Australia's notifiable diseases status, 2000

Annual report of the National Notifiable Diseases Surveillance System

Ming Lin,[1] Paul Roche,[1] Jenean Spencer,[1] Alison Milton,[1] Phil Wright,[1] David Witteveen,[1] Robyn Leader,[1] Angela Merianos,[1] Chris Bunn,[2] Heather Gidding,[3] John Kaldor,[4] Martyn Kirk,[5] Rob Hall,[6] Tony Della-Porta[7]

With contributions from:

National organisations

Communicable Diseases Network Australia

Australian Childhood Immunisation Register

Australian National Creutzfeldt-Jakob Disease Registry

Australian Gonococcal Surveillance Programme

Australian Meningococcal Surveillance Programme

Australian Sentinel Practice Research Network

Australian Quarantine and 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

World Health Organization Collaborating Centre for Reference and Research on Influenza

State and Territory health departments

Communicable Diseases Control Unit, Australian Capital Territory Department of Health and Community Care, Australian Capital Territory

Communicable Diseases Surveillance and Control Unit, New South Wales Health Department, New South Wales

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

Communicable Diseases Unit, Queensland Health, Queensland

Communicable Diseases Control Branch, South Australian Health Commission, South Australia

Communicable Diseases Surveillance, Department of Health and Human Services, Tasmania

Communicable Diseases Section, Department of Human Services, Victoria

Communicable Diseases Control Branch, Health Department of Western Australia, Western Australia

Abstract

In 2000, there were 89,740 notifications of communicable diseases in Australia collected by the National Notifiable Diseases Surveillance System (NNDSS). The number of notifications in 2000 was an increase of 5.9 per cent over those reported in 1999 (84,743) and the largest reporting year since the NNDSS commenced in 1991. Notifications in 2000 consisted of 28,341 bloodborne infections (32% of total), 24,319 sexually transmitted infections (27%), 21,303 gastrointestinal infections (24%), 6,617 vaccine preventable infections (7%), 6,069 vectorborne infections (7%), 2,121 other bacterial infections (legionellosis, meningococcal infection, leprosy and tuberculosis) (2%), 969 zoonotic infections (1%) and only one case of a quarantinable infection. Steep declines in some childhood vaccine preventable diseases such as *Haemophilus influenzae* type b, measles, mumps and rubella, continued in 2000. In contrast, notifications of pertussis and legionellosis increased sharply in the year. Notifications of bloodborne viral diseases (particularly hepatitis B and hepatitis C) and some sexually transmitted infections such as chlamydia, continue to increase in Australia. This report also summarises data on communicable diseases from other surveillance systems including the Laboratory Virology and Serology Surveillance Scheme (LabVISE) and sentinel general practitioner schemes. In addition this report comments on other important developments in communicable disease control in Australia in 2000. *Commun Dis Intell* 2002;26:118-203.

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1. Surveillance and Epidemiology Section, Commonwealth Department of Health and Ageing, Australian Capital Territory.
2. Principal Veterinary Officer, Animal Health and Welfare Branch, Bureau of Resources Sciences, Department of Agriculture, Fisheries and Forestries Australia, Australian Capital Territory.
3. Epidemiology Research Officer, National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases, New South Wales.
4. Deputy Director, National Centre in HIV Epidemiology and Clinical Research, New South Wales.
5. Coordinating Epidemiologist, OzFoodNet Victoria.
6. Director, Communicable Disease Control Branch, Department of Human Services, South Australia.
7. Manager, Technical and Support Services, Australian Animal Health Laboratory, Commonwealth Scientific and Industrial Research Organisation,

Corresponding author: Dr Ming Lin, Epidemiologist, Surveillance and Epidemiology Section, Commonwealth Department of Health and Ageing, PO Box 9848 (MDP 6), Canberra, Australian Capital Territory, 2601. Telephone: +61 2 6289 7304. Facsimile: +61 2 6289 7791. E-mail: ming.lin@health.gov.au.

Contents

Tables

Figures

Maps

Abbreviations used in this report

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ACIR	Australian Childhood Immunisation Register
ADF	Australian Defence Forces
ADT	Adult diphtheria tetanus vaccine
AFP	Acute flaccid paralysis
AGSP	Australian Gonococcal Surveillance Programme
AIDS	Acquired immune deficiency syndrome
AIHW	Australian Institute of Health and Welfare
Ag	Antigen
AHMC	Australian Health Minister's conference
ASPREN	Australian Sentinel Practice Research Network
ATAGI	Australian Technical Advisory Group on Immunisation
BBV	Bloodborne viruses
CDC	Centres for Disease Control and Prevention, Atlanta, Georgia
CDI	Communicable Diseases Intelligence
CDNA	Communicable Diseases Network Australia
CIJIG	Commonwealth Inter-departmental JETACAR Implementation Group
CJD	Creutzfeldt-Jakob Disease
CSF	Cerebrospinal fluid
DoHA	Department of Health and Ageing
DTP	Diphtheria, Tetanus, Pertussis (vaccine)
EAGAR	Expert Advisory Group on Antimicrobial Resistance
ELISA	Enzyme-linked Immunosorbant assay
GBS	Guillain Barre Syndrome
FAO	Food and Agriculture Organization of the United Nations
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HDV	Hepatitis D virus
HEV	Hepatitis E virus
Hib	*Haemophilus influenzae* type b
HIV	Human immunodeficiency virus
HUS	Haemolytic uraemic syndrome
ICD–10	International Classification of Diseases, version 10
IFA	Immunofluorescence assay
IgG	Immunoglobulin G
IgM	Immunoglobulin M
JE	Japanese encephalitis
JETACAR	Joint Expert Technical Advisory Committee on Antibiotic Resistance
LabVISE	Laboratory Virology and Serology Reporting Scheme
MMR	Measles-mumps-rubella (vaccine)
MVE	Murray Valley encephalitis
NNDSS	National Notifiable Diseases Surveillance System

NCHECR	National Centre in HIV Epidemiology and Clinical Research
NEC	Not elsewhere classified
NEPSS	National Enteric Pathogen Surveillance Scheme
NHMRC	National Health and Medical Research Council
NMSS	National Mycobacterial Surveillance System
NN	Not notifiable
NSW	New South Wales
NT	Northern Territory
OPV	Oral polio vaccine
PCR	Polymerase chain reaction
Qld	Queensland
SA	South Australia
SD	Statistical Division
SLTEC	Shiga-like toxin producing *Escherichia coli*
STI	Sexually transmitted infection
Tas	Tasmania
TB	Tuberculosis
UK	United Kingdom
USA	United States of America
vCJD	Variant Creutzfeldt-Jakob disease
Vic	Victoria
VPD	Vaccine preventable diseases
VTEC	Verotoxin-producing *Escherichia coli*
WA	Western Australia
WHO	World Health Organization
WPR	Western Pacific Region

2000: The year in review

In 2000, there were continuing challenges to and advances in communicable disease control in Australia. Important initiatives were taken which will have impacts on communicable diseases surveillance and control well into the future.

In September 2000, Sydney hosted the Olympic games. This event drew around 300,000 domestic and international visitors as well as 15,000 athletes and officials from 200 countries. Media attention was intense with around 15,000 media personnel attending the games. The size of this event necessitated active health surveillance covering notifiable diseases as well as surveillance of presentations to emergency departments and medical centres, and environmental and food safety inspections.[1] Data from all these sources were entered into a special database and reviewed daily by medical epidemiologists. High priority diseases for surveillance included foodborne diseases, pneumonia, influenza, pertussis, meningitis, measles and hepatitis. The Games were completed without any major public health incidents.

In April 2000, a large outbreak of legionellosis occurred in Melbourne, with 113 cases notified in Victoria and another 12 cases elsewhere in Australia and New Zealand. The outbreak was associated with visits to the Melbourne aquarium and resulted in 4 deaths. A contaminated water-cooling tower was implicated.

The deployment of 5,500 Australian Defence Forces (ADF) to East Timor in late 1999 resulted in increased exposure to malaria and dengue. Two hundred and sixty-seven ADF personnel contracted malaria, with 64 developing clinical symptoms in East Timor and 212 being diagnosed on return to Australia. A further 26 ADF personnel contracted dengue.

