Australia's notifiable disease status, 2013: Annual report of the National Notifiable Diseases Surveillance System

NNDSS Annual Report Writing Group

Abstract

In 2013, 65 diseases and conditions were nationally notifiable in Australia. States and territories reported a total of 224,434 notifications of communicable diseases to the National Notifiable Diseases Surveillance System, a decrease of 8% on the number of notifications in 2012. In 2013, the most frequently notified diseases were sexually transmissible infections (100,949 notifications, 45% of total notifications), vaccine preventable diseases (59,630 notifications, 26.6% of total notifications), and gastrointestinal diseases (32,536 notifications, 14.5% of total notifications). There were 17,919 notifications of bloodborne diseases; 10,831 notifications of vectorborne diseases; 1,932 notifications of other bacterial infections; 634 notifications of zoonoses and 3 notifications of quarantinable diseases. *Commun Dis Intell* 2015;39(3):E387–E478.

Keywords: Australia, communicable diseases, epidemiology, surveillance

Introduction

Australia's notifiable diseases status, 2013, 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 the national level includes:

- identifying national trends;
- providing guidance for policy development and resource allocation at the national level;
- monitoring the need for and impact of national disease control programs;
- coordinating the response to national or multi-jurisdictional outbreaks;
- describing 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
- supporting quarantine activities, which are the responsibility of the Commonwealth 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 signed by Health Ministers in April 2008, establishes the operational arrangements to formalise and enhance existing surveillance and reporting systems, an important objective of the Act. Under the Agreement, in 2013 states and territories forwarded de-identified notification data on the nationally agreed set of 65 communicable diseases to the Department of Health for the purposes of national communicable disease surveillance, although not all 65 diseases were notifiable in each jurisdiction. Data were electronically updated daily from states and territories. The system was complemented by other surveillance systems, which provided information on various diseases, including four that are not reported to the National Notifiable Diseases Surveillance System (NNDSS), human immunodeficiency virus (HIV), acquired immune deficiency syndrome (AIDS) and the classical and variant forms of Creutzfeldt-Jakob disease (CJD).

The NNDSS core dataset requires the following mandatory data fields: unique record reference number; notifying state or territory; disease code; confirmation status and the date when the jurisdictional health department was notified (notification received date). In addition, the following data fields

were supplied where possible: date of birth; age at onset; sex; Indigenous status; postcode of residence; disease onset date; date when the pathology service authorised a report or a 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, donovanosis, gonococcal infection and syphilis < 2 years duration) were reported from states and territories to NNDSS. With the exception of hepatitis B and hepatitis C these enhanced data are not included in this report. These data, along with influenza enhanced data, are reported in individual annual reports. 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 2013. These notifications 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]

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

Information on communicable disease surveillance is communicated through several avenues. The most up-to-date information on topics of interest is provided at the fortnightly teleconferences of the Communicable Diseases Network Australia (CDNA). A summary of these reports is available online from the CDNA website (http://www.health.gov.au/internet/main/publishing.nsf/Content/cdnareport.htm).[6]

The *Communicable Diseases Intelligence* (CDI) quarterly journal publishes surveillance data, annual surveillance reports, short reports, and articles on the epidemiology and control of communicable diseases.

Notification rates for each notifiable disease were calculated using the estimated 2013 December resident population supplied by the Australian Bureau of Statistics (Appendix 1 and Appendix 2).[7] 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 with 2011 census data as the standard population. All rates are represented as the rate per 100,000 population unless stated otherwise.

Direct age standardised notification rates, using the method described by the Australian Institute of Health and Welfare[8] were calculated for Aboriginal and Torres Strait Islander and non-Indigenous notifications for relevant sexually transmissible infections (STIs) for jurisdictions that had Indigenous status data completed for more than 50% of notifications over the period 2007 to 2012. 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 may occur predominately in specific high risk groups, including in remote Aboriginal and Torres Strait Islander populations. Recent studies have suggested that higher rates in Aboriginal and Torres Strait Islander populations may be attributable to higher prevalence and reinfection rates while others have suggested that it may be due to increased testing and contact tracing.[9]

In the national case definitions for chlamydial infection, gonococcal infection and syphilis the mode of transmission cannot be inferred from the site of infection. Infections in children may be acquired perinatally (e.g. congenital chlamydia).[10] Notifications of chlamydial, gonococcal and non-congenital syphilis infections were excluded from analysis of age and sex distribution where the case was aged less than 13 years and the infection was able to be determined as non-sexually acquired through enhanced surveillance data where available.

Notes on interpretation

This present report is based on 2013 data from each state and territory, agreed upon in June 2014, and represents a snap shot of the year after duplicate records and incorrect or incomplete data were removed. Totals in this report may vary slightly from the totals reported in CDI quarterly publications.

Analyses in this report were based on the date of disease diagnosis in an attempt to estimate disease activity within the reporting period. The date of diagnosis is the onset date or where the onset date was not known, the earliest of the following dates, specimen collection date, the notification date, or the notification receive date. In January 2014, the NSC redefined the diagnosis date methodology for hepatitis B (unspecified), hepatitis C (unspecified), leprosy, syphilis (unspecified) and tuberculosis. As a considerable amount of time can elapse between the initial infection, the onset of symptoms and the subsequent diagnosis, the diagnosis date for these 5 diseases is derived from the notification receive date.

When referring to NNDSS notification data throughout the report, the term 'cases' or 'notified cases' are used to identify individuals in whom 'notification' of a condition has been received by NNDSS. These notifications 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 jurisdiction, over time and by disease. This caveat is particularly relevant to STIs, many or most of which are identified through screening programs (Figure 1).

A survey of jurisdictional public health departments was conducted in 2013 to ascertain the source of each notification (Table 1). Whilst most jurisdictions have data on laboratory notifications, the percentage of notifications attributed to doctor only and laboratory and doctor for each state and territory are based on estimates deduced from the data that are available, noting that fields for these data may be incomplete. Only Western Australia and New South Wales maintain data on the source of notifications from laboratories and/or doctors.

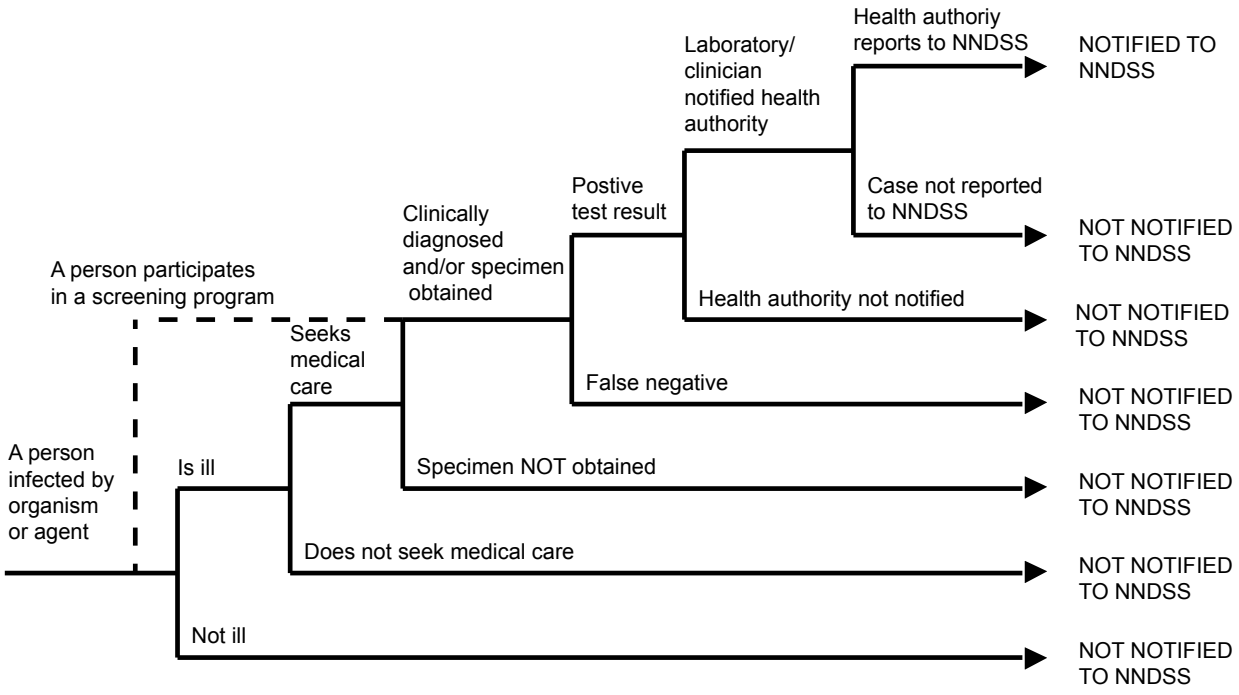
Methods of surveillance vary between states and territories, each having different requirements for notification by medical practitioners, laboratories

Table 1: Percentage of notified cases from different sources in each jurisdiction, 2013*

State or territory	Source of notifications		
	Laboratory only	Doctor only	Laboratory and doctor
ACT	95.0	<1.0	~4.0
NSW	98.2	0.7	0.3
NT	98.0	0.7	1.3
Qld	99.5	0.1	0.3
SA	4.0	3.0	93.0
Tas.	99.0	1.0	<1.0
Vic.	38.0	5.0	52.0
WA	33.4	1.4	65.2

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

Figure 1: Communicable diseases notifiable fraction



and hospitals. Although the National Notifiable Diseases List[2] was established, some diseases are not notifiable in all 8 jurisdictions (Table 2).

Changes in surveillance practices may have been introduced in some jurisdictions and not in others, and must be taken into consideration when comparing data between jurisdictions. In this report, some additional information was obtained from states and territories, to assist in the interpretation of the 2013 data. These include changes in surveillance practices, screening practices, laboratory practices, and major disease control or prevention initiatives.

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 cases' 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.

Table 2: Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2013

Disease	Data received from
Bloodborne diseases	
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 fever	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
Syphilis – congenital	All jurisdictions

Table 2 (cont'd): Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2013

Disease	Data received from
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
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 infection	All jurisdictions
Brucellosis	All jurisdictions
Leptospirosis	All jurisdictions
Lyssavirus infection (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*.

NEC Not elsewhere classified.

The percentage of data completeness was defined as:

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

The Indigenous status was defined by the following nationally accepted criteria:[11]

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)

For the purposes of this report, an Indigenous person includes responses 1, 2 or 3 with non-Indigenous including response 4 only.

9=Not stated

In interpreting STI notification 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,[12,13] the use of less invasive and more sensitive diagnostic tests[14] and periodic public awareness campaigns[15] may influence the number of notifications that occur over time. Rates for STIs are particularly susceptible to overall rates of testing, with low testing rates resulting in an underestimation of disease and increased testing potentially causing an increase in notifications.[16] For some diseases, changes in surveillance practices may also need to be taken into account when interpreting national trends.

The differences in rates between females and males for STIs should be interpreted with caution, as rates of testing, symptom status, health care-seeking behaviours, and partner notification differ between the sexes.[17]

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 in 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) as required.

The national surveillance case definitions and their review status are available from the Department of Health web site (http://www.health.gov.au/case-definitions).

Results

There were 224,434 communicable disease notifications received by NNDSS in 2013 (Table 3).

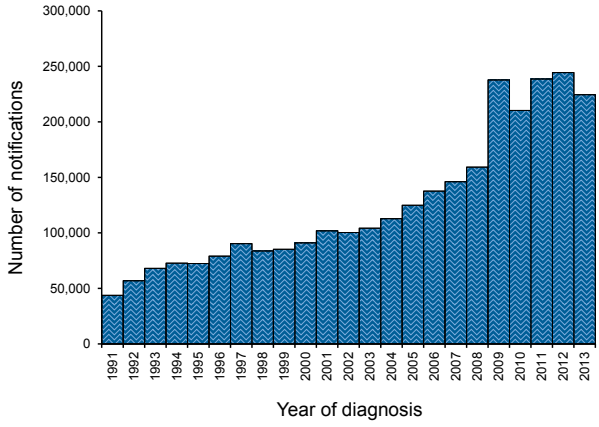
In 2013, the most frequently notified diseases were sexually transmissible infections (100,949 notifications, 45% of total notifications), vaccine preventable diseases (59,630 notifications, 26.6% of total notifications), and gastrointestinal diseases (32,535 notifications, 14.5% of total notifications).

Table 3: Notifications to the National Notifiable Diseases Surveillance System, Australia, 2013, by disease category rank order

Disease category	Number	%
Sexually transmissible infections	100,949	45.0
Vaccine preventable diseases	59,630	26.6
Gastrointestinal diseases	32,536	14.5
Bloodborne diseases	17,919	8.0
Vectorborne diseases	10,831	4.8
Other bacterial diseases	1,932	0.9
Zoonoses	634	0.3
Quarantinable diseases	3	<0.1
Total	224,434	100.0

There was a decrease of 8% compared with the total number of notifications in 2012 (Figure 2). The decrease can largely be attributed to the 2013 influenza season, which commenced later and occurred over a shorter period and was considered a more moderate season when compared with the 2012 season.

Figure 2: Notifications received by the National Notifiable Diseases Surveillance System, Australia, 1991 to 2013



Notifications and notification rates per 100,000 for each disease in 2013, by state or territory, are shown in Table 4 and Table 5 respectively. Notifications and rates per 100,000 for the period 2008 to 2013 are shown in Table 6.

Table 4: Notified cases of communicable diseases, Australia, 2013, by state or territory

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Bloodborne diseases									
Hepatitis B (newly acquired)*	4	33	6	45	8	3	34	39	172
Hepatitis B (unspecified)†	107	2,506	325	906	286	55	1,850	944	6,979
Hepatitis C (newly acquired)*	14	43	1	NN	62	19	145	123	407
Hepatitis C (unspecified)†,‡	170	3,503	256	2,469	414	210	2,130	1,156	10,308
Hepatitis D	0	9	1	13	4	0	22	4	53
Gastrointestinal diseases									
Botulism	0	2	0	0	0	0	2	0	4
Campylobacteriosis	373	NN	199	3,831	1,719	696	5,953	1,927	14,698
Cryptosporidiosis	39	1,107	89	766	135	74	1,264	372	3,846
Haemolytic uraemic syndrome	0	9	1	2	1	0	2	0	15
Hepatitis A	4	62	0	45	11	0	53	14	189
Hepatitis E	1	16	0	2	0	0	8	4	31
Listeriosis	1	29	3	9	2	2	22	8	76
Salmonellosis	279	3,456	385	3,207	982	249	2,954	1,279	12,791
Shigellosis	10	149	108	73	29	3	115	69	556
STEC,VTEC§	3	25	0	83	53	1	11	4	180
Typhoid fever	5	59	0	24	8	0	44	10	150
Quarantinable diseases									
Cholera	0	2	0	0	0	0	1	0	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‖,¶	1,269	20,827	2,998	19,497	5,183	1,538	19,467	11,747	82,526
Donovanosis	0	0	0	0	0	0	0	0	0
Gonococcal infection¶	114	4,231	1,955	2,732	855	69	3,014	1,972	14,942
Syphilis – congenital¶	0	3	1	1	0	0	0	2	7
Syphilis < 2 years duration*,¶,**	10	598	22	328	56	19	652	83	1,768
Syphilis > 2 years or unspecified duration†,¶	9	417	94	306	104	11	564	201	1,706
Vaccine preventable diseases									
Diphtheria	0	0	0	1	1	0	0	0	2
Haemophilus influenzae type b	0	9	0	7	0	0	4	0	20
Influenza (laboratory confirmed)	570	8,398	481	5,509	4,825	297	5,854	2,395	28,329
Measles	1	34	0	52	16	0	41	14	158
Mumps	1	90	6	41	5	5	24	45	217
Pertussis	228	2,336	108	3,808	811	513	2,898	1,639	12,341
Pneumococcal disease (invasive)	14	467	58	272	112	37	393	193	1,546
Poliomyelitis	0	0	0	0	0	0	0	0	0
Rubella	1	12	0	6	2	0	3	1	25
Rubella – congenital	0	0	0	0	1	0	1	0	2
Tetanus	0	2	0	0	1	0	0	1	4

Table 4 (cont'd): Notified cases of communicable diseases, Australia, 2013, by state or territory

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Vaccine preventable diseases (cont'd)									
Varicella zoster (chickenpox)	20	NN	97	280	386	29	871	359	2,042
Varicella zoster (shingles)	52	NN	246	45	1,899	247	1,223	1,305	5,017
Varicella zoster (unspecified)	138	NN	10	5,337	105	89	3,018	1,230	9,927
Vectorborne diseases									
Arbovirus infection (NEC)	0	0	1	20	0	0	0	0	21
Barmah Forest virus infection	6	431	405	2,224	74	3	72	1,024	4,239
Dengue virus infection	10	300	56	489	75	19	414	478	1,841
Japanese encephalitis virus infection	0	0	0	2	1	0	0	1	4
Kunjin virus infection††	0	0	0	3	0	0	0	0	3
Malaria	13	88	22	108	8	11	88	76	414
Murray Valley encephalitis virus infection	0	0	0	1	0	0	0	0	1
Ross River virus infection	4	503	300	1,787	167	8	171	1,368	4,308
Zoonoses									
Anthrax	0	0	0	0	0	0	0	0	0
Australia bat lyssavirus infection	0	0	0	1	0	0	0	0	1
Brucellosis	0	3	0	11	0	0	0	0	14
Leptospirosis	0	12	4	67	2	0	9	1	95
Lyssavirus infection (NEC)	0	0	0	0	0	0	0	0	0
Ornithosis	0	8	0	1	0	0	34	4	47
Q fever	0	167	1	243	17	0	41	8	477
Tularaemia	0	0	0	0	0	0	0	0	0
Other bacterial diseases									
Legionellosis	1	105	6	165	63	6	66	93	505
Leprosy	1	2	2	1	1	0	3	3	13
Meningococcal infection‡‡	3	48	2	33	20	3	25	15	149
Tuberculosis	18	440	41	156	69	8	383	150	1,265
Total	3,493	50,540	8,290	55,005	18,573	4,224	53,943	30,361	224,429

* Newly acquired hepatitis and syphilis < 2 years duration 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 newly acquired hepatitis C cases.

§ Infection with Shiga toxin/verotoxin producing *Escherichia coli*.

|| Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only cervical, urine and urethral specimens; the Northern Territory and Western Australia exclude ocular infections. From 1 July 2013 the case definition changed to exclude all 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).

** Data for all states and territories are reported by diagnosis date, except Queensland, which is reported by notification receive date.

†† 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 the Australian Capital Territory and New South Wales also report conjunctival cases.

HPAIH Highly pathogenic avian influenza in humans.

NEC Not elsewhere classified.

NN Not notifiable.

Table 5: Notification rates per 100,000 of nationally notifiable communicable diseases, Australia, 2013, by state or territory

Disease	State or territory								Aust.
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	
Bloodborne diseases									
Hepatitis B (newly acquired)*	1.0	0.4	2.5	1.0	0.5	0.6	0.6	1.5	0.7
Hepatitis B (unspecified)†	28.0	33.8	134.7	19.5	17.1	10.7	32.2	37.5	30.2
Hepatitis C (newly acquired)*	3.7	0.6	0.4	NN	3.7	3.7	2.5	4.9	2.2
Hepatitis C (unspecified)†,‡	44.6	47.3	106.1	53.0	24.8	40.9	37.1	45.9	44.6
Hepatitis D	–	0.1	0.4	0.3	0.2	–	0.4	0.2	0.2
Gastrointestinal diseases									
Botulism	–	<0.1	–	–	–	–	<0.1	–	<0.1
Campylobacteriosis	97.8	NN	82.5	82.3	102.9	135.6	103.7	76.5	93.5
Cryptosporidiosis	10.2	14.9	36.9	16.5	8.1	14.4	22.0	14.8	16.6
Haemolytic uraemic syndrome	–	0.1	0.4	<0.1	0.1	–	<0.1	–	0.1
Hepatitis A	1.0	0.8	–	1.0	0.7	–	0.9	0.6	0.8
Hepatitis E	0.3	0.2	–	<0.1	–	–	0.1	0.2	0.1
Listeriosis	0.3	0.4	1.2	0.2	0.1	0.4	0.4	0.3	0.3
Salmonellosis	73.1	46.6	159.6	68.9	58.8	48.5	51.5	50.7	55.3
Shigellosis	2.6	2.0	44.8	1.6	1.7	0.6	2.0	2.7	2.4
STEC,VTEC§	0.8	0.3	–	1.8	3.2	0.2	0.2	0.2	0.8
Typhoid fever	1.3	0.8	–	0.5	0.5	–	0.8	0.4	0.6
Quarantinable diseases									
Cholera	–	<0.1	–	–	–	–	<0.1	–	<0.1
HPAIH	–	–	–	–	–	–	–	–	–
Plague	–	–	–	–	–	–	–	–	–
Rabies	–	–	–	–	–	–	–	–	–
Severe acute respiratory syndrome	–	–	–	–	–	–	–	–	–
Smallpox	–	–	–	–	–	–	–	–	–
Viral haemorrhagic fever	–	–	–	–	–	–	–	–	–
Yellow fever	–	–	–	–	–	–	–	–	–
Sexually transmissible infections									
Chlamydial infection‖,¶	332.7	281.1	1243.0	418.8	310.2	299.7	339.2	466.0	356.7
Donovanosis	–	–	–	–	–	–	–	–	–
Gonococcal infection¶	29.9	57.1	810.5	58.7	51.2	13.4	52.5	78.2	64.6
Syphilis – congenital¶	–	<0.1	0.4	<0.1	–	–	–	0.1	<0.1
Syphilis < 2 years duration*,¶,**	2.6	8.1	9.1	7.0	3.4	3.7	11.4	3.3	7.6
Syphilis > 2 years or unspecified duration†,¶	2.4	5.6	39.0	6.6	6.2	2.1	9.8	8.0	7.4
Vaccine preventable diseases									
Diphtheria	–	–	–	<0.1	0.1	–	–	–	<0.1
Haemophilus influenzae type b	–	0.1	–	0.2	–	–	0.1	–	0.1
Influenza (laboratory confirmed)	149.4	113.3	199.4	118.3	288.8	57.9	102.0	95.0	122.5
Measles	0.3	0.5	–	1.1	1.0	–	0.7	0.6	0.7
Mumps	0.3	1.2	2.5	0.9	0.3	1.0	0.4	1.8	0.9
Pertussis	59.8	31.5	44.8	81.8	48.5	100.0	50.5	65.0	53.3
Pneumococcal disease (invasive)	3.7	6.3	24.0	5.8	6.7	7.2	6.8	7.7	6.7
Poliomyelitis	–	–	–	–	–	–	–	–	–
Rubella	0.3	0.2	–	0.1	0.1	–	0.1	<0.1	0.11
Rubella – congenital	–	–	–	–	0.1	–	<0.1	–	<0.1
Tetanus	–	<0.1	–	–	0.1	–	–	<0.1	<0.1

Table 5 (cont'd): Notification rates per 100,000 of nationally notifiable communicable diseases, Australia, 2013, by state or territory

Disease	State or territory								Aust.
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	
Vaccine preventable diseases (cont'd)									
Varicella zoster (chickenpox)	5.2	NN	40.2	6.0	23.1	5.7	15.2	14.2	13.0
Varicella zoster (shingles)	13.6	NN	102.0	1.0	113.7	48.1	21.3	51.8	31.9
Varicella zoster (unspecified)	36.2	NN	4.1	114.7	6.3	17.3	52.6	48.8	63.1
Vectorborne diseases									
Arbovirus infection (NEC)	–	–	0.4	0.4	–	–	–	–	0.1
Barmah Forest virus infection	1.6	5.8	167.9	47.8	4.4	0.6	1.3	40.6	18.3
Dengue virus infection	2.6	4.0	23.2	10.5	4.5	3.7	7.2	19.0	8.0
Japanese encephalitis virus infection	–	–	–	<0.1	0.1	–	–	<0.1	<0.1
Kunjin virus infection††	–	–	–	0.1	–	–	–	–	<0.1
Malaria	3.4	1.2	9.1	2.3	0.5	2.1	1.5	3.0	1.8
Murray Valley encephalitis virus infection	–	–	–	<0.1	–	–	–	–	<0.1
Ross River virus infection	1.0	6.8	124.4	38.4	10.0	1.6	3.0	54.3	18.6
Zoonoses									
Anthrax	–	–	–	–	–	–	–	–	–
Australia bat lyssavirus infection	–	–	–	<0.1	–	–	–	–	<0.1
Brucellosis	–	<0.1	–	0.2	–	–	–	–	0.1
Leptospirosis	–	0.2	1.7	1.4	0.1	–	0.2	<0.1	0.4
Lyssavirus infection (NEC)	–	–	–	–	–	–	–	–	–
Ornithosis	–	0.1	–	<0.1	–	–	0.6	0.2	0.2
Q fever	–	2.3	0.4	5.2	1.0	–	0.7	0.3	2.1
Tularaemia	–	–	–	–	–	–	–	–	–
Other bacterial diseases									
Legionellosis	0.3	1.4	2.5	3.5	3.8	1.2	1.2	3.7	2.2
Leprosy	0.3	<0.1	0.8	<0.1	0.1	–	0.1	0.1	0.1
Meningococcal infection‡‡	0.8	0.6	0.8	0.7	1.2	0.6	0.4	0.6	0.6
Tuberculosis	4.7	5.9	17.0	3.4	4.1	1.6	6.7	6.0	5.5

* Newly acquired hepatitis and syphilis < 2 years duration 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 newly acquired hepatitis C cases.

§ Infection with Shiga toxin/verotoxin producing *Escherichia coli.*

|| Includes *Chlamydia trachomatis* identified from cervical, rectal, urine, urethral, throat and eye samples, except for South Australia, which reports only cervical, urine and urethral specimens; the Northern Territory and Western Australia exclude ocular infections. From 1 July 2013 the case definition changed to exclude all 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).

** Data for all states and territories are reported by diagnosis date, except Queensland, which is reported by notification receive date.

†† 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 the Australian Capital Territory and New South Wales also report conjunctival cases.

HPAIH Highly pathogenic avian influenza in humans.

NEC Not elsewhere classified.

NN Not notifiable.

Table 6: Notified cases and notification rate for communicable diseases, Australia, 2008 to 2013

Disease	Number of notified cases								Notification rate per 100,000					
	2008	2009	2010	2011	2012	2013	5-year mean	Ratio (2013: 5-year mean)	2008	2009	2010	2011	2012	2013
Bloodborne diseases														
Hepatitis B (newly acquired)*	261	253	230	193	198	172	227.0	0.8	1.2	1.2	1.0	0.9	0.9	0.7
Hepatitis B (unspecified)†	6,377	7,127	6,957	6,559	6,538	6,979	6,711.6	1.0	29.7	32.9	31.6	29.4	28.8	30.2
Hepatitis C (newly acquired)*	364	399	400	412	486	407	412.2	1.0	2.1	2.3	2.3	2.3	2.7	2.2
Hepatitis C (unspecified)†‡	10,801	11,104	11,086	9,882	9,641	10,308	10,502.8	1.0	50.2	51.2	50.3	44.2	42.4	44.6
Hepatitis D	41	35	36	39	31	53	36.4	1.5	0.2	0.2	0.2	0.2	0.1	0.2
Gastrointestinal diseases														
Botulism	0	1	0	2	0	4	0.6	6.7	–	<0.1	–	<0.1	–	<0.1
Campylobacteriosis	15,561	16,104	16,990	17,725	15,655	14,698	16,407.0	0.9	107.4	110.0	114.1	117.2	101.5	93.5
Cryptosporidiosis	2,001	4,624	1,481	1,811	3,142	3,846	2,611.8	1.5	9.3	21.3	6.7	8.1	13.8	16.6
Haemolytic uraemic syndrome	32	13	9	13	20	15	17.4	0.9	0.1	0.1	<0.1	0.1	0.1	0.1
Hepatitis A	276	563	267	145	166	189	283.4	0.7	1.3	2.6	1.2	0.6	0.7	0.8
Hepatitis E	44	33	37	41	35	31	38.0	0.8	0.2	0.2	0.2	0.2	0.2	0.1
Listeriosis	68	92	71	70	93	76	78.8	1.0	0.3	0.4	0.3	0.3	0.4	0.3
Salmonellosis	8,297	9,503	11,912	12,276	11,256	12,791	10,648.8	1.2	38.6	43.8	54.1	55.0	49.5	55.3
Shigellosis	830	616	552	493	548	556	607.8	0.9	3.9	2.8	2.5	2.2	2.4	2.4
STEC,VTEC§	98	128	80	95	111	180	102.4	1.8	0.5	0.6	0.4	0.4	0.5	0.8
Typhoid fever	106	115	96	135	124	150	115.2	1.3	0.5	0.5	0.4	0.6	0.5	0.6
Quarantinable diseases														
Cholera	4	5	3	6	5	3	4.6	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HPAIH	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Plague	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Rabies	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Severe acute respiratory syndrome	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Smallpox	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Viral haemorrhagic fever	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Yellow fever	0	0	0	2	0	0	0.4	–	–	–	–	<0.1	–	–

Table 6 (cont'd): Notified cases and notification rate for communicable diseases, Australia, 2008 to 2013

Disease	Number of notified cases						5-year mean	Ratio (2013: 5-year mean)	Notification rate per 100,000					
	2008	2009	2010	2011	2012	2013			2008	2009	2010	2011	2012	2013
Sexually transmissible infections														
Chlamydial infection[‖,¶]	58,456	63,013	74,320	80,918	82,903	82,526	71,922.0	1.1	271.9	290.5	337.3	362.2	364.8	356.7
Donovanosis	2	1	1	0	1	0	1.0	–	<0.1	<0.1	<0.1	–	<0.1	–
Gonococcal infection[¶]	7,678	8,279	10,324	12,100	13,842	14,942	10,444.6	1.4	35.7	38.2	46.9	54.2	60.9	64.6
Syphilis – congenital[¶]	6	3	3	7	1	7	4.0	1.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Syphilis < 2 years duration[*,¶,**]	1,323	1,314	1,118	1,318	1,570	1,768	1,328.6	1.3	6.2	6.1	5.1	5.9	6.9	7.6
Syphilis > 2 years or unspecified duration[†,¶]	1,359	1,445	1,329	1,315	1,381	1,706	1,365.8	1.2	6.8	7.2	6.5	6.4	6.1	7.4
Vaccine preventable diseases														
Diphtheria	0	0	0	4	0	2	0.8	2.5	–	–	–	<0.1	–	<0.1
Haemophilus influenzae type b	25	19	24	13	15	20	19.2	1.0	0.1	0.1	0.1	0.1	0.1	0.1
Influenza (laboratory confirmed)	9,173	59,028	13,466	27,228	44,571	28,329	30,693.2	0.9	42.7	272.1	61.1	121.9	196.1	122.5
Measles	65	104	70	194	199	158	126.4	1.3	0.3	0.5	0.3	0.9	0.9	0.7
Mumps	286	166	98	155	200	217	181.0	1.2	1.3	0.8	0.4	0.7	0.9	0.9
Pertussis	14,286	30,163	34,821	38,727	24,074	12,341	28,414.2	0.4	66.5	139.1	158.0	173.4	105.9	53.3
Pneumococcal disease (invasive)	1,626	1,557	1,640	1,883	1,823	1,546	1,705.8	0.9	7.6	7.2	7.4	8.4	8.0	6.7
Poliomyelitis	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Rubella	36	27	44	58	37	25	40.4	0.6	0.2	0.1	0.2	0.3	0.2	0.1
Rubella – congenital	0	0	0	0	1	2	0.2	10.0	–	–	–	–	<0.1	<0.1
Tetanus	4	3	2	3	7	4	3.8	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Varicella zoster (chickenpox)	1,807	1,796	1,792	2,100	1,977	2,042	1,894.4	1.1	19.7	12.3	12.0	13.9	12.8	13.0
Varicella zoster (shingles)	2,341	2,779	3,047	4,025	4,507	5,017	3,339.8	1.5	25.6	19.0	20.5	26.6	29.2	31.9
Varicella zoster (unspecified)	4,410	6,761	7,269	7,689	8,437	9,927	6,913.2	1.4	48.2	46.2	48.8	50.8	54.7	63.1
Vectorborne diseases														
Arbovirus infection (NEC)	12	6	14	18	9	21	11.8	1.8	0.1	<0.1	0.1	0.1	<0.1	0.1
Barmah Forest virus infection	2,080	1,473	1,470	1,863	1,730	4,239	1,723.2	2.5	9.7	6.8	6.7	8.3	7.6	18.3
Dengue virus infection	561	1,402	1,228	821	1,540	1,841	1,110.4	1.7	2.6	6.5	5.6	3.7	6.8	8.0
Japanese encephalitis virus infection	1	0	0	0	1	4	0.4	10.0	<0.1	–	–	–	<0.1	<0.1
Kunjin virus infection[††]	1	2	2	2	0	3	1.4	2.1	<0.1	<0.1	<0.1	<0.1	–	<0.1
Malaria	529	504	404	418	345	414	440.0	0.9	2.5	2.3	1.8	1.9	1.5	1.8

Table 6 (cont'd): Notified cases and notification rate for communicable diseases, Australia, 2008 to 2013

Disease	Number of notified cases						5-year mean	Ratio (2013: 5-year mean)	Notification rate per 100,000					
	2008	2009	2010	2011	2012	2013			2008	2009	2010	2011	2012	2013
Murray Valley encephalitis virus infection††	2	4	0	16	1	1	4.6	0.2	<0.1	<0.1	–	0.1	<0.1	<0.1
Ross River virus infection	5,612	4,742	5,129	5,136	4,686	4,308	5,061.0	0.9	26.1	21.9	23.3	23.0	20.6	18.6
Zoonoses														
Anthrax	0	0	1	0	0	0	0.2	–	–	–	<0.1	–	–	–
Australia bat lyssavirus infection	0	0	0	0	0	1	0.0	–	–	–	–	–	–	<0.1
Brucellosis	46	32	21	38	30	14	33.4	0.4	0.2	0.1	0.1	0.2	0.1	0.1
Leptospirosis	111	141	131	215	115	95	142.6	0.7	0.5	0.7	0.6	1.0	0.5	0.4
Lyssavirus infection (NEC)	0	0	0	0	0	0	0.0	–	–	–	–	–	–	–
Ornithosis	102	65	61	91	76	47	79.0	0.6	0.5	0.3	0.3	0.4	0.3	0.2
Q fever	378	313	336	350	362	477	347.8	1.4	1.8	1.4	1.5	1.6	1.6	2.1
Tularaemia	0	0	0	2	0	0	0.4	–	–	–	–	<0.1	–	–
Other bacterial diseases														
Legionellosis	272	301	306	360	383	505	324.4	1.6	1.3	1.4	1.4	1.6	1.7	2.2
Leprosy	11	5	10	10	7	13	8.6	1.5	0.1	<0.1	<0.1	<0.1	<0.1	0.1
Meningococcal infection‡‡	287	260	228	242	222	149	247.8	0.6	1.3	1.2	1.0	1.1	1.0	0.6
Tuberculosis	1,217	1,306	1,367	1,384	1,323	1,265	1,319.4	1.0	5.7	6.0	6.2	6.2	5.8	5.5
Total	159,271	237,729	210,283	238,606	244,424	224,429								

* Newly acquired hepatitis and syphilis < 2 years duration 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 newly acquired hepatitis C cases.

§ 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 cervical, urine and urethral specimens; the Northern Territory and Western Australia exclude ocular infections. From 1 July 2013 case definition changed to exclude all 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).

** Data for all states and territories are reported by diagnosis date, except Queensland which is reported by notification receive date.

†† 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 the Australian Capital Territory and New South Wales also report conjunctival cases.

HPAIH Highly pathogenic avian influenza in humans.

NEC Not elsewhere classified.

NN Not notifiable.

Data completeness

In 2013, sex and age at onset was complete for 99.8% of notifications in NNDSS (Table 7).

Indigenous status

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.

Indigenous status was complete in 47.6% of all notifications reported to NNDSS in 2013. Indigenous status was complete in 94.6% of data reported in the Northern Territory, 92% in Western Australia and 90.7% in South Australia. In the remaining jurisdictions, Indigenous status completeness ranged from 18.2% to 47.3% (Table 8).

Data completeness on Indigenous status also varied by disease as summarised in Appendix 3. In 2013, CDNA set target thresholds of 95% completeness for 18 priority diseases (17 notifiable to NNDSS and one, HIV, which is notified to the Kirby Institute) (Table 9) and 80% completeness for the remainder of the notifiable diseases. Of all diseases there were 33 diseases that equalled or exceeded 80% completeness for Indigenous status and 33% (11/33) were priority diseases.

In 2013, 7 of the 17 priority diseases notified to NNDSS had an Indigenous completeness that exceeded 95% (hepatitis A, meningococcal infection, pneumococcal disease < 5 years, pneumococcal disease ≥ 50 years, syphilis – congenital, leprosy, and tuberculosis).

Bloodborne diseases

In 2013, the bloodborne viruses reported to the NNDSS were hepatitis B, C, and D. Both hepatitis B and C cases were notified to the NNDSS as either 'newly acquired', where evidence was available that the infection was acquired in the 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 being 'greater than 2 years or unspecified'. The determination of a

Table 7: Completeness of National Notifiable Diseases Surveillance System data, Australia, 2013, by state or territory

	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Total notifications	3,493	50,541	8,290	55,009	18,573	4,224	53,943	30,361	224,434
Sex									
Unknown/ missing	0	59	0	0	76	0	169	1	305
Per cent complete	100.0	99.8	100.0	100.0	99.0	100.0	99.7	>99.9	99.8
Age at onset*									
Unknown/ missing	0	20	0	0	76	0	182	1	279
Per cent complete	100.0	>99.9	100.0	100.0	99.0	100.0	99.7	>99.9	99.8

* For many diseases onset date in unknown, but is calculated using the diagnosis date derived by the diagnosis date algorithm.

Table 8: Indigenous status completeness of National Notifiable Diseases Surveillance System data, Australia, 2013, by state or territory

	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Total notifications	3,493	50,541	8,290	55,009	18,573	4,224	53,943	30,361	224,434
Indigenous status									
Unknown/ missing	2,507	41,325	446	29,741	1,720	2,227	37,139	2,442	117,547
Per cent complete	28.2	18.2	94.6	45.9	90.7	47.3	31.2	92.0	47.6

Table 9: Percentage completeness of priority diseases for Indigenous status of National Notifiable Diseases Surveillance System data, Australia, 2013, by state or territory

Priority disease	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Dengue virus (locally acquired)	No cases	100.0	No cases	91.4	100.0	No cases	100.0	50.0	91.5
Donovanosis	No cases	No cases	No cases	No cases	No cases	No cases	No cases	No cases	No cases
Gonococcal infection	100.0	56.0	98.1	62.0	90.9	95.7	61.0	99.9	71.9
Haemophilus influenzae type b	No cases	100.0	No cases	85.7	No cases	No cases	75.0	No cases	90.0
Leprosy	100.0	100.0	100.0	100.0	100.0	No cases	100.0	100.0	100.0
Measles	100.0	100.0	No cases	76.9	100.0	No cases	92.7	100.0	90.5
Meningococcal disease (invasive)	100.0	100.0	100.0	97.0	100.0	100.0	84.0	100.0	96.6
Pertussis <5 years	87.5	94.6	100.0	67.2	100.0	100.0	78.8	98.7	85.6
Shigellosis	100.0	85.9	99.1	76.7	100.0	33.3	91.3	98.6	90.6
Tuberculosis	94.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9
Hepatitis A	100.0	100.0	No cases	82.2	100.0	No cases	98.1	100.0	95.2
Hepatitis B (newly acquired)	100.0	81.8	100.0	55.6	87.5	100.0	94.1	100.0	83.1
Hepatitis C (newly acquired)	100.0	81.4	100.0	No cases	95.2	89.5	66.2	100.0	84.8
Syphilis – congenital	No cases	100.0	100.0	100.0	No cases	No cases	No cases	100.0	100.0
HIV	NDP	NDP	NDP	NDP	NDP	NDP	NDP	NDP	NDP
Pneumococcal disease <5 years	100.0	100.0	100.0	97.7	85.7	100.0	89.7	100.0	96.8
Pneumococcal disease ≥50 years	100.0	99.7	100.0	88.8	97.0	100.0	89.7	100.0	95.1
Syphilis < 2 years	100.0	92.5	100.0	94.5	80.4	100.0	85.9	100.0	90.6

NDP – No data provided

case as 'newly acquired' is outlined in the national surveillance case definitions.[18] 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. National testing policies developed by the Australian Society for HIV Medicine[19,20] and screening programs, including the preferential testing of high risk populations such as prisoners, 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) of, or risk factors for, infection for hepatitis B and C was reported in a subset of diagnoses of newly acquired infections. The collection of enhanced data is also dependent on the level of public health follow-up, which is variable by jurisdiction and over time.

