of dengue virus in Australia is restricted to areas of northern Queensland where the key mosquito vector, *Aedes aegypti,* is present. Dengue is not endemic to Queensland, but outbreaks occur when the virus is imported via international travellers or residents returning home from overseas. In 2010, the proportion of cases that were locally acquired was much lower than in 2009 (66%), and there were no significant local outbreaks. The majority of locally-acquired cases were reported from Queensland, with a small number from other states (n = 9), but all were acquired in North Queensland. In 2010, majority of locally-acquired cases that were typed, were due to serotype 2 (91%, 52/57).

No cases in 2010 were reported to have been fatal. Dengue-related deaths have been very rare in Australia. A death reported in March 2009 and 2 deaths in early 2004 were the first deaths attributed to dengue in over 100 years.[64]

Japanese encephalitis virus infections

Japanese encephalitis is the leading cause of childhood encephalitis in Asia.[65] The usual host of the virus is birds or pigs, and it is transmitted to humans through the bite of infected mosquitoes of the genus *Culex*. There were no notified cases of JEV infection reported to the NNDSS in 2010. JEV infection is rare in Australia with only 3 cases reported in the past 10 years, all acquired overseas.

JEV emerged in Australia in 1995 with an outbreak in the Torres Strait. In an outbreak in 1998, a further 2 cases were reported, one of them acquired on the mainland (Cape York Peninsula).[66] Seasonal incursions of JEV have been detected (usually in sentinel pigs) in the Torres Strait every year except 1999.[65] Targeted vaccination programs of residents of the Torres Strait commenced in 1995.

Kunjin virus infection

There were 2 notified cases of KUNV infection reported in 2010; one from Queensland and one from the Northern Territory. Between 2005 and 2009, there were 8 notifications of KUNV infection.

Murray Valley encephalitis virus infection

During 2010, there were no notifications of MVEV infection reported. There were 9 notifications between 2005 and 2009 (Table 6).

Arbovirus infections (NEC)

In 2010, there were 24 notified cases of arbovirus infection not elsewhere classified (NEC). There was 1 notification each from New South Wales and Queensland, 10 from the Northern Territory and 12 from Victoria. The median age of cases was 36 years and 33% of cases were male.

Ten cases were chikungunya virus infection, reported by the Northern Territory, one was unspecified, and the remainder were flavivirus infections (Kokobera [1], not further specified [13]).

Malaria

Malaria is a serious acute febrile illness which can be transmitted to humans through the bite of an infected mosquito. It is caused by parasites of the genus *Plasmodium* that includes 5 species that cause disease in humans – *vivax, falciparum, malariae,knowlesi* and *ovale*.[16] There were 399 notified cases of malaria in Australia in 2010, which was down from 526 in 2009.[67]

All cases in 2010 were acquired overseas. Australia was declared malaria free in 1981, and since then, there have been 2 reported outbreaks of locally-acquired malaria; in 1986 and 2002 with a total of 15 cases. Where the country of acquisition was available (84%, n = 337 notifications), the most frequently reported country was Papua New Guinea (28%, n = 94, with 53 of these reported from Queensland), followed by India (16%, n = 53).

Malaria was most frequently reported amongst males aged 20–29 years with 69% of all malaria cases being males (Figure 60).

The infecting *Plasmodium* species was reported for 97% of malaria notifications in 2010 (Table 16). The predominant infecting species were *P. falciparum* (45%) and *P. vivax* (43%).

Zoonoses

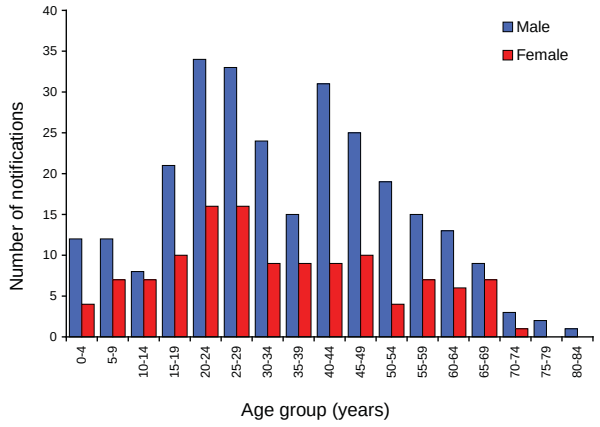
Zoonoses are 'those diseases and infections which are naturally transmitted between vertebrate animals and man'.[68] Approximately 60%–70% of emerging human infectious diseases are zoonoses[69,70] and more than 70%

Table 16: Notified cases of malaria, Australia, 2009, by parasite type and state or territory

	State or territory								Aust	
Plasmodium species	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	n	%
P. falciparum	1	58	3	53	3	2	26	35	181	45
P. vivax	0	44	8	64	4	1	37	15	173	43
P. ovale	0	12	0	3	0	1	2	1	19	5
P. malariae	0	5	0	1	0	0	1	3	10	3
P. falciparum and *P. vivax**	0	0	0	0	0	0	1	1	2	1
P. falciparum and *P. malariae**	0	0	0	0	0	0	0	1	1	0
Plasmodium species	1	5	0	5	1	1	0	0	13	3
Total	2	124	11	126	8	5	67	56	399	100

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

Figure 60: Notified cases of malaria, Australia, 2010, by age group and sex



of emerging zoonoses originate from wildlife.[69] 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'.[71]

The zoonoses notifiable to the NNDSS included in this chapter are anthrax, Australian bat lyssavirus or lyssavirus (unspecified) infection, brucellosis, leptospirosis, ornithosis, Q fever, and tularaemia. During 2010, 532 notified cases of these zoonotic diseases were reported to the NNDSS. Queensland accounted for 47% (n = 251) and New South Wales 33% (n = 173) of notified cases. Notifications were generally more frequent amongst males (77%, n = 412). There were only 5 notified cases (< 1%) of zoonotic disease in persons aged less than 15 years.

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

Anthrax

Anthrax is primarily a disease of herbivores; humans and carnivores are incidental hosts.[16] Anthrax has a low incidence in animals, and occurs only sporadically in Australia.[72] It can be an occupational hazard for veterinarians, and agriculture, wildlife and industry livestock workers who handle infected animals or animal by-products.

One case of anthrax was reported to NNDSS in 2010. The case occurred in New South Wales in February 2010. Over the previous 10 years, only 2 human cases of anthrax were reported in Australia. Both cases were cutaneous anthrax and were reported in 2006 and 2007.[73,74] Australia has never recorded a human case of inhalational or gastrointestinal anthrax.