A milestone in communicable disease control was passed in October 2000, when Australia, along with all other countries in the Western Pacific Region (WPR) was declared polio-free by the World Health Organization (WHO). Australia's last case of polio was reported in 1977 and all cases since then have been vaccine associated.[2]

A special issue of the *Medical Journal of Australia* in October 2000 focussed attention on the burden of pneumococcal disease in Australia and future use of pneumococcal vaccines. The incidence of pneumococcal disease among Aboriginal children in central Australia is among the highest in the world.[3] To date, vaccines composed of pneumococcal polysaccharides were the only available and these were not effective in preventing infections in children. In 2000, the first efficacy trial of a new multivalent conjugate vaccine against *Streptococcus pneumoniae* showed a very high protective efficacy against invasive pneumococcal disease in children.[4] The vaccine was licensed for use in Australia in December 2000 and recommendations for a vaccination program in Australian children were published in March 2001. It is hoped that this vaccination program, focussing on groups of children at highest risk of disease, will have a major impact on pneumococcal disease in Australia.

An important new initiative in the control of foodborne disease in Australia was launched in 2000. The Commonwealth Department of Health and Ageing (DoHA) established and funded a collaborative network, called 'OzFoodNet' to enhance the existing surveillance mechanisms for foodborne disease across Australia. OzFoodNet aims to estimate the incidence of foodborne disease in Australia, to learn more about causes and determinants of foodborne disease, to identify risky practices associated with food handling and preparation and to train foodborne disease epidemiologists.[5] Specific studies include a national survey of diarrhoeal disease prevalence, case control studies on risk factors for infections with *Campylobacter*, *Salmonella* Enteriditis, *Listeria* and Shiga-like toxin producing *Escherichia coli* (SLTEC) and developing a register to record foodborne disease outbreaks.

In August 2000, the Commonwealth published an implementation plan in response to the report by the Joint Expert Advisory Committee on Antibiotic Resistance (JETACAR) *The use of antibiotics in food-producing animals: antibiotic resistant bacteria in animals and humans.* An inter-departmental implementation group guided by an expert advisory committee is working on developing surveillance systems to monitor the prevalence of antibiotic resistance and other measures to control the prevalence of antibiotic resistance in Australia.

As international concern over variant Creutzfeldt-Jakob disease (vCJD) increased in 2000, Australian Health Ministers implemented a blood donor deferral policy from people who had resided in the United Kingdom (UK) for 6 months or more during the period 1980 to 1996. No cases of bovine spongiform encephalopathy have been found in Australian cattle nor have there been any cases of vCJD in Australia to date.

Since 1991, national communicable disease notification data has been collected and collated under the National Notifiable Diseases Surveillance System (NNDSS). In 2000, Australian States and Territories agreed with the Commonwealth to collect more comprehensive data on each case notified to the NNDSS and began planning for enhanced surveillance for a number of key diseases. The new data set will provide more detail on the causative organism and the vaccination status of the case, and provide more comprehensive epidemiological data. This will allow more sophisticated analyses of the national communicable diseases data set. Improvements in the electronic transfer of data from States and Territories to NNDSS continued in 2000. Development of a new data acquisition system was commenced and discussion around appropriate data collection for enhanced tuberculosis (TB) surveillance was initiated. This enhanced surveillance was an initiative of the National TB Advisory Committee and will improve national monitoring of TB in Australia by recording complete clinical data, including antibiotic susceptibility, and outcomes of treatment on all notified cases.

In summary, communicable disease control in Australia in 2000 was advanced by the certification of polio eradication and the introduction of new vaccine initiatives for pneumococcal disease. Improvements to understanding the epidemiology of foodborne disease in Australia through the OzFoodNet initiative and the prevalence of antibiotic resistance will have long-term benefits for disease control. Improvements to data quality and information systems will further enhance the national surveillance system and communicable disease control.

Introduction

It is of critical importance to collect, analyse and report surveillance data on potential communicable diseases. This action is essential to the success of public health efforts. Surveillance allows the detection of disease outbreaks prompting the appropriate investigation and control measures to be instigated. Surveillance also allows for the monitoring of trends in disease prevalence and considers the impact and effectiveness of interventions to control the spread of diseases. Surveillance systems exist at national, state and local levels. State and local surveillance systems are crucial to the timely and effective detection and management of outbreaks and in assisting in the effective implementation of national policies. The national surveillance system combines some of the data collected from state and territory-based systems to provide an overview at a national level. Specific functions of the national surveillance system include: detection and management of outbreaks affecting more than one jurisdiction; monitoring of the need for and impact of national control programs; guidance of national policy development; resource allocation and description of the epidemiology of rare diseases for which there are only a few notifications in each jurisdiction. National surveillance also assists with quarantine activities and facilitates agreed international collaborations such as reporting to the WHO.

The National Notifiable Diseases Surveillance System was established in its current form in 1991, under the auspices of the Communicable Diseases Network Australia (CDNA, formally the Communicable Diseases Network of Australia and New Zealand). The CDNA monitors the notification/reporting of an agreed list of communicable diseases in Australia. Data are regularly published in the *Communicable Diseases Intelligence (CDI)* journal and on the Communicable Diseases — Australia Website. This is achieved through the national collation of notifications of these diseases received by health authorities in the States and Territories. In 2000, 50 diseases or disease categories were included, largely as recommended by the National Health and Medical Research Council (NHMRC).[6] In years since 2000 the list of notifiable diseases and categories has undergone review and revision. Information collected on notifiable diseases has been published in the Annual Report of the NNDSS since 1991.[7,8,9,10,11,12,13,14,15]

In 2000, 50 diseases or disease categories were nationally notifiable in Australia (Table 1) and the national case definitions used in this year are listed in Appendix 1a–1h.

Table 1. Diseases notified to the National Notifiable Diseases Surveillance System, Australia, 2000

Disease group	Disease	Comments
Bloodborne diseases	Hepatitis B (incident)	All jurisdictions
	Hepatitis B (unspecified)	All jurisdictions except NT
	Hepatitis C (incident)	All jurisdictions except NT, Qld*
	Hepatitis C (unspecified)	All jurisdictions
	Hepatitis D	All jurisdictions except WA
	Hepatitis (NEC)	All jurisdictions except WA
Gastrointestinal diseases	Botulism	All jurisdictions except WA
	Campylobacteriosis	All jurisdictions except NSW
	Haemolytic uraemic syndrome	All jurisdictions
	Hepatitis A	All jurisdictions
	Hepatitis E	All jurisdictions except WA
	Listeriosis	All jurisdictions
	Salmonellosis	All jurisdictions
	Shigellosis	All jurisdictions except NSW
	SLTEC,VTEC	All jurisdictions except Qld, WA
	Typhoid	All jurisdictions
	Yersiniosis	All jurisdictions except NSW
Quarantinable diseases	Cholera	All jurisdictions
	Plague	All jurisdictions
	Rabies	All jurisdictions
	Viral haemorrhagic fever	All jurisdictions
	Yellow fever	All jurisdictions
Sexually transmitted infections	Chancroid	All jurisdictions
	Chlamydial infections	All jurisdictions
	Donovanosis	All jurisdictions except NSW, SA
	Gonococcal infection	All jurisdictions
	Lymphogranuloma venereum	All jurisdictions except WA
	Syphilis	All jurisdictions
Vaccine preventable diseases	Diphtheria	All jurisdictions
	Haemophilus influenzae type B	All jurisdictions
	Measles	All jurisdictions
	Mumps	All jurisdictions except Qld†
	Pertussis	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
	Malaria	All jurisdictions
	Ross River virus infection	All jurisdictions
Zoonoses	Brucellosis	All jurisdictions
	Hydatid disease	All jurisdictions except NSW
	Leptospirosis	All jurisdictions
	Ornithosis	All jurisdictions except NSW and Qld
	Q fever	All jurisdictions
Other bacterial infections	Legionellosis	All jurisdictions
	Leprosy	All jurisdictions
	Meningococcal infection	All jurisdictions
	Tuberculosis	All jurisdictions

* Notifications of hepatitis C (incident) were reported under hepatitis C (unspecified) in the Northern Territory and Queensland.

† Notification of mumps was removed from the notification list in Queensland from 2 July 1999 and the entire year of 2000.

NEC: not elsewhere classified

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). The States and Territories collect notifications of communicable diseases under their public health legislation. The Commonwealth (or Federal) Government does not have any legislative responsibility for public health apart from human quarantine. States and Territories have agreed to forward data on communicable diseases to the DoHA for the purposes of national communicable disease surveillance.

In 2000, data were transmitted from States and Territories to DoHA, fortnightly. Summaries of the data were published on the Communicable Diseases — Australia Website fortnightly and in the *CDI* monthly. The Commonwealth received final data sets from the States and Territories of cases reported in 2000 by August 2001. Missing data and apparent errors together with any queries arising from the data were returned to jurisdictions for review, correction of errors and ascertainment of completeness of case information for the year.