Notifications of HIV and AIDS diagnoses were reported directly to The Kirby Institute, which maintains the National HIV Registry. Information on national HIV and AIDS surveillance can be obtained from the Kirby Institute web site (http://www.kirby.unsw.edu.au/).

Hepatitis B

- 7,151 cases of hepatitis B were notified in 2013.
- Over the past 11 years, notifications of newly acquired hepatitis B have declined.

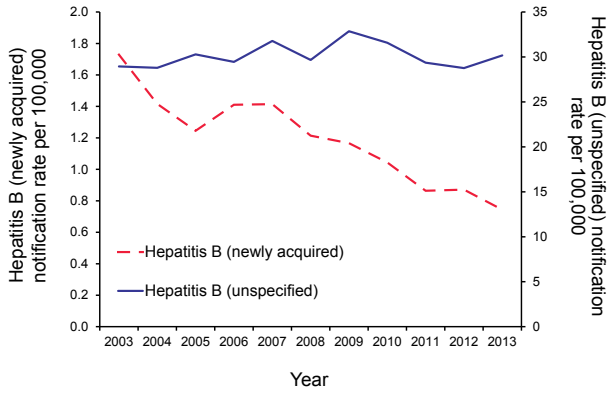
Infection with hepatitis B virus causes inflammation of the liver.[21] Notifications of acute hepatitis B are classified as 'newly acquired' and chronic infections as 'unspecified'.

Epidemiological situation in 2013

In 2013, there were 7,151 notified cases of hepatitis B (both newly acquired and unspecified), equating to a rate of 30.9 cases per 100,000 (Figure 3).

Between 2003 and 2013, newly acquired hepatitis B rates decreased 57% from 1.7 to 0.7 per 100,000 (Figure 3). The continued decline in newly acquired hepatitis B notifications may be attributed to the hepatitis B vaccination program, which was introduced nationally for infants in 2000, and the adolescent hepatitis B vaccination program, which was introduced in 1997.[22] As at 30 June 2014, approximately 92% of children 12–15 months of age in Australia were assessed as being fully immunised for hepatitis B.[23] A 2007 study showed significant improvements in immunity for the 12–17 years age range in jurisdictions with established school-based programs, compared with those jurisdictions without such programs.[24]

Figure 3: Notification rate for newly acquired hepatitis B* and unspecified hepatitis B,† Australia, 2003 to 2013, by year



* Data for newly acquired hepatitis B for the Northern Territory (2003–2004) includes some unspecified hepatitis B cases.

† Data for unspecified hepatitis B for all states and territories, excluding the Northern Territory between 2003 and 2004.

In Australia, hepatitis B vaccination was also recommended for certain at-risk adults from the 1980s, with the list of groups and occupations identified as at-risk varying over time.[25] Some jurisdictions implemented vaccination programs to target identified at-risk adults in a variety of settings and at various times.[22] The full impact of Australian vaccination programs from the 1990s should be reflected in trends in chronic infection and reductions in hepatitis B related complications in the near future.[26]

Between 2003 and 2013, unspecified hepatitis B rates remained relatively stable, increasing slightly by 4.2% from 29.0 to 30.2 per 100,000. It is important to note the significant impact of immigration on rates for unspecified hepatitis B. In 2011, an Australian study found that more than 95% of new cases of chronic hepatitis B virus infection entered the population through migration.[27] While many cases of unspecified hepatitis B go undiagnosed, there is also the potential for duplication, with the National Hepatitis B Testing Policy encouraging clinicians to use patient records to prevent duplication of testing for people from culturally and linguistically diverse backgrounds.[19]

Newly acquired hepatitis B

- 172 cases of newly acquired hepatitis B were notified in 2013.
- The highest rates were in males aged 25–44 years.

Epidemiological situation in 2013

In 2013, 172 newly acquired hepatitis B notifications (0.7 per 100,000) were reported to the NNDSS, a 15% decrease compared with the 198 cases (0.9 per 100,000) reported in 2012 and a continuation of the downward trend in notification rates (Figure 3).

Geographical distribution

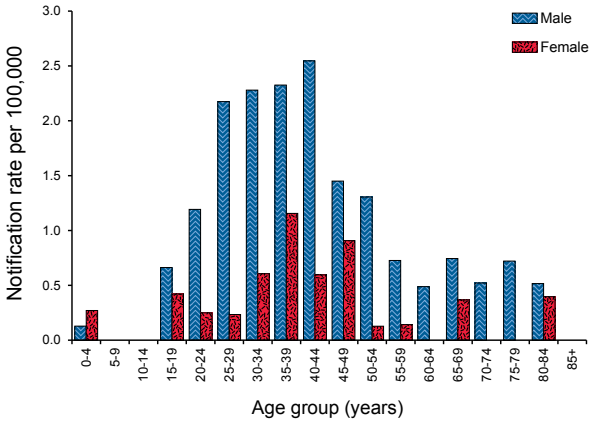
The highest rates were reported from the Northern Territory (2.5 per 100,000) and Western Australia (1.5 per 100,000).

Age and sex distribution

Overall, notification rates were higher among males than females, with a male to female ratio of 3.3:1. In 2013, the highest rates of newly acquired hepatitis B infection were observed among males aged 40–44 years, 30–39 years and 25–29 years (2.5, 2.3 and 2.2 per 100,000 respectively) (Figure 4).

Exposure to hepatitis B may be more common in certain high risk groups, including men who have sex with men; injecting drug users; Aboriginal and Torres Strait Islander peoples; prisoners; and immigrants from endemic regions.[21,27] The greater representation of males in some of these groups may contribute to the higher notification rates among males.

Figure 4: Notification rate for newly acquired hepatitis B, Australia, 2013, by age group and sex*



* Excludes 1 notification where sex was not reported.

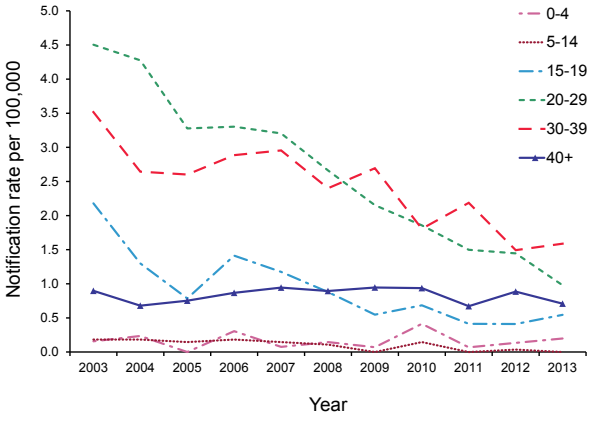
Between 2003 and 2013, most age group specific notification rates were trending downwards. The most marked decreases occurred among those aged 15–19 years and 20–29 years. During this period, notification rates among the 20–29 years age group declined by 78% from 4.5 to 1.0 per 100,000 and notification rates among the 15–19 years age group declined by 75% from 2.2 to 0.5 per 100,000 (Figure 5). These declines are likely to be attributable in part to the adolescent hepatitis B vaccination program.[28]

Risk groups

Enhanced data on risk factors and country of birth was provided by the Australian Capital Territory, New South Wales, South Australia, Tasmania, Victoria and Western Australia* (Table 10). In 2013, 44% (n=76) of these cases had at least 1 risk factor recorded, with a potential source of exposure not recorded or unable to be determined for the remainder. Injecting drug use was the most frequently reported potential source of infection (47%), followed by skin penetration procedures (20%), which includes tattoos, ear or body piercing and acupuncture. Of the 106 cases for which country of birth was reported, 82 were in Australian born persons (77.4%) and 24 cases were born overseas.

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

Figure 5: Notification rate for newly acquired hepatitis B,* Australia, 2003 to 2013, by year and selected age groups



* Data for newly acquired hepatitis B for the Northern Territory (2003–2004) includes some unspecified hepatitis B cases.

Unspecified hepatitis B

- 6,979 cases of unspecified hepatitis B were notified in 2013.
- The highest rates were in males aged 30–34 years.

Epidemiological situation in 2013

In 2013, 6,979 cases of unspecified hepatitis B infection were notified to the NNDSS, a rate of 30.2 per 100,000, compared with 6,538 cases (28.8 per 100,000) reported in 2012.

Geographical distribution

In 2013, the Northern Territory had the highest rate of unspecified hepatitis B infection (134.7 per 100,000) (Table 5).

Age and sex distribution

In 2013, the overall male rate (34.9 per 100,000) was higher than for females (25.2 per 100,000), a rate ratio of 1.4:1. Notification rates were higher among males in most age groups, peaking in males aged 30–34 years. For females, the peak notification rate occurred among those aged 25–34 years (Figure 6).

Table 10: Notifications of newly acquired hepatitis B, selected jurisdictions,* 2013, by sex and risk factors†,‡

Exposure category	Number of exposure factors reported			Percentage of total cases (n=76)‖
	Male	Female	Total§	
Injecting drug use	27	9	36	47
Imprisonment	2	0	2	3
Skin penetration procedure	12	3	15	20
Tattoos	8	1	9	12
Ear or body piercing	3	2	5	7
Acupuncture	1	0	1	1
Healthcare exposure	1	2	3	4
Surgical work	1	0	1	1
Major dental surgery work	0	2	2	3
Sexual exposure	8	1	9	12
Sexual contact (hepatitis B positive partner) – opposite sex	3	1	4	5
Sexual contact (hepatitis B positive partner) – same sex	5	0	5	7
Other	22	4	28	37
Household contact	1	0	1	1
Needlestick/biohazardous injury¶	2	0	2	3
Perinatal transmission	1	1	3	4
Other – not further categorised	18	3	22	29
Cases with at least 1 exposure	54	15	69	91
Undetermined	5	2	7	9
Unknown*	12	6	18	–
Total exposure factors reported	77	21	100	–
Total number of cases	59	17	76	–

* Cases from the Australian Capital Territory, New South Wales, South Australia, Tasmania, Victoria and Western Australia. While these jurisdictions provided enhanced data on risk factors, not all cases had this information recorded.

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

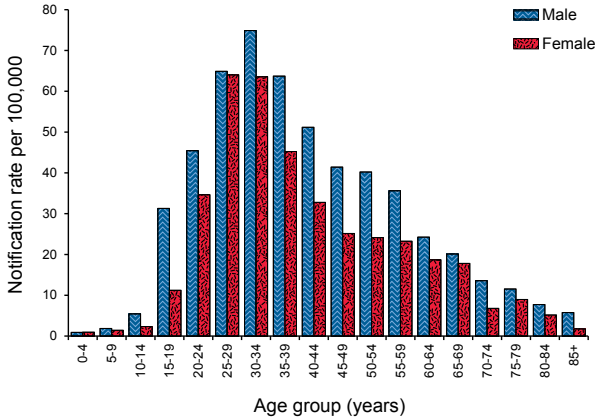
‡ Analysis and categorisation of these exposures are subject to interpretation and may vary.

§ Total includes cases where no sex was reported.

‖ The denominator used to calculate the percentage is based on the total number of cases from all jurisdictions that provide enhanced data (Australian Capital Territory, New South Wales, South Australia, Tasmania, Victoria and Western Australia). As more than 1 exposure category for each notification could be recorded, the total percentage does not equal 100%.

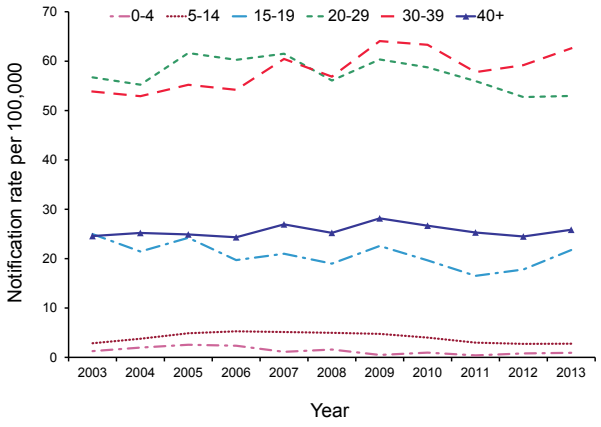
¶ Includes both occupational and non-occupational exposures.

Figure 6: Notification rate for unspecified hepatitis B, Australia, 2013, by age group and sex*



* Excludes 41 cases where age and/or sex were not reported.

Figure 7: Notification rate for unspecified hepatitis B,* Australia, 2003 to 2013, by year and age group†



* Data for hepatitis B (unspecified) from all states and territories except the Northern Territory between 2003–2004.

† Excludes 43 cases where age was not known.

Between 2003 and 2013, notification rates for unspecified hepatitis B remained relatively stable for most age groups. However, there has been a slight upward trend in the notification rate for the 15–19 years age group (from 16.5 to 21.7 per 100,000) and the 30–39 years age groups (from 53.9 to 62.6 per 100,000) (Figure 7).

Hepatitis C

- 10,715 cases of hepatitis C were notified in 2013.
- Over the past 11 years, notifications of hepatitis C have declined by 33%.

Infection with hepatitis C virus causes inflammation of the liver. In more than 90% of cases initial infection with hepatitis C virus is asymptomatic or mildly symptomatic. Approximately 50%–80% of cases go on to develop a chronic infection. Of those who develop a chronic infection, half will eventually develop cirrhosis or cancer of the liver.[21]

Hepatitis C notifications are classified as being either 'newly acquired' (evidence that infection was acquired within the 24 months prior to diagnosis) or 'unspecified' (infection acquired more than 24 months prior to diagnosis or not able to be specified). Ascertaining a person's hepatitis C serostatus and clinical history usually requires active follow-up by public health units.

Epidemiological situation in 2013

Between 2003 and 2013, hepatitis C notifications declined by 33% from 13,748 (69.7 per 100,000) to 10,715 (46.8 per 100,000). This declining trend is reflected in both newly acquired and unspecified hepatitis C notifications (Figure 8).

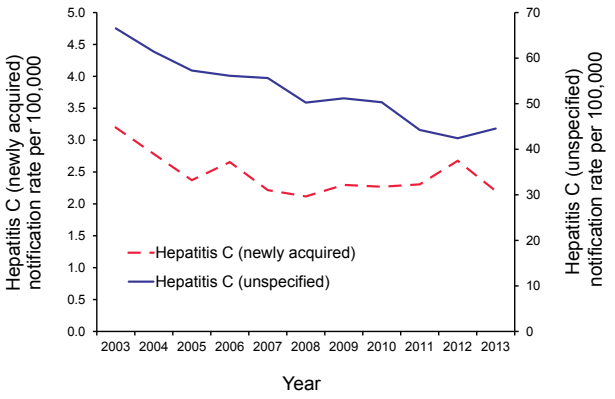
Newly acquired hepatitis C

- 407 cases of newly acquired hepatitis C were notified in 2013.
- The majority of newly acquired cases in 2013 had a history of injecting drug use.
- The highest notification rates in 2013 were among males in the 20–24 years age group.

Epidemiological situation in 2013

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. Nationally, there were 407 notifications in 2013 (2.2 per 100,000) compared with 486 notifications in 2012 (2.7 per 100,000).

Figure 8: Notification rate for hepatitis C (newly acquired* and unspecified†), Australia, 2003 to 2013, by year



* Data for newly acquired hepatitis C from all states and territories except Queensland 2003–2013 and the Northern Territory 2003–2004.

† Data for unspecified hepatitis C provided from Queensland (2003–2013) and the Northern Territory (2003–2004) includes both newly acquired and unspecified hepatitis C cases.

Geographical distribution

The highest rates of newly acquired hepatitis C infection were reported in Western Australia (4.9 per 100,000), South Australia, Tasmania and the Australian Capital Territory (all 3.7 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.

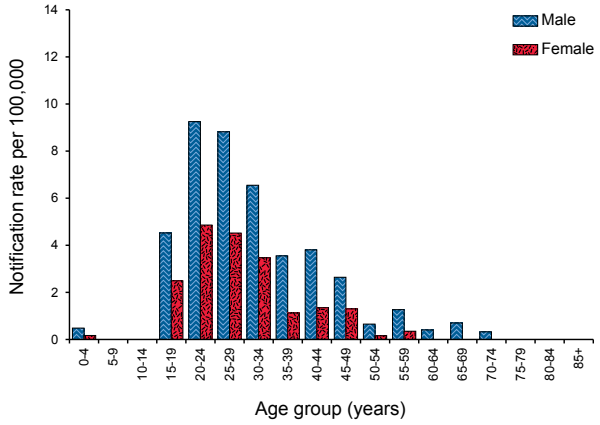
Age and sex distribution

Nationally in 2013, the notification rate for newly acquired hepatitis C in males was 3.0 per 100,000 and in females was 1.4 per 100,000, a male to female ratio of 2.2:1. Notification rates in males exceeded those in females across all age groups for which there were cases. The highest notification rates among males and females were in the 20–24 years (9.3 and 4.3 per 100,000 respectively), 25–29 years (8.8 and 4.5 per 100,000 respectively), and 30–34 years (6.5 and 3.5 per 100,000 respectively) age groups (Figure 9).

Between 2003 and 2013, notification rates for newly acquired hepatitis C have declined overall among those in the 15–39 years age groups The largest decreases from 2003 to 2013 occurred in the 15–19 years age groups (from 6.5 to 3.5 per 100,000), and the 20–29 years age groups (from 11.7

to 6.9 per 100,000). A recent survey suggested there has been a decrease in the prevalence of injecting drug use among young people in Australia.[28] Notification rates in the 0–4 and the 40 years or over age groups have remained low and relatively stable over this time (Figure 10).

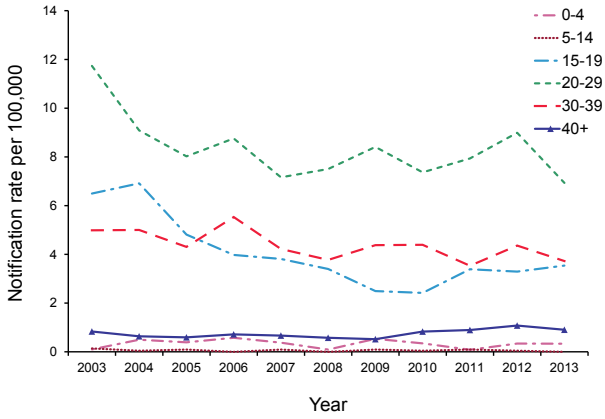
Figure 9: Notification rate for newly acquired hepatitis C, Australia,* 2013, by age group and sex†



* Data from all states and territories except Queensland.

† Excludes 2 cases where age and/or sex were not reported.

Figure 10: Notification rate for newly acquired hepatitis C, Australia,* 2003 to 2013, by year and selected age groups



* Data from all states and territories except Queensland (2003–2013) and the Northern Territory (2003–2004).

Risk groups

Exposure histories for newly acquired hepatitis C cases reported in 2013 were analysed for all jurisdictions except Queensland (notified as unspecified hepatitis C), Western Australia (no exposure data notified) and the Northern Territory (data not available at time of analysis) (Table 11). In 2013, 71.5% of cases had at least 1 risk factor recorded, with the potential source of exposure not recorded or unable to be determined for the remainder. Of the cases for which exposure history was reported, approximately 67% had a history of injecting drug use and approximately 32% reported skin penetration procedures.

Approximately 38% (n=111) of cases with exposure history had reported imprisonment. Of these cases, approximately 47% (n=52) had also reported a history of injecting drug use. However, it is important to note that screening rates are generally higher in the prison entry population than the general population. A screening survey of prison entrants conducted over a two-week period found that the prevalence of hepatitis C, based on hepatitis C antibody detection, was 22% in 2012, a decrease from 35% in 2007.[29]

Unspecified hepatitis C

- 10,308 cases of unspecified hepatitis C were notified in 2013.
- The highest notification rates in 2013 were among males in the 30–39 years age groups.

Epidemiological situation in 2013

In 2013, 10,308 cases of unspecified hepatitis C infections were notified to the NNDSS (44.6 per 100,000) compared with 9,641 cases in 2012 (42.4 per 100,000). Apart from the slight rise from 2012 to 2013, notification rates have decreased annually since 2003, with an overall decline of 33% between 2003 (66.5 per 100,000) and 2013 (44.6 per 100,000) (Figure 11).

Several factors may account for the decrease including changes in surveillance practices, removal of duplicate notifications and a gradual decline in the prevalent group of hepatitis C cases accumulated prior to the introduction of hepatitis C testing in the early 1990s.[24,30] The continuing decline in the notification rate may also be attributable to an apparent decrease in the prevalence of injecting drug use among young people in Australia.[28]

Geographical distribution

In 2013, the Northern Territory continued to have the highest notification rate (106.1 per 100,000).

Age and sex distribution

Nationally in 2013, the notification rate for unspecified hepatitis C in males was 58.5 per 100,000

Table 11: Notified cases of newly acquired hepatitis C, selected jurisdictions,* 2013, by sex and risk factors†,‡

Exposure category	Number of exposure factors reported			Percentage of total cases (n=291)§
	Male	Female	Total	
Injecting drug use	142	53	195	67
Imprisonment	100	11	111	38
Skin penetration procedure	71	22	93	32
Tattoos	54	13	67	23
Ear or body piercing	17	9	26	9
Health care exposure	9	7	16	6
Surgical work	5	6	11	4
Major dental surgery work	3	1	4	1
Haemodialysis	1	0	1	<1
Sexual exposure	21	20	41	14
Sexual contact (hepatitis B positive partner) – opposite sex	9	19	28	10
Sexual contact (hepatitis B positive partner) – same sex	12	1	13	5
Other	68	35	103	35
Household contact	14	10	24	8
Needlestick/biohazardous injury‖	10	3	13	5
Perinatal transmission‡	17	15	32	11
Other – not further specified‡	27	7	34	12
Cases with at least 1 exposure	202	81	283	97
Undetermined	2	6	8	3
Unknown‡	3	4	7	–
Total exposure factors reported	411	148	559	–
Total number of cases	204	87	291	–

* Includes data from all states and territories except Queensland (not notified), the Northern Territory (data not available at time of analysis) and Western Australia (no enhanced data on risk factors). While 5 jurisdictions provided enhanced data on risk factors, not all cases had this information recorded.

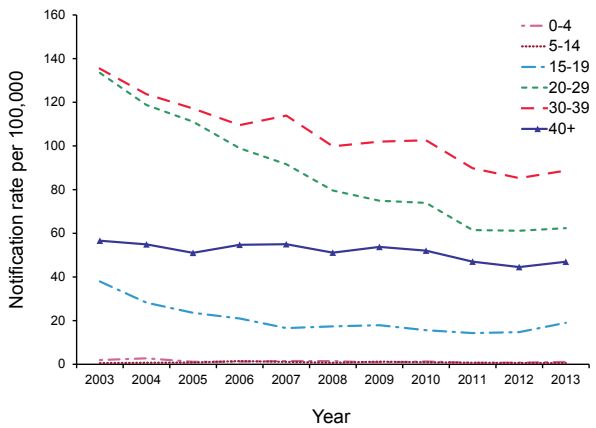
† More than 1 exposure category for each notification could be recorded.

‡ Analysis and categorisation of these exposures are subject to interpretation and may vary.

§ The denominator used to calculate the percentage is based on the total number of notified cases from all jurisdictions, except Queensland (notified as unspecified hepatitis C), Northern Territory (n=0) and Western Australia (no exposure data notified, n=125). As more than 1 exposure category for each case could be recorded, the total percentage does not equate to 100%.

‖ Includes both occupational and non-occupational exposures.

Figure 11: Notification rate for unspecified hepatitis C, Australia,* 2003 to 2013, by selected age groups†



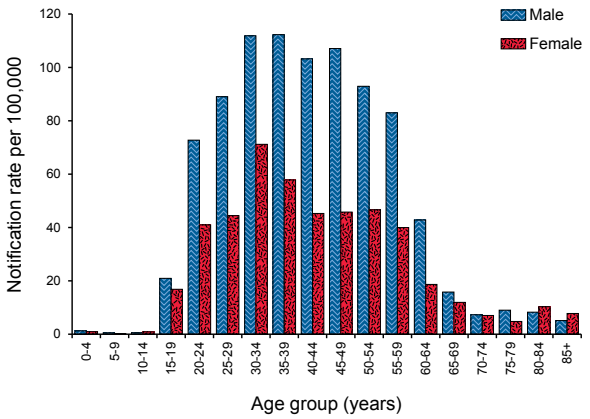
* Data provided from Queensland (2003–2013) and the Northern Territory (2003–2004) includes both newly acquired and unspecified hepatitis C cases.

† Excludes 80 cases where age was not reported.

and in females 30.4 per 100,000, a male to female ratio of 1.9:1. Notification rates in males exceeded those in females across almost all age groups. The highest notification rates were among males in the 35–39 year (112.3 per 100,000) and 30–34 year (111.8 per 100,000) age groups. The highest notification rates among females were for those in the 30–34 years (71.2 per 100,000) and 35–39 years (57.8 per 100,000) age groups (Figure 12).

Between 2003 and 2013, notifications rates for unspecified hepatitis C have declined overall across all age groups, except for the 0–4 years, 5–14 year and 40+ years age groups for which rates have remained relatively stable (Figure 11). The largest decreases have occurred in the 20–29 years (from 133.5 to 62.4 per 100,000), 30–39 years (135.4 to 88.7 per 100,000) and 15–19 years (37.9 to 19.0 per 100,000) age groups.

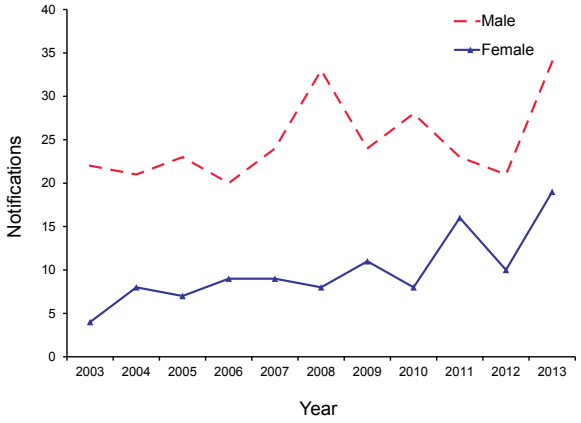
Figure 12: Notification rate for unspecified hepatitis C,* Australia, 2013, by age group and sex†



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

† Excludes 38 cases where age and/or sex was missing or unknown.

Figure 13: Notified cases of hepatitis D, Australia, 2003 to 2013, by year and sex



Hepatitis D

- 53 cases of hepatitis D were notified in 2013.
- Hepatitis D is always associated with hepatitis B co-infection.

Hepatitis D is a defective single-stranded RNA virus that replicates in the presence of the hepatitis B virus. Hepatitis D infection can occur as either an acute co-infection with hepatitis B or as a super-infection with chronic hepatitis B infection. The modes of hepatitis D transmission are similar to those for hepatitis B.[21]

Epidemiological situation in 2013

In Australia, the notification rate for hepatitis D remains low. In 2013, there were 53 notified cases of hepatitis D, a rate of 0.2 per 100,000. Over the preceding 10 years, notifications of hepatitis D remained relatively low with an average of almost 35 cases notified per year (range: 26 to 53).

Geographical distribution

In 2013, Victoria reported the highest number of cases (22) followed by Queensland (13), New South Wales (9), South Australia and Western Australia (both 4) and the Northern Territory (1). No cases were reported from the Australian Capital Territory or Tasmania during this period.

Age and sex distribution

The male to female ratio in 2013 was 1.8:1. This was less than the average ratio of 2.7:1 over the preceding 5 years (Figure 13).

Gastrointestinal diseases

Overview

In 2013, gastrointestinal diseases notified to NNDSS and discussed in this section were: botulism, campylobacteriosis, cryptosporidiosis, haemolytic uraemic syndrome (HUS), hepatitis A, hepatitis E, listeriosis, salmonellosis, shigellosis, Shiga toxin-producing *Escherichia coli* (STEC) infections and typhoid fever.

Overall, notified cases of gastrointestinal diseases increased from 31,155 in 2012 to 32,535 in 2013. Notifications for salmonellosis, typhoid fever and STEC were at the highest levels since NNDSS records began in 1991.

Surveillance systems overview

The Australian Government established OzFoodNet—Australia's enhanced foodborne disease surveillance system—in 2000 as a collaborative network of epidemiologists and microbiologists who conduct enhanced surveillance, epidemiological outbreak investigations and applied research into foodborne disease across Australia. OzFoodNet's mission is to apply concentrated effort at the national level to investigate and understand foodborne disease, to describe its epidemiology more effectively and to identify ways to minimise foodborne illness in Australia. The data and results summarised in the following sections will be reported in more detail in the OzFoodNet annual report 2013.

Botulism

- 4 cases of botulism were notified in 2013.

Botulism is a rare but extremely serious intoxication resulting from toxins produced by *Clostridium*

botulinum (commonly toxin types A, B and E). Four forms of botulism are recognised; infant, foodborne, wound and adult intestinal toxaemia.[21]

Epidemiological situation in 2013

There were 4 notified cases of botulism in 2013; all four were infant botulism but no links between them were identified. This compares with no notified cases in 2012 and 2 infant botulism cases in 2011.

Campylobacteriosis

- 14,698 cases of campylobacteriosis were notified in 2013.
- This was the most frequently notified enteric infection in 2013.

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), abdominal pain, fever, nausea and or vomiting.[21] Campylobacteriosis is notifiable in all Australian states and territories except New South Wales.

Epidemiological situation in 2013

There were 14,698 notified cases of campylobacteriosis in 2013 making it the most frequently notified enteric infection (93.5 per 100,000 not including New South Wales). This was a decrease of 6.1% on the number of notifications received for 2012 (n=15,655) and a 10.4% decrease on the 5-year mean (n=16,407). Notification rates ranged from 76.5 per 100,000 in Western Australia to 135.6 per 100,000 in Tasmania.

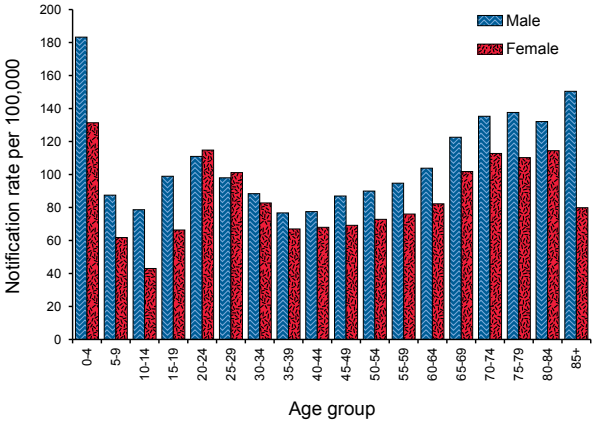
Age and sex distribution

Campylobacteriosis was most frequently notified among the 0–4 age group for both males (183.3 per 100,000) and females (131.3 per 100,000). The median age of notified cases was 28 years and 54.8% (n= 8,056) were male. Notification rates were highest among males in nearly all age groups (Figure 14).

Cryptosporidiosis

- 3,846 cases of cryptosporidiosis were notified in 2013.
- There was 1 outbreak in New South Wales.

Figure 14: Notification rate for campylobacteriosis, Australia, 2013, by age group and sex



Cryptosporidiosis is a parasitic infection characterised by abdominal cramping and usually large-volume watery diarrhoea. Ingesting contaminated water, typically from a recreational source like a community swimming pool or lake is a major risk factor for infection.[21]

Epidemiological situation in 2013

There were 3,846 notified cases of cryptosporidiosis in 2013 (16.6 per 100,000). This represents a 23.1% increase over the 3,124 cases reported in 2012 and a 47.2% increase over the 5-year mean of 2,612 cases. Notification rates ranged from 8.1 per 100,000 in South Australia to 36.9 per 100,000 in the Northern Territory.

Age and sex distribution

In 2013, notified cases of cryptosporidiosis were most frequently reported among the 0–4 years age group (36.6%, n=1,407) and of these, 58.8% (n=828) were male. This was consistent with 2012 figures when notifications of cryptosporidiosis were also most frequent in the 0–4 years age group (45.8%, n=1,437), and the majority of these were male (59.0%, n=848).

Outbreaks

An outbreak of cryptosporidiosis occurred in New South Wales in the 1st quarter of 2013, associated with community swimming pools across New South Wales and particularly in north-eastern Sydney.[31]

Haemolytic uraemic syndrome

- 15 cases of haemolytic uraemic syndrome were notified in 2013.
- Cases were most frequently notified among the 0–4 years age group.

HUS is a rare but serious illness that is characterised by acute renal impairment; with 50% of patients requiring dialysis and about 5% dying.[21] Not all diagnoses of HUS are related to enteric pathogens, but Australian cases are commonly associated with STEC infection.[32] In 2013, 66.7% (10/15) of HUS cases were positive for STEC.

Epidemiological situation in 2013

There were 15 notified cases of HUS in 2013 compared with 20 in 2012 and a mean of 17.2 cases per year between 2008 and 2012. Five of these cases were associated with STEC.

Age and sex distribution

In 2013, HUS was most frequently notified among the 0–4 years age group (27%, n=4), with a median age of 18 years (range 1–82 years). One-third of notified cases were in males (n=5) compared with 70% (n=14) in 2012.

Hepatitis A

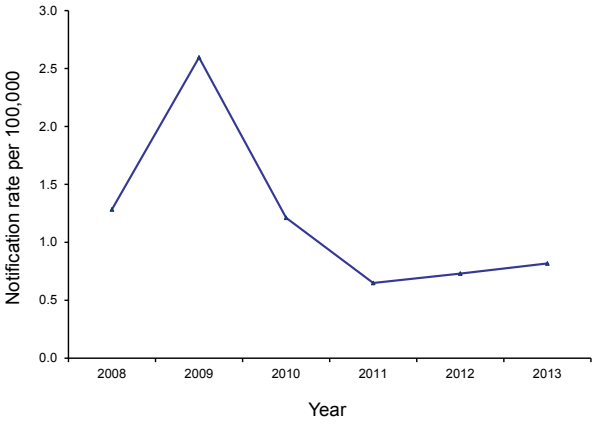
- 189 cases of hepatitis A were notified in 2013.
- Overseas travel was the primary risk factor for notified cases.

Hepatitis A is an acute viral infection primarily of the liver characterised by fever, malaise, anorexia, nausea and abdominal discomfort followed by jaundice. The disease varies from a mild illness to a severely disabling disease lasting several months. Infection is usually spread from person to person via the faecal-oral route but can also be foodborne or waterborne.[21]

Epidemiological situation in 2013

There were 189 notified cases of hepatitis A in 2013 (0.8 per 100,000). This was a 13.8% increase on the number of cases in 2012 (n=166), and a 33.3% decrease on the 5-year mean (n=283.4). The historical mean reflects the impact of a 2009–2010 outbreak of hepatitis A associated with the consumption of semi-dried tomatoes (Figure 15).

Figure 15: Notification rate for hepatitis A, Australia, 2008 to 2013



Age and sex distribution

Hepatitis A was most frequently notified among the 5–9 years age group (n=23) in 2013. The median age of notified cases was 25 years (range 1–79 years), and 59.3% (n=112) of all cases were male compared with 48% in 2012 (n=80).

Indigenous status

Indigenous status was known for 95.2% (n=180) of cases of hepatitis A. Of these, 3 were identified as being Indigenous.

Place of acquisition

Overseas travel was the primary risk factor for notified cases. In 2013, 61.4% (n=116) reported overseas travel during their incubation period for hepatitis A and were considered to have been overseas acquired. Travel to India, the Philippines and Vanuatu were most frequently reported.

In 2013, 20.6% (n=39) of notified cases were locally acquired. This was an increase from 2012 where 18% (n=30) of notified cases were locally acquired (Table 12). A 2009–2010 outbreak associated with

Table 12: Notified cases of hepatitis A, Australia, 2008 to 2013, by place of acquisition

	Locally acquired		Overseas acquired		Unknown		
Year	n	%	n	%	n	%	Total
2008	64	23	121	44	91	33	276
2009	304	54	184	33	75	13	563
2010	112	42	144	54	11	4	267
2011	39	27	97	67	9	6	145
2012	30	18	111	67	25	15	166
2013	39	21	116	61	34	18	189

the consumption of semi-dried tomatoes contributed to an increase in locally acquired hepatitis A cases in those years.[33]

Hepatitis E

- 31 cases of hepatitis E were notified in 2013.
- The first 3 confirmed locally acquired infections occurred in 2013.

Hepatitis E is an acute viral infection primarily of the liver that is transmitted by the faecal-oral route, most often via food or water. [21] The infection is usually acquired overseas among travellers to endemic areas.

Epidemiological situation in 2013

There were 31 notified cases of hepatitis E in 2013, compared with a 5-year mean of 38 cases.

Age and sex distribution

Hepatitis E was most frequently notified among the 25–39 years age group (n=8), the median age of cases was 32 years (range 4–72 years), and 68% (n=21) of total cases were male.

Place of acquisition

Hepatitis E in Australia has traditionally been associated with overseas travel. In 2013, 87% of cases (n=27) reported overseas travel during their incubation period and were considered to have been acquired overseas, of these, 41% (n=11) reported travel to India. The first 3 confirmed cases of locally acquired hepatitis E occurred in New South Wales in the last quarter of 2013.

Listeriosis

- 76 cases of listeriosis were notified in 2013.
- Notified cases were highest in the 80+ years age group.

Invasive listeriosis is caused by a bacterial infection that commonly affects the elderly or immunocompromised, and typically occurs among people with serious underlying illnesses. Listeriosis can also affect pregnant women and infect their unborn baby. Laboratory-confirmed infections in a mother and her unborn child or neonate are notified separately in the NNDSS.

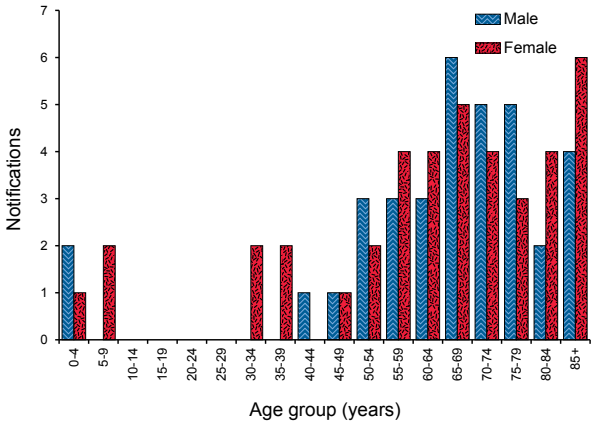
Epidemiological situation in 2013

There were 76 notified cases of invasive *Listeria monocytogenes* infection in 2013 (0.3 per 100,000) compared with a 5-year mean of 78.8 cases.

Age and sex distribution

Notifications for listeriosis were highest in the 80+ years age group (21%, n=16), with 53% (n=40) of all notified cases being female (Figure 16).

Figure 16: Notified cases of listeriosis, Australia, 2013, by age group and sex



Enhanced surveillance datasets

In 2010 OzFoodNet started collecting enhanced surveillance data on all notified cases of listeriosis in Australia. The information collected on cases includes the characterisation of *Listeria monocytogenes* isolates by molecular subtyping methods, food histories and exposure data. The overall aim of this enhanced surveillance is to enable timely detection of outbreaks and subsequent public health response.[32] Further information on OzFoodNet's enhanced *Listeria* surveillance system can be found in OzFoodNet annual reports (http://www.ozfoodnet.gov.au/internet/ozfoodnet/publishing.nsf/Content/reports-1).

Salmonellosis (non-typhoidal)

- 12,791 cases of salmonellosis were notified in 2013.
- Cases were most frequently notified among the 0–4 years age group.

Salmonellosis is a bacterial disease characterised by the 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. The predominant mode of transmission is contaminated food, mainly of animal origin.[21]

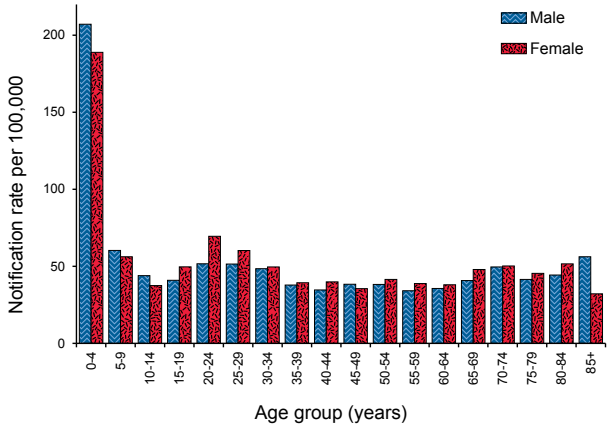
Epidemiological situation in 2013

There were 12,791 notified cases of salmonellosis in 2013 (55.3 per 100,000) with the number of cases being 20.1% higher than the 5-year mean of 10,649 cases. This represents a 13.5% increase in cases compared with 2012 (n=11,265). The number of cases for 2013 was the highest recorded in NNDSS since 1991. Rates ranged from 46.6 per 100,000 in New South Wales to 159.6 per 100,000 in the Northern Territory.

