Australia's notifiable diseases status, 2001

Annual report of the National Notifiable Diseases Surveillance System

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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

National Centre in HIV Epidemiology and Clinical Research

National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases

National Enteric Pathogens Surveillance Scheme

National Rotavirus Research Centre

Sentinel Chicken Surveillance Programme

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Abstract

In 2001 there were 104,187 notifications of communicable diseases in Australia reported to the National Notifiable Diseases Surveillance System (NNDSS). The number of notifications in 2001 was an increase of 16 per cent of those reported in 2000 (89,740) and the largest annual total since the NNDSS commenced in 1991. In 2001, nine new diseases were added to the list of diseases reported to NNDSS and four diseases were removed. The new diseases were cryptosporidiosis, laboratory-confirmed influenza, invasive pneumococcal disease, Japanese encephalitis, Kunjin virus infection, Murray Valley encephalitis virus infection, anthrax, Australian bat lyssavirus, and other lyssaviruses (not elsewhere classified). Bloodborne virus infections remained the most frequently notified disease (29,057 reports, 27.9% of total), followed by sexually transmitted infections (27,647, 26.5%), gastrointestinal diseases (26,086, 25%), vaccine preventable diseases (13,030 (12.5%), vectorborne diseases (5,294, 5.1%), other bacterial infections (1,978, 1.9%), zoonotic infections (1,091, 1%) and four cases of quarantinable diseases. In 2001 there were increases in the number of notifications of incident hepatitis C, chlamydial infections, pertussis, Barmah Forest virus infection and ornithosis. There were decreases in the number of notifications of hepatitis A, *Haemophilus influenzae* type b infections, measles, rubella, Ross River virus infections and brucellosis. This report also summarises data on communicable diseases from other surveillance systems including the Laboratory Virology and Serology Reporting Scheme and sentinel general practitioner schemes. In addition, this report comments on other important developments in communicable disease control in Australia in 2001. *Commun Dis Intell* 2003;27:1–78.

Keywords: surveillance, communicable diseases, epidemiology

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Abbreviations used in this report

7vPCV	7-valent conjugate pneumococcal vaccine
23vPPV	23-valent conjugate pneumococcal vaccine
AIDS	Acquired immune deficiency syndrome
ASPREN	Australian Sentinel Practice Research Network
BF	Barmah Forest virus
CDNA	Communicable Diseases Network Australia
CJD	Creutzfeldt-Jakob disease
DoHA	Department of Health and Ageing
DT	Definitive Type (of *Salmonella*)
DTP	Diphtheria-tetanus-pertussis
EAGAR	Expert Advisory Group for Antimicrobial Resistance
Hib	*Haemophilus influenzae* type b
HIV	Human immunodeficiency virus
HUS	Haemolytic uraemic syndrome
ICD10-AM	International Classification of Diseases, version 10, Australian Modification
IDU	Injecting drug use(r)
IPD	Invasive pneumococcal disease
JE	Japanese encephalitis virus
JETACAR	Joint Expert Technical Advisory Committee on Antibiotic Resistance
LabVISE	Laboratory Virology and Serology Reporting Scheme
MMR	Measles-mumps-rubella
MVE	Murray Valley encephalitis virus
NCHECR	National Centre in HIV Epidemiology and Clinical Research
NCIRS	National Centre for Immunisation Research and Surveillance
NEC	Not elsewhere classified
NN	Not notifiable
NNDSS	National Notifiable Diseases Surveillance System
OPV	Oral polio vaccine
PNG	Papua New Guinea
RR	Ross River virus
SLTEC/VTEC	Shiga-like toxin producing *Escherichia coli*, Verotoxin-producing *E. coli*
STI(s)	Sexually transmitted infection(s)
STM	*Salmonella* Typhimurium
TB	Tuberculosis
USA	United States of America
WHO	World Health Organization
WPR	Western Pacific Region

2001: the year in review

The year 2001 will be remembered for the terrorist attacks on the United States of America (USA) and the deliberate release of anthrax. A total of 22 cases of anthrax were detected and there were five deaths.[1] In response to these events, governments around the world prepared for bioterrorism by stockpiling of vaccines and antibiotics, monitoring unusual clinical presentations through 'syndromic surveillance' and strengthening laboratory capacity to test clinical and environmental samples for pathogens of biosecurity concern. The release of anthrax in the USA was followed by 'white powder incidents' in Australia and elsewhere, straining emergency, medical and laboratory services. No deliberate releases of pathogens were detected in Australia.

Improvements continued to be made in the surveillance and control of communicable diseases in Australia in 2001. Following the demonstration of high vaccine efficacy in the USA,[2] the seven-valent conjugate pneumococcal vaccine (7vPCV) was introduced in Australia in July 2001. A targeted vaccination schedule was developed to immunise children at high risk. Enhanced surveillance was introduced to measure the impact of vaccines on the serotype frequency and prevalence of antibiotic resistance in the pneumococci. Continued development of Australia's response to the transmissible spongiform encephalopathies included the introduction of a certification system for imported beef products in July 2001.[3] The publication of *Guidelines for the early clinical and public health management of meningococcal disease in Australia* by the Communicable Diseases Network Australia (CDNA) in June 2001 was timely as there were a number of highly publicised clusters of meningococcal cases in Australia later in 2001.

Internationally, cases of vaccine-derived polio causing paralytic disease caused concern about the global polio eradication program. An outbreak of 21 cases of polio in Hispaniola and three cases in the Philippines occurred in communities with relatively low vaccination rates. These outbreaks demonstrate the potential of the polio virus to evade the impact of vaccination, and underline the importance of maintaining high levels of vaccination coverage.

New molecular clues to the basis of the virulence of pandemic strains of laboratory-confirmed influenza were unravelled in 2001.[4,5] The Australian Action Plan for Pandemic Influenza, updated in 2001, established plans, levels of alerts and responsibilities for the control of an influenza pandemic, were one to occur.

The surveillance of communicable diseases in Australia was further improved in 2001 by a revision of the diseases under surveillance and through the introduction of enhanced surveillance of invasive pneumococcal disease. In their first year of operation OzFoodNet, the network of foodborne disease epidemiologists in Australia, were involved in the control of two international foodborne disease outbreaks and identified 86 domestic outbreaks. The OzFoodNet report for 2001 provides valuable additional information about the epidemiology of foodborne disease in Australia.[6]

Control of communicable diseases in Australia continues to face challenges. In 2001, these included imported cases of measles causing outbreaks among unvaccinated people. Clusters of meningococcal disease in adolescents and young adults in a series of well publicised clusters in 2001 and 2002, prompted the Commonwealth Government to commence an immunisation program with the meningococcal C vaccine.

Continued improvements will need to be made to surveillance systems to manage the changing epidemiology of communicable diseases in Australia and to provide essential data for biosecurity.

Introduction

Surveillance of communicable diseases is vital for the control of communicable diseases, to identify and assess diseases requiring control or prevention and to monitor trends over time. It is also required for the guidance of policy making.

Surveillance in Australia exists at the national, state/territory and local levels. Primary responsibility for public health action lies with the states and territories and local health authorities.

The role of surveillance at a national level includes:

- identifying national trends in disease;
- guidance for policy development at a national level and resource allocation;
- Monitoring the need for and impact of national control programs;
- coordination of national or multi-jurisdictional outbreaks;
- description of the epidemiology of rare diseases, that occur infrequently at state and territory levels;
- meeting various international reporting requirements, such as providing disease statistics to the World Health Organization (WHO); and
- support for quarantine activities, which are a Commonwealth responsibility.

The National Notifiable Diseases Surveillance System (NNDSS) is based on fortnightly reporting by the states and territories to the Commonwealth. Fifty-five communicable diseases agreed upon nationally through CDNA are reported to NNDSS (Table 1). The system is complemented by several other surveillance systems, which provide information on other particular diseases, including some that are not reported to NNDSS.

Table 1. Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2001

Disease group	Disease	Data received from:*
Bloodborne diseases	Hepatitis B (incident)	All jurisdictions
	Hepatitis B (unspecified)	All jurisdiction, except NT
	Hepatitis C (incident)	All jurisdictions except Queensland and NT
	Hepatitis C (unspecified)	All jurisdictions
	Hepatitis D	All jurisdictions
	Hepatitis (NEC)	All jurisdictions
Gastrointestinal diseases	Botulism	All jurisdictions
	Campylobacterosis	All jurisdictions except NSW
	Cryptosporidiosis	All jurisdictions
	Haemolytic uraemic syndrome	All jurisdictions
	Hepatitis A	All jurisdictions
	Hepatitis E	All jurisdictions
	Listeriosis	All jurisdictions
	Salmonellosis	All jurisdictions
	Shigellosis	All jurisdictions
	SLTEC,VTEC	All jurisdictions
	Typhoid	All jurisdictions
Quarantinable diseases	Cholera	All jurisdictions
	Plague	All jurisdictions
	Rabies	All jurisdictions
	Viral haemorrhagic fever	All jurisdictions
	Yellow fever	All jurisdictions
Sexually transmissible infections	Chlamydial infection	All jurisdictions
	Donovanosis	All jurisdictions except SA
	Gonococcal infection	All jurisdictions
	Syphilis	All jurisdictions
Vaccine preventable diseases	Diphtheria	All jurisdictions
	Haemophilus influenzae type b	All jurisdictions
	Laboratory-confirmed influenza	All jurisdictions
	Measles	All jurisdictions
	Mumps	All jurisdictions
	Pertussis	All jurisdictions
	Invasive pneumococcal disease	All jurisdictions
	Poliomyelitis	All jurisdictions
	Rubella	All jurisdictions
	Tetanus	All jurisdictions
Vectorborne diseases	Arbovirus infection NEC	All jurisdictions
	Barmah Forest virus infection	All jurisdictions
	Dengue	All jurisdictions
	Japanese encephalitis	All jurisdictions
	Kunjin	All jurisdictions except ACT†
	Malaria	All jurisdictions
	Murray Valley encephalitis	All jurisdictions†
	Ross River virus infection	All jurisdictions
Zoonoses	Anthrax	All jurisdictions except SA
	Australian bat lyssavirus	All jurisdictions
	Brucellosis	All jurisdictions
	Leptospirosis	All jurisdictions
	Ornithosis	All jurisdictions
	Lyssaviruses (unspecified)	All jurisdictions
	Q fever	All jurisdictions

Table 1 (continued). Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2001

Disease group	Disease	Data received from:*
Other bacterial infections	Legionellosis	All jurisdictions
	Leprosy	All jurisdictions
	Invasive meningococcal infection	All jurisdictions
	Tuberculosis	All jurisdictions

* Jurisdictions may not have reported a disease either because legislation had not yet made that disease notifiable in that jurisdiction, or because notification data for that disease were not reported to the Commonwealth in 2001.

† In the Australian Capital Territory, infections with Murray Valley encephalitis virus and Kunjin virus were combined under Murray Valley encephalitis

NEC: Not elsewhere classified

The results of communicable disease surveillance are reported through several avenues of communication. Fortnightly teleconferences of the CDNA provide the most up-to-date information on topics of immediate interest. The *Communicable Diseases Intelligence* journal, published quarterly, contains results of surveillance and research reports on the epidemiology and control of various communicable diseases. Data summaries are published on the Communicable Diseases Australia website on a fortnightly basis. The annual report of the NNDSS, Australia's notifiable diseases status, provides yearly summaries of notifications.

Methods

Australia is a federation of six states (New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia) and two territories (the Australian Capital Territory and the Northern Territory). State and Territory health departments collect notifications of communicable diseases under their public health legislation. The Commonwealth Department of Health and Ageing (DoHA) does not have any legislated responsibility for public health apart from human quarantine. States and territories have agreed to forward data on nationally agreed communicable diseases to DoHA for the purposes of national communicable disease surveillance.

In 2001, data were transmitted to DoHA each fortnight by the states and territories. The Commonwealth received final data sets for 2001 from the states and territories by July 2002. Apparent errors or incomplete data for some diseases, together with any queries arising from the data, were returned to the states and territories for review.

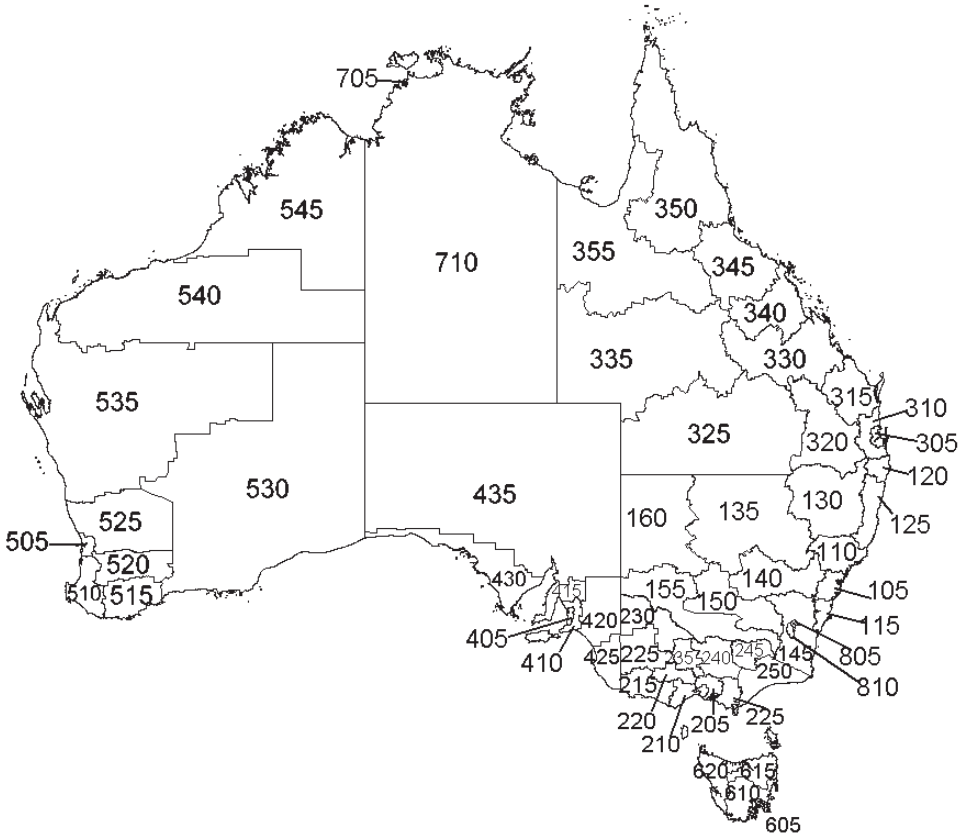
The national data set includes fields for a unique record reference number; notifying state or territory; disease code; age; sex; Indigenous status; postcode of residence; the date of onset of the disease; and the date of report to the state or territory health department. Additional information was available on the species and serogroups isolated in cases of legionellosis, invasive meningococcal disease and malaria, and on the vaccination status in cases of childhood vaccine-preventable diseases. While not included in the national dataset, additional information concerning mortality and specific health risk factors for some diseases was obtained from states and territories.

Analyses in this report are based on date of disease onset, unless otherwise specified. For analysis of seasonal trends, notifications were reported by month of onset. Population notification rates were calculated using 2001 mid-year census-based estimates of the resident population, supplied by the Australian Bureau of Statistics (Appendix 1). Population data used in previous annual reports was based on forward projections from the 1996 census. The population calculated for the year 2001 is less than the year 2000 estimate. Comparison of rates across these years will thus be subject to slight error.

Where diseases were not notifiable in a state or territory for a particular year, adjusted rates were calculated using a denominator excluding that jurisdiction's population. The Australian Institute of Health and Welfare supplied hospital admission data for the financial year 2000–01.

Maps were generated using MapInfo, and were based on postcodes of residence, which have been allocated to Statistical Divisions by the Australian Bureau of Statistics (Map 1). The two Statistical Divisions that make up the Australian Capital Territory are combined, as the population for one division is very small. Similarly, the Darwin and 'Northern Territory – balance' Statistical Divisions have been combined to calculate rates for the Northern Territory as a whole. Rates for the different Statistical Divisions were ordered into six groups — the highest value, the lowest value (above zero) those equal to zero, and the intermediate values divided into three equal-sized groups.

Map 1. Australian Bureau of Statistics Statistical Divisions



Statistical Division		Population
Australian Capital Territory		
805	Canberra	310,521
810	ACT - balance	318
New South Wales		
105	Sydney	4,085,578
110	Hunter	576,863
115	Illawarra	389,271
120	Richmond-Tweed	211,167
125	Mid-North Coast	272,966
130	Northern	173,218
135	North Western	116,895
140	Central West	172,749
145	South Eastern	182,464
150	Murrumbidgee	148,737
155	Murray	109,960
160	Far West	23,587
Northern Territory		
705	Darwin	90,011
710	NT - balance	105,452
Queensland		
305	Brisbane	1,626,865
310	Moreton	694,464
315	Wide Bay-Burnett	234,751

Statistical Division		Population
Queensland continued		
320	Darling Downs	202,352
325	South West	25,597
330	Fitzroy	181,206
335	Central West	12,135
340	Mackay	127,531
345	Northern	200,174
350	Far North	225,522
355	North West	35,760
South Australia		
405	Adelaide	1,096,102
410	Outer Adelaide	110,663
415	Yorke & Lower North	44,225
420	Murray Lands	68,497
425	South East	62,794
430	Eyre	33,493
435	Northern	81,860
Tasmania		
605	Greater Hobart	194,228
610	Southern	34,832
615	Northern	133,080
620	Mersey-Lyell	108,236

Statistical Division		Population
Victoria		
205	Melbourne	3,466,025
210	Barwon	249,067
215	Western District	98,344
220	Central Highlands	138,229
225	Wimmera	50,838
230	Mallee	88,372
235	Loddon-Campaspe	162,031
240	Goulburn	188,124
245	Ovens-Murray	90,943
250	East Gippsland	79,849
255	Gippsland	154,034
Western Australia		
505	Perth	1,381,127
510	South West	187,862
515	Lower Great Southern	52,128
520	Upper Great Southern	19,610
525	Midlands	52,986
530	South Eastern	58926
535	Central	60,253
540	Pilbara	40,429
545	Kimberley	30,539
Total Australia		19,467,896

Notes on interpretation

The notifications reported to the NNDSS may be influenced by a number of factors that should be considered when interpreting the data. Due to under-reporting, notified cases can only represent a proportion of the total number of cases that occurred (Figure 1). This proportion (the 'notified fraction') varies between diseases, between states and territories and with time.

Figure 1. The communicable disease surveillance pyramid

Adopted from the Centers for Disease Control and Prevention Website: (http://www.cdc.gov/foodnet/Surveys.htm#whatpyr)

The surveillance pyramid is a model for understanding disease reporting. This illustration shows the chain of events that must occur for an episode of illness in the population to be notified. At the bottom of the pyramid, 1) some of the general population is exposed to an organism; 2) exposed persons become ill; 3) the illness is sufficiently troubling that some persons seek care; 4) a specimen is obtained from some persons and submitted to a clinical laboratory; 5) a laboratory appropriately tests the specimen; 6) the laboratory identifies the causative organism and thereby confirms the case, or the diagnosing doctor confirms the case on clinical grounds; 7) the laboratory-confirmed or clinically-confirmed case is reported to a local or state health department, then to the Commonwealth.

Methods of surveillance can vary between states and territories, each with different requirements for notification by medical practitioners, laboratories and hospitals. In addition, the list of notifiable diseases and the case definitions may vary between states and territories.

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

The completeness of data in this report is summarised in Appendix 2. The patient's sex was missing in 0.5 per cent of notifications (n=509) and patient's age missing in 0.9 per cent of notifications (n=900). The patient's Indigenous status was reported for 55,084 (52.9%) notifications nationally. The proportion of reports with missing data in these fields varied by state and territory and by disease.

The date of disease onset is uncertain for some communicable diseases and is often equivalent to the date of presentation to a medical practitioner or date of specimen collection at a laboratory. Analysis by disease onset is an attempt to estimate disease activity within a reporting period. As considerable time may have elapsed between onset and report dates for some diseases, analyses were performed by report date for hepatitis B (unspecified) and hepatitis C (unspecified).

Between May and August every year, DoHA receives a final annual dataset from all states and territories. This yearly procedure updates only the notifications reported to NNDSS during the last calendar year. States and territories may still revise notification counts for earlier years, as duplicates are removed and other data corrected. An update of historical data for 1991 to 1999 was carried out during the year 2000 to address this issue. States and territories were also surveyed on changes in surveillance and other disease control or health promotion activities during 2001.

The present report is based on 'finalised' annual data from each state and territory, from which duplicate records or erroneous data have been removed. Totals in this report may vary slightly from the cumulative totals of the numbers reported in *Communicable Diseases Intelligence*. The present report has been informed by the discussions and comments of CDNA members and state and territory epidemiologists. The state and territory data managers also met through 2001, and their contribution to the accuracy of these data is gratefully acknowledged.

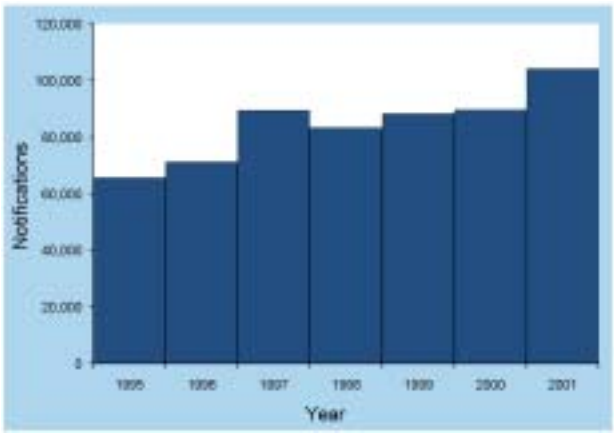
Results

Summary of 2001 data

There were 104,187 communicable disease notifications for 2001 (Table 2). Notification rates per 100,000 population for each disease by state or territory are shown in Table 3. Comparative data for the period 1997 to 2001 are shown in Table 4a. Table 4b presents details on reporting of diseases by states and territories since 1991.

The number of notifications in 2001 was an increase of 16 per cent on notifications in 2000 (89,740) and the largest number of reports received in any year since the NNDSS commenced in 1991 (Figure 2).

Figure 2. Trends in notifications to the National Notifiable Diseases Surveillance System, Australia, 1991 to 2001



In part the increase in total notifications to NNDSS in 2001 was due to changes in the number of diseases reported. In 2001, nine new diseases were added to the NNDSS and four diseases were removed. The new diseases were cryptosporidiosis, laboratory-confirmed influenza, invasive pneumococcal disease, Japanese encephalitis (JE), Kunjin virus infection, Murray Valley encephalitis virus (MVE) infection, anthrax, Australian bat lyssavirus and other lyssaviruses [not elsewhere classified (NEC)]. While there were no reports for four of these diseases, in 2001 there were 1,615 cases of cryptosporidiosis notified, 1,286 cases of laboratory-confirmed influenza, 1,681 cases of invasive pneumococcal disease, four cases of Kunjin and six cases of MVE. The four diseases removed from the NNDSS schedule in 2001 were yersiniosis, chancroid, lymphogranuloma venereum and hydatid disease, which together accounted for only 100 notifications in 2000.

In 2001, bloodborne virus infections remained the most frequently notified disease (29,057 reports, 27.9% of total), followed by sexually transmitted infections (27,647, 26.5%), gastrointestinal diseases (26,086, 25%), vaccine preventable diseases (13,030, 12.5%), vectorborne diseases (5,294, 5.1%), other bacterial infections (1,978, 1.9%), zoonotic infections (1,091, 1%) and four cases of quarantinable diseases (Figure 3).

The major changes in communicable disease notifications in 2001 are shown in Figure 4, as the ratio of notifications in 2001 compared to the mean number of notifications for the previous five years. There were increases in the number of notifications of incident hepatitis C, chlamydial infection, pertussis, Barmah Forest virus (BF) infection and ornithosis and invasive meningococcal disease. There were decreases in the number of notifications of hepatitis A, *Haemophilus influenzae* type b (Hib) infection, measles, rubella, Ross River virus (RR) infection and brucellosis.

In the financial year 2000–01, there were 89,318 hospital separations in Australian hospitals with a primary diagnosis of infectious diseases (International Classification of Diseases, version 10, Australian Modification (ICD10–AM) codes A01–B99, the Australian Institute of Health and Welfare). This represents 1.5 per cent of all hospital separations in that period. A further 61,035 separations were recorded with a principal diagnosis of influenza or pneumonia (ICD10-AM J10-J18).

Figure 3. Notifications to the National Notifiable Diseases Surveillance System, Australia, 2001, by disease category

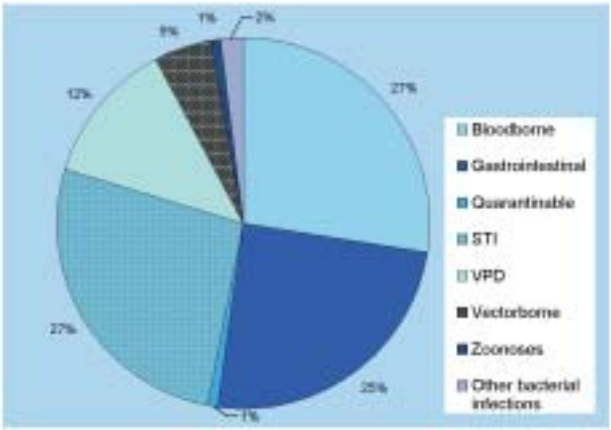


Figure 4. Selected diseases from the National Notifiable Diseases Surveillance System, comparison of total notifications for 2001 with previous five year means

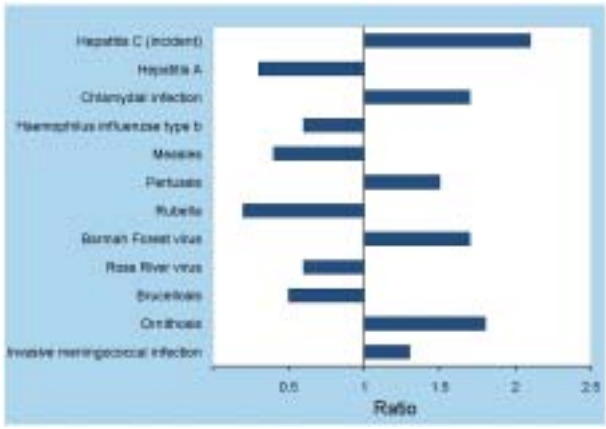


Table 2. Notifications of communicable diseases, Australia, 2001, by state or territory*

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Bloodborne diseases									
Hepatitis B (incident)	2	88	3	48	23	22	199	39	424
Hepatitis B (unspecified)†‡	54	4,710	NN	773	310	28	1,899	650	8,424
Hepatitis C (incident)	18	251	-	-	80	7	86	158	600
Hepatitis C (unspecified)†‡§	213	8,439	213	3,156	884	381	4,972	1,328	19,586
Hepatitis D	0	12	0	2	0	0	7	0	21
Hepatitis (NEC)	0	0	0	0	2	0	0	0	2
Gastrointestinal diseases									
Botulism	0	0	0	1	0	0	1	0	2
Campylobacteriosis‖	425	-	277	3,969	2,661	677	5,486	2,629	16,124
Cryptosporidiosis	10	192	248	418	66	79	436	166	1,615
Haemolytic uraemic syndrome	0	2	0	0	1	0	0	0	3
Hepatitis A	14	195	38	120	20	4	102	37	530
Hepatitis E	0	6	0	1	0	0	3	0	10
Listeriosis	1	12	0	20	6	2	10	11	62
Salmonellosis	76	1,647	373	2,201	610	163	1,085	890	7,045
Shigellosis	6	132	103	108	34	6	94	79	562
SLTEC,VTEC¶	0	1	0	14	27	0	4	3	49
Typhoid	2	32	2	10	3	1	17	17	84
Quarantinable diseases									
Cholera	0	1	0	1	1	0	1	0	4
Plague	0	0	0	0	0	0	0	0	0
Rabies	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 transmissible diseases									
Chlamydial infection	301	4,451	1,239	5,596	1,402	380	3,924	2,733	20,026
Donovanosis	0	0	13	19	NN	0	0	10	42
Gonococcal infection**	20	1,341	1,424	1,102	208	21	696	1,346	6,158
Syphilis††	11	502	427	225	20	16	15	205	1,421
Vaccine preventable diseases									
Diphtheria	0	0	1	0	0	0	0	0	1
Haemophilus influenzae type b	0	9	3	6	3	0	4	1	26
Laboratory-confirmed Influenza	14	243	92	392	135	0	177	233	1,286
Measles	0	30	0	11	2	2	83	13	141
Mumps	1	28	1	3	12	2	38	29	114
Pertussis	86	4,435	145	1,634	2,010	106	872	227	9,515
Invasive pneumococcal disease	18	434	97	425	114	61	327	205	1,681
Poliomyelitis	0	0	0	0	0	0	0	0	0
Rubella‡‡	1	58	0	134	5	2	60	3	263
Tetanus	0	0	0	0	1	1	1	0	3
Vectorborne diseases									
Arbovirus infection (NEC)	1	15	0	3	0	1	16	0	36
Barmah Forest virus infection	2	398	37	603	6	1	19	75	1,141
Dengue	11	50	43	43	7	1	6	15	176
Japanese encephalitis	0	0	0	0	0	0	0	0	0
Kunjin virus infection	-	1	2	0	0	0	0	1	4
Malaria	17	153	61	300	35	8	88	50	712
Murray Valley encephalitis	0	0	3	1	1	0	0	1	6
Ross River virus infection	9	717	223	1,569	141	13	345	202	3,219

Table 2 (continued). Notifications of communicable diseases, Australia, 2001, by state or territory*

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Zoonoses									
Anthrax	0	0	0	0	NN	0	0	0	0
Australian bat lyssavirus	0	0	0	0	0	0	0	0	0
Brucellosis	0	0	0	17	1	0	1	0	19
Leptospirosis	0	65	4	129	3	5	37	2	245
Ornithosis	1	37	1	0	15	0	68	9	131
Lyssavirus (unspecified)	0	0	0	0	0	0	0	0	0
Q fever	2	139	0	454	16	1	65	19	696
Other bacterial infections									
Legionellosis	2	67	3	37	32	3	121	42	307
Leprosy	0	3	0	0	0	0	0	2	5
Invasive meningococcal infection	6	230	13	127	39	23	163	76	677
Tuberculosis	9	415	35	100	51	12	299	68	989
Total	1,333	29,541	5,124	23,772	8,987	2,029	21,827	11,574	104,187

* Analysis by date of onset, except for hepatitis B and hepatitis C unspecified, where analysis is by report date. Date of onset is a composite of three components: (i) the true onset date from a clinician, if available, (ii) the date the laboratory test was ordered, or (iii) the date reported to NNDSS.

† Unspecified hepatitis includes cases with hepatitis in whom the duration of illness cannot be determined.

‡ The analysis was performed by report date.

§ Includes incident hepatitis C in the Northern Territory and Queensland.

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

¶ Infections with Shiga-like toxin (verotoxin) producing *E. coli.* (SLTEC/VTEC).

** Northern Territory, Queensland, South Australia, Victoria and Western Australia: includes gonococcal neonatal ophthalmia.

†† Includes congenital syphilis.

‡‡ Includes congenital rubella.

NN Not notifiable.

NEC Not elsewhere classified.

- Elsewhere classified.