For each case the national data set included fields for a unique record reference number; jurisdiction of notification; disease code; age; sex; Indigenous status; postcode of residence; the date of onset of the disease and date of report to the State or Territory health authority. Analysis of the data by Indigenous status was not possible because of the incomplete reporting of this information. Additional information was available on the species and serogroups isolated in cases of legionellosis, meningococcal disease and malaria, and on the vaccination status in cases of childhood vaccine preventable diseases. Additional information was obtained from States and Territories concerning mortality and specific health risk factors of some diseases.

Analyses in this report are based on date of disease onset, unless specified. For analysis of seasonal trends, notifications were reported by month of onset. Population notification rates were calculated using 2000 mid-year estimates of the resident population supplied by the Australian Bureau of Statistics (ABS). An adjusted rate was calculated where a disease was not notifiable in a State or Territory, using a denominator which excluded that population.

Maps were generated using MapInfo based on the postcode of residence and allocated to Australian Bureau of Statistics Statistical Divisions (Map 1). The two Statistical Divisions that make up the Australian Capital Territory were combined, as the population for one division is very small. Notifications for Darwin and the remainder of the Northern Territory were also combined to calculate rates for the Northern Territory as a whole. In general, notification rates for Statistical Divisions were depicted in maps or discussed in the text only where the number of notifications was sufficiently large for these to be meaningful.

Notes on interpretation

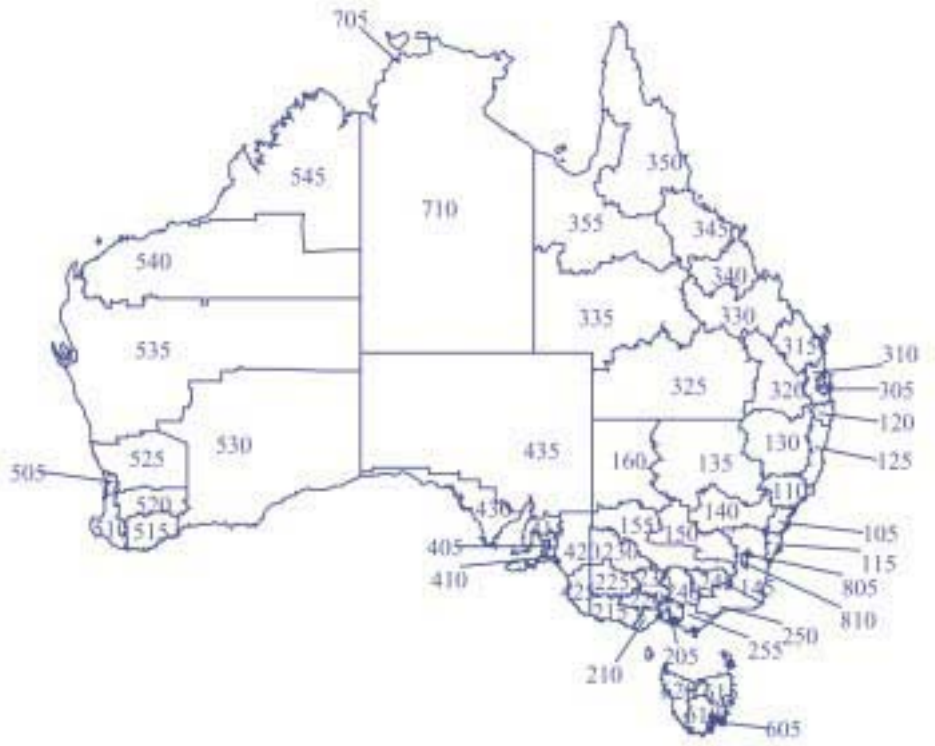
The notifications compiled by the NNDSS may be influenced by a number of factors that should be considered when interpreting the data. Due to under-reporting, notified cases are likely to only represent a proportion of the total number of cases that occurred (Figure 1). This proportion (the 'notified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

Figure 1. Communicable disease surveillance pyramid

Adopted from CDC Website.
(http://www.cdc.gov/foodnet/Surveys.htm#whatpyr)

The burden of illness 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 registered in surveillance. At the bottom of the pyramid, 1) some of the general population is exposed to an organism; 2) some 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 doctors 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.

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	181,206,215
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	99,477
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	90,102
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	52,304
530 South Eastern	58,926
535 Central	60,300
540 Pilbara	40,429
545 Kimberley	30,539
Total Australia	**19,157,037**

Methods of surveillance may vary between jurisdictions, 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 jurisdictions.

Postcode information usually reflects the postcode of residence. However, the postcode of residence may not necessarily represent the place of acquisition of the disease, or the area in which public health action was taken in response to the notification.

As no personal identifiers are collected in records, duplication in reporting may occur if patients moved from one jurisdiction to another and were notified in both. Data from those Statistical Divisions with small populations (Map 1) may result in high notification rates even with small numbers of cases.

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 = 420) and patient's age missing in 0.4 per cent of notifications (n = 340). The patient's Indigenous status was reported for 28,552 notifications (31.8%) nationally. The proportion of reports with missing data in these fields varied by State or Territory, and also by disease.

Data were analysed by date of disease onset, unless specified. 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. Analysis by date of onset should be interpreted with caution, particularly for chronic diseases such as hepatitis B and C, as considerable time may have elapsed between onset and report date for these diseases. To overcome this problem, analysis was performed by report date for hepatitis B (unspecified) and hepatitis C (unspecified).

Rates per 100,000 population were calculated using State/Territory and national population estimates for mid-year 2000 (Appendix 3) supplied by the Australian Bureau of Statistics. Mortality statistics for 2000 were available from the ABS in 2001. The Australian Institute of Health and Welfare (AIHW) supplied hospital admission data for the financial year 1999/2000.

Between May and August every year, the NNDSS receives a final annual dataset from all jurisdictions to update its system. This yearly operation only updates the notifications reported to the NNDSS during the last calendar year. States and Territories continue to revise totals from previous years as duplicates are removed and other data corrected. However, the NNDSS had not revised its historical notifications since 1991. As a result, there was considerable difference in the number of notifications held in the NNDSS and the State and Territory records. Providing high quality and precise information that is consistent with State and Territory records is a vital part of maintaining good surveillance information. In 2001, the CDNA approved the revising of the NNDSS records with jurisdictions' 1991 to 1999 historical notifications. During November to December 2001, all jurisdictions except Victoria resent notifications collected between 1991 and 1999 to the NNDSS. Victoria confirmed that records held at the Commonwealth level were accurate. Comparative historical data for 1991 to 1999 used in this report represents more accurate information and may vary from previous reports.

During 2000, data were analysed monthly and the result and commentary published in *CDI*. In contrast, this report is based on 'finalised' annual data from each jurisdiction, from which duplicates or erroneous records have been removed. For this reason, totals in this report may vary from the cumulative totals of the numbers reported in the monthly *CDI* reports. This report is informed by the discussions and comments of members of the CDNA, who met fortnightly by teleconference to discuss developments in communicable disease in their jurisdiction. The CDNA data managers also met through 2000 and their contribution to accurate data in this report is gratefully acknowledged.

Results

Summary of 2000 data

There were a total of 89,740 communicable disease notifications for 2000 (Table 2). Notification rates per 100,000 population for each disease by State or Territory are described in Table 3.

The number of notifications in 2000 was an increase of 5.9 per cent on notifications in 1999 (84,743) and the largest number of reports since the NNDSS commenced in 1991 (Figure 2). Nationally in 2000, bloodborne infections remained the most frequently notified disease group (28,341 cases; 32% of total), followed by 24,319 sexually transmitted infections (27%), 21,303 gastrointestinal infections (24%), 6,617 vaccine preventable diseases (7%), 6,069 vectorborne diseases (7%), 2,121 other bacterial infections (2%), 969 zoonotic infections (1%) and only one case of a quarantinable disease (Figure 3).