Age and sex distribution

Salmonellosis was most frequently notified among the 0–4 years age group (23.6%, n=3,015), the median age of notified cases was 27 years (range 0–93 years) and 50.5% (n=6,461) of cases where sex was stated were females (Figure 17).

Figure 17: Notification rate for salmonellosis, Australia, 2013, by age group and sex*



* Sex and/or age were not reported for 39 cases.

Shigellosis

- 556 cases of shigellosis were notified in 2013.
- 38% of notified cases were acquired overseas.

Epidemiological situation in 2013

There were 556 notified cases of shigellosis in 2013 (2.4 per 100,000), which was fewer than the 5-year mean of 608 cases. Notification rates ranged from 0.6 per 100,000 in Tasmania to 44.8 per 100,000 in the Northern Territory.

Shigellosis is a 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 through contaminated food or water.[21]

Age and sex distribution

Notifications for shigellosis were highest in the 0–4 years age group (19.8%, n=110). In 2013, the median age of notified cases was 29 years (range 0–87 years) and 51.5% (n=286) were male.

Indigenous status

Information on Indigenous status was available for 90.6% (n=504) of shigellosis cases. This proportion varied by state or territory, with Queensland and Tasmania being less than 80% complete. Among states and territories with greater than 80% completeness, the proportion of notified cases who identified as being of Aboriginal or Torres Strait Islander origin was 23.9% (115/481).

Place of acquisition

Thirty-nine per cent (n=216) of notified cases of shigellosis were reported as being acquired overseas. The most frequently reported countries of acquisition for imported cases were India (22.2%, n=48) and Indonesia (17.3%, n=38). The place of acquisition for 35.6% (n=198) was inadequately described or unknown, down from 64% (n=530) in 2008 (Table 13).

Shiga toxin-producing *Escherichia coli*

- 180 cases of Shiga toxin-producing *Escherichia coli* were notified in 2013.

Shiga toxin-producing *Escherichia coli* is a common cause of diarrhoeal illness in humans. People can become infected via faecal-oral transmission, ingesting contaminated food, through animal contact and from environmental exposures. Severe illness can progress to HUS. Children under 5 years of age are most frequently diagnosed with infection and are at greatest risk of developing HUS.[21]

Epidemiological situation in 2013

There were 180 notified cases of STEC in 2013 (0.8 per 100,000) compared with a 5-year mean of 102 cases. Of these, 5 cases developed HUS.

Table 13: Notified cases of shigellosis, Australia, 2008 to 2013, by place of acquisition

	Locally acquired		Overseas acquired		Unknown		
Year notified	n	%	n	%	n	%	Total
2008	207	25	93	11	530	64	830
2009	205	33	55	9	356	58	616
2010	153	28	163	30	236	43	552
2011	152	31	133	27	208	42	493
2012	137	25	173	32	238	43	548
2013	142	26	216	39	198	36	556

Detection of STEC infection is strongly influenced by jurisdictional practices regarding the screening of stool specimens.[32] South Australia continues to test all bloody stools for STEC using polymerase chain reaction (PCR) and subsequently has the highest notification rate in the country (3.2 cases per 100,000 compared with between 0.2 and 1.8 cases per 100,000 in other states and territories reporting cases). In addition, Victoria notified cases of HUS caused by STEC as HUS only, whereas all other jurisdictions notify each case as both organisms. These differences in testing practice mean that meaningful comparison of notification data by jurisdiction and over time are not valid.

Age and sex distribution

In 2013, 53% (n=95) of notified STEC cases were female. The median age of notified cases was 23 years (range 0–91 years).

Typhoid

- 150 cases of typhoid were notified in 2013.
- 94% of notified cases were acquired overseas.

Typhoid is a bacterial disease caused by *Salmonella enterica* serotype Typhi. Symptoms include sustained fever, marked headache, malaise and constipation more often than diarrhoea in adults. The transmission mode is the same as for salmonellosis, however typhoid differs in that humans are the reservoir for the bacterium.[21]

Epidemiological situation in 2013

There were 150 notified cases of typhoid in 2013 (0.6 per 100,000), compared with the 5-year mean of 115.2 cases. This was a 21% increase on the number of cases in 2012 (n=124).

Age and sex distribution

Typhoid was most frequently notified among the 10–14 years age group (15%, n=22), the median age of notified cases was 23 years (range 1–58 years), and 51% (n=77) were female.

Place of acquisition

As in previous years, overseas travel was the primary risk factor for notified cases. In 2013, 94% (n=141) reported overseas travel during their exposure period and were considered overseas acquired. India continues to be the most frequently reported country of acquisition, accounting for 61% (n=86) of overseas-acquired cases in 2013. Eight cases (5%) were locally acquired and the place of acquisition was unknown for 1 case (1%).

Quarantinable diseases

Human diseases covered by the *Quarantine Act 1908,* and notifiable in Australia and to the WHO in 2013 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). These diseases are of international public health significance.

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 Travel Health Information web site (www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-quaranti-index.htm) and from the Smartraveller website (www.smartraveller.gov.au/).

There were no cases of plague, rabies, smallpox, yellow fever, SARS, HPAIH or viral haemorrhagic fevers reported in Australia in 2013. While there were 3 cases of cholera, Australia remains free of all the listed quarantinable diseases (Table 14).

Table 14: Australia's status for human quarantinable diseases, 2013

Disease	Status	Date of last record and notes
Cholera	Free	Small number of cases reported annually related to overseas travel. Very rare instances of local acquisition as described under the section 'Cholera'.
Plague	Free	Last case recorded in Australia in 1923[34]
Rabies	Free	Last case (overseas acquired) recorded in Australia in 1990[35]
Smallpox	Free	Last case recorded in Australia in 1938, last case worldwide in 1977, declared eradicated by the World Health Organization 1980[36,37]
Yellow fever	Free	Two cases in 2011 were the first recorded, related to overseas travel[38]
SARS	Free	Last case recorded in Australia in 2003[39]
HPAIH	Free	No cases recorded[40]
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

- 3 cases of cholera were notified in 2013.

Cholera is an infection of the digestive tract (or gut) caused by certain strains of the bacterium *Vibrio cholerae* that produce toxins (poisons) and is most commonly acquired in parts of Africa, Asia, South America, the Middle East and the Pacific islands. *V. cholerae* is found in the faeces of infected people, and is spread by drinking contaminated water, eating food washed with contaminated water or prepared with soiled hands or eating fish or shellfish caught in contaminated water. Person-to-person spread of cholera is less common. Most people do not develop symptoms or have only mild illness but a small proportion of people will develop severe symptoms. Symptoms typically start between 2 hours and 5 days (usually 2–3 days) after ingesting the bacteria. Symptoms can include characteristic 'rice water' faeces (profuse, watery diarrhoea), nausea and vomiting, signs of dehydration, such as weakness, lethargy and muscle cramps. Only toxigenic *V. cholerae* O1 or O139 are notifiable in Australia.

Epidemiological situation in 2013

In 2013, there were 3 notifications of cholera in Australia. There were 23 cases of cholera in total in Australia between 2008 and 2012. The following details are available about the relevant exposures or place of acquisition for the 3 cases in 2013:

- all cases were aged between 20 and 40 years, 2 cases were male and one was female;
- two were reported by New South Wales and one by Victoria;
- the country of acquisition was reported as Bangladesh (2 cases) and Australia;
- the case acquired in Australia was laboratory-acquired.

All cases of cholera reported since the commencement of the NNDSS in 1991 to 2012 have been acquired outside Australia except for 1 case of laboratory-acquired cholera in 1996[41] and 3 cases in 2006 linked to imported whitebait.[42]

Sexually transmissible infections

Overview

In 2013, the 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 for Infection and Immunity in Society.

Chlamydial infection

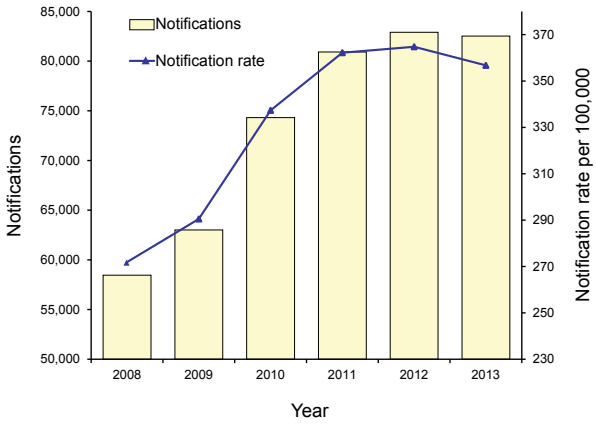
- 82,526 cases of chlamydial infection were notified in 2013.
- 2013 notification rates were similar to 2012.
- Women under 25 years of age and Aboriginal and Torres Strait Islander people were disproportionately represented in the notifications of chlamydial infection.

Genital chlamydial infection is caused by the bacterium *Chlamydia trachomatis* serogroups D–K. Screening is important in detecting chlamydial infections, as a large proportion of infections are asymptomatic. Chlamydial infection is highly treatable, although reinfection is common.[43] If left untreated, complications such as epididymitis in males and infertility and pelvic inflammatory disease in females can arise.[21]

Epidemiological situation in 2013

Chlamydial infection was the most frequently notified disease to the NNDSS (37% of all notifications in 2013), with 82,526 cases (357 per 100,000) notified in 2013. Between 2008 and 2010, notification rates for chlamydial infection increased by 24% (from 272 to 337 per 100,000) but remained relatively stable between 2010 and 2013 (from 337 to 357 per 100,000) (Figure 18).

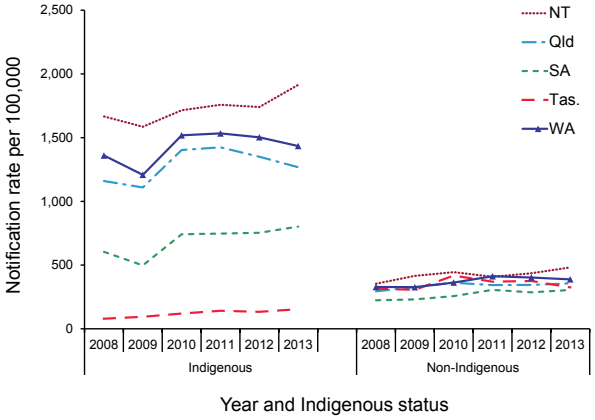
Figure 18: Notified cases and notification rate for chlamydial infection, Australia, 2008 to 2013, by year



Geographical distribution

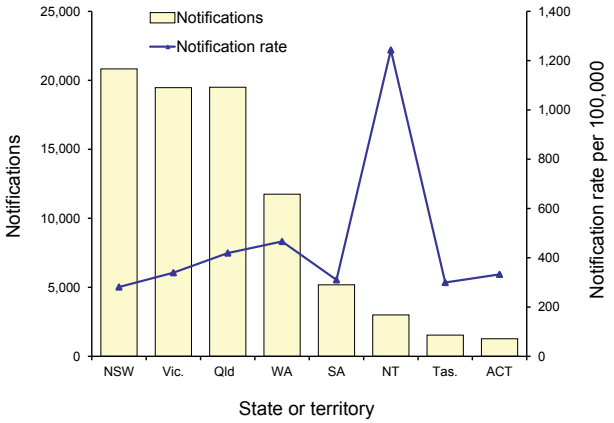
In 2013, the notification rate for chlamydial infection was almost 3.5 times higher in the Northern Territory (1,243 per 100,000) than nationally (357 per 100,000). This variation is mostly explained by the relatively large number of Aboriginal and Torres Strait Islander people in the Northern Territory, who have higher notification rates for chlamydial infection than the general population (Figure 19). In the remaining jurisdictions notification rates ranged between 281 per 100,000 in New South Wales and 466 per 100,000 in Western Australia (Figure 20).

Figure 19: Age standardised notification rate for chlamydial infection, selected states and territories,* 2008 to 2013, by year and Indigenous status



* Includes the states and territories where Indigenous status was reported for more than 50% of cases between 2008 and 2013: excludes New South Wales.

Figure 20: Notified cases and notification rate for chlamydial infection, Australia, 2013, by state or territory



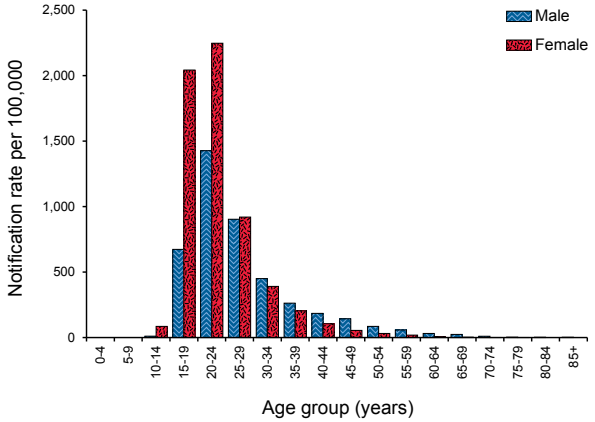
Age and sex distribution

Nationally in 2013, the notification rate for chlamydial infection was 302 per 100,000 in males, and 410 per 100,000 in females. The notification rates for males and females remained relatively stable over the past year, from 307 and 419 per 100,000 respectively in 2012. From 2008 to 2013, notification rates increased 37% for males and 28% for females. In 2013, chlamydial infection occurred predominately among those in the 15–29 years age range, accounting for 79% of notified cases.

In 2013, notification rates in females exceeded those in males for those under the age of 30 years, especially for those in the 15–19 years age group (F:M, 3.03:1) and in the 20–24 years age group

(F:M, 1.58:1). However, in the 30+ years age groups males had higher rates than females (Figure 21). The overall higher rate among females may be partly attributable to preferential testing of women attending health services compared with men.[9,44]

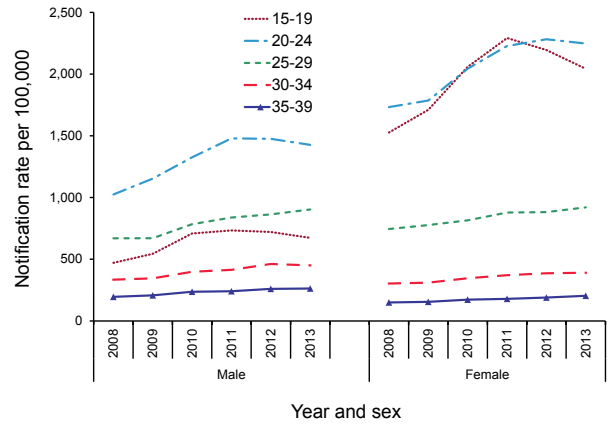
Figure 21: Notification rate for chlamydial infection, Australia, 2013, by age group and sex*



* Excludes notifications where age and/or sex were not reported and notifications where the case was aged less than 13 years.

When considering notification rates over time in the high risk age groups (15–39 years), they have increased overall since 2008, with slight declines from 2011 to 2013 for females (from 1,771 to 1,707 per 100,000) and from 2012 to 2013 for males (from 1,028 to 1,011 per 100,000) (Figure 22).

Figure 22: Notification rate for chlamydial infection in persons aged 15 to 39 years, Australia, 2008 to 2013, by year and sex* and age group



* Excludes notifications for whom age and/or sex were not reported and notifications where the case was aged less than 13 years.

Indigenous population

The completeness of Indigenous status identification in the notification data varies by year and by jurisdiction. Nationally in 2013, data on Indigenous status were complete for 38% of notifications, which is markedly lower than the preceding 5-year average of 50% (range: 49%–51%). Five jurisdictions had greater than 50% completeness of the Indigenous status field across the 2008 to 2013 period: the Northern Territory, Queensland, South Australia, Tasmania, and Western Australia. Among these jurisdictions, the combined age-standardised notification rate ratio between Indigenous and non-Indigenous populations in 2013 was 3.0:1. Overall, the ratio has varied little over the previous 5 years (range: 2.8–3.2).

Among the Indigenous population, the age-standardised notification rate declined from 2008 to 2009 (from 1,195 to 1,116 per 100,000), increased from 2010 and 2011 (from 1,360 to 1,383 per 100,000), which was followed by another decline from 1,339 per 100,000 in 2012 to 1,327 per 100,000 in 2013. Overall, the age-standardised rates in 2013 were 11% higher than in 2008 (1,195 per 100,000).

Age-standardised notification rates among the non-Indigenous population have decreased by 23% from 2008 (294 per 100,000) to 2013 (226 per 100,000). Between 2012 and 2013, age-standardised notification rates for chlamydial infection in the Indigenous population decreased in Queensland by 6% (from 1,350 to 1,268 per 100,000) and in Western Australia by 5% (from 1,503 to 1,435 per 100,000). Conversely, rates increased in the Northern Territory by 10% (from 1,740 to 1,915 per 100,000), in South Australia by 6% (from 753 to 802 per 100,000) and in Tasmania by 15% (from 134 to 154 per 100,000).

Between 2012 and 2013, the age-standardised notification rates for chlamydial infection in the non-Indigenous population increased by 10% in the Northern Territory (from 436 to 482 per 100,000), by 4% in Queensland (from 344 to 357 per 100,000), and by 7% in South Australia (from 286 to 305 per 100,000). In the same period, age-standardised notification rates decreased 13% in Tasmania (from 375 to 325 per 100,000) and by 4% in Western Australia (from 403 to 388 per 100,000) (Figure 19).

Donovanosis

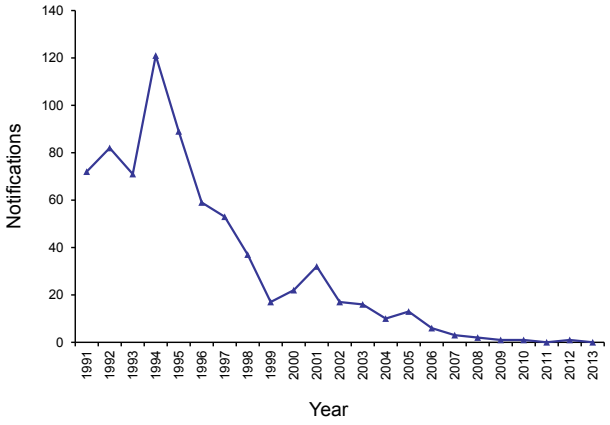
- No cases of donovanosis were notified in 2013.
- This disease is now rare in Australia.

Donovanosis, caused by the bacterium *Klebsiella granulomatis*, is a chronic, progressively destructive infection that affects the skin and mucous membranes of the external genitalia, inguinal and anal regions.[45] Donovanosis was targeted for elimination in Australia through the National Donovanosis Elimination Project 2001–2004.[46] The disease predominantly occurred in Aboriginal and Torres Strait Islander females in rural and remote communities in central and northern Australia. It is now rare, with fewer than 17 cases notified each year since 2002, and fewer than 6 cases notified each year since 2006.

Epidemiological situation in 2013

In 2013, no cases of donovanosis were notified in Australia (Figure 23).

Figure 23: Notified cases of donovanosis, Australia, 1991 to 2013, by year



Gonococcal infection

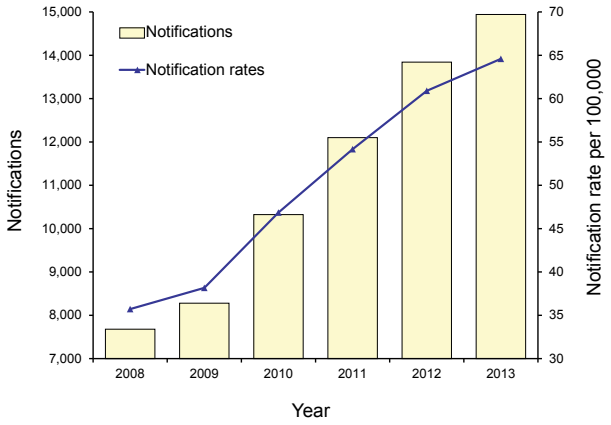
- 14,942 cases of gonococcal infection were notified in 2013.
- Notification rates for gonococcal infection continue to increase.
- Notifications in 2013 occurred predominately in males aged 20–39 years.

Gonorrhoea is caused by the bacterium *Neisseria gonorrhoeae,* which affects the mucous membranes causing symptomatic and asymptomatic genital and extra-genital tract infections.[21] If left untreated, it can lead to pelvic inflammatory disease in women and infertility in both men and women. Gonococcal infection also increases the risk of both acquisition and transmission of HIV.[45]

Epidemiological situation in 2013

In 2013, there were 14,942 cases of gonococcal infection reported to the NNDSS, a notification rate of 65 per 100,000. This was a 6% increase compared with the rate reported in 2012 (61 per 100,000). Overall, gonococcal infection notification rates increased by 81% from 2008 (36 per 100,000) to 2013 (65 per 100,000), at an average of 13% each year (range: 6%–23%) (Figure 24).

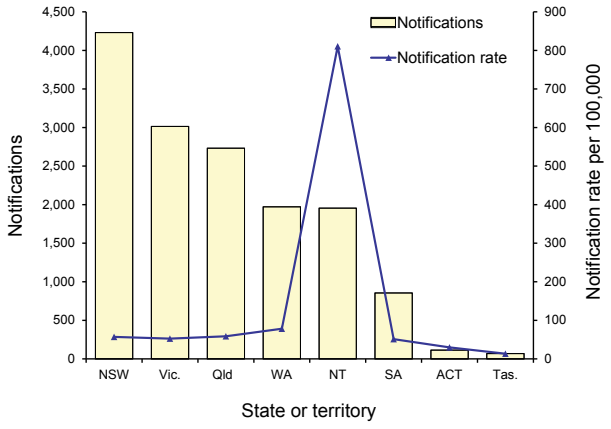
Figure 24: Notified cases and notification rate for gonococcal infection, Australia, 2008 to 2013, by year



Geographical distribution

In 2013, the notification rate for gonococcal infection was 12.5 times higher in the Northern Territory (811 per 100,000) than nationally (65 per 100,000) (Figure 25). This variation is partly explained by the relatively large number of Aboriginal and Torres Strait Islander people in the

Figure 25: Notified cases and notification rate for gonococcal infection, Australia, 2013, by state or territory



Northern Territory, who have higher notification rates for gonococcal infection than the general population (Figure 26).

Age and sex distribution

Nationally in 2013, the notification rate for gonococcal infection was 91 per 100,000 in males and 38 per 100,000 in females, which represented a slight increase from 2012 (84 per 100,000 in males and 36 per 100,000 in females). In 2013, gonococcal infection occurred predominately among those aged 15–34 years, who accounted for 72% of notified cases.

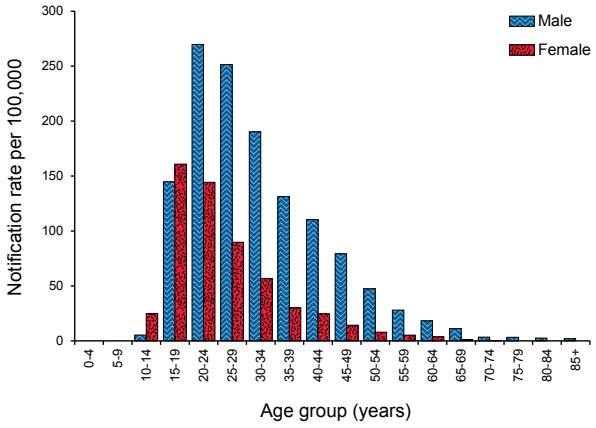
Overall, the male to female ratio was 2.4:1 in 2013, which has not changed from 2012. In 2013, notification rates in females exceeded those in males in the under 20 years age groups, but was the reverse for all age groups above 20 years (Figure 27).

When considering trends over time in those aged 15–49 years, notification rates increased from 2008 to 2013 in all age groups across both sexes, with the exception of females in the 15–19 years age group, where rates declined between 2011 and 2013 (Figure 28).

Indigenous population

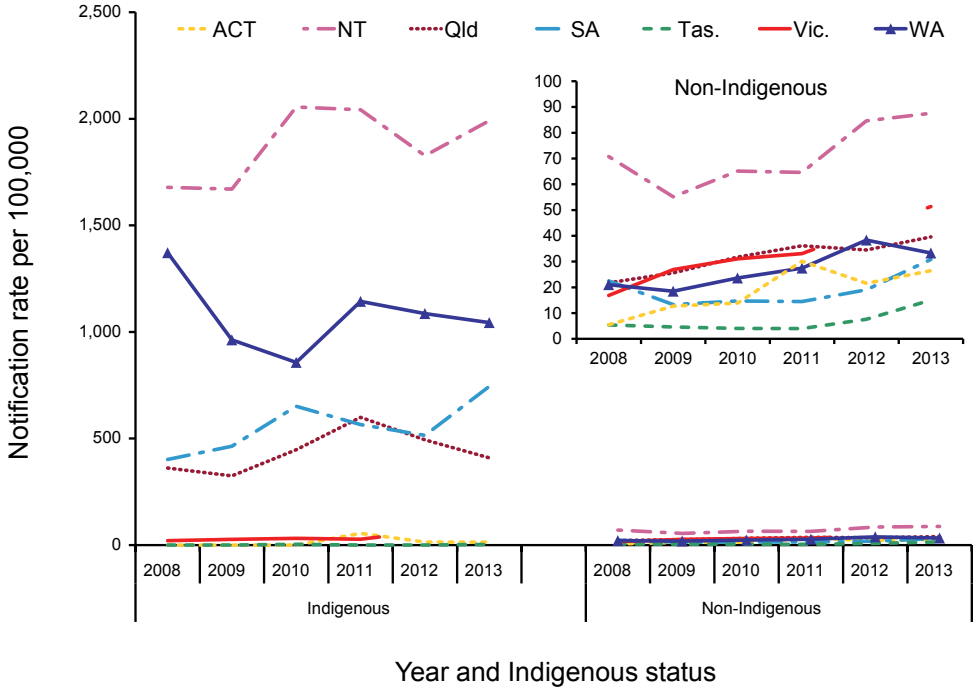
The completeness of Indigenous status identification in the notification data varies by year and by jurisdiction. Nationally in 2013, data on Indigenous status were complete for 72% of notifications, which was higher than the preceding 5–year average of 68% (range: 66%–73%). All states and territories except New South Wales had greater than

Figure 27: Notification rate for gonococcal infection, Australia, 2013, by age group and sex*



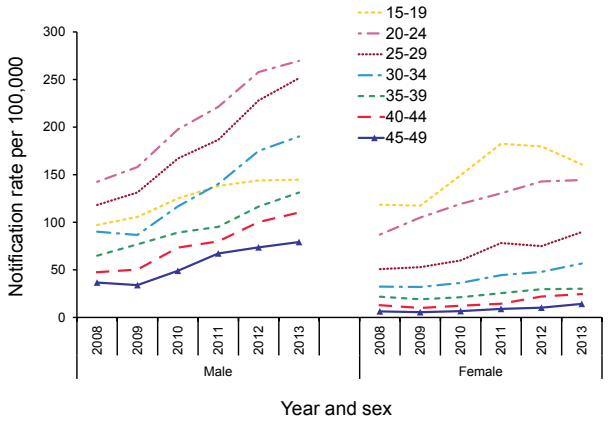
* Excludes notifications where age and/or sex were not reported and notifications where the case was aged less than 13 years and the infection was able to be determined as non-sexually acquired.

Figure 26: Age-standardised notification rate for gonococcal infection, selected states and territories,* 2008 to 2013, by year and Indigenous status



* Includes the states and territories where Indigenous status was reported for more than 50% of cases between 2008 and 2013: excludes New South Wales.

Figure 28: Notification rate for gonococcal infection in persons aged 15 to 49 years, Australia, 2008 to 2013, by year and sex and age group*



* Excludes notifications where age and/or sex were not reported.

50% completeness of the Indigenous status field across the 2008 to 2013 period. Among these states and territories, the combined age-standardised notification rate ratio between Indigenous and non-Indigenous populations in 2013 was 18.5:1, declining from 21.3:1 in 2012. Overall, the rate ratio has declined by 51% from 2008 to 2013 (from 37.6:1 to 18.5:1).

Among the Indigenous population, the age-standardised notification rate increased by less than 1% from 2012 to 2013 (from 770 to 773 per 100,000). Rates in 2013 were 4% lower than in 2008 (745 per 100,000).

The age-standardised notification rate among the non-Indigenous population has more than doubled from 2008 to 2013 (20 and 42 per 100,000 respectively). The average annual increase over this period was 16% (range: 11%–19%).

In terms of geographical trends, age-standardised notification rates for gonococcal infection in the Indigenous population between 2012 and 2013 both increased and decreased among the states and territories in which Indigenous status was more than 50% complete; rates decreased in the Australian Capital Territory by 6% (from 15 to 14 per 100,000), in Queensland by 17% (from 494 to 410 per 100,000), in Victoria by 28% (63 to 45 per 100,000) and in Western Australia by 4% (from 1,086 to 1,044 per 100,000). Conversely, notification rates increased in the Northern Territory by 9% (from 1,827 to 1,991 per 100,000), and in South Australia by 45% (from 515 to 745 per 100,000). Tasmania reported no cases in 2012 but a notification rate of 2.75 in 2013 (Figure 26).

Between 2012 and 2013, the age-standardised rates for gonococcal infection in the non-Indigenous population increased by 23% in the Australian Capital Territory (from 22 to 26 per 100,000), by 4% in the Northern Territory (from 85 to 88 per 100,000), by 15% in Queensland (from 35 to 40 per 100,000), by 62% in South Australia (from 19 to 31 per 100,000), by 98% in Tasmania (from 8 to 15 per 100,000), and by 21% in Victoria (from 42 to 51 per 100,000). Conversely, notification rates decreased in Western Australia by 13% (from 38 to 33 per 100,000) (Figure 26).

Microbiological trends

The AGSP is the national surveillance system for monitoring the antimicrobial resistance of *N. gonorrhoeae* isolates. These results are published in more detail in the AGSP annual report in CDI.[47]

In 2013, the AGSP reported that a total of 4,896 gonococcal isolates were referred for antibiotic susceptibility testing, representing 33% of gonococcal infection notified to the NNDSS. This was slightly lower than the proportion of NNDSS cases tested in 2012 (35%), and a further decrease from the 40%–42% referred in 2008 to 2010.

Eighty-two per cent of the isolates (n=4,032) were from males and 18% (n=862) were from females (M:F, 4.7:1). There were 2 isolates for which gender was unknown. The proportion of gonococcal isolates from males and females tested by the AGSP has remained similar over recent years (<1% variation).

Syphilis (non-congenital categories)

- 3,474 cases of syphilis (non-congenital categories) were notified in 2013, a rate of 15.0 per 100,000.
- In 2013, the notification rate for infectious syphilis was 7.6 per 100,000 and the notification rate for syphilis of more than 2 years or unspecified duration was 7.4 per 100,000.

Syphilis, caused by the bacterium *Treponema palladium*, is characterised by a primary lesion, a secondary eruption involving skin and mucous membranes, long periods of latency and late lesions of skin, bone, viscera, cardiovascular and nervous systems.[21]

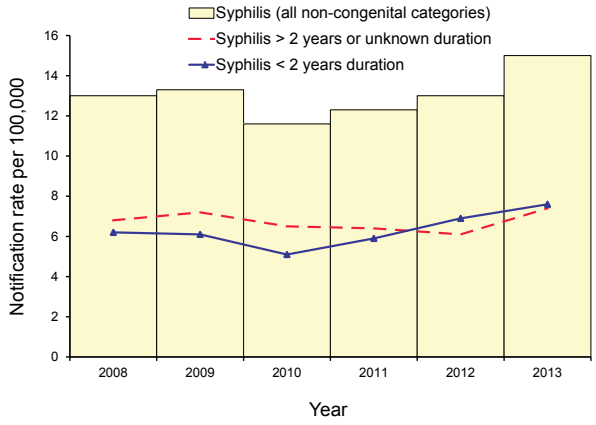
In 2004, all jurisdictions except South Australia began reporting non-congenital syphilis infections to the NNDSS, separately categorised as: infectious syphilis (primary, secondary or early latent) of less than 2 years duration; and syphilis of more than 2 years or unknown duration. From 2004 to 2011,

South Australia reported only cases of infectious syphilis, and then in 2012 commenced reporting syphilis of more than 2 years or unknown duration. Data for all states and territories are reported by diagnosis date, except Queensland, which is reported by notification receive date.

Epidemiological situation in 2013

In 2013, a total of 3,474 cases of syphilis (non-congenital) were reported. This represents a rate of 15.0 per 100,000, a 15% increase compared with 2012 (13.0 per 100,000) (Figure 29). In 2013, 49% of syphilis notifications were categorised as greater than 2 years or unknown duration, and 51% of cases were categorised as less than 2 years duration.

Figure 29: Notification rate for non-congenital syphilis infection (all categories),*,† Australia, 2008 to 2013, by year and category



* For infectious syphilis, excludes notifications where the case was aged less than 13 years and the infection was able to be determined as non-sexually acquired. For syphilis of more than 2 years or unknown duration, excludes all notifications where the case was aged less than 13 years.

† For syphilis of more than 2 years or unknown duration, excludes South Australia from 2008–2011.

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

- 1,768 cases of infectious syphilis were notified in 2013.
- In 2013, 79% of all notifications occurred in males aged 20–54 years. Notification rates in males exceeded those in females in almost all age groups.
- Cases of infectious syphilis were almost completely in men who have sex with men.

Epidemiological situation in 2013

In 2013, 1,768 notified cases of infectious syphilis (primary, secondary and early latent), less than 2 years duration, were reported to the NNDSS, representing a rate of 7.6 per 100,000. This was an 11% increase compared with the rate reported in 2012 (6.9 per 100,000). The notification rate for infectious syphilis increased overall by 23% from 2008 to 2013 (from 6.2 to 7.6 per 100,000) (Table 6).

Geographical description

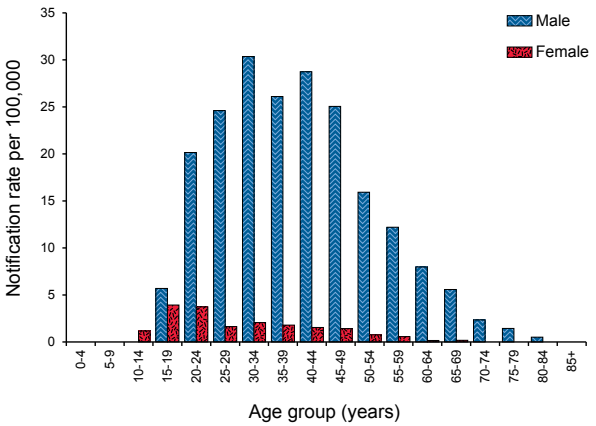
In 2013, notification rates for infectious syphilis (less than 2 years duration) were highest in Victoria, the Northern Territory and New South Wales (11.4, 9.1 and 8.1 per 100,000 respectively) (Table 5).

Age and sex distribution

Nationally in 2013, the notification rate for infectious syphilis was 14.0 per 100,000 in males and 1.3 per 100,000 in females, a male to female rate ratio of 11.0:1. In males, this was an increase of 12% when compared with the 2012 rate (12.4 per 100,000) and in females this was a decrease of 5% compared with the 2012 rate (1.3 per 100,000). In 2013, 79% of all notifications occurred in males aged 20–54 years, and notification rates for males exceeded those for females in almost all age groups (Figure 30). Diagnoses of infectious syphilis in 2013 were almost completely confined to men who have sex with men.[28]

Notification rates for males aged 15 years or over increased overall among most age groups from

Figure 30: Notification rate for infectious syphilis (primary, secondary and early latent), less than 2 years duration, Australia, 2013, by age group and sex*

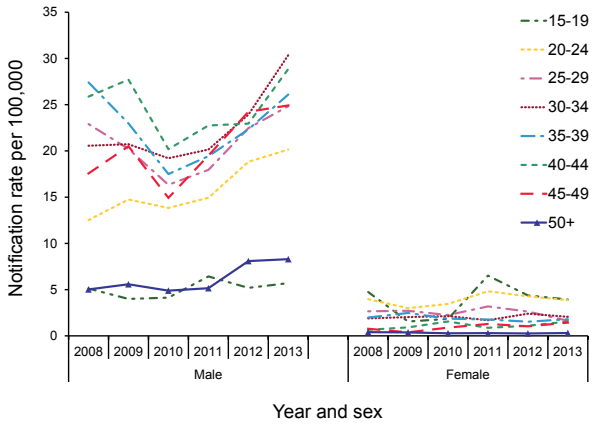


* Excludes notifications where age and/or sex were not reported and notifications where the case was aged less than 13 years and the infection was able to be determined as non-sexually acquired.

2008 to 2013. An exception was the 35–39 years age group, for which the rate declined overall from 2008 to 2013 (from 27 to 26 per 100,000) (Figure 31).

In females aged 15 years or over, notification rates between 2008 and 2013 have averaged 2.1 per 100,000 (range: 0.3–3.9). Over the 6-year period, the notification rates remained low for females across all age groups.

Figure 31: Notification rate for infectious syphilis (primary, secondary and early latent), less than 2 years duration, in persons aged 15 years or over,* Australia, 2008 to 2013, by year and sex and age group*



* Excludes notifications where age and/or sex were not reported.

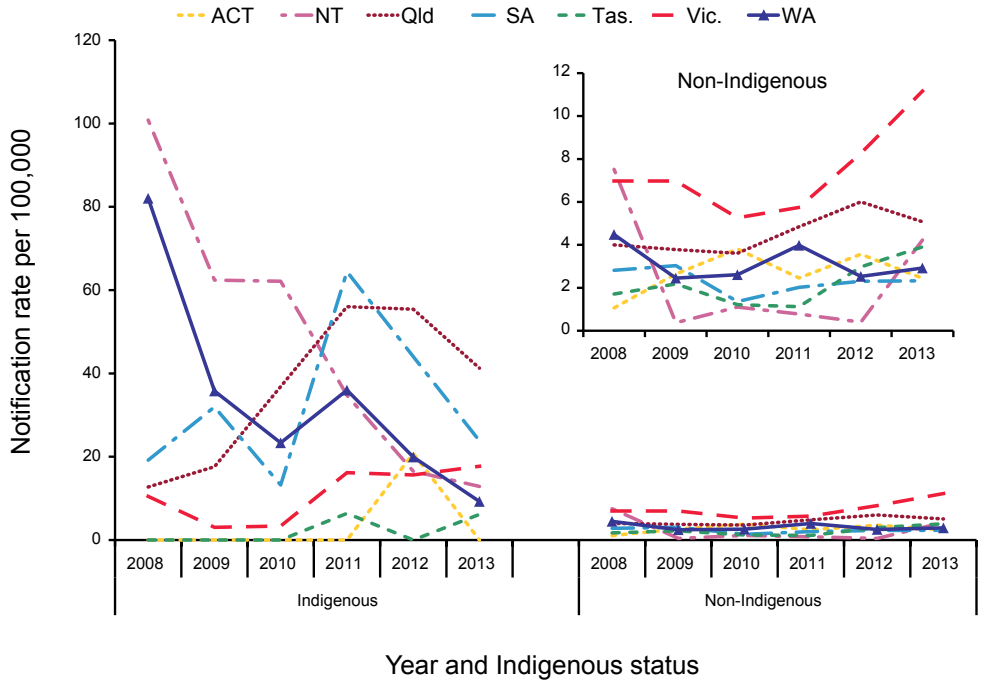
Indigenous population

The completeness of Indigenous status identification in the notification data varies by year and by jurisdiction. Nationally in 2013, data on Indigenous status were complete for 72% of notifications, an increase compared with 2012 (66% complete) and higher than the preceding 5–year average of 68% (range: 66%–73%). All states and territories except New South Wales had greater than 50% completeness of the Indigenous status field across the 2008 to 2013 period.

Among the states and territories with greater than 50% completeness for Indigenous status, the combined age standardised notification rate ratio between the Indigenous and non-Indigenous populations in 2013 was 3.7:1, which was lower than the preceding 5–year average of 7.6:1 (range: 5.7–9.3).