Table 3. Notification rates of communicable diseases, Australia, 2001, by state or territory (rate per 100,000 population)*

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Bloodborne diseases									
Hepatitis B (incident)	0.6	1.3	1.5	1.3	1.5	4.7	4.1	2.0	2.2
Hepatitis B (unspecified)†‡	16.7	71.3	NN	21.3	20.5	5.9	39.4	34.1	43.7
Hepatitis C (incident)	5.6	3.8	-	-	5.3	1.5	1.8	8.3	3.8
Hepatitis C (unspecified)†‡§	65.7	127.7	106.5	86.8	58.4	80.6	103.1	69.7	100.5
Hepatitis D	0.0	0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.1
Hepatitis (NEC)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Gastrointestinal diseases									
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis‖	131.1	-	138.5	109.2	175.7	143.1	113.8	137.9	125.2
Cryptosporidiosis	3.1	2.9	124.0	11.5	4.4	16.7	9.0	8.7	8.3
Haemolytic uraemic syndrome	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Hepatitis A	4.3	3.0	19.0	3.3	1.3	0.8	2.1	1.9	2.7
Hepatitis E	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Listeriosis	0.3	0.2	0.0	0.6	0.4	0.4	0.2	0.6	0.3
Salmonellosis	23.4	24.9	186.5	60.5	40.3	34.5	22.5	46.7	36.2
Shigellosis	1.9	2.0	51.5	3.0	2.2	1.3	1.9	4.1	2.9
SLTEC,VTEC¶	0.0	0.0	0.0	0.4	1.8	0.0	0.1	0.2	0.3
Typhoid	0.6	0.5	1.0	0.3	0.2	0.2	0.4	0.9	0.4
Quarantinable diseases									
Cholera	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Plague	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sexually transmissible diseases									
Chlamydial infection	92.8	67.3	619.4	153.9	92.6	80.3	81.4	143.4	102.8
Donovanosis	0.0	0.0	6.5	0.5	NN	0.0	0.0	0.5	0.2
Gonococcal infection**	6.2	20.3	711.9	30.3	13.7	4.4	14.4	70.6	31.6
Syphilis††	3.4	7.6	213.5	6.2	1.3	3.4	0.3	10.8	7.3
Vaccine preventable diseases									
Diphtheria	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	0.0	0.1	1.5	0.2	0.2	0.0	0.1	0.1	0.1
Laboratory-confirmed influenza	4.3	3.7	46.0	10.8	8.9	0.0	3.7	12.2	6.6
Measles	0.0	0.5	0.0	0.3	0.1	0.4	1.7	0.7	0.7
Mumps	0.3	0.4	0.5	0.1	0.8	0.4	0.8	1.5	0.6
Pertussis	26.5	67.1	72.5	45.0	132.7	22.4	18.1	11.9	48.8
Invasive pneumococcal disease	5.6	6.6	48.5	11.7	7.5	12.9	6.8	10.8	8.6
Poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella‡‡	0.3	0.9	0.0	3.7	0.3	0.4	1.2	0.2	1.3
Tetanus	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0
Vectorborne diseases									
Arbovirus infection (NEC)	0.3	0.2	0.0	0.1	0.0	0.2	0.3	0.0	0.2
Barmah Forest virus infection	0.6	6.0	18.5	16.6	0.4	0.2	0.4	3.9	5.9
Dengue	3.4	0.8	21.5	1.2	0.5	0.2	0.1	0.8	0.9
Japanese encephalitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kunjin virus infection	-	0.0	1.0	0.0	0.0	0.0	0.0	0.1	0.0
Malaria	5.2	2.3	30.5	8.3	2.3	1.7	1.8	2.6	3.7
Murray Valley encephalitis	0.0	0.0	1.5	0.0	0.1	0.0	0.0	0.1	0.0
Ross River virus infection	2.8	10.8	111.5	43.2	9.3	2.7	7.2	10.6	16.5

Table 3 (continued). Notification rates of communicable diseases, Australia, 2001, by state or territory (rate per 100,000 population)*

Disease	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Zoonoses									
Anthrax	0.0	0.0	0.0	0.0	NN	0.0	0.0	0.0	0.0
Australian bat lyssavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.1
Leptospirosis	0.0	1.0	2.0	3.5	0.2	1.1	0.8	0.1	1.3
Ornithosis	0.3	0.6	0.5	0.0	1.0	0.0	1.4	0.5	0.7
Lyssavirus (unspecified)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q fever	0.6	2.1	0.0	12.5	1.1	0.2	1.3	1.0	3.6
Other bacterial infections									
Legionellosis	0.6	1.0	1.5	1.0	2.1	0.6	2.5	2.2	1.6
Leprosy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Invasive meningococcal infection	1.9	3.5	6.5	3.5	2.6	4.9	3.4	4.0	3.5
Tuberculosis	2.8	6.3	17.5	2.8	3.4	2.5	6.2	3.6	5.1

* Analysis by date of onset, except for hepatitis B and hepatitis C unspecified, where analysis is by report date. Date of onset is a composite of three components: (i) the true onset date from a clinician, if available, (ii) the date the laboratory test was ordered, or (iii) the date reported to NNDSS.

† Unspecified hepatitis includes cases with hepatitis in whom the duration of illness cannot be determined.

‡ The analysis was performed by report date.

§ Includes incident hepatitis C in the Northern Territory and Queensland.

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

¶ Infections with Shiga-like toxin (verotoxin) producing *E. coli.* (SLTEC/VTEC).

** Northern Territory, Queensland, South Australia, Victoria and Western Australia: includes gonococcal neonatal ophthalmia.

†† Includes congenital syphilis.

‡‡ Includes congenital rubella.

NN Not notifiable.

NEC Not elsewhere classified.

\- Elsewhere classified.

Table 4a. Notifications and notification rates of communicable diseases, Australia, 1997 to 2001, by state or territory (rate per 100,000 population)*

Disease	Notifications					Rate per 100,000 population				
	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
Bloodborne diseases										
Hepatitis B (incident)	269	265	303	395	424	1.5	1.4	1.6	2.1	2.2
Hepatitis B (unspecified)†‡	6,542	6,562	7,164	7,908	8,424	35.7	35.4	38.2	41.7	43.7
Hepatitis C (incident)	154	350	396	441	600	1.0	2.3	2.6	2.9	3.8
Hepatitis C (unspecified)†‡§	17,290	18,075	18,655	19,569	19,586	93.4	96.5	98.4	102.2	100.5
Hepatitis D	-	-	19	27	21	-	-	0.1	0.2	0.1
Hepatitis (NEC)	6	4	0	1	2	<0.1	<0.1	0.0	<0.1	<0.1
Gastrointestinal diseases										
Botulism	0	1	0	2	2	0.0	<0.1	0.0	<0.1	<0.1
Campylobacteriosis‖	11,752	13,433	12,657	13,595	16,124	95.9	108.4	100.8	107.1	125.2
Cryptosporidiosis	-	-	-	-	1,615	-	-	-	-	8.3
Haemolytic uraemic syndrome	-	-	23	15	3	-	-	0.1	0.1	<0.1
Hepatitis A	3,044	2,697	1,554	812	530	16.4	13.3	8.2	4.2	2.7
Hepatitis E	-	-	9	10	10	-	-	0.1	0.1	0.1
Listeriosis	73	55	64	67	62	0.4	0.3	0.3	0.3	0.3
Salmonellosis	7,054	7,613	7,147	6,151	7,045	38.1	40.7	37.7	32.1	36.2
Shigellosis	795	599	547	487	562	6.5	4.8	4.4	3.8	2.9
SLTEC,VTEC¶	-	-	47	33	49	-	-	0.3	0.2	0.3
Typhoid	79	60	68	58	84	0.4	0.3	0.4	0.3	0.4
Quarantinable diseases										
Cholera	2	4	3	1	4	<0.1	<0.1	<0.1	<0.1	<0.1
Plague	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Rabies	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Sexually transmissible diseases										
Chlamydial infection	9,239	10,927	14,045	16,866	20,026	75.4	88.2	74.1	88.0	102.8
Donovanosis	49	31	17	12	42	0.5	0.3	0.2	0.1	0.2
Gonococcal infection**	4,684	5,469	5,644	5,686	6,158	25.3	29.2	29.8	29.7	31.6
Syphilis††	1,296	1,683	1,844	1,755	1,421	7.0	9.0	9.7	9.2	7.3
Vaccine preventable diseases										
Diphtheria	0	0	0	0	1	0.0	0.0	0.0	0.0	<0.1
Haemophilus influenzae type b	51	35	40	28	26	0.3	0.2	0.2	0.1	0.1
Laboratory-confirmed influenza	-	-	-	-	1,286	-	-	-	-	6.6
Measles	838	288	238	107	141	4.5	1.5	1.3	0.6	0.7
Mumps	191	182	172	212	114	1.0	1.0	1.1	1.4	0.6
Pertussis	10,825	5,791	4,417	5,942	9,515	58.4	30.9	23.3	31.0	48.8
Invasive pneumococcal disease	-	-	-	-	1,681	-	-	-	-	8.6
Poliomyelitis	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0

Table 4a (continued). Notifications and notification rates of communicable diseases, Australia, 1997 to 2001, by state or territory (rate per 100,000 population)

Disease	Notifications					Rate per 100,000 population				
	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
Rubella‡‡	1,387	753	377	322	263	7.5	4.0	2.0	1.7	1.3
Tetanus	7	8	2	6	3	<0.1	<0.1	<0.1	<0.1	<0.1
Vectorborne diseases										
Arbovirus infection (NEC)	19	88	62	69	36	0.1	0.5	0.3	0.4	0.2
Barmah Forest virus infection	691	529	638	634	1,141	3.7	2.8	3.4	3.3	5.9
Dengue	174	579	132	215	176	0.9	3.1	0.7	1.1	0.9
Japanese encephalitis	-	-	-	-	0	-	-	-	-	0.0
Kunjin virus infection	-	-	-	-	4	-	-	-	-	<0.1
Malaria	749	660	732	951	712	4.0	3.5	3.9	5.0	3.7
Murray Valley encephalitis	-	-	-	-	6	-	-	-	-	<0.1
Ross River virus infection	6,596	3,151	4,416	4,200	3,219	35.6	16.8	23.3	21.9	16.5
Zoonoses										
Anthrax	-	-	-	-	0	-	-	-	-	0.0
Australian bat lyssavirus	-	-	-	-	0	-	-	-	-	0.0
Brucellosis	39	45	52	27	19	0.2	0.2	0.3	0.1	0.1
Leptospirosis	114	202	323	243	245	0.6	1.1	1.7	1.3	1.3
Ornithosis	35	64	84	100	131	0.4	0.7	0.9	1.1	0.7
Lyssavirus (unspecified)	-	-	-	-	0	-	-	-	-	0.0
Q fever	545	560	515	573	696	2.9	3.0	2.7	3.0	3.6
Other bacterial infections										
Legionellosis	157	262	249	472	307	0.8	1.4	1.3	2.5	1.6
Leprosy	12	3	6	4	5	0.1	<0.1	<0.1	<0.1	<0.1
Invasive meningococcal infection	494	480	591	621	677	2.7	2.6	3.1	3.2	3.5
Tuberculosis	989	960	1,143	1,024	989	5.3	5.1	6.0	5.3	5.1
Total	86,241	82,468	84,395	89,641	104,187					

* Analysis by date of onset, except for hepatitis B and hepatitis C unspecified, where analysis is by report date. Date of onset is a composite of three components: (i) the true onset date from a clinician, if available, (ii) the date the laboratory test was ordered, or (iii) the date reported to NNDSS.

† Unspecified hepatitis includes cases with hepatitis in whom the duration of illness cannot be determined.

‡ The analysis was performed by report date.

§ Includes incident hepatitis C in the Northern Territory and Queensland.

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

¶ Infections with Shiga-like toxin (verotoxin) producing *E. coli.* (SLTEC/VTEC).

** Northern Territory, Queensland, South Australia, Victoria and Western Australia: includes gonococcal neonatal ophthalmia.

†† Includes congenital syphilis.

‡‡ Includes congenital rubella.

NEC Not elsewhere classified.

\- Elsewhere classified.

Table 4b. Years from which diseases became notifiable to NNDSS in different jurisdictions in Australia*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Bloodborne diseases										
Hepatitis B (incident)	1995	1993	1993	1991	1993	1993	1993	1996	1995 to present	ACT did not report 1994; WA did not report 1994-1995
Hepatitis B (unspecified)	1991	1991	NN	1991	1991	1991	1991	1991	1991 to present	NT does not report
Hepatitis C (incident)	1995	1993	-	-	1993	1995	1997	1997	1993 to present	All jurisdictions except Qld and NT
Hepatitis C (unspecified)	1991	1991	1991	1991	1994	1991	1991	1993	1995 to present	Includes reports of incident hepatitis C, 1991 to 1994
Hepatitis D	1999	1999	1999	1999	1999	1999	1999	2001	1999 to present	WA did not report 1991-2000
Hepatitis (NEC)	1991	1991	1991	1991	1991	1991	1991	2001	1991 to present	WA did not report 1991-2000
Gastrointestinal diseases										
Botulism	1992	1998	1998	1998	1993	1992	1992	2001	1992 to present	State reporting started as shown
Campylobacteriosis	1991	NN	1991	1991	1991	1991	1991	1991	1991 to present	NSW does not report
Cryptosporidiosis	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Haemolytic uraemic syndrome	1999	1999	1999	1999	1999	1999	1999	1999	1999 to present	
Hepatitis A	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Hepatitis E	1999	1999	1999	1999	1999	1999	1999	2001	1999 to present	WA did not report 1991-2000
Listeriosis	1991	1991	1994	1991	1992	1991	1991	1991	1991 to present	SA did not report 1991 NT did not report 1991-1993
Salmonellosis (NEC)	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Shigellosis	1991	2001	1991	1991	1991	1991	1991	1991	1991 to present	NSW did not report 1991-2000
SLTEC, VTEC	1999	1999	1999	2001	1999	1999	1999	2001	1999 to present	Qld and WA did not report 1991-2000
Typhoid[1]	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Quarantinable diseases										
Cholera	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Plague	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Rabies	1993	1997	1991	1991	1991	1991	1991	1991	1991 to present	
Viral haemorrhagic fever	1993	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Yellow fever	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	

Table 4b (continued). Years from which diseases became notifiable to NNDSS in different jurisdictions in Australia*

Disease	Year in which data first sent to Commonwealth								Period of national reporting	Exceptions to national reporting
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA		
Sexually transmissible diseases										
Chlamydial infection	1993	1991	1991	1991	1993	1991	1991	1994	1994 to present	NSW did not report 1994 - 1998
Donovanosis	1991	2002	1991	1991	2002	1993	1991	1991	1991 to present	NSW and SA did not report 1991-2001 Tasmania did not report 1991-1992
Gonococcal infection[2]	1991	1993	1991	1991	1991	1991	1991	1991	1991 to present	
Syphilis (includes congenital syphilis)	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Vaccine preventable diseases										
Diphtheria	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Haemophilus influenzae type b	1991	1991	1991	1991	1991	1991	1991	1994	1991 to present	WA did not report 1991-1993
Laboratory-confirmed influenza	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Measles	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Mumps	1992	1992	1995	1997	1994	1995	1992	1994	1995 to present	Qld did not report (1995-1996 & 1999-2000)
Pertussis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Invasive pneumococcal disease	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Poliomyelitis	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Rubella (includes congenital rubella)	1991	1991	1993	1991	1993	1995	1992	1994	1993 to present	Tasmania did not report 1993-1994
Tetanus	1991	1991	1991	1994	1991	1991	1991	1991	1991 to present	Qld did not report 1991-1993
Vectorborne diseases										
Arbovirus infection (NEC)[3]	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	Includes JE, MVE and Kunjin 1991-2000
Barmah Forest virus infection	1995	1995	1997	1995	1995	1995	1995	1996	1995 to present	
Dengue	1993	1991	1991	1991	1991	1991	1991	1991	1991 to present	ACT did not report 1991-1992
Japanese encephalitis	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	
Kunjin virus infection	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	Reported under MVE in ACT
Malaria	1991	1991	1991	1991	1991	1991	1991	1991	1991 to present	
Murray Valley encephalitis	2001	2001	2001	2001	2001	2001	2001	2001	2001 to present	Combined with Kunjin in ACT
Ross River virus infection	1993	1993	1991	1991	1993	1993	1991	1993	1993 to present	

Table 4b (continued). Years from which diseases became notifiable to NNDSS in different jurisdictions in Australia*

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

* Data from NNDSS annual reports from 1991. First full year of reporting to Commonwealth is shown. Some diseases may have been notifiable to State or Territory Health Departments before the dates shown here.

1. Includes paratyphoid in New South Wales, Queensland and Victoria.
2. Includes neonatal ophthalmia in the Northern Territory, Queensland, South Australia, and Victoria.
3. Before 1997, includes Ross River virus, dengue and Barmah Forest virus infection.

NN Not notifiable in 2001

Bloodborne diseases

In 2001, bloodborne viruses reported to the NNDSS included hepatitis B, C, D and hepatitis (NEC). Diagnoses of infections with human immuno-deficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) are reported directly to the National Centre in HIV Epidemiology and Clinical Research (NCHECR). Information on national HIV/AIDS surveillance can be obtained through the NCHECR website at: http//www.med.unsw.edu.au/ nchecr.

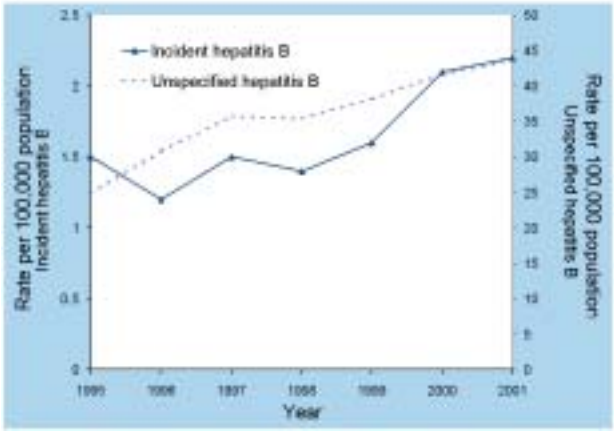
When reported to NNDSS, newly acquired hepatitis C and hepatitis B virus infections (referred to as 'incident') were differentiated from those where the timing of disease acquisition was unknown (referred to as 'unspecified'). As considerable time may have elapsed between onset and report date for chronic hepatitis infections, the analysis of unspecified hepatitis B and unspecified hepatitis C infections in the following sections is by report date, rather than by onset date.

Hepatitis B

Incident hepatitis B notifications

Since 1994, all states and territories, except the Australian Capital Territory, have reported incident cases of hepatitis B to the NNDSS. The Australian Capital Territory began reporting hepatitis B in 1995. The rate of incident hepatitis B notification between 1995 and 2000 ranges from around 1 to 2 cases per 100,000 population (Figure 5). In total, 424 incident cases were reported to the NNDSS with an onset date in 2001, giving a national notification rate of 2.2 cases per 100,000 population for the year. In 2001, the highest rates were reported from Tasmania (4.7 cases per 100,000 population) and Victoria (4.1 cases per 100,000 population).

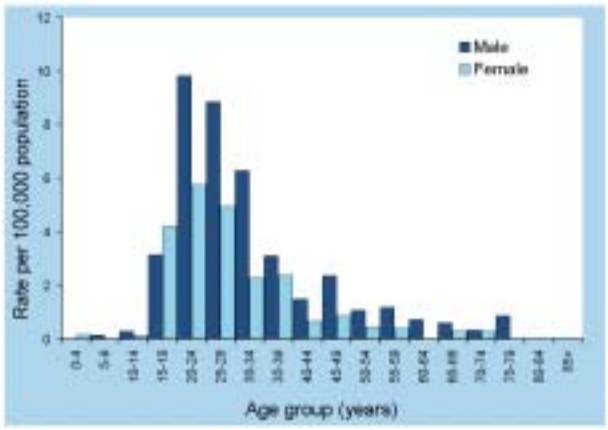
Figure 5. Trends in notification rates, incident and unspecified* hepatitis B virus infection, Australia, 1995 to 2001



* By report date.

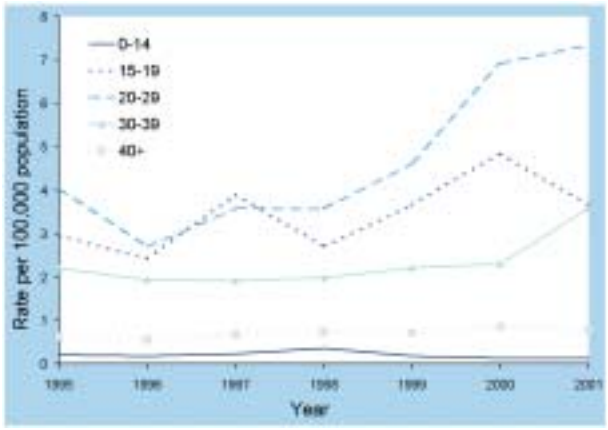
The highest rate of incident hepatitis B notifications were in the 20–24 year age group for both males and females (Figure 6). The highest notification rate for men was 9.8 cases per 100,000 population, while the highest notification rate for women was 5.8 cases per 100,000 population. Overall, there were more infections in males than in females, with a male to female ratio of 1.7:1.

Figure 6. Notification rates for incident hepatitis B virus infections, Australia, 2001, by age group and sex



Trends in the age distribution of incident hepatitis B virus infections are shown in Figure 7. Rates in children aged 0–14 years and adults over 40 years of age have remained relatively stable, while increases have been observed in the 20–39 year age range.

Figure 7. Trends in notification rates of incident hepatitis B virus infections, Australia, 1995 to 2001, by age group



Risk factor information for incident hepatitis B virus infection was available from all states and territories, except New South Wales and Queensland. The data are summarised in Table 5.

Table 5. Risk factors identified in notifications of incident hepatitis B virus infection, Australia, 2001, by reporting state or territory

Risk factor	ACT		NT		SA		Tas		Vic		WA	
	n	%	n	%	n	%	n	%	n	%	n	%
Injecting drug use*	1	50	0	–	5	21.7	15	68	94	48.0	13	33.3
Sexual contact with hepatitis B case	0	–	0	–	7	30.4	2	9	66	33.7	9	23.1
Household/other contact with hepatitis B	0	–	0	–	0	–	0	–	1	0.5	1	2.6
Overseas travel	0	–	0	–	1	4.3	0	–	0	–	2	5.1
Other	0	–	0	–	4	17.4	3	14	22	11.2		–
None identified	1	50	0	–	6	26.1	2	9	13	6.6	3	7.7
No information available	0		3	100	0	–	0	–	0	–	11	28.2
Total	2		3		23		22		196		39	

* Injecting drug users may have multiple risk factors for hepatitis B virus infection.

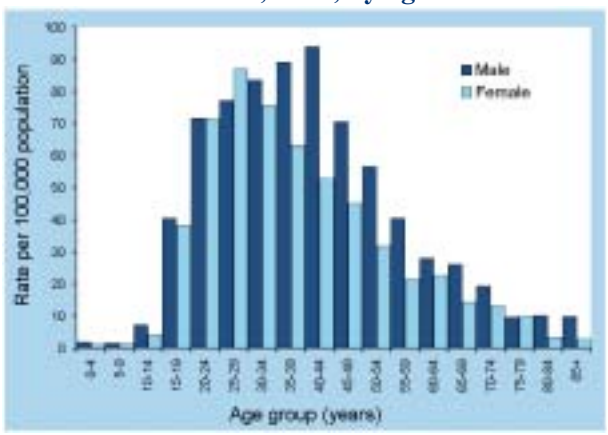
In response to an outbreak of incident hepatitis B observed in Victoria during the second quarter of the year, the Victorian Department of Human Services commenced enhanced surveillance to obtain detailed risk factor information directly from cases. A public alert was released through needle and syringe programs, and a strategy implemented to provide free hepatitis B vaccine to people known to be injecting drug users.

Unspecified hepatitis B notifications

Hepatitis B notifications have been reported to the NNDSS since 1991 by all jurisdictions except the Northern Territory, with unspecified cases separately notified from incident cases in most jurisdictions since 1994. The notification rate of unspecified hepatitis B cases ranged from 20 to 40 cases per 100,000 population between 1995 and 2001 (Figure 5). In 2001 there were 8,424 unspecified hepatitis B virus infection cases notified, at a rate of 43.7 cases per 100,000 population. The male to female ratio for unspecified hepatitis B cases was 1.3:1. By state and territory, the highest rates of notification were in New South Wales (71.3 cases per 100,000 population), Western Australia (34.1cases per 100,000 population) and Victoria (39.4 cases per 100,000 population). The highest rates were in the 40–44 year age group for men (93.9 cases per 100,000 population) and the 25–29 year age group for women (87.0 cases per 100,000 population, Figure 8).

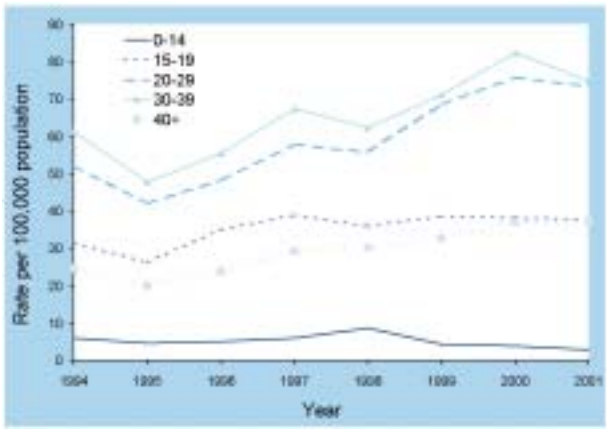
Trends in the age distribution of unspecified hepatitis B virus infections are shown in Figure 9. There have been moderate decreases in the number of reports of unspecified hepatitis B cases in the 0–14 year age range, while all other age groups have shown an upward trend in reporting rates over time.

Figure 8. Notification rates for unspecified hepatitis B virus infections, Australia, 2001, by age and sex*



* By report date.

Figure 9. Trends in notification rates of unspecified hepatitis B virus infections, Australia, 1994 to 2001, by age group



There were nine cases of unspecified hepatitis B virus infection in children in the 0–4 year age group reported from New South Wales, South Australia, Queensland and Western Australia. No unspecified hepatitis B cases were identified in children aged 0–4 years in the Australian Capital Territory, the Northern Territory, Tasmania or Victoria. Infant hepatitis B immunisation for Indigenous infants was introduced in the Northern Territory in 1988 and then expanded to all infants in this jurisdiction in 1990. Universal infant hepatitis B immunisation was introduced in the rest of Australia in May 2000. The effect of vaccination may take a number of years to become observable in childhood rates of the disease. Data on vaccination coverage, provided by the Australian Childhood Immunisation Register, indicates approximately 95 per cent of infants are currently receiving hepatitis B vaccination in Australia.

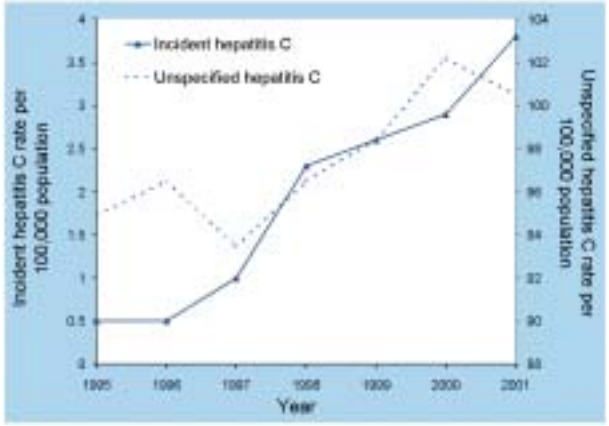
Hepatitis C

Unspecified hepatitis C notifications

Hepatitis C infection has been notifiable in all Australian states and territories since 1995. While the rate of unspecified hepatitis C notifications has ranged from 1.5 to 3 cases per 100,000 population in 1997 and 2000 respectively, (Figure 10), 2001 is the first year since 1997 where the number of notifications has decreased. Improved surveillance practice, such as better classification of incident cases and increased duplicate checking may account for some of the decrease in unspecified hepatitis C notifications. Whether the decrease represents a smaller pool of infected individuals previously undiagnosed will only become apparent in coming years.

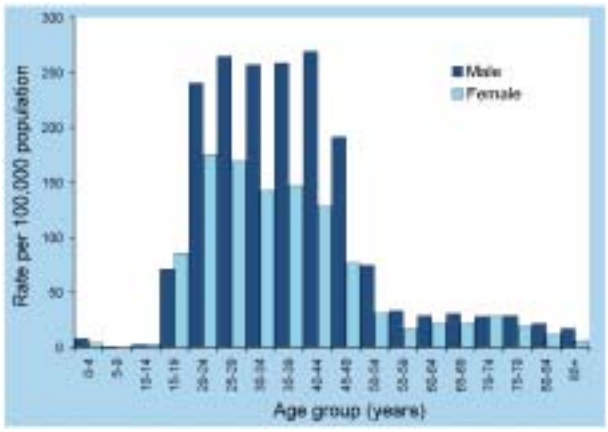
In 2001 there were 19,586 unspecified hepatitis C infections reported to NNDSS, a notification rate of 100.5 cases per 100,000 population. Of the total notifications of unspecified hepatitis C, 43 per cent of the notifications were from New South Wales. The highest notification rates were from the Northern Territory (106.5 cases per 100,000 population) and Victoria (103.1 cases per 100,000 population). The male to female ratio was 1.7:1. The highest reporting rate was in the 40–44 year age group for males (269.1 cases per 100,000 population), although there was little variation across the 25–44 year age range, from 240 to 269.1 cases per 100,000 population. The highest notification rate for females (175.1 cases per 100,000 population) was in the 20–24 year age group (Figure 11), while again there was little variation across the 20–44 year age range.

Figure 10. Trends in notification rates, incident and unspecified* hepatitis C infection, Australia, 1995 to 2001



* By report date.

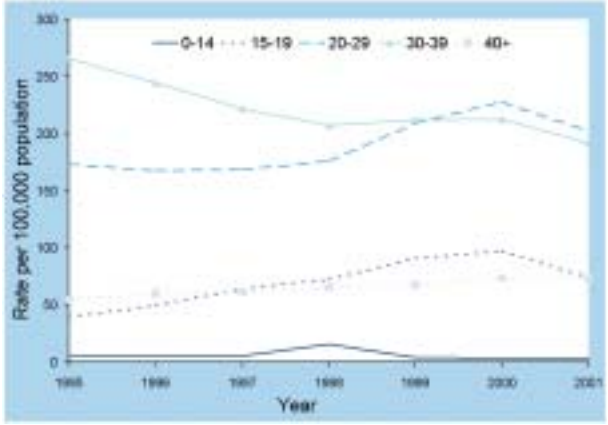
Figure 11. Notification rates for unspecified hepatitis C infections, Australia, 2001, by age group and sex*



* By report date.

Trends in the age distribution of unspecified hepatitis C infections are shown in Figure 12. Overall, the highest rates are in the 20–39 year age range. The most notable trends are the increase in notification rates in the 15–24 year age range and a decrease in the 30–39 year age group between 1998 and 2000. Between 2000 and 2001 there were decreases in all groups in the 15–39 year age range.

Figure 12. Trends in notification rates of unspecified hepatitis C infections, Australia, 1995 to 2001, by age group*



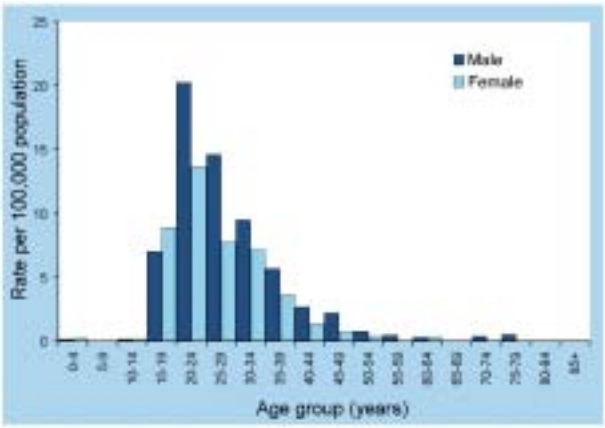
* By report date.

Incident hepatitis C notifications

Reporting of incident hepatitis C notifications from New South Wales and Western Australia commenced in 1993, from the Australian Capital Territory in 1994, from South Australia and Tasmania in 1995 and from Victoria in 1997. Incident hepatitis C cases are not differentiated from unspecified hepatitis C cases in Queensland or the Northern Territory. For the purposes of this report, only incident hepatitis C cases from 1997 onwards were analysed.

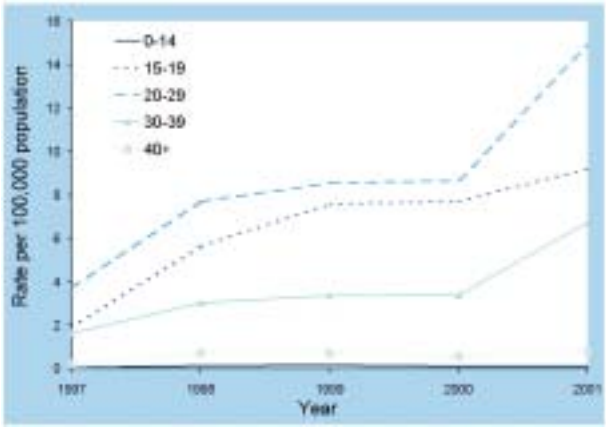
In total there were 600 incident cases of hepatitis C reported with an onset date in 2001, giving a rate of 3.8 cases per 100,000 population. The proportion of all hepatitis C infection notifications that were identified as incident cases was three per cent in 2001, which continues the upward trend of this proportion since 1997, when the proportion was 0.9 per cent. The highest rates of incident hepatitis C infection in 2001 were reported from Western Australia (8.3 cases per 100,000 population), the Australian Capital Territory (5.6 cases per 100,000 population and South Australia (5.3 cases per 100,000 population). The majority of incident hepatitis C notifications were in the 20–24 year age group for both males and females, with rates of 20.3 and 13.7 cases per 100,000 population, respectively (Figure 13). Overall, the male to female ratio was 1.5:1.