Figure 2. Trends in notification rates of communicable diseases, Australia, 1991 to 2000

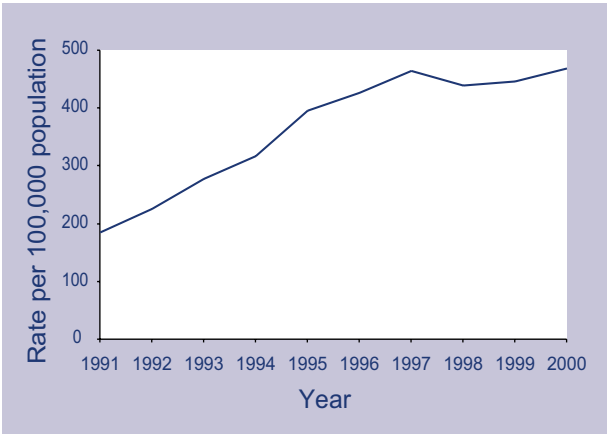
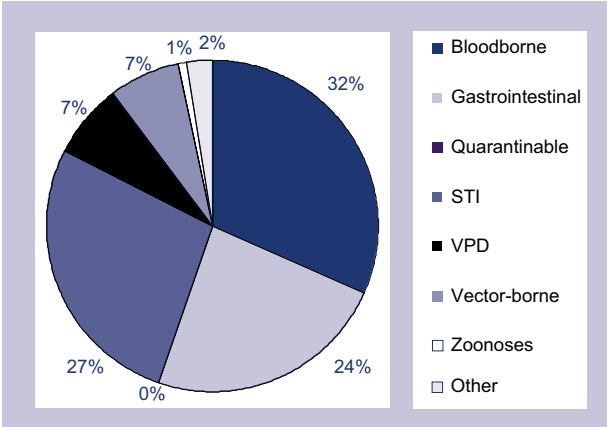
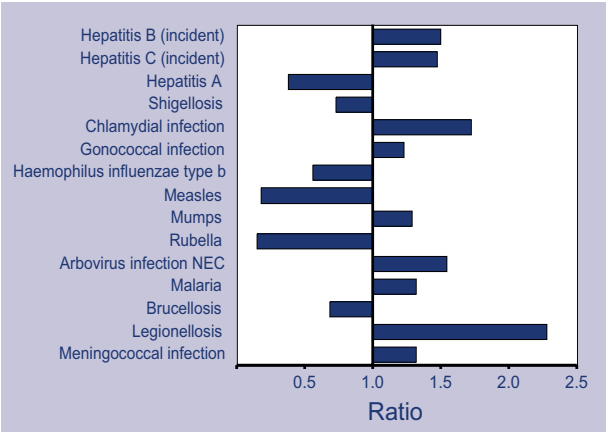


Figure 3. Breakdown of communicable disease notifications by disease category



The major changes in notifications in 2000 are shown in Figure 4. as a ratio of notifications received in the year compared with the mean of the preceding 5 years. Only diseases with major changes in numbers of notifications in 2000 are shown. There were major increases in notifications of legionellosis and dengue. Increases were also noted in the reporting of hepatitis B (both incident and unspecified), hepatitis C (incident), gonococcal infection, mumps, malaria and meningococcal infection. Measles notifications fell by more than 50 per cent compared with 1999. Declines in *Haemophilus influenzae* type b (Hib) infections and rubella were also noted.

Figure 4. Selected diseases from National Notifiable Diseases Surveillance System, comparison of totals for 2000 with previous 5 year mean



In 2000, infectious diseases accounted for 3.6 per cent of all deaths in Australia (4,582 deaths, 23.9 deaths per 100,000 population). Pneumonia and influenza remained as the major cause of mortality, accounting for more 50 per cent of deaths from infectious diseases (2,937 deaths, 15.3 deaths per 100,000 population). Death rates from pneumonic and influenza generally increased with age and were greater for males than females aged 60 years and over. There was a total of 12,859 infectious disease related hospitalisations during the 1999/2000 financial year. (Source: National Hospital Morbidity Database, 1990–2000: AIHW) Among these hospitalisations, influenza/pneumonia was the most common cause for admission, accounting for 20.1 per cent of the total hospitalisations (2,591 admissions). It should be noted that a range of causative agents are included in the broad ICD–10 coding group of 'influenza/pneumonia'.

Table 2. Notifications of communicable diseases, Australia, 2000, by State or Territory*

Disease	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Bloodborne diseases									
Hepatitis B (incident)	3	96	6	56	30	18	114	72	**395**
Hepatitis B (unspecified)†‡	48	3,893	NN	896	257	48	1,964	802	**7,908**
Hepatitis C (incident)	20	139	–	–	89	31	87	75	**441**
Hepatitis C (unspecified)†‡§	212	7,265	183	3,395	788	335	5,730	1,661	**19,569**
Hepatitis D	0	10	0	5	0	0	12	NN	**27**
Hepatitis (NEC)	0	1	0	0	0	0	0	NN	**1**
Gastrointestinal diseases									
Botulism	0	0	1	0	0	0	1	NN	**2**
Campylobacteriosis‖	333	–	182	3,675	1,883	510	5,037	1,975	**13,595**
Haemolytic uraemic syndrome	0	9	0	2	1	0	2	1	**15**
Hepatitis A	5	200	44	133	54	3	193	180	**812**
Hepatitis E	0	9	0	0	0	1	0	NN	**10**
Listeriosis	0	18	3	13	7	3	10	13	**67**
Salmonellosis	105	1,409	304	1,827	450	131	1,021	904	**6,151**
Shigellosis‖	7	–	114	108	30	2	120	106	**487**
SLTEC,VTEC¶	0	0	0	NN	33	0	0	NN	**33**
Typhoid	0	27	0	2	3	0	14	12	**58**
Yersiniosis‖	3	–	2	59	0	0	8	1	**73**
Quarantinable diseases									
Cholera	0	0	0	0	1	0	0	0	**1**
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									
Chancroid	0	0	0	0	0	0	0	0	**0**
Chlamydial infection	243	3,482	959	4,931	1,023	332	3,336	2,560	**16,866**
Donovanosis	0	NN	5	6	NN	0	0	1	**12**
Gonococcal infection**	14	1,060	1,128	1,137	270	17	742	1,318	**5,686**
Lymphogranuloma venereum	0	0	0	0	0	0	0	NN	**0**
Syphilis††	13	541	175	887	13	9	8	109	**1,755**

Table 2. Notifications of communicable diseases, Australia, 2000, by State or Territory,* continued

Disease	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Vaccine preventable diseases									
Diphtheria	0	0	0	0	0	0	0	0	**0**
Haemophilus influenzae type b	0	8	2	12	2	0	3	1	**28**
Measles	3	35	0	26	11	1	21	10	**107**
Mumps	17	92	4	NN	15	2	43	39	**212**
Pertussis	208	3,683	5	525	588	143	699	91	**5,942**
Poliomyelitis	0	0	0	0	0	0	0	0	**0**
Rubella‡‡	4	191	0	46	7	1	67	6	**322**
Tetanus	0	2	0	0	3	0	1	0	**6**
Vectorborne diseases									
Arbovirus infection NEC	0	12	9	10	0	1	26	11	**69**
Barmah Forest virus infection	0	190	9	346	12	0	19	58	**634**
Dengue	1	21	93	84	6	0	2	8	**215**
Malaria	18	231	76	409	41	7	115	54	**951**
Ross River virus infection	16	746	128	1,477	415	8	326	1,084	**4,200**
Zoonoses									
Brucellosis	0	1	0	26	0	0	0	0	**27**
Hydatid infection	0	NN	0	8	0	0	13	5	**26**
Leptospirosis	1	53	8	134	8	0	35	4	**243**
Ornithosis	0	NN	1	NN	6	6	85	2	**100**
Q fever	0	130	0	390	11	1	27	14	**573**
Other diseases									
Legionellosis	5	41	1	47	89	4	250	35	**472**
Leprosy	0	2	0	1	1	0	0	0	**4**
Meningococcal infection	5	253	9	60	32	15	162	85	**621**
Tuberculosis	18	438	43	89	58	10	284	84	**1,024**
Total	**1,302**	**24,288**	**3,494**	**20,822**	**6,237**	**1,639**	**20,577**	**11,381**	**89,740**

* 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 the NNDSS.

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

‡ The analysis was performed by report date.