The age-standardised notification rate in the Indigenous population declined from 34 per 100,000 in 2012 to 25 per 100,000 in 2013. Overall, 2013 rates are 41% lower than 2008 rates (41 per 100,000). This declining trend is not seen in all jurisdictions (Figure 32) but it is likely that programs that include population screening and

Figure 32: Age-standardised notification rate for infectious syphilis (primary, secondary and early latent), less than 2 years duration, selected states and territories,* 2008 to 2013, by Indigenous status and year



* Includes the states and territories where Indigenous status was reported for more than 50% of cases between 2008 and 2013: excludes New South Wales.

case management, supported by centrally based state-wide syphilis registers, are making some progress towards elimination of infectious syphilis in Indigenous communities.[48]

The age-standardised notification rate in the non-Indigenous population has increased from 6.0 per 100,000 in 2012 to 6.6 per 100,000 in 2013. The rate in 2013 was 32% higher than it was in 2008 (5.0 per 100,000).

In terms of geographical trends, from 2012 to 2013, the age-standardised rates for syphilis infection in the Indigenous population declined in all states and territories except Victoria and Tasmania (Figure 32). Between 2008 and 2013, the Northern Territory was the only jurisdiction to report declining Indigenous age-standardised notification rates every year. The increase evident in Indigenous notification rates in Western Australia in 2008 was largely attributable to an outbreak that occurred in the Pilbara region among Aboriginal people during that year.[49]

Among the non-Indigenous population between 2012 and 2013, the age-standardised rates for syphilis infections increased in all jurisdictions except the Australian Capital Territory and Queensland (Figure 32).

Syphilis of more than 2 years or unknown duration

- 1,706 cases of syphilis of more than 2 years or unknown duration were notified in 2013.
- Overall, notification rates have increased from 6.3 per 100,000 in 2008 to 7.4 per 100,000 in 2013.
- The notification rate among males (10.8 per 100,000) was more than double that for females (3.9 per 100,000) in 2013.

Epidemiological situation in 2013

In 2013, 1,706 cases of syphilis of more than 2 years or unknown duration were reported to the NNDSS. This represents a notification rate of 7.4 per 100,000. Overall, notification rates have increased by 17% from 2008 to 2013 (6.8 to 7.4 per 100,000) (Table 6).

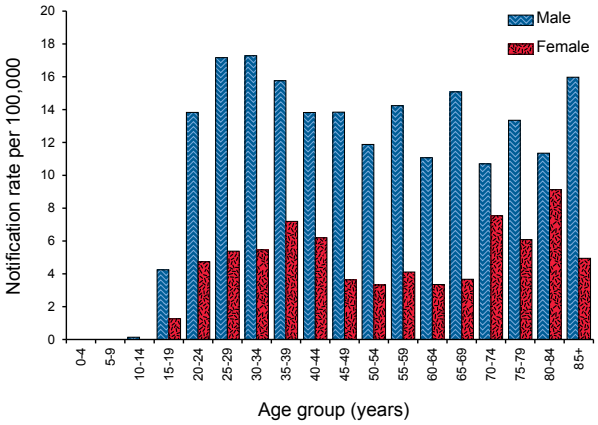
Geographical distribution

In 2013, notification rates for syphilis of more than 2 years or unknown duration were highest in the Northern Territory (39.0 per 100,000), followed by Victoria (9.8 per 100,000) (Table 5).

Age and sex distribution

Nationally in 2013, the notification rate for syphilis of more than 2 years or unknown duration was 10.8 per 100,000 for males and 3.9 per 100,000 in females, a male to female ratio of 2.8:1. In males, this was an increase of 30% when compared with the 2012 rate (8.3 per 100,000), and in females a 4% increase from the 2012 rate (3.8 per 100,000). Around 71% of all notifications occurred in males aged 20 years or over, and notification rates in males exceeded those in females in all age groups (Figure 33).

Figure 33: Notification rate for syphilis of more than 2 years or unknown duration,* Australia, 2013, by age group and sex



* Excludes notifications for whom age and or sex were not reported and notifications where the case was aged less than 13 years and the infection was able to be determined as non-sexually acquired.

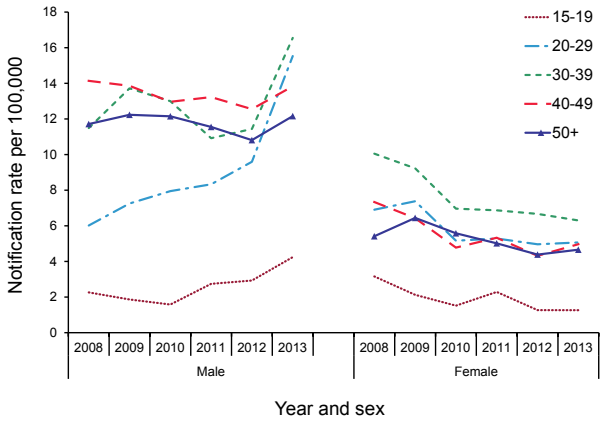
Notification rates for those aged 15 years or over from 2008 to 2013 increased overall in most age groups for males, and declined overall across all age groups for females (Figure 34).

Congenital syphilis

- Seven cases of congenital syphilis were notified in 2013.
- Congenital syphilis remains rare in Australia.

Congenital syphilis is caused by foetal infection with the bacteria *T. pallidum*. Syphilis is acquired by infants either in-utero or at birth from women with untreated early infection. Infections commonly result in abortion or stillbirth and may cause the death of a newborn infant. Congenital syphilis can be asymptomatic, especially in the first weeks of life.[21]

Figure 34: Notification rate for syphilis of more than 2 years or unknown duration, in persons aged 15 years or over,* Australia,† 2008 to 2013, by year and sex and age group



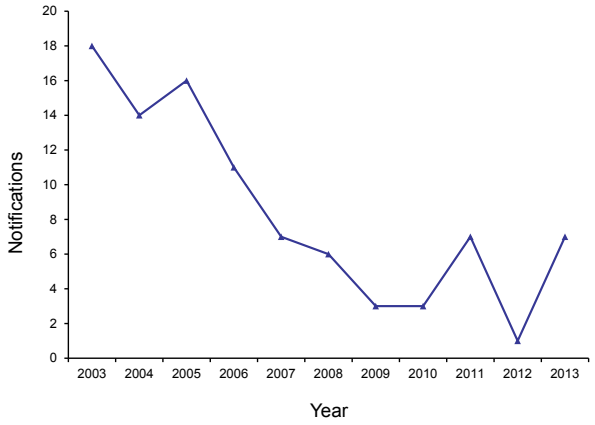
* Excludes notifications where age and/or sex were not reported.

† Data from all states and territories except South Australia in 2008–2011.

Epidemiological situation in 2013

There were 7 notifications of congenital syphilis in 2013, which remains low after a decrease observed over the 10 years prior (Figure 35). Antenatal screening for syphilis with follow-up and adequate treatment is considered to be a contributor to this decline.[48]

Figure 35: Notified cases of congenital syphilis, Australia, 2003 to 2013, by year



Vaccine preventable diseases

Overview

This section summarises the national surveillance data for notifiable diseases targeted by the National Immunisation Program (NIP) in 2013. These include diphtheria, invasive *Haemophilus influenzae* type b (Hib) infection, laboratory confirmed influenza, measles, mumps, pertussis, invasive pneumococcal disease (IPD), poliomyelitis, rubella, tetanus and varicella zoster infections (unspecified, chickenpox and shingles). 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 reported under the 'Gastrointestinal' and 'Zoonoses' sections respectively. More detailed reports on historical data, including notifications, hospitalisations and deaths are published in the CDI journal supplements 'Vaccine Preventable Diseases in Australia'[26] and additional analysis on individual diseases are published in CDI in the 'Australian Vaccine Preventable Diseases Epidemiological Review Series'.

In 2013, there were 59,630 VPD notifications reported to the NNDSS, representing 27% of all reported cases and a 31% decrease compared with 2012 (85,848 cases). Influenza was the most commonly notified VPD with 28,329 cases (48%) reported, followed by pertussis (12,341 cases, 21%). The number of notifications and notification rates for VPDs in Australia are shown in Table 3, Table 4 and Table 5.

Vaccination coverage is an important factor influencing the incidence of VPDs. 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, in which there is an increased potential for VPD cases, remain. As no vaccine is 100% effective, infections with these diseases sometimes do occur in fully vaccinated people, and some are reported later in this section. However, vaccines do provide a substantially lower chance of becoming infected or will reduce the severity of disease.

Information on a case's vaccination history was previously recorded in the NNDSS using the 'vaccination status' field (fully or partially vaccinated for age or not vaccinated), plus fields capturing the number of doses, the last vaccination date and how the vaccination information was validated. In January 2008 new, more detailed fields were incorporated for recording 'vaccine type', and 'vaccination date' for each dose of vaccine given. The new fields were intended to replace the old fields, with a transition period allowing either field to be utilised. In 2013, all jurisdictions were using the new fields except for the Australian Capital Territory. In this report the vaccination status of a case is

interpreted according to the data provided by the states and territories from the 2 different formats. A case is described as fully vaccinated if they have received all doses of the relevant vaccine according to the most recent edition of *The Australian Immunisation Handbook*[50] and at least 14 days prior to disease onset. In contrast, fully vaccinated for age describes a case that has received all recommended doses of a vaccine for their age but may not yet have received the full course of vaccinations required to be considered fully vaccinated.

In 2013, the measles-mumps-rubella-varicella (MMRV) vaccine for all children at 18 months of age and the combined Hib and monovalent meningococcal C conjugate vaccine (Hib-MenCCV) for all children at 12 months of age were added to the NIP. The MMRV replaced the 2nd dose of MMR previously provided at 4 years of age and combined it with the varicella vaccine already given at 18 months of age. This change is expected to provide earlier protection and improve coverage of the second dose of MMR while being consistent with the World Health Organization (WHO) recommendation that a 2nd dose of measles containing vaccine should be given in the 2nd year of life.[51] Hib-MenCCV replaces the single dose of MenCCV and booster dose of monovalent Hib vaccine previously scheduled at 12 months of age.[50]

Diphtheria

- There were 2 cases of diphtheria notified in Australia in 2013.
- Diphtheria is now rare in Australia.

Diphtheria is an acute pharyngeal or cutaneous infection caused mainly by toxigenic strains of *Corynebacterium diphtheriae*. The exotoxin acts locally on the mucous membranes of the respiratory tract, and on damaged skin, although this is not as common. Disease is mainly due to local membranous inflammation, which for pharyngeal diphtheria can cause airway obstruction. Occasionally, systemic infections occur and cause damage to the myocardium, nervous system and kidneys. Diphtheria is spread by respiratory droplets or direct contact with nasopharyngeal secretions or skin lesions. While there are non-toxigenic strains of *C. diphtheriae,* they usually only cause mild throat or skin infection and are not nationally notifiable.[21]

Epidemiological situation in 2013

In 2013, there were 2 notifications of diphtheria reported to the NNDSS, one from Queensland and one from South Australia. Both cases were imported infections from Papua New Guinea and India respectively.

Diphtheria is rare in Australia, with most cases associated with sporadic importations from countries in which this disease remains endemic. Since the 1 case of cutaneous diphtheria reported in 2001, the only other year before 2013 in which cases were reported was 2011, when a cluster of 3 infections, including 1 death, and an unrelated case of cutaneous diphtheria were notified.

Influenza

- In 2013, notifications of laboratory confirmed influenza decreased by almost 37% from 2012 making it a mild to moderate season since the 2009 pandemic season.
- Children aged 9 years or under, and also middle aged adults, as well as those with underlying medical conditions were most affected.

Influenza is a common, highly infectious acute respiratory disease caused by infection with influenza viruses. The virus is transmitted from person to person by airborne droplets of exhaled respiratory secretions, especially by coughing or sneezing.[52] The disease caused by infection with influenza viruses ranges from asymptomatic[53] through to mild upper respiratory tract illness, to severe complications including pneumonia. The severity of disease is determined by features intrinsic to the virus including its similarity to previous circulating and vaccine strains and by host factors including the presence of chronic conditions, pregnancy and smoking in the population.[54] The goals of influenza surveillance are to determine the magnitude and distribution of illness, detect outbreaks, monitor for changes in the virus and to facilitate policy development and planning.[55]

Annual influenza vaccination is the primary means of preventing or attenuating influenza and its complications and is included in the NIP for individuals who are at increased risk of complications from influenza infection. In 2013, the NIP funded influenza vaccine for people aged 6 months or over with medical conditions placing them at risk of serious complications due to influenza, Aboriginal and Torres Strait Islander people aged 15 years or over, pregnant women and people aged 65 years or over.

Epidemiological situation in 2013

In 2013, there were 28,329 cases of laboratory confirmed influenza, which was almost two-thirds the number of notified cases reported in 2012, but similar to the number of cases notified in 2011.

Geographic distribution

Notification rates were highest in South Australia (289 per 100,000) and the Northern Territory (199 per 100,000). Notifications in the Australian Capital Territory, New South Wales, Queensland, Victoria and Western Australia were somewhat similar to the national notification rate of 123 per 100,000, while the Tasmanian rate was substantially lower than the national rate at 58 per 100,000. New South Wales reported the highest number of influenza cases of any jurisdiction, comprising 30% of all notifications, which differed from previous seasons, when Queensland reported the highest number (Figure 36).

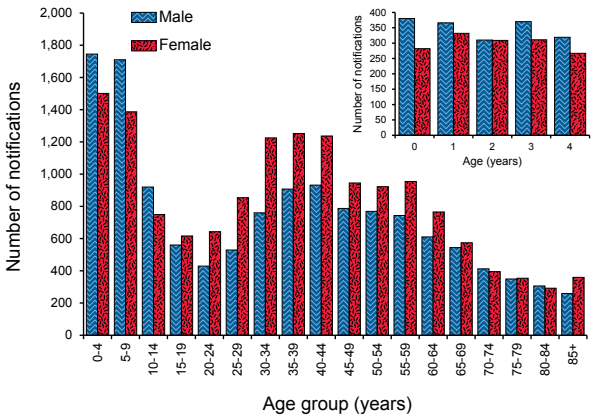
Age and sex distribution

The highest number of influenza notifications occurred in the 0–4 years and 5–9 years age groups, which together accounted for 22% of all notifications (Figure 37).

Likewise, notification rates were highest in the 0–4 years and 5–9 years age groups (214 and 213 notifications per 100,000 respectively) (Figure 38). There were also higher notification rates seen in middle aged adults (35–39 years and 40–44 years age groups).[56]

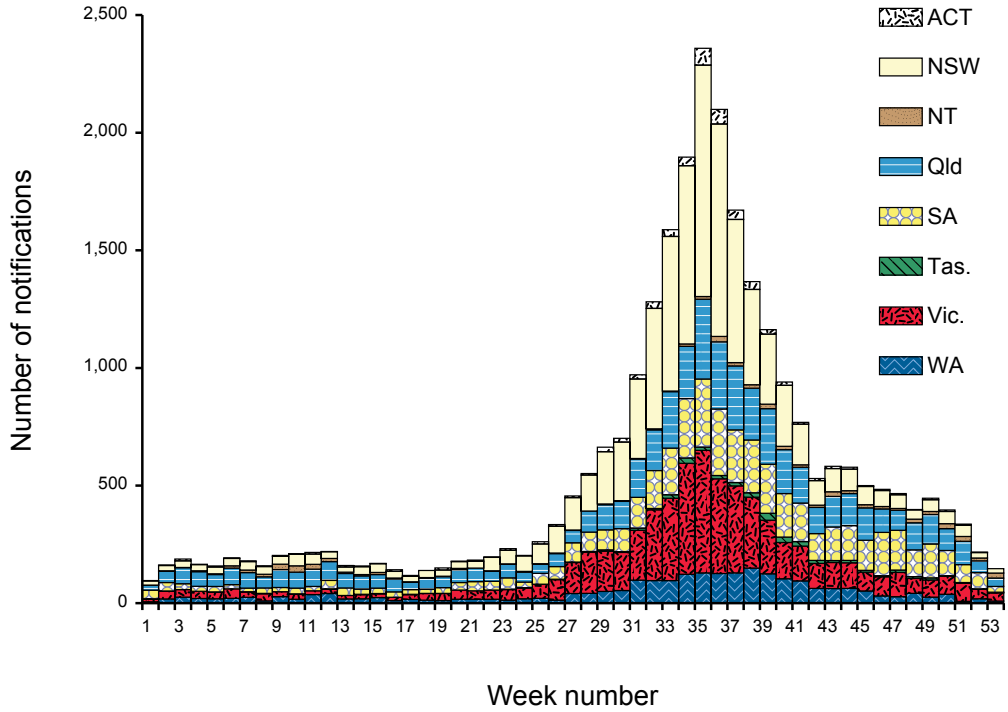
In seasons dominated by the influenza A(H1N1) pdm09 virus, such as 2009, 2010 and 2011, the age distribution of influenza notifications showed a downward trend with increasing age. For comparison, in 2012, which was dominated by influenza A(H3N2), the age distribution of influenza notifications was bimodal with peaks in those aged

Figure 37: Notified cases of laboratory confirmed influenza, Australia, 2013, by age group and sex*



* Excludes 35 notifications for which age or sex was not reported.

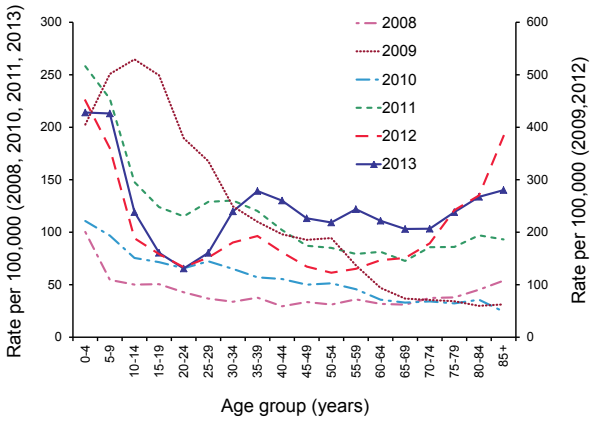
Figure 36: Notified cases of laboratory confirmed influenza, Australia, 2013, by week and state or territory



under 10 years and in those aged 70 years or over, and a small peak among those aged 30–44 years. The 2013 influenza season has been characterised by co-circulation of A(H1N1)pdm09, influenza A(H3N2) and influenza B viruses.

In 2013, females accounted for 15,033 (53%) of the influenza notifications for which sex was reported. Notification rates per 100,000 were generally higher among females in the adult age groups, whereas males dominated the younger age groups (0–14 years).

Figure 38: Notification rate for laboratory confirmed influenza, Australia, 2008 to 2013, by age group and year



Seasonality

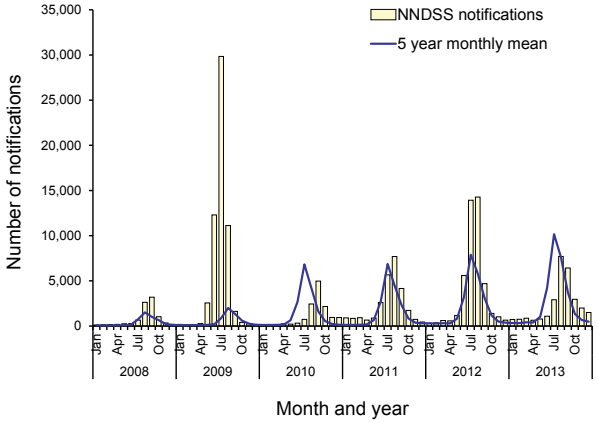
Influenza notification activity during the 2012–13 inter-seasonal period was the 2nd highest on record behind that observed during the 2010–11 inter-seasonal period. Excluding 2010, notifications of influenza in 2013 started their seasonal increase later, and rose and peaked moderately in comparison with previous years (Figure 39).

The majority of jurisdictions peaked in activity around late August, followed by a decline in influenza activity back to inter-seasonal levels. However, influenza activity remained particularly elevated in South Australia, Queensland and the Northern Territory during the latter part of 2013

Indigenous status

Of those states where Indigenous status completeness was greater than 50% (Western Australia, South Australia and the Northern Territory), the age standardised notification rate for influenza was 265 per 100,000 in the Indigenous population and 163 per 100,000 for the non-Indigenous population, representing a rate ratio of 1.6:1.

Figure 39: Notified cases of laboratory confirmed influenza, Australia,* 2008 to 2013, by month and year



* In South Australia, influenza was not made notifiable through legislation until May 2008.

Mortality

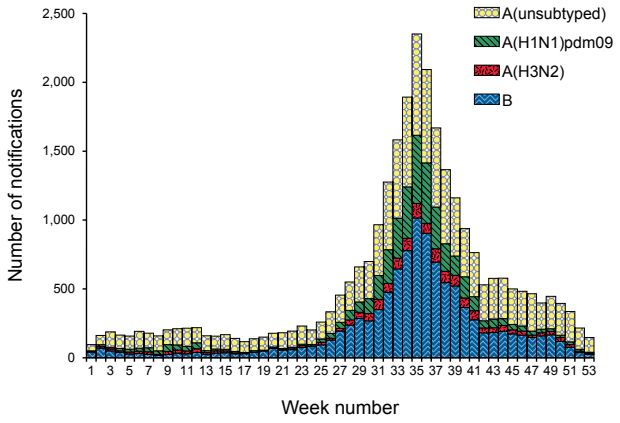
Nationally, there were 48 influenza-associated deaths notified to the NNDSS, with a median age of 67 years (range 27–97 years). The majority of deaths were associated with influenza A infections (n=39; 81%), and of these, 16 were associated with A(unsubtyped) infections, 16 were A(H3N2) and seven were A(H1N1)pdm09. Indigenous status was reported for 75% (n=36) of the influenza-associated deaths; and Indigenous peoples accounted for 8% (n=3) of these deaths. The number of influenza-associated deaths reported to the NNDSS is reliant on the follow-up of cases to determine the outcome of their infection and most likely underestimates the true mortality impact associated with this disease.

Microbiological trends

In 2013, typing data was reported for all but 11 laboratory confirmed influenza notifications. Of notifications with typing information, 63% were type A (43% A(unsubtyped), 14% (H1N1) pdm09 and 6% (H3N2) and 37% type B. Mixed influenza type A and B infections accounted for <1% of notifications. None were reported as influenza type C (Figure 40).

The overall type breakdown was similar in 2011 and 2012. Whilst the majority of influenza A reports are unsubtyped, 14% of overall notifications were reported as influenza A(H1N1)pdm09, compared with less than 1% in 2012. Further, the proportion of influenza B notifications reported in 2013 has been higher than in previous years.

Figure 40: Notified cases of laboratory confirmed influenza,* Australia, 2013, by week and subtype



* Excludes 77 mixed type A and B, and untyped influenza infections.

For 2013, the WHO Collaborating Centre for Reference and Research on Influenza (WHOCC) analysed 1,570 specimens from Australian influenza cases. This represented approximately 6% of the 28,329 laboratory confirmed cases reported to the NNDSS. Influenza A(H1N1)pdm09 comprised 45% (n=699) of influenza viruses followed by influenza B (39%; n=613) and influenza A(H3N2) (16%; n=258) (Figure 41).

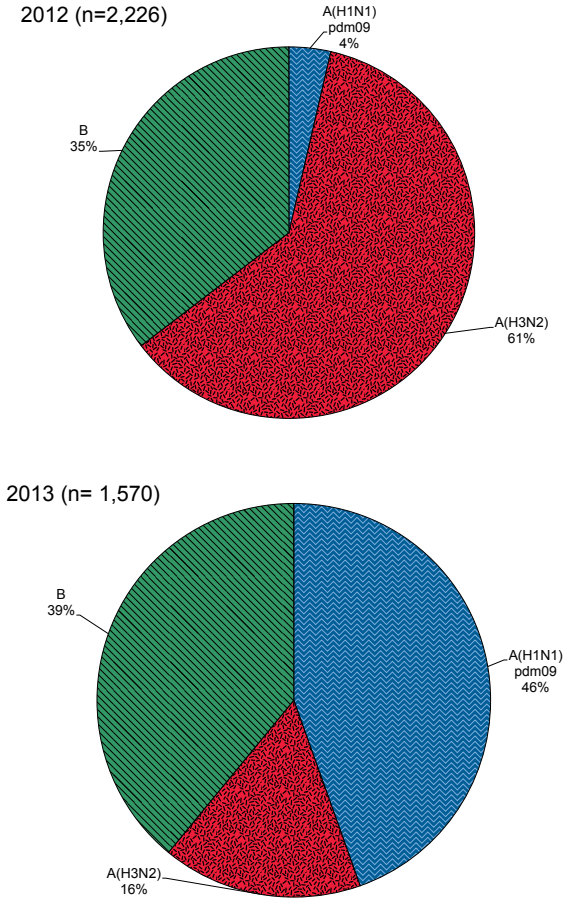
The WHOCC assessed the antigenic similarity of circulating influenza virus isolates to reference strains by haemagglutination inhibition (n=1,532 influenza virus isolates). All of the A(H1N1) pdm09 isolates (n=688) were antigenically similar to the A/California/7/2009 vaccine virus, with 5% (n=35) characterised as 'low reactors'. The haemagglutinin of these low reactor viruses mostly contained amino acid substitutions acquired *in vitro* as a result of adaptation to growth in Madin-Darby canine kidney cells as these changes were not present in the original clinical samples. All of the A(H3N2) isolates (n=234) were antigenically similar to the A/Victoria/361/2011 vaccine virus.

Of the influenza B viruses (n=610), 96% were from the B/Yamagata lineage, with the remainder from the B/Victoria lineage. Of the B/Yamagata lineage viruses (n=583), almost all were B/Massachusetts/2/2012-like viruses (n=580), including a few 'low reactors' (n=7), with the remaining B/Yamagata lineage viruses (n=3) characterised as low reactor B/Wisconsin/1/2010-like viruses. The small number of B/Victoria lineage viruses (n=27) were all antigenically similar to the former vaccine strain B/Brisbane/60/2008.

Of the viruses included in the 2013 trivalent Australian influenza vaccine, the influenza A(H1N1)pmd09 and A(H3N2) viruses that were isolated during 2013 were antigenically similar to the 2013 vaccine viruses. However, the B/Yamagata lineage virus isolates were mostly antigenically similar to the B/Massachusetts/2/2012 virus, with very few detections of the B/Wisconsin/1/2010 vaccine strain.

Viruses collected in 2013 were also tested for sensitivity to the neuraminidase inhibitor class of antiviral drugs. Neuraminidase inhibition assays were performed on 1,458 virus isolates consisting of 665 A(H1N1)pdm09, 575 B and 218 A(H3N2) viruses. Reduced inhibition by oseltamivir was detected in 4 A(H1N1)pdm09 isolates and was mediated by the well characterised H275Y mutation, which is known to confer resistance to oseltamivir.[57] Reduced inhibition to zanamivir was detected in a single B/Yamagata lineage isolate.

Figure 41: World Health Organization Collaborating Centre for Reference and Research on Influenza subtyped influenza virus samples, Australia, 2012 and 2013



Enhanced surveillance data sets

In addition to NNDSS data, a series of targeted influenza surveillance systems operated during 2013. Together, these systems collected data that were used to describe the season under the areas of epidemiology, morbidity, mortality and virology and supported the conclusions drawn from analyses of NNDSS notification data. Enhanced influenza surveillance was based on the following additional sources of data:

- the number and proportion of calls to a national health call centre network for influenza or influenza-like illness (ILI);
- rates of ILI from a community survey;
- consultation rates for ILI identified by sentinel general practitioners;
- consultation rates for ILI identified by hospital emergency departments in Western Australia, New South Wales and the Northern Territory;
- hospitalised cases of influenza from 15 sentinel hospitals across Australia;
- mortality data from the New South Wales Registry of Births, Deaths and Marriages; and
- typing and subtyping for influenza from sentinel laboratories in New South Wales, Victoria, Western Australia and Tasmania.

These data sources were used to inform the overall picture of influenza activity in Australia and comprehensive analysis of these data are provided in the fortnightly Australian Influenza Surveillance Report, which was published during the influenza season, and in the annual National Influenza Surveillance Scheme report.

Discussion

The 2013 influenza season in Australia began in early July, peaked in late August and was largely concluded by mid-December. Australia experienced sustained virus circulation until mid-October, which continued until mid-December for South Australia, Queensland and the Northern Territory in particular. Peak NNDSS notifications occurred approximately 1 month later than the median week of peak transmission for 2012.[58] The most commonly detected virus was influenza A(H1N1)pdm09, however influenza type B and A(H3N2) were also prominent. The age distribution of influenza notifications in the 2013 season was mixed, with infants and young children most affected, followed by middle-aged adults.

Taken together, data from most influenza surveillance systems showed that the overall impact of influenza in 2013 was indicative of a relatively mild to moderate season with some sustained activity experienced in the latter part of the year. The average number of influenza notifications reported per week during the season were around half that in 2012, and both ILI and influenza activity across systems were overall lower than in 2012.[59]

Invasive *Haemophilus influenzae* type b

- There were 20 cases of invasive Hib reported in 2013.
- Of the cases reported 60% were female and 55% were under the age of 5 years.
- The 2013 notification rate of Hib remains low at 0.1 per 100,000 population.

Invasive Hib is a bacterium that 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 on to the NIP in 1993, there has been a reduction of more than 95% in notified cases of Hib disease in Australia, which now has one of the lowest rates in the world.[26]

Epidemiological situation in 2013

In 2013, there were 20 notifications of Hib disease reported. This was a slight increase compared with cases reported in 2012 (n=15), and representing a ratio of 1.0 compared with the mean of the previous 5 years. The 2013 notification rate was 0.1 per 100,000 and was consistent with the very low rates seen since the introduction of the vaccine on the NIP in July 1993 (Figure 42).

Cases occurred in the 3 most populous states of New South Wales (n=9), Queensland (n=7) and Victoria (n=4). The notification rates were consistent between states ranging from 0.1 per 100,000 in Victoria to 0.2 per 100,000 in Queensland. There were no infants deaths reported in 2013. One Hib associated death was reported in a 65-year-old non-Indigenous female of unknown vaccination status.

Age and sex distribution

In 2013, the male to female ratio was 0.7:1, 8 male and 12 female cases. More than half of the cases (n=11) were in children aged less than 5 years

and 73% (n=8) of these were among infants less than 1 year. Consistent with previous years, the 0–4 years age group had the highest notification rate (0.7 per 100,000). There were no cases reported among young adults between 20 and 39 years of age while adults 40 years of age or over accounted for 35% (n=8) of cases (Figure 43).

Figure 42: Notified cases and notification rate for invasive *Haemophilus influenzae* type b infection, Australia, 1993 to 2013, by year of diagnosis

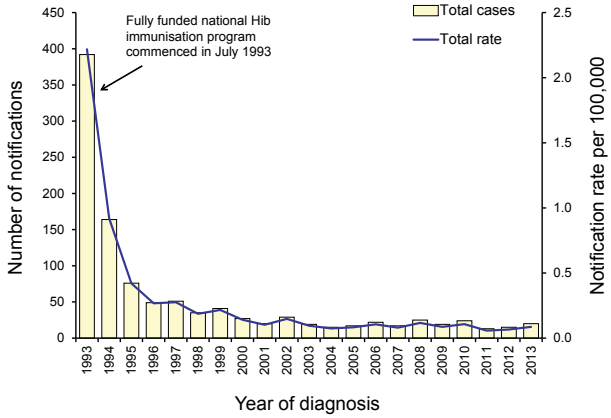
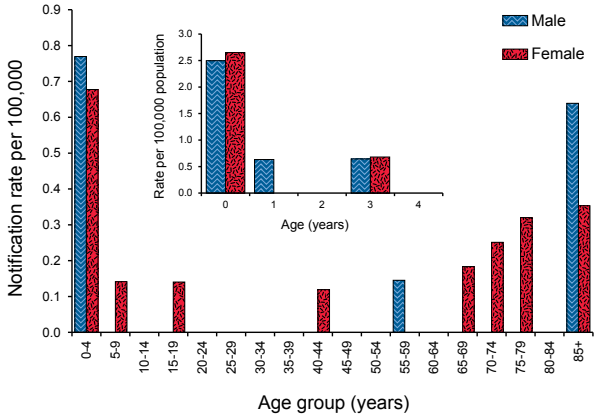


Figure 43: Notification rate for invasive *Haemophilus influenzae* type b infection, Australia, 2013, by age group and sex



Indigenous status

Indigenous status was reported for 90% (n=18) of all cases in 2013. Two cases were reported as being Indigenous, representing a notification rate of 0.3 per 100,000, which was consistent with 2012 and 2011 (0.3 per 100,000 and 0.4 per 100,000 respectively) and lower than 2010 (1.4 per 100,000).

Vaccination

The NIP schedule in 2013 recommended a primary course of 3 doses at 2, 4, and 6 months of age, with additional booster doses at 4 years and between 10 and 15 years, delivered through school-based programs.[50]

In 2013, persons aged less than 21 years of age were eligible for Hib vaccination under the NIP during their infancy. Twelve of the 20 Hib cases reported in 2013 were eligible for vaccination. Of the 5 cases who were 12 months of age or over and therefore eligible for the full vaccine course, none were fully vaccinated. Of the 7 cases who were less than 12 months of age, six were partially vaccinated and one was not vaccinated. Two partially vaccinated cases had received all 3 primary vaccine doses, two had received 2 doses and two had received 1 dose.

Invasive pneumococcal disease

- A total of 1,546 cases of invasive pneumococcal disease were notified in 2013, representing a notification rate of 6.7 per 100,000.
- This was the lowest national rate reported since the introduction of the universal 7-valent pneumococcal conjugate vaccine (7vPCV) program for young children in 2005 and follows the replacement of the 7vPCV with the 13-valent pneumococcal conjugate vaccine (13vPCV) in July 2011.

Invasive pneumococcal disease is a disease in which *Streptococcus pneumoniae* is isolated from a normally sterile site such as blood, cerebrospinal fluid or pleural fluid. Transmission of the bacterium from person to person is usually via the inhalation of infected respiratory droplets. Many of the signs and symptoms of IPD are non-specific including fever, chills, headache, stiff neck and a general feeling of being 'out-of-sorts', through to seizures and occasionally coma.

Epidemiological situation in 2013

There were 1,546 notified cases of IPD reported in 2013, representing a notification rate of 6.7 per 100,000. This was the lowest national rate reported since the introduction of the universal 7vPCV program for young children in 2005.

Geographic description

The number of cases in all states and territories, except for Victoria, decreased in 2013 with the Australian Capital Territory recording the greatest reduction in cases (48% decrease) when compared

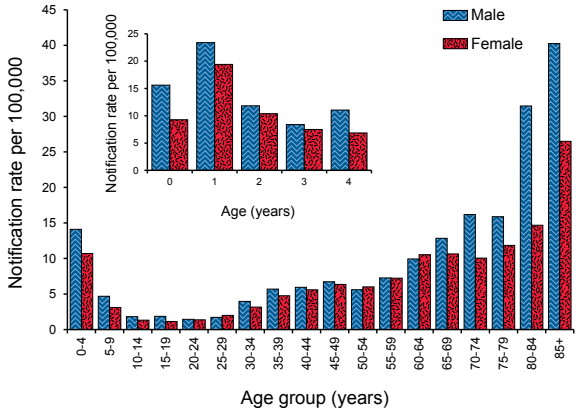
with 2012. The notification rate of IPD varied from 3.7 per 100,000 in the Australian Capital Territory to 24.0 per 100,000 in the Northern Territory. Victoria recorded only a small increase in the number of cases notified, maintaining the same rate as recorded in 2012 (6.8 per 100,000).

Age and sex distribution

In 2013, males accounted for 54% (n=829) of cases of IPD, resulting in a male to female ratio of 1.2:1. The rate for disease in males exceeded that in females in all age groups except for the 25–29, 50–54, 55–59 and 60–64 years age groups (Figure 44).

In 2013, the notification rate for IPD was highest in the elderly and in young children, with an age distribution similar to the distribution seen in 2012. In the elderly, the highest notification rate was in those aged 85 years or over (31.4 per 100,000), while the highest rate in children aged less than 5 years was in those aged 1 year (21.4 per 100,000) (Figure 44).

Figure 44: Notification rate for invasive pneumococcal disease, Australia, 2013, by age group and sex



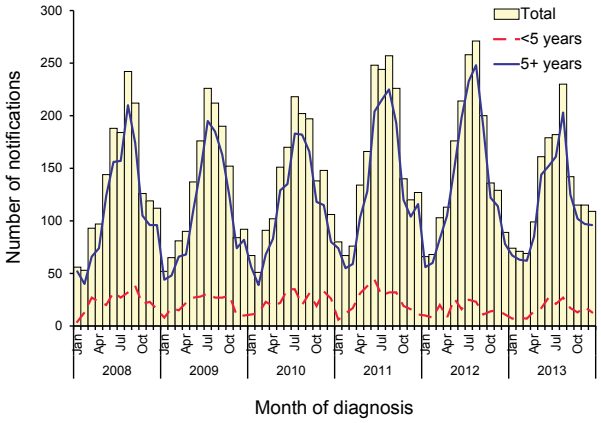
Seasonality

Many respiratory diseases including IPD are known to show a distinct seasonal trend that generally peaks during the winter months. In 2013, the seasonal trend of IPD was consistent with previous years with notifications peaking in August (n=230) (Figure 45).

Indigenous status

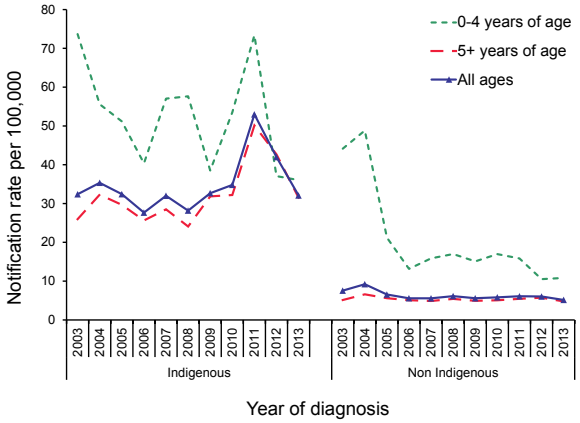
Completeness of Indigenous status reporting was reasonable in 2013, with 88% (n=1,356) of cases reported with a known Indigenous status. Of those cases with a known Indigenous status,

Figure 45: Notified cases of invasive pneumococcal disease, Australia, 2008 to 2013, by month of diagnosis



14% (n=193) of notifications were reported as Indigenous. In 2013, the notification rate for IPD in the Indigenous population (32.1 per 100,000) was approximately 6 times the rate for non-Indigenous people (5.2 per 100,000). In 2013, the notification rate for IPD in the non-Indigenous population was the lowest recorded since the introduction of the universal 7vPCV program for young children in 2005 (Figure 46).

Figure 46: Notification rate for invasive pneumococcal disease, Australia, 2003 to 2013, by Indigenous status, year of diagnosis and age group



2005 – Introduction of universal childhood 7vPCV immunisation program.

July 2011 – The 13vPCV immunisation replaced the 7vPCV component in the universal childhood immunisation program.

In 2013, the notification rate for IPD in Indigenous children aged under 5 years (36.1 per 100,000) reached its lowest since 2005. The rate in non-Indigenous children aged under 5 years (10.8 per

100,000) only slightly exceeds the lowest rate recorded in this subgroup since 2005 (10.5 per 100,000 in 2012).

Vaccination

In Australia, pneumococcal vaccination is recommended as part of routine immunisation for the medically at-risk, children under 5 years of age, Aboriginal and Torres Strait Islander peoples aged 50 years or over and other Australians aged 65 years or over.[50]

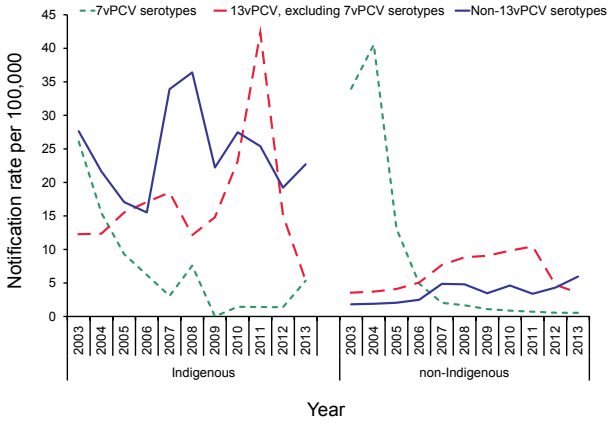
The 7vPCV was added to the NIP schedule in 2001 for Indigenous and medically at-risk children and then expanded in 2005 to include all infants nationally, together with a catch-up vaccination for all children aged less than 2 years. In 2011, the 7vPCV was replaced on the NIP by the 13vPCV and further expanded to include all children aged under 5 years. The 7vPCV targets 7 *S. pneumoniae* serotypes (4, 6B, 9V, 14, 18C, 19F and 23F) and the 13vPCV targets the same 7 serotypes plus 6 additional serotypes (1, 3, 5, 6A, 7F, 19A). In 2013, 37% of notifications in children aged under 5 years were a result of a serotype included in either the 7vPCV or 13vPCV vaccines.