In 2010, 5 anthrax incidents were reported in livestock. Three occurred in New South Wales, where cases have been known to occur in the past, and two in north-eastern Victoria. In all instances, properties were subject to the recommended protocol of quarantine, disposal of carcasses, and vaccination and tracing of at-risk animals and their products.

Australian bat lyssavirus, rabies and lyssavirus (unspecified) infections

Classical rabies virus does not occur in Australia, although a related virus called Australian bat lyssavirus was identified in 1996 and is present in some Australian bats and flying foxes.[75] No notified cases of either Australian bat lyssavirus infection (ABL), rabies or lyssavirus (unspecified) infections were reported to the NNDSS during 2010. Only 2 known cases of ABL infection in humans have been reported in Australia, in 1996 and 1998. Both cases occurred after close contact with an infected bat and both were fatal.[76,77] Surveillance indicates that ABL may have been present in Australian bats for at least 15 years prior to its first detection. Sick and injured bats and changes in bat ecology pose an increased public health risk.[78] Testing of bats conducted by the Australian Wildlife Health Network between January and June 2010 yielded 4 ABL detections compared with 12 detections in bats during 2009.[79]

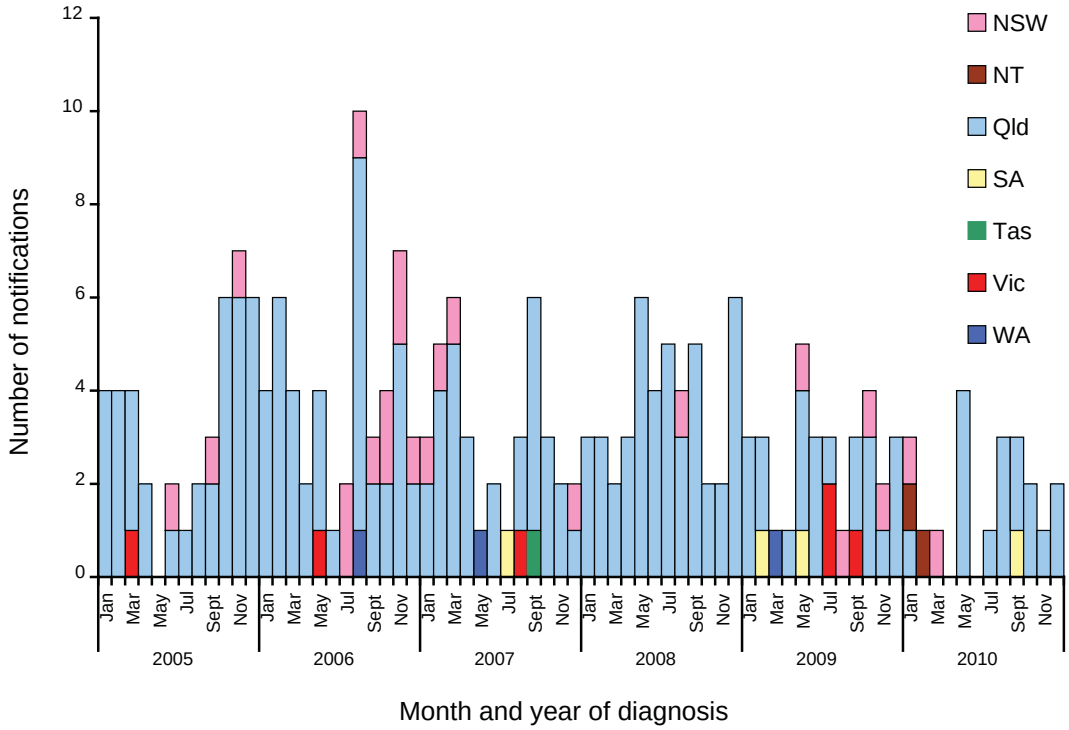
Brucellosis

Several *Brucella* species can infect both animals and humans including *Brucella melitensis* from sheep and goats, *Brucella suis* from pigs and *Brucella abortus* from cattle. *B. abortus* was eradicated from Australian cattle herds in 1989[72] and *B. melitensis* has never been reported in Australian sheep or goats.[72] All human cases of *B. melitensis* or *B. abortus* in Australia are related to overseas travel. *B. suis* is confined to some areas of Queensland, where it occurs in feral pigs.

Internationally, brucellosis is mainly an occupational disease of farm workers, veterinarians, and abattoir workers who work with infected animals or their tissues.[16] In Australia, 83% of cases since 1991 have been reported from Queensland, where feral pig hunting is the most common risk factor for infection.[80]

In 2010, there were 21 notified cases of brucellosis reported to the NNDSS; a 49% decline in notifications compared with the 5-year average of 41 cases (Figure 61). Seventy-six per cent of notifications

Figure 61: Notified cases of brucellosis, Australia, 2005 to 2010, by month and year and state or territory*



* There have been no cases reported from the Australian Capital Territory.

were from Queensland (n = 16). Most cases were in males (81%, n = 17) aged between 15 and 49 years (85%, n = 18).

The species of the infecting organism was available for 38% of notifications (n = 8), of which seven were *B. suis* (all from Queensland, and all in males aged between 27 and 43 years). There was 1 imported case of *B. melitensis,* which was acquired in Iraq.

Leptospirosis

Leptospirosis is caused by spirochaetes of the genus, *Leptospira,* which is found in the genital tract and renal tubules of domestic and wild animals. In affected areas, where there is exposure to infected urine of domestic and wild animals, this disease can be an occupational and recreational hazard (such as certain agricultural sectors and swimming or wading in contaminated water).[16]

In 2010, there were 131 notified cases of leptospirosis reported; giving a rate of 0.6 per 100,000 population compared with the 5-year mean of 128.0 notifications. Cases were reported in all jurisdictions, but Queensland accounted for 64% (n = 84) of notifications (Figure 62). Eighty-seven per cent (n = 127) of leptospirosis cases were male and 82% (n = 120) of all cases were aged between 15 and 54 years (Figure 63).

The WHO/FAO/OIE Collaborating Centre for Reference and Research on Leptospirosis provides an annual surveillance report of leptospirosis cases that are sent for typing.‡ In 2010, the reference centre typed 94 cases of leptospirosis. The most frequently identified serovars were Arborea (21% n = 20, Australis (16%, n = 15), Zanoni (15%, n = 14), and Hardjo (15%, n = 14).81 In 2009, Serovar Arborea was the most frequently reported serovar, accounting for 29% of all notifications.[82] The last reported death in Australia attributed to leptospriosis was in 2002.