§ Includes hepatitis C (incident) cases in 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, 2000, by State or Territory (rate per 100,000 population)*

Disease	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Bloodborne diseases									
Hepatitis B (incident)	1.0	1.5	3.1	1.6	2.0	3.8	2.4	3.8	**2.1**
Hepatitis B (unspecified)†‡	15.3	60.2	NN	25.1	17.2	10.2	41.2	42.6	**41.7**
Hepatitis C (incident)	6.4	2.2	–	–	5.9	6.6	1.8	4.0	**2.9**
Hepatitis C (unspecified)†‡§	67.5	112.4	93.6	95.2	52.6	71.2	120.2	88.2	**102.2**
Hepatitis D	0.0	0.2	0.0	0.1	0.0	0.0	0.3	NN	**0.2**
Hepatitis (NEC)	0.0	< 0.1	0.0	0.0	0.0	0.0	0.0	NN	**< 0.1**
Gastrointestinal diseases									
Botulism	0.0	0.0	0.5	0.0	0.0	0.0	< 0.1	NN	**< 0.1**
Campylobacteriosis‖	106.0	–	93.1	103.0	125.7	108.4	105.7	104.8	**107.1**
Haemolytic uraemic syndrome	0.0	0.1	0.0	0.1	0.1	0.0	< 0.1	0.1	**0.1**
Hepatitis A	1.6	3.1	22.5	3.7	3.6	0.6	4.0	9.6	**4.2**
Hepatitis E	0.0	0.1	0.0	0.0	0.0	0.2	0.0	NN	**0.1**
Listeriosis	0.0	0.3	1.5	0.4	0.5	0.6	0.2	0.7	**0.3**
Salmonellosis	33.4	21.8	155.5	51.2	30.0	27.9	21.4	48.0	**32.1**
Shigellosis‖	2.2	–	58.3	3.0	2.0	0.4	2.5	5.6	**3.8**
SLTEC,VTEC¶	0.0	0.0	0.0	NN	2.2	0.0	0.0	NN	**0.2**
Typhoid	0.0	0.4	0.0	0.1	0.2	0.0	0.3	0.6	**0.3**
Yersiniosis‖	1.0	–	1.0	1.7	0.0	0.0	0.2	0.1	**0.6**
Quarantinable diseases									
Cholera	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	**< 0.1**
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									
Chancroid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Chlamydial infection	77.4	53.9	490.6	138.3	68.3	70.6	70.0	135.9	**88.0**
Donovanosis	0.0	NN	2.6	0.2	NN	0.0	0.0	0.1	**0.1**
Gonococcal infection**	4.5	16.4	577.1	31.9	18.0	3.6	15.6	70.0	**29.7**
Lymphogranuloma venereum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NN	**0.0**
Syphilis††	4.1	8.4	89.5	24.9	0.9	1.9	0.2	5.8	**9.2**

Table 3. Notification rates of communicable diseases, Australia, 2000, by State or Territory (rate per 100,000 population)*, continued

Disease	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Vaccine preventable diseases									
Diphtheria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Haemophilus influenzae type b	0.0	0.1	1.0	0.3	0.1	0.0	0.1	0.1	**0.1**
Measles	1.0	0.5	0.0	0.7	0.7	0.2	0.4	0.5	**0.6**
Mumps	5.4	1.4	2.0	NN	1.0	0.4	0.9	2.1	**1.4**
Pertussis	66.2	57.0	2.6	14.7	39.3	30.4	14.7	4.8	**31.0**
Poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Rubella‡‡	1.3	3.0	0.0	1.3	0.5	0.2	1.4	0.3	**1.7**
Tetanus	0.0	< 0.1	0.0	0.0	0.2	0.0	< 0.1	0.0	**< 0.1**
Vectorborne diseases									
Arbovirus infection NEC	0.0	0.2	4.6	0.3	0.0	0.2	0.5	0.6	**0.4**
Barmah Forest virus infection	0.0	2.9	4.6	9.7	0.8	0.0	0.4	3.1	**3.3**
Dengue	0.3	0.3	47.6	2.4	0.4	0.0	< 0.1	0.4	**1.1**
Malaria	5.7	3.6	38.9	11.5	2.7	1.5	2.4	2.9	**5.0**
Ross River virus infection	5.1	11.5	65.5	41.4	27.7	1.7	6.8	57.5	**21.9**
Zoonoses									
Brucellosis	0.0	< 0.1	0.0	0.7	0.0	0.0	0.0	0.0	**0.1**
Hydatid infection	0.0	NN	0.0	0.2	0.0	0.0	0.3	0.3	**0.2**
Leptospirosis	0.3	0.8	4.1	3.8	0.5	0.0	0.7	0.2	**1.3**
Ornithosis	0.0	NN	0.5	NN	0.4	1.3	1.8	0.1	**1.1**
Q fever	0.0	2.0	0.0	10.9	0.7	0.2	0.6	0.7	**3.0**
Other diseases									
Legionellosis	1.6	0.6	0.5	1.3	5.9	0.9	5.2	1.9	**2.5**
Leprosy	0.0	< 0.1	0.0	< 0.1	0.1	0.0	0.0	0.0	**< 0.1**
Meningococcal infection	1.6	3.9	4.6	1.7	2.1	3.2	3.4	4.5	**3.2**
Tuberculosis	5.7	6.8	22.0	2.5	3.9	2.1	6.0	4.5	**5.3**

* 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 the NNDSS.

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

‡ The analysis was performed by report date.

§ Includes hepatitis C (incident) cases in 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.

Bloodborne diseases

Introduction

In 2000, bloodborne viruses (BBV) reported to the NNDSS included hepatitis B, C, D and hepatitis 'not elsewhere classified' (NEC). Newly acquired hepatitis C virus (HCV) and hepatitis B virus (HBV) infections (incident) were differentiated from those where the timing of disease acquisition is unknown (unspecified). HIV and AIDS diagnoses are reported directly to the National Centre in HIV Epidemiology and Clinical Research (NCHECR). Information on national HIV/AIDS surveillance can be obtained through the NCHECR Website at www.med.unsw.edu.au/nchecr.

As considerable time may have elapsed between onset and report date for chronic hepatitis infections, the analysis of unspecified HBV and unspecified HCV infections in the following sections is by report date, rather than by onset date.

In 2000, bloodborne virus infections accounted for 28,341 notifications to the NNDSS, which was 31.6 per cent of the total notified cases.

The overall trends in the number of notifications and rates for bloodborne viruses reported to the NNDSS since 1991 are shown in Tables 4 and 5. Hepatitis C remains the most commonly notified BBV in Australia. While most of the BBV show an increase in the total number of notifications across this reporting period, the increases are likely to reflect changes in surveillance practices rather than a true change in disease activity. Changes in surveillance are discussed on a disease by disease basis in the following sections. Only the reporting of hepatitis NEC has decreased over time, probably due to improved classification into the other hepatitis groups

Table 4. Trends in notifications of bloodborne viruses, Australia, 1991 to 2000*†

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Hepatitis B (incident)	–	–	–	283	271	212	269	265	303	395
Hepatitis B (unspecified)	3,469	4,847	5,282	5,394	4,434	5,580	6,542	6,562	7,164	7,908
Hepatitis C (incident)	–	–	25	26	77	71	154	350	396	441
Hepatitis C (unspecified)	–	–	–	–	17,154	17,674	17,290	18,075	18,655	19,569
Hepatitis D	–	–	–	–	–	–	–	–	19	27
Hepatitis (NEC)	253	34	33	23	12	15	6	4	0	1

* Notifications of hepatitis B (unspecified) and hepatitis C (unspecified) were analysed by report date.

† All jurisdictions reported for all years with the following exceptions:

Hepatitis B (incident) not reported from the Australian Capital Territory (1994)

Hepatitis B (unspecified) not reported from the Northern Territory (1991 to 2000)

Hepatitis C (incident) not separated from hepatitis C (unspecified) in Queensland or the Northern Territory (1991 to 2000)

Hepatitis D not reported from Western Australia

Hepatitis (NEC) not reported from Western Australia

Table 5. Trends in notification rates of bloodborne viruses, Australia, 1991 to 2000*† (rate per 100,000 population)

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Hepatitis B (incident)	–	–	–	1.6	1.5	1.2	1.5	1.4	1.6	2.1
Hepatitis B (unspecified)	20.3	28.0	30.2	30.5	24.8	30.8	35.7	35.4	38.2	41.7
Hepatitis C (incident)	–	–	0.2	0.2	0.5	0.5	1.0	2.3	2.6	2.9
Hepatitis C (unspecified)	–	–	–	–	94.9	96.5	93.4	96.5	98.4	102.2
Hepatitis D	–	–	–	–	–	–	–	–	0.1	0.2
Hepatitis (NEC)	1.6	0.2	0.2	0.1	0.1	0.1	< 0.1	< 0.1	0.0	< 0.1

* Notifications of hepatitis B (unspecified) and hepatitis C (unspecified) were analysed by report date.

† All jurisdictions reported for all years with the following exceptions:

Hepatitis B (incident) not reported from the Australian Capital Territory (1994).

Hepatitis B (unspecified) not reported from the Northern Territory (1991 to 2000).

Hepatitis C (incident) not separated from hepatitis C (unspecified) in Queensland or the Northern Territory (1991 to 2000).

Hepatitis D not reported from Western Australia.