Vaccination with the 23-valent pneumococcal polysaccharide vaccine (23vPPV) was added to the NIP for Indigenous Australians aged 50 years or over in 1999 and for non-Indigenous Australians aged 65 years or over from January 2005.[60] The 23vPPV targets 23 *S. pneumoniae* serotypes (1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F and 33F). In 2013, 63% of notifications in Indigenous peoples aged 50 years or over, and 59% of notifications in non-Indigenous Australians aged 65 years or over, were a result of a serotype included in 23vPPV.

Microbiological trends

Although there are over 90 *S. pneumoniae* serotypes, a relatively limited number cause the majority of IPD. Data on serotypes of pneumococcal isolates is critical for understanding of vaccine effects in both immunised and non-immunised populations such as herd immunity effects and serotype replacement. IPD serotypes were reported in 96% (n=1,491) of notified cases in 2013. The dramatic reduction in IPD due to serotypes targeted by the 7vPCV, following the introduction of the vaccine, in children aged under 5 years has been maintained, although the rate for IPD in Indigenous children aged under 5 years increased from 1.4 per 100,000 (n=1) in 2012 to 5.3 per 100,000 (n=4) in 2013 (Figure 47). This is likely to be a sporadic increase in this group as all 4 cases were caused by a different serotype (14, 18C, 19F and 9V). In 2013, the 7vPCV serotypes accounted for only 7% (n=12) of IPD notifications with known serotype in children aged under 5 years.

Figure 47: Notification rate for invasive pneumococcal disease in children aged less than 5 years, Australia, 2002 to 2013, by Indigenous status, year and serotype category



2001 – Introduction of 7vPCV immunisation for Aboriginal and Torres Strait Islander and medically at-risk children and 23vPPV booster for Aboriginal and Torres Strait Island children in the Northern Territory, Western Australia, South Australia and Queensland.

2005 – Introduction of universal childhood 7vPCV immunisation program.

July 2011 – The 13vPCV immunisation replaced the 7vPCV component in the universal childhood immunisation program.

Enhanced surveillance data sets

Enhanced data are available for IPD notifications. Further analyses, including risk factors and antibiotic susceptibilities can be found in the IPD annual report series also published in CDI.

Prior to 2011, an increasing trend in IPD due to the 6 additional serotypes targeted by the 13vPCV (13vnon7v), indicative of serotype replacement, was observed in children under 5 years of age. However, since the introduction of the 13vPCV in 2011, the rate for IPD due to the 13vnon7v serotypes in both Indigenous children and non-Indigenous children has reduced to the lowest rate recorded in a decade (5.3 per 100,000 and 3.5 per 100,000 respectively). Overall in 2013, 13vnon7v serotypes accounted for 31% (n=58) of IPD notifications in children aged under 5 years compared with 44% (n=82) in 2012. For both Indigenous and non-Indigenous children, the most common 13vnon7v serotype causing disease in 2013 was still serotype 19A: 100% of cases in Indigenous children and 61% of cases in non-Indigenous children.

Measles

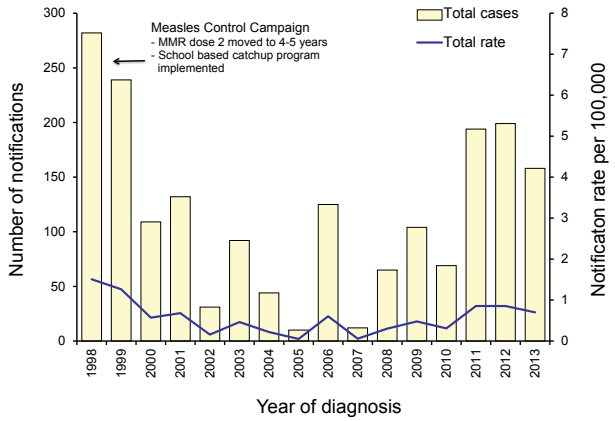
- In 2013, there were 158 notified cases of measles, the majority of which were either imported or import-related.
- There were 20 clusters of two or more epidemiologically linked cases in 2013.
- Transmission was interrupted quickly in all except 1 outbreak involving 44 cases over 17 weeks.
- Of cases eligible for vaccination, the majority were either not vaccinated (43%) or their vaccination status was not able to be established (38%).

Measles is a highly infectious, acute viral illness spread by respiratory secretions, including aerosol transmission.[61] Initial symptoms last 2 to 4 days and are characterised by fever and malaise, followed by a cough, coryza and conjunctivitis. It is usually followed by a red blotchy rash, which typically begins on the face, and then becomes generalised. Measles is often a severe disease with complications more common in the chronically ill, including otitis media, pneumonia, diarrhoea and acute encephalitis.[62] Subacute sclerosing panencephalitis is a late, rare (approximately 1 in 100,000 cases) complication of measles caused by persistent infection and is always fatal.[50] Complications are more common in children under 5 years of age and in adults over 20 years of age.[63]

Epidemiological situation in 2013

In 2013, there were 158 notifications of measles. This represents a notification rate of 0.7 per 100,000, which is 1.3 times the mean of the previous 5 years but a decrease compared with 2012 and 2011, where 199 and 194 cases were reported respectively (Figure 48).

Figure 48: Notified cases and notification rate for measles, Australia, 1998 to 2013, by year



Geographic description

In 2013, cases of measles occurred in all states and territories, except the Northern Territory and Tasmania. The majority of cases occurred in Queensland (n=52), followed by Victoria (n=41), New South Wales (n=34), South Australia (n=16), Western Australia (n=14) and the Australian Capital Territory (n=1) (Figure 49).

Age and sex distribution

The overall male to female ratio was 1.3:1 in 2013, representing a male rate for 0.8 per 100,000 compared with a female rate for 0.6 per 100,000. There was a wide variation in the male to female rate ratio across the age groups with 3 times as many males compared with females in the 25–29 years age group (n=13 and n=4 respectively) and equal numbers in the 0–4 years age group (n=10) (Figure 50)

In 2013, age at diagnosis ranged from 0 to 51 years with a median age of 21 years. Notification rates decreased or remained consistent across all age groups in 2013, compared with 2012. Consistent with recent years, infants less than 1 year of age had the highest age specific rate, 2.3 per 100,000, in 2013. Rates have remained below 2.5 per 100,000 in all age groups between 2008 and 2013, with the exception of the less than 1 year age group in 2011 and 2012 (Figure 51).

Twenty-three cases occurred in those born between 1978 and 1982 (31–35 years of age in 2013), a cohort previously identified as susceptible to measles infection.[64] One case was born before 1966, a cohort that is considered to have high levels of natural immunity.[65]

Seasonality

In Australia, a seasonal pattern is no longer evident due to the virus no longer being endemic (Figure 49). In temperate climates and where measles transmission remains endemic, the majority of cases occur in late winter to early spring.[66]

Indigenous status

Indigenous status was completed for 91% of cases in 2013 (n=143), a decrease compared with the 98% of cases in 2012. Of these cases, 2.1% (n=3) were reported as Indigenous.

Figure 49: Notified cases of measles, Australia, 2008 to 2013, by month of diagnosis and state and territory

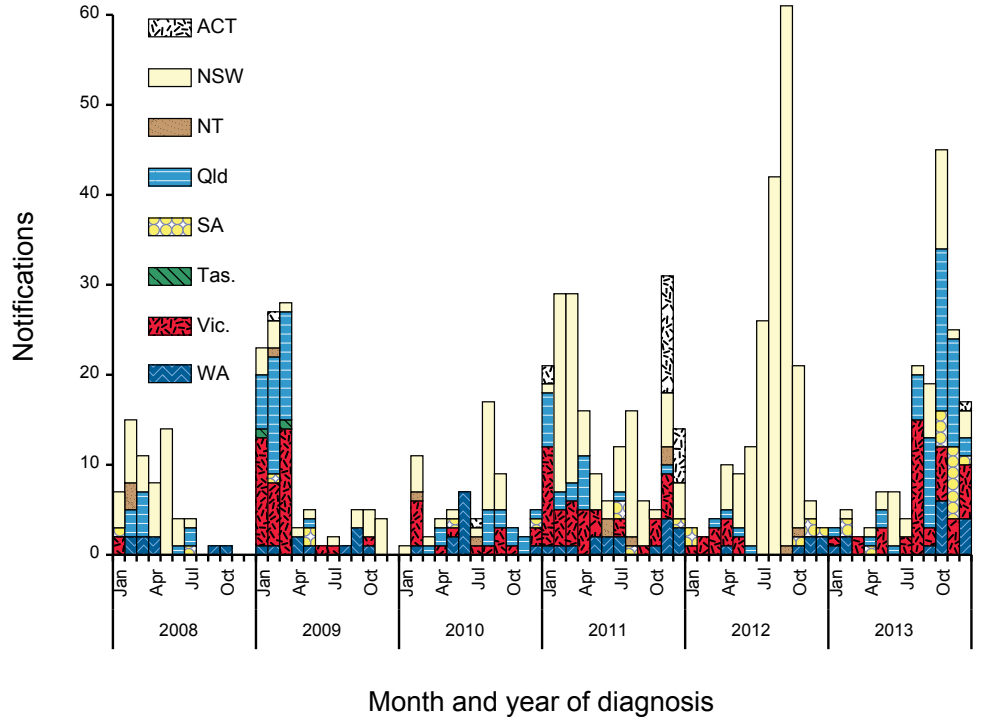


Figure 50: Notification rate for measles, Australia, 2013, by age group and sex

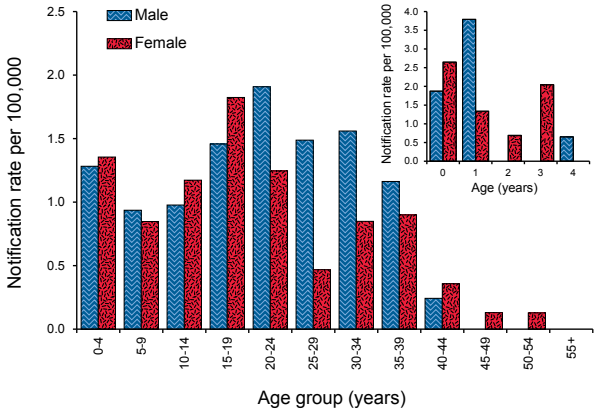
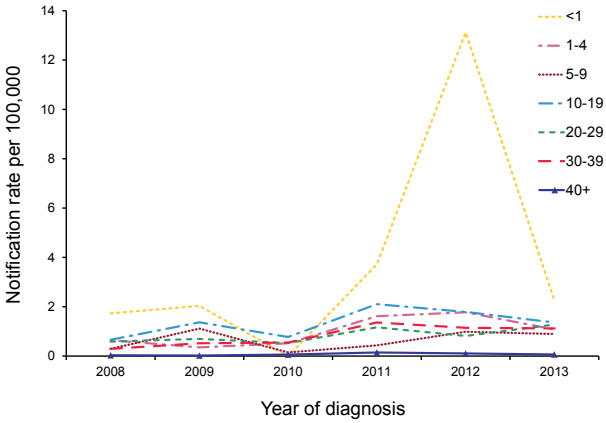


Figure 51: Notification rate for measles, Australia, 2008 to 2013, by year of diagnosis and selected age groups



Source of infection and outbreaks

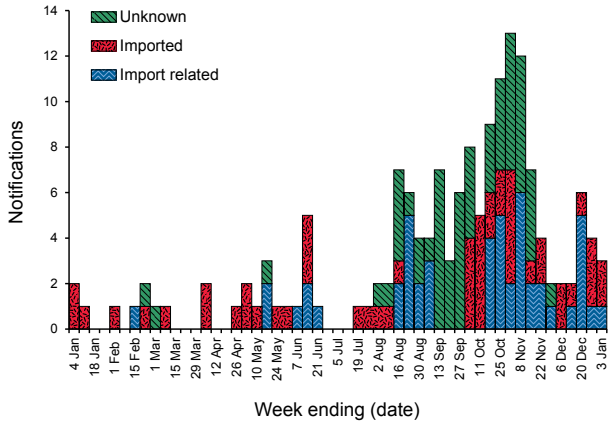
Sixty-four per cent of cases in 2013 were either imported (n=52) or import-related (n=49) with the remaining 36% (n=57) of unknown source (Figure 52).

Of the imported cases, 65% (n=34) were from the WHO defined South East Asia Region, the majority of which were from Indonesia (n=20). The WHO Western Pacific Region, of which Australia is a part, accounted for 17% (n=9) of imported cases. The remaining 18% from the WHO Eastern Mediterranean Region (n=4) and the European Region (n=5).

There were 20 clusters of two or more epidemiologically linked cases in 2013 accounting for 75% (n=119) of all cases. The remaining 25% of cases comprised sporadic imported cases (n=32) and sporadic cases acquired in Australia of unknown source (n=7). The majority of clusters were import related (n=17) comprising 58% (n=69) of cluster cases. The 3 clusters of locally-acquired cases of unknown source occurred in 3 separate states

including Western Australia: 1 cluster of 2 cases; New South Wales: 1 cluster of 4 cases; and the large outbreak involving both Victoria and Queensland (n=44 cases).

Figure 52: Notified cases of measles, Australia, 2013, by diagnosis week ending and source of infection



Transmission was interrupted quickly in all except 1 outbreak. The median duration was 18 days (range 1–118 days) between the onset of symptoms in the index and the last case and the median numbers of generations[67] was 2 (range 0–12). Nineteen of 20 clusters had less than 10 cases with a median of 3.5 (range 2–44) cases. The largest outbreak, comprising 44 cases, commenced in Victoria (n=7) with subsequent linked cases in Queensland (n=37). This outbreak lasted approximately 17 weeks from the end of July and included 12 generations of spread. While it was classified as being of unknown source, it was most likely associated with an imported case at an international gaming convention in Melbourne, which the index case had attended during the exposure period.

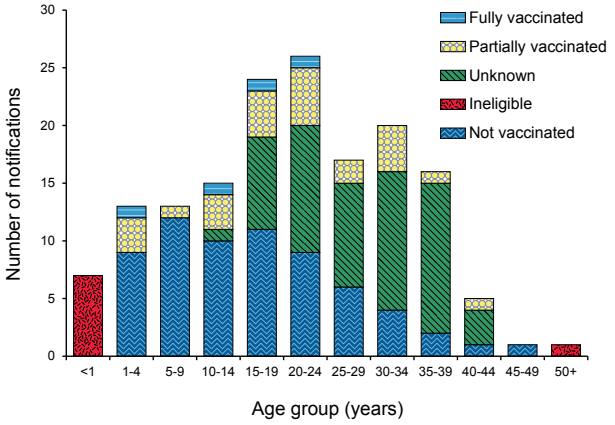
Vaccination

Two doses of the measles containing vaccine are recommended for all persons born during or after 1966. The MMR induces long term measles immunity in 95% of recipients after a single dose and 99% of recipients after the 2nd dose.[50]

Of the 158 cases notified in 2013, 95% (n=150) were born after 1965 and were 12 months of age or over and therefore eligible for at least 1 dose of a publicly funded measles-containing vaccine. Over 80% of cases eligible for vaccination were either not vaccinated (43%, n=65) or of unknown vaccination status (38%, n=57). Of the remaining 19% (n=28) who were vaccinated, four had received the full course of 2 doses of a measles-containing vaccine and 24 were partially vaccinated with 1 dose (Figure 53).

The 5–9 years age group had the highest proportion of unvaccinated cases (18%) with young children and adolescents between 5 and 19 years of age accounting for 51% of all unvaccinated cases. The proportion of cases with unknown vaccination status increases with age and where provided may be less reliable mostly being based on self-reporting. In 2013, there was 1 case less than 15 years of age reported as of unknown vaccination in contrast to 44% (n=48) of cases 15 years or over having unknown vaccination status (Figure 53).

Figure 53: Notified cases of measles, Australia, 2013, by selected age groups and vaccination status

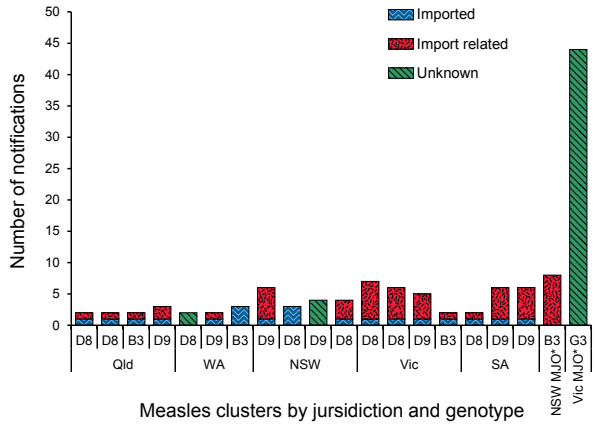


Microbiological trends

Genotyping data were available for all 20 clusters with 2 or more linked cases in 2013. Genotype D9 was associated with 7 separate clusters (n=32 cases), D8 with 8 clusters (n=28 cases), B3 with 3 clusters (n=15 cases) and G3 with the large outbreak across Victoria and Queensland (n=44 cases) (Figure 54). Of the 39 sporadic cases 72% (n=28) were genotyped.

Imported genotypes varied by WHO region. A single genotype was imported from 2 regions; 4 separate importations of B3 from the Eastern Mediterranean Region and 3 separate importations of D8 from the European Region. Multiple genotypes were imported from the South East Asia Region (B3, D8, D9 and G3) and the Western Pacific Region (B3, D8 and D9).

Figure 54: Measles clusters, Australia, 2013, by state or territory, genotype and source of infection



MJO = multi-jurisdictional outbreak

Discussion

The increasing prevalence of measles in some parts of the world and the continued circulation of the virus in countries of close geographical proximity to Australia will result in a continual source of imported virus in Australia. This was particularly the case in 2013 with 52 separate importations occurring. Despite this large number of importations in 2013, the majority were sporadic and did not lead to ongoing local transmission.

Evidence suggests that endemic measles has been eliminated from Australia, since at least 2005.[66] Based on the WHO definitions, Australia has continued to maintain this status. In 2013, none of the outbreaks persisted for more than 12 months and there was no evidence of a single genotype continuously circulating. Ongoing evidence of high population immunity was demonstrated by the small number of cases and the short duration of outbreaks. Only 1 outbreak in 2013 involved more than 4 generations of transmission, or lasted greater than 6 weeks.

However, due to the highly infectious nature of measles, local transmission and outbreaks will continue to occur, mostly among susceptible contacts of non-immune travellers from countries where measles remains prevalent.

Mumps

- The mumps notification rate has been less than 1 per 100,000 since 2009.
- In 2013 there were 217 notified cases of mumps.

Mumps is an acute viral illness with an incubation period of 12 to 25 days. Transmission is usually by respiratory secretions, including aerosol transmission, or by direct contact with saliva. Asymptomatic infections occur in one-third of cases. Symptomatic disease ranges from mild upper respiratory tract infections to systemic involvement. The characteristic bilateral, or occasionally unilateral, parotid swelling occurs in 60% to 70% of clinical cases, however a high proportion have non-specific symptoms including fever, headache, malaise, myalgia and anorexia.[68] Mumps encephalitis has been estimated to occur in 1 to 2 per 10,000 cases, with a case fatality rate of around 1%.

Epidemiological situation in 2013

In 2013, there were 217 notifications of mumps. A notification rate of 0.9 per 100,000, which represented an 8.5% increase compared with the 200 cases reported in 2012 and continues the slight upward trend noted since 2011 (Figure 55). From 2007 to 2010 the overall notification rate of mumps declined, falling from a peak of 2.8 per 100,000 in 2007 to 0.4 per 100,000 in 2010.

Geographic description

Cases were reported from all states and territories. Jurisdictional specific rates were highest in the Northern Territory (2.5 per 100,000) followed by Western Australia (1.8 per 100,000).

Age and sex distribution

In 2013, the overall male to female ratio was 1.4:1, with some variation in this ratio between age groups. The highest rates for males occurred in the 15–19 years age group at 2.5 per 100,000, while for females rates were highest in the 40–44 years age group at 1.4 per 100,000 (Figure 56).

There were cases of mumps notified across all age groups with the median age at diagnosis being 32 years (range 0–90 years). Consistent with recent years, young adults in the 30–39 and 20–29 years age groups had the highest rates of infection with 1.6 per 100,000 and 1.4 per 100,000 respectively. The most notable increase in age group rates occurred among children less than 1 year of age (Figure 57).

Indigenous status

A known Indigenous status was reported for 79% (n=171) of mumps cases in 2013. This was higher than the level of completeness over the previous 5-year period (mean 63%, range 51% to 77%). Of the cases with a known Indigenous status reported,

Figure 55: Notified cases of mumps, Australia, 2008 to 2013, by month of diagnosis and state or territory

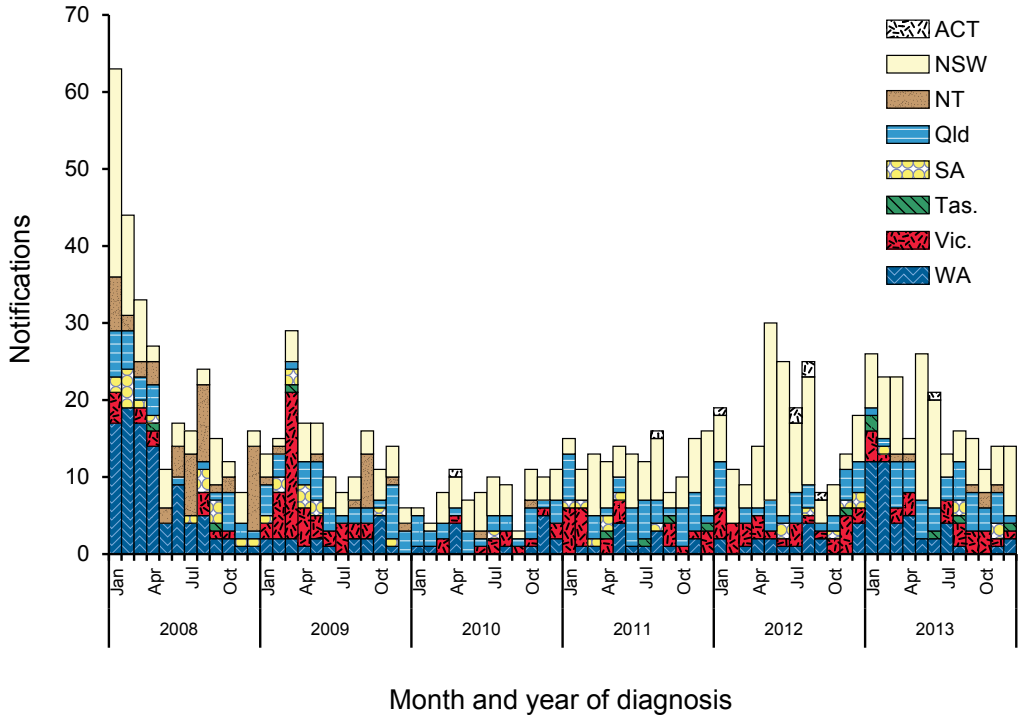


Figure 56: Notification rate for mumps, Australia, 2013, by age group and sex

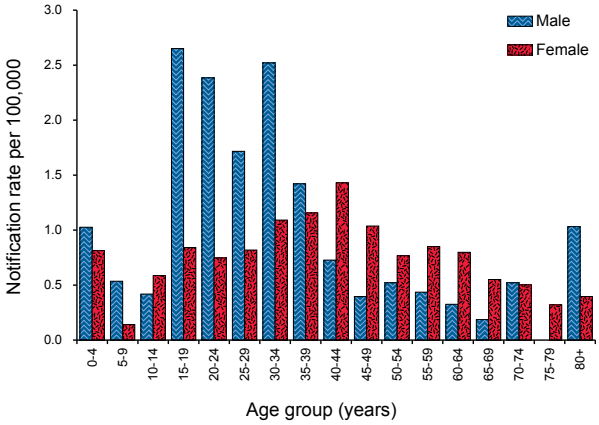
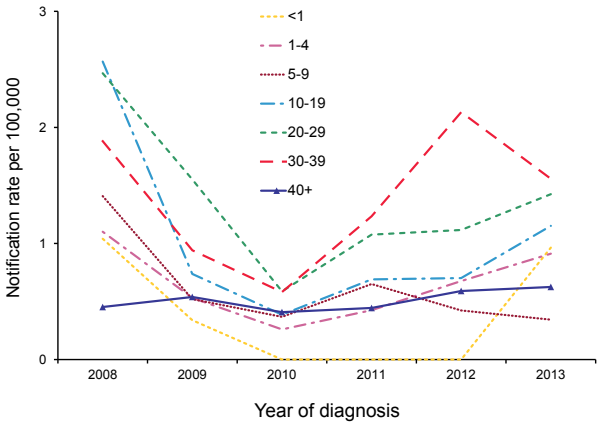


Figure 57: Notification rate for mumps, Australia, 2008 to 2013, by year of diagnosis and selected age groups



5 cases (3%) were reported as Indigenous. The proportion of mumps notifications reported as Indigenous has been less than 5% since 2010.

Outbreaks

Place of acquisition was complete for 74% (n=160) of cases in 2013 of which 18% were imported from overseas: 21 from Asia, five from Europe, two from the Americas and one from Africa. Eighty-two per cent were reported as locally acquired in Australia.

The outbreak reference field was completed for 6% (n=13) of cases in 2013. There were 6 outbreaks of two or more epidemiologically linked cases, all of which occurred in Western Australia. Two of these outbreaks were linked to imported cases.

Vaccination

The mumps vaccine was first funded on the NIP schedule in 1982 for infants at 12 months of age, with those born after 1980 eligible for at least 1 dose of a mumps-containing vaccine.

The mumps component of the MMR vaccine is considered to be the least effective of the 3 com-

ponents with 1 dose vaccine effectiveness varying between 60% and 90%.[69–71] While protection is greater in 2-dose vaccine recipients, recent outbreaks have been reported among these, particularly young adults who received their vaccines more than 10 years previously.[72,73] Reduced effectiveness of the mumps vaccine over time may also partially account for the proportion of vaccinated cases and contribute to mumps outbreaks in older vaccinated populations.[74]

Of the 217 cases in 2013, 50% (n=109) were eligible for at least 1 dose of a publicly funded mumps-containing vaccine. Of these, 12% (n=13) were unvaccinated and 50% (n=54) were of unknown vaccination status. Of the remaining 38% of cases (n=42), 18 were fully vaccinated, having received 2 doses of a mumps-containing vaccine, 22 were partially vaccinated with 1 dose of a mumps-containing vaccine and 2 cases had no dose number information provided.

Pertussis

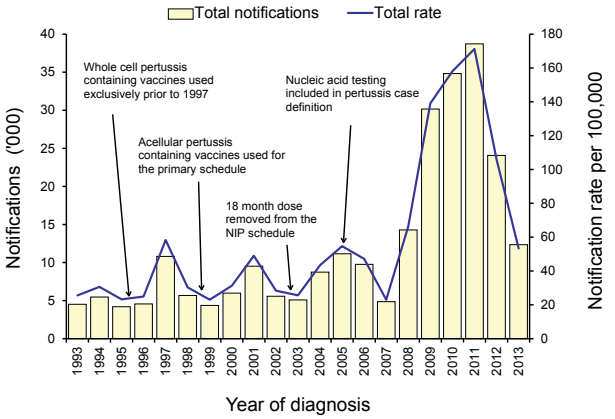
- Pertussis is the least well controlled of all VPDs and remains highly prevalent in Australia.
- In 2013 there were 12,341 cases of pertussis reported, representing a notification rate of 106 per 100,000 population and continuing the downward trend in annual notifications since 2011.
- In 2013, children under 15 years of age had a notification rate 2.7 times higher compared with those 15 years of age or over.

Pertussis, commonly known as whooping cough, is a highly infectious respiratory disease caused by *Bordetella pertussis* and is spread by respiratory droplets. The characteristic paroxysmal cough with inspiratory whoop seen among unvaccinated children is less common in individuals who have some acquired immunity from vaccination or infection.[75] Most deaths occur in unvaccinated infants under 6 months of age. Complications include pneumonia, atelectasis, seizures, encephalopathy, and hernias, with pneumonia as the most common cause of death.[21]

Epidemiological situation in 2013

In 2013, there were 12,341 notifications of pertussis. A 49% decrease in notified cases compared with 2012 (n=24,074) and 14% less than in 2008 (n=14,286) the year in which the most recent Australia-wide epidemic,[76] which peaked in 2011, began (Figure 58 and Figure 59). There were no pertussis related deaths reported in 2013.

Figure 58: Notified cases and notification rate for pertussis, Australia, 1993 to 2013, by year of diagnosis



Geographic description

In 2013, all jurisdictional specific rates decreased compared with 2012. Despite the timing of peak pertussis activity in the most recent epidemic period varying across jurisdictions, in 2013 most jurisdictional specific rates had returned to or were approaching, pre-epidemic levels. However, activity remained high in Tasmania (100 per 100,000) and Western Australia (65 per 100,000) compared with pre-epidemic rates in those states (Figure 60).

Age and sex distribution

Females accounted for 57% (n=6,986) of cases in 2013. Females had higher rates across all age groups, except among adults aged 80 years or over (Figure 61). The highest notification rate in both males and females occurred in the 5–9 years age group (117 and 130 per 100,000 respectively). Notification rates in females were on average 1.6 times that of males in the 25–64 years age groups.

In 2013, the trend prominent in this recent epidemic period of higher notification rates in children less than 15 years of age compared with those 15 years of age or over continued. Children less than 15 years of age represented 39% (n=4,807) of notifications and had a notification rate (110 per 100,000) 2.7 times higher compared with those 15 years of age or over (40 per 100,000). However, rates in children less than 15 years of age have declined steeply since reaching a peak in 2011. The highest age specific rates in 2013 occurred in the 5–9 years age group (123 per 100,000) consistent with the trend since 2010, while all age group rates continued the downward trend commenced in 2012 (Figure 62).

Figure 59: Notified cases of pertussis, Australia, 2008 to 2013, by month and year of diagnosis and state or territory

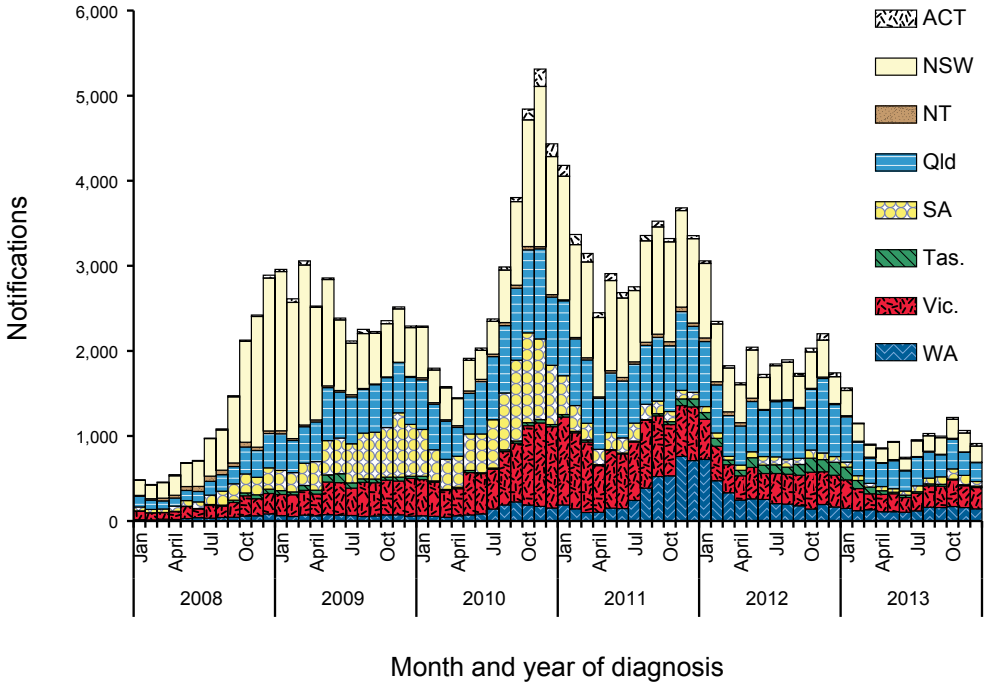


Figure 60: Notification rate for pertussis, 2008 to 2013, by year of diagnosis and state and territory

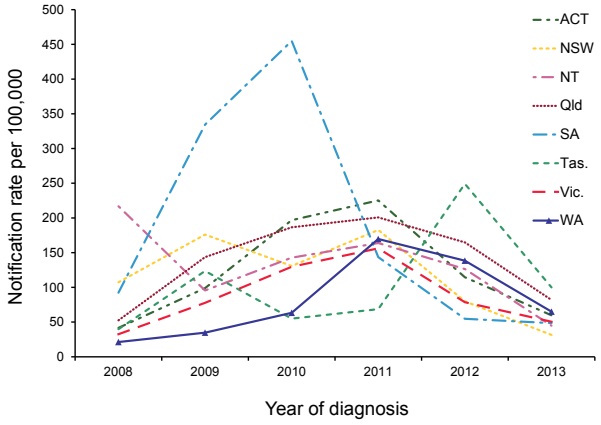


Figure 61: Notification rate for pertussis, Australia, 2013, by age group and sex

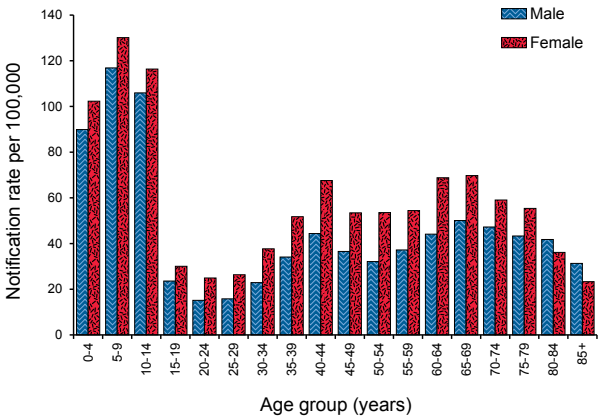
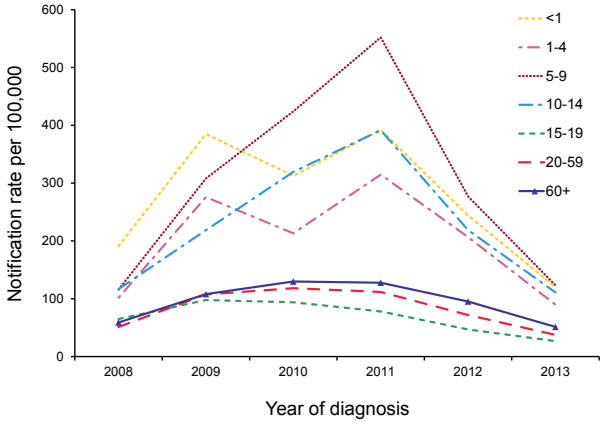


Figure 62: Notification rate for pertussis, Australia, 2008 to 2013, by year of diagnosis and selected age groups



Vaccination

The NIP schedule in 2013 included a primary course of 3 doses of vaccine at 2, 4, and 6 months of age, with additional booster doses provided at 4 years of age and between 10 and 15 years of age.[50]

Pertussis vaccine effectiveness among Australian children has been estimated to range from 82%–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.[77] Immunity to disease decreases over time post-vaccination with estimates of protection remaining for 4–12 years.[78–80]

In order to determine the vaccination status of cases, public health follow-up is required. During large epidemic periods the follow-up of all cases is not feasible and as per the pertussis national guidelines for public health units,[81] jurisdictions prioritise case follow-up to those less than 5 years of age. During 2013, those aged less than 5 years accounted for 12% (n=1,458) of all notified cases and information about vaccination status was available for 93% (n=1,350) of these cases.

For children eligible to receive the full primary course of 3 vaccinations, 66% (n=664) had done so and 24% (n=49) of those eligible had received the full scheduled course of 4 doses (Table 15).

While pertussis can affect people of any age, infants are at highest risk of more severe disease as adequate immunity is not achieved through infant vaccination until receiving at least the 2nd vaccine dose at 4 months of age.[82] Seventy-one per cent (n=1,029) of cases less than 5 years of age had received at least 2 doses of a pertussis-containing vaccine.

Discussion

Epidemics of pertussis have historically occurred at regular intervals of approximately 4 years on a background of endemic circulation in Australia. The most recent epidemic appears to be over, with most jurisdictions reporting pertussis activity consistent with pre-epidemic levels. Notification rates have decreased in all states and territories and across all age groups in 2013 compared with their epidemic peaks. Most jurisdictions correspondingly ceased their respective cocooning programs in 2012, which included various combinations of providing free booster vaccinations to pregnant women, parents and carers of infants with only the Northern Territory and New South Wales continuing this strategy into 2013.

Poliomyelitis

- Australia was certified by the WHO in 2000 as having eradicated Indigenous poliovirus.
- There were no cases of poliomyelitis identified in Australia in 2013.

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).[21]

Vaccines formulated with inactivated poliovirus, are available in combination with diphtheria toxin, tetanus and other antigens. The NIP schedule in 2013 recommended a primary course of 3 doses at 2, 4, and 6 months of age, with additional booster doses at 4 years and between 10 and 15 years, delivered through school based programs.[50]

In 2013 there were no notifications of poliomyelitis. Australia, along with the Western Pacific Region, remains 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 free country is 1 case of AFP per 100,000 children less than 15 years of age. Australia has achieved this surveillance target in all years since 2008. However, the virological surveillance indicator of adequate stool specimen collection in 80% of AFP cases has never been met. More details can be found in the annual report

Table 15: Notified cases of pertussis in children aged 0 to 5 years, Australia, 2013, by age group and number of doses of vaccine

Age group	Number of vaccine doses					Unknown	Total
	0	1	2	3	4		
Less than 6 weeks of age (not eligible for vaccination)	49	5				20	74
6 weeks to <4 months (eligible for 1 dose of vaccine)	22	72	6			7	107
4 to < 6 months (eligible for two doses of vaccine)	7	17	33			1	58
6 months to < 4 years (eligible for 3 doses of vaccine)	85	33	174	662	2	56	1,012
4 to 5 years (eligible for 4 doses of vaccine)	27	4	28	75	49	24	207
Total	190	131	241	737	51	108	1,458

series published in the CDI by the Australian Enterovirus Reference Laboratory who coordinate poliovirus surveillance activities in Australia.

Rubella and congenital rubella syndrome

- Rubella is a rare disease in Australia.
- Since 2003, rubella notifications have been less than 0.3 per 100,000.
- In 2013 there were 25 cases of rubella and 2 cases of congenital rubella syndrome reported.

Rubella is generally a mild and self-limiting viral infectious disease. It is spread from person to person through contact with respiratory secretions, including aerosol transmission. Clinically, rubella can be difficult to distinguish from other diseases that also cause febrile rash, such as measles, and is asymptomatic in up to 50% of cases.[21]

Epidemiological situation in 2013

In 2013 there were 25 cases of rubella reported, which was a rate of 0.1 per 100,000. While this is consistent with the low rates of this disease experienced since 2003, it is a marked decline from the peak rate of more than 30 per 100,000 in 1995 (Figure 63). Indigenous status was recorded for all cases, none of which were reported as Indigenous. There were 2 cases of congenital rubella syndrome (CRS) reported in 2013. Both cases were imported, one each from Nepal and Thailand. The first was a newly arrived refugee infant born overseas and diagnosed later on arrival in Australia. The 2nd infant was born in Australia to a non-immune mother who acquired her infection whilst overseas.

Geographic distribution

Cases were reported from New South Wales (n=12), Queensland (n=6), Victoria (n=3), South Australia (n=2) and one each from the Australian Capital Territory and Western Australia (Figure 64).