Figure 13. Notification rates for incident hepatitis C infections, Australia, 2001, by age group and sex



Trends in the age distribution of incident hepatitis C infections are shown in Figure 14. While rates in the 0–14 year and over 40 year age groups have remained stable, increases were observed in the 15–39 year age range, with steep increases in the 20–39 year age range between 2000 and 2001.

Figure 14. Trends in notification rates of incident hepatitis C infections, Australia, 1997 to 2001, by age group



Enhanced surveillance for incident hepatitis C infection notifications

In 1998 CDNA established the Hepatitis C Surveillance Committee. The committee was given the responsibility for improving the national capacity to monitor the occurrence of the infection and its consequences, by the development and implementation of a national hepatitis C surveillance strategy.[7] In 2001, its terms of reference were extended to include the development of national surveillance for hepatitis B virus infection, and the name was changed to the CDNA Viral Hepatitis Surveillance Committee.

In reviewing existing procedures in the course of developing the surveillance strategy, the committee identified the lack of standard case definitions across jurisdictions, and the absence of information on risk factors for hepatitis C as key weaknesses in national surveillance. The committee endorsed standard case definitions, and a set of categories that would be used to classify exposure for all cases determined to be incident. Despite competing priorities and resource limitations, in 2001 some states and territories were able to introduce enhanced surveillance for incident hepatitis C infections.

Surveillance of incident hepatitis C infection cases is difficult due to the asymptomatic nature of the disease and the need to collect paired sera to diagnose recent infection by seroconversion. Detection of incident cases prior to 2001 was on the basis of seroconversion or clinical illness. In recognition that cases of transmission from mother to child would not usually be detected by either seroconversion or clinical illness, in 2001 perinatal cases were included as incident infections. Enhanced surveillance, where all hepatitis C notifications are further investigated to ascertain the likely time of infection, is time and labour intensive, due to the large number of notifications. Trends in the number of incident cases are affected

by surveillance practice, and it is recognised that the number of hepatitis C notifications may vastly underestimate the true incidence of hepatitis C in Australia. The increase in incident hepatitis C notifications to the NNDSS should not necessarily be interpreted as evidence of increasing transmission in the Australian community. Instead the increase in the number of notifications may be a product of improved surveillance, increased awareness, and more widespread testing.

Incident hepatitis C cases have been separately reported by all jurisdictions except Queensland and the Northern Territory since 1997. In 2001, Western Australia, South Australia, Victoria, New South Wales and Tasmania undertook enhanced surveillance for incident cases. Enhanced surveillance has operated in South Australia and Tasmania for several years. Western Australia commenced enhanced surveillance for incident hepatitis C infections in 2001, incorporating new nationally agreed variables from the hepatitis C surveillance strategy. Data collection forms were sent to:

- doctors who notify cases as incident;
- doctors of patients identified by the major public laboratory as seroconverting within the past two years;
- a 30 per cent sample of doctors who notified unspecified hepatitis C infection cases.

All Public Health Units in New South Wales introduced enhanced surveillance in 2001. All hepatitis C notifications were followed up in a two phase process. Firstly, a form was sent to all doctors notifying a hepatitis C positive case, asking the doctor to indicate if the case was an incident infection. If a positive response was received, either the doctor or the case (with consent of the diagnosing doctor) were contacted, for collection of additional risk factor information. Efforts were taken to improve data quality by coordination and cleaning of the data at the New South Wales Health Department Central Office.

In Victoria, enhanced hepatitis C surveillance commenced in February 2001. In this populous state with a centralised reporting system, a 10 per cent random sample of all hepatitis C notifications were followed up with the diagnosing physician to determine if they were incident infections.

In 2001, additional data collected on incident hepatitis C infections were available from the Australian Capital Territory, South Australia, Tasmania and Victoria. The following analyses refer only to incident hepatitis C cases reported in these jurisdictions in 2001, thus the figures reported below may vary from the analysis by onset date. In total there were 209 cases: 18 cases from both the Australian Capital Territory and Tasmania, 86 cases from South Australia and 87 cases from Victoria. Most incident hepatitis C infections (165 of 209, 79%) were diagnosed by seroconversion alone (Table 6). Some cases were diagnosed both clinically and by seroconversion. One perinatal case was identified in South Australia.

The majority (176/209, 84%) of cases of incident hepatitis C were associated with injecting drug use (IDU) (Table 7). Further analysis of exposure in people who did not report injecting drug use are shown in Table 8. Multiple exposures were recorded. Cases not reported to be associated with injecting drug use include transmission via blood transfusion (n=1), needle stick injuries in a healthcare worker (n=2), surgery (n=1), perinatal transmission (n=1), tattoos (n=1), ear or body piercing (n=1), imprisonment (n=5), and sexual partner with hepatitis C infection (n=4). One case with an exposure identified as 'other' was a victim of domestic violence by a partner with hepatitis C. In total, an exposure could not be identified for 16 non-IDU cases.

There may be selection bias in the analysis of exposure for incident cases, as injecting drug users are more likely to undergo regular testing, due to the recognised risk in this group. The most likely route of infection is difficult to determine when multiple possible exposures are recorded.

Projections of hepatitis C in Australia

It is recognised that notifications of hepatitis C infection do not provide an accurate estimate of the number of people in Australia living with hepatitis C infection. To plan an appropriate public health response to the epidemic, accurate estimates of incidence and prevalence, and projections of the long-term sequelae of infection, are required.

In 2001 the Hepatitis C Virus Projections Working Group undertook mathematical modelling of the epidemiology and natural history of hepatitis C infection in Australia, in order to estimate hepatitis C infection incidence and prevalence rates in Australia up to the end of 2001. Future trends in the long-term sequelae of hepatitis C infection were also modelled.[8]

It was estimated that in Australia in 2001 there would be 16,000 incident cases of hepatitis C infection, and that 210,000 (range 157,000–252,000) people will have antibodies to the virus. It was estimated that in 2001, 6,500 people were living with hepatitis C related cirrhosis, that 175 people developed hepatitis C associated liver failure, and that 50 people developed hepatitis C related hepatocellular carcinoma. Finally, it was estimated that 22,500 quality adjusted life years will have been lost in Australia in 2001 due to chronic hepatitis C infection, the majority (77%) in people with early (stage 0/1) liver disease. These models suggest that by 2020 the prevalence of hepatitis C related cirrhosis and the incidence of hepatitis C related liver failure and hepatocellular carcinoma will more than triple in Australia.

Table 6. Method of diagnosis, incident hepatitis C cases, the Australian Capital Territory, South Australia, Tasmania and Victoria, 2001

Method of diagnosis	State or territory				Total
	ACT	SA	Tas	Vic	
Seroconversion	18	71	14	62	165
Clinical	0	6	4	14	24
Seroconversion and clinical	0	8	0	11	19
Perinatal	0	1	0	0	1
Total	18	86	18	87	209

Table 7. Assessment of injecting drug use, incident hepatitis C cases, Australian Capital Territory, South Australia, Tasmania and Victoria, 2001

Injecting drug use	State or territory			
	ACT	SA	Tas	Vic
Only in previous 2 years	0	79	0	15
More than 2 years ago	0	0	0	50
IDU, but time not specified	14	0	18	0
No history of IDU	0	7	0	8
IDU status unknown	4	0	0	14
Total	18	86	18	87

IDU Injecting drug use

Table 8. Exposure assessment, incident hepatitis C cases, Australian Capital Territory, South Australia, Tasmania and Victoria, 2001

Risk factor	State or territory						
	ACT		SA		Tas	Vic	
	All cases (n=18)	Non-IDU* (n=4)	All cases (n=86)	Non-IDU* (n=7)	All cases (n=18)	All cases (n=87)	Non-IDU* (n=22)
Injecting drug use (IDU)	14	na	79	na	18	65	na
Household contact with hepatitis C	1	0	0	0	0	0	0
Received blood product in Australia	0	0	1	1	0	0	0
Needlestick injury, healthcare worker	0	0	2	2	0	0	0
Surgical work	0	0	0	0	0	4	1
Perinatal	0	0	1	1	0	0	0
Tattoos	0	0	0	0	4	6	1
Ear/body piercing	0	0	0	0	2	4	1
Sexual partner with hepatitis C	1	0	0	0	4	14	4
Imprisonment	0	0	0	0	3	16	5
Household contact with hepatitis C	0	0	0	0	1	0	0
Other risk identified	0	0	1	1	0	0	0
Non-IDU risk identified, but not in past 2 years	0	0	0	0	0	1	0
Unable to determine risk	4	4	2	2	0	10	10

Note: Some people may have more than one exposure

Hepatitis D

The hepatitis D virus is a defective single-stranded RNA virus that requires the hepatitis B virus to replicate. Infection with the hepatitis D virus can be acquired either as a co-infection with hepatitis B virus infection or as a superinfection of persons with chronic hepatitis B virus infection. People co-infected with hepatitis B virus infection and hepatitis D may have more severe acute disease and a higher risk of fulminant hepatitis compared with those infected with hepatitis B virus alone. The modes of hepatitis D transmission are similar to those for other bloodborne viruses, and in countries with low prevalence of hepatitis B virus infection, such as Australia, intravenous drug users are the main group at risk.

In Australia in 2001, there were 21 notifications of hepatitis D to the NNDSS, a notification rate of 0.1 cases per 100,000 population. Of the 21 notifications, 12 were reported from New South Wales, seven from Victoria, and two from Queensland. The majority (16/21, 76%) of cases were for males, with the highest rate reported in the 35–39 year age group (0.5 cases per 100,000 population).

Gastrointestinal diseases

Gastrointestinal diseases are a major cause of illness in Australia. Recently, incidence of gastroenteritis in Australia has been estimated at approximately one episode per person per year.[9] If 35 per cent of gastroenteritis is due to contaminated food, then there may be significantly more than the previously estimated four million annual cases of foodborne disease in Australia each year.[10] Since the majority of gastroenteritis is mild and self-limiting, only a small proportion of cases present to medical practitioners, an even smaller number are investigated, and fewer yet are notified to health departments for transmission to the NNDSS.

In 2001, notifications of gastroenteritis increased to 26,086, which was 25 per cent of all notifications to NNDSS. This represents a 22 per cent increase from notifications in 2000. The overall increase in notifications was due to the changes in gastrointestinal diseases that were notifiable in Australia in 2001. Diseases notified are botulism, campylobacteriosis, cryptosporidiosis, haemolytic uraemic syndrome (HUS), hepatitis A and E, listeriosis, salmonellosis, shigellosis, shiga-like toxin producing *E. Coli*/verotoxigenic *E. coli* (SLTEC/VTEC) and typhoid.

Cryptosporidiosis was made a notifiable disease from 2001. Although the reporting of cryptosporidiosis was incomplete in 2001, the relatively large number of cases notified, accounts for some of the increase in total notifications of gastrointestinal disease in 2001. Other reasons for the increase in notifications include an 18 per cent increase in campylobacteriosis. In 2001, New South Wales reported shigellosis for the first time and Western Australia began reporting botulism, hepatitis E and SLTEC/VTEC.

Yersiniosis was removed from the list of gastrointestinal diseases notifiable in 2001. Notifications of this disease had declined from 370 cases in 1993 to 73 cases in 2000 (a decline from 3.2 to 0.6 cases per 100,000 population). This disease is rare in Australia and the USA, but common in Europe, where it is frequently associated with the consumption of undercooked pork.[11]

In 2001, OzFoodNet a network of foodborne disease epidemiologists began work to enhance the surveillance of foodborne disease in Australia. The annual report of OzFoodNet activities in 2001[6] contains additional information on gastrointestinal disease, which complements data in this report.

Botulism

Botulism is a notifiable disease in all Australian states and territories. No cases of classic foodborne botulism have been reported since notification commenced. Infant (or intestinal) botulism cases arise from ingestion of *Clostridium botulinum* spores, which germinate in the intestine. Sources of spores are multiple, and include dust and foods such as honey.[12] There have been five cases of infant intestinal botulism reported since 1996, including two cases reported in 2001.

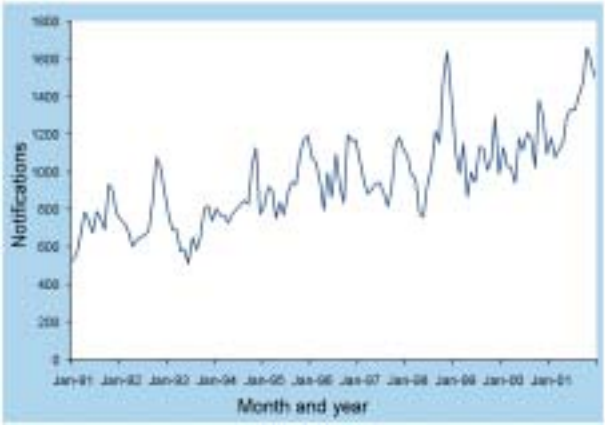
Of these two cases, one was from Victoria and the other from Queensland, and both occurred in infants aged less than one year. The first case was a five-month-old infant hospitalised after a three-day history of poor feeding, constipation, ptosis, difficulty in swallowing, weakness and loss of head control. Although there were various potential environmental exposures, including dust, no source for the child's infection could be determined.

The second case was a 10-week-old infant who presented with acute flaccid paralysis (prominent bulbar weakness). Subsequently, *Clostridium botulinum* type B was isolated from the faeces. The infant had a history of probable consumption of honey within the two weeks prior to onset of the disease. Parents are advised not to feed honey to infants or to dip pacifiers in honey, because of the risk of botulism.[13]

Campylobacteriosis

There were 16,124 notifications of campylobacteriosis in Australia in 2001. This represents an increase of 18 per cent on the 13,595 cases reported in 2000 and continues a trend of increasing notifications of campylobacteriosis in Australia (Figure 15). The national rate of campylobacteriosis reported to NNDSS (125.2 cases per 100,000 population) makes this disease the most commonly reported disease in Australia and it exceeds that of *Salmonella* more than threefold. Data from the United Kingdom suggest that this disease may be under-reported by a factor of eight times.[14] *Campylobacter jejuni* is now the most common bacterial cause of foodborne disease in industrialised countries.[15]

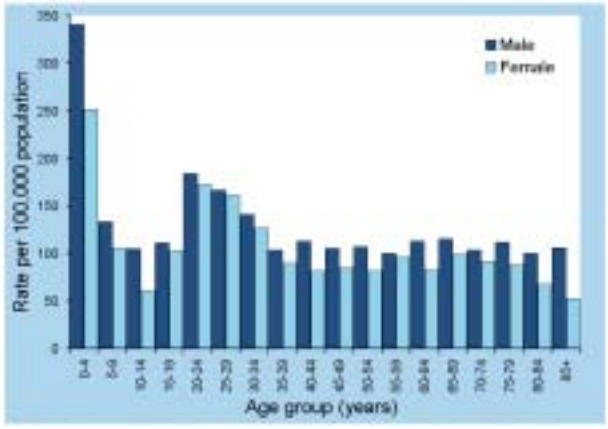
Figure 15. Trends in notifications of campylobacteriosis, Australia, 1991 to 2001, by month of onset



Reports were received from all states and territories except New South Wales, where cases are included in the categories 'foodborne disease' or 'gastroenteritis in an institution.' The highest rates of campylobacteriosis were in South Australia (175.7 cases per 100,000 population) and the lowest in Queensland (109.2 cases per 100,000 population). Nationally, notifications were most common in October (1,688 reports). Despite the high rates of disease, only six outbreaks were identified during 2001. Three small outbreaks were associated with take-away kebabs and two were associated with the consumption of chicken.[6]

The highest age specific rate of campylobacteriosis was 296 cases per 100,000 population in children aged 0–4 years. Rates according to age group and sex are shown in Figure 16. In the 0–4 year age group the rates were higher in males (341 cases per 100,000 population) than in females (251 cases per 100,000 population). The male to female ratio in this age group was 1.4:1, while overall it was 1.2:1.

Figure 16. Notification rates of campylobacteriosis, Australia, 2001, by age group and sex



Cryptosporidiosis

Cryptosporidiosis is spread by faecal contamination and includes person-to-person, animal-to-person, waterborne and foodborne transmission. The prevalence of infection is between 1 to 4.5 per cent of individuals in developed countries and between 3 to 20 per cent of individuals in developing countries.[16] Children under two years of age, animal handlers, travellers and men who have sex with men are recognised to be at greater risk of infection.

Infections with *Cryptosporidium* are commonly asymptomatic and carriers can shed oocysts in their faeces and be a source of infection to others.[16] The infective dose is very small (approximately a hundred oocysts) and previous exposure in immunocompetent adults is not entirely protective, although it may decrease the severity of the disease caused by subsequent infections. People with markedly impaired immune systems due to HIV infection are susceptible to severe persistent diarrhoea caused by cryptosporidiosis and the infection may spread to the biliary tract. Declines in the prevalence of cryptosporidiosis in HIV and AIDS patients treated with highly active anti-retroviral therapy have been reported.[17]

Notification of cryptosporidiosis to NNDSS was agreed by all Australian states and territories from January 2001. Since addition of new diseases to the notifiable list requires legislative change in each Australian jurisdiction, reports of cryptosporidiosis received by NNDSS in 2001 probably underestimate the national annual total.

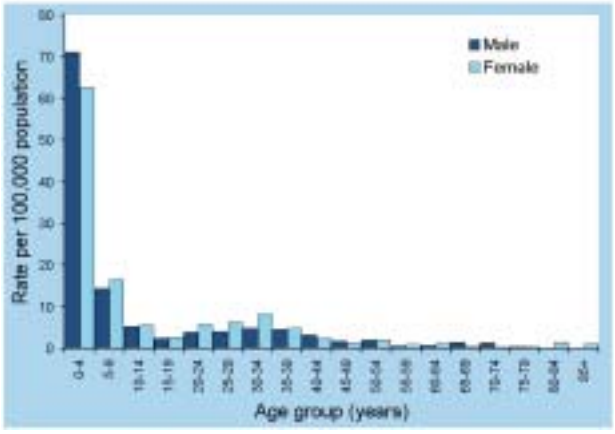
In the autumn quarter of 2001 (April-June), sporadic cryptosporidiosis infections associated with use of swimming pools were reported from several states and territories in Australia. Compared to previous years, Victoria observed increased notifications of cryptosporidiosis, predominantly from the Melbourne

metropolitan area. The majority of cases reported exposure to public swimming pools before becoming ill and small clusters were associated with several pools. Swimming pools are common sources for outbreaks of cryptosporidiosis. In summer 2001 in the United States of America, five protracted outbreaks of cryptosporidiosis associated with swimming pool use were reported.[18] Such outbreaks can be prevented by rigorous control of water pool quality, provision of advice to people that they should not swim if they have gastroenteritis, and enforcement of a faecal accident policy. The Queensland government has published guidelines to prevent outbreaks of cryptosporidiosis in swimming pools (www.health.qld.au/phs/Documents/cdu/5436.pdf).

In Queensland, five linked cases of cryptosporidiosis were reported, which were associated with consumption of unpasteurised milk intended for animal consumption. Of the five cases, three were hospitalised.[19] Cryptosporidiosis infection associated with consumption of unpasteurised products are possibly due to contamination with cow manure.[16] A cluster of 45 *Cryptosporidium* infections occurred in northern Tasmania in November 2001 and an animal nursery at an agricultural show was suspected to be the source. The majority of cases were children who had attended the show, with secondary cases arising in families through person-to-person transmission. (Ashbolt, *Commun Dis Intell* submitted)

The notification rates for cryptosporidiosis by age group and sex are shown in Figure 17. More than half the cases were in children under the age of five years (869 cases, 53% of total). There was no difference in the notification rates between males and females.

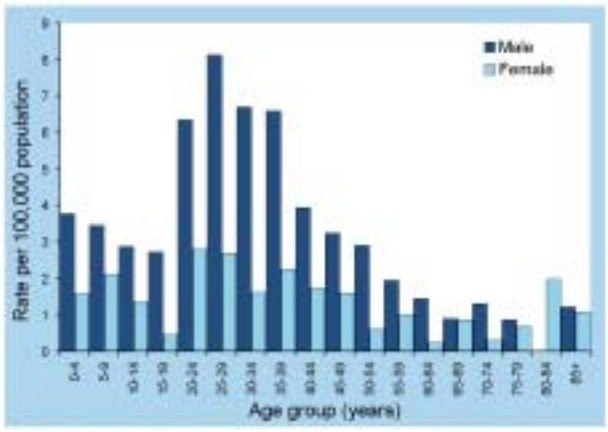
Figure 17. Notification rates of cryptosporidiosis, Australia, 2001, by age group and sex



Hepatitis A

There were 530 notifications of hepatitis A in Australia in 2001, the lowest since NNDSS began in 1991 and a 35 per cent decline from the 812 cases reported in 2000. The majority of cases occurred in the larger states: New South Wales (n=195), Queensland (n=120) and Victoria (n=102). The rates in these states were similar (2.1–3.3 cases per 100,000 population). The Northern Territory had the highest notification rate for hepatitis A (19.0 cases per 100,000 population, n=38). The highest age-specific rates were in males in the 25–29 year age group and females in the 20–24 year age group (8.1 and 2.8 cases per 100,000 population, respectively) and the overall male to female ratio was 2.6:1 (Figure 18).

Figure 18. Notification rates of hepatitis A, Australia, 2001, by age group and sex



Marked declines in the annual number of notifications of hepatitis A have been seen in north Queensland since hepatitis A vaccination was introduced for Indigenous children in the region in early 1999. There were 231 notifications of hepatitis A in Far North Queensland in 1999, 34 cases in 2000, and 11 cases in the first nine months of 2001. The last case in an Indigenous person was in June 2000. The majority of cases in Far North Queensland during 2000 and 2001 were acquired abroad, particularly in Papua New Guinea (PNG) (Jeffrey Hanna, Tropical Public Health Unit Network, personal communication, November 2001).

Apart from rare large outbreaks associated with food, such as the outbreak associated with oysters in 1997,[20] hepatitis A in Australia is most commonly acquired through household or close contact with a case, recreational drug use and overseas travel. Risk exposure information was available for 247 of the 530 cases (47%) in 2001 (Table 9).

Table 9. Risk exposures associated with infection with hepatitis A virus infection, Australia, 2001 by reporting state or territory

	State or territory							
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
Injecting drug use	3	–	–	12	2	–	23	1
Household /close contact of case	1	–	9	17	3	–	6	2
Overseas travel	2	36	1	20	6	1	26	16
Childcare	–	–	–	32	0	–	0	–
Homosexual contact	–	–	–	6	1	–	6	–
Sex worker	–	–	–	0	–	–	0	–
Other	–	–	–	33*	–	2†	–	–
Total with risk factors identified	6	36	20	120	12	3	61	19
Unknown	8	159	28	0	8	1	41	18
Total	14	195	38	120	20	4	102	37

* Includes exposure to shellfish (n=17) and Indigenous person or contact with Indigenous community (n=13)

† The two cases notified from Tasmania became infected in Queensland.

A national cross-sectional hepatitis A seroprevalence survey of opportunistically obtained serum was performed in 1998 and reported in 2001.[21] This study found 41 per cent of the samples were positive for antibodies to hepatitis A, and the proportion of positive samples increased with age. When combined with declining notifications of hepatitis A, these data support the idea of a declining incidence, with fewer young people being exposed to the virus.

Hepatitis E

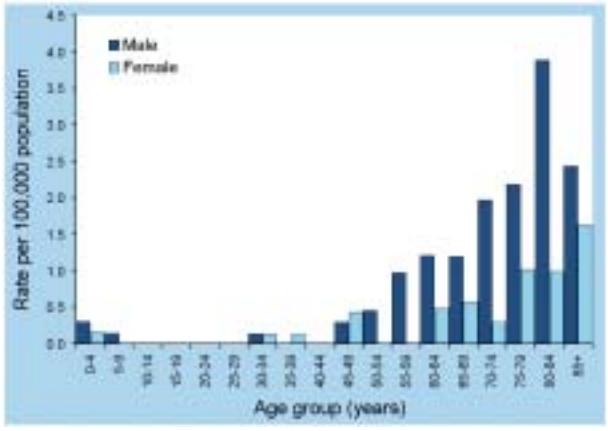
There were 10 cases of hepatitis E reported to NNDSS in 2001, the same number as in 2000. The cases occurred in New South Wales (n=6), Victoria (n=3) and Queensland (n=1). There were six female and four male cases and three of the women were of child-bearing age (15–49 years). All three of the cases reported in Victoria had travelled overseas.

Listeriosis

Listeriosis is a serious bacterial disease caused by the consumption of food contaminated with *Listeria monocytogenes*. Changes in food processing and distribution and a growing population with predisposing risk factors for infection with *Listeria monocytogenes* has raised concerns about this pathogen.[22]

In 2001, 62 cases of listeriosis were notified to NNDSS. This was lower than the 67 cases notified in 2000. The national rate was 0.3 cases per 100,000 population. Rates of 0.6 cases per 100,000 population were reported in Queensland (n=20) and Western Australia (n=11). There were no clusters or outbreaks reported. There was a predominance of male cases, with a male to female ratio of 2.2:1. Rates according to age group and sex are shown in Figure 19. OzFoodNet reported that 6 out of 61 cases were maternal foetal infections, which resulted in three foetal deaths.[6] The majority of listeriosis notifications occurred in the elderly, with 40 cases (64% of total) occurring in people aged more than 60 years. OzFoodNet reported a mortality rate of 13 per cent among non-pregnancy-related cases.[6]

Figure 19. Notification rates of listeriosis, Australia, 2001, by age group and sex



A recent review of the epidemiology of listeriosis in Australia found a stable and low rate of listeriosis, which did not vary from jurisdiction to jurisdiction.[23] There were inconsistencies identified in how a maternal-foetal pair was reported, either as a single case or mother and child reported separately.

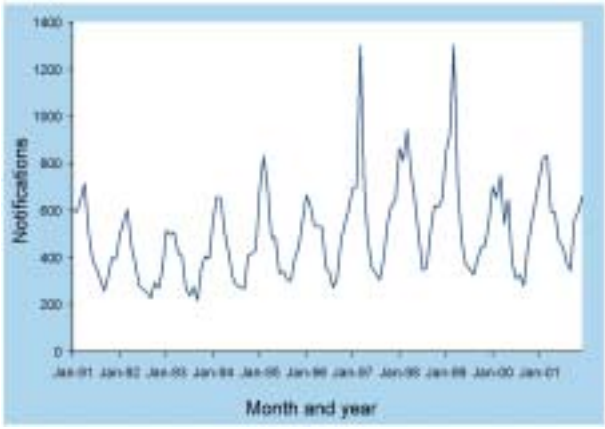
Australia's Imported Food Program undertakes surveillance of imported food, and is a joint activity of Food Standards Australia New Zealand and the Australian Quarantine Inspection Service. All 'ready-to-eat' imported foods, such as soft cheese and smoked fish, must be free of *Listeria*. Data from the Imported Food Program from 1995 to 1998 show an increasing percentage of imported food items (up to 8%) was contaminated with *Listeria*.[24] Surveillance for *Listeria* contamination of imported food is therefore a vital measure for control of listeriosis in Australia.

Salmonellosis (excluding typhoid)

Salmonellosis is the second most commonly notified gastrointestinal disease in Australia and is primarily associated with food.[25] In 2001, there were 7,045 cases reported, an increase of 14.5 per cent on the 6,151 cases reported in 2000. While there has been a variable trend over the last 10 years, improvements in the investigation of foodborne disease by states and territories may have contributed to recent increased notifications.

Cases of salmonellosis were reported from each Australian state and territory in 2001, and the national rate was 36.2 cases per 100,000 population. The highest rate was in the Northern Territory (186.5 cases per 100,000 population). Rates of salmonellosis varied by Statistical Division (Map 2), with the Kimberley district of northern Western Australia having the highest rate (602 cases per 100,000 population). In general, there were higher rates of salmonellosis in more northerly areas of the country. Reports of salmonellosis were highest in summer months (January–March, Figure 20). As in previous years, the highest age-specific rate was in children aged less than five years (196 cases per 100,000 population) and the male to female ratio was 1.1:1. Rates according to age group and sex are shown in Figure 21.

Figure 20. Trends in notifications of salmonellosis, Australia, 1991 to 2001, by month of onset



Map 2. Notification rates of salmonellosis, Australia, 2001, by Statistical Division of residence

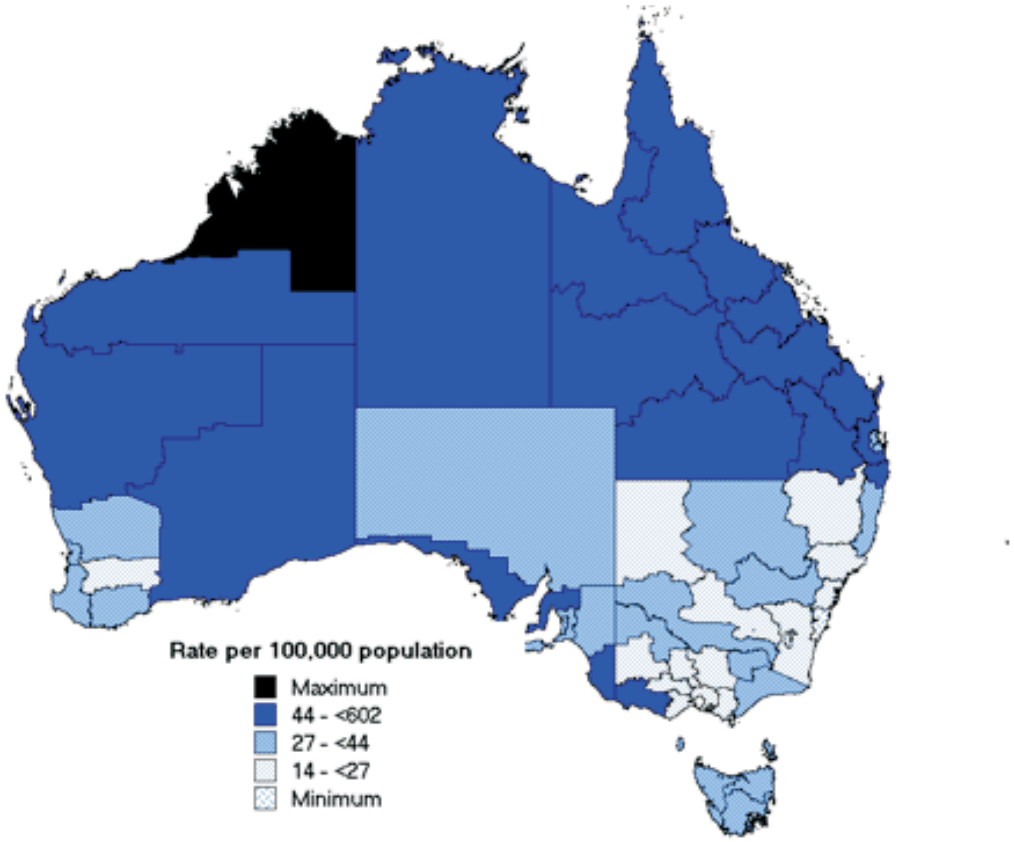
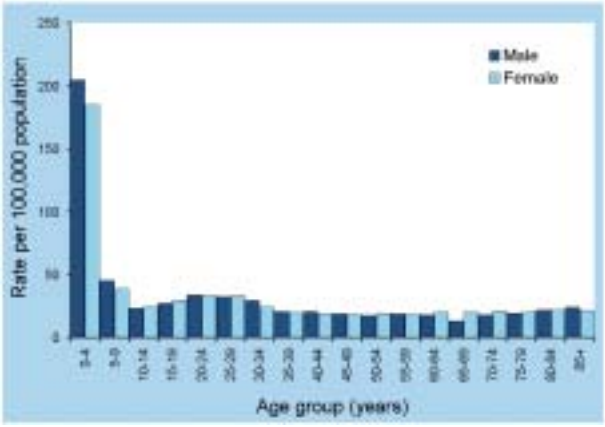


Figure 21. Notification rates of salmonellosis, Australia, 2001, by age group and sex



The National Enteric Pathogens Surveillance Scheme reported 6,932 cases of *Salmonella* infection in 2001.[26] The 10 most frequently isolated serovars and phage types of *Salmonella* which account for 45.2 per cent of all isolates, are shown in Table 10.

Outbreaks of *Salmonella*

Salmonella Typhimurium Definitive Type 104

During 2001 the Victorian Department of Human Services investigated an outbreak of *Salmonella* Typhimurium Definitive Type 104 (STM DT104), which was found to be associated with helva, a sweet made from sesame seeds, sugar and flavourings, imported from Turkey. The investigation in Victoria was in conjunction with Sweden, Norway and other European countries, where salmonellosis cases associated with helva were also identified.[27] Twenty of the 23 (87%) of Australian cases occurred in Victoria, and two cases occurred in New South Wales and one in Queensland.