Ornithosis

Ornithosis (or psittacosis) is caused by infection with the bacterium *Chlamydophila psittaci* and is transmitted to humans by exposure to waterfowl, seabirds, shore birds, pigeons and doves and many species of parrot. Birds can become carriers of the disease without becoming symptomatic. The mode of transmission to humans is by inhaling bacteria, usually from contaminated dried faeces, nasal or eye secretions and dust from infected birds.[16] Person-to-person transmission is rare.

‡ Reference laboratory numbers consist of data submitted to/by the reference laboratory and are reported by notification date, thus numbers will not necessarily be the same as those reported from NNDSS in this report.

Figure 62: Notified cases of leptospirosis, Australia, 2005 to 2010, by month and year and state or territory

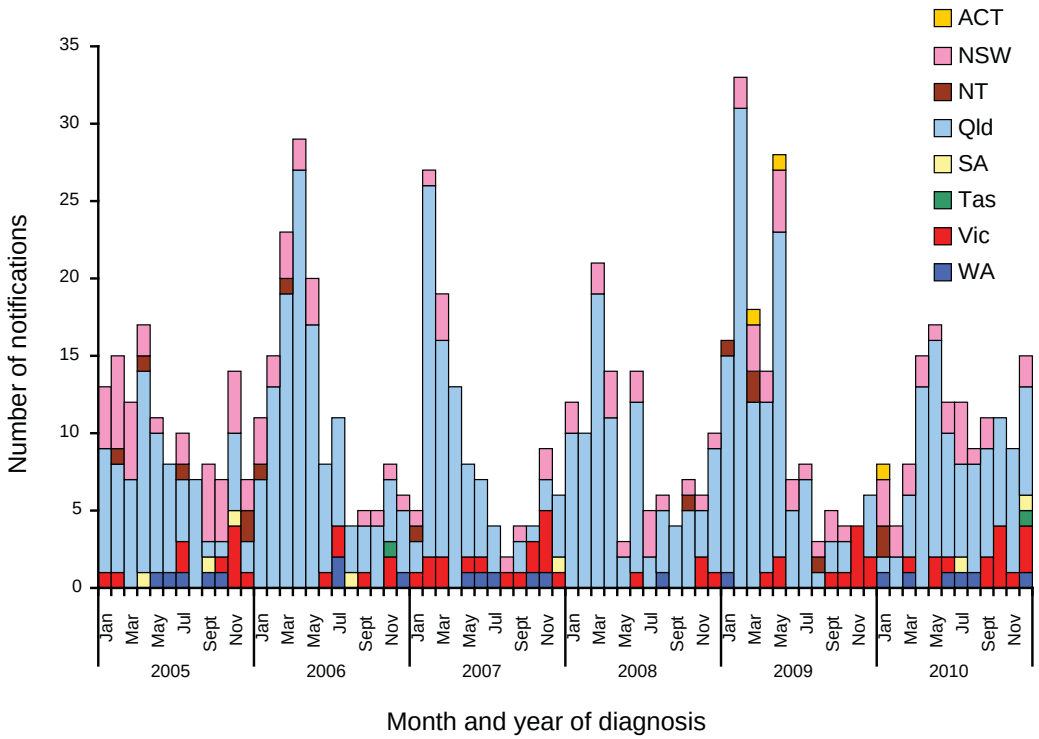
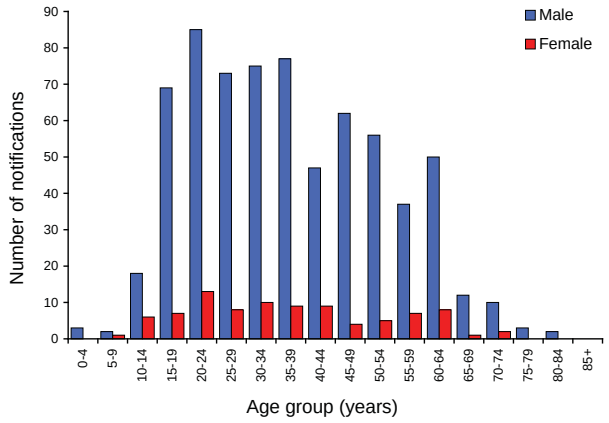


Figure 63: Notified cases of leptospirosis, Australia, 2010, by age group and sex



In 2010, there were 56 notified cases of ornithosis reported; giving a rate of 0.3 per 100,000 population. The number of ornithosis notifications has declined steadily in recent years (Figure 64), and case numbers in 2010 are the lowest since 2001.

Notifications were from all states and territories except the Northern Territory, but the majority of notifications were from Victoria (64%, n = 36). This represents a change from the previous 5 years, where the majority of cases were from New South Wales (53%, 312/589). Sixty-six per cent of cases in 2010 were male (39 cases). All cases were aged 20 years or older and 83% were aged 40 years or older. Cases of ornithosis over the previous 5 years have been mainly in adults, with a median age of 54 years (Figure 65).

Individuals at risk of contracting ornithosis include bird owners, pet shop employees, veterinarians, poultry-processing workers, zoo workers and taxidermists. Older adults and pregnant women may experience a more severe illness.[83]

Q fever

Q fever is caused by infection with the bacterium, *Coxiella burnetii*. The primary reservoirs of these bacteria are cattle, sheep and goats. *C. burnetii* is resistant to environmental conditions and many common disinfectants.[16] Q fever is most commonly transmitted via the airborne route, where the organism is carried in dust contaminated with tissue, birth fluids or excreta from infected animals.[84] It can also occur through 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. Prior to vaccination programs in Australia, approximately half of all cases in New South Wales, Queensland and Victoria were amongst abattoir workers.[16,85,86] The Australian Government previously funded the National Q Fever Management Program between 2001 and 2006 for states and territories to provide

Figure 64: Notified cases of ornithosis, Australia, 2005 to 2010, by month and year and state or territory