Figure 63: Notification rate for rubella, Australia, 1991 to 2013, by year of diagnosis

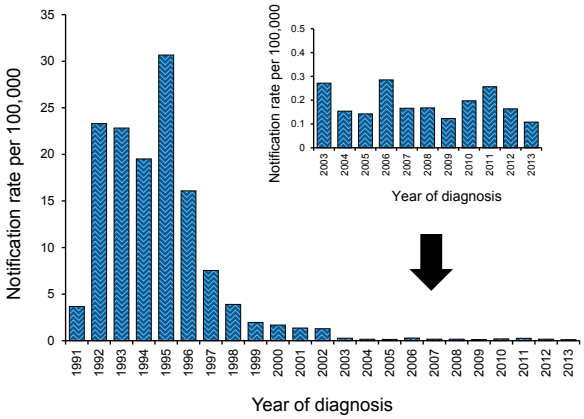
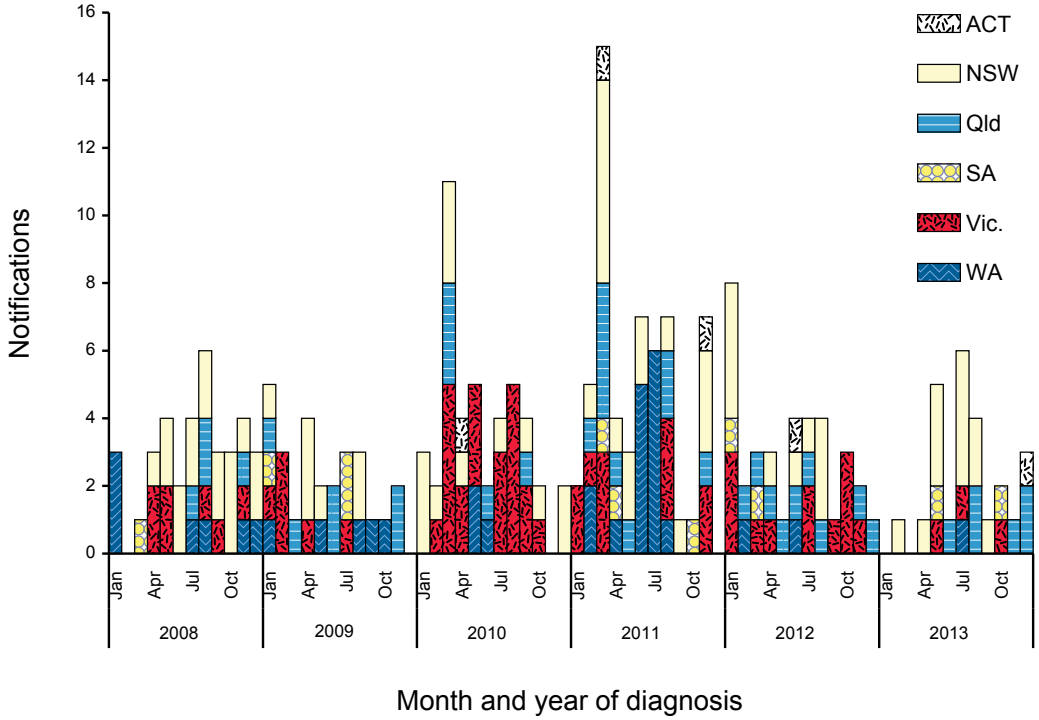


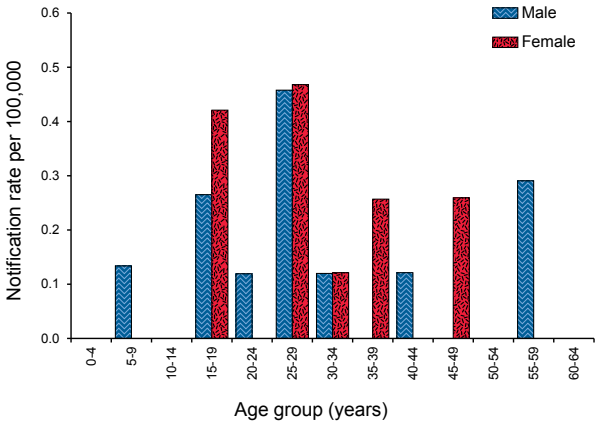
Figure 64: Notified cases of rubella, Australia, 2008 to 2013, by month and year of diagnosis and state or territory



Age and sex distribution

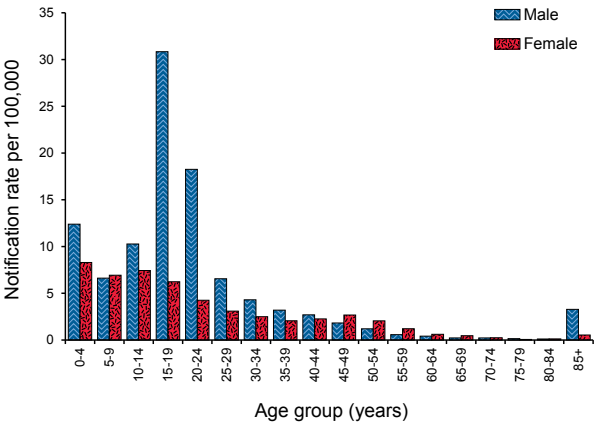
There were approximately equal numbers of males (n=13) and females (n=12) in 2013. The median age was 29 years (range 8–85 years) (Figure 65). Consistent with previous years, the majority of cases (52%) occurred in adults aged 20–39 years of age. Of all female cases, 83% (n=10) were notified in women of child bearing age (15–44 years) (Figure 65).

Figure 65: Notification rate for rubella, Australia, 2013, by age group and sex



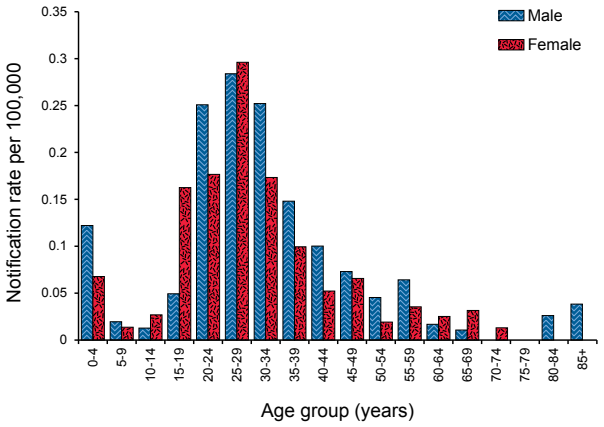
When reviewing the age and sex trend since 1991, a change in the epidemiology is evident. Between 1991 and 2002, males represented 67% of all notifications. The highest age group rates during this period occurred in the male 15–19 years age group at 31 notifications per 100,000 (Figure 66). In contrast, between 2003 and 2013 the male to female rate ratio was roughly equal with males representing 54% of all notifications. During this later period the highest rates occurred at an older age occurring in the 25–29 years age group

Figure 66: Notification rate for rubella, Australia, 1991 to 2002, by age group and sex



(0.3 per 100,000) (Figure 67). The median age also increased from 18 years of age between 1991 and 2002 to 29 years of age between 2003 and 2013.

Figure 67: Notification rate for rubella, Australia, 2003 to 2013, by age group and sex



Vaccination

Rubella vaccine is provided in the combined MMR or MMRV vaccine and in 2013 was provided under the NIP schedule at 12 months and 4 years of age. From 1 July 2013, the 2nd dose is recommended at 18 months of age.[50]

The primary aim of immunisation against rubella is to prevent cases of CRS.[83] Two doses of a rubella containing vaccine are recommended for all non-immune persons born during or since 1966 and who are greater than 18 months of age.

Of the 25 cases notified in 2013, 72% (n=18) were of unknown vaccination status and a further 24% (n=6) were reported as unvaccinated. One case was vaccinated; an 8-year-old child who had received both doses of a rubella-containing vaccine. The high level of incompleteness in this field for rubella makes any additional analysis difficult.

Discussion

The WHO Western Pacific Region, of which Australia is a member, has also endorsed accelerated rubella and CRS goals, and more recently proposed a regional goal of elimination with a target year yet to be determined.[84]

Evidence suggests that endemic rubella is well controlled in Australia. A marked decline in rubella notifications since 2003 has seen rates consistently well below the 1 per 100,000 WHO goal indicative of rubella control.[85] The increasing trend in

age of notifications likely reflects the declining rates of rubella among children since routine MMR immunisation was implemented and the subsequent achievement of high 2 dose coverage. Males, historically more susceptible because universal vaccination was not introduced until 1989, no longer appear to be at greater risk of infection compared with females.

Congenital rubella syndrome is rare in Australia and in recent years mainly occurs among infants of overseas-born women, a cohort previously identified as being at risk of non-immunity to rubella.

Improvements in surveillance data would include more routine genotyping of cases and increased completeness of vaccination status, particularly among high risk groups.

Tetanus

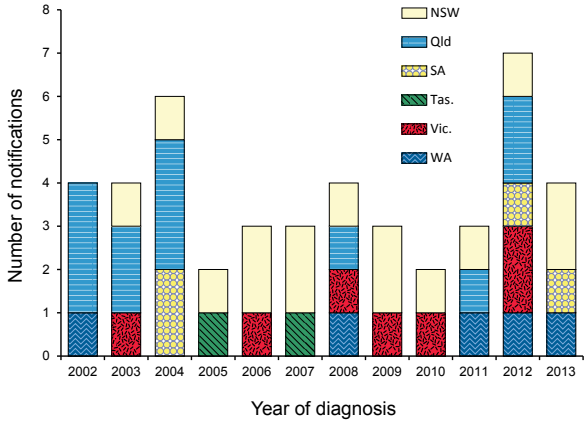
- Cases of tetanus are uncommon in Australia.
- Cases generally occur in older unvaccinated people or in those who have not received a booster dose in the last 10 years.
- In 2013, there were 4 cases of tetanus reported, with no notified deaths

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 manured soil.[21] 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. The disease usually occurs after an incubation period of 3 to 21 days (ranging from 1 day to several months), with a median time of onset at 10 days post injury. In Australia, tetanus is rare, occurring primarily in older adults who have never been vaccinated or were vaccinated in the remote past. A high level of diagnostic awareness of tetanus is important in the elderly, as most deaths occur in people over 70 years of age, especially women, and may be associated with an apparent minor injury.[50]

Epidemiological situation in 2013

In 2013, there were 4 notifications of tetanus, which was consistent with the low numbers of this disease notified in recent years. The place of acquisition for 3 cases was reported as Australia (Figure 68). There were no reported deaths due to tetanus.

Figure 68: Notified cases of tetanus, Australia, 2002 to 2013, by year of diagnosis and state or territory



Age and sex distribution

The 4 cases comprised 3 males and 1 female. One case was in the 30–34 years age group and the remaining 3 cases were over 60 years of age.

Indigenous status

Indigenous status was complete for 3 of the 4 cases, none of which were reported as Indigenous.

Vaccination

The NIP schedule in 2012 recommends a primary course of tetanus vaccination including 3 doses provided at 2, 4, and 6 months of age. Two booster doses are provided at 4 years and between 10 and 15 years delivered through school based programs. Booster doses are additionally recommended for all adults at the age of 50 years who have not received one in the previous 10 years. Complete immunisation induces protection lasting throughout childhood but by middle age 50% of vaccinees have low or undetectable levels of antibodies. However, tetanus is uncommon in people who have received 4 or more doses of a tetanus-containing vaccine and in those who received their last dose within 10 years.[50]

Of the 4 cases in 2013, one had received a single dose of a tetanus-containing vaccine and the remaining 3 cases, all of whom were over 60 years of age, were either not vaccinated or reported with an unknown vaccination status.

Varicella zoster virus

- In 2013, a total of 16,986 cases of varicella zoster virus infection were reported, which was an increase of 14% from 2012.
- 58% of cases were reported as unspecified varicella zoster infection, 30% of cases were reported as shingles and 12% of cases were reported as chickenpox.

The varicella zoster virus (VZV) is a highly contagious member of the herpesvirus family and causes 2 distinct illnesses; chickenpox as the primary infection; and following initial infection, shingles (herpes zoster), which occurs following reactivation, often many years later, of latent virus in approximately 20% to 30% of cases of chickenpox overall. Shingles occurs more frequently among older adults (most commonly after 50 years of age) and in immunocompromised people.[21]

In 2006, CDNA agreed to make the 3 categories of VZV infection nationally notifiable; 'chickenpox', 'shingles' and 'varicella zoster virus unspecified'. By 2009 all jurisdictions were notifying VZV infections to the NNDSS with the exception of New South Wales, where VZV is not notifiable.

The ability to categorise a VZV infection as chickenpox or shingles depends largely on clinical evidence. Due to the absence of information on clinical presentation for many cases, the majority of VZV infections nationally are reported as unspecified.

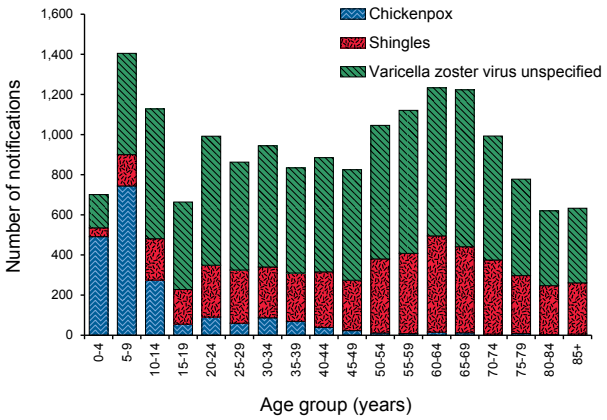
Epidemiological situation in 2013

In 2013, there were 16,986 VZV notifications from the 7 reporting jurisdictions. This was a 14% increase on cases notified in 2012 (n=14,898). Of the total VZV notifications in 2013, 58% (n=9,927) of cases were reported as unspecified varicella infection, 30% (n=5,071) as shingles and 12% (n=2,042) as chickenpox (Figure 69 and Figure 70).

Varicella zoster virus (unspecified)

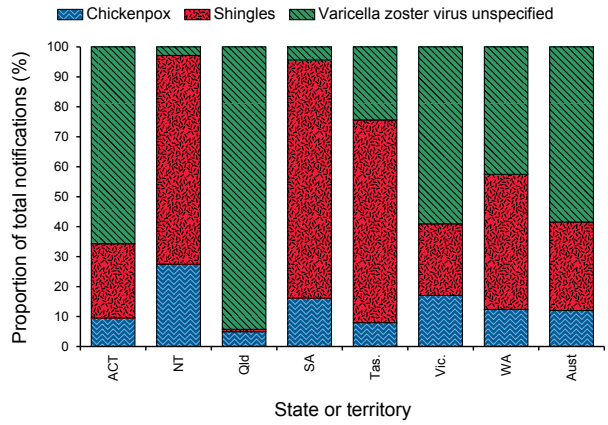
- Notifications of varicella zoster virus infection (unspecified) are laboratory confirmed cases that are positive for varicella zoster virus, that do not have the clinical diagnosis available to distinguish as chickenpox or shingles.
- In 2013 there were 9,927 cases of varicella zoster virus (unspecified) reported, which was an increase of 18% from 2012.

Figure 69: Notified cases of varicella zoster virus infection, 2013, by age group*



* Excluding New South Wales.

Figure 70: Proportion of notified cases of varicella zoster virus unspecified, chickenpox and shingles, 2013, by state or territory*



* Excluding New South Wales.

Epidemiological situation in 2013

In 2013, there were 9,927 cases of unspecified VZV infections reported. This represented a notification rate of 63 per 100,000 and an 18% increase in notifications compared with 2012 (n=8,437).

Geographic description

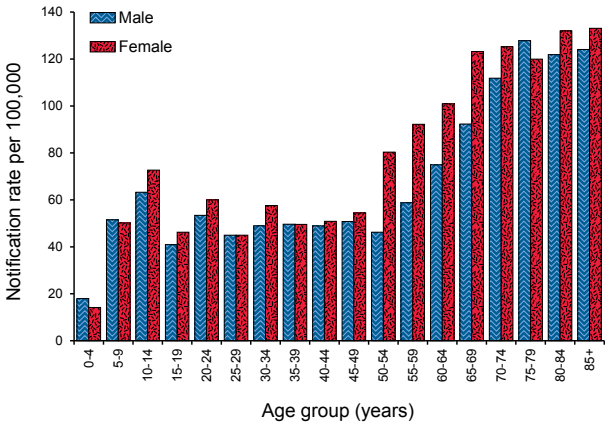
The highest notification rate for unspecified VZV was reported from Queensland at 115 per 100,000 (n=5,337) followed by Victoria at 53 per 100,000 (n=3,018) and Western Australia at 49 per 100,000 (n=1,230). VZV unspecified rates should be interpreted with caution as they are dependent on the individual jurisdictional practice of following up laboratory notifications to establish clinical presentation. For example, Queensland routinely conducts follow-up for cases of VZV in those

under 8 years of age, leading to a high proportion of VZV infections in older age groups classified as unspecified.

Age and sex distribution

The male to female ratio in the unspecified VZV notifications was 0.8:1. Females have an overall higher notification rate (69 cases per 100,000) compared with males (57 per 100,000), which predominates across the majority of age groups. The highest age group specific notification rates occurred in the 85 years or over age group for females, (133 per 100,000) and in the 75–79 years age group for males, (124 per 100,000). The lowest age group specific notification rates were in the 0–4 years age group for both males and females. These age distribution trends are likely reflect the practice of increased follow-up among younger age groups, especially in children aged less than 15 years, to determine clinical presentation (Figure 71).

Figure 71: Notification rate for varicella zoster virus unspecified, Australia,* 2013, by age group and sex



* Excluding New South Wales.

Chickenpox

- Chickenpox is normally a mild disease that occurs in childhood. However, in about 1% of cases complications can arise.
- The primary purpose of the vaccine is to prevent deaths, reduce the severity of disease and in the longer term reduce rates of VZV reactivation as shingles.
- In 2013, there were 2,042 cases of chickenpox reported, a 3% increase from 2012 (n=1,977).

Chickenpox is a highly contagious infection spread by respiratory secretions, including aerosol transmission, or from the vesicle fluid of skin lesions from a patient with chickenpox or shingles infection. Chickenpox is usually a mild disease of childhood; however, complications occur in approximately 1% of cases. It is more severe in adults and in persons of any age who are immunocompromised, in whom complications, disseminated disease, and fatal illness are more likely to occur.[50]

Epidemiological situation in 2013

In 2013, there were 2,042 cases of chickenpox reported. Representing a notification rate of 13 per 100,000 and a 3% increase in the number of notifications compared with 2012 (n=1,977). Rates of chickenpox have remained stable between 12 and 14 per 100,000 in all years since 2009.

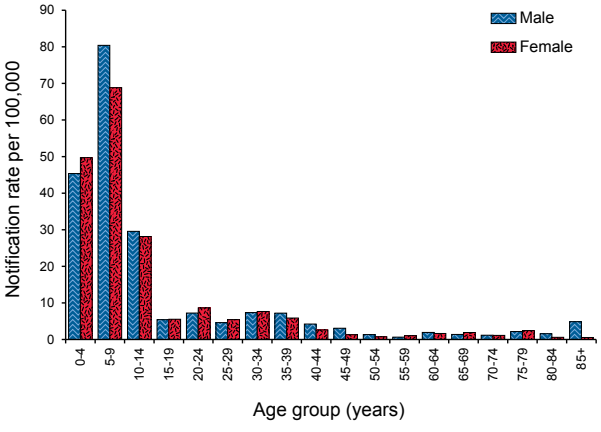
Geographic description

The highest notification rate, 40 per 100,000, was reported from the Northern Territory (n=97), followed by South Australia, 23 per 100,000 (n=386), reflecting the increased case ascertainment in these jurisdictions compared with others.

Age and sex distribution

The male to female ratio in 2013 was 1.1:1 with 1,065 notifications for males and 968 for females. Seventy-four per cent of notified chickenpox cases (n=1,501) occurred in children less than 10 years of age. The 5–9 years age group had the highest notification rate for both sexes, (80 per 100,000 for males and 69 per 100,000 for females) (Figure 72). Although higher rates among children compared with adults is expected for chickenpox, the distri-

Figure 72: Notification rate for chickenpox, Australia,* 2013, by age group and sex



* Excluding New South Wales.

bution of cases by age group also reflects general jurisdictional practice of limiting follow-up for cases in children less than 15 years of age.

Vaccination

Routine use of a varicella-containing vaccine in children was first recommended in Australia in 2003. In November 2005, the vaccine was funded under the NIP for all children at 18 months of age, with a school-based catch-up program for children 10–13 years of age with no history of disease or previous vaccination.

In 2013, the oldest cohort of children eligible for varicella vaccination at 18 months of age under the NIP would be 9 years of age. The analysis of vaccination status is restricted to this cohort. Vaccination status information was available for 50% (n=504) of cases that occurred in children less than 10 years of age who were eligible for vaccination with 76% (n=381) vaccinated and 24% not vaccinated (n=123). Post-marketing studies in the United States of America have estimated the effectiveness of 1 dose of monovalent varicella vaccine in children to be 80%–85% against any disease and 95%–98% against severe varicella.[86]

Shingles

- Herpes zoster or shingles is a sporadic disease caused by reactivation of latent varicella zoster virus following primary infection of chickenpox.
- In 2013, there were 5,017 cases of shingles reported, which was a 12% increase from 2012.

Shingles occurs most commonly with increasing age, impaired immunity, and a history of chickenpox in the 1st year of life.[50] Reactivation of VZV to cause shingles is thought to be due to a decline in cellular immunity to the virus. Shingles typically presents as a unilateral vesicular rash localised in a dermatomal distribution. Associated symptoms may include headache, photophobia, malaise, and 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 neuropathic pain or post herpetic neuralgia.[21]

A single dose of zoster vaccine is recommended, but not presently funded through the NIP, for adults aged 60 years or over who have not previously received a dose of zoster vaccine.[50]

Epidemiological situation in 2013

In 2013, there were 5,017 cases of shingles reported to the NNDSS. This was a notification rate of 32 per 100,000 and an 11% increase compared with 2012 (n=4,507).

Geographic description

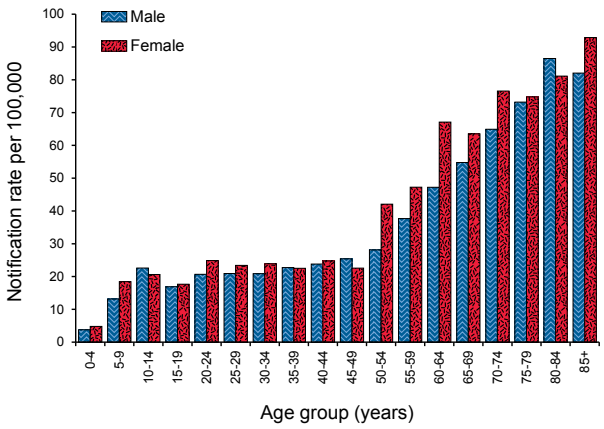
The highest rates of shingles occurred in South Australia with 114 per 100,000 (n=1,899), followed by the Northern Territory, 102 per 100,000 (n=246). The high rates in these jurisdictions most likely reflect their higher levels of case ascertainment compared with other jurisdictions.

Age and sex distribution

The notification rate was lower in males at 29 per 100,000 compared with females at 35 per 100,000, representing a ratio of 0.8:1.

As expected, rates increased with age with the highest in the 80–84 years age group for males, 87 per 100,000 and in the 85 years or over age group for females, 93 per 100,000 (Figure 73).

Figure 73: Notification rate for shingles, Australia,* 2013, by age group and sex



* Excluding New South Wales.

Discussion

Rates of chickenpox have remained relatively stable in all years since 2009. Noting that 2009 was the 1st year in which all jurisdictions, with the exception of New South Wales, reported cases to the NNDSS. An unpublished analysis of these data show an increase in shingles notifications in South Australia since 2006, which is consistent with an upward trend noted in the national data since 2009. This increase is likely to be due to multiple factors

including changes in health-care seeking behaviour, clinical practice, and awareness of reporting requirements as well as an ageing population.

Vectorborne diseases

Overview

Vectorborne diseases are infections transmitted by arthropods such as mosquitoes and ticks. A vectorborne disease may involve a simple transfer via the arthropod, or, may involve replication of the disease-causing organism in the vector.[21] Vectorborne diseases of public health importance in Australia listed in this chapter are: arbovirus not elsewhere classified (NEC); Barmah Forest virus (BFV) infection; dengue virus (DENV) infection; Japanese encephalitis virus (JEV) infection; Kunjin virus (KUNV) infection, malaria, Murray Valley encephalitis virus (MVEV) infection and Ross River virus (RRV) infection. Some vectorborne diseases, including yellow fever infection, plague and certain viral haemorrhagic fevers, are listed under quarantinable diseases. The National Arbovirus and Malaria Advisory Committee provide expert technical advice on vectorborne diseases to the Australian Health Protection Principal Committee through CDNA.

Alphaviruses

Viruses in the genus *Alphavirus* that are notifiable in Australia are BFV and RRV. These viruses are unique to the Australasian region.[87] Infection can cause a clinical illness, which is characterised by fever, rash and polyarthritis. The viruses are transmitted by numerous species of mosquito that breed in diverse environments.[88] The alphavirus chikungunya was not nationally notifiable in 2013, and thus not included in this annual report. However, it is notifiable in all states and territories except the Australian Capital Territory, and states and territories send information about cases to the Commonwealth for national collation and analysis.[89,90] Chikungunya virus infection was made nationally notifiable in January 2015.

The national case definitions for RRV and BFV require only a single IgM positive test to 1 virus, in the absence of IgM to the other.[18] False positive IgM diagnoses for BFV in particular are a known issue, thus it is unclear what proportion of notifications represent true cases.

Barmah Forest virus infection

- There was a dramatic increase in case numbers and rates thought to be due to an increase in false positive notifications.
- Females were disproportionately affected in 2013, and the most affected age groups were younger than in previous years.

Epidemiological situation in 2013

In 2013, there were 4,239 notifications of BFV infection, for a rate of 18.3 per 100,000 population. This compares with a 5-year mean of 1,723 notifications and a 5-year mean rate of 7.8 per 100,000. The number of notifications of Barmah Forest virus increased sharply from October 2012 (Figure 74). This increase continued into late 2013 and beyond for some jurisdictions. The increase was considered likely to have been due to a high rate of false positive IgM test results from the use of a commercial test kit in private laboratories, and resulted in a recall of the affected kits in September 2013.[91]

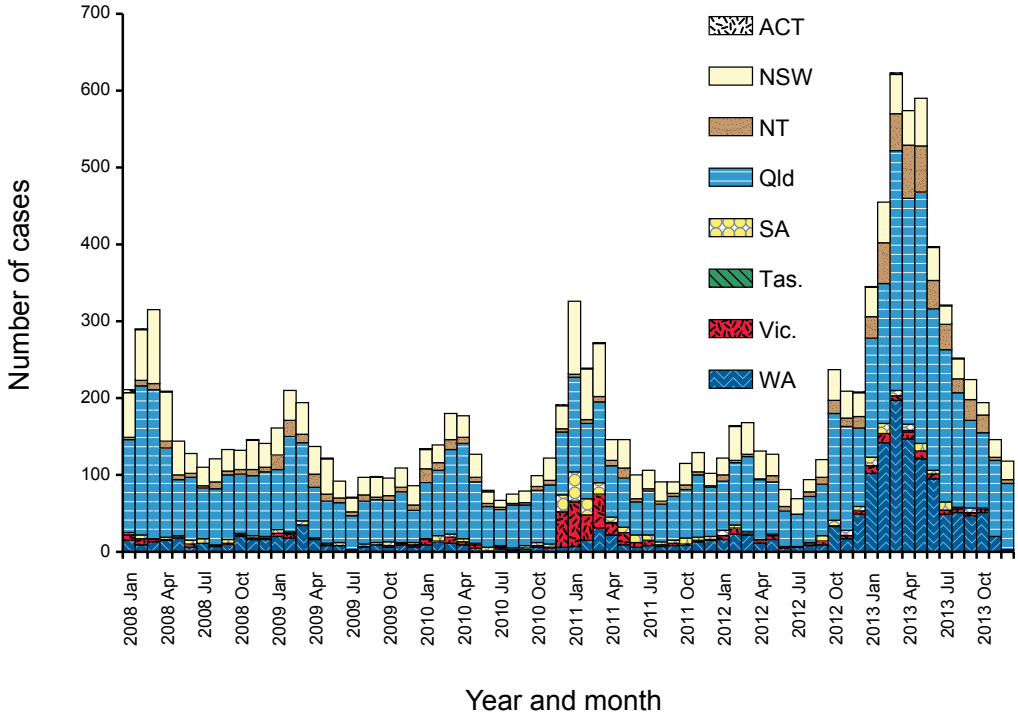
Geographic description

More than half of all BFV notifications in 2013 were from Queensland (52%, 2,224/4,239) and population rates were highest in the Northern Territory (167.9 per 100,000), Queensland (47.8 per 100,000) and Western Australia (40.6 per 100,000). All of these rates were more than double the 5-year mean, with rate ratios of 4.5, 2.2 and 6.4 respectively for 2013 compared with the 5-year mean rate. In New South Wales, South Australia and Victoria, rates were similar to the 5-year mean.

Age and sex distribution

In 2013, BFV infection was most frequently reported in people aged between 10 and 54 years (median 46 years, range 0–92 years), in contrast to previous years where the age groups most affected were middle aged and older adults. In 2013, age and sex specific rates were highest among females in the 35–54 years age group, and the next highest rate was among females aged 15–34 years (Figure 75). In 2013, rates were much higher in females overall than in males (21.9 and 14.7 per 100,000 respectively) with a rate ratio of 1.5:1. By contrast, between 2008 and 2012, rates in females were marginally lower than in males (7.6 and 8.0 per 100,000 respectively) with a rate ratio of 0.9:1.

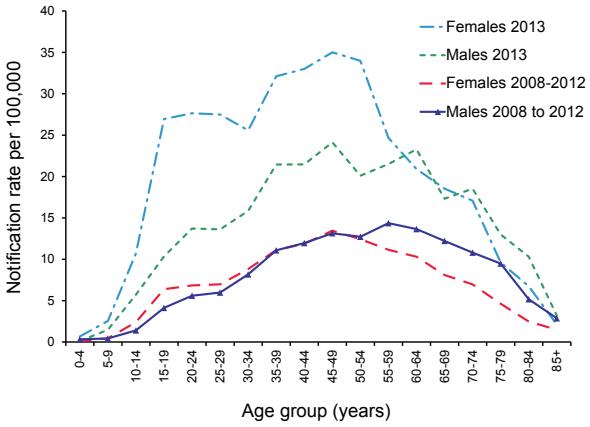
Figure 74: Notified cases of Barmah Forest virus infection, Australia, 2008 to 2013, by year and month and state or territory



Seasonality

Peak incidence of BFV could be expected to occur during the warmer months (or during wetter months in northern areas of Australia) when mosquito numbers are high. However, seasonality of notifications is less marked than expected (Figure 75), and a high proportion of inter-seasonal notifications are thought to be due to false positive diagnoses. Peak notification of BFV in 2013 was between January and April, with 47% (1,997/4,239) of notifications being during this period, similar to between 2008 and 2012 (46% ,3,925/8,616). The increase from October 2012 that was thought to be due to false positive notifications was earlier than the expected seasonal increase.

Figure 75: Notification rate for Barmah Forest virus, Australia, 2013 and 2008 to 2012, by age group and sex (n=12,852)



Discussion

The dramatic increase in counts and rates in 2013 disproportionately affected females, with much higher rates in females and in younger age groups than observed in previous years. The CDNA surveillance case definition for BFV[92] in 2013 allowed for confirmation based on a single positive IgM, in the absence of IgM to other alphaviruses. Not all jurisdictions reported increases, and this may in part be due to differences in laboratory and notification practices. South Australia requires seroconversion to BFV, and in Victoria, metropolitan cases without any travel to non-metropolitan areas require evidence of seroconversion.

Given the dramatic increase in notifications in late 2012 and 2013, the possibility of false positive diagnoses based on a single positive IgM, and also the difference in surveillance and notification practices, CDNA has referred the BFV surveillance case definition to the CDWG for review.

Ross River virus infection

- Notifications were similar to the 5-year mean.

Epidemiological situation in 2013

In 2013, there were 4,308 notifications of RRV, which was a rate of 18.6 per 100,000. This compares with a 5-year mean of 5,061 cases and a 5-year mean rate of 23.0 per 100,000.

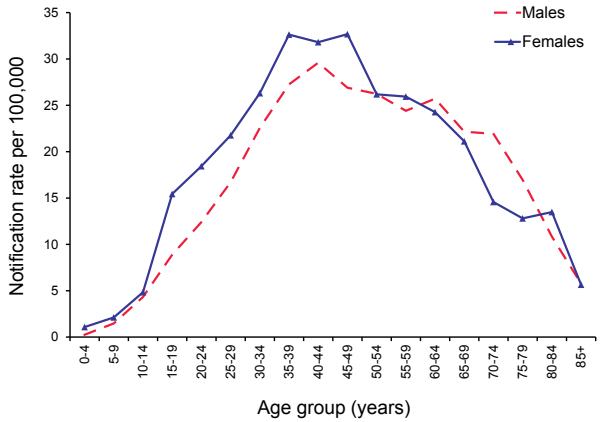
Geographic description

In 2013, nearly half of all RRV infections were from Queensland (41% of all cases, 1,787/4,308, for a rate of 38.4 cases per 100,000), but population rates were highest in the Northern Territory (124.4 per 100,000) and Western Australia (54.3 per 100,000).

Age and sex distribution

RRV was most frequently reported in adults aged in their 30s or 40s (median 44 years, range 0–95 years), similar to previous years. Rates were similar in females and males (rates of 19.7 and 17.5 per 100,000 respectively) with a ratio of 1.1:1, similar to previous years. In 2013, age specific rates were highest among the 35–49 year age range for females, and the 35–44 year age range for males (Figure 76).

Figure 76: Notification rates for Ross River virus, 2013, by age group and sex (n=4,308)



Seasonality

Peak notification for RRV in 2013 was between January and April, and 44% of cases were diagnosed during these months (Figure 77). Between 2008 and 2012, 58% of notifications were between January and April, indicating that in 2013, the proportion of inter-seasonal notifications was higher than in previous years.

Flaviviruses

In Australia, flavivirus infections of particular public health importance are DENV, KUNV, MVEV and JEV. Yellow fever is reported under Quarantinable diseases. These infections are nationally notifiable. No specific treatment is available for these diseases and care is largely supportive. A vaccine is available to prevent JEV infection[50] but there are no vaccines currently for DENV, MVEV or KUNV infection.

Infection with MVEV, KUNV or JEV is usually asymptomatic or produces a non-specific illness, but a small percentage of cases progress to encephalomyelitis of variable severity. *Culex annulirostris* is the major vector of MVEV, JEV and KUNV. DENV has 4 serotypes, each containing numerous genotypes. The serotypes isolated from returning travellers (and thus involved in local outbreaks) vary by year and geographical region. Infection with 1 serotype probably confers lifelong immunity to that serotype,[21] but subsequent infection with a different serotype is 1 factor thought to increase the risk of severe outcomes, along with the infecting serotype and genotype, and host factors.[21,93–95] The clinical illness is characterised by mild to severe febrile illness with fever, headache, muscle and joint pain and sometimes a rash. A minority of cases progress to severe dengue with haemorrhage and shock. *Aedes aegypti* is the major vector of DENV in Australia.

Arbovirus NEC

- 21 cases of arbovirus (NEC) were notified in 2013.

Unspecified flavivirus infections are reported under arbovirus NEC. From 2015, arbovirus NEC has been renamed flavivirus NEC.

Epidemiological situation in 2013

In 2013, there were 21 notifications of arbovirus (NEC) compared with an average of 11.8 during the previous 5 years. All but one of these notifications was from Queensland. These notifications comprised Alfuy (1 case), Kokobera (5 cases) and Zika (1 case), and the infecting flavivirus was unknown or not supplied for a further 14 cases (Table 16).

Figure 77: Notified cases of Ross River virus, Australia, 2008 to 2013, by year and month and state or territory

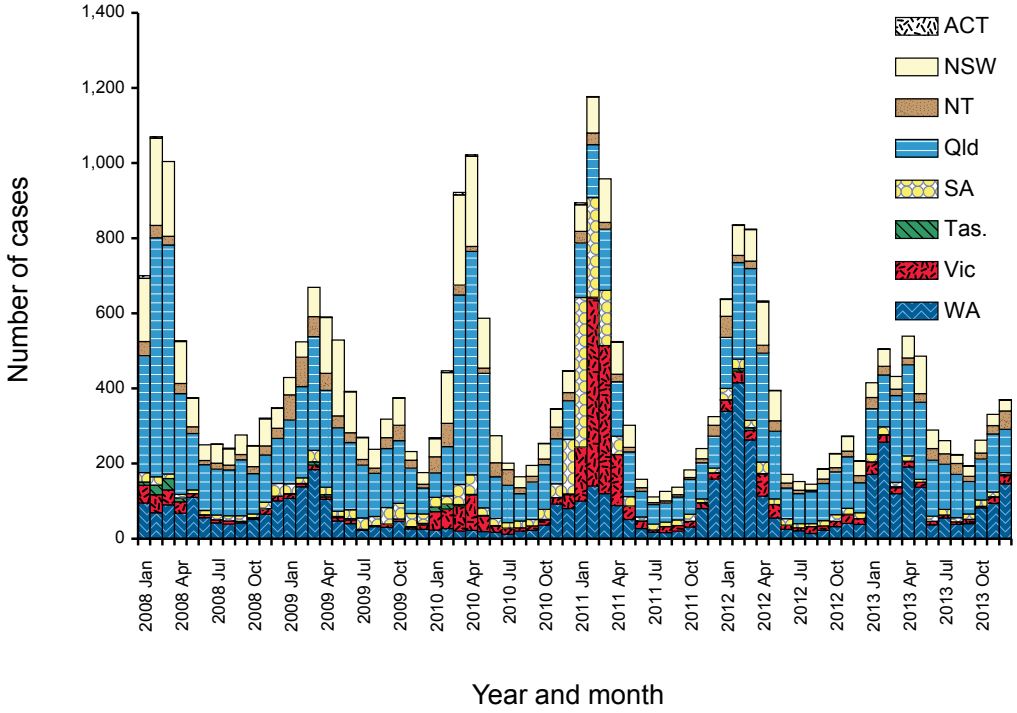


Table 16: Notified cases of arbovirus NEC, Australia, 2013

State or territory	Country of acquisition	Organism	Age group	Sex
Qld	Unknown	Kokobera	20–24	Female
Qld	Unknown	Kokobera	35–39	Female
Qld	Unknown	Kokobera	55–59	Male
Qld	Unknown	Kokobera	75–79	Male
Qld	Unknown	Untyped	25–29	Male
Qld	Unknown	Untyped	50–54	Female
Qld	Unknown	Untyped	55–59	Female
Qld	Unknown	Untyped	60–64	Male
Qld	Australia	Kokobera	15–19	Female
Qld	Papua New Guinea	Untyped	20–24	Female
Qld	Papua New Guinea	Untyped	35–39	Male
Qld	Vanuatu	Alfuy	35–39	Female
Qld	Democratic Republic of Korea (North Korea)	Untyped	45–49	Male
Qld	Democratic Republic of Korea (North Korea)	Untyped	50–54	Male
Qld	Republic of Korea (South Korea)	Untyped	30–34	Male
Qld	Indonesia	Untyped	20–24	Male
Qld	Indonesia	Untyped	45–49	Male
Qld	Indonesia	Untyped	50–54	Male
Qld	Philippines	Untyped	40–44	Female
Qld	India	Untyped	45–49	Female
NT	Indonesia	Zika	25–29	Male

Information about the country of acquisition was available for 62% of cases (13/21), and 12 of these were acquired overseas.

The median age of cases was 43 years (range 19–76 years). Nine cases were female and 12 cases were male.

Dengue virus infection

- There was a continuing increase in the number of overseas acquired cases.
- 235 cases were acquired in Australia in 2013, including acquired in Western Australia.

Local transmission of dengue in Australia is normally restricted to areas of northern Queensland where the key mosquito vector, *Ae. aegypti* is present.[96] Dengue is not endemic in North Queensland, but local transmission can occur upon introduction of the virus to the mosquito vector by a viraemic tourist or a resident returning from a dengue-affected area overseas.[97]

The CDNA case definition for dengue was changed in 2013 to accept dengue non-structural protein 1 (NS1) antigen in blood as laboratory definitive evidence for infection and a number of states and territories had been sending notifications based on a positive NS1 antigen prior to this change.