S. Typhimurium DT104 emerged worldwide during the 1990s and now constitutes 8 to 9 per cent of isolates in the USA. DT104 constituted only 0.4 per cent of isolates in Australia in 2001, almost all of which were cases from the outbreak reported above. The DT 104 strain carries resistance to multiple antibiotics (ampicillin, chloramphenicol, trimethoprim-sulphamethazol, streptomycin and tetracycline). Isolates of DT104 with decreased susceptibility to fluoroquinolones have been isolated in the United Kingdom and the emergence of this additional resistance is linked to veterinary use of these antibiotics.[28]

Salmonella Stanley

An outbreak of 24 cases of *Salmonella* Stanley infection, associated with the consumption of contaminated dried peanuts imported from China, affected several Australian states and territories in 2001. Two people with *Salmonella* Newport infections also reported eating the same brand of peanuts. Three *Salmonella* serovars: Stanley, Newport and Lexington were isolated from the peanuts. These findings triggered an international product recall and assisted health agencies in Canada and the United Kingdom who were investigating similar outbreaks.[29]

Table 10. Top 10 isolates of *Salmonella*, Australia, 2001

Organism	State or territory									
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust	Total %
S. Typhimurium PT135	5	257	9	140	25	4	91	104	635	9.2
S. Virchow	5	65	1	289	21	0	95	2	478	6.9
S. Typhimurium PT9	10	139	0	52	48	11	122	17	399	5.8
S. Typhimurium PT126	4	94	9	73	111	2	18	2	313	4.5
S. Enteritidis	6	79	3	62	20	8	50	66	294	4.2
S. Saintpaul	1	33	20	175	5	2	8	43	287	4.1
S. Birkenhead	2	109	0	132	2	0	6	2	253	3.6
S. Bovismorbificans	5	54	2	54	13	2	30	7	167	2.4
S. Chester	1	30	15	64	13	0	11	31	165	2.4
S. Typhimurium PT64	1	61	3	5	31	1	11	35	148	2.1
Others	44	768	309	1,076	324	131	631	510	3,793	54.8
Total	84	1,689	371	2,122	613	161	1,073	819	6,932	

Source: National Enteric Pathogens Surveillance Scheme, annual report, 2001.

Salmonella Typhimurium phage type 126

A community-wide outbreak of *Salmonella* Typhimurium phage type 126 (STM 126) involving 88 cases occurred in South Australia. The outbreak lasted for several months, with cases emerging in other states and territories later in the epidemic. A case-control study demonstrated that illness was associated with consumption of chicken. Descriptive epidemiology and microbiological evidence of pathogens from samples of raw chicken provided corroborating evidence for this link. The South Australian Department of Human Services observed a decrease in human cases of STM 126 following interventions at breeder farms, hatcheries and processing plants.

Salmonella Bovismorbificans

In June 2001, Queensland investigated a state-wide increase in *Salmonella* Bovismorbificans phage type 32. The outbreak was suspected to be linked to a food product purchased from a fast food restaurant. A case control study implicated a product containing iceberg lettuce, and environmental investigations identified a mechanical slicer at the processing facility that was positive for *Salmonella* Bovismorbificans phage type 32. Thirty-six cases occurred, six of whom were hospitalised.[30]

Salmonella Mgulani

The Northern Territory reported 15 cases of *S.* Mgulani in October and November 2001. Previously, this serovar had rarely been identified in the Territory. Cases were widely dispersed and occurred mostly in non-Indigenous people. Although interviews were conducted, no food source was identified.[31] A cluster of *S. Mgulani* in New South Wales in December 1999 and January 2000 involved 542 cases.[32]

Shigellosis

It is estimated that the majority of shigellosis is due to person-to-person transmission and that only 20 per cent may be foodborne.[25] In Australia, the majority of *Shigella* infections are seen in men who have sex with men, Indigenous communities and travellers returning from overseas. Foodborne outbreaks are rare in Australia, largely as a result of improved standards of sanitation and food-handling.[33] The last outbreak of foodborne shigellosis was in 1998,[34] although outbreaks via person-to-person contact have been reported.[35,36] OzFoodNet reported no outbreaks or confirmed links with food among shigellosis cases notified in 2001.[6]

Shigellosis became a notifiable condition in New South Wales for the first time in 2001. This accounts for the increase in the number of cases (562 cases compared with 487 cases in 2000). Despite this, the national notification rate (2.9 cases per 100,000 population) continued to decline (Figure 22). The highest notification rate was in the Northern Territory, with 51.5 cases per 100,000 population. By age, the highest rates were in children aged less than five years (11 cases per 100,000 population). Overall there was a slight predominance of males (male:female ratio 1.3:1). Rates according to age group and sex are shown in Figure 23.

Figure 22. Trends in notifications of shigellosis, Australia, 1991 to 2001, by month of onset

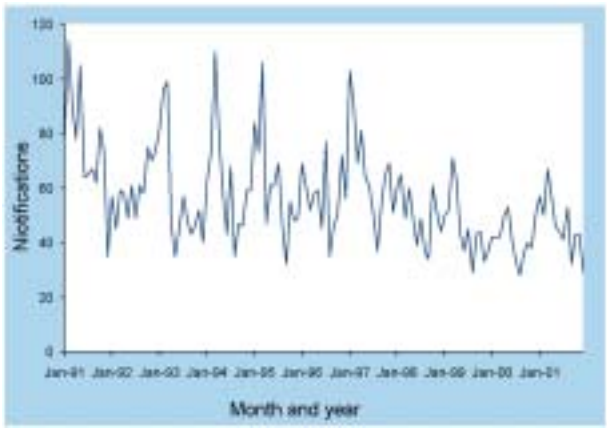
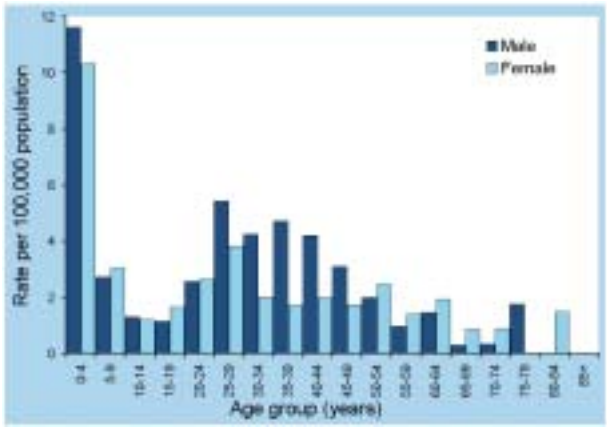


Figure 23. Notification rates for shigellosis, Australia, 2001, by age group and



Shiga-like toxin producing *Escherichia coli*/ verotoxigenic *E. coli*

There were 49 cases of SLTEC/VTEC notified to NNDSS in 2001. This was an increase of 48 per cent on the 33 cases reported in 2000. Reports of SLTEC/VTEC infections were received from Queensland and Western Australia for the first time in 2001. The notification rate rose slightly to 0.3 cases per 100,000 population.

As in previous years, more than 50 per cent (27/49) of cases were notified in South Australia, reflecting a policy of screening all bloody stools for toxin genes by polymerase chain reaction. OzFoodNet reported that *E. coli* O157 was identified in 3 of 26 cases in South Australia, 2 of 4 cases in Victoria and 4 of 10 cases in Queensland, although typing methods are difficult to compare between jurisdictions.[6]

Haemolytic uraemic syndrome

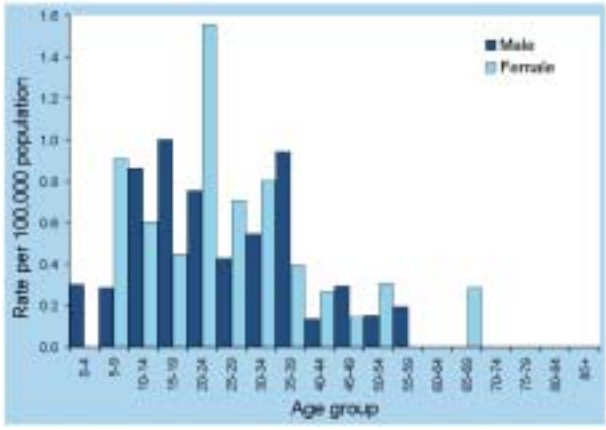
Infections with SLTEC/VTEC have the potential to cause severe and life-threatening illness, including haemolytic uraemic syndrome. Young children are more at risk and HUS in children is typically post-diarrhoeal. *E. coli* O157:H7 infection in children aged less than five years progress to HUS in 10 to 14 per cent of cases.[37]

There were only three cases of HUS notified to the NNDSS in 2001, which was markedly lower than the 15 cases reported in 2000. There is evidence that notified cases of HUS represent only a small proportion of all cases. In California only 44 per cent of cases were reported to public health authorities.[37] The Australia Paediatric Surveillance Unit recorded 325 reports of HUS from paediatricians between July 1994 and December 2000, in children aged less than 15 years. Of these 137 were confirmed and 97 were associated with diarrhoea.[38] In the same period, only 83 cases were notified to the NNDSS. A survey of Australian hospitalisation data conducted by OzFoodNet has shown 90 separations for HUS in the 1998–99 financial year and 47 in the 1999–00 financial year. By contrast, for the same periods there were 21 and 16 notifications of HUS to NNDSS, respectively.[6] Ongoing studies are needed to address the differences seen between the datasets and notification mechanisms in the states and territories.

Typhoid

Typhoid infections in Australia are usually associated with overseas travel. In 2001, there were 84 notifications of typhoid to the NNDSS. This represents a 43 per cent increase on the 60 cases reported in 2000. Of the 84 cases, the highest notification rates were in the 20–24 year age group (1.2 cases per 100,000 population) and there was a male to female ratio of 1:1. Rates according to age group and sex are shown in Figure 24.

Figure 24. Notification rates of typhoid, Australia, 2001, by age group and sex



The National Enteric Pathogen Surveillance Scheme identified 69 isolates of *S.* Typhi in 2001. Fifty-two isolates were from Australian residents, nine from refugees in detention centres and eight from overseas visitors. The percentage known to be acquired overseas was 84 per cent (58/69). There was a single case of typhoid acquired within Australia, which was a laboratory-acquired infection.[26]

Quarantinable diseases

In Australia in 2001, the human diseases which were covered by the *Quarantine Act 1908* were cholera, plague, rabies, yellow fever, and four viral haemorrhagic fevers (Ebola, Marburg, Lassa and Crimean-Congo). These infections are of international public health significance, with mandatory reporting to the WHO. All states and territories notify quarantinable diseases to the NNDSS.

Four cases of cholera were the only reports of quarantinable disease notified in Australia in 2001. All cases were imported and occurred in two males and two females in New South Wales, Queensland, South Australia and Victoria. The organism was identified in one case as *V. cholerae* 01 — El Tor Inaba, imported from Hong Kong; another as *V. cholerae* 01, imported from Bali, Indonesia and a third as *V. cholerae* 01 — Ogawa, which also was acquired in Bali. The occurrence of cholera in returning travellers demonstrates the importance of consuming safe food and drink in areas where cholera is known to occur.

Two human cases of rabies, in which symptoms developed in Australia, were the result of overseas exposure in 1987 and 1990.[39] Although no cases of rabies or yellow fever were reported in Australia in 2001, worldwide these two diseases continue to cause fatalities and travellers should be aware of measures they can take to prevent infection with these viruses. Travellers intending to visit central

Africa or central South America are encouraged to receive the yellow fever vaccine from an approved Australian vaccination centre. Information on quarantinable diseases can be found on the DoHA's website: (www.health.gov.au/pubhlth/strateg/quaranti/index.htm).

Sexually transmitted infections

Sexually transmitted infections (STIs) remain a prevalent public health problem in Australia, despite efforts in prevention and education. In 2001, chlamydial infection, donovanosis, gonococcal infection and syphilis were nationally reportable to NNDSS, while chancroid and lymphogranuloma venereum were removed from NNDSS reporting. During 2001, a total of 27,817 STI notifications were received by NNDSS, which accounted for 27 per cent of all notifications.

A number of systems are involved in STI surveillance in Australia, including the NNDSS, the Laboratory Virology and Serology Reporting Scheme (LabVISE) (for chlamydia and syphilis) and specialist laboratory networks such as the Australian Gonococcal Surveillance Programme.[40] The NCHECR has an interest in STI surveillance, and have further analysed data from the NNDSS and other reporting sources in their annual surveillance report.[41]

The number of chlamydia and gonococcal infections reported in 2001 were the highest since 1991. Increases were also observed for donovanosis, while the number of syphilis notifications were at their lowest level since reporting commenced. Increases in some STIs may be due to higher rates of diagnosis, however, changes in surveillance methods may also account for some of the observed trends.

Chlamydial infection

The rate of chlamydial infections continued to increase in 2001 (Figure 25). During the year, a total of 20,026 notifications of chlamydial infection were received by NNDSS, an 18 per cent increase on the 17,018 cases reported in 2000. The notification rate for chlamydial infections in 2001 was 103 cases per 100,000 population, an increase from 88 cases per 100,000 population in 2000.

The increase in the number of chlamydial notifications occurred in all states and territories (Table 11). South Australia recorded the largest increase in 2001, of 37 per cent.

Notification rates vary widely between states and territories. The rates were above the national average in the Northern Territory (619.4 cases per 100,000 population), Queensland (153.9 cases per 100,000 population) and Western Australia (143.4 cases per 100,000 population, Map 3).

Figure 25. Trends in notification rates of chlamydial infection, Australia, 1994 to 2001, by year of onset

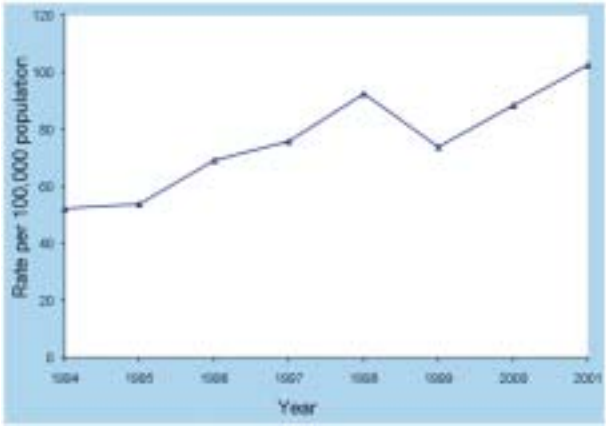
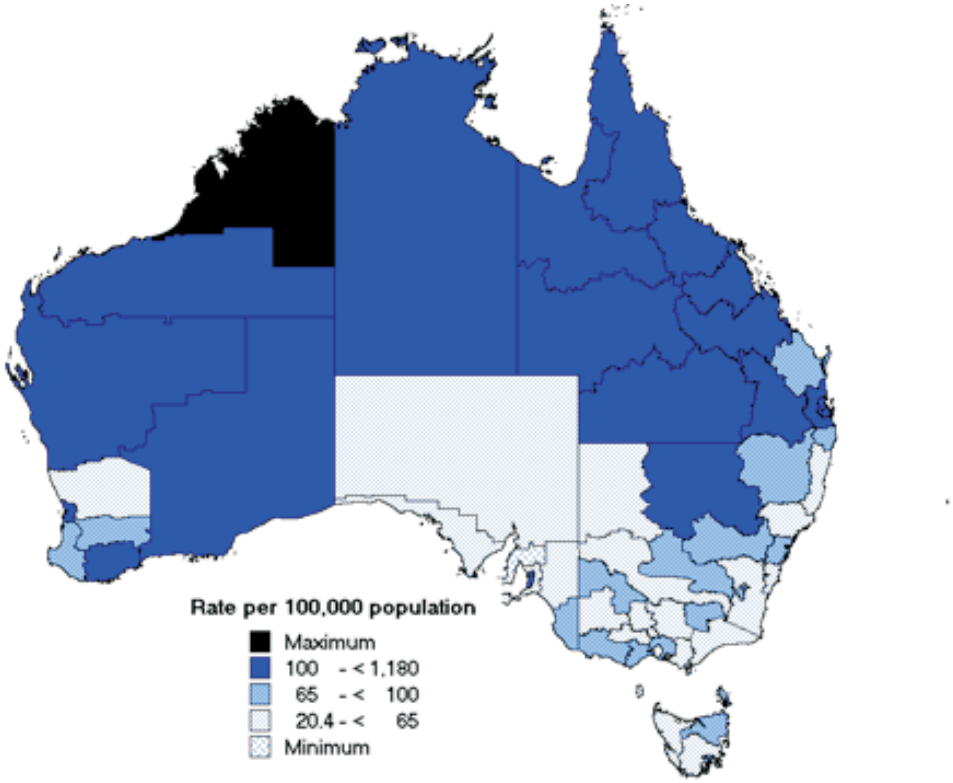


Table 11. Trends in notifications of chlamydial infection, 1994 to 2001, by state or territory

Year	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
1994	88	NN*	737	2,444	727	5	1,318	834	6,179
1995	80	NN	520	2,414	768	283	1,317	1,025	6,439
1996	110	NN	670	3,266	1,024	293	1,559	1,444	8,390
1997	142	NN	629	3,508	1,005	249	2,115	1,591	9,302
1998	194	NN	791	4,076	1,024	202	2,569	2,071	11,490
1999	177	2,461	863	4,476	973	254	2,939	1,903	14,046
2000	244	3,555	1,000	4,932	1,023	332	3,335	2,597	17,018
2001	301	4,389	1,239	5,596	1,402	380	3,924	2,733	19,964
Increase from 2000 (%)	23.4	23.5	23.9	13.5	37.0	14.5	17.7	5.2	17.3

* Not notifiable

Map 3. Notification rates of chlamydial infection, Australia, 2001, by Statistical Division of residence



The overall notification rate was 82.7 cases per 100,000 population for males and 122.2 cases per 100,000 population for females in 2001. The male to female ratio was 1:1.5, which was similar to 2000. Chlamydia is predominantly a disease of young adults. Among the cases in 2001, 77 per cent were in adolescents and young adults between the ages of 15 and 29 years. Notification rates of chlamydia in females exceeded those of males in each age group, with the greatest differences occurring in the 10–14 year age group (male:female ratio 1:7.7) and the 15–19 year age group (male:female ratio 1:3.8). Rates according to age group and sex are shown in Figure 26.

In 2001, the highest notification rate for females occurred in the 20–24 year age group (653.2 cases per 100,000 population), followed by the 15–19 year age group (565.3 cases per 100,000 population). These rates are 5.3 times and 4.6 times the national rate for women, in those aged 20–24 and 15–19 years respectively.

Trends in the sex distribution pattern for the 15–29 year age range since 1997 (Figure 27) show increases for all three age groups (15–19, 20–24, 25–29 years). The largest increases for chlamydia notifications were observed for females in the 15–19 and 20–24 year age groups and for males in the 25–29 years group.

Figure 26. Notification rates of chlamydial infection, Australia, 2001, by age group and sex

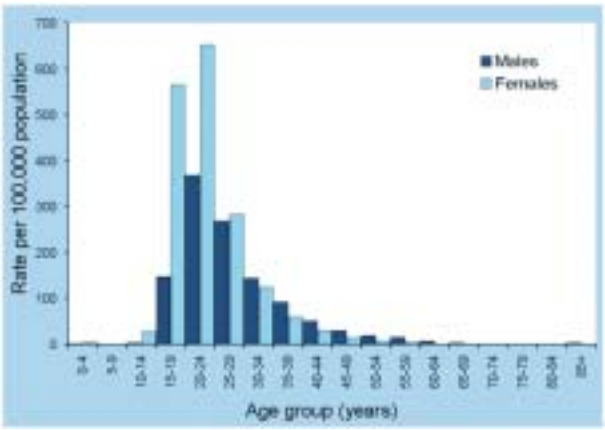
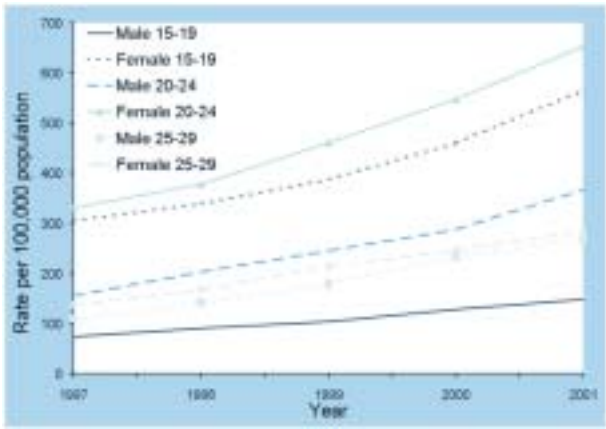


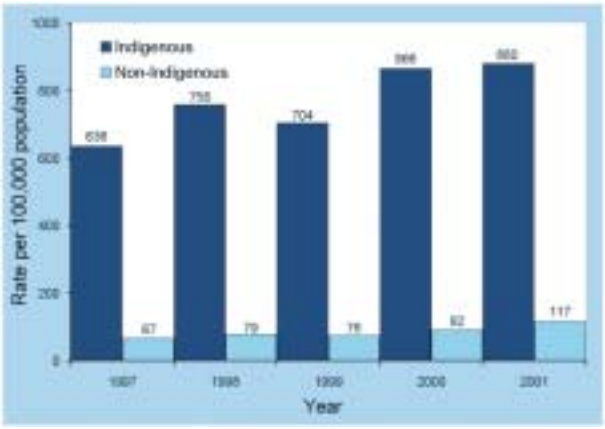
Figure 27. Trends in notification rates of chlamydial infection in persons aged 15–29 years, Australia, 1997 to 2001, by sex



There were 53 cases of chlamydia infection reported in children aged less than 10 years. All of these were cases of chlamydial conjunctivitis. Notifications were from all states and territories except South Australia and Tasmania.

Based on notifications from the Northern Territory, South Australia and Western Australia to NNDSS, the NCHECR have reported further details on chlamydial infection in Indigenous Australians. For these jurisdictions, Indigenous status was identified in 73 per cent of the notifications.[41] In 2001, the estimated age standardised rate of chlamydial infection among Indigenous Australians was 880 cases per 100,000 population, compared with the rate of 117 cases per 100,000 population in non-Indigenous Australians. Trends in notification rates of chlamydia in Indigenous and non-Indigenous Australians between 1997 and 2001 are shown in Figure 28.

Figure 28. Trends in age-standardised notification rates of chlamydial infection, the Northern Territory, South Australia and Western Australia (combined), 1997 to 2001, by Indigenous status*



* Data for 2001 unfinalised

Source: NCHECR HIV/AIDS Annual surveillance report: 2001

Chlamydial infection is caused by *Chlamydia trachomatis.* The infection can be asymptomatic. It has been estimated that in about 80 per cent of females and 40 per cent of males the infections are asymptomatic, and can easily remain undiagnosed.[42] It is difficult, therefore, to estimate the true burden of chlamydial infection in Australia. The disease is usually transmitted by vaginal intercourse or during oral or anal sex. Mother-to-child transmission can also occur during birth and may result in conjunctivitis or pneumonia in the newborn.

There may be a number of reasons for the increase in the number of chlamydial cases over the past decade. The increase may reflect the effect of chlamydia control campaigns that increase the rate of screening. The use of non-invasive tests (e.g., testing of urine) and more sensitive assays for chlamydial infection may increase the number of tests undertaken and the number of positive results. Enhanced surveillance activities by health authorities and greater awareness of the disease by health professionals may improve reporting.

If real, the continued increase in cases of chlamydia infection over the past decade, particularly among adolescents and young adults, is a cause for public health concern. Data on risk factors and evaluations of preventative programs may help understand disease transmission and deliver more comprehensive and effective control programs. In 2001 the Department of Human Services, Victoria, launched the *Chlamydia Strategy for Victoria, 2001 – 2004* to address the continuing increase in chlamydial infections.[43]

Donovanosis

Donovanosis is a sexually transmissible infection caused by *Calymmatobacterium granulomatis,* a gram-negative pleomorphic bacillus. It is characterised by genital ulcerative lesions which may develop into a chronic ulcerative disease if untreated. Lesions may be extensive and extragenital, and may be associated with secondary bacterial infection. The mode of transmission of donovanosis is primarily through sexual contact, although it may also be acquired by a faecal route, or at birth by passage through an infected birth canal.[44]

Internationally, donovanosis is endemic in tropical and sub-tropical areas, particularly PNG, central America, southern Africa and southern India.[16] In Australia, the disease is rare in the general population. It is, however, more common in Indigenous communities in rural and remote areas of northern Australia.[45,46]

Donovanosis was notifiable in all states and territories except South Australia in 2001. Among the notifiable STIs, donovanosis is the least commonly reported. NNDSS received a total of 42 notifications of donovanosis from the Northern Territory, Queensland and Western Australia in 2001, with a rate of 0.2 cases per 100,000 population.

The number of donovanosis cases in 2001 was twice that of 2000 (n=21). The increase of donovanosis notifications may be the result of the donovanosis eradication program, which includes enhanced surveillance in addition to the use of more sensitive and acceptable diagnostic assays, such as polymerase chain reaction.[47,48] Ultimately though, it should lead to eradication. As part of the program, in 2001 a project officer was employed in Western Australia, to raise awareness of donovanosis among health-care workers and communities in rural and remote areas of the State.

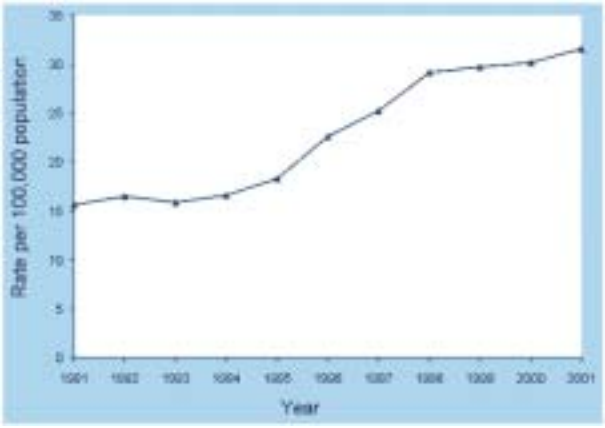
The highest group specific rates in 2001 were reported for females in the 15–19 year age group (0.8 cases per 100,000 population) and males in the 20–24 year age group (0.7 cases per 100,000 population) and with a male to female ratio of 1:1.8. Data on Indigenous status were available for all notifications and all but two cases were in Indigenous Australians.

Gonorrhoea

Infection by *Neisseria gonorrhoeae* is transmitted from person to person through vaginal, anal, or oral sexual contact. The disease may also be transmitted to the new-born from the mother's birth canal to cause gonococcal ophthalmia neonatorum. Humans are the only host for the bacterium.

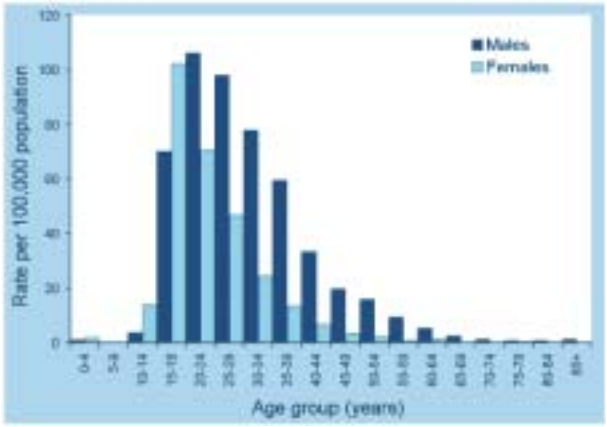
As with chlamydial infection, the number of notifications of gonococcal infection in Australia has increased over the last decade. The annual national notification rate of gonococcal infection has increased steadily from 16 cases per 100,000 population in 1993 to 32 cases per 100,000 population in 2001 (Figure 29). In 2001, a total of 6,158 notifications of gonococcal infection were reported nationally, an increase from the 5,801 reports received in 2000. The increase occurred in the Australian Capital Territory, New South Wales, the Northern Territory and Tasmania. The remaining states and territories showed a decrease in notifications in 2001.

Figure 29. Trends in notification rates of gonococcal infection, Australia, 1991 to 2001



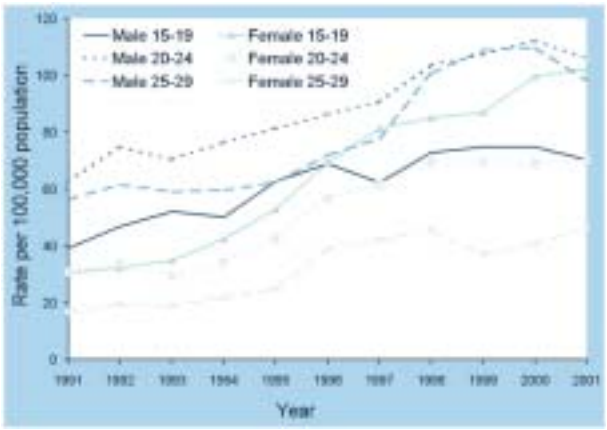
The notification rate was higher than the national average in the Northern Territory and Western Australia, with a rate 22 times the national level in the Northern Territory in 2001. The notification rate of gonococcal infection in 2001 was 42.9 cases per 100,000 population for males and 20.4 cases per 100,000 population for females. As in previous years, the male to female ratio remains 2:1. The age group specific notification rate of gonococcal infection in females was higher than that in males in the 10–14 year age group (male:female ratio; 1:3.8) and the 15–19 year age group (male:female ratio 1:1.5), while higher rates were observed in males compared to females in all other adult age groups (Figure 30).

Figure 30. Notification rates of gonococcal infection, Australia, 2001, by age group and sex



Trends in the sex-specific rates of gonococcal infection in persons aged 15–29 years over recent years all show a general increase. The increase was greatest for females in the 15–19 year group. The highest age group and sex-specific rates over time have been in males aged 20–29 years (Figure 31).

Figure 31. Trends in notification rates of gonococcal infection, in persons aged 15–29 years, Australia, 1991 to 2001, by sex

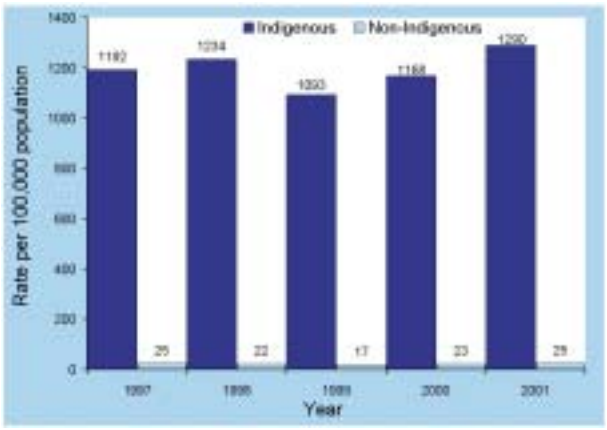


Increased testing, the availability of more sensitive diagnostic tests, and enhanced surveillance may account for some of the increase. True increases in disease may occur in some communities, such as men who have sex with men.[49,50] In the Northern Territory, increased screening for gonococcal infection through four sentinel practices in 2001 may also have increased notification rates. The use of polymerase chain reaction in place of culture for diagnosis in some areas may be reducing the number of gonococcal isolates that can be used to monitor antibiotic resistance.

There was wide geographical variation in the rate of notification of gonococcal infection. The highest rates of notification were reported in the Kimberley (1,580 cases per 100,000 population) and Pilbara (780 cases per 100,000 population) Statistical Divisions in northern Western Australia and in the Northern Territory (765 cases per 100,000 population) (Map 4).