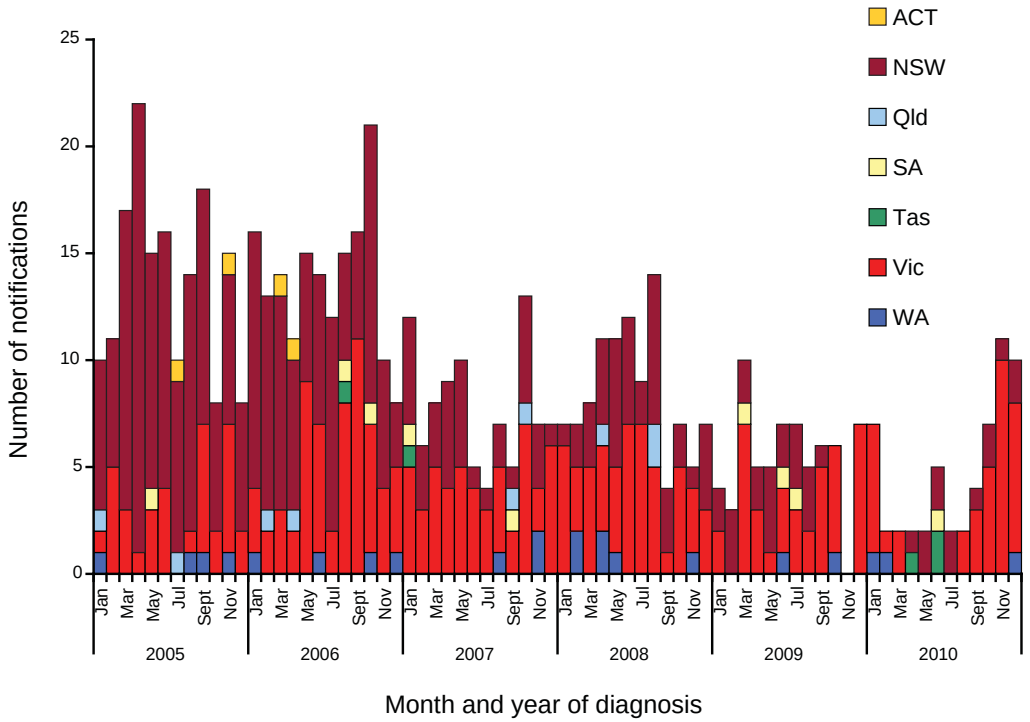


Figure 65: Notified cases of ornithosis, Australia, 2005 to 2010, by age group and sex

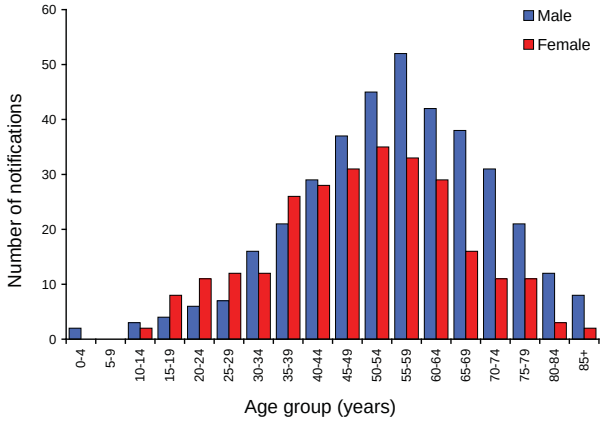
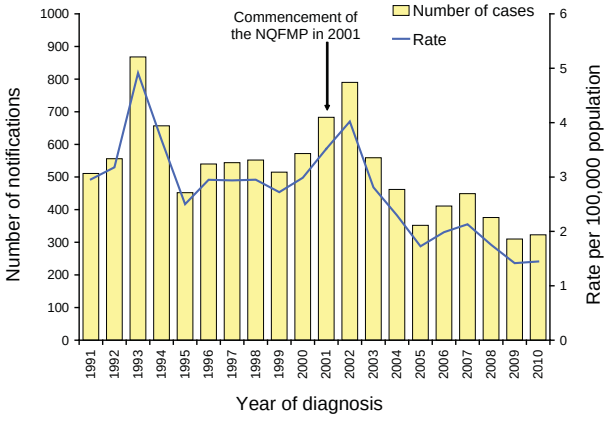


Figure 66: Notified cases of Q fever, Australia, by year



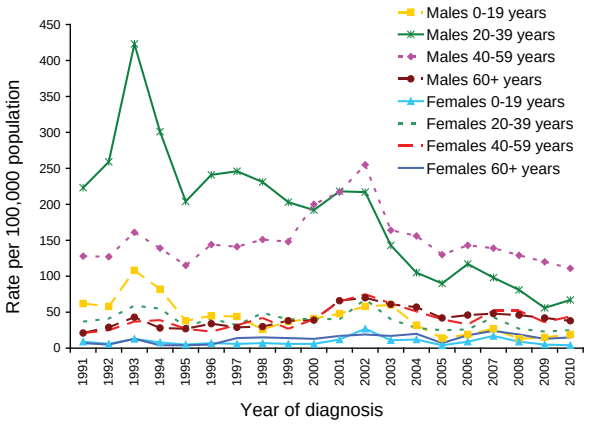
free vaccine to at risk groups (such as abattoir workers). The Australian Government has secured the supply of vaccine through to 2016.

In 2010, there were 323 notified cases of Q fever reported to the NNDSS; a rate of 1.4 per 100,000 population. Between 1991 and 2001, and prior to the introduction of the National Q Fever Management Program, Q fever notification rates ranged between 2.5 and 4.9 per 100,000 population (Figure 66).

In 2010, the highest notification rates were from Queensland (151; 3.3 per 100,000 population) and New South Wales (136; 1.9 per 100,000 population). Cases also occurred in Victoria (n = 16), South Australia (10 cases) and Western Australia (n = 8). There was 1 case each in the Australian Capital Territory and the Northern Territory.

Between 1991 and 2010, Q fever cases have been most frequently reported amongst males aged between 20 and 59 years, and it is in these groups that are likely to be at highest risk of infection where the declines in notifications are most pronounced (Figure 67). Whilst the ending of drought conditions may have contributed to the decrease, it is likely that vaccination programs have been highly effective at preventing Q fever amongst those most at risk.

Figure 67: Notified cases of Q fever, Australia, by year, age group and sex



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

Tularaemia

Tularaemia is caused by infection with the bacterium *Francisella tularensis*. The most common modes of transmission are through arthropod bites, handling infected animals, inhalation of infectious aerosols or exposure to contaminated food or water. Small mammals such as rodents, rabbits and hares are often the reservoir host.[26]

There were no notified cases of tularaemia in 2010, and no cases in any previous years.

Other bacterial infections

Legionellosis, leprosy, meningococcal infection and tuberculosis were notifiable in all states and territories in 2010 and classified as 'other bacterial infections' in the NNDSS. A total of 1,866 notifications were included in this group in 2010, which accounted for less than 1% of all the notifications to NNDSS, a decrease in cases and a similar proportion as in 2009 (n = 1,911 and 1% of total).