Epidemiological situation in 2013

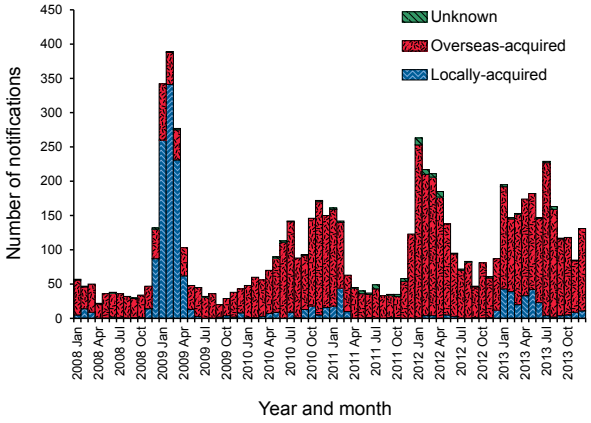
There were 1,841 notifications of dengue in 2013, which was 1.7 times the 5-year mean of 1,110.4 notifications. Most infections were acquired overseas (n=1,591) (Figure 78). There were 235 infections acquired in Australia. For 15 cases, no information was supplied on the place of acquisition.

Geographic description

More than 99% (1,826/1,841) of notifications in 2013 contained complete information on the place of acquisition. Overseas acquired infections comprised 86% of notifications (1,591/1,841) (Table 17). The number of overseas-acquired infections was the largest number ever reported, up from 1,473 in 2012, which was previously the largest number ever reported.[76] Between 2007 and 2010, the number of DENV cases known to have been acquired overseas increased each year, from 254 in 2007 to 1,137 in 2010 (Figure 78).

Cases acquired in Indonesia continue to account for the largest number and proportion of all notifications, accounting for 50% (800/1,591) of

Figure 78: Notified cases of dengue virus infection, Australia, 2008 to 2013, by year and month and place of acquisition



all overseas-acquired cases in 2013 (Table 18), up from an average of 30% per year in 2008 and 2009, but down from an average of 60% between 2010 and 2012. DENV acquired in Indonesia was frequently serotype 1, comprising 50% of cases with a known serotype (72/143 cases), although data completeness for serotype was very low. Other frequently reported source countries in 2013 included Thailand, the Philippines, India and Malaysia.

All but 13 of the 235 locally-acquired cases in 2013 were reported in NNDSS to have been associated with one of the 10 outbreaks of locally-acquired infection in Queensland in 2013.[98] The largest of these outbreaks was in Cairns and began in late 2012, with 141 associated notifications in 2013, the last case of them with onset in July 2013. One case in the Pilbara Region of Western Australia was locally acquired from an unknown source,[99] and another case in Western Australia, while notified as locally acquired in the data on which this report is based, should have been listed as overseas acquired.

Age and sex distribution

DENV infections acquired overseas in 2013 were most commonly reported among younger and middle aged adults (median 39 years, range 1–86 years), with a slight peak of notifications among females aged 25–29 years and males aged 50–54 years, but with similar numbers notified in all age groups between 20 and 54 years (Figure 79). Females comprised 50% (793/1,541) of overseas acquired cases.

Locally-acquired cases peaked in several adult age groups, but was less common among people aged less than 20 years or more than 74 years

Table 17: Notified cases of dengue virus infection, 2013, by serotype and place of acquisition

Country of acquisition	Serotype				Untyped	Total
	DENV 1	DENV 2	DENV 3	DENV 4		
Locally-acquired						
Australia	175	4	11	0	45	235
Unknown						
Not stated	1	0	1	0	13	15
Overseas-acquired						
Indonesia	72	36	28	7	657	800
Thailand	35	12	14	1	206	268
Philippines	9	5	1	4	44	63
India	3	5	2	0	48	58
Malaysia	3	4	0	3	43	53
East Timor	10	0	9	0	29	48
Papua New Guinea	5	6	2	0	22	35
Cambodia	4	0	4	1	22	31
South-East Asia, nfd	2	1	1	0	24	28
Sri Lanka	6	0	0	0	22	28
Vietnam	1	1	1	3	20	26
Singapore	3	3	1	1	10	18
Bangladesh	0	1	0	0	15	16
Solomon Islands	0	0	6	0	9	15
Fiji	3	2	1	0	8	14
Burma (Myanmar)	3	0	0	0	8	11
Other countries	12	3	2	4	55	76
Overseas – country unknown	1	0	0	0	2	3
Total for overseas acquired	172	79	72	24	1,244	1,591
Total	348	83	84	24	1,302	1,841

nfd Not further defined.

Table 18: Notifications of dengue virus infection acquired overseas between 2008 and 2013, by selected countries of acquisition

Country of acquisition	2008	2009	2010	2011	2012	2013	Total
Indonesia	101	169	715	458	803	800	3,046
Thailand	55	24	124	85	278	268	834
India	8	15	43	29	60	58	213
The Philippines	7	9	42	23	54	63	198
East Timor	11	24	37	12	52	48	184
Malaysia	9	15	17	20	20	53	134
Vietnam	8	18	34	14	21	26	121
Papua New Guinea	13	11	21	15	16	35	111
Cambodia		5	11	5	30	31	82
Fiji	13	8	1	6	32	14	74
Sri Lanka	3		4	12	26	28	73
Total	420	472	1,137	721	1,473	1,591	5,814

(Figure 80). The median age of locally-acquired cases was 41 years (range 1 to 86 years). Females comprised 49% (116/235) of locally-acquired cases.

Figure 79: Notified cases of overseas-acquired dengue virus infection, Australia, 2013, by age group and sex (n=1,591)

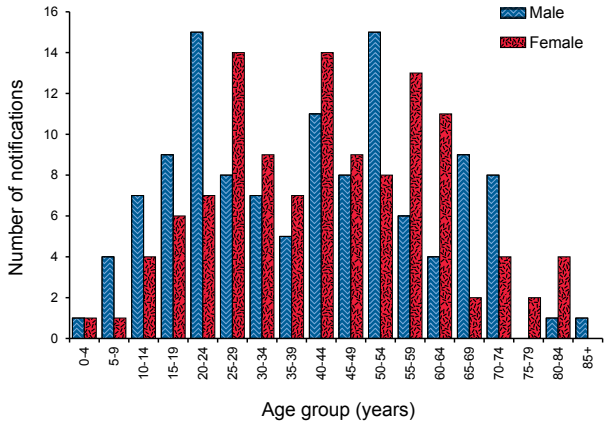
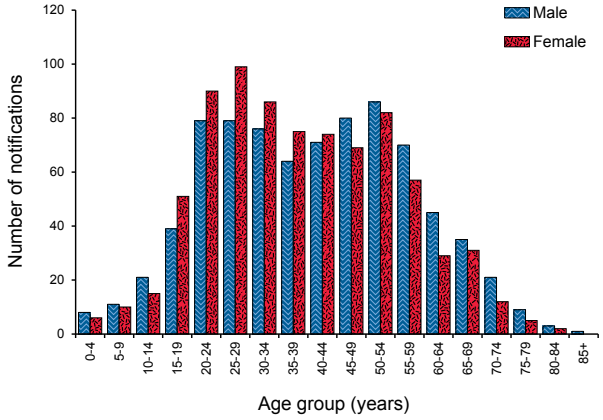


Figure 80: Notified cases of dengue virus infection acquired in Australia, 2013, by age group and sex (n=235)



Seasonality

No particular pattern of seasonality was evident for overseas acquired cases of dengue, although the largest numbers were reported in July. For locally-acquired cases, only 15 cases were reported between July and October demonstrating that outbreaks are not continuing through the cooler months.

Microbiological trends

In 2013, serotype information was available for 29% of notifications (539/1,841), which was a decrease compared with the 5-year mean of 43% (Table 19). In 2013, 65% (348/539) of cases with a known serotype were due to DENV 1 in contrast to 2012, when DENV2 was more frequently reported, noting the low completeness of reporting serotype information (Table 19).

Discussion

The number of overseas-acquired cases reported in Australia continues to increase each year. In recent years, improved diagnostic techniques, in particular the availability of the rapid NS1 antigen detection kit, have improved detection and would have contributed to the observed increase in reported numbers of overseas-acquired dengue in Australia,[100] along with the dramatic re-emergence and geographical expansion of dengue overseas over the past 50 years, combined with explosive outbreaks.[95]

While local outbreaks of dengue occur each year in North Queensland, each outbreak is relatively small, and prompt and effective responses by public health authorities in Queensland have ensured that the disease does not become endemic there.

The number of dengue infections that are serotyped continues to decline. The decreased reporting of a serotype may reflect the increasing use of NS1 antigen detection and/or other diagnostic methods that do not provide a serotype.

Japanese encephalitis virus infection

- Four cases of JEV were notified in 2013.

Epidemiological situation in 2013

There were 4 notifications of JEV infection in 2013. One of these notifications (a notification from Western Australia) was subsequently found not to meet the case definition. The 3 remaining cases were acquired in Thailand, Taiwan and the Philippines. There was 1 notification in 2012, and 1 notification in 2008, both acquired overseas. The last locally-acquired case was in 1998.[101]

Kunjin virus infection

- Three cases of KUNV were notified in 2013.

Epidemiological situation in 2013

There were 3 notifications of KUNV infection in 2013, one each acquired in East Timor, Indonesia and Papua New Guinea. There were no notifications of KUNV infection in 2012.

Table 19: Serotype of dengue virus infection, Australia, 2008 to 2013

Serotype	2008	2009	2010	2011	2012	2013
DENV1	40	82	190	139	81	348
DENV 1 and DENV 4	0	0	0	0	1	0
DENV 2	32	54	255	153	137	83
DENV 3	143	771	106	78	57	84
DENV 4	37	43	47	43	8	24
Untyped/unknown	309	452	630	408	1,256	1,302
Total	561	1,402	1,228	821	1,540	1,841
% with a serotype supplied	45	68	49	50	18	29

Murray Valley encephalitis infection

- One case of MVEV was notified in 2013.
- MVEV is a rare disease in Australia, but also acquired in the region.

Epidemiological situation in 2013

There was 1 notification of MVEV infection in 2013, acquired in Indonesia.

There was 1 case in 2012, 16 cases in 2011, 2 cases in 2008 and 4 cases in 2009. The cases notified in 2011, including an outbreak in south east Australia, have been described elsewhere.[89,102–104]

Malaria

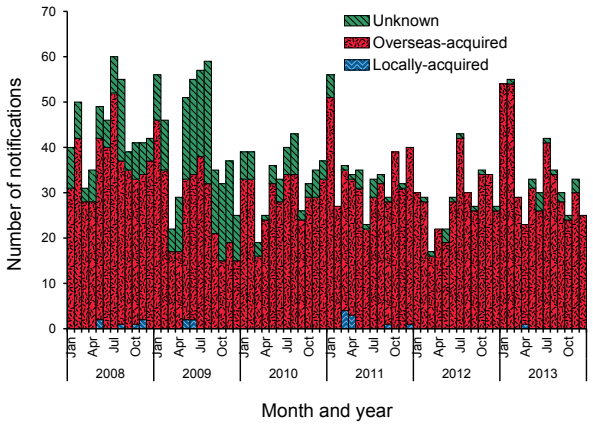
- Notifications continued the gradual decline observed since 2005.
- One case was known to have been acquired in Australia in 2013.

Malaria is caused by a protozoan parasite in the genus *Plasmodium*, and 5 species are known to infect humans; *Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale* and *Plasmodium knowlesi*.[21,105] Malaria is a serious acute febrile illness that is transmitted from person to person via the bite of an infected mosquito of the genus *Anopheles*. Australia was declared free of malaria in 1981,[106] but suitable vectors are present in northern Australia, and the area remains malaria-receptive. Malaria is the most frequently reported cause of fever in returned travellers worldwide.[107] A case series in the Northern Territory showed that malaria cases were reported in travellers returning from endemic areas, but also reflected current events such as military operations and increased refugee arrivals from malaria endemic areas.[108] Malaria cases in Australia can be found either through testing of symptomatic persons with a compatible travel history, or through screening of refugees who may be asymptomatic.

Epidemiological situation in 2013

There were 414 cases of malaria notified in Australia in 2013, a 6% decrease compared with a 5-year mean of 440 cases, and continuing the trend of gradually decreasing notifications since 2005 (Figure 81). The largest number of cases was reported by Queensland (108 cases).

Figure 81: Notified cases of malaria, Australia, 2008 to 2013, by month and year and place of acquisition



Geographic description

Malaria in Australia is a disease associated with overseas travel or residence in areas with endemic transmission. The last cases acquired on mainland Australia were during an outbreak in North Queensland in 2002.[109] Limited transmission occurs occasionally in the Torres Strait.

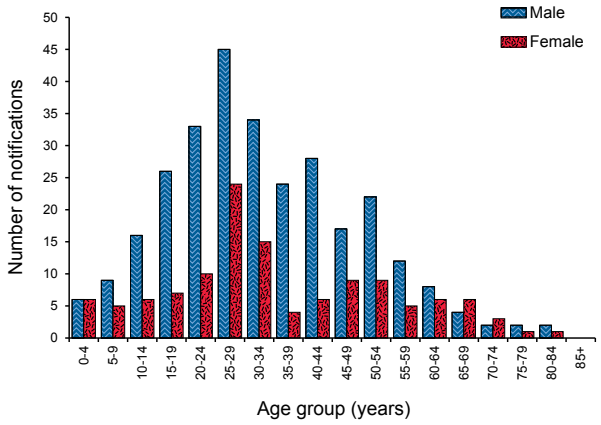
The place of acquisition for malaria notifications in 2013 was listed as overseas for 398 cases. For 16 cases, no place of acquisition information was supplied to NNDSS. One case in 2013 was listed as locally-acquired on Saibai Island in the Torres Strait. Prior to this case, the last known locally-acquired infections were during the 2011 outbreak in the Torres Strait.[110]

Complete information on the country or region of acquisition was supplied for all but eight of the cases known to have been acquired overseas, and these remaining cases were notified as being overseas acquired, country unknown or not stated. The most frequent countries of acquisition were Papua New Guinea (16% of cases with complete information) and India (16%) (Table 20). Most cases acquired in Papua New Guinea were reported by Queensland (31 cases).

Age and sex distribution

In 2013, sex was stated for all cases while age was supplied for all but 1 case. Malaria was most commonly reported in males (70%, 290/414 cases) with a peak of notifications in males aged 25 to 29 years (Figure 82). The median age of cases was 30 years (range 0–83 years).

Figure 82: Notified cases of malaria, Australia, 2013, by age group and sex (n=413)*



* Age was not reported for 1 case.

Seasonality

Increases in notifications or an observable pattern of seasonality in a predominantly overseas-acquired infection can relate to the seasonality of travel patterns, or to local disease epidemiology in the source countries. In 2013, there was apparent increase in notifications in January and February compared with other months (54 and 55 notifications respectively, compared with an average of 30.5 notifications for the other months).

Microbiological trends

The infecting species was supplied for 98% (404/414) of cases in 2012 (Table 20). The most frequent infecting species was *P. falciparum* (reported in 55% of cases with complete information). *P. vivax* was associated with Asia and the Pacific, whilst most cases acquired in African countries were *P. falciparum*. In cases acquired in Indonesia and Papua New Guinea however, *P. falciparum* and *P. vivax* infections were reported in similar numbers.

Zoonoses

Overview

Zoonoses are those diseases and infections that are naturally transmitted between vertebrate animals and humans.[111] Approximately 60%–70% of emerging human infectious diseases are zoonoses[112–114] and more than 70% of emerging zoonoses originate from wildlife.[113] 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".[115]

The zoonoses notifiable to the NNDSS included in this chapter are: anthrax, Australian bat lyssavirus (ABLV) or lyssavirus (unspecified) infection, brucellosis, leptospirosis, ornithosis, Q fever, and tularaemia.

Several zoonoses notifiable to the NNDSS are included under other headings in this report. For example, *Salmonella* and *Campylobacter* infections are typically acquired from contaminated food and are listed under the gastrointestinal diseases section. Rabies is listed under Quarantinable diseases.

Anthrax

- No cases of anthrax were notified in 2013.

Anthrax is caused by the bacterium *Bacillus anthracis* and most frequently causes cutaneous infection. However, it can also cause gastrointestinal and respiratory infections. Anthrax is primarily a disease of herbivores; humans and carnivores are incidental hosts. It can be an occupational hazard for veterinarians, and agriculture, wildlife and livestock workers who handle infected animals or by-products. [21]

Table 20: Notified cases of malaria, Australia 2013, by infecting species and region and country of acquisition

Region and country	*P. falciparum*	*P. malariae*	*P. ovale*	*P. vivax*	Mixed species infection	*Plasmodium* species	Total
Oceania							
Australia	0	0	0	1	0	0	1
Papua New Guinea	23	1	0	35	0	1	60
Solomon Islands	0	0	0	7	0	0	7
Vanuatu	0	0	0	3	0	0	3
Fiji	1	0	0	0	0	0	1
South East Asia							
South-East Asia, NFD	0	0	0	1	0	0	1
Mainland South-East Asia, NFD	0	0	0	1	0	0	1
Burma (Myanmar)	0	0	0	2	0	0	2
Cambodia	1	0	0	3	0	0	4
Thailand	2	0	0	0	0	0	2
Vietnam	1	0	0	1	0	0	2
Brunei Darussalam	0	1	0	0	0	0	1
Indonesia	5	1	2	9	1	0	18
Malaysia	0	0	1	0	0	1	2
East Timor	0	0	0	0	1	0	1
North East Asia							
Korea, Republic of (South)	0	0	0	1	0	0	1
Southern and Central Asia							
India	2	0	0	60	1	2	65
Nepal	0	0	0	1	0	0	1
Pakistan	0	0	0	6	0	0	6
Africa							
Africa NFD	1	0	0	0	0	0	1
North Africa and the Middle East							
North Africa, NFD	2	0	0	0	0	0	2
Sudan	47	1	4	1	1	1	55
Western Sahara	1	0	0	1	0	0	2
Sub-saharan Africa							
Sub-Saharan Africa, NFD	12	1	0	0	0	0	13
Burkina Faso	1	0	0	0	0	1	2
Cameroon	1	0	0	0	0	0	1
Congo, Democratic Republic of	2	1	0	0	0	0	3
Cote d'Ivoire	3	0	0	0	0	0	3
Equatorial Guinea	1	0	2	0	0	0	3
Gabon	1	0	0	0	0	1	2
Ghana	14	0	0	0	0	0	14
Guinea	1	0	0	0	0	0	1
Liberia	5	0	1	0	0	0	6
Mali	4	0	1	1	0	0	6
Nigeria	9	0	3	0	0	1	13
Sierra Leone	10	0	0	0	0	1	11
Togo	1	0	0	0	0	0	1

Table 20 (cont'd): Notified cases of malaria, Australia 2013, by infecting species and region and country of acquisition

Region and country	*P. falciparum*	*P. malariae*	*P. ovale*	*P. vivax*	Mixed species infection	*Plasmodium* species	Total
Southern and East Africa							
Southern and East Africa, NFD	1	0	1	0	0	0	2
Burundi	3	0	0	0	0	0	3
Ethiopia	1	0	0	2	0	0	3
Kenya	15	1	1	0	1	0	18
Malawi	0	0	0	0	1	0	1
Mozambique	2	0	1	0	0	0	3
South Africa	2	0	0	0	0	0	2
Tanzania	10	1	1	0	0	0	12
Uganda	20	0	0	1	2	0	23
Zambia	3	0	0	0	0	0	3
Zimbabwe	1	0	0	0	0	0	1
Europe							
South Eastern Europe NFD	0	1	0	0	0	0	1
Americas							
Peru	0	0	0	1	0	0	1
Overseas acquired – country and region not stated/unknown							
Unknown country	5	0	1	0	0	1	7
Overseas-acquired total	214	9	19	138	8	10	398
Place of acquisition unknown	7	1	0	6	2	0	16
Total	221	10	19	144	10	10	414

NFD Not further defined.

In Australia, the areas of anthrax risk are well defined and include the northern and north-eastern districts of Victoria and central New South Wales.[116] Anthrax occurs only sporadically in livestock in the at-risk areas. Rare or isolated incidents or cases have historically occurred in Queensland, South Australia, Tasmania and Western Australia.[116]

Epidemiological situation in 2013

In 2013 there were no notified cases of anthrax in Australia. Over the previous 10 years, only 3 human cases of anthrax were reported in Australia; in 2006, 2007 and 2010.[117–119] All had domestic farm or animal related exposures and all were cutaneous anthrax. Australia has never recorded a human case of inhalational or gastrointestinal anthrax.

There were 2 anthrax incidents reported in livestock in Australia in 2013. All properties were located within the known New South Wales anthrax endemic area.[116]

Australian bat lyssavirus and lyssavirus (unspecified)

- 1 case of ABLV was notified in 2013.

ABLV belongs to the genus lyssavirus, which also includes the rabies virus. Both invariably result in progressive, fatal encephalomyelitis in humans.[120] ABLV was first identified in Australia in 1996.[121,122] and is present in some Australian bats and flying foxes. Australia is free of terrestrial rabies.

The best way to prevent ABLV infection is to avoid contact with bats. For people whose occupation (including volunteer work) or recreational activities place them at increased risk of being exposed to ABLV, rabies virus vaccine is effective in preventing infection. Pre-exposure vaccination with rabies virus vaccine is recommended for bat handlers, veterinarians and laboratory personnel working with live lyssaviruses.[123] Post-exposure prophylaxis for ABLV consists of wound care and administration of a combination of rabies virus

vaccine and human rabies virus immunoglobulin, depending on exposure category and prior vaccination or antibody status.[50,123]

Epidemiological situation in 2013

In 2013, there was 1 notified case of ABLV. The case was an 8-year-old boy in Queensland.[124] Also in 2013, the Queensland Department of Agriculture, Fisheries and Forestry confirmed the first known equine cases of ABLV infection in 2 horses on a Queensland property.[125,126] There were no cases of lyssavirus (unspecified) infection in Australia. There were no cases of rabies in 2013.

There have been 3 human cases of ABLV infection in humans in Australia, in 1996, 1998 and 2013. All cases occurred after close contact with an infected bat and all were fatal.[124,127,128]

The bat health focus group in Wildlife Health Australia (formerly the Australian Wildlife Health Network) gathers and collates information from a range of organisations on opportunistic testing of bats for ABLV. In 2013, there were 14 ABLV detections in bats compared with 5 detections during 2012.[129]

Brucellosis

- 14 cases of brucellosis were notified in 2013.

Brucellosis is characterised by a fever of variable duration with symptoms including headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss and generalised aching.[21] *Brucella* species that can cause illness in humans include *Brucella melitensis* acquired from sheep and goats, *Brucella suis* from pigs and *Brucella abortus* from cattle. *B. abortus* was eradicated from Australian cattle herds in 1989 and *B. melitensis* has never been reported in Australian sheep or goats.[130] Therefore, all 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. Eales et al (2010)[131] found that feral pig hunting was the most common risk factor for brucellosis in Townsville during 1996 to 2009.

Internationally, brucellosis is mainly an occupational disease of farm workers, veterinarians, and abattoir workers who work with infected animals or their tissues.[21]

Epidemiological situation in 2013

In 2013, there were 14 notified cases of brucellosis in Australia (a rate of 0.1 cases per 100,000), compared with the 5-year mean of 33.4 cases (2008 to 2012). Seventy-nine per cent of cases (n=11) were from Queensland (Figure 83), with a rate of 0.2 cases per 100,000. Since 1991, 83% of cases have been from Queensland.

The species of the infecting organism was available for 57% of cases (n=8). Of these, 5 cases were *B. suis*; four from Queensland and one from New South Wales. All were males aged between 22 and 46 years. There were 3 cases of *B. melitensis*, with the countries of acquisition listed as Iraq, Iran and Afghanistan. All other cases of brucellosis acquired the organism in Australia.

Age and sex distribution

The median age of cases of brucellosis was 30 years (range 20–67 years) and 79% of cases (n=11) were male.

Leptospirosis

- 95 cases of leptospirosis were notified in 2013.

Leptospirosis can cause a variety of illnesses varying in severity from a mild influenza-like illness to Weil's syndrome, meningitis or pulmonary haemorrhage with respiratory failure possibly leading to death.[21] 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 in certain agricultural sectors and swimming or wading in contaminated water.[132,133] The last reported death in Australia attributed to leptospirosis was in 2002.[134]

Epidemiological situation in 2013

In 2013 there were 95 notified cases of leptospirosis in Australia (a rate of 0.4 cases per 100,000), compared with the 5-year mean of 143 cases (2008 to 2012). In 2013, Queensland accounted for 71% (n=67) of cases (Figure 84).

Age and sex distribution

The median age of leptospirosis cases was 42 years (range 15–80 years) and 76% of cases (n=72) were male. The highest notification rate was observed in males aged 35–39 years (1.3 cases per 100,000 male population).

Microbiological trends

The WHO Food and Agriculture Organization World Organisation for Animal Health

Figure 83: Notified cases of brucellosis, Australia, 2008 to 2013, by month and year of diagnosis and state or territory

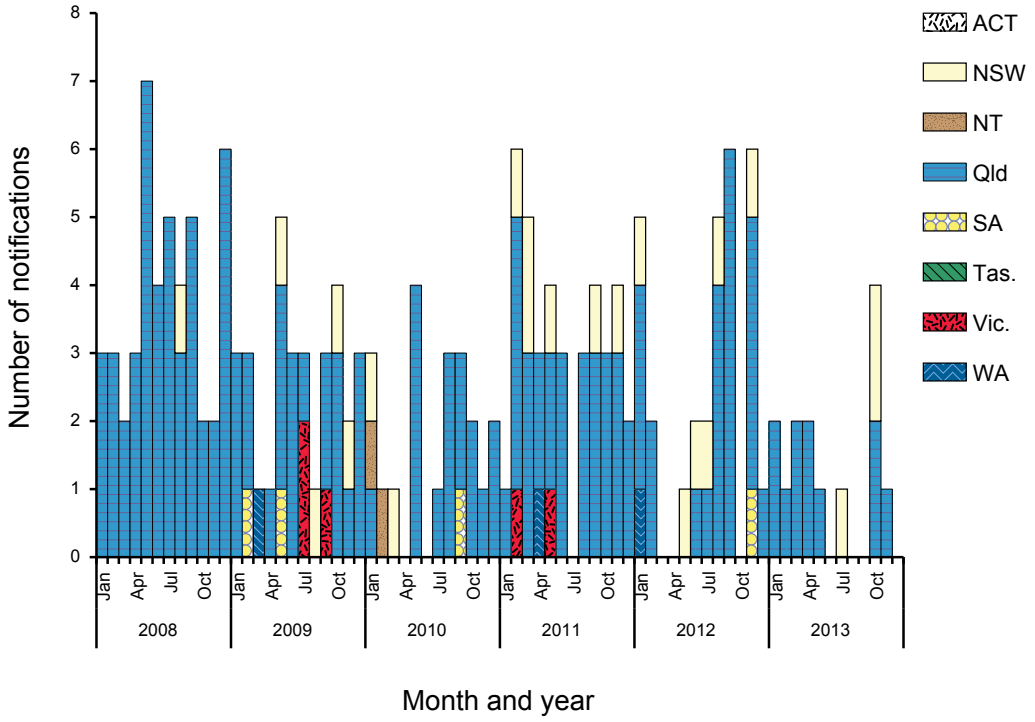
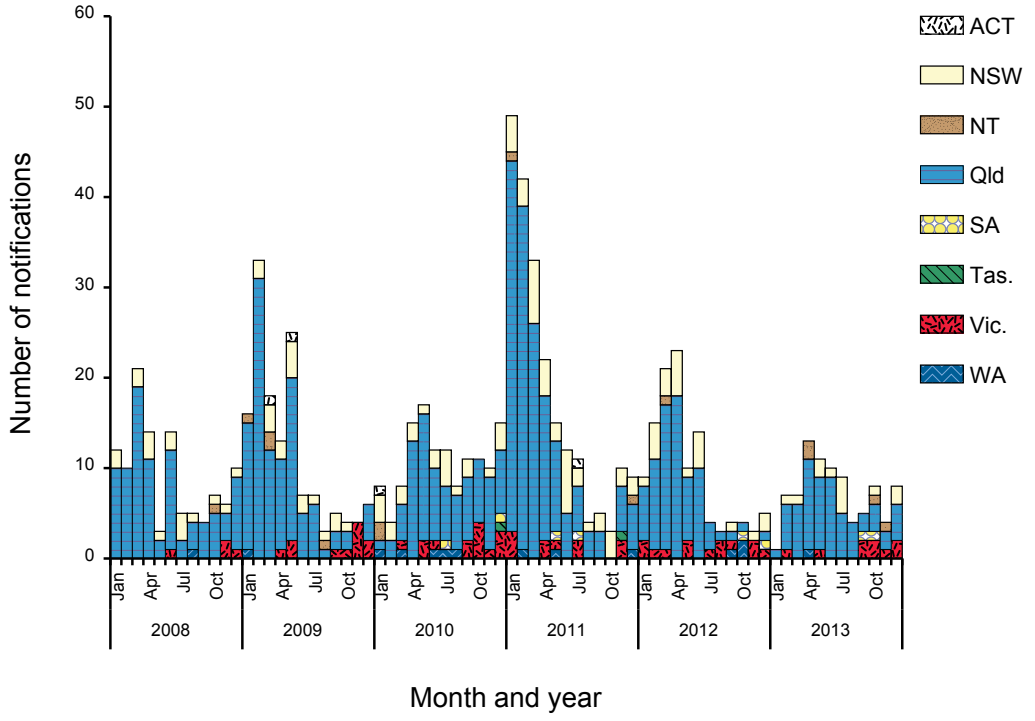


Figure 84: Notified cases of leptospirosis, Australia, 2008 to 2013, by month and year of diagnosis and state or territory



Collaborating Centre for Reference and Research on Leptospirosis routinely conducts PCR-based serotyping for leptospirosis cases from Queensland (from whence the majority of cases are reported), and collates national data that may be submitted to the laboratory from other states or territories. At the time of compiling this report, data for 2013 were not publicly available.

In Australia, serotyping is only conducted on pathogenic *Leptospira* species of which typing information was available for 89% (76/85). The most frequently reported serovars were *L. interrogans* serovar Australis (20%, n=17), *L. borgpetersenii* serovar Arborea (15%, n=13), *L. interrogans* serovar Hardjo (15%, n=13) and *L. interrogans* serovar Zanoni (15%, n=13). In 2012, *L. borgpetersenii* serovar Arborea was the most frequently reported serovar (22/103).

Ornithosis

- 47 cases of ornithosis were notified in 2013.
- The majority of notified cases in 2013 were from Victoria.

Ornithosis (or psittacosis) is a pneumonia-like illness caused by infection with the bacterium *Chlamydophila psittaci*.[21] It is transmitted to humans primarily from infected parrots of many species, but also poultry and a range of other birds.[135] Transmission to humans can occur via the inhalation of contaminated dried faeces, nasal or eye secretions and dust from the feathers. Individuals at risk of contracting ornithosis include bird owners and those with occupational exposure to birds.[136]

Epidemiological situation in 2013

In 2013 there were 47 notified cases of ornithosis in Australia (a rate of 0.2 cases per 100,000), compared with the 5-year mean of 79 cases (2008 to 2012, Figure 85). Similar to previous years, the majority of cases in 2013 were from Victoria (72%, n=34).

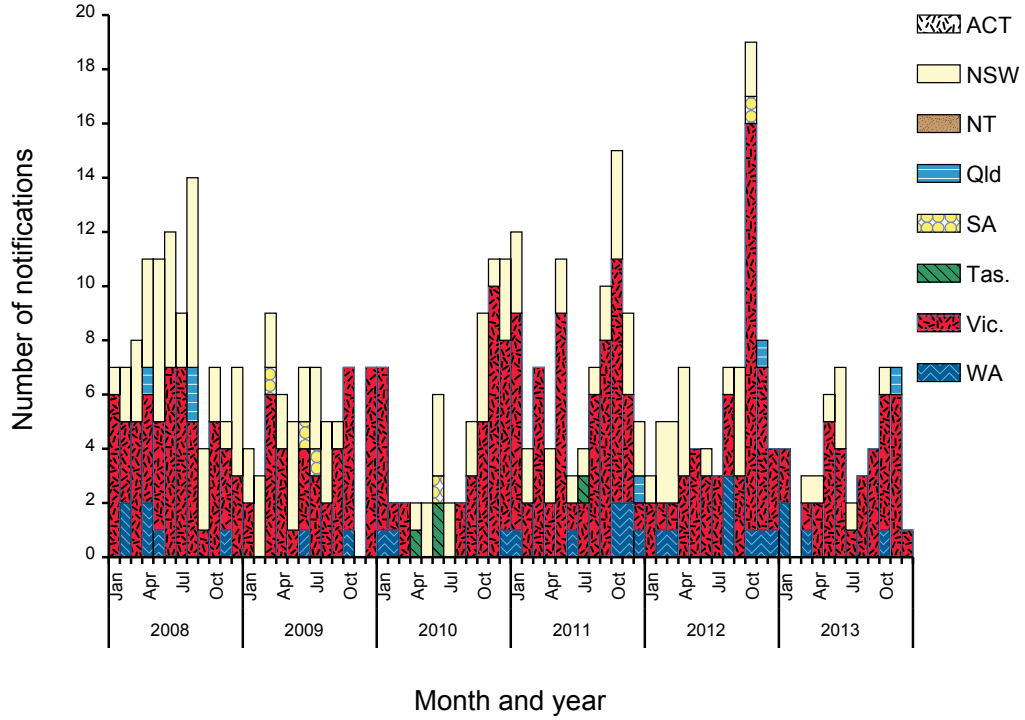
Age and sex distribution

The median age of ornithosis cases was 53 years (range 10–91 years) and 53% (n=25) of cases were female.

Q fever

- 477 cases of Q fever were notified in 2013.
- 78% of cases were male and the highest notification rate was observed in males aged 55–64 years (6.2 cases per 100,000).

Figure 85: Notified cases of ornithosis, Australia, 2008 to 2013, by month and year of diagnosis and state or territory



Q fever is caused by infection with the bacterium, *Coxiella burnetii*. The primary reservoirs of these bacteria are cattle, sheep and goats. *Coxiella burnetii* is resistant to environmental conditions and many common disinfectants.[137] 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.[138] Prior to the commencement of vaccination programs in Australia, approximately half of all cases in New South Wales, Queensland and Victoria were among abattoir workers.[139,140]

The Australian Government funded the National Q Fever Management Program (NQFMP) between 2001 and 2006 for states and territories to provide free vaccine to at-risk groups (such as abattoir workers).[141]

Adults at risk of Q fever infection, including abattoir workers, farmers, veterinarians, stockyard workers, shearers and animal transporters, should be considered for vaccination. The administration of the Q fever vaccine requires a pre-vaccination screening test to exclude those recipients with a previous (possibly unrecognised) exposure to the organism, including previous vaccination. A Q fever vaccine may cause an adverse reaction in a person who has already been exposed to the bacterium. Vaccination is not recommended for children under 15 years of age.[50]

Epidemiological situation in 2013

In 2013 there were 477 notified cases of Q fever in Australia (a rate of 2.1 cases per 100,000), which was a 37% increase compared with the 5-year mean of 348 cases (2008 to 2012), and higher than any year since 2003.[141] This can be attributed to an increase in the number of cases notified in New South Wales during December. Whereas nationally, 10% (50/477) of cases were notified in December, 16% (26/167) of cases in New South Wales were notified in the same time period.

Between 1991 and 2001, and prior to the introduction of the NQFMP, Q fever notification rates ranged between 2.5 and 4.9 cases per 100,000.[141] In 2013, the highest notification rate was in Queensland (5.2 cases per 100,000, n=243). Cases were reported in all jurisdictions except the Australian Capital Territory and Tasmania (Figure 86).

Age and sex distribution

The median age of Q fever cases was 47 years (range 1–88 years) and 78% (n=370) were male (Figure 87). The highest notification rate was observed in males aged 55–64 years (6.2 cases per 100,000 male population). This was consistent with a report that found higher rates of Q fever in men aged 50–59 years, and that agriculture-related occupations (including farming) are the most commonly reported.[138]

Figure 86: Notified cases of Q fever, Australia, 2008 to 2013, by month and year of diagnosis and state or territory

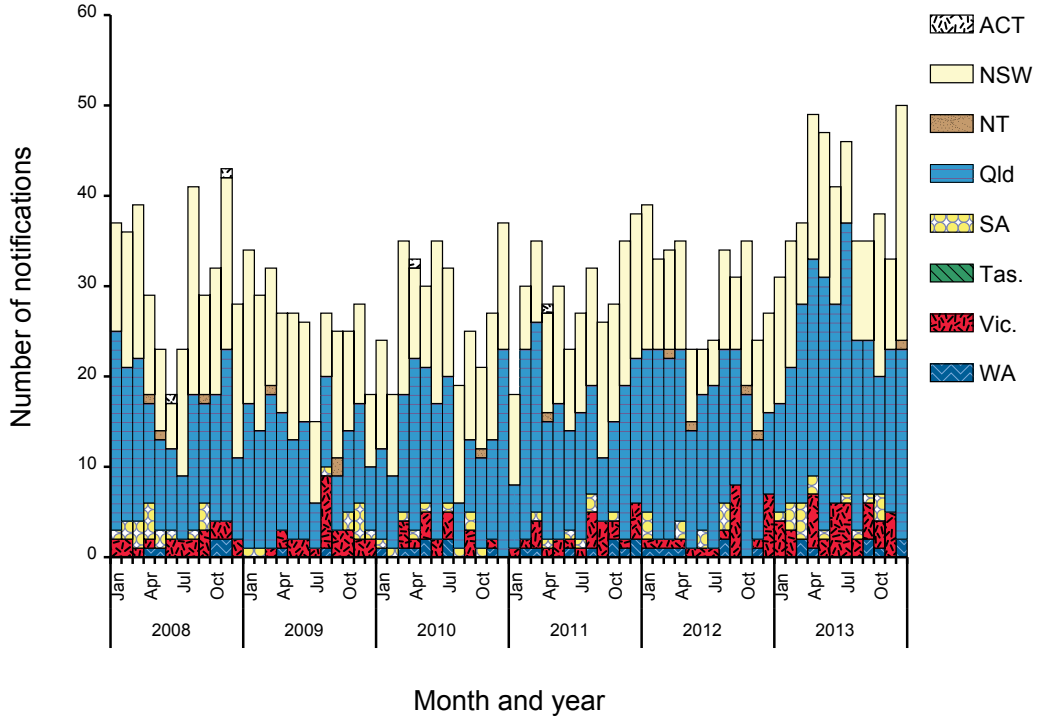
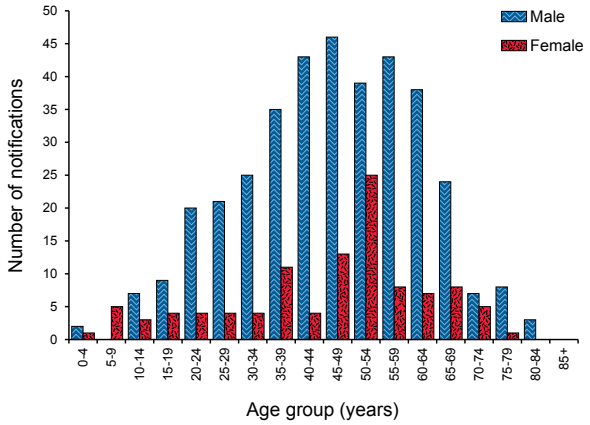


Figure 87: Notified cases of Q fever, Australia, 2013, by age group and sex



Tularaemia

- No cases of tularaemia were notified in 2013.

Tularaemia is a non-specific disease with diverse manifestations, often with an influenza-like onset, caused by infection with the bacterium *Francisella tularensis*.[21] 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.[142]

Tularaemia was last notified in 2011, with 2 cases from Tasmania. This was the first time that *F. tularensis* type B had been detected in the Southern Hemisphere.[38,143,144]

Other bacterial infections

Legionellosis

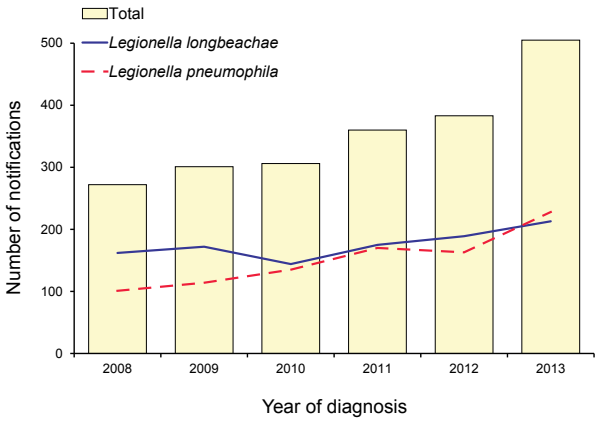
- A total of 505 cases of legionellosis were notified in 2013.
- Compared with 2012, notifications of legionellosis increased by 32% in 2013.
- *Legionella pneumophila*, commonly associated with man-made water systems, was the most frequently reported causative species in 2013.
- Five clusters and 3 outbreaks of legionellosis were reported in 2013.