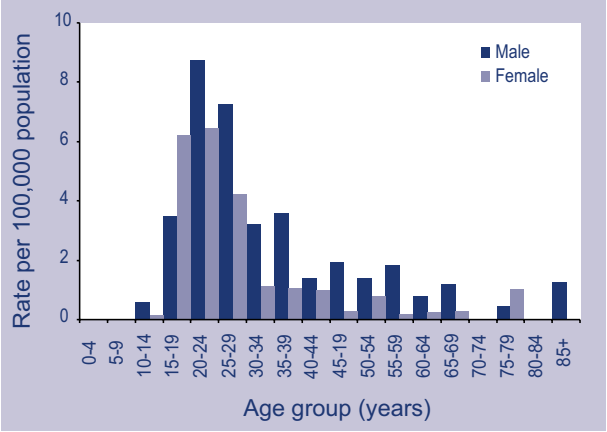
Hepatitis (NEC) not reported from Western Australia.

Hepatitis B

In the early 1990s incident and unspecified hepatitis B notifications were not reported separately by most jurisdictions. Since 1994, all jurisdictions have reported incident cases of hepatitis B to the NNDSS. The overall trend in incident HBV notification rates between 1994 and 2000 shows a relatively stable reporting rate, between 1–2 cases per 100,000 population.

In total, 395 incident cases of hepatitis B were reported to the NNDSS with an onset date in 2000, giving a national notification rate of 2.1 cases per 100,000 population for this year. This represents an increase from the 303 incident cases reported in 1999 (1.6 cases per 100,000 population), with the most notable increases in the number of notifications from Western Australia, Tasmania and New South Wales. In 2000, the highest rates were reported from Western Australia (3.8 cases per 100,000 population), Tasmania (3.8 cases per 100,000 population) and the Northern Territory (3.1 cases per 100,000 population). The majority of incident hepatitis B notifications were in the 20–24 year age group (Figure 5). Overall, infections in males exceeded those in females (male to female ratio of 1.6:1).

Figure 5. Notification rates of incident hepatitis B infections, Australia, 2000 by age and sex



Risk factor information for incident HBV infection was available from four jurisdictions, the Australian Capital Territory, South Australia, Tasmania and Victoria and is summarised in Table 6. The following analyses refer only to incident HBV cases reported in these jurisdictions in 2000, thus the jurisdictional totals reported below may vary from the analysis by onset date.

Table 6. Risk factors identified in notifications of incident hepatitis B virus infections, 2000, Australia, by reporting State or Territory

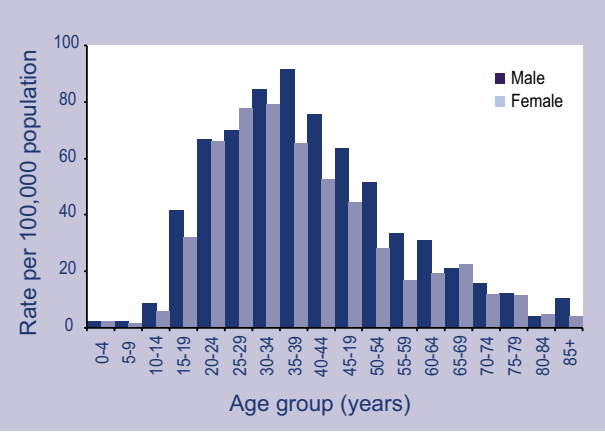
Risk factor	Australian Capital Territory		South Australia		Tasmania		Victoria	
	n	%	n	%	n	%	n	%
Injecting drug user*	3	100	15	50	11	61	65	57
Sexual contact with HBV case	0	0	5	17	0	0	31	27
Household/other contact	0	0	2	6	1	5	1	1
Overseas travel	0	0	3	10	0	0	0	0
Occupational	0	0	0	0	0	0	1	1
Other	0	0	0	0	3	17	0	0
None identified	0	0	5	17	3	17	16	14
Total	**3**	**100**	**30**	**100**	**18**	**100**	**114**	**100**

* Injecting drug users may have multiple risk factors for HBV infection

Unspecified hepatitis B notifications have been reported to the NNDSS by all jurisdictions except the Northern Territory since 1997. The notification rate has remained stable between 1997 and 2000, at around 40 cases per 100,000 population (Table 5). In 2000 there were 7,908 unspecified HBV cases notified, at a rate of 41.7 cases per 100,000 population (Tables 4 and 5). This rate is consistent with that recorded in 1999 (38.2 cases per 100,000 population). The male to female ratio for unspecified HBV cases reported in 2000 was 1.2:1. By jurisdiction, the highest rates of notification were in New South Wales (60.2 cases per 100,000 population), Western Australia (42.6 cases per 100,000 population) and Victoria (41.2 cases per 100,000 population). The highest rates were in the 35–39 year age group for men (91.4 cases per 100,000 population) and in the 30–34 year age group for women (79.1 cases per 100,000 population, Figure 6).

Figure 6 indicates a small number of unspecified HBV cases reported in the 0–4 age group. Some of these cases may be perinatally acquired (particularly in 0–1 year olds), and could be reported as incident cases if the timing of infection is known to be at birth.

Figure 6. Notification rates of unspecified hepatitis B infections, Australia, 2000, by age and sex



While free universal neonatal vaccination was introduced in the Northern Territory in 1990, prior to 1997 most other jurisdictions only vaccinated infants from ethnic groups with a high hepatitis B carriage rate, or those born to known HBV positive mothers. In 1997 there was an interim recommendation that universal vaccination of infants at birth be introduced, and in 2000, with the availability of combination vaccines, DTPa–hepB vaccine was included in the childhood immunisation schedule. Continued surveillance is essential to measure the impact of this vaccination program.

Hepatitis C

Hepatitis C infection has been notifiable in most Australian jurisdictions since 1991 (Table 7). The total number of unspecified hepatitis C notifications has remained stable since 1994 at around 15,000–20,000 cases per annum.

In 2000, there were 19,569 unspecified hepatitis C infections reported to the NNDSS, a notification rate of 102.2 cases per 100,000 population, slightly higher than the 98.4 cases per 100,000 population reported in 1999. Of the total notifications of unspecified hepatitis C, 37 per cent of the notifications were from New South Wales. The highest notification rates were from Victoria (120.2 cases per 100,000 population) and New South Wales (112.4 cases per 100,000 population). The male to female ratio was 1.8:1. The highest notification rates were in the 25–29 year age group for males (279.7 cases per 100,000 population) and in the 20–24 year age group for females (159.9 cases per 100,000 population, Figure 7).

Similar to HBV, there were a number of HCV notifications in the 0-4 age group (Table 8) which could be classified as incident if perinatally acquired.

Incident cases of hepatitis C have been separately notifiable since 1997 in all jurisdictions except the Northern Territory and Queensland (Table 9). It is recognised that the number of notifications vastly underestimates 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 incident HCV notifications is largely a product of improved surveillance, increased awareness, and more widespread testing.

The numbers of incident cases detected are likely to be affected by the surveillance methods.[16] In the larger jurisdictions classification of incident cases is determined by passive reporting. In smaller jurisdictions, where all (or the majority) of hepatitis C notifications were actively investigated to determine if they were incident or prevalent during this time period, a much higher proportion of incident cases was reported.

Figure 7. Notification rates of unspecified hepatitis C infections, Australia, 2000, by age and sex

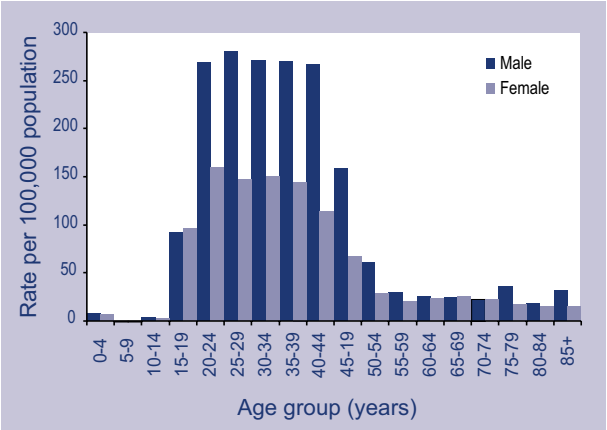


Table 7. Trends in notifications of unspecified hepatitis C virus infections, Australia 1991 to 2000, by State or Territory and date of report

Year	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
1991	59	657	10	1,491	NR	NR	1,667	NR	**3,884**
1992	110	3,761	93	2,702	NR	NR	1,262	NR	**7,928**
1993	244	5,640	212	2,670	NR	NR	2,659	1,106	**12,531**
1994	308	7,564	301	2,990	NR	NR	3,523	1,305	**15,991**
1995	330	6,782	301	2,808	1,026	274	4,506	1,127	**17,154**
1996	267	7,318	216	2,796	1,075	291	4,597	1,114	**17,674**
1997	315	6,775	295	2,843	835	234	4,940	1,053	**17,290**
1998	290	6,759	233	2,921	795	275	5,681	1,121	**18,075**
1999	282	6,780	191	3,046	854	310	6,165	1,027	**18,655**
2000	212	7,265	183	3,395	788	335	5,730	1,661	**19,569**

NR not reported

Table 8. Trends in notifications of hepatitis C virus infections in the 0–4 age group, Australia, 1997 to 2000

Year	Incident HCV infections*	Unspecified HCV infections†	Total
1997	0	167	167
1998	5	573	578
1999	1	105	106
2000	1	97	98

* By date of onset.