Legionellosis

Legionellosis, caused by the bacterium *Legionella,* can take the form of either Legionnaires' disease, a severe form of infection of the lungs or Pontiac fever, a milder influenza-like illness. The species that are most commonly associated with human disease in Australia are *L. pneumophila* and *L. longbeachae*. *Legionella* bacteria are found naturally in low levels in the environment. In the absence of effective environmental treatment *Legionella* organisms can breed to high numbers in air conditioning cooling towers, hot water systems, showerheads, spa pools, fountains or potting mix.

Infections caused by any *Legionella* species are notifiable, provided they meet the national surveillance case definition. There were 298 notified cases of legionellosis reported in 2010, giving a national rate of 1.3 per 100,000 and consistent with the 302 cases reported in 2009 (Figure 68). Rates for states and territories ranged from 0.9 per 100,000 in Queensland to 2.4 in Western Australia in 2010.

Data on the causative species were available for 91% of cases; the majority were *L. longbeachae* (46%) and *L. pneumophila* (45%) (Table 17).

Historically, there have been differences in the geographic distribution of *L. longbeachae* and *L. pneumophila*, with *L. longbeachae* making up the majority of notifications from South Australia and Western Australia, while *L. pneumophila* has been the most common infecting species in the

Table 17: Cases of legionellosis, Australia, 2010, by species and state or territory

Species	State or territory								Aust	Total %
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Legionella longbeachae	0	47	2	17	20	1	5	46	138*	46
Legionella pneumophila	0	39	1	18	9	5	53	8	133†	45
Legionella bozemanii	0	0	0	0	0	0	1	0	1	0.3
Unknown species	4	7	0	7	0	0	8	0	26	9
Total	4	93	3	42	29	6	67	54	298	100

* Two deaths.

† Five deaths.

eastern states (Queensland, New South Wales and Victoria). However, similar to 2009, *L. longbeachae* was notified more frequently than *L. pneumophila* in New South Wales and almost as frequently in Queensland in 2010.

Six of the 8 *L. pneumophila* cases reported in Western Australia in 2010 acquired their infections in Bali, Indonesia and five of these cases stayed at a particular hotel in Kuta, Bali. An additional 4 cases associated with this hotel or a nearby exposure source were identified in Victoria from travellers recently returned from Bali. Disease onset for these 10 cases ranged between 10 August 2010 and 1 January 2011.

In 2010, diagnoses of legionellosis were highest in May (11%; n = 34,) and August (n = 33) (Figure 68). *L. pneumophila* occurred most frequently in the autumn months, with 46 cases reported over the period March to May 2010 (Figure 69). Twenty-one cases of *L. pneumophila* were reported in May 2010, the largest number of cases diagnosed in a month since 23 cases were reported in March 2006. *L. longbeachae* cases peaked in spring 2010, with 45 cases reported over the period September to November 2010, the majority (n = 21) of which occurred in November.

Males accounted for 65% of legionellosis cases in 2010, with a male to female ratio of 1.9:1. There were no cases in people under the age of 15 years. The notification rate was highest in the 75–79 year age group (5.3). The highest age and sex-specific rates were observed in men aged 80–84 years (7.9) and women aged 75–79 years (4.4) (Figure 70).

Analysis of infecting species by age group showed that 89% (123/138) of *L. longbeachae* notifications were in persons aged 45 years or older, with the highest rate in the 75–79 year age group (2.4). Similarly, the proportion of *L. pneumophila* infections in persons 45 years or older was 87% (116/133), with the highest rate in the 70–74 year age group (2.5).

Figure 69: Notified cases of legionellosis, Australia, 2005 to 2010, by month and year and organism

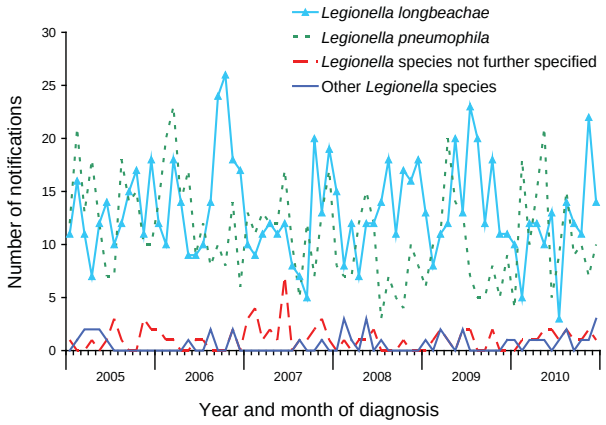


Figure 68: Notified cases of legionellosis, Australia, 2005 to 2010, by month and year and state or territory