Legionellosis is an environmentally acquired pneumonia caused by the bacteria *Legionella*. It can take the form of either Legionnaires' disease, a severe form of infection of the lungs, or Pontiac fever, a milder influenza-like illness.[21] The species most commonly associated with human disease in Australia are *Legionella pneumophila* and *Legionella longbeachae*. *Legionella* bacteria are found naturally in low levels in the environment. In the absence of effective environmental treatments *Legionella* organisms can breed in air conditioning cooling towers, hot water systems, showerheads, spa pools, fountains, commercial potting mix and other decomposing material such as bark and sawdust.[145–148] *Legionella* is generally transmitted to humans through contaminated water or dust aerosols.

Epidemiological situation in 2013

There were 505 notifications of legionellosis in 2013, representing a rate of 2.2 notifications per 100,000. Compared with the previous reporting period notifications of legionellosis increased in 2013 by 32% and were the highest since 2008 (Figure 88). It is likely that at least half of the increase in 2013 can be attributed to the outbreak at the Wesley Hospital in Queensland and the subsequent increase in serological testing during that period.[149] This outbreak received significant media coverage and resulted in Queensland issuing public health alerts to the community.

Figure 88: Notified cases of legionellosis, Australia, 2008 to 2013, by year of diagnosis and species

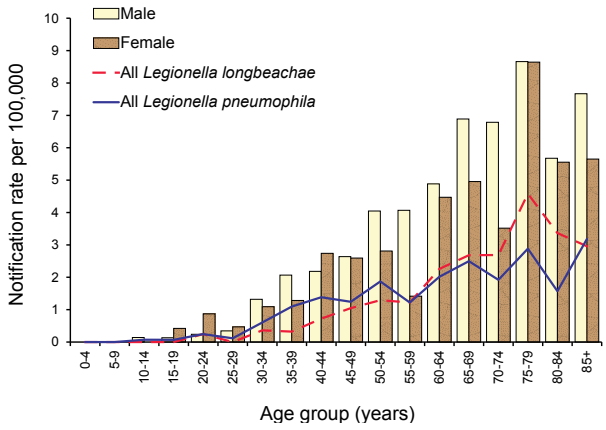


In 2013, data on the causative species were available for 88% (n=444) of notifications reported. Proportionally, there were slightly more notifications of *Le. pneumophila* (51%) than *Le. longbeachae* (48%). A single notification of *Le. anisa* and 2 notifications of *Le. micdadei* were also reported (Table 21). Serogroup information was only reported for 70% of *Le. pneumophila* notifications and 17% of *Le. longbeachae* notifications. Of these, 91% of *Le. pneumophila* notifications were typed

to *Le. pneumophila* serogroup 1 and all *Le. longbeachae* notifications were typed to *Le. longbeachae* serogroup 1.

Over the period 2008 to 2013, the notified cases of *Le. pneumophila* ranged from 101 to 228, whilst notified cases of *Le. longbeachae* ranged from 144 to 213 (Figure 89). When compared with 2012, notifications of *Le. pneumophila* increased by 40% and *Le. longbeachae* by 13%.

Figure 89: Notification rate for legionellosis, Australia, 2013, by age group and sex and species



In 2013, mortality data was available for 71% (n=358) of notifications. Of these, 4% (n=15) were reported to have died due to legionellosis. This proportion was equivalent to the proportion of notifications reported to have died in 2012 (3%, n=11). The majority of deaths were attributed to infection with *Le. pneumophila* (80%, n=12) (Table 21). Over the last 5 years (2008 to 2013) the mortality data of legionellosis notification has improved with the proportion of cases reported with death information increasing from 49% in 2008 to 71% in 2013.

Geographic description

In 2013, jurisdictional-specific rates of legionellosis varied from 0.3 per 100,000 in the Australian Capital Territory to 3.8 per 100,000 in South Australia (Table 21).

In 2013, *Le. pneumophila* was the most notified infecting species in the Australian Capital Territory, New South Wales, Queensland, South Australia and Victoria, while *Le. longbeachae* was more common in the Northern Territory and Western Australia. Tasmania reported and equal number of notifications of both species. The geographic distribution in 2013 differed from 2012 in that *Le. pneumophila* was the most commonly notified species in only New South Wales, Tasmania and Victoria, with *Le. longbeachae* being more commonly notified in all other remaining states and territories.

Age and sex distribution

In 2013, legionellosis was predominantly seen in older males. Males accounted for the majority (54%, n=271) of the notifications resulting in a male to female ratio of 1.2:1. There were no notifications in people under the age of 10 years. The highest age and sex specific rates were observed in men and women aged 75–79 years or over at 8.7 per 100,000 and 8.6 per 100,000, respectively (Figure 89). The ages of the 15 cases reported to have died due to legionellosis in 2013 ranged between 38 and 96 years (median 72 years); 11 deaths were male

Table 21: Notified cases, rates and deaths for legionellosis, Australia, 2013, by species and state or territory

Species	ACT	NSW	NT	Qld	SA	Tas.	Vic	WA	Aust.	Deaths due to legionellosis
Le. longbeachae	0	38	4	45	31‡	3	13‡	79	213	2
Le. pneumophila	1	54*	1	73*	32†	3	50†	14†	228	12
Le. anisa	0	0	0	1	0	0	0	0	1	0
Le. micdadei	0	0	0	0	0	0	2	0	2	0
Unknown species	0	13	1	46‡	0	0	1	0	61	1
Total	1	105	6	165	63	6	66	93	505	15
Rate (per 100,000)	0.3	1.4	2.5	3.5	3.8	1.2	1.2	3.7	2.2	

* 3 deaths.
† 2 deaths.
‡ 1 death.

and 4 were female. In 2013, the demographic profile of legionellosis remained consistent with the recognised epidemiology of the disease.[21,150,151]

Analysis by infecting species and age group identified that 93% of *Le. longbeachae* notifications were reported in persons aged 40 years or over and was the predominant species reported in the 75–79 years age groups (4.6 per 100,000). Similarly, 85% of notified *Le. pneumophila* infections were in persons aged 40 years or over and was the predominant species in the 85 years or over age group (3.2 per 100,000).

Seasonality

In 2013, diagnoses of legionellosis were highest in September, with 60 notified cases (Figure 90). In 2013, the seasonal pattern of *Le. pneumophila* and *Le. longbeachae* differed from the seasonal patterns seen in the previous 5 years. From 2008 to 2012, the diagnosis of *Le. pneumophila* commonly occurred in the autumn and summer months, whilst a diagnosis of *Le. longbeachae* was more common in the spring months. In 2013, the diagnosis of both species peaked in winter, with 70 *Le. pneumophila* cases and 71 *Le. longbeachae* cases notified in June, July and August (Figure 90). It is unclear why this change in seasonality occurred, but it may be the result of the increase in legionellosis testing in Queensland between June and September 2013 following the Wesley Hospital outbreak.

Place of acquisition

In 2013, a place of acquisition was reported in 80% (n=402) of legionellosis notifications. Of these, 94% (n=379) were reported to be acquired within Australia and 6% (n=23) were reported to be acquired overseas. Of the overseas acquired notifications, Thailand (17%, n=4) and Indonesia (13%, n=3) were the most commonly reported places of acquisition.

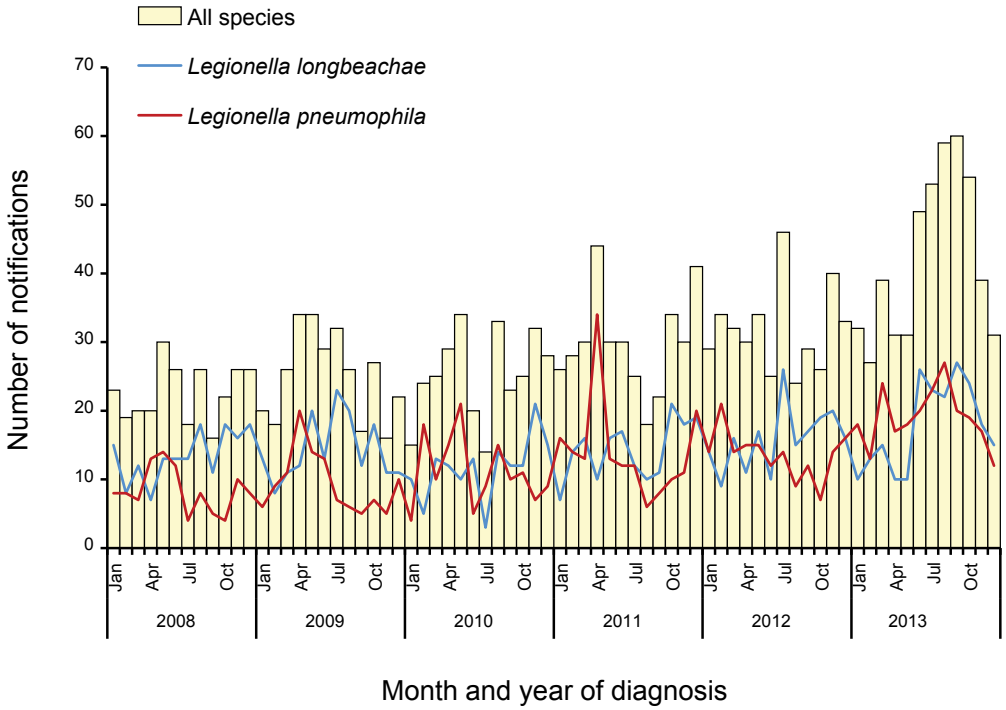
Outbreaks

In 2013, there were 5 clusters and 3 outbreaks of legionellosis notified to the NNDSS. All were attributed to *Le. pneumophila* serogroup 1 and occurred in 3 jurisdictions; Queensland, South Australia and Victoria.

There was 1 outbreak reported in Queensland. On 5 June 2013, the Wesley Hospital notified Queensland Health of 2 legionellosis cases, one resulting in death. Environmental investigations identified the most probable source of infection for this outbreak of *Le. pneumophila* was contamination of the hospitals heated water systems.[149]

In 2013, Victoria reported 4 clusters and 2 outbreaks, involving a total of 26 cases, and South Australia reported 1 cluster involving 12 cases. The sources of infection of these clusters and outbreaks were not determined.

Figure 90: Notified cases of legionellosis, Australia, 2008 to 2013, by month and year of diagnosis and species



Leprosy

- A total of 13 cases of leprosy were notified in 2013, maintaining a notification rate of less than 0.1 per 100,000.

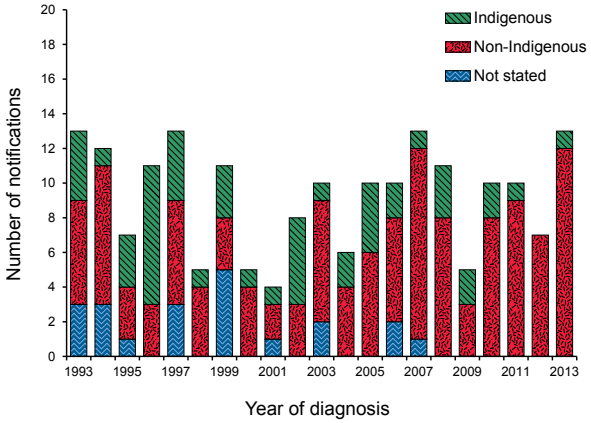
Leprosy is a chronic infection of the skin and peripheral nerves with the bacterium *Mycobacterium leprae*. Leprosy is an uncommon disease in Australia with the majority of cases occurring among migrants from leprosy endemic countries. The incidence of leprosy worldwide is declining due to various factors including economic development, bacillus Calmette-Guérin (BCG) immunisation and high coverage with multi-drug therapy.[21] Leprosy is not a highly infectious disease and is typically slow to progress to a symptomatic stage. The incubation period for leprosy is about 5 years; however, it can take as long as 20 years for symptoms to appear.[152] People at risk are generally in close and frequent contact with leprosy patients or living in countries where the disease is more common. New treatments mean the disease is now curable and once a person with leprosy begins appropriate treatment, they quickly become non-infectious.

In January 2014, the NSC redefined the diagnosis date methodology used to count leprosy cases due to the considerable amount of time that can elapse between the initial infection, the onset of symptoms and the subsequent diagnosis; and that in many of Australia's leprosy cases the infection was acquired prior to the case migrating to Australia. The diagnosis date is now derived from the 'notification received date' field rather than the earliest date recorded in either the 'true onset date', 'specimen date', 'notification date' or 'notification received date' fields. This definition also aligns with the methodology to count tuberculosis cases in Australia. Note that the new methodology has been applied retrospectively to the historical notification data described in this report. Therefore, data presented in this report may not correspond with NNDSS leprosy data published prior to January 2014.

Epidemiological situation in 2013

In 2013, a total of 13 cases of leprosy were notified (8 male, 5 female), representing a rate of 0.1 per 100,000. Cases were spread across all jurisdictions except Tasmania (Table 4). Cases ranged in age from 28 to 56 years, with a median age of 36 years. Only 1 case was recorded as Indigenous. Since 1993, annual notifications of leprosy have ranged from 4 to 13 cases per year (Figure 91).

Figure 91: Notified cases of leprosy, Australia, 1993 to 2013, by year of diagnosis and Indigenous status



Meningococcal disease (invasive)

Meningococcal disease is caused by the bacterium *Neisseria meningitidis,* and invasive disease occurs when bacteria enter a normally sterile site, usually the blood (septicaemia), cerebrospinal fluid (meningitis) or both. Asymptomatic respiratory tract carriage of meningococci is present in 5%–10% of the population and prevalence may be higher when groups of people occupy small areas of any space.[21, 50] The disease is transmitted via respiratory droplets and has an incubation period of between 1 and 10 days, more commonly 3 to 4 days.[50,153] It occasionally causes a rapidly progressive serious illness, most commonly in previously healthy children and young adults. Globally, serogroups A, B, C, W135 and Y most commonly cause disease.[21] Historically, *N. meningitidis* serogroups B and C have been the major cause of invasive meningococcal disease (IMD) in Australia.

Epidemiological situation in 2013

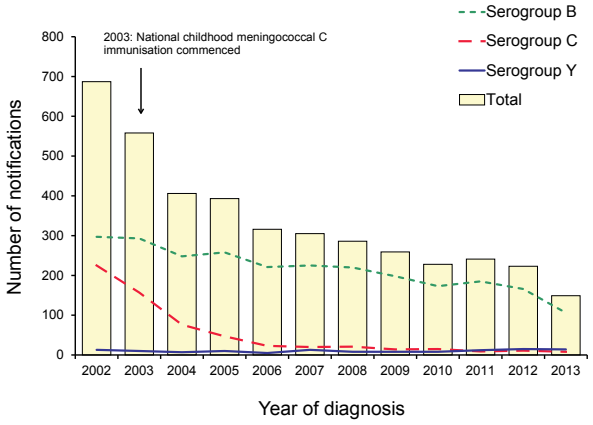
In 2013, there were 149 cases of IMD representing a rate of 0.6 per 100,000. This was a decrease of 33% compared with 2012 (n=222) and the lowest number of cases notified over the previous 10 years (Figure 92).

Most cases (n=145) notified in 2013 met the case definition as a confirmed case, that is, diagnosed based on laboratory definitive evidence, or laboratory suggestive evidence and clinical evidence.[154] A small number of cases (n=4) met the case definition as a probable case, that is, diagnosed based on clinical evidence only.

Data on serogroup were available for 94% (n = 140) of cases in 2013; 76% of which were caused by serogroup B organisms, 10% by serogroup Y, 6% by serogroup C and 9% by serogroup W135

(Table 22). The number of cases of IMD caused by serogroup B notified in 2013 was lower than in any of the preceding 10 years. Notifications of IMD caused by serogroup C organisms decreased by 27.3% from the previous year (n= 11). The number of serogroup Y cases notified in 2013 (n=14) was consistent with 2012 (n=15) but higher than the average of the previous 10 years (2003–2012) of 9.6 cases. Serogroup Y infections account for a small but increasing proportion of total IMD notifications, increasing from 3% of cases notified in 2009 to 4% in 2010, 5% in 2011 and 7% in 2012. Since the introduction of the meningococcal C vaccine on the NIP in 2003, notifications caused by serogroup C organisms have decreased by 94% with fewer than 10 cases reported annually for the past 3 years.

Figure 92: Notified cases of invasive meningococcal disease, Australia, 2002 to 2013, by year of diagnosis and serogroup



Mortality data were available for 60% (n=89) of cases reported to the NNDSS in 2013. There were 5 cases reported as having died from IMD, including two due to serogroup B, one due to serogroup C, one due to serogroup Y and 1 death due to an unknown serogroup (Table 22).

The serogroup C related death occurred in an unvaccinated person in the 50–54 years age group. Of the deaths due to serogroup B organisms, 1 child was less than 5 years of age, and the other was in the 15–19 years age group. The unknown serogroup death occurred in the 45–49 years age group and the serogroup Y related death occurred in the 85 years or over age group.

Geographic description

All jurisdictions aligned with the national case definition for IMD, except the Australian Capital Territory and New South Wales where conjunctival cases were also reportable under the local case definition and reported nationally. Conjunctival cases cannot be distinguished from invasive cases in the national dataset.

In 2013, cases of IMD were reported from all states and territories, ranging from two cases in the Northern Territory to 48 cases from New South Wales (Table 22). Jurisdictional specific rates ranged from 0.6 per 100,000 in Tasmania to 1.8 per 100,000 in South Australia.

Age and sex distribution

More males than females were reported with IMD in 2013, with a male to female ratio of 1.3:1. Proportionally, 40% of all cases (n=102) reported were less than 25 years of age, of which those less than 5 years of age made up almost half (n=47). Specifically, the 0–4 years age group had the highest rate of 6.1 per 100,000 followed by the 15–19 years age group (3.7 per 100,000) and the 20–24 years age group (1.7 per 100,000) (Figure 93).

Serogroup B accounted for the majority of cases across all age groups including those aged less

Table 22: Notified cases of invasive meningococcal disease and deaths due to invasive meningococcal disease, Australia, 2013, by serogroup and state or territory

	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.	Deaths due to IMD
B	2	27	2	25	18	2	19	11	106	2
C	0	3	0	2	0	0	1	2	8	1
W135	0	6	0	3	1	0	1	1	12	0
Y	1	8	0	2	1	0	1	1	14	1
Unknown	0	4	0	1	0	1	3	0	9	1
Total	3	48	2	33	20	3	25	15	149	5
Rate (cases per 100,000)	0.8	0.6	0.8	0.7	1.2	0.6	0.4	0.6	0.6	–

than 25 years. While the age-specific rates of serogroup B infection in 2013 remain high compared with other serogroups they continue to trend downward across all age groups (Figure 94).

Figure 93: Notification rate for invasive meningococcal disease, Australia, 2013, by age group and sex

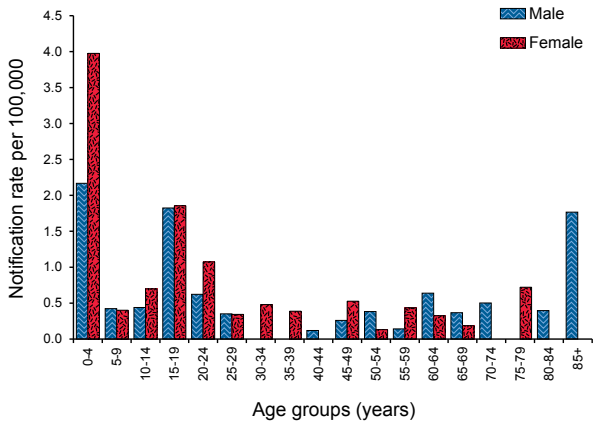
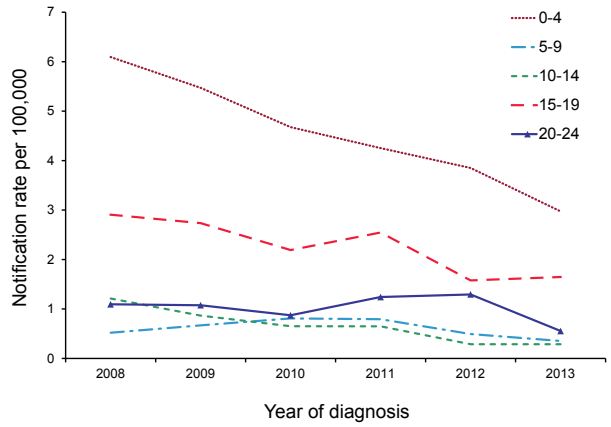


Figure 94: Notification rate for serogroup B invasive meningococcal disease, Australia, 2008 to 2013, by year of diagnosis and select age groups

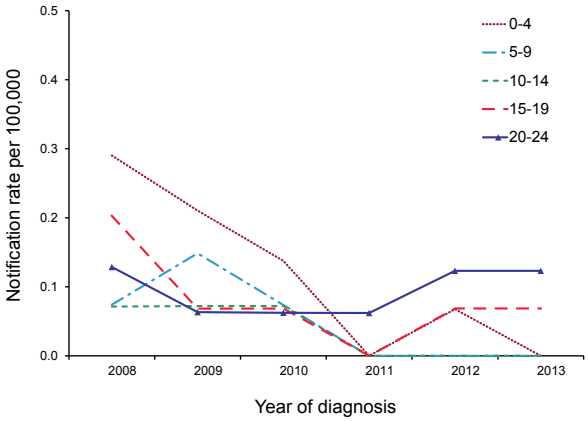


Of the 8 cases of IMD due to serogroup C notified in 2013 only 3 were among children and young adults aged less than 25 years of age, and therefore eligible for vaccination. None of the cases were in the 0–4 years of age group. Age-specific rates have been maintained at very low levels in 2013, with no age group exceeding 0.1 cases per 100,000 in 2013 (Figure 95).

Seasonality

An average of 12 cases of IMD was reported monthly in 2013, with a monthly range of 5 to 21 cases. A clear seasonal pattern was apparent, with the highest number of notifications reported in the winter months. This was consistent with the normal seasonal pattern of this disease (Figure 96). The seasonal trend was more marked in cases aged 5 years or over.

Figure 95: Notification rate for serogroup C invasive meningococcal disease, Australia, 2008 to 2013, by select age groups



Susceptibility

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.

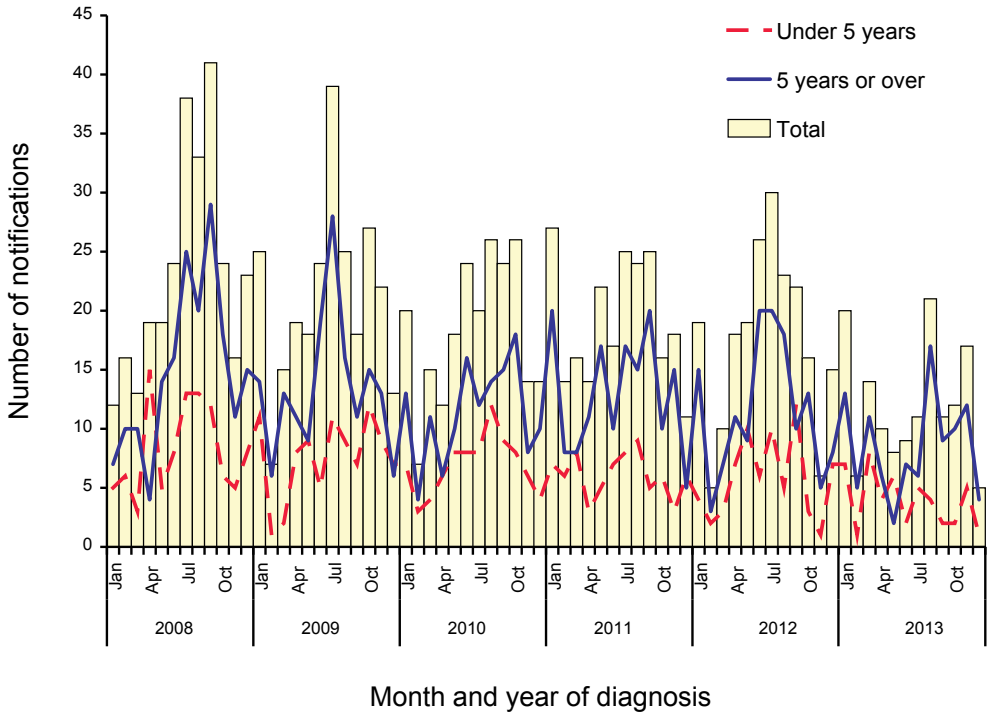
Annual reports of the AMSP are published in CDI with the most recent report published for 2013.[76] The latest data from AMSP show that 79% of isolates tested demonstrated decreased susceptibility to the penicillin group of antibiotics, and no isolates exhibited resistance to penicillin. All IMD isolates tested were susceptible to ceftriaxone; ciprofloxacin and rifampicin.

Vaccination

From 2003, meningococcal C vaccine has been available for infants aged 12 months as a part of the childhood immunisation schedule funded under the NIP. Additionally, a catch-up program provided access to the meningococcal C vaccine for children and adolescents born between 1984 and 2001.

Of the 8 cases of IMD caused by serogroup C organisms reported in 2013, three were eligible for

Figure 96: Notified cases of invasive meningococcal disease, Australia, 2008 to 2013, by age group and month and year of diagnosis



vaccination of which 1 case was reported as vaccinated and the remaining two were of unknown vaccination status.

Discussion

In Australia, IMD has reached its lowest levels since the national notification commenced in 1991. The reduction has been seen most considerably in disease caused by serogroup C; however, declines in disease caused by serogroup B are also evident. In 2013, serogroup Y continued to account for an increasing proportion of notified cases. This small but increasing trend in serogroup Y infections will continue to be monitored.

Tuberculosis

- 1,265 cases of tuberculosis were notified in 2013.

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 TB in the world, the disease remains a public health issue, particularly in Australia's overseas-born and Indigenous communities.[155]

Epidemiological situation in 2013

In 2013, a total of 1,265 cases of TB were notified to the NNDSS representing a rate of 5.5 per 100,000. Australia has achieved good TB control and has maintained low rates of TB since the mid-1980s; however, in the decade leading up to 2011 a steady increase in incidence was observed. Contrary to this increasing trend the 2012 and 2013 rates have both decreased and may be an indication that incidence is beginning to plateau or even decrease (Figure 97).

In 2013, 2.4% of TB notifications were recorded as being Indigenous. This represents a rate of 5.0 per 100,000 in Aboriginal and Torres Strait Islander peoples.

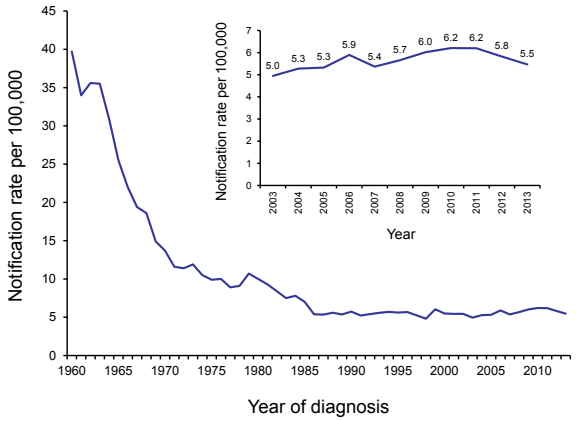
Geographic description

New South Wales (n=440), Victoria (n=383), Queensland (n=156) and Western Australia (n=150) accounted for 89% of all cases of TB diagnosed in Australia. The Northern Territory (17.0 per 100,000), Victoria (6.7 per 100,000), Western Australia (6.0 per 100,000) and New South Wales (5.9 per 100,000) all recorded a rate higher than the national notification rate.

In 2013, the Northern Territory, Tasmania and Victoria all recorded higher notification rates than the previous year. All the other states and ter-

ritories reported a decrease on the previous year, with the greatest decrease being reported by South Australia (18% decrease).

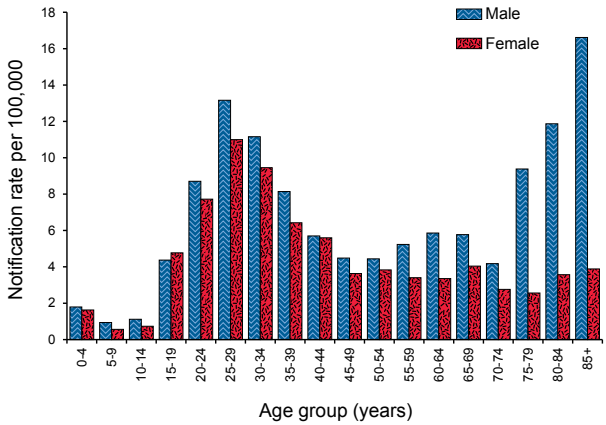
Figure 97: Notification rate for tuberculosis, Australia, 1960 to 2013, by year of diagnosis



Age and sex distribution

In 2013, 50% of all TB notifications were seen in people aged 20–39 years. Overall, the age group with the highest notification rate was the 25–29 years age group (12.1 per 100,000) and the highest age and sex specific rates were observed in men aged 85 years or over (16.6 per 100,000) and women aged 25–29 years (11.0 per 100,000)0 (Figure 98).

Figure 98: Notification rate for tuberculosis, Australia, 2013, by age group and sex



Males accounted for more than half (57%) of the TB notifications, resulting in a male to female ratio of 1.3:1.

Vaccination

The BCG vaccine was first introduced for protection against tuberculosis in the 1920s and despite variable evidence on the efficacy of the vaccine it remains the only vaccine in use for TB today.[156,157]

According to national guidelines developed by Australia's National Tuberculosis Advisory Committee, BCG vaccination is recommended for: Aboriginal and Torres Strait Islander neonates in communities with a high incidence of TB; neonates and children under 5 years of age who will be travelling to or living in countries or areas with a high prevalence of TB for extended periods; and neonates born to parents with leprosy or a family history of leprosy.

BCG vaccination is not recommended for general use in the Australian population or for most health care workers and is contraindicated in HIV infected persons.[158] Note that BCG immunisation practices may vary between states and territories due to differences in jurisdiction-specific TB vaccination policies and population demographics.

Enhanced surveillance data sets

Enhanced data are collected on all cases of TB. Further analyses, including identification of risk groups and reporting on treatment outcomes, can be found in the TB annual report series also published in CDI.

Acknowledgements

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

Rachel de Kluyver, Office of Health Protection

Members of the National Surveillance Committee

The National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases

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Zoonoses: Fiona May

Other bacterial infections: Cindy Toms, Anna Glynn-Robinson

With contributions from:

National organisations

Communicable Diseases Network Australia and subcommittees

Australian Childhood Immunisation Register

Australian Gonococcal Surveillance Programme

Australian Meningococcal Surveillance Programme

Australian Sentinel Practice Research Network

Australian Quarantine Inspection Service

The Kirby Institute

National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases

National Enteric Pathogens Surveillance Scheme

OzFoodNet Working Group

World Health Organization Collaborating Centre for Reference and Research on Influenza

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Communicable Diseases Surveillance and Control Unit, NSW Ministry of Health, New South Wales

Centre for Disease Control, Northern Territory Department of Health and Community Services, Northern Territory

Communicable Diseases Branch, Queensland Health, Queensland

Communicable Disease Control, South Australian Department of Health, South Australia

Communicable Diseases Prevention Unit, Department of Health and Human Services, Tasmania

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Abbreviations

7vPCV	7 valent pneumococcal conjugate vaccine
13vPCV	13 valent pneumococcal conjugate vaccine
23vPPV	23 valent pneumococcal polysaccharide vaccine
ABLV	Australian bat lyssavirus
AFP	acute flaccid paralysis
AGSP	Australian Gonococcal Surveillance Programme
AIDS	acquired immune deficiency syndrome
AMSP	Australian Meningococcal Surveillance Programme
ANCJDR	Australian National Creutzfeldt-Jakob Disease Registry
BCG	bacillus Calmette–Guérin
BFV	Barmah Forest virus
CDI	Communicable Diseases Intelligence
CDNA	Communicable Diseases Network Australia
CDWG	Case Definitions Working Group
CJD	Creutzfeldt-Jakob disease
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
ILI	influenza like illness
IMD	invasive meningococcal disease
IPD	invasive pneumococcal disease
JEV	Japanese encephalitis virus
KUNV	Kunjin virus
MenCCV	meningococcal serogroup C vaccine
MMR	measles-mumps-rubella
MMRV	measles-mumps-rubella-varicella
MVEV	Murray Valley encephalitis virus
NDP	no data provided
NEC	not elsewhere classified
NIP	National Immunisation Program
NN	not notifiable
NNDSS	National Notifiable Diseases Surveillance System
NQFMP	National Q Fever Management Program
NSC	National Surveillance Committee
NS1	non-structural protein 1
PCR	polymerase chain reaction
RRV	Ross River virus
SARS	severe acute respiratory syndrome
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 Centre for Reference and Research on Influenza

Appendices

Appendix 1: December estimate of Australian population, 2013, by state or territory

	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aus.
Males	189,768	3,678,352	127,257	2,321,199	828,037	255,702	2,839,733	1,275,196	11,517,323
Females	191,701	3,731,240	113,939	2,333,812	842,652	257,422	2,899,143	1,245,377	11,616,389
Total	381,469	7,409,592	241,196	4,655,011	1,670,689	513,124	5,738,876	2,520,573	23,133,712

Source : Australian Bureau of Statistics 3101.0 Table 4, Estimated Resident Population, State and Territories. Australian Demographic Statistics, Dec 2013

Appendix 2: December estimate of Australian population, 2013, by state or territory and age

Age group	State or territory								
	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aus.
00–04	25,991	487,499	19,047	315,970	100,154	31,398	368,889	168,540	1,517,647
05–09	23,173	464,532	17,794	309,807	97,897	31,619	349,581	160,960	1,455,520
10–14	21,309	446,747	17,035	298,286	97,330	32,076	332,759	153,006	1,398,739
15–19	23,139	464,824	16,441	308,284	104,427	33,778	355,920	160,096	1,467,083
20–24	33,378	506,478	19,415	333,470	115,159	31,511	415,446	186,518	1,641,597
25–29	34,120	531,807	23,298	339,744	115,037	29,710	442,778	211,548	1,728,480
30–34	31,683	527,248	21,394	323,018	107,734	29,179	424,394	193,052	1,658,077
35–39	27,927	495,899	18,392	310,893	102,797	29,506	392,703	174,020	1,552,362
40–44	28,069	523,433	18,474	339,039	116,213	34,967	417,107	186,341	1,663,899
45–49	24,901	482,285	15,938	308,603	112,752	34,093	380,574	170,171	1,529,523
50–54	24,511	499,586	15,538	310,798	116,210	37,694	377,742	166,499	1,548,794
55–59	21,274	452,953	13,249	275,044	107,068	35,756	340,422	147,621	1,393,560
60–64	18,641	402,227	10,202	248,185	98,343	33,267	301,625	127,929	1,240,619
65–69	15,272	356,695	6,898	216,879	86,919	29,431	264,253	105,312	1,081,738
70–74	10,129	260,379	3,958	153,226	63,235	21,288	194,038	74,910	781,221
75–79	7,344	200,443	2,117	108,522	49,494	15,629	150,539	55,352	589,468
80–84	5,261	153,463	1,223	79,364	38,926	11,477	115,655	40,432	445,819
85+	5,347	153,094	783	75,879	40,994	10,745	114,451	38,266	439,566
Total	381,469	7,409,592	241,196	4,655,011	1,670,689	513,124	5,738,876	2,520,573	23,133,712

Source : Australian Bureau of Statistics 3101.0 Australian Demographic Statistics Tables, Dec 2013.

Appendix 3: Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2013, 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
Arbovirus (NEC)	2	–	–	8	11	–	21	48	10	11
Australian bat lyssavirus	–	–	–	1	–	–	1	100	1	–
Barmah Forest virus infection	91	7	5	1,811	1,798	527	4,239	45	1,914	2,325
Botulism	–	–	–	2	1	1	4	50	2	2
Brucellosis	–	–	–	11	3	–	14	79	11	3
Campylobacteriosis	226	12	11	7,473	6,607	369	14,698	53	7,722	6,976
Chlamydial infection	5,792	655	344	24,835	30,504	20,396	82,526	38	31,626	50,900
Cholera	–	–	–	3	–	–	3	100	3	–
Cryptosporidiosis	168	2	5	2,085	1,318	268	3,846	59	2,260	1,586
Dengue virus infection	9	5	–	1,515	269	43	1,841	83	1,529	312
Diphtheria	–	–	–	1	1	–	2	50	1	1
Gonococcal infection	3,856	217	108	6,565	2,866	1,330	14,942	72	10,746	4,196
Haemolytic uraemic syndrome	–	–	–	14	1	–	15	93	14	1
Haemophilus influenzae type b	1	–	1	16	2	–	20	90	18	2
Hepatitis A	2	–	1	177	9	–	189	95	180	9
Hepatitis B (newly acquired)	11	1	1	130	24	5	172	83	143	29
Hepatitis B (unspecified)	171	17	5	2,563	1,891	2,332	6,979	40	2,756	4,223
Hepatitis C (newly acquired)	71	–	1	273	55	7	407	85	345	62
Hepatitis C (unspecified)	687	12	25	3,323	3,372	2,889	10,308	39	4,047	6,261
Hepatitis D	–	–	–	44	8	1	53	83	44	9
Hepatitis E	–	–	–	29	2	–	31	94	29	2
Influenza (laboratory confirmed)	662	47	27	10,630	8,312	8,651	28,329	40	11,366	16,963
Japanese encephalitis virus infection	–	–	–	3	1	–	4	75	3	1
Kunjin virus infection	–	–	–	1	2	–	3	33	1	2
Legionellosis	14	1	1	390	97	2	505	80	406	99
Leprosy	1	–	–	12	–	–	13	100	13	–
Leptospirosis	2	–	–	74	19	–	95	80	76	19
Listeriosis	2	–	–	68	6	–	76	92	70	6
Malaria	1	1	–	331	80	1	414	80	333	81
Measles	3	–	–	140	15	–	158	91	143	15

Appendix 3 (cont'd): Indigenous status, National Notifiable Diseases Surveillance System, Australia, 2013, 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
Meningococcal disease (invasive)	13	1	–	130	5	–	149	97	144	5
Mumps	5	–	–	166	38	8	217	79	171	46
Murray Valley encephalitis virus infection	–	–	–	–	1	–	1	–	–	1
Ornithosis	–	–	–	38	8	1	47	81	38	9
Pertussis	265	6	17	6,019	4,780	1,254	12,341	51	6,307	6,034
Pneumococcal disease (invasive)	182	6	5	1,163	130	60	1,546	88	1,356	190
Q fever	16	1	3	375	73	9	477	83	395	82
Ross River virus infection	89	4	6	2,070	1,548	591	4,308	50	2,169	2,139
Rubella	–	–	–	20	4	1	25	80	20	5
Rubella – congenital	–	–	–	2	–	–	2	100	2	–
Salmonellosis	374	9	17	6,348	3,356	2,687	12,791	53	6,748	6,043
Shigellosis	133	1	1	369	38	14	556	91	504	52
STEC	2	–	–	134	40	4	180	75	136	44
Syphilis – congenital	3	–	–	4	–	–	7	100	7	–
Syphilis < 2 years	126	9	7	1,457	155	14	1,768	91	1,599	169
Syphilis > 2 years or unspecified duration	188	21	8	1,096	384	9	1,706	77	1,313	393
Tetanus	–	–	–	3	–	1	4	75	3	1
Tuberculosis	27	5	–	1,232	1	–	1,265	100	1,264	1
Typhoid fever	–	2	–	140	6	2	150	95	142	8
Varicella zoster (chickenpox)	97	1	5	1,735	165	39	2,042	90	1,838	204
Varicella zoster (shingles)	136	2	5	4,358	413	103	5,017	90	4,501	516
Varicella zoster (unspecified)	126	12	5	2,272	7,185	327	9,927	24	2,415	7,512
Total	13,554	1,057	614	91,659	75,604	41,946	224,434	48	106,884	117,550

* 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.

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