† By date of report.

Table 9. Trends in notifications of incident hepatitis C virus infections, by State or Territory, 1993 to 2000

Year	ACT	NSW	SA	Tas	Vic	WA	Aust
1993	NR*	23	NR	NR	NR	2	**25**
1994	6	20	NR	NR	NR	0	**26**
1995	8	33	33	2	NR	1	**77**
1996	8	19	28	4	NR	12	**71**
1997	3	19	48	2	9	73	**154**
1998	8	110	67	18	21	126	**350**
1999	20	100	80	18	70	108	**396**
2000	20	139	89	31	87	75	**441**

NR not reported

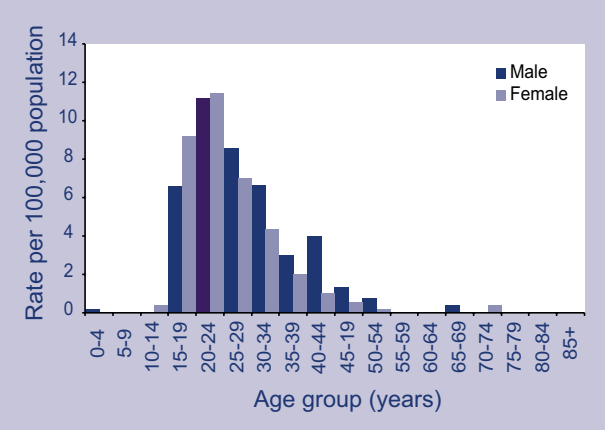
Table 10. Demographics of incident hepatitis C cases reported in the Australian Capital Territory, the Northern Territory, South Australia, Tasmania and Victoria, 2000

	ACT (n=20)	NT (n=5*)	SA (n=88)	Tasmania (n=27)	Victoria (n=77)
Median age in years (range)					
Males	24 (22–39)	32 (28–45)	26 (18–45)	26 (18–48)	23 (15–42)
Females	28 (17–28)	37 (27–47)	24 (15–50)	28 (17–36)	22 (14–39)

* Since enhanced surveillance commenced in July 2000.

In total there were 441 incident cases of hepatitis C reported with an onset date in 2000, giving a rate of 2.9 cases per 100,000 population. The proportion of all HCV notifications that were known to be incident cases was 2.2 per cent in 2000, similar to the proportion in 1999 (2.1%), but reflecting the upward trend in this proportion since 1993. The highest rates of incident hepatitis C infection were reported from Tasmania (6.6 cases per 100,000 population), the Australian Capital Territory (6.4 cases per 100,000 population) and South Australia (5.9 cases per 100,000 population). The majority of incident hepatitis C notifications were in the 20–24 year age group (Figure 8).

Figure 8. Notification rates of incident hepatitis C infections, Australia, 2000, by age and sex



In 2000, additional data were collected on incident hepatitis C infections in the Australian Capital Territory, the Northern Territory, South Australia, Tasmania and Victoria (M. Robotin, NCHECR, personal communication). The following analyses refer only to incident hepatitis C cases reported in these jurisdictions in 2000, thus the jurisdictional totals reported below may vary from the analysis by onset date.

Demographic profile of incident hepatitis C cases

The age and sex of incident hepatitis C cases notified in 2000 are summarised in Table 10, according to the State or Territory of diagnosis.

Method of diagnosis of incident hepatitis C

The basis of diagnosis was seroconversion in 72 per cent, clinical hepatitis in 23 per cent or a combination in 4 per cent of cases.

Reason for testing or reporting source

The reason for testing or the reporting source was recorded in three jurisdictions (the Northern Territory, Tasmania and Victoria). While no direct comparison can be made, as varying reasons were investigated in each jurisdiction, drug and alcohol screening was the major reason for testing in Tasmania (accounting for 44% of cases) and Victoria (27% of cases), while the investigation of symptoms was the major reason for testing in the Northern Territory (accounting for 60% of cases).

Exposure assessment for incident hepatitis C infections

Information on exposure assessment was available from four jurisdictions (the Australian Capital Territory, the Northern Territory, Tasmania and Victoria). Injecting drug use was the most common mode of transmission, accounting for 60 per cent of cases in the Northern Territory, 70 per cent of cases in the Australian Capital Territory, 74 per cent of cases in Tasmania and 86 per cent of cases in Victoria. Less common modes of transmission (for example, via tattoos, sexual exposure, iatrogenic exposure) were documented, although multiple exposures were not always recorded in each jurisdiction. In jurisdictions where multiple exposures were recorded, the majority were associated with injecting drug use.

Hepatitis D

Hepatitis D is an unusual virus as it uses the hepatitis B surface antigen in its own replication, and therefore requires co-infection with HBV.[17] Infection can occur concurrently with HBV, or can occur as a superinfection, providing the individual is a HBV carrier.

There were 27 notifications of hepatitis D to the NNDSS in 2000 at a notification rate of 0.2 cases per 100,000 population. Of the 27 notifications, 12 were reported from Victoria, 10 from New South Wales and 5 from Queensland. The majority (85%) of notifications were from males, with the highest rate reported in 30–34 year age group (0.9 cases per 100,000 population).

Gastrointestinal disease

Introduction

Gastrointestinal and foodborne diseases are a major cause of illness in Australia. In 2000, gastrointestinal illness accounted for 21,303 notifications to the NNDSS, which was 23.7 per cent of the total notified diseases. Notifications of foodborne diseases to the NNDSS and notification rates for foodborne diseases in Australia are shown in Tables 11 and 12.

The true prevalence of gastrointestinal disease is not easy to quantify. There is a significant under-reporting in surveillance data especially of milder gastrointestinal disease. Mead et al[18] have estimated that the notified fraction of foodborne disease in the United States of American (USA) varied from 2 per cent to 50 per cent depending on the severity of the disease. In the UK, it was estimated that for every case of infectious intestinal disease notified there were on average 136 cases in the community.[19] This under-reporting varied depending on the pathogen concerned. In addition there are multiple modes of transmission for the organisms that cause gastrointestinal disease (i.e. some pathogens are also transmitted via other routes). This complicates our ability to estimate what proportion of infections are actually transmitted by food. Again, this may vary by disease. The estimated proportion of gastrointestinal disease which is attributable to food ranges from 5 per cent for hepatitis A to 99 per cent for *Listeria*.[18] Surveillance data may also be biased by different levels of reporting of gastrointestinal disease in different age groups, with children and the elderly more likely to be seen by a medical practitioner.

Differences in laboratory testing practices and surveillance methods in States and Territories may also account for the difference in observed notification rates. This is particularly true for diseases such as Shiga-like toxin producing /Verotoxin producing *E. coli* (SLTEC/VTEC), where laboratory diagnosis is difficult. States and Territories also have different reporting requirements for doctors and laboratories, which can make national comparison difficult. In 2000, all Australian States and Territories supplied data to the NNDSS on hepatitis A, haemolytic uraemic syndrome, listeriosis, salmonellosis and typhoid. Data on botulism, campylobacteriosis, hepatitis E, shigellosis, Shiga-like toxin producing /Verotoxin producing *E. coli* (SLTEC/VTEC) and yersiniosis were available from most but not all jurisdictions (Table 1). To overcome some of these difficulties, the CDNA agreed to standardise reportable conditions in each jurisdiction from 1 January 2001.