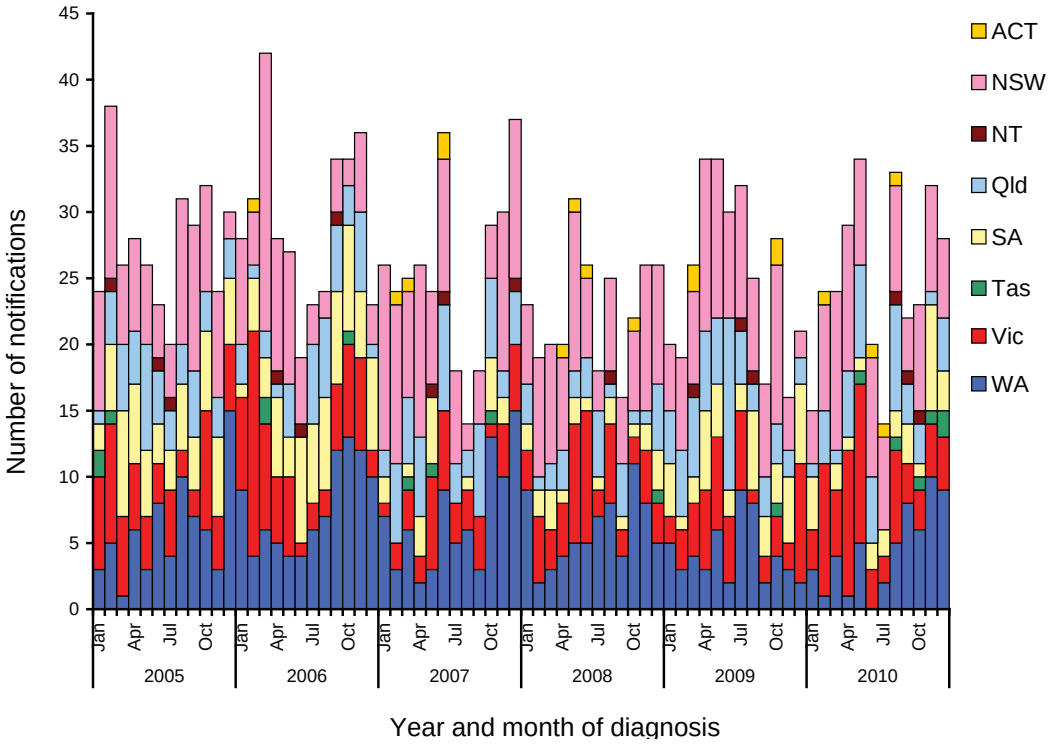


Figure 70: Rate for legionellosis, Australia, 2010, by age group and sex

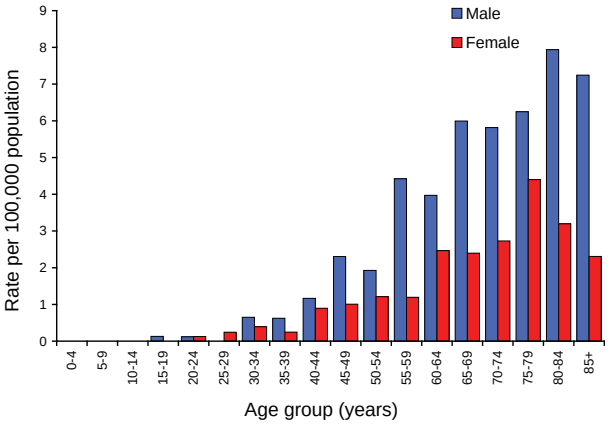
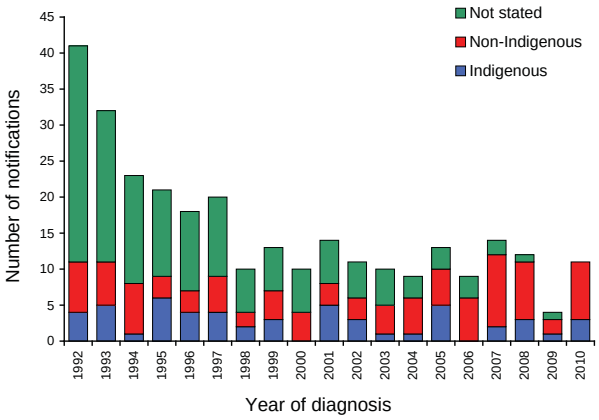


Figure 71: Notified cases of leprosy, Australia, 1992 to 2010, by year and Indigenous status



Mortality data were available for 58% of notifications. There were 7 reported deaths due to legionellosis in Australia in 2010, which was a decrease from 10 reported deaths in 2009. Those who died ranged in age between 55 and 86 years (median 76 years); 5 deaths were males and 2 deaths were females. There were 5 deaths associated with *L. pneumophila* infection and 2 deaths were associated with *L. longbeachae* (Table 17). Mortality data should be interpreted with caution given the large proportion of cases without outcome details and the variability across jurisdictions in reporting death to the NNDSS.

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 amongst migrants from leprosy-endemic countries and occasional locally acquired cases in Indigenous communities. Trends in leprosy notifications in Indigenous and non-Indigenous Australians are shown in Figure 71.

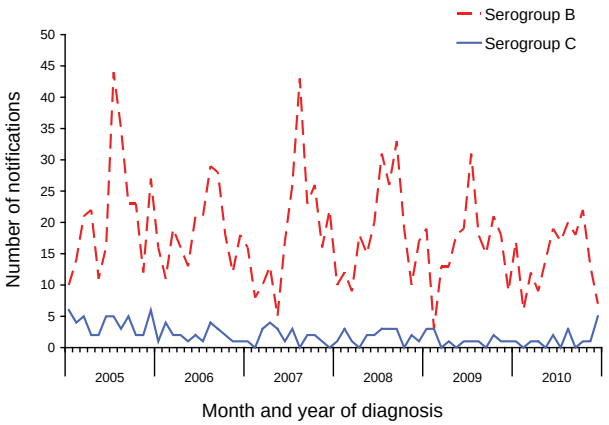
In 2010, 11 notified cases of leprosy were reported (8 male, 3 female), compared with 3 cases in 2009 and 11 in 2008. The majority of cases were reported from Victoria (n = 4) followed by Western Australia (n = 3) and Queensland (n = 2) with one each from New South Wales and the Northern Territory. Three cases were identified as Indigenous. Ten of the 11 cases were adults aged 24 years or older (range 24–55) and the remaining case was a 10-year-old.

Invasive meningococcal disease

Meningococcal disease is caused by the bacterium *Neisseria meningiditis* and becomes invasive when bacteria enter a normally sterile site, usually the blood (septicaemia), cerebrospinal fluid (meningitis) or both. The bacterium is carried by about 10% of the population without causing disease, and is transmitted via respiratory droplets. It occasionally causes a rapidly progressive serious illness, most commonly in previously healthy children and young adults. There are 13 known serogroups of meningococcus. Globally, serogroups A, B, C, W135 and Y most commonly cause disease.[16] Historically, *N. meningitidis* serogroups B and C have been the major cause of invasive meningococcal disease (IMD) in Australia. There has been a marked decrease in rates of IMD due to *N. meningitidis* serogroup C infections following the introduction of the National Meningococcal C Vaccination Program in 2003.

In 2010, there were 230 notified cases of IMD; an 11% decrease from 259 cases in 2009, and the lowest number since 1996. Rates have halved from 2 to 1 case per 100,000 between 2004 and 2010. During 2010, case numbers started to rise in May and remained elevated over the winter months in a clear seasonal pattern before declining from a peak in October (Figure 72).

Figure 72: Notified cases of invasive meningococcal disease, Australia, 2005 to 2010, by month and year and serogroup



Cases were evenly distributed amongst males and females in 2010 with 116 and 114 cases respectively. Ninety-four per cent of notified cases (n = 217) met the national case definition as 'confirmed' and the remaining 6% (n = 13) were classified as 'probable', based on clinical symptoms alone.

Ninety per cent of IMD cases in 2010 had serogroup data available of which 76% were caused by serogroup B organisms, 7% by C (Figure 72), 4% by W135 and 3% by Y (Table 18); a similar distribution to 2009.