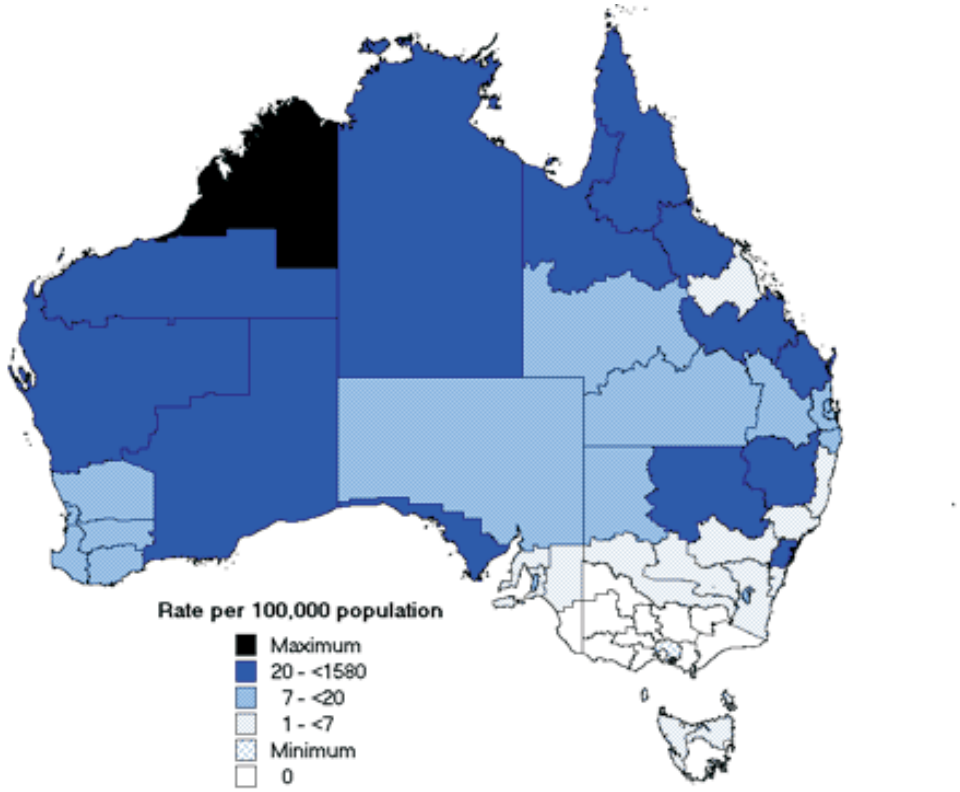
Based on the notifications from the Northern Territory, South Australia and Western Australia to NNDSS, the NCHECR reported further details on gonococcal infection in Indigenous Australians.[41] From these three jurisdictions, data on Indigenous status in 2001 were available for 87 per cent of notifications. The age standardised gonococcal notification rates were estimated to be 1,290 cases per 100,000 population in the Indigenous population, compared with 25 cases per 100,000 population in the non-Indigenous population. This represents an increase in gonococcal notification rates since 1999 for Indigenous Australians. The same trend was also observed in non-Indigenous Australians (Figure 32).

Figure 32. Trends in age-standardised notification rates of gonococcal infection, the Northern Territory, South Australia and Western Australia (combined), 1997 to 2001, by Indigenous status*



Source: NCHECR HIV/AIDS Annual surveillance report: 2001

Map 4. Notification rates of gonococcal infection, Australia, 2001, by Statistical Division of residence



Other surveillance activities for gonococcal infections

The Australia Gonococcal Surveillance Programme is the national laboratory-based surveillance system that monitors the antibiotic susceptibility of the gonococcus. The program is undertaken by a network of reference laboratories in each state and territory, which use an agreed and standardised methodology to quantitatively determine susceptibility of the organism to a core group of antibiotics. The annual results of the Australian Gonococcal Surveillance Programme have recently been published.[51]

In 2001, a total of 3,706 of gonococcal isolates were analysed by the Australian Gonococcal Surveillance Programme, an increase of five per cent on the previous year's total. The most common anatomical sites of isolates obtained for testing were from the urethra for males (80%) and from the cervix for females (92%). Rectal isolates, obtained only from males, comprised ten per cent of the isolates. Of the total number of isolates, 85 per cent were from men, and this ratio was little changed from 2000.

Table 12 presents trends in annual antibiotic resistance rates in Australia between 1998 and 2001. The proportion of isolates resistant to penicillin by chromosomally-controlled mechanisms increased from 10.6 per cent in 2000 to 15.3 per cent in 2001, but this rate is still less than the 22 per cent recorded in 1998. While the level of quinolone resistance in gonococci decreased slightly from the previous year, it became more widespread in Australia in 2001. Antibiotic susceptibility patterns varied considerably between regions and resistance to the penicillins remained high in larger urban centres.[51]

Syphilis

During 2001, 1,406 cases of syphilis were reported to the NNDSS. This represents a decrease of notifications for the second consecutive year and it was the lowest number of cases received by NNDSS since 1991. In Australia, all states and territories report syphilis (including primary, secondary and latent syphilis) and congenital syphilis separately, to NNDSS.

In 2001 the overall notification rate for syphilis was 8.4 cases per 100,000 population for males and 6.1 cases per 100,000 population for females. The male to female ratio was 1:0.7. The peak notification rate was reported in females in the 15–19 year age group (16.2 cases per 100,000 population). The disease is more common in females in their child-bearing years. In 2001, 75 per cent of the cases in females occurred in the 15–44 year age range. The highest age specific notification rate for males was in the 20–24 year age group (14.4 cases per 100,000 population, Figure 33). Since 1991, overall decreases in the syphilis notification rate have been clearly observed in the 15–29 year age range, for both males and females (Figure 34).

The national notification rate for syphilis in 2001 was 7.3 cases per 100,000 population, a decrease from 9.3 cases per 100,000 population in 2000. Decreases were seen in the Australian Capital Territory, New South Wales and Queensland. Increases in the number of syphilis notifications cases in 2001 was reported in the other five states and territories. The increase may reflect a more active follow-up of suspected cases.[52] Significant cleaning of syphilis notification data in some states and territories in 2001 has accounted for decreased numbers of notifications.

Figure 33. Notification rates of syphilis, Australia, 2001, by age group and sex

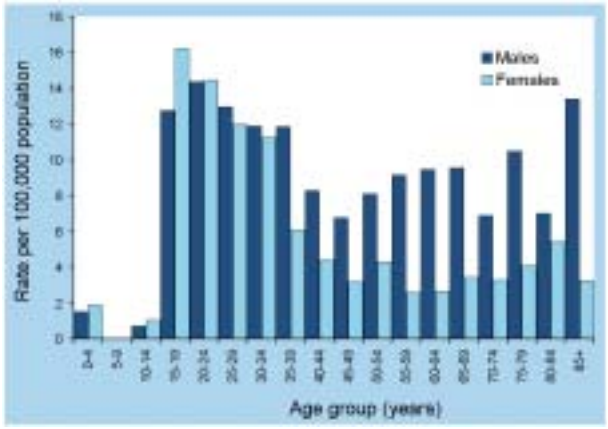
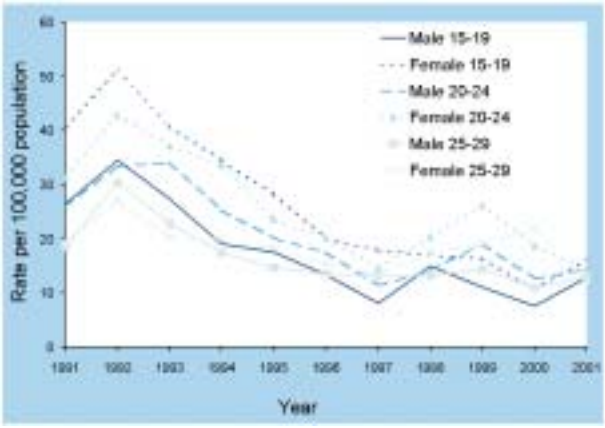


Table 12. Proportion of gonococcal isolates showing antibiotic resistance, Australia, 1998 to 2001

	Penicillin resistance (% resistant)		Quinolone resistance (% resistant)	High level tetracycline resistance (% resistant)
	Plasmid mediated resistance	Chromosomally mediated resistance		
1998	5.3	21.8	5.2	NR
1999	7.4	14.3	17.2	7.9
2000	8.7	10.6	17.8	9.1
2001	7.5	15.3	17.5	9.4

NR Not recorded

Figure 34. Trends in notification rates of syphilis, in persons aged 15–29 years, Australia, 1991 to 2001, by sex

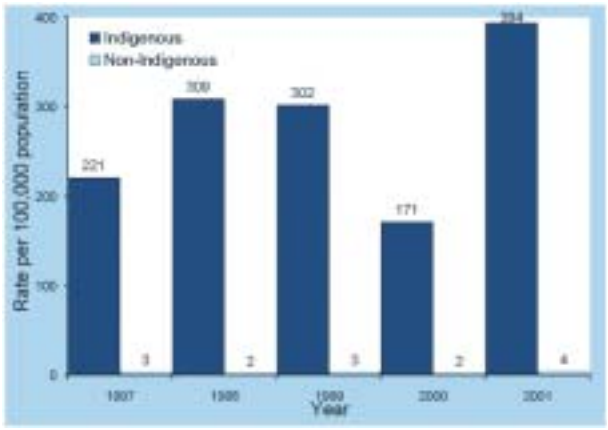


In 2001, there was wide geographical variation in notification rates for syphilis (Map 5). The highest rate occurred in Western Australia in the Kimberley Statistical Division (360.9 cases per 100,000 population).

There were 21 cases of syphilis in children aged less than one year (3 in New South Wales, 17 in the Northern Territory and 1 in Western Australia). All were confirmed as congenital syphilis.

Based on the notifications from the Northern Territory, South Australia and Western Australia to NNDSS, the NCHECR reported further details on syphilis in Indigenous Australians.[41] From these three jurisdictions, data on Indigenous status was available for 93 per cent of notifications in 2001. The age standardised syphilis rates were estimated to be 394 cases per 100,000 population for Indigenous Australians, compared with 4 cases per 100,000 population for non-Indigenous Australians. Trends in notification rates of syphilis in Indigenous and non-Indigenous Australians from these states and territories between 1997 and 2001 are shown in Figure 35.

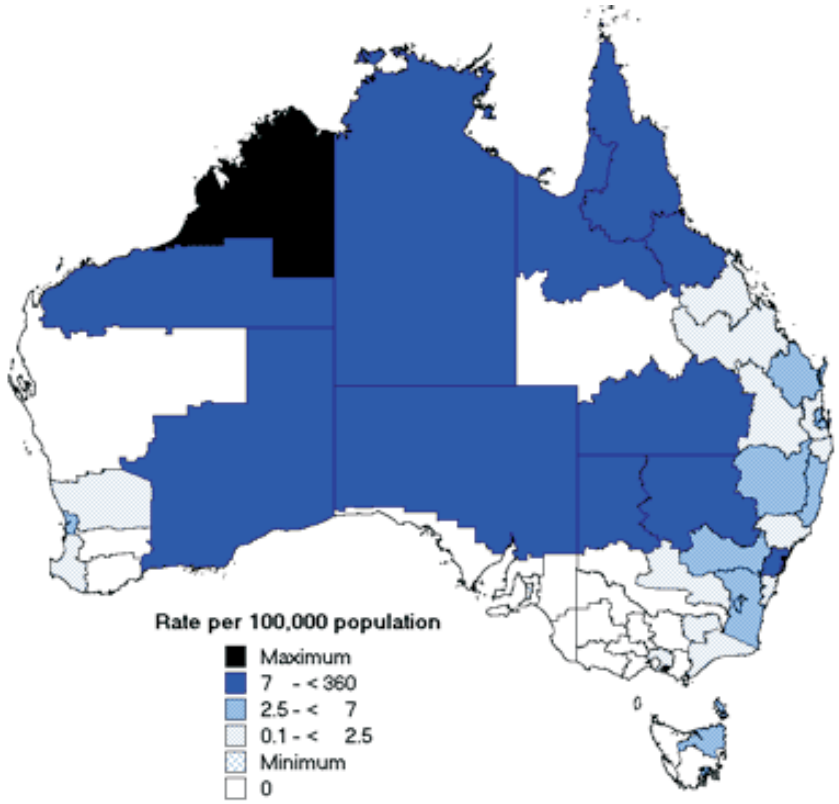
Figure 35. Trends in age-standardised notification rates of syphilis, the Northern Territory, South Australia and Western Australia (combined), 1997 to 2001, by Indigenous status*



* Data for 2001 unfinalised

Source: NCHECR HIV/AIDS Annual surveillance report: 2001

Map 5. Notification rates of syphilis, Australia, 2001, by Statistical Division of residence



Vaccine preventable diseases

This section summarises the national notification data for laboratory-confirmed influenza and invasive pneumococcal disease as well as diseases targeted by the Australian Standard Vaccination Schedule in 2001. This includes diphtheria, *Haemophilus influenzae* type b (Hib) infection, measles, mumps, pertussis, poliomyelitis, rubella and tetanus. The National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases (NCIRS) have recently published a detailed analysis of vaccine preventable diseases in Australia for 1999 to 2000.[53]

Laboratory-confirmed influenza and invasive pneumococcal disease (IPD), were added to the list of nationally notifiable diseases in 2001. Both these diseases were made notifiable in all Australian states and territories during 2001. Because of the need to change public health legislation to include these diseases, complete data for 2001 were not available from all states and territories.

The rationale for the introduction of surveillance of laboratory-confirmed influenza was to give better national data on the annual incidence of influenza, the circulating viral subtypes and the effectiveness of annual influenza vaccinations. In Australia, annual vaccination against influenza is provided free of charge to non-Indigenous Australians aged 65 years and above and to Indigenous Australians aged 50 years and above. It is also recommended for individuals who are at increased risk of influenza-related complications and those who may transmit influenza to persons at increased risk.[54]

There was only one change to the Childhood Immunisation Schedule in 2001 — a program for at-risk children using the seven-valent conjugate pneumococcal vaccine was recommended and publicly funded (Table 13). The program was introduced with a focus on Indigenous children, who have some of the highest incidences of invasive pneumococcal disease in the world.[55] The conjugate vaccine has been demonstrated to have an efficacy of 94 per cent in preventing invasive pneumococcal disease in young children.[2]

There were 13,030 notifications of vaccine preventable diseases in 2001; one in eight of the total notifications to NNDSS. Pertussis was by far the most common with 9,515 notifications, or 73 per cent of all vaccine preventable disease notifications.

Diphtheria

A single case of cutaneous diphtheria in a 52-year-old man was reported from the Northern Territory in March 2001. A toxigenic strain of *Corynebacterium diphtheriae* var. *mitis* was isolated. The patient acquired the disease in East Timor and had an uncertain vaccination history. This is the first case reported in Australia since 1993.

Haemophilus influenzae type b disease

Notifications of Hib disease have fallen more than 30-fold since 1991, due to the efficacy of Hib conjugate vaccines (Figure 36). There were 26 notifications of Hib disease in 2001, a rate of 0.1 cases per 100,000 population. This is eight per cent less than in 2000, and the lowest number of notifications recorded since national surveillance began in 1991. Most notified cases (14, 53%) were aged less than five years and five were infants aged less than one year. Rates according to age group and sex are shown in Figure 37. There were less notifications of Hib disease for males than for females (male:female ratio 0.7:1) in 2001.

Table 13. Vaccination schedules for seven-valent conjugate pneumococcal vaccine in Australia

Date implemented	July 2001
Serogroups in vaccine	4, 6B, 9V, 14, 18C, 19F, 23F
Target populations	All Aboriginal and Torres Strait Islander infants in a 3-dose series at 2, 4 and 6 months of age, with a booster dose of the 23-valent pneumococcal polysaccharide vaccine (23vPPV) at 18–24 months of age. Catch-up is recommended for Aboriginal children in Central Australia up to the fifth birthday and for Aboriginal and Torres Strait Islander children elsewhere up to the second birthday. All Australian children with underlying predisposing medical conditions at 2, 4 and 6 months of age with a booster dose (of 7vPCV) at 12 months of age and a booster dose of 23vPPV at 4–5 years of age. Catch-up vaccination is recommended for these children up to the fifth birthday. Non-Indigenous children residing in Central Australia up to the second birthday, as catch up vaccination.
Data source	*Australian Immunisation Handbook*, 8th edition

Figure 36. Trends in notifications of *Haemophilus influenzae* type b infections, Australia, 1991 to 2001, by month of onset

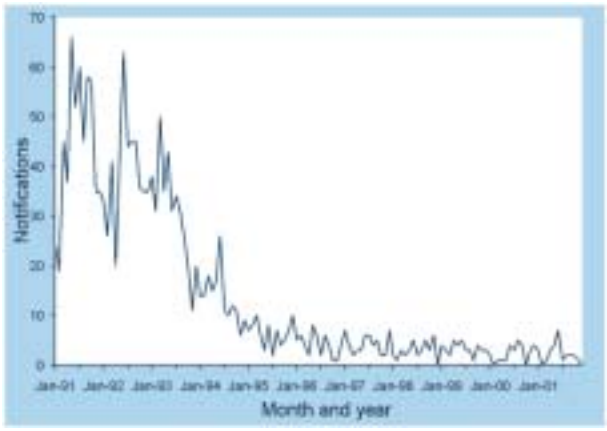
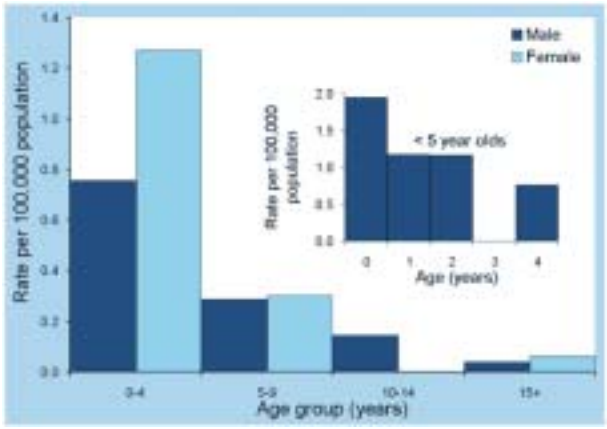


Figure 37. Notification rates of *Haemophilus influenzae* type b infection, Australia, 2001, by age group and



The Northern Territory had the highest notification rate (n=3, 1.5 cases per 100,000 population) although most cases were from New South Wales (9/26). The vaccination status of eleven cases was known; seven were unvaccinated, two partially vaccinated and two cases in Victoria were fully vaccinated. These two children were confirmed cases with documented evidence of receipt of four doses of Hib vaccine and had no identified risk factors.

Laboratory-confirmed influenza

There were 1,286 reports of laboratory-confirmed influenza in 2001 to the NNDSS, a rate of 6.6 cases per 100,000 population. As noted above, data were not available from all states and territories for the full year, consequently these numbers are an underestimate of the true incidence. No notifications were received from Tasmania. Notifications of laboratory-confirmed influenza showed a peak in August and September (late winter). These data, together with the month when reporting began in each state or territory, are shown in Figure 38.

The highest rates of laboratory-confirmed influenza were in children aged less than five years (Figure 39). The male to female ratio was 1.1:1.

In 2001, influenza A was the dominant type, 81 per cent of which were subtype H1N1 and 19 per cent were subtype H3N2. The influenza A (H1N1) isolates analysed were all A/New Caledonia/20/99-like strains. The H3N2 isolates were antigenically similar to the reference strain (A/Moscow/10/99) and the vaccine strain (A/Panama/2007/99). The influenza B isolates, which made up only 10 per cent of all (influenza A and B) isolates, were mainly B/Sichuan/379/99-like strains. Ten per cent of the influenza B isolates though were more closely related to B/Harbin/7/94-like viruses, which have circulated in previous years. The Australian 2001 influenza vaccine therefore represented a good match for the circulating viruses and 77 per cent of the over 65 year age group in Australia was vaccinated in 2001.[56]

Figure 38. Notifications of laboratory-confirmed influenza and month when reporting to the National Notifiable Diseases Surveillance System began in each state or territory, Australia, 2001

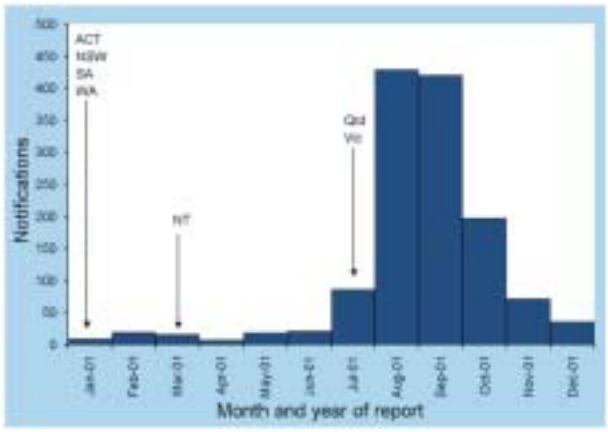
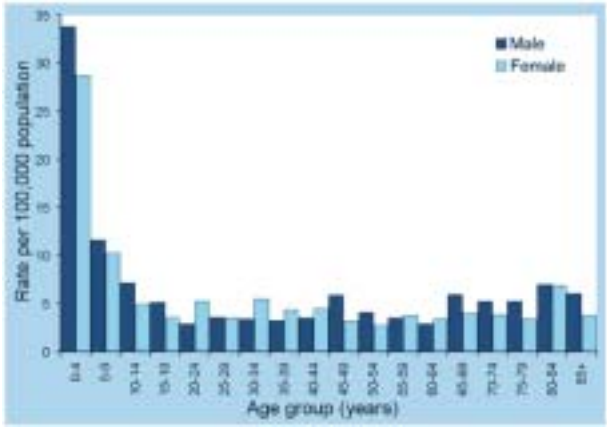


Figure 39. Notification rates of laboratory-confirmed influenza, Australia, 2001, by age group and sex

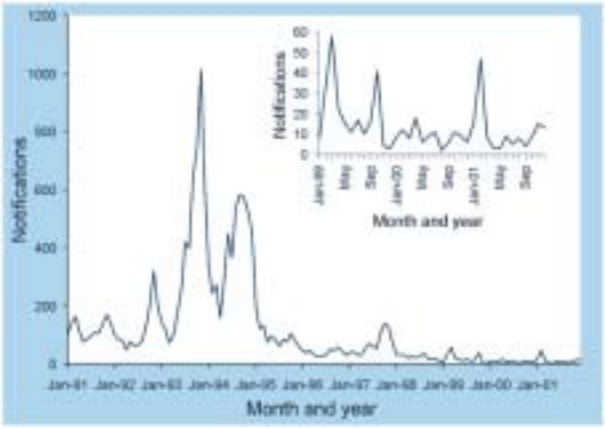


Measles

Measles is the most important cause of vaccine-preventable death in the world. In 1998 an estimated 30 million measles cases and 880,000 measles-associated deaths occurred worldwide, with 85 per cent of deaths occurring in Africa and South-East Asia.[57] In recent years a dramatic reduction in measles incidence and elimination of endemic measles transmission has been achieved in a number of countries with a variety of vaccination strategies.[58]

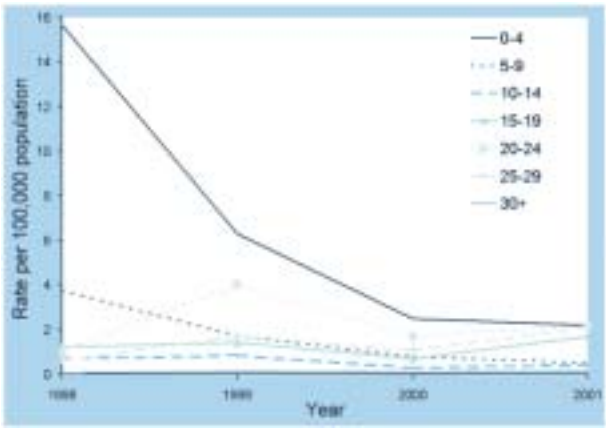
In Australia there were 141 measles notifications in 2001, a national rate of 0.7 cases per 100,000 population. This is a slight increase on the 107 cases reported in 2000, which was the lowest annual rate for Australia since national surveillance began in 1991 (Figure 40). The highest rate was in Victoria with 1.7 cases per 100,000 population (n=83).

Figure 40. Trends in notification rates of measles, Australia, 1991 to 2001, by month of onset



As in recent years, the age-specific notification rate of measles was highest for the 0–4 year age group (2.2 cases per 100,000 population). The rate for this age group was considerably lower than it has been in the past (Figure 41). Within the 0–4 year age group most cases (54%) were aged less than one year old. The rate for the 5–9 year age group (0.5 cases per 100,000 population) was also the lowest on record. Following the 0–4 year age group, the next highest rates were in the 20–24 year age group (2.2 cases per 100,000 population) and the 25–29 year age group (2.1 cases per 100,000 population). The proportion of cases in the 20–29 year age group has been increasing since national surveillance began, from 6 per cent in the early 1990s to above 30 per cent in 1999 to 2000. In 2001, the 20–29 year age range accounted for 41 per cent (58/141) of the reported cases.

Figure 41. Notification rates of measles, Australia, 1998 to 2001, by age group



There were a number of measles outbreaks in Australia in 2001. In January, a young Australian recently returned from India was the index case in an outbreak affecting 50 young adults in Melbourne. All cases were laboratory confirmed.[59] The median age was 25 years (range 10 months to 34 years) with 90 per cent aged 15 to 34 years. Most cases were unvaccinated and four were partially vaccinated against measles. Twenty-two (43%) of the confirmed cases were hospitalised for an average of four days (range 1–10 days) but there were no deaths.

A second outbreak of measles in Victoria was reported in October. The index case had acquired the infection overseas and there were 17 laboratory-confirmed cases linked to the index case. All 18 cases were infected with the D5 measles genotype. The majority of cases were aged between 18 and 34 years and none had a documented history of measles vaccination.

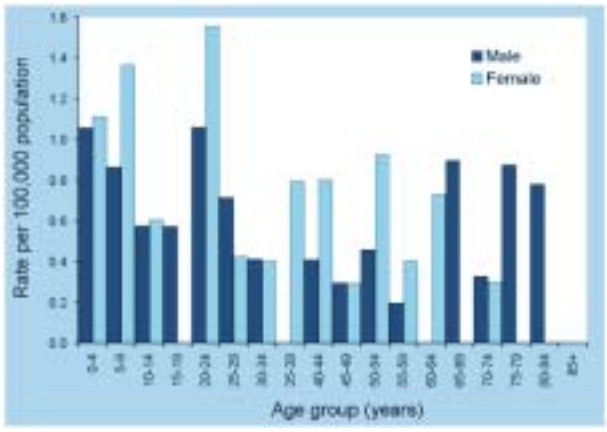
The third cluster of seven cases (five of which were laboratory confirmed) occurred in the second quarter of the year in western Sydney. The index case was probably infected while travelling overseas. Three infants aged 8–12 months and four young adults aged 19–26 years were involved in this outbreak. A measles outbreak in PNG in June 2001 prompted CDNA to warn intending travellers to that country that they should be vaccinated against measles.

In 2001, the Victorian Infectious Diseases Reference Laboratory established the National Measles Laboratory in Melbourne. The laboratory analysed samples from five Australian states and territories during the year, and 18 distinct measles strains belonging to eight different measles genotypes were identified. These observations suggest that indigenous measles transmission has been eliminated in Australia, and that periodic introductions of the virus occurs predominantly from South-East Asia.[60]

Mumps

In 2001, there were 114 notifications of mumps, a rate of 0.6 cases per 100,000 population. This is a decrease of 47 per cent on the 212 cases reported in 2000 and the lowest rate since all states and territories began notifying the disease in 1996 (although mumps was not notifiable in Queensland between July 1999 and December 2000). There were cases in most age groups (Figure 42) but the majority (n=77, 68%) were from people aged 15 years or more. Although rates were also considerably less than in 2000, the 20–24 year age group still had the highest rate of notifications (1.2 cases per 100,000 population). The next highest rates were in the 0–4 and 5–9 year age groups (both 1.1 cases per 100,000 population). Unlike most previous years, there was a slight preponderance of mumps cases in females (male:female ratio 0.8:1).

Figure 42. Notification rates of mumps, Australia, 2001, by age group and sex



Pertussis

Pertussis continues to be the most common vaccine preventable illness in Australia, with periodic epidemics occurring at intervals of 3 to 5 years (Figure 43).[61] There were 9,515 notified cases of pertussis in 2001, 60 per cent more than the 5,942 cases reported in 2000. The annual notification rate was 48.8 cases per 100,000 population.

Since 1999, the 10–14 year age group have had the highest notification rates of pertussis and this pattern continued in 2001 (187 cases per 100,000 population) (Figure 44). Changes in the age distribution of cases is a result of the introduction of a fifth dose of pertussis vaccine in 1994, which is given at four years of age. Children less than one year of age (particularly those under six months who have received fewer than three doses of vaccine) also have high notification rates. This age group has significantly higher morbidity and mortality than any other age group.[53]

For all age groups up to 80 years there were higher notification rates in females than in males (Figure 45), and the overall male to female ratio was 0.8:1.

Notification rates of pertussis varied considerably by geographic location (Map 6). At the state or territory level, rates were highest in South Australia (132.7 cases per 100,000 population) and lowest in Western Australia (11.9 cases per 100,000 population).

Figure 43. Trends in notifications of pertussis, Australia, 1991 to 2001, by month of onset

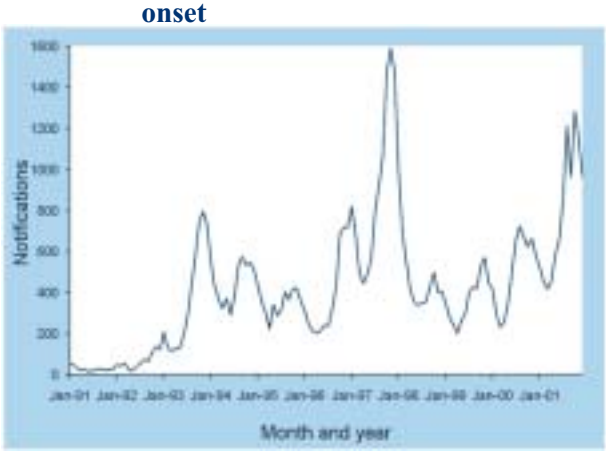


Figure 44. Notification rates of pertussis, Australia, 1996 to 2001, by age group

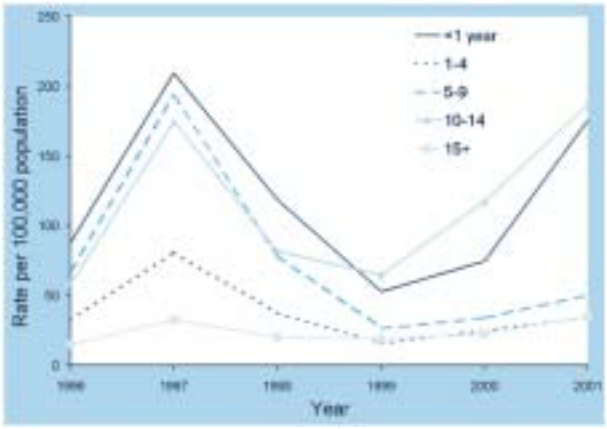
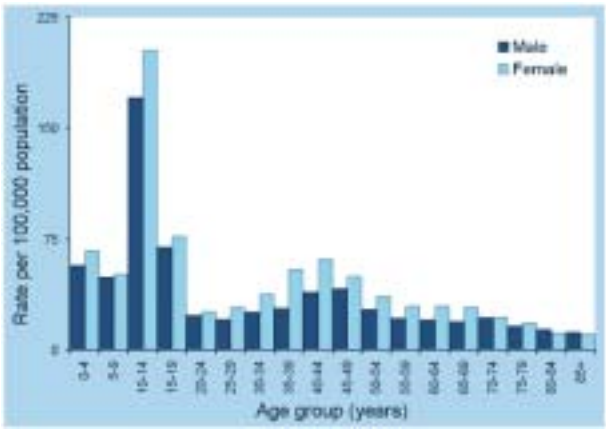
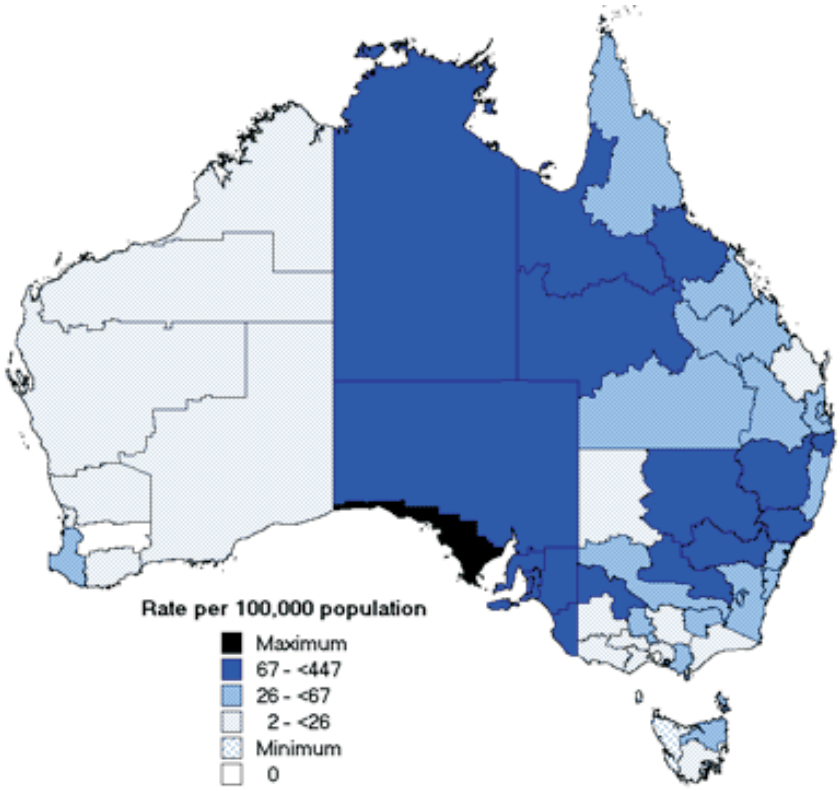


Figure 45. Notification rates of pertussis, Australia, 2001, by age group and sex



Map 6. Notification rates of pertussis, Australia, 2001, by Statistical Division of residence



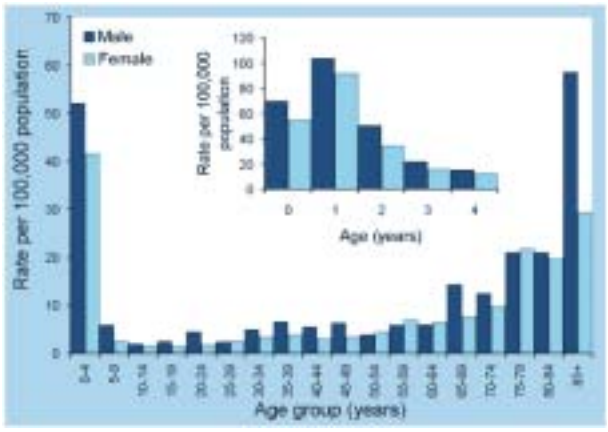
Invasive pneumococcal disease

There were 1,681 notifications of IPD in Australia in 2001, giving a rate of 8.6 cases per 100,000 population. The rates for 2001 are likely to be an under-estimate because for some jurisdictions data on IPD was not available for the whole year. While the largest number of cases were found in New South Wales, Queensland and Victoria, the highest rate occurred in the Northern Territory (48.5 cases per 100,000 population), which was more than five times the national rate. The geographical distribution of IPD varied within states and territories (Map 7), with the highest rates in central and northern Australia.