Although there is no vaccine available to protect against serogroup B disease, the rate for IMD due to serogroup B organisms has continued to decline, particularly in the 0–4 and 5–9 year age groups over the period 2005 to 2010 (Figure 73). The highest age-specific IMD rate (6) in 2010 was in children aged 0–4 years. Of the cases reported in this age group, 80% were serogroup B. The highest rate for serogroup B infection in 2010 was 4.7 in the 0–4 year age group (n = 69), representing a 40% rate decline from 2005 (7.8, n = 101). There was a corresponding 50% decline in the 5–9 year age group from a rate of 1.6 (n = 22) in 2005 to 0.8 (n = 11) in 2010.

Notification rates for IMD due to serogroup C infections remained low in most age groups in 2010. The largest decline has been in the 0–4 year age group, decreasing from a rate of 0.6 (n = 8) in 2005 to 0.1 (n = 2) in 2010 (Figure 74).

In 2010, vaccination information was recorded for 3 of the 4 notified cases of serogroup C disease who were eligible for the meningococcal C vaccine (aged between 1 and 26 years in 2010) of which one was vaccinated and two were unvaccinated.

Mortality data for IMD were available for 50% of cases reported to the NNDSS in 2010. Of these, there were 14 deaths due to IMD (10 serogroup B, 1 serogroup C and 1 serogroup W135 and two of unknown serogroup) (Table 19). This was an increase from 10 deaths in 2009 (although mortal-

Figure 73: Rate for serogroup B invasive meningococcal disease, Australia, 2005 to 2010, by year and select age group

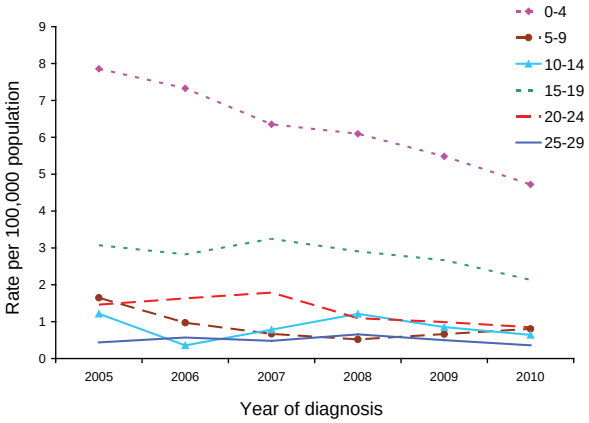


Table 18: Notified cases of invasive meningococcal disease, Australia, 2010, by serogroup and state or territory

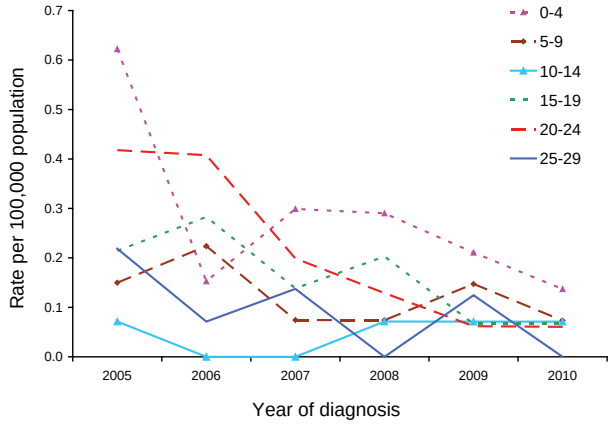
Serogroup	State or territory								Aust	% of total
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
B	1	50	2	41	22	5	34	19	174	76
C	0	6	0	5	2	0	1	1	15	7
W135	0	4	1	1	0	0	4	0	10	4
Y	0	3	0	0	1	0	3	1	8	3
Unknown	0	13	0	6	0	1	2	1	23	10

Table 19: Deaths due to invasive meningococcal infection, Australia, 2010, by serogroup and state or territory

Species	State or territory								Aust
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Serogroup B	0	3	0	1	1	0	2	3	10
Serogroup C	0	0	0	0	0	0	0	1	1
Serogroup W135	0	1	0	0	0	0	0	0	1
Serogroup Y	0	0	0	0	0	0	0	0	0
Serogroup unknown	0	1	0	1	0	0	0	0	2
Total deaths	0	5	0	2	1	0	2	4	14

ity data completeness in NNDSS for 2009 was only 38%). Mortality data should be interpreted with caution given the low level of completeness and the variability across jurisdictions in reporting death as an outcome in NNDSS.

Figure 74: Rate for serogroup C invasive meningococcal disease, Australia, 2005 to 2010, by year and select age group



Laboratory based meningococcal disease surveillance

The Australian Meningococcal Surveillance Program (AMSP) was established in 1994 for the purpose of monitoring and analysing isolates of *N. meningitidis* from cases of IMD in Australia. The program is undertaken by a network of reference laboratories in each state and territory, using standardised methodology to determine the phenotype (serogroup, serotype and serosubtype) and the susceptibility of *N. meningitidis* to a core group of antibiotics. Annual reports of the AMSP are published in CDI.

Tuberculosis

Tuberculosis (TB) is an infection caused by the bacterium *Mycobacterium tuberculosis*. TB is transmitted by airborne droplets produced by people with pulmonary or respiratory tract TB during coughing or sneezing. While Australia has one of the lowest rates of tuberculosis in the world, the disease remains a public health issue in the overseas-born and Indigenous communities. In 2010, 1,327 notified cases of TB were reported to NNDSS, a rate of 5.9 and consistent with the rate reported in 2009 (6) and 2008 (5.6). TB rates were higher than the national average in the Northern Territory (13), Victoria (7.8) and New South Wales (6.6), and the lowest rate occurred in Tasmania (2).

Further details and analysis of TB cases can be found in the tuberculosis annual report series which is published in CDI.

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Abbreviations

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

Appendices

Appendix 1: Mid-year estimate of Australian population, 2010, by state or territory

	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aus
Males	178,639	3,588,734	119,052	2,257,344	812,591	250,434	2,751,566	1,164,553	11,124,254
Females	180,255	3,650,085	110,623	2,259,017	832,051	257,192	2,795,961	1,131,858	11,218,144
Total	358,894	7,238,819	229,675	4,516,361	1,644,642	507,626	5,547,527	2,296,411	22,342,398

Source: ABS 3201.0 Population by Age and Sex, Australian States and Territories. June 2010 population.[7]

Appendix 2: Mid-year estimate of Australian population, 2010, by state or territory and age