IPD is largely a disease of the very young and very old. In 2001 the highest rates of disease were in children aged less than five years (47.3 cases per 100,000 population) and adults aged more than 85 years (38.7 cases per 100,000 population). Rates according to age group and sex are shown in Figure 46. There were more cases among males, with a male to female ratio of 1.2:1. A peak of IPD occurred in late winter and early spring, with the largest number, 259 notifications, being reported in August 2001.

Additional data were collected on cases of invasive pneumococcal disease in some Australian states and territories during 2001. Analyses of these data have recently been published.[62,63]

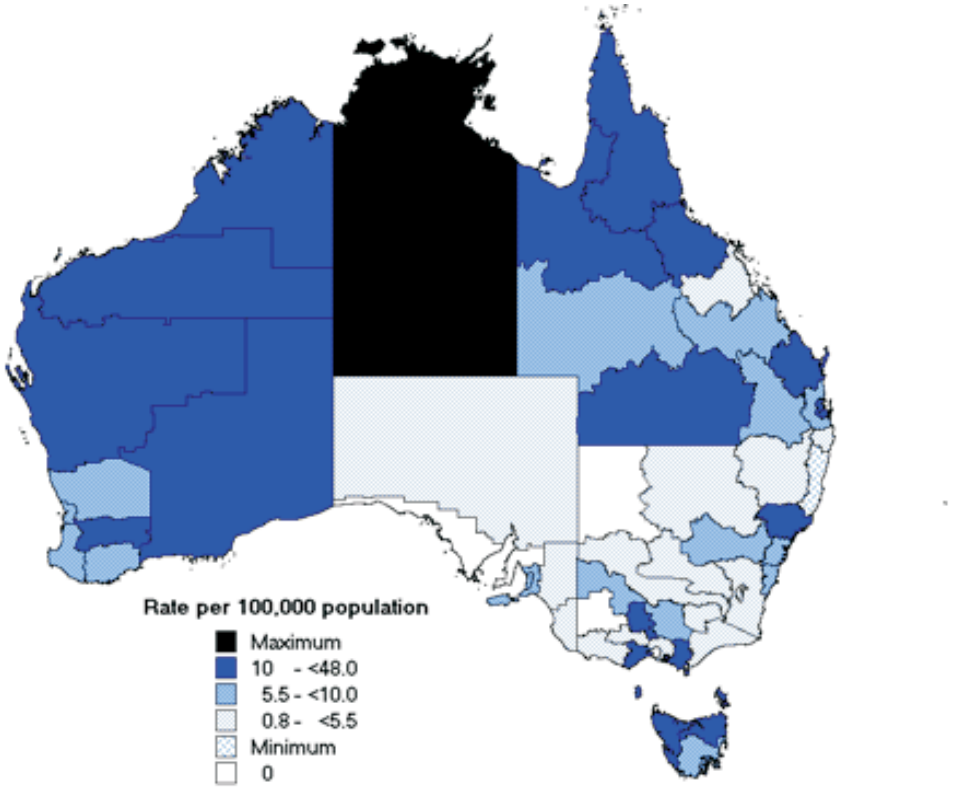
Figure 46. Notification rates of invasive pneumococcal disease, Australia, 2001, by age group and sex



Poliomyelitis

No cases of poliomyelitis were reported in Australia in 2001. The National Poliovirus Reference Laboratory at the Victorian Infectious Diseases Reference Laboratory is responsible for poliovirus testing for Australia. It is also the regional reference laboratory for the Western Pacific Region (WPR) of WHO. Surveillance for acute flaccid paralysis, a clinical manifestation of poliomyelitis, is coordinated at the Victorian Infectious Diseases Reference Laboratory in collaboration with the Australian Paediatric Surveillance Unit.

Map 7. Notification rates of invasive pneumococcal disease, Australia, 2001, by Statistical Division of residence



There were 60 unique notifications of acute flaccid paralysis in 2001, of which 44 were classified by the Polio Expert Committee as eligible non-polio acute flaccid paralysis cases (isolates from patients resident in Australia and aged less than 15 years). Polioviruses were isolated from only one acute flaccid paralysis patient and characterised as Sabin oral poliovirus vaccine-like serotypes 1,2 and 3. In the same patient *Clostridium botulinum* type b organism and toxin were also detected and the case was classified as infant botulism.

As part of the laboratory containment of poliovirus, during 2001 the National Polio Reference Laboratory received viral isolates or samples stored in laboratories across Australia that may contain poliovirus. Forty Sabin-like viruses and five non-Sabin-like polioviruses were identified from 74 referred laboratory isolates and specimens.

The WPR, of which Australia is a member nation, was declared free of circulating wild poliovirus in October 2000. During 2001, however, viruses derived from the Sabin oral polio vaccine caused three cases of poliomyelitis in the Philippines, also a member nation of the WPR. The identification of these three cases has emphasised the necessity of maintaining a high level of vaccination coverage within Australia and an effective surveillance system to detect cases of poliomyelitis.[64]

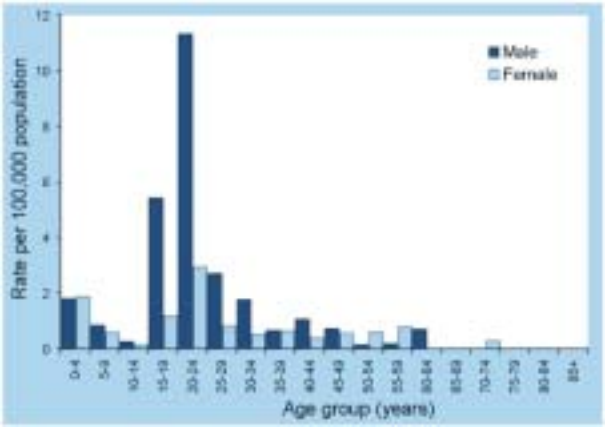
Rubella

Since 1995 the annual number of rubella notifications have been declining. This decrease has occurred at the same time as the measles, mumps and rubella vaccination coverage rates have increased. In 2001, there were 263 notifications, a notification rate of 1.3 cases per 100,000 population, an 18 per cent decrease from the 322 cases of rubella reported in 2000. This is the lowest rate on record since the NNDSS commenced in 1991. As in previous years, the highest number of notified cases occurred in October, reflecting the usual seasonal increase in spring months. The highest notification rate was in Queensland (3.7 cases per 100,000 population).

In 2001, notification rates were highest in males in the 20–24 year age group (11.3 cases per 100,000 population, Figure 47). As in previous years, there were more males than females notified with rubella (male:female ratio 2.5:1) and the ratio is higher than in the past five years.

There were 49 cases of rubella in women of childbearing age (15–49 years) in 2001. Seven cases occurred in young infants, five within two months of birth. There were no notifications of congenital rubella in 2001.

Figure 47. Notification rates of rubella, Australia, 2001, by age group and sex



Tetanus

There have been less than eight cases of tetanus notified each year in Australia since 1995 mainly in adults aged over 70 years. In 2001, there were three cases. Two were aged 70 years or more and the third was also an adult. Two cases were male and one cases was female.

Childhood vaccination coverage reports

Estimates of vaccination coverage both overall and for individual vaccines for children at 12 months of age continued to improve in 2001. This trend was also evident in each state and territory. Vaccination coverage at one year of age is shown in Table 14.

Vaccination coverage at two years of age was first reported in 1998. Coverage estimates for vaccines recommended at 12 and 18 months of age were higher in 2001, compared with the previous year, as were the estimates for being 'fully vaccinated' at two years of age. Vaccination coverage at two years of age is shown in Table 15. The reported 'fully vaccinated' coverage levels are lower than the levels for individual vaccines, because children who have missed vaccination against some diseases are not necessarily those who have missed vaccination against the other diseases. It is important to note that in other countries such as the United Kingdom, three doses of the diphtheria-tetanus-pertussis and Hib vaccines constitute full vaccination for these vaccines at two years of age.

Table 14. Percentage of Australian children born in 2000 vaccinated according to data available on the Australian Childhood Immunisation Register. Estimate at one year of age

Vaccine group	Per cent vaccinated			
	1 Jan–31 Mar 2000	1 Apr–30 Jun 2000	1 Jul–30 Sep 2000	1 Oct–31 Dec 2000
DTP	91.8	91.9	92.2	92.0
OPV	91.7	91.8	92.1	91.9
Hib	94.8	94.5	94.3	94.5
Hepatitis B	NA	NA	94.3	94.4
Fully vaccinated	91.5	91.2	90.4	90.5

DTP Diphtheria-tetanus-pertussis
OPV Oral polio vaccine
NA Not available

Table 15. Percentage of Australian children born in 1999 vaccinated according to data available on the Australian Childhood Immunisation Register. Estimate at two years of age

Vaccine group	Per cent vaccinated			
	1 Jan–31 Mar 1999	1 Apr–30 Jun 1999	1 Jul–30 Sep 1999	1 Oct–31 Dec 1999
DTP	89.5	89.8	90.3	90.2
OPV	93.9	93.9	94.3	94.4
Hib	95.0	95.2	95.3	95.4
MMR	92.8	93.1	93.2	93.4
Fully vaccinated	86.6	87.0	88.0	87.8

DTP Diphtheria-tetanus-pertussis
OPV Oral polio vaccine
MMR Measles-mumps-rubella

Vectorborne diseases

Introduction

Vectorborne diseases reported to the NNDSS include arbovirus infections and malaria. Arboviruses (arthropod-borne viruses) belong to two families, the alphaviruses, which include Barmah Forest virus infection (BF) and Ross River virus infection (RR) and the flaviviruses, which include dengue and the Murray Valley encephalitis virus (MVE), Kunjin virus and Japanese encephalitis virus (JE). Malaria cases recorded by NNDSS include infections caused by four *Plasmodium* species.

Arboviruses and malaria are transmitted to humans through the bite of infected mosquitoes. The human population acts as the host species for dengue and malaria. The remaining arboviruses discussed in this chapter have a complex life cycle involving vertebrate hosts, mosquitoes and humans. The vertebrate reservoirs include marsupials, introduced placental mammals and avian species. During epidemics it is possible that newly infected humans further spread these viruses.

Malaria and dengue cases have been reported to NNDSS since 1991. At this time, all other arboviruses were reported to NNDSS as 'Arbovirus — NEC'. Infection with RR became separately notifiable in 1993 and BF in 1995. Infection with MVE, Kunjin virus and JE were separately reported in 2001.

Alphaviruses

Barmah Forest virus infection and Ross River virus infection

Clinical infections with BF and RR are characterised by arthritis, myalgia, fever, headaches and lethargy. A rash is also usually present. The spectrum of illness ranges from the sub-clinical, through to illness that may last for months or even years.[65] Recent results, however, suggest that persistence for long periods may be overestimated.[66]

Infections with BF and RR are diagnosed by serological tests. As exposure to the viruses may have occurred in the past (resulting in persistent antibodies), it is important to obtain both acute and convalescent sera, approximately two weeks apart, in order to demonstrate seroconversion or the increase in antibody levels that characterises new infections.

In Australia the primary arthropod vectors for both BF and RR are mosquitoes of the *Ochlerotatus* (previously *Aedes*) and *Culex* genera. The primary hosts for RR are believed to be macropods (kangaroos and wallabies), but horses and fruit bats have shown serological evidence of infection. The range of primary hosts for BF is less understood.

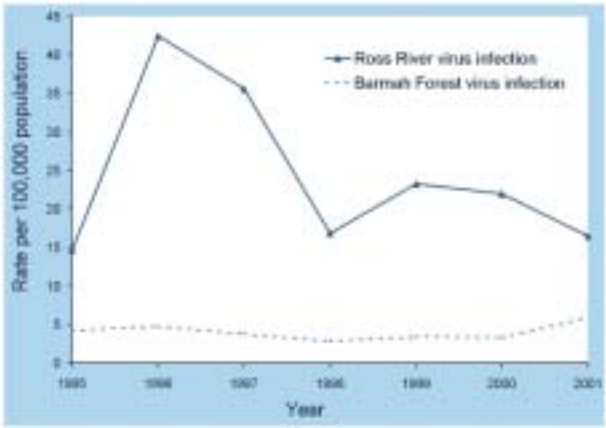
The first human infection with BF was identified in 1986. The first recognised outbreak occurred in Nhulunbuy, on the Gove Peninsula in the Northern Territory in 1992.[67]

RR is the most commonly reported arboviral disease in Australia. During 2001, 3,219 notifications of RR infection and 1,141 notifications of BF infection were received. A comparison of the annual trends in the notification rates of RR infection and BF infection since 1995 is shown in Figure 48. The wide fluctuation in the rates of RR infection probably reflects the occurrence of outbreaks against a background of sporadic cases.

The number of cases of BF notified in 2001 was the largest recorded since it became separately notifiable in 1995. The national notification rate for 2001 was 5.9 cases per 100,000 population. Prior to this rates have ranged between 4.8 cases per 100,000 population (1996) and 2.8 cases per 100,000 population (1998). In 2001 most notifications of BF infection came from Queensland (n=603) and New South Wales (n=398). The highest rate at the state and territory level occurred in the Northern Territory (18.5 cases per 100,000 population).

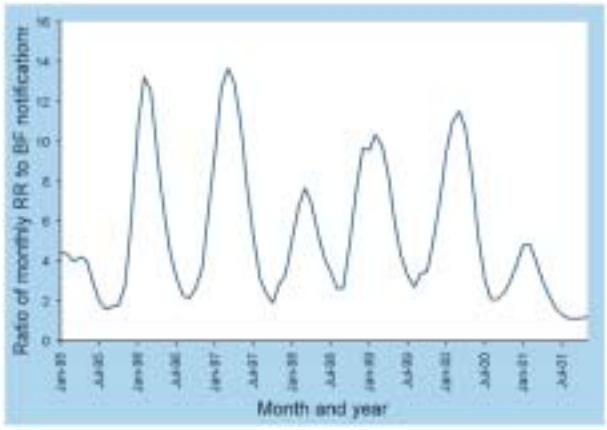
By contrast, the number of notifications for RR infection in 2001 was lower than in 2000 (n=3,219). While this represents a decrease of 25 per cent compared to the previous year, Figure 48 indicates that there is variation in reports over years. The overall rate for 2001 was 16.5 cases per 100,000 population. Most notifications came from Queensland (n=1,569) and the highest rate was observed in the Northern Territory (111.5 cases per 100,000 population). An outbreak of 18 cases of RR was reported in the Morgan Council area, which lies on the lower Murray River in South Australia.

Figure 48. Trends in notification rates of Barmah Forest virus infection and Ross River virus infection, Australia, 1995 to 2001, by year of onset



The co-occurrence of BF and RR infection between 1995 and 2001 by month of onset, measured as the ratio of RR to BF notifications, is shown in Figure 49. The seasonality of the curve possibly represents a more episodic characteristic of BF compared to RR. Further exploration of the epidemiology of the two viruses at smaller geographical areas and over longer periods will allow the interaction between them to be better understood.

Figure 49. Trends in ratio of Ross River virus infection to Barmah Forest virus infection notification, Australia, 1995 to 2001, by month of onset



Both BF and RR infections show similar age group and sex distributions (Figures 50 and 51). For both, there is a relative paucity of notifications in younger children and the early teenage years. The highest rates of notification were observed in 35–60 year old males and females, with the highest rates being about 10 cases per 100,000 population for infection with BF, and between 25 and 30 cases per 100,000 population for RR infection.

Figure 50. Notification rates of Barmah Forest virus infection, Australia, 2001, by age group and sex

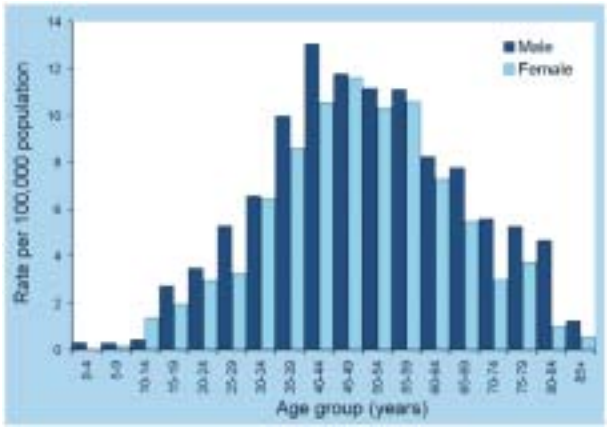
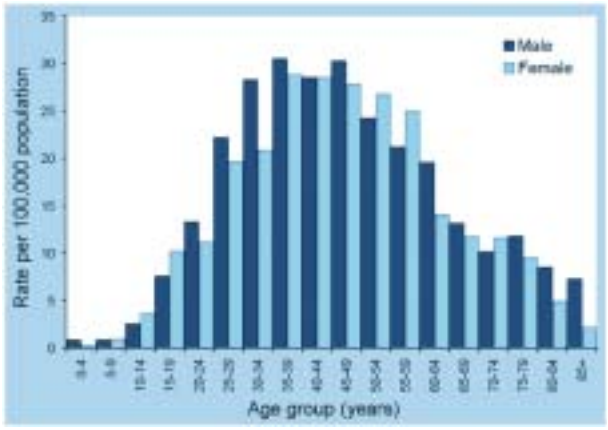


Figure 51. Notification rates of Ross River virus infection, Australia, 2001, by age group and sex



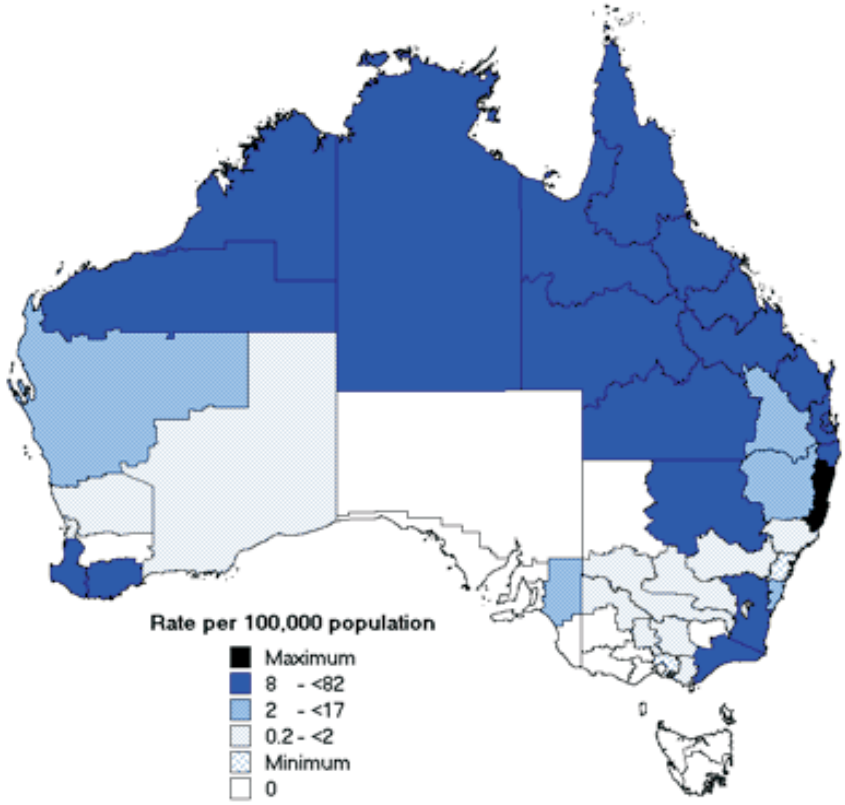
In 2001 infection with RR and BF were notified relatively equally in males and females. For BF infection, the male to female ratio was 1.2:1, and for RR infection the male to female ratio was 1.1:1.

Notification rates by Statistical Division are shown for the two diseases in Maps 8 and 9. The areas of highest rates of occurrence for BF infection were the New South Wales Mid-North Coast Statistical Division (82.2 case per 100,000 population) and the south-west areas of Queensland (44.6 cases per 100,000 population). For notifications of RR infection the highest rates occurred in north-west Queensland (186.4 cases per 100,000 population) and the Kimberley Statistical Division in Western Australia (159.0 cases per 100,000 population).

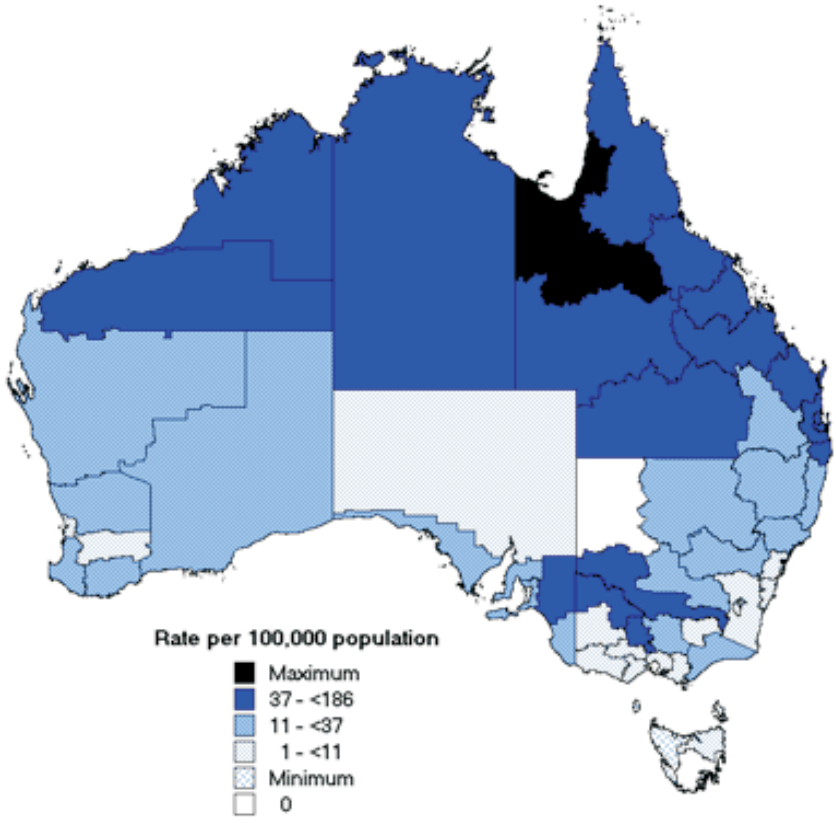
There were geographically isolated outbreaks of BF, in the south-west of Western Australia (the South West and Lower Great Southern Statistical Divisions), and outbreaks of RR along the Murray River region.

There is debate as to whether there is any overall increase in the activity of RR, and whether disease activity is expanding into areas where it has not occurred before.[68,69,70,71] Variations in notifications of RR can reflect the natural ecological variability of virus activity, while the availability of susceptible populations and human geographical and environmental change, also affect rates of RR in humans. At the local level, the numbers of infections have been shown to correlate with the abundance of various mosquito species.[72] Mosquito control programs may affect vector abundance and virus transmission to humans. Possible artefacts should be considered when assessing surveillance data. Increased awareness and testing for RR may account for increases in notifications. The change in reporting methods from clinical diagnosis to laboratory notification together with the adoption of standardised clinical and laboratory definitions may also have contributed to changes in surveillance data.

Map 8. Notification rates of Barmah Forest virus infection, Australia 2001, by Statistical Division of residence



Map 9. Notification rates of Ross River virus infection, Australia 2001, by Statistical Division of residence



Change in the rate of notification of BF may also be affected by surveillance artefacts or may be the result of changes in the epidemiology of this infection. A combination of unusual environmental conditions, together with a highly susceptible (that is, previously unexposed) human population, were the most probable factors contributing to the magnitude of the BF epidemic on the New South Wales south coast in 1995.[73] This outbreak is possibly reflected in the lower than usual ratio of RR to BF notifications for that year in Figure 49.

The extensive outbreak of RR in the Western Pacific in 1979–80 demonstrates the potential of the virus to spread throughout the region.[69] Serological surveys have shown the virus to exist in PNG, areas of Indonesia and in the Solomon Islands,[74,75] and the virus has recently been isolated for the first time from PNG.[76] A competent vector is generally required for transmission to humans. The introduction of *Aedes camptorhyncus* to New Zealand during 1998, highlights the risk to neighbouring countries.[77] During the late 1970s, at the time of the Pacific outbreak, three cases of RR infection were notified in New Zealand but all were acquired outside the country, and none have been notified since.

Murray Valley encephalitis and Kunjin

MVE is enzootic in the Kimberley region of Western Australia and the top two-thirds of the Northern Territory, where it is active principally in the wet season. The virus is epizootic in the Pilbara of Western Australia and the southern part of the Northern Territory, where it is associated with high summer rainfalls and flooding. Human cases occur sporadically in northern Queensland. Since 1974, however, nearly all cases of arboviral encephalitis due to MVE have been reported from Western Australia and the Northern Territory, with MVE activity (as indicated by seroconversion in chicken flocks) and human disease occurring in most years.[75,78] The major vector for the virus is *Cx. annulirostris*, and the main vertebrate hosts are water birds of the ardeid (heron) family.[75,78]

Although most cases are asymptomatic, infection with MVE can lead to serious illness or death. Symptoms include headache, neck stiffness, fever, tremor, weakness, confusion, fitting and sometimes coma.[79] The case fatality rate following symptomatic infection with MVE is 20 per cent and approximately 25 per cent of survivors will be left with significant residual neurological damage.[80] Infection with Kunjin virus generally causes milder disease,[79] but recent cases of Kunjin-associated encephalitis have been reported from Central Australia.[81,82] The number of MVE infections that are asymptomatic have been estimated to be between 500 and 1,500 for each one that is clinically identified.[75,78]

Infections with MVE and Kunjin virus have been separately notifiable since 2001. Prior to this, information on the location of cases and deaths was recorded in individual states and territories. A summary of these cases has previously been reported.[78] In addition, a summary of cases, and of the ecology and epidemiology of Kunjin virus, has been extensively reviewed because of its reclassification as a member of the West Nile virus lineage 1.[83]

In 2001, five cases of MVE and four cases of Kunjin virus infection were notified. Table 16 describes the eight cases that occurred in the first half of the year (corresponding to the 2000–01 arbovirus season). From January to June 2001, four notifications of MVE infection and four cases of infection with Kunjin virus were notified. In the second half of the year (the 2001–02 arbovirus season) only one case of MVE was notified. This was reported in the Northern Territory in July. The case was a two-year-old female. There were no cases of Kunjin notified in the second half of the year.

Table 16. Notifications of infection with Murray Valley encephalitis and Kunjin viruses, Australia, 2001

Notifying jurisdiction	Onset month	Gender	Age (yrs)	Follow-up
	Murray Valley encephalitis virus infection: Jan – June 2001			
Qld	Feb	M	3	Alive, severe neurological sequelae
NT	Feb	F	49	Died
SA	Feb	M	59	Alive
WA*	Mar	M	60	Unknown
	Kunjin virus infection: Jan – June 2001			
NSW	March	Unknown	58	Unknown
NT	March	M	11	Alive
WA	March	F	27	Unknown
NT	May	F	23	Alive

* Possibly acquired in Queensland or the Northern Territory

Although cases of MVE and Kunjin were both notified from Western Australia and the Northern Territory, there was some uncertainty as to where the infections were acquired as they occurred in tourists travelling through northern Australia. An additional case of MVE was diagnosed in Germany in a tourist returning from travel in Northern Australia.[84]

Viral infection of mosquitoes and seroconversion in sentinel animals may be used to monitor the potential for human infections with MVE and Kunjin virus. The locality of sentinel chicken flocks is shown in Map 10, and Figures 52a and 52b chart the number of seroconversions to MVE and Kunjin respectively during 2001. Although seroconversion counts for the different states and the Northern Territory are given

Figure 52a. Numbers of seroconversions to Murray Valley encephalitis virus in sentinel chickens, New South Wales, Northern Territory and Western Australia, 2001

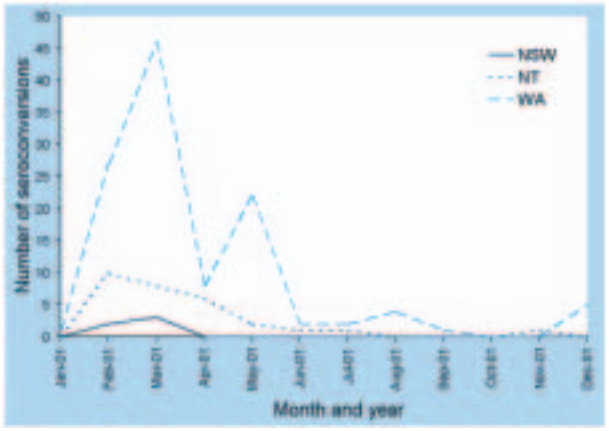
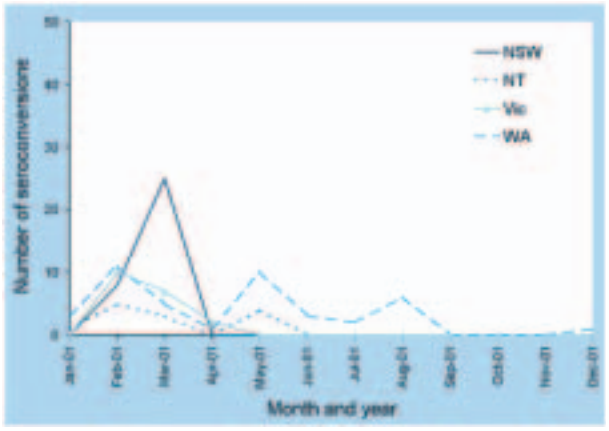


Figure 52b. Numbers of seroconversions to Kunjin virus in sentinel chickens, New South Wales, Northern Territory, Western Australia, and Victoria, 2001



Map 10. Geographical distribution of sentinel chicken flocks for the surveillance of arboviruses, Australia, 2001

they are not directly comparable as the number of flocks and birds within them vary across jurisdictions. Seroconversion in sentinel chicken flocks occurs mostly during the arbovirus season, but also throughout the year.

Surveillance of MVE and its control have been recently reviewed and an integrated system of surveillance based on sentinel chicken and mosquito monitoring was recommended.[78] As viral activity is demonstrated in these systems, public health control measures can then be implemented to prevent human infections.

Japanese encephalitis

Most infections with JE are asymptomatic. Between 1 in 30 and 1 in 300 infections result in clinical disease.[75] The fatality rate in symptomatic cases can be as high as 30 per cent, and neurological sequelae are reported in 50 per cent of survivors. A higher case-fatality rate is reported in the elderly, but serious sequelae (neurological) are more frequent in the very young.

Surveillance efforts in Australia have focussed on the detection of JE virus activity in Torres Strait and are based on the detection of virus carriage in the mosquito vector (*Cx. annulirostris*) and infection of domestic pigs, the amplifying host. In 1995 a localised outbreak of three cases occurred in the Torres Strait region.[85] Two additional sporadic cases were detected in 1998 at Badu Island and at Mitchell River, on the Gulf in Far North Queensland.[86] There were no notifications of JE in Australia in 2001. The absence of human infections in Australia since 1998 can be attributed to a human vaccination program and changes in pig husbandry following the earlier outbreaks.[86]

Feral pigs may be important in the ecology of JE in the Far North Queensland region. Birds, abundant during the wet season in tropical regions, may also play a role in virus transmission cycles. Native Australian macropods though, are thought to be unlikely hosts for JE.[87]

JE is a widespread and emerging disease in South-East Asia, and is probably now endemic in New Guinea.[75,88] The practice of rice-paddy farming throughout much of South-East Asia provides favourable conditions for the mosquito vector, and intensive pig husbandry provides an ideal reservoir species for the virus. These factors, combined with large and growing human populations, provide a fertile environment for the spread of the disease.

Despite an effective vaccine, outbreaks of the disease continue to occur and extend its known range. In Indonesia, the general absence of pig farming is associated with a relative lack of JE. The island of Bali is an exception because of its different religion and attitudes towards pork. The 1995 and 1996 cases of JE in the Torres Strait and West Papua marked a sudden unexplained range extension to the east. The isolation of the virus at three locations since then, and serological detection of more cases suggest that the virus has become endemic on the island of New Guinea.[88]

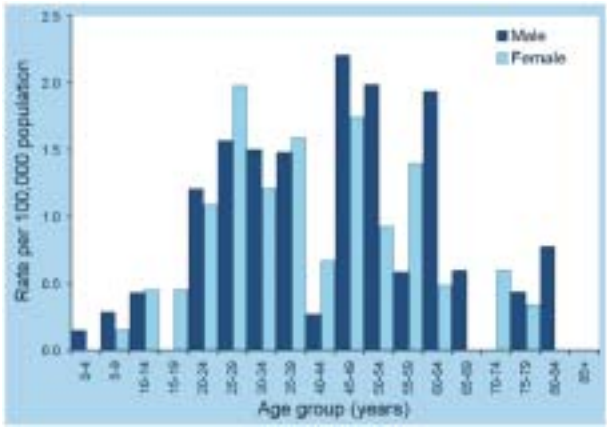
Dengue

Infection with any of four dengue viruses (serotypes 1– 4) is characterised by fever, muscle and joint pain, lymphadenopathy and rash. Secondary infection with a heterologous serotype of dengue virus can result in dengue shock syndrome or dengue haemorrhagic fever.[89,90]

Dengue was reintroduced to Australia in 1981 after an absence of more than 25 years.[91] Dengue virus activity occurs only in Far North Queensland, where the host mosquito *Aedes aegypti* has become established. Because of the absence of the mosquito vector elsewhere in Australia, dengue cases reported from other states and territories are infected either in Queensland or overseas.

During 2001, 176 notifications of dengue were received, corresponding to a national rate of 0.9 cases per 100,000 population. The largest number were from New South Wales (n=50, 0.8 cases per 100,000 population), and 43 notifications came from both the Northern Territory and Queensland (21.5 and 1.2 cases per 100,000 population respectively). Most notifications were for adults between the ages of 20 and 50 years, with a male to female ratio of 1.1:1. Rates according to age group and sex are shown in Figure 53. Relatively low numbers of notifications (n=176) most probably account for gaps in the age distribution.

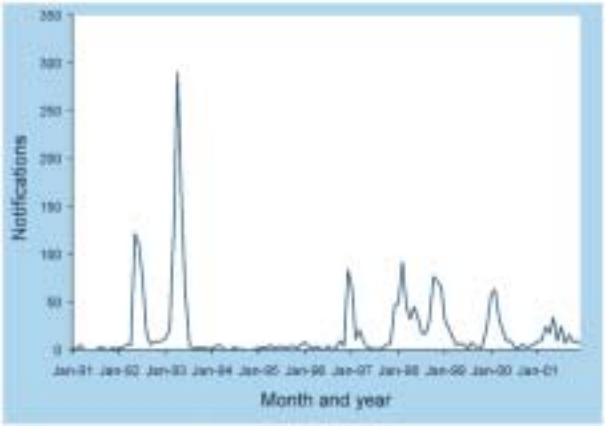
Figure 53. Notification rates of dengue, Australia, 2001, by age group and sex



In Queensland eight of the 43 cases notified were locally acquired, 21 were acquired overseas, while the place of infection was unknown for the remaining 14 cases. All of the remaining cases of dengue notified from other jurisdictions in 2001 were known to have been acquired overseas, except for three cases where the place of acquisition was not known. Information on dengue serotype was available for six cases notified from Victoria. Five were of serotype 1, and one was serotype 3.

The number of dengue notifications by month between 1991 and 2001 is shown in Figure 54. Two extensive outbreaks are represented in these data. The first was in Townsville and Charters Towers, in 1992–93, and the second in Cairns, Mossman and Port Douglas from 1997 to 1999. In these epidemics, 900 and 498 cases, respectively, were notified. The first outbreak was of dengue type 2, and the second outbreak was of dengue type 3. For 2001, the number of notifications are similar to the number notified in the preceding year (n=216), which included an outbreak of 49 cases in Cairns.

Figure 54. Trends in notifications of dengue, Australia, 1991 to 2001, by month of onset



The five-year *Dengue Fever Management Plan for North Queensland 2000–2005* aims to improve disease surveillance in humans, enhance mosquito control and surveillance, and to educate the community and professional groups on mosquito control and the prevention of infection (Queensland Government Health Department: Dengue fever for North Queensland, 2000–2005, http://www.health.qld.gov.au/phs/Documents/tphun/9168dmp.htm). The effectiveness of control measures when undertaken without delay was demonstrated in 2001, when an outbreak in Townsville was limited to only nine cases.[92]

Dengue affects large numbers of people throughout the Pacific region and remains a key public health concern. In 2001 the WHO reported 132,949 cases and 586 deaths from dengue in the WPR (www.wpro.who.int/public/regstatistics/reg_spec.asp). French Polynesia reported 30,000 cases of dengue serotype 1. The epidemic spread to other states in the Pacific, including Western Samoa, New Caledonia, American Samoa, Tokelau and the Cook Islands. New Zealand reported 60 imported dengue cases.

Factors contributing to increases in global dengue incidence include the creation of mosquito breeding sites by poorly planned urbanisation, lapses in mosquito eradication programs in the Americas and large-scale movements of people and cargo around the world. In the 1950s an annual average of 900 cases of dengue haemorrhagic fever were reported worldwide. This increased to over 514,000 cases during the 1990s, and in 1998 1.2 million cases of dengue and dengue haemorrhagic fever infections were reported. Modelling suggests that over 51 million infections in total occur each year.[93]

Arbovirus — not elsewhere classified

Thirty-six notifications were categorised as 'Arbovirus — not elsewhere classified' in 2001. New South Wales and Victoria reported 15 and 16 notifications respectively. Cases may include unspecified flavivirus infections (where serology is inconclusive and Kunjin or MVE cannot be distinguished) or infections caused by other arboviruses.

Malaria

Indigenous transmission of malaria in Australia occurs infrequently. Australia has maintained its WHO malaria-free status since 1983, despite the continued presence of competent *Anopheles* vectors, principally *An. farauti*. This mosquito is found in coastal regions of the Northern Territory and Queensland north of approximately the 17 or 18 degree south of latitude.

All 705 malaria cases reported to NNDSS in 2001 were people who had returned to Australia from malaria endemic regions (Table 17). Most notifications were reported from Queensland (n=300), New South Wales (n=153) and Victoria (n=88). The incidence of malaria has been stable over the last decade, with about 700 notifications occurring each year, giving an annual rate ranging between three and five cases per 100,000 population (Figure 55). Most reported cases were in the 20–24 and 25–29 year age groups. Overall, the male to female ratio was 2.4:1. Rates according to age group and sex are shown in Figure 56.

The species of *Plasmodium* the causing of infection was identified for 274 notifications (38%) (Table 18). Of these most were *P. vivax* (67%) and *P. falciparum* (28%).

Table 17. Notifications of malaria, Australia, 2001, by country of infection

Country of infection	State or territory notifying* (% of total)						
	ACT	NSW	NT	Qld	SA	Tas	Vic
PNG	63.1	42.2	19.3	24.7	19.0	11.1	40.2
Solomon Islands	5.3	3.5	1.8	0.0	3.0	0.0	0.0
Vanuatu	5.3	1.7	0.0	0.0	0.0	0.0	0.0
Indonesia	5.3	8.1	33.3	3.0	6.0	11.1	8.1
Vietnam	0.0	0.6	0.0	0.3	0.0	0.0	0.0
East Timor	0.0	13.9	43.9	3.7	3.0	0.0	14.9
India/Pakistan	10.5	9.8	1.7	0.0	9.0	0.0	0.0
Afghanistan	0.0	0.6	0.0	0.0	0.0	11.1	0.0
Africa	10.5	17.3	0.0	0.7	39.0	55.6	13.8
South America	0.0	0.0	0.0	0.3	0.0	0.0	2.3
Other	0.0	2.3	0.0	0.0	9.0	0.0	20.7
Unknown	0.0	0.0	0.0	67.3	12.0	11.1	0.0

* Data unavailable from Western Australia

Figure 55. Trends in notification rates of malaria, Australia, 1991 to 2001, by year of onset

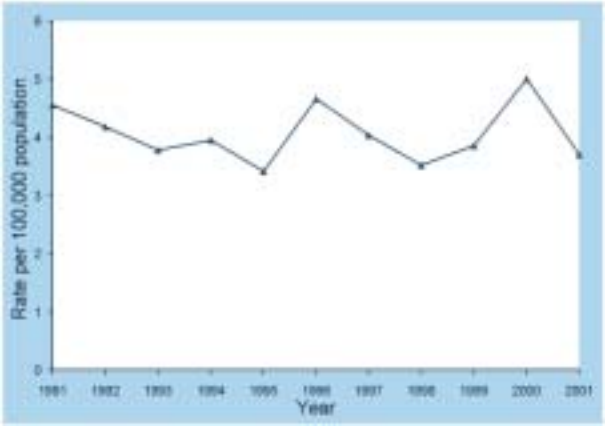


Figure 56. Notification rates of malaria, Australia, 2001, by age group and sex

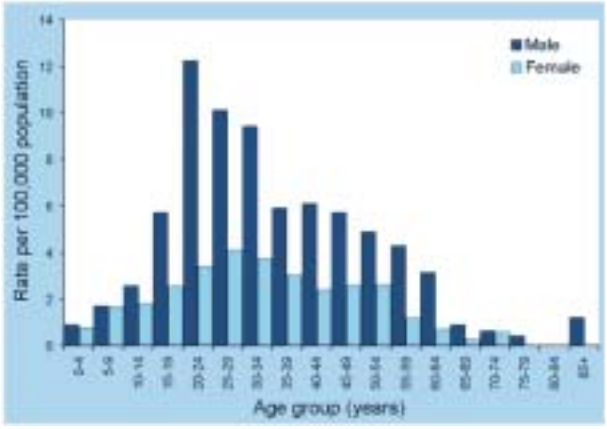


Table 18. Notifications of malaria, Australia, 2001, by *Plasmodium* species

Plasmodium sp.	Number of notifications by species	Per cent species where known
P. vivax	184	67
P. falciparum	76	28
P. vivax AND *falciparum*	2	1
P. malariae	8	3
P. ovale	4	1
Unknown	431	
Total	705	

A large number of malaria infections in Australians have occurred in defence personnel during their peace-keeping operations overseas (LtCdr P. Corrigan, personal communication). The number of malaria cases reported by area of operation (East Timor, Bougainville, Papua New Guinea and 'other') and against *Plasmodium* species by year is shown in Table 19.

These data represent clinical occurrences of malaria, and so include relapses of previously acquired infections. Cases are diagnosed either in the area of operation, or on return to Australia. Infections with *P. falciparum* are commonly diagnosed in East Timor, whereas diagnoses of *P. vivax* are more commonly detected on return to Australia. It should be noted that infections with *P. falciparum* can mask dual infection with *P. vivax*. After treatment for the *P. falciparum* infection, the *P. vivax* infection can then become patent.

Table 19. Number of malaria cases reported to the Army Malaria Institute, 1998 to 2001, by area of operation and *Plasmodium* species*

Year	East Timor					Bougainville/Papua New Guinea					Other				Total
	Pf	Pv	Pf/ Pv	Po	Unk	Pf	Pv	Pf/ Pv	Po	Unk	Pf	Pv	Po	Unk	
1998	0	0	0	0	0	0	9	0	0	0	0	2	0	0	11
1999	23	7	2	0	0	3	22	1	0	0	0	2	1	0	61
2000	26	290	6	1	14	3	27	1	1	1	2	23	0	1	396
2001	1	46	0	0	2	3	5	0	0	2	0	11	0	2	72

* Pf – *Plasmodium falciparum*; Pv – *P. vivax*; Pf/Pv – infected with both; Po – *P. ovale,* Unk — unknown

The endemicity of malaria in South-East Asia and the Pacific and the presence of competent mosquito vectors in Australia underscores the potential for the re-introduction of malaria to Australia.

Zoonoses

The list of zoonoses (diseases transmitted to humans from animals that are the primary host) which are notified to NNDSS was modified in 2001. Hydatid disease was no longer notifiable and three new diseases (anthrax, Australian bat lyssavirus and other lyssaviruses) were made notifiable. Anthrax has been added to the list because of its potential for use as an agent of bioterrorism. The Australian bat lyssavirus came to attention after a human became infected and died after handling a fruit bat in 1996. The other notifiable zoonotic diseases are brucellosis, leptospirosis, ornithosis and Q fever.

Altogether, 1,091 notifications of zoonoses were received. This number accounted for one per cent of the total of all notifications for all diseases during 2001.

Brucellosis

Brucellosis in humans is caused by four species of *Brucella* bacteria, found in four different hosts — *B. melitensis* (sheep/goats), *B. abortus* (cattle), *B. suis* (pigs) and *B. canis* (dogs). Infection occurs principally from exposure through breaks in the skin to the fluid or tissues of infected animals, or from the ingestion of unpasteurised goat or sheep's milk and cheese (most often in visitors from overseas). The disease is characterised by fever, headache, arthralgia, depression and weight-loss.

In Australia during 2001, 19 cases (0.1 cases per 100,000 population) of human brucellosis were notified to the NNDSS. Most of these (n=17) were from Queensland (0.5 cases per 100,000 population), with one each from South Australian and Victoria. The 19 notifications for brucellosis in 2001 are the second lowest since 1991 (Figure 57).

Of the 19 notifications of brucellosis, 17 were in adult males (age range 17–79 years) and the highest notification rates were observed in the 20–25 year age-group(n=4, 0.6 cases per 100,000 population). The two female cases were aged 40 and over 70 years. The male to female ratio was 8.5:1.

Bovine brucellosis was eradicated from Australia in 1989,[94] and the notifications of human disease occurring now are due to infections from the other species. The feral pig population in northern Queensland, estimated to be more than several million (McGaw and Mitchell, referred to in Williams *et. al.*),[95] has been identified as a primary reservoir of brucellosis.[95] Of the 17 notifications from Queensland, only two were typed to species level, both *B. suis*.

Figure 57. Trends in notifications of brucellosis, Australia, 1991 to 2001, by year of onset

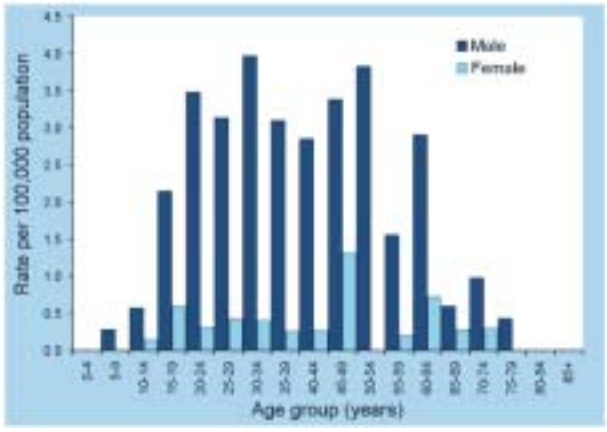
Leptospirosis

Leptospirosis is caused by infection with the *Leptospira* spirochaete. Infection in humans occurs from exposure, through mucosal surfaces or breaks in the skin, to soils or fluids (bodies of water and animal urine) contaminated with the organism. Rats are a common reservoir of infection, and their presence in the cane fields in Australia is a source of exposure to cane growers. Fever, headache, lower limb myalgia and conjunctival suffusion are typical symptoms. There is a wide range of disease severity, from sub-clinical to death from hepatorenal failure. Increased disease severity is associated with increased age and with certain leptospiral serovars. Clinical disease is more likely to be milder in areas of endemic infection.[16]

There were 245 notifications of leptospirosis in Australia during 2001 (1.3 cases per 100,000 population). Notifications were received from all states and territories except the Australian Capital Territory. Most cases occurred in Queensland (n=129) and New South Wales (n=65). The highest rate was observed in Queensland (3.5 cases per 100,000 population). By Statistical Division, the areas with the highest rates were the Central West of Queensland (32.0 cases per 100,000 population) and Far North Queensland (31.4 cases per 100,000 population) (Map 11).

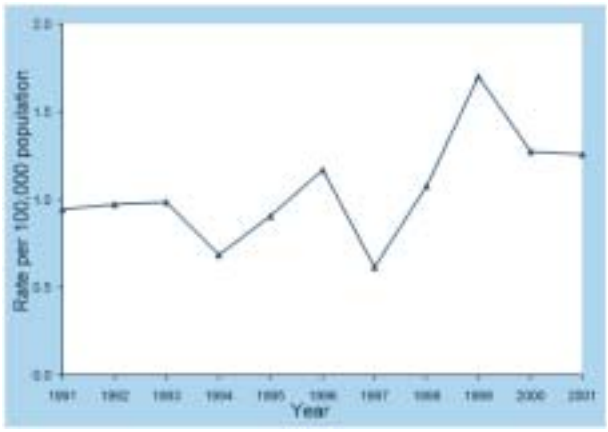
Reflective of a strong occupational association with the stock and horticultural (bananas, sugarcane) industries, males aged 15–64 years accounted for 87 per cent of all notifications. The peak rate of 4.0 notifications per 100,000 population occurred in males in the 30–34 year age group (Figure 58).The male to female ratio was 6.7:1.

Figure 58. Notification rates of leptospirosis, Australia, 2001, by age group and sex



Trends in the notification rate for leptospirosis are shown in Figure 59. A peak in notification rates was observed in 1999, when 184 cases were notified. This has been attributed to prolonged rainfall in northern Queensland, with a concomitant increase in rodent populations.[96] It is possible, however, that reporting artefacts, such as increased awareness, underlie these changes.

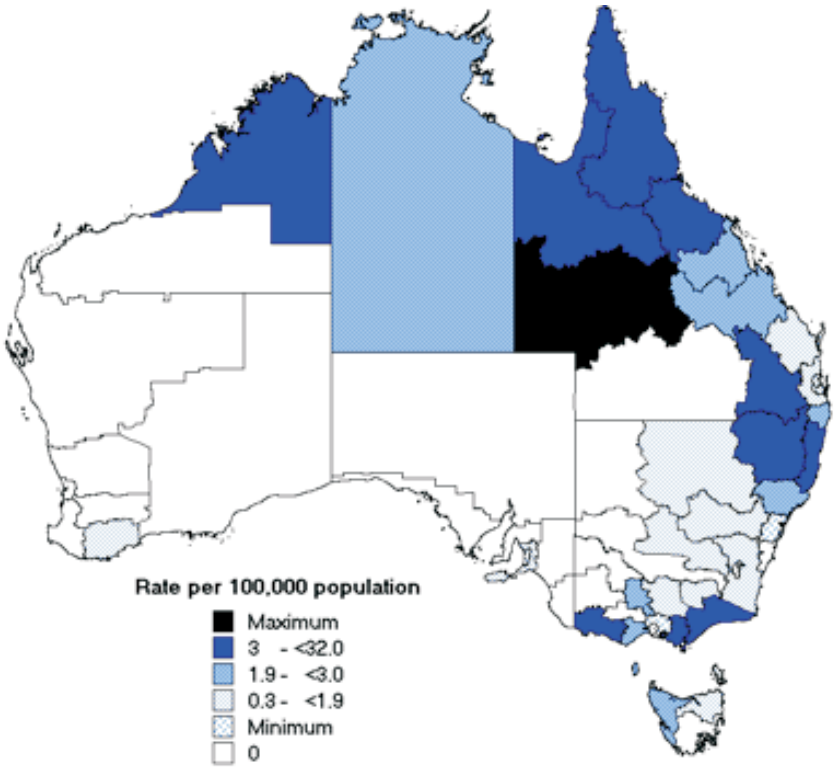
Figure 59. Trends in notification rates of leptospirosis, Australia, 1991 to 2001, by year of onset



The 2001 annual report of the WHO Leptospirosis Reference Laboratory further describes the laboratory characteristics of leptospirosis isolates in Australia (www.health.qld.gov.au/qhpss/qhss/lepto_jandec_2001.pdf). Seventeen serovars were identified in human infections in 2001, and the *Leptospira interogans* serovar *hardjo* was the most commonly identified, in 38 per cent of infections. This serovar is most associated with the cattle and dairy industry, whereas *Leptospira interogans* serovar *australis*, identified in 12 per cent of cases, occurs more in horticultural settings. Since 1992, the number of notifications of *Leptospira interogans* serovar *hardjo* has increased tenfold.

Infection with leptospirosis is a public health concern in the tropical WPR. New Caledonia for example, reported 180 cases per 100,000 population — a rate over 100 times greater than that observed in Australia.[97] Leptospirosis has also been identified as an emerging infectious disease, because of changes in animal husbandry, climate and human behaviour.[98]

Map 11. Notification rates of leptospirosis, Australia, 2001, by Statistical Division of residence



Ornithosis

Ornithosis is an infection caused by the intracellular organism *Chlamydia psittaci*. Symptoms of infection include fever, headache, rash and respiratory tract infections and, especially among older people, atypical pneumonia. *C. psittaci* often infects birds but because of its more particular association with parrots the human disease is also known as psittacosis. As well as directly from birds, the disease can be transmitted to humans through bird detritus (e.g., feathers and dust) and droppings. As infections in birds are commonly asymptomatic, it is prudent to avoid these materials.

During 2001, 131 notifications of ornithosis were reported in Australia. The largest number were from Victoria (n=68) and New South Wales (n=37). The highest rate occurred in Victoria with 1.4 cases per 100,000 population. Notification in Queensland commenced from July 2001. Nationally the rate was 0.7 cases per 100,000 population. The trends in the annual national notification rate between 1991 and 2001 ranged from approximately 0.5 to 1.5 cases per 100,000 population. The peaks in notification rates may reflect particular outbreaks (Figure 60).

In 2001, males and females were equally affected by ornithosis (male: female ratio 1.1:1). The highest notification rates of ornithosis were in males in the 75–79 years age group and in females in the 55–59 years age group (4.4 and 3.0 cases per 100,000 population respectively, Figure 61).

Figure 60. Trends in notification rates of ornithosis, Australia, 1991 to 2001, by year of onset

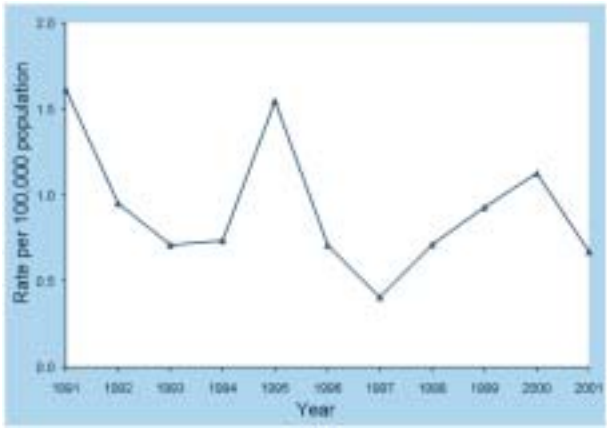
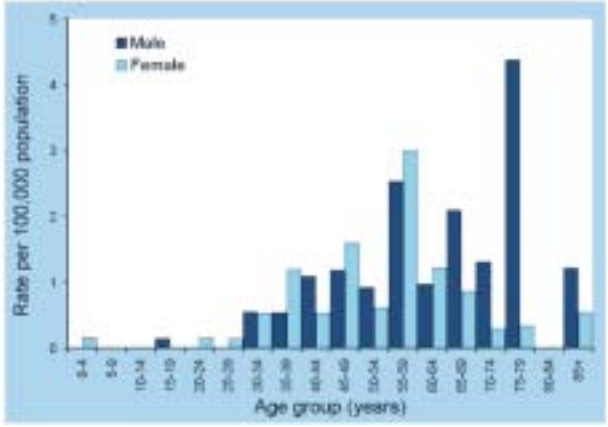


Figure 61. Notification rates of ornithosis, Australia, 2001, by age group and sex



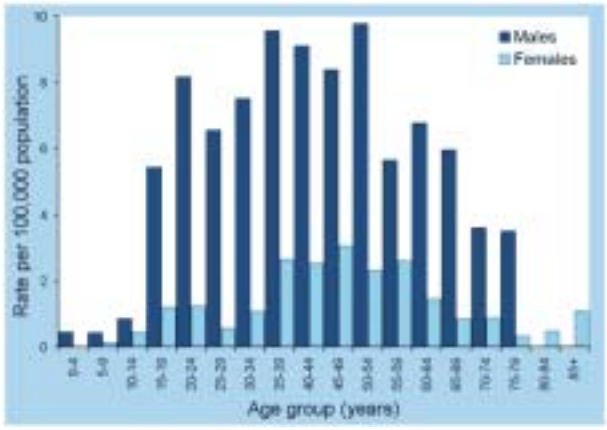
Q fever

Q fever is caused by infection with the rickettsia *Coxiella burnetii*. The disease is particularly associated with workers in the livestock industry. The organism is extremely infectious, and the tissues and fluids of infected animals are sources of infection. The dusts around stock facilities are also sources of infection because the organism is resistant to desiccation.

In 2001, 698 cases of Q fever were notified to NNDSS, a rate of 3.6 cases per 100,000 population. Most cases were from Queensland (n=454, 12.5 cases per 100,000 population). In Victoria, an outbreak of 18 cases occurred in Wodonga between early April and July.

The groups with the highest notification rates were 50–54 year old males (9.6 cases per 100,000 male population) and 45–49 year old females (3.0 cases per 100,000 female population) (Figure 62). The overall male to female ratio was 4.1:1.

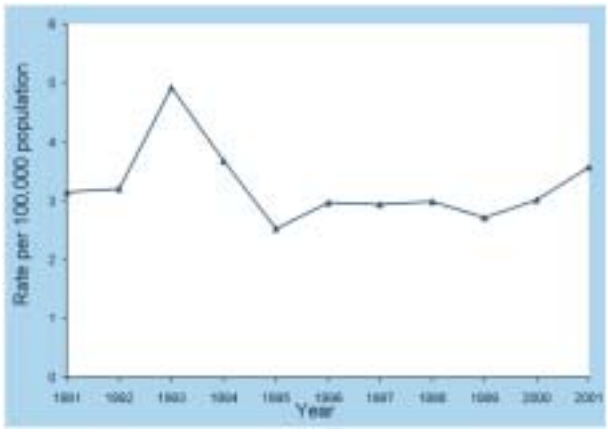
Figure 62. Notification rates of Q fever, Australia, 2001, by age group and sex



Sixteen cases of Q fever in children (aged less than 15 years) were notified from New South Wales (n=4) and Queensland (n=12). Information on exposure was available for 10 cases, all of who lived on or visited farms. Seven cases were linked to other cases of Q fever in family members, neighbours or other contacts.

The rate of Q fever notifications in Australia in recent years has remained relatively consistent since 1995 (Figure 63). Recent increases may be due to increased testing as a result of the Q fever vaccination program.

Figure 63. Trends in notification rates of Q fever, Australia, 1991 to 2000, by year of onset



A Commonwealth program to reduce the occurrence of Q fever commenced in October 2000. In the first phase abattoir workers and shearers were provided with free skin testing and Q fever vaccination. Under this program, Q fever-related medical costs were underwritten by the Commonwealth. The Q fever register has been established to provide a record of the vaccination status of abattoir workers (www.qfever.org). The second phase commenced in October 2001, and is directed at beef, sheep and dairy workers.

Australian bat lyssavirus and lyssavirus (unspecified)

The death of two Queensland women after handling fruit bats in 1996 and 1998 led to the discovery of the Australian bat lyssavirus (ABL). ABL and lyssavirus (unspecified) are closely related to the rabies virus. During 2001 there were no notifications of Australian bat lyssavirus or lyssavirus (unspecified) in Australia. African and European lyssaviruses may infect travellers and thus are included in lyssavirus (unspecified) on the list of notifiable diseases.

The symptoms of lyssavirus infection are similar to those of rabies, and are sometimes indistinguishable. Onset of symptoms occurs weeks after infection (this can be longer again in pre-pubertal individuals). Early symptoms are headache, fever and malaise, and, indicative of neural involvement, a sense of apprehension, and indefinite sensory changes. Following this, excitability, paresis or paralysis, a fear of water, delirium and convulsions then occur. By this stage the disease is inevitably fatal.[16,89]

Between 1996 and 1999, 205 people reported being bitten or scratched by bats in Queensland.[99] The rate of ABL seropositivity in bats involved in human exposures or in sick, injured or orphaned bats was approximately 5.5 per cent .

Anthrax

The bacterium causing anthrax, *Bacillus anthracis*, occurs in many parts of the world, most commonly as spores in the soil. When soil becomes moist and warm, spores enter a reproductive stage and quickly multiply. Animal hosts such as herbivores (sheep, goats, cows) can then become infected, and if not treated, die. Following the animal's death spores are released, which can lie dormant in the soil for decades. Vaccination protects livestock from becoming infected, and also provides protection from infection in humans.

There were no cases of human anthrax infection in Australia in 2001. Human anthrax occurs in three forms (cutaneous, gastrointestinal and pulmonary), depending on the route of infection.[89] Cutaneous anthrax occurs in handlers of animals or animal hides (tannery workers were once a high risk occupational group). The skin lesion is quite characteristic. With treatment the mortality rate is usually less than one per cent. Gastrointestinal anthrax results from the consumption of infected meat. The primary site of infection may be the lower gut or throat. This form has been effectively eliminated in countries where the butchering of livestock is regulated. The non-specific nature of the early symptoms (nausea, vomiting and fever) prevents early diagnosis, and the mortality rates can be substantial.

Pulmonary anthrax results from inhalation of the anthrax spores into the lungs. A two-phase illness results. The first phase produces only mild symptoms, which again are non-specific (e.g., fatigue, myalgia, mild fever), and last for 2–4 days. The second phase of illness is characterised by severe respiratory distress with a sudden onset. The highest rate of mortality from anthrax infection occurs with pulmonary anthrax. In the past, workers in textile mills inhaling fine dusts were often affected by anthrax (wool-sorters disease). Improvements in industrial hygiene and the use of synthetic fabrics have since resulted in fewer cases of pulmonary anthrax being recorded.[89]

In October 2001, 22 people in the United States of America became infected with anthrax. The source of infection was believed to be letters containing anthrax spores. Eleven cases were of the cutaneous form, and the other 11 were inhalational anthrax. Five deaths resulted.[1] Shortly afterwards in Australia and other countries there were many white powder incidents. Over 400 samples were tested for the presence of anthrax in New South Wales. None contained anthrax spores.[100]

Human anthrax infections arising from natural (i.e., soil-borne) sources in Australia have been reported between 1917 and 1990. Infections occurred at very low rates of about 0.8 to 1.0 cases per 100,000 population, and were associated with occupational exposure.[101]

Some areas in Australia are well known for sporadic anthrax infection in livestock. Most cases in livestock in Australia occur in a band running north-south in central New South Wales and into northern Victoria. The occurrence of cases has been correlated with drier periods in summer following wet or humid weather (www.brs.gov.au/usr-bin/aphb/ahsq?Disease=ATX).

Other bacterial infections

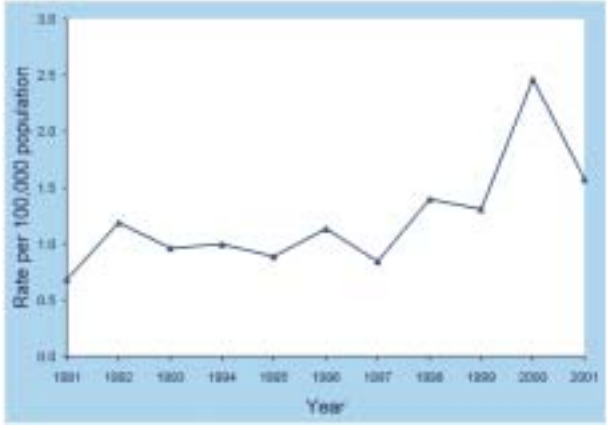
Legionellosis, leprosy, invasive meningococcal infection and tuberculosis (TB) were notifiable in all states and territories in 2001 and classified as 'other bacterial infections' in NNDSS. A total of 1,978 notifications were classified in this group in 2001, which accounted for 1.9 per cent of all the notifications to NNDSS.