Age group	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aus*
0–4	24,134	462,888	18,761	314,493	98,912	33,655	353,610	154,511	1,461,088
5–9	20,969	441,773	17,556	289,868	93,857	30,803	328,154	142,614	1,365,747
10–14	20,974	450,467	16,762	297,328	100,272	33,168	335,668	148,933	1,403,778
15–19	24,224	479,867	16,844	314,118	107,978	34,983	365,523	157,285	1,501,010
20–24	31,023	523,865	18,952	330,942	116,277	31,807	423,869	172,796	1,649,659
25–29	31,963	539,075	21,122	333,893	111,581	29,236	423,522	174,699	1,665,263
30–34	27,892	502,698	18,884	303,580	101,966	28,255	391,259	159,367	1,534,043
35–39	27,501	522,538	18,579	328,642	110,337	32,838	407,324	168,128	1,616,051
40–44	25,166	489,989	17,003	314,179	113,724	33,936	392,503	165,950	1,552,666
45–49	25,113	508,660	16,133	318,201	117,841	36,908	386,780	165,206	1,575,053
50–54	23,501	475,539	14,554	293,227	113,131	36,589	360,605	153,040	1,470,376
55–59	20,934	428,644	12,422	265,641	104,417	34,231	322,990	136,531	1,326,013
60–64	18,294	394,475	9,380	244,649	97,333	32,177	295,661	120,433	1,212,537
65–69	12,204	301,563	5,683	182,739	72,983	24,543	222,554	87,136	909,512
70–74	8,856	238,870	3,381	135,883	58,841	18,865	178,661	67,030	710,444
75–79	6,507	188,238	1,799	100,842	47,486	14,643	141,709	50,371	551,621
80–84	5,010	151,442	1,131	77,708	40,323	11,076	114,215	38,393	439,306
85+	4,629	138,228	729	70,428	37,383	9,913	102,920	33,988	398,231
Total	358,894	7,238,819	229,675	4,516,361	1,644,642	507,626	5,547,527	2,296,411	22,342,398

Source: ABS 3201.0 Population by Age and Sex, Australian States and Territories. Jun 2010 population.[7]

Appendix 3: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2010, by notifiable disease*

Disease name	Aboriginal but not TSI origin	TSI but not Aboriginal origin	Aboriginal and TSI origin	Not Indigenous	Not stated	Blank/ missing	Total	% complete	Number complete	Number incomplete
Anthrax	0	0	0	1	0	0	1	100.0	1	0
Cholera	1	0	0	2	0	0	3	100.0	3	0
Leprosy	3	0	0	8	0	0	11	100.0	11	0
Syphilis - congenital	2	0	0	1	0	0	3	100.0	3	0
Tetanus	0	0	0	2	0	0	2	100.0	2	0
Tuberculosis	37	3	0	1,266	21	0	1,327	98.4	1,306	21
Meningococcal disease (invasive)	17	2	1	201	9	0	230	96.1	221	9
Syphilis <2 years	108	16	6	912	51	6	1,099	94.8	1,042	57
Typhoid fever	0	1	0	88	7	0	96	92.7	89	7
Haemophilus influenzae type b	8	0	0	14	1	1	24	91.7	22	2
Listeriosis	1	0	1	63	6	0	71	91.5	65	6
Measles	1	0	0	63	6	0	70	91.4	64	6
Hepatitis A	0	0	0	240	22	1	263	91.3	240	23
Rubella	0	0	0	40	3	1	44	90.9	40	4
Varicella zoster (chickenpox)+	95	7	3	1,447	172	19	1,743	89.0	1,552	191
Hepatitis C (newly acquired)	51	0	0	264	36	7	358	88.0	315	43
Arbovirus infection (NEC)	4	1	1	15	2	1	24	87.5	21	3
Haemolytic uraemic syndrome	0	0	0	7	1	0	8	87.5	7	1
Hepatitis E	0	0	0	33	4	1	38	86.8	33	5
Varicella zoster (shingles)+	85	1	4	2,489	364	35	2,978	86.6	2,579	399
Legionellosis	3	0	0	255	33	7	298	86.6	258	40
Pneumococcal disease (invasive)	187	6	4	1,224	143	80	1,644	86.4	1,421	223
STEC, VTEC	1	0	0	66	13	1	81	82.7	67	14
Malaria	2	5	1	321	58	12	399	82.5	329	70
Shigellosis	138	3	5	305	59	42	552	81.7	451	101
Ornithosis	0	1	0	44	10	1	56	80.4	45	11
Hepatitis B (newly acquired)	16	3	0	164	40	5	228	80.3	183	45
Dengue virus infection	3	0	0	930	217	51	1,201	77.7	933	268
Q fever	9	0	0	231	76	7	323	74.3	240	83
Leptospirosis	5	0	2	89	31	4	131	73.3	96	35

Appendix 3 *continued*: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2010, by notifiable disease*

Disease name	Aboriginal but not TSI origin	TSI but not Aboriginal origin	Aboriginal and TSI origin	Not Indigenous	Not stated	Blank/ missing	Total	% complete	Number complete	Number incomplete
Syphilis >2 years or unspecified duration	134	16	11	748	324	8	1,241	73.2	909	332
Gonococcal infection	3,256	264	82	2,885	1,911	1,573	9,971	65.1	6,487	3,484
Influenza (laboratory confirmed)	605	53	15	6,970	4,241	1,535	13,419	57.0	7,643	5,776
Cryptosporidiosis	139	2	2	684	562	91	1,480	55.9	827	653
Pertussis	488	19	31	17,280	12,432	4,543	34,793	51.2	17,818	16,975
Mumps	2	0	0	46	30	17	95	50.5	48	47
Chlamydial infection	5,524	834	323	30,766	23,839	13,019	74,305	50.4	37,447	36,858
Campylobacteriosis	173	14	9	8,333	8,109	328	16,966	50.3	8,529	8,437
Kunjin virus infection	0	0	0	1	1	0	2	50.0	1	1
Hepatitis D	0	0	0	17	15	3	35	48.6	17	18
Salmonellosis	403	22	14	5,364	3,909	2,281	11,993	48.4	5,803	6,190
Brucellosis	0	0	0	9	12	0	21	42.9	9	12
Ross River virus infection	67	7	7	1,877	2,734	455	5,147	38.0	1,958	3,189
Hepatitis C (unspecified)	536	14	18	3,352	4,706	2,177	10,803	36.3	3,920	6,883
Hepatitis B (unspecified)	211	23	6	2,237	2,611	1,790	6,878	36.0	2,477	4,401
Barmah Forest virus infection	41	4	3	432	858	133	1,471	32.6	480	991
Varicella zoster (unspecified)+	100	19	5	1,705	5,141	182	7,152	25.6	1,829	5,323
Donovanosis	0	0	0	0	1	0	1	0.0	0	1

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

TSI Torres Strait Islander