Legionellosis

Legionellosis is an acute infection caused by various species of *Legionella* bacteria with two clinical manifestations: Legionnaires' disease and Pontiac fever. Legionnaires' disease, caused commonly by *Legionella pneumophila*, is a severe form of pneumonia, which may be accompanied by involvement of other organs such as the brain, the bowel and the kidneys. Symptoms include a rapid onset of high fever, a non-productive cough, chills, headache and general malaise. Diagnosis is based on isolating and identifying *Legionella pneumophila* from the patient's respiratory secretions or blood. The incubation period is usually 2–10 days. Less than five per cent of exposed persons become ill, but up to 30 per cent of those who become ill may die, depending on the population.[16]

Legionellosis is notifiable in all the states and territories of Australia, and includes notifications of infections caused by all *Legionella* species. The annual rates since 1991 show a marked increase in notifications in 2000 (Figure 64), because of the Melbourne aquarium outbreak.[102] This was followed

Figure 64. Trends in notification rates of legionellosis, Australia, 1991 to 2001, by year of onset



in 2001 by a decrease in notifications, but the number was still greater than those in years prior to 2000. A recent analysis of national legionellosis notification data showed a significant increase between 1991 and 2000, even when outbreak cases were excluded.[103]

There were 307 notifications of legionellosis reported in 2001, giving a national rate of 1.6 cases per 100,000 population. The highest rates of legionellosis were reported in Victoria (2.5 cases per 100,000 population) and Western Australia (2.2 cases per 100,000 population). Legionellosis notifications showed a peak in reports in autumn and spring.

Men accounted for 209 of the 307 (68 %) cases of legionellosis in 2001, to give a male to female ratio of 2.1:1. The highest rates were in the 80–84 year age group for men (10.1 cases per 100,000 population) and the 85 year and over age group for women (4.3 per 100,000 population, Figure 65).

Data on the causative species was available for 286 (93%) of the legionellosis cases. Of these, 152 (52%) were identified as *L. longbeachae,* 131 (46%) as *L. pneumophilia*, and three (1%) as other species (Table 20). In 2001 the proportion of *L. pneumophila* causing legionellosis cases was significantly higher in Victoria (109/121, 90%) than in the rest of the Australia (22/186, 12%, chi-square =180, p<0.0001).

There were 12 deaths identified as due to legionellosis in Australia in 2001, giving a case fatality rate of 3.9 per cent. The breakdown of deaths by state and territory and infecting *Legionella* species is shown in Table 21. The case fatality rate for infections with *L. pneumophila* (11/131, 8.4%) was significantly higher than the case fatality rate for *L. longbeachae* infections (1/152, 0.6%, chi-square=8.5, p<0.005).

Table 20. Notifications of legionellosis, Australia, 2001, by species and state or territory

State or territory	Species of *Legionella*				
	L. longbeachae	*L. pneumophila*	Other species*	Unknown	Total
ACT	2	0	0	0	**2**
NSW	63	0	0	4	**67**
NT	3	0	0	0	**3**
Qld	17	15	0	5	37
SA	29	3	0	0	32
Tas	1	1	0	1	3
Vic	6	109	3	3	121
WA	31	3	0	8	42
Total	152	131	3	21	307

* Other includes *L. micdadei* and *L. bozemannii*.

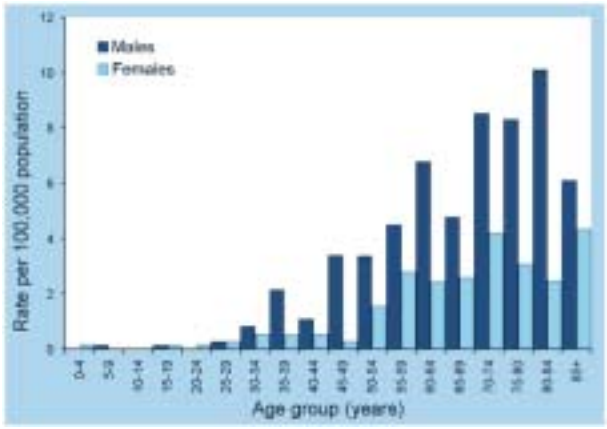
Table 21. Deaths due to legionellosis, Australia, 2001, by species and state or territory

State or territory*	Species of *Legionella*				
	L. longbeachae	*L. pneumophila*	Other species†	Unknown	Total
ACT	0	0	0	0	0
NT	0	0	0	0	0
Qld	0	1	0	0	1
SA	1	1	0	0	2
Tas	0	0	0	0	0
Vic	0	8	0	0	8
WA	0	1	0	0	1
Total	1	11	0	0	12

* No data available for New South Wales.

† Other includes *L. micdadei* and *L. Bozemannii*.

Figure 65. Notification rates of legionellosis, Australia, 2001, by age group and sex



Leprosy

Leprosy is a chronic infection of the skin and peripheral nerves with *Mycobacterium leprae*. Despite elimination from most countries, the disease remains a major endemic public health problem in six countries. One of these, India, accounts for 64 per cent of prevalent infections and 78 per cent of incident cases worldwide.[104] In Australia, leprosy is a rare disease, with the majority of cases occurring in migrants from leprosy-endemic countries or Indigenous communities.

In 2001, five leprosy cases were notified, compared with four in 2000. Three of the five cases occurred in New South Wales and two in Western Australia. Of these, four were male and one female, and the age range was 18–48 years. The country of birth was known for all five cases, and only one was born overseas, in Vietnam. Among the four Australian-born cases, three were identified as Indigenous Australians (two from Western Australia; one from New South Wales), while the Indigenous status of the fourth was not stated.

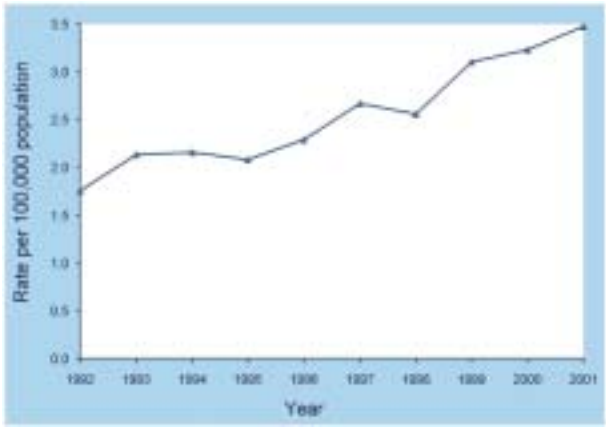
Invasive meningococcal disease

The meningococcus (*Neisseria meningitidis*) is an asymptomatic nasopharyngeal colonising organism found in 25 to 50 per cent of the general population. Invasive infection, however, can cause severe clinical meningitis, which has a high fatality rate.[105] Children, adolescents and the elderly are most at risk of this form of infection.

Meningococcal serogroups A, B, C, Y and W-135 are the main human pathogens. In Australia, serogroups B and C are the major causes of invasive meningococcal disease. WHO estimated that, internationally, there are at least 500,000 cases of invasive meningococcal disease and 50,000 deaths from the disease every year.[106]

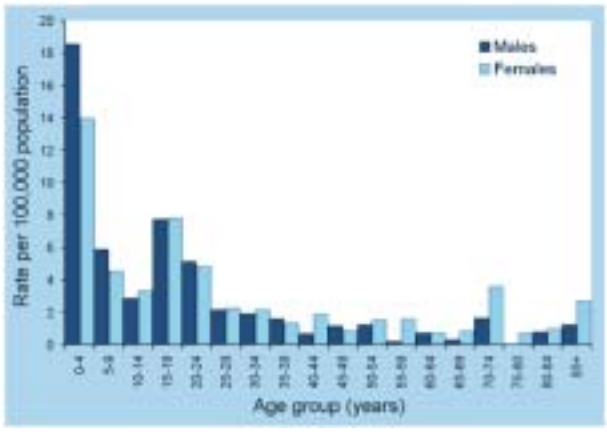
The annual notification rate for meningococcal disease has been increasing in Australia over the past 10 years (Figure 66). In 2001, there were 677 notifications giving a national notification rate of 3.5 cases per 100,000 population, a slight increase from the 622 cases and rate of 3.2 cases per 100,000 population reported in 2000.

Figure 66. Trends in notification rates of invasive meningococcal infection, Australia, 1992 to 2001, by year of onset



The largest number of cases in 2001 occurred in late winter (August, n=93) and early spring (September, n=81). The highest age specific rate was in children in the 0–4 year age group (16.3 cases per 100,000 population) and in the 15–19 year age group (7.8 cases per 100,000 population). Rates according to age group and sex are shown in Figure 67. More cases occurred among male children aged less than five years, and the male to female ratio was 2.6:1.

Figure 67. Notification rates of invasive meningococcal infection, Australia, 2001, by age group and sex



Among 677 meningococcal cases, 452 (67%) had the serogroup identified. Of these, serogroup B occurred in 283 (63%), 155 (34%) were serogroup C and 14 (3%) were serogroup W135 or Y (Table 22).

In 2001 there were 43 deaths due to meningococcal disease giving a crude case fatality rate of 6.3 per cent. The breakdown of deaths by state and territory and serogroup are shown in Table 23. Meningococcal serogroup C disease was associated with a significantly higher case fatality rate (23/155, 14.8%) than serogroup B disease (16/283, 5.6%, chi-square=9.3, $p<0.005$).

There were a number of linked cases of meningococcal disease in 2001 in all jurisdictions except the Northern Territory, where all cases were sporadic. A pair of linked cases in Queensland prompted the vaccination and chemoprophylaxis of more than 2,000 contacts. In Western Australia, four cases of serogroup B invasive meningococcal disease occurred over a period of 10 months in an Aboriginal community in an outer metropolitan area. These cases occurred in November 2000, and February, late July and early August 2001, in children aged between two and nine years. On each occasion, appropriate public health actions, including contact tracing and provision of advice and chemoprophylaxis to identified household and other close contacts, were performed. Mass chemoprophylaxis was provided to all residents of the community and regular visitors to it. There have been no further cases following these interventions.

A large outbreak of 14 cases of serogroup C (phenotype 2a:P1.5,2) occurred in southern Tasmania. In response, antibiotic prophylaxis was offered to contacts of cases and intensified surveillance, through laboratory and clinical services, was carried out. Regular press conferences were also held, in which the importance of early detection and empirical treatment were emphasised. General practitioners, pharmacists and schools were also alerted more directly to relevant disease information. A further two cases of serogroup C occurred in northern Tasmania, but these were shown to be due to a different phenotype.

Table 22. Notifications of invasive meningococcal infection by serogroups, 2001, by state or territory

Jurisdiction	Meningococcal serotype				Total
	Serogroup B	Serogroup C	Serogroups A, Y or W	Unknown serogroup	
ACT	2	0	0	4	6
NSW	85	35	4	106	230
NT	10	2	0	1	13
Qld	67	32	6	22	127
SA	22	7	1	9	39
Tas	5	17	0	1	23
Vic	47	56	2	58	163
WA	45	6	1	24	76
Total	283	155	14	225	677

Table 23. Deaths due to invasive meningococcal infection by serogroups, 2001, by state or territory

Jurisdiction	Meningococcal serotype				Total
	Serogroup B	Serogroup C	Serogroup A, Y or W	Unknown serogroup	
ACT	0	0	0	0	0
NSW	2	5	0	0	7
NT	1	1	0	0	2
Qld	4	5	0	2	11
SA	2	1	0	0	3
Tas	1	4	0	0	5
Vic	2	7	0	2	11
WA	4	0	0	0	4
Total	16	23	0	4	43

The Australian Meningococcal Surveillance Programme was established in 1994 for the purpose of monitoring drug resistance in *Neisseria meningitidis* isolates causing invasive meningococcal disease in Australia. The program is undertaken by a network of reference laboratories in each state and territory, using agreed standard methodology to quantitatively determine the susceptibility of *N. meningitidis* to a core group of antibiotics. The results of the surveillance in 2001 have recently been published.[107] In 2001 about two-thirds of all the isolates showed decreased susceptibility to the penicillin group of antibiotics (MIC 0.06-0.5 mg/L), but all isolates tested were susceptible to third generation cephalosporins.

Tuberculosis

TB is an infectious disease caused by *Mycobacterium tuberculosis*. The disease commonly affects the lungs and is usually transmitted person-to-person by airborne droplets.

Australia has one of the lowest rates of TB in the world, with most cases occurring in overseas-born and Indigenous Australians. The Federal Minister for Health and Ageing recently launched *The National Strategic Plan for Tuberculosis Control in Australia Beyond 2000*, prepared by the National Tuberculosis Advisory Committee. The plan consists of three key elements: case finding; treatment; and surveillance. Performance indicators have been developed to allow a regular review of the progress of the Strategic Plan.

In 2001, 989 TB notifications were received by NNDSS, a rate of 5.1 cases per 100,000 population. The notification rates of TB were lower than the national average in the Australian Capital Territory, Queensland, South Australia, Tasmania and Western Australia. The highest rate was reported in the Northern Territory (17.5 cases per 100,000 population).

In 2001, the male to female ratio was equal as it has been in the previous years. TB cases occurred in all age groups, with the highest age-specific rates reported in the 85 years and over age group for both males (29.3 cases per 100,000 population) and females (11.4 cases per 100,000 population) (Figure 68). Detailed analyses of TB in Australia have recently been published.[108]

Figure 68. Notification rates of tuberculosis Australia, 2001, by age group and sex

Other communicable disease surveillance

Laboratory Virology and Serology Reporting Scheme

LabVISE is a passive surveillance scheme based on voluntary reports of infectious agents from virology and serology laboratories around Australia. In 2001, reports from the scheme were analysed and published quarterly in *Communicable Diseases Intelligence.* LabVISE provides information on a number of viruses and other infectious agents (bacteria, parasites and fungi) and the demographic characteristics of those infected. The scheme monitors some infectious agents that are not reported by other surveillance systems. Interpretation of LabVISE data is limited by uncertainties about the representativeness of the data, the lack of denominator data to calculate rates, and variable reporting coverage over time. In addition, there are no consistent case definitions currently in use. Data from LabVISE between 1991 and 2000 were recently analysed.[109]

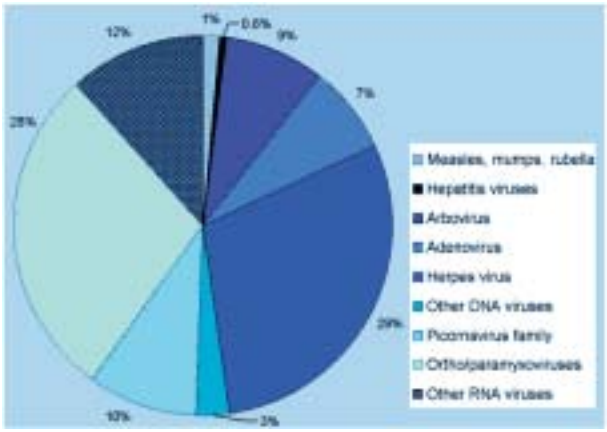
In 2001, 15 laboratories contributed 24,492 reports to LabVISE. This was an increase of 3.5 per cent on the number of reports in 2000 and data were received from one additional laboratory (Canberra Hospital, ACT) in 2001. The total reports received are shown by state and territory in Table 24.

Table 24. Infectious agents reported to the Laboratory Virology and Serology Reporting Scheme, 2001, by jurisdiction

Organism	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Measles virus	0	5	0	5	2	1	99	12	**124**
Mumps virus	0	1	0	1	4	0	8	18	**32**
Rubella virus	1	5	0	53	5	1	12	7	**84**
Hepatitis A virus	0	6	9	41	8	0	4	13	**81**
Hepatitis D virus	0	0	0	2	5	0	3	1	**11**
Hepatitis E virus	0	0	0	0	0	0	3	2	**5**
Ross River virus	0	31	92	463	89	3	33	153	**864**
Barmah Forest virus infection	0	14	7	208	3	0	1	36	**269**
Dengue	0	4	152	0	9	1	1	68	**235**
Murray Valley encephalitis virus	0	0	5	1	0	0	0	1	**7**
Kunjin virus	0	0	3	1	0	0	0	5	**9**
Flavivirus (unspecified)	0	0	2	8	0	0	16	0	**26**
Adenovirus	6	249	32	33	404	14	245	235	**1,218**
Herpes virus	16	508	82	1,117	1,445	26	651	1,018	**4,863**
Other DNA viruses	0	6	5	86	194	0	53	103	**447**
Picornavirus	15	644	50	30	40	18	169	596	**1,562**
Ortho/paramyxoviruses	23	1,383	56	242	1,284	57	443	1,166	**4,654**
Other RNA viruses	21	668	5	1	322	16	333	524	**1,890**
Chlamydia trachomatis	50	529	129	927	773	29	41	930	**3,409**
Chlamydia pneumoniae	0	3	1	1	0	0	0	2	**7**
Chlamydia psittaci	1	4	4	0	0	0	59	9	**77**
Mycoplasma pneumoniae	0	88	28	221	268	15	178	173	**971**
Coxiella burnetii	4	10	0	59	13	0	47	28	**161**
Rickettsia species	0	0	0	0	1	4	2	3	**10**
Streptococcus group A	13	32	36	209	0	0	109	0	**399**
Streptococcus group B	20	0	0	0	0	0	0	0	**20**
Yersinia enterocolitica	0	4	0	0	0	0	1	0	**5**
Brucella species	0	0	0	4	1	0	1	0	**6**
Bordetella pertussis	23	202	35	239	863	7	269	28	**1,666**
Legionella pneumophila	0	2	0	0	0	0	62	3	**67**
Legionella longbeachae	0	1	2	0	3	0	3	28	**37**
Legionella species	0	0	0	0	0	0	15	0	**15**
Cryptococcus species	0	5	0	4	12	0	0	0	**21**
Leptospira species	0	1	1	24	11	1	0	2	**40**
Treponema pallidum	0	91	257	353	377	0	2	41	**1,121**
Protozoa		11		2	5	4	21	3	**46**
Echinococcus granulosus	0	0	0	0	19	0	1	13	**33**
Total	**193**	**4,507**	**993**	**4,335**	**6,160**	**197**	**2,885**	**5,221**	**24,492**

Of reports received in 2001, 19,790 (81%) were of viral infections and 4,702 (19%) were bacterial or other infectious agents. Among the viral infections reported to LabVISE, viruses belonging to the herpes virus family (cytomegalovirus, varicella-zoster virus, Epstein-Barr virus and herpesvirus type 6) were the most commonly reported (4,863 reports, 24.5 per cent of all viral reports) . A similar number of reports of ortho/paramyxovirus infections (laboratory-confirmed influenza, parainfluenza, respiratory syncytial virus) were also received (4,654 reports, 23.5% of viral reports) (Figure 69). Laboratory reports of *Chlamydia trachomatis* made up 72 per cent of all non-viral reports to LabVISE in 2001 (n=3,409).

Figure 69. Reports of viral infections to the Laboratory Virology and Serology Reporting Scheme, 2001, by viral group



There were 1,727 laboratory reports of varicella-zoster virus to LabVISE in 2001. Analysis of these reports over time showed that a peak in January coincided with a peak in hospitalisations for varicella in Australia (Figure 70).[110] Laboratory testing for varicella is an important measure of the disease burden, which will become increasingly important should varicella vaccines be introduced into the Australian Standard Vaccination Schedule.

There were 1,727 laboratory reports of rotavirus to LabVISE in 2001. LabVISE has received reports of rotavirus since 1991. Regular epidemics of rotavirus occur in Australia every winter (Figure 71).

There was a large outbreak of rotavirus gastroenteritis in the Northern Territory in 2001. The outbreak began in Alice Springs and spread throughout the Northern Territory and into western Queensland. Ninety-five per cent of cases were in children under the age of five years and notification rates were five times higher in Indigenous compared with non-Indigenous people. The predominant strain was serotype G9, a strain of rotavirus group A which has only been reported in the Northern Territory since 1999.[111] Surveillance of rotavirus by the National Rotavirus Reference Centre continued in 2001.[112] Between 1 June 2001 and 30 June 2002, 754 samples were examined and this has shown that serotype G9 has become the most prevalent and widely dispersed serotype in Australia.

Figure 70. Laboratory reports of varicella-zoster virus to the Laboratory Virology and Serology Reporting Scheme and hospitalisations with a principal diagnosis of varicella, Australia, 1997 to 1999

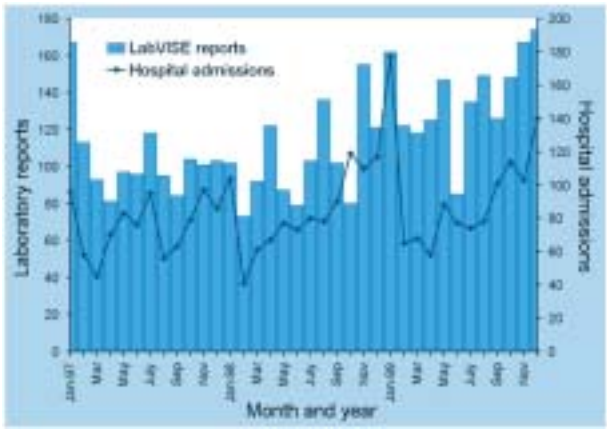
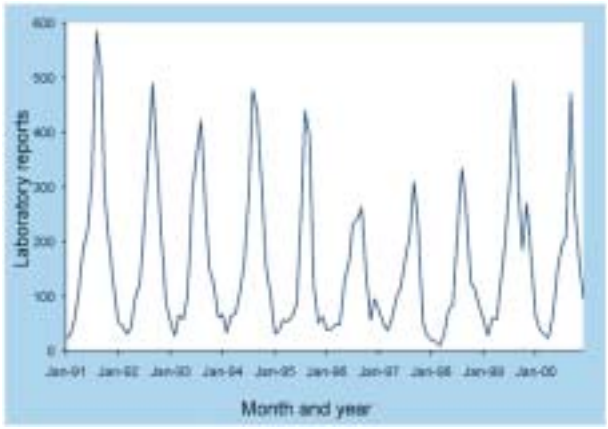


Figure 71. Laboratory reports to the Laboratory Virology and Serology Reporting Scheme of rotavirus infection, Australia, 1991 to 2000, by month of specimen collection



Australian Sentinel Practice Research Network

The Research and Health Promotion Unit of the Royal Australian College of General Practitioners operates the Australian Sentinel Practice Research Network (ASPREN). ASPREN is a national network of general practitioners that report each week on a number of conditions selected annually. The data provide an indicator of the burden of disease in the primary care setting and allow trends in consultation rates to be detected.

There were approximately 120 general practitioners participating in the scheme from all states and territories in 2001. Approximately 75 per cent of these are located in metropolitan areas and the remainder are in rural areas. Each week, an average of 56 participating practices reported an average 6,476 consultations to the scheme. In 2001, four conditions related to communicable diseases were reported. These were influenza-like illnesses, culture-confirmed influenza, chickenpox and shingles. Case definitions for these conditions were published in *Commun Dis Intell* 2000;24:7–8.

In 2001, a total of 336,745 consultations were reported to ASPREN by participating General Practitioners. Among consultations for communicable diseases, influenza-like illness was the most commonly reported condition (n=1,878), with a further 36 culture positive influenza cases reported to the scheme. Weekly reports of influenza-like illness peaked in winter months.

There were 656 cases of chickenpox and 460 cases of shingles reported to ASPREN in 2001, corresponding to an average weekly rate for chickenpox of 1.9 cases per 10,000 consultations and 1.4 cases per 1,000 consultations for shingles.

Antibiotic resistance in Australia

Since the release of *The Commonwealth Government Response to the Report of the Joint Expert Technical Advisory Group on Antibiotic Resistance* (JETACAR) in October 2000, the government has continued its work toward the development of a national antibiotic resistance management program.[113] Two committees were established to further this aim:

- The Expert Advisory Group for Antimicrobial Resistance (EAGAR), was set up in April 2001 under the auspices of the National Health and Medical Research Council, to provide continuing advice on antibiotic resistance and related matters; and
- The Commonwealth Interdepartmental JETACAR Implementation Group was established in November 2000, to oversee and coordinate the continuing government response to JETACAR, to respond to the policy advice received from EAGAR and to seek funding for implementation purposes.

During 2001, EAGAR developed and commenced the use of a protocol to assess the risk of antibiotic resistance developing in new and existing antibiotics.

Activities undertaken by the Commonwealth Interdepartmental JETACAR Implementation Group and its member agencies in 2001 include:

- an informal consultation meeting in March, *The Monitoring of the Distribution of Antibiotics for Veterinary and Human Use in Australia*; and
- the release in April of the draft report, *National surveillance of healthcare associated infection in Australia,* for consultation.

Other important activities included:

- the workshop on *Antibiotic Resistance Surveillance* (4 May);
- the *National Summit on Antibiotic Resistance* (30 and 31 May);
- a nationwide consultation toward development of a National Antibiotic Resistance Surveillance System for Antibiotic Resistance Management (July–September); and
- the initiation of the EAGAR website — http://www.health.gov.au/pubhlth/strateg/jetacar/eagar.htm.

Progress reports on implementation of the Government Response are available on the implementing JETACAR website — http://www.health.gov.au/pubhlth/strateg/jetacar/index.htm.

Through the *National Summit on Antibiotic Resistance*, representatives from governments, health, agricultural, industry and consumer groups identified priorities for action. In particular, the need for the development of a national system of surveillance for antibiotics was recognised to measure the prevalence of antibiotic resistance. Further needs were also identified including:

- improved education and awareness, leading to more appropriate use of antibiotics;
- clearer research focuses, and better communication and regulation;
- more effective linkages between corporate and peak organisational bodies; and
- reduced incidence of health care-associated infections in Australia.

Creutzfeldt-Jakob disease

This section is based on reports for the period from the Australian National Creutzfeldt-Jakob disease (CJD) Registry, the University of Melbourne.

The Australian National CJD Registry was established in 1993, in response to recognition of four probable cases of iatrogenic CJD resulting from the use of human pituitary hormones. It has subsequently undertaken retrospective case ascertainment in addition to its ongoing monitoring and surveillance activities and the Register now includes cases of CJD dating back to 1 January 1970 (Table 25).

Table 25. Cases reported to the Australian National Creutzfeldt-Jakob Disease Registry: 1970 to 2001

Classification	Number of cases as at December 2001	Change in number of cases during 2001*
Definite	243	+ 7
Probable	170	+10
Possible	0	– 1
Incomplete†	66	– 23
Total	479	– 7

* These changes are due to reclassification of previously notified cases, as more definitive data confirm or exclude provisional diagnoses

The average annual incidence of CJD in Australia between 1988 and 2000 is 1.13 cases per million population. International rates are generally around one case per million population per annum. Of the cases recorded on the Register, 90.3 per cent of cases are sporadic, 7.5 per cent of cases are familial and 2.2 per cent of cases are iatrogenic in origin. No new cases of iatrogenic disease were recorded in Australia in 2001.

The average age of death for sporadic CJD cases by sex was 64 years for males and 67 years for females. For familial CJD the average age for death was 52 years for males and 59 years for females, and for people who acquired the disease iatrogenically, the average age of death was 45 years for both males and females.

As at the end of December 2001, Australia remains free of animal forms of transmissible spongiform encephalopathies and no cases of the variant form of CJD have been detected.

In Australia, autopsy rates have been steadily declining, in line with international trends. Lack of autopsy frequently compromises the ability of the Registry to classify cases as definite, pending the development of additional tests. The Registry has seen an increase in notification of suspected cases since the introduction of diagnostic testing of the 14–3–3 protein in cerobrospinal fluid.

Responses to possible bioterrorism

Public health authorities in Australia and overseas have developed contingency plans to deal with any threats, however unlikely, from chemical, biological, and radiological agents.

Australia has developed its own chemical, biological, and radiological plans through Emergency Management Australia, working in partnership with health agencies and other arms of government.

Australia has had counter-terrorism plans in place for a number of years, and the health system's level of preparedness was increased in preparation for the Sydney Olympics, and again following the events of 11 September 2001 and the cases of anthrax associated with contaminated mail in the USA, and the more recent bombings in Bali. Further details of the anthrax cases in the USA are provided in the zoonoses section of this report.

Preparations by the Department of Health and Ageing include:

- training within health departments and with other agencies;
- adoption of medical treatment protocols suitable for a civilian population;
- stockpiling of appropriate pharmaceutical supplies;
- increasing diagnostic and health surveillance capability;
- improved coordination and advisory arrangements; and
- access to international advice to alert Australian authorities to overseas developments.

The Department of Health and Ageing will continue to be engaged in the development of a coordinated bioterrorism response with state and territory health authorities and with laboratory networks. Australia's laboratories performed extremely well during the anthrax hoaxes and false alarms in October and November 2001, responding rapidly and effectively to the increased workloads and the demand for speedy and accurate results.

Appendices

Appendix 1. Australian Bureau of Statistics population data used in the calculation of rates

Population age structure by state or territory and sex

	State or territory								
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Males	156,554	3,251,412	104,326	1,813,215	743,153	231,175	2,392,413	961,442	9,655,422
Females	157,617	3,281,047	93,264	1,814,601	759,244	239,097	2,436,555	948,309	9,731,241
Persons	314,171	6,532,459	197,590	3,627,816	1,502,397	470,272	4,828,968	1,909,751	19,386,663

Population age structure by state or territory and age group

	State or territory								
Age group	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
0–4	20,929	429,371	17,555	241,421	90,576	30,302	301,986	125,117	1,257,471
05–09	21,374	443,504	17,485	259,211	98,110	33,182	322,324	132,796	1,328,290
10–14	21,814	443,803	16,063	259,006	99,695	34,204	323,937	138,589	1,337,457
15–19	24,257	448,117	14,945	265,639	103,119	34,476	330,373	140,871	1,362,106
20–24	28,184	455,001	16,181	258,880	98,520	29,409	353,840	142,244	1,382,408
25–29	25,939	492,684	19,294	268,578	102,042	29,354	369,632	145,634	1,453,387
30–34	24,426	490,605	18,963	268,759	106,708	31,413	375,736	144,348	1,461,251
35–39	23,999	499,952	17,101	274,234	111,753	33,840	369,135	147,882	1,478,222
40–44	24,294	495,174	15,371	275,220	114,779	36,088	364,053	148,827	1,474,085
45–49	23,393	453,004	13,404	254,854	107,217	33,823	335,408	139,489	1,360,860
50–54	22,385	428,163	11,546	243,905	103,730	32,387	315,932	128,061	1,286,335
55–59	15,504	337,496	7,798	190,390	81,069	25,557	245,898	94,574	998,401
60–64	10,917	274,949	4,681	148,752	66,313	21,569	201,683	75,328	804,278
65–69	8,235	233,440	2,880	119,404	57,661	18,155	172,652	60,597	673,063
70–74	6,932	220,337	2,015	109,524	56,630	16,834	161,856	54,266	628,418
75–79	5,707	181,272	1,128	88,449	48,282	13,684	133,025	42,304	513,860
80–84	3,392	114,844	622	56,792	31,003	8,816	82,647	25,988	324,113
85+	2,490	90,743	558	44,798	25,190	7,179	68,851	22,836	262,658

Appendix 2. Completeness of National Notifiable Diseases Surveillance System data received from states and territories, 2001

Completeness of National Notifiable Diseases Surveillance System data received from states and territories, 2001

Total notifications	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Sex									
No. missing	8	93	13	4	0	0	322	69	509
% complete	99.4	99.7	99.7	100.0	100.0	100.0	98.5	99.4	99.5
Age									
No. missing	0	40	38	0	2	10	786	24	900
% complete	100.0	99.9	99.3	100.0	100.0	99.5	96.4	99.8	99.1
Indigenous status									
No. missing	1,037	874	524	20,032	1,659	1,521	18,077	5,380	49,104
% complete	22.2	97.0	89.8	15.7	81.5	25.0	17.2	53.5	52.9

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Composition of Australian influenza vaccine for the 2003 season

In order to select virus strains for the manufacture of the influenza vaccine for the 2003 season, a meeting of the Australian Influenza Vaccine Committee on Influenza Vaccines was convened on 10 October 2002.

Having considered information on international surveillance by the World Health Organization (WHO), and up-to-date epidemiology and strain characterisation presented at the meeting, the Committee considered that the WHO recommendations on the composition of vaccines for the 2003 Southern Hemisphere season should be followed.

A H1N1 strain:	an A/New Caledonia/20/99 (H1N1)-like strain A/New Caledonia/20/99 (IVR-116) is recommended as a suitable vaccine strain.	15 µg HA per dose.
A H3N2 strain:	an A/Moscow/10/99 (H3N2)-like strain A/Panama/2007/99 (RESVIR-17) is recommended as a suitable vaccine strain.	15 µg HA per dose.
B Strain:	a B/Hong Kong/330/2001-like strain B/Shangdong/7/97 and B/Brisbane/32/2002 are recommended as suitable vaccine strains.	15 µg HA per dose.