The National Enteric Pathogen Surveillance Scheme (NEPSS) maintained by the Microbiological Diagnostic Unit, Department of Microbiology and Immunology at the University of Melbourne, provide important surveillance data on bacterial enteric pathogens. NEPSS collects, analysis and disseminates data on human enteric bacterial infections diagnosed in Australia. These pathogens include *Salmonella, Shigella, E. coli, Vibrio, Yersinia, Plesiomonas, Aeromonas and Campylobacter* spp. NEPSS holds more than 140,000 records of human infections and 78,000 records of isolates from non-human sources such as food and animals. NEPSS monitors trends in the epidemiology of human enteric bacterial infections, identifies outbreaks (particularly when geographically and/or temporally dispersed), identifies potential sources of pathogens causing human disease and monitors antibiotic resistance among bacterial enteric pathogens.

Botulism

There have been no cases of foodborne botulism reported to the NNDSS since the inception of the system in 1991. There were 2 cases of infant botulism reported in 2000, one case each from Victoria and the Northern Territory, both in children aged less than one year.

Infant (or intestinal) botulism cases arise from ingestion of *Clostridium botulinum* spores, which germinate in the intestine. Spores are widespread and are found in soil and dust as well as in foods such as honey. Symptoms include acute flaccid paralysis (AFP) thus botulism is often identified and reported in the differential diagnosis of AFP, which is an important part of polio surveillance in Australia.

Table 11. Trends in notifications of foodborne disease, Australia, 1991 to 2000*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Botulism	0	0	0	0	0	0	0	1	0	2
Campylobacteriosis	8,813	9,221	8,070	10,069	11,240	12,109	11,752	13,433	12,657	13,595
Haemolytic uraemic syndrome	–	–	–	–	–	–	–	–	23	15
Hepatitis A	2,234	2,118	1,951	1,912	1,621	2,104	3,044	2,497	1,554	812
Hepatitis E	–	–	–	–	–	–	–	–	9	10
Listeriosis	49	45	49	36	59	70	73	55	64	67
Salmonellosis	5,496	4,416	4,505	5,199	5,873	5,786	7,054	7,613	7,147	6,151
Shigellosis	913	716	691	740	731	680	795	599	547	487
SLTEC,VTEC	–	–	–	–	–	–	–	–	47	33
Typhoid	93	41	80	66	70	80	79	60	68	58
Yersiniosis	329	352	370	311	207	215	207	160	125	73

* All jurisdictions reported for all years with the following exceptions

Botulism not reported from Western Australia.

Campylobacteriosis not reported from New South Wales.

Hepatitis E not reported from Western Australia.

Listeriosis not reported from South Australia (1991) or Northern Territory (1991 to 1993).

Shigellosis not reported from New South Wales.

SLTEC/VTEC not reported from Queensland or Western Australia.

Yersiniosis not reported from New South Wales (1991 to 2000) or Australian Capital Territory (1991 to 1992).

Table 12. Trends in notification rates of foodborne disease, Australia, 1991 to 2000* (rate per 100,000 population)

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 0.1	0.0	< 0.1
Campylobacteriosis	77.4	80.0	69.2	85.4	94.1	100.1	95.9	108.4	100.8	107.1
Haemolytic uraemic syndrome	–	–	–	–	–	–	–	–	0.1	0.1
Hepatitis A	12.9	12.1	11.0	10.7	9.0	11.5	16.4	13.3	8.2	4.2
Hepatitis E	–	–	–	–	–	–	–	–	0.1	0.1
Listeriosis	0.3	0.3	0.3	0.2	0.3	0.4	0.4	0.3	0.3	0.3
Salmonellosis	31.8	25.2	25.5	29.1	32.5	31.6	38.1	40.7	37.7	32.1
Shigellosis	8.0	6.2	5.9	6.3	6.1	5.6	6.5	4.8	4.4	3.8
SLTEC,VTEC	–	–	–	–	–	–	–	–	0.3	0.2
Typhoid	0.5	0.2	0.5	0.4	0.4	0.4	0.4	0.3	0.4	0.3
Yersiniosis	3.0	3.1	3.2	2.6	1.7	1.8	1.7	1.3	1.0	0.6

* All jurisdictions reported for all years with the following exceptions

Botulism not reported from Western Australia.

Campylobacteriosis not reported from New South Wales.

Hepatitis E not reported from Western Australia.

Listeriosis not reported from South Australia (1991) or Northern Territory (1991 to 1993).

Shigellosis not reported from New South Wales.

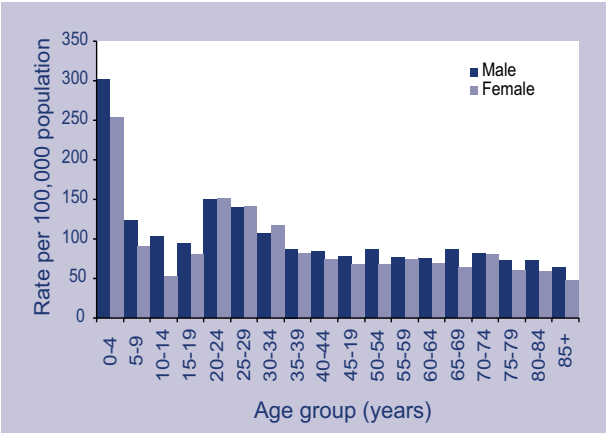
SLTEC/VTEC not reported from Queensland or Western Australia.

Yersiniosis not reported from New South Wales (1991 to 2000) or Australian Capital Territory (1991 to 1992).

Campylobacteriosis

The rate of campylobacteriosis has steadily increased in Australia since reporting to the NNDSS began in 1991. At 107.1 cases per 100,000 population in 2000, campylobacteriosis is reported more than 3 times as frequently as salmonellosis. Campylobacteriosis is now the most common cause of bacterial gastroenteritis in many industrialised countries.[20] The apparent increase in *Campylobacter* in recent decades reflects the easier laboratory identification due to the development of selective media in the 1980s and polymerase chain reaction (PCR) for *Campylobacter* in the 1990s. Researchers believe that chicken accounts for between 50 and 70 per cent of *Campylobacter* infections and it is now recognised that chicken flocks are almost universally infected. Under cooking of chicken or contamination of other foods with juices from uncooked chicken may be the major routes of infection. Consumption of other kinds of foods and contact with animals are also recognised transmission routes. A joint Food and Agriculture Organization of the United Nations (FAO) and WHO expert consultation on risk assessment of microbiological hazards in foods is currently assessing hazard identification and characterisation and exposure to *Campylobacter* spp. from broiler chickens.[21] *Campylobacter* infections cause an acute self-limiting gastroenteritis, although a significant proportion of infections may be asymptomatic. *C. jejuni* infection appears to be an important risk factor in the development of Guillain-Barré syndrome (GBS). The risk of developing GBS is 100-fold higher following a symptomatic episode of *C. jejuni* infection.[22]

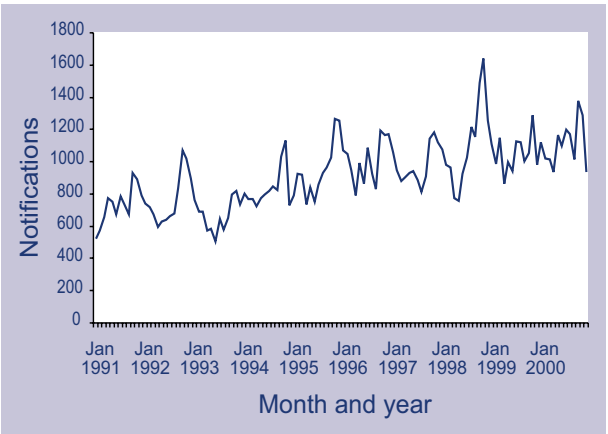
Figure 9. Notification rates of campylobacteriosis, Australia, 2000, by age and sex



There were 13,595 cases of campylobacteriosis notified to the NNDSS with symptom onset in 2000, which was an increase of 7.4 per cent from the 12,657 cases notified in 1999. Reports were received from every jurisdiction except New South Wales where cases are included in the categories 'foodborne disease' or 'gastroenteritis in an institution'. *Campylobacter* species are the most common cause of gastrointestinal disease notified to the NNDSS. Despite this there are very few outbreaks detected due to the lack of a robust typing method. During 2000, Tasmania reported a small outbreak affecting 3 students in a student residential setting, but no food source was identified.[23] Another cluster of cases in South Australia identified an association between consumption of raw milk and *Campylobacter* infection.[24] Overall, the highest age-specific rate of campylobacteriosis was 281 cases per 100,000 population in 0–4 year-old children (Figure 9). The male to female ratio was 1.2:1.

The highest notification rate was in South Australia (125.7 cases per 100,000 population) and the lowest rate was in the Northern Territory (93.1 cases per 100,000 population). Reports of campylobacteriosis were more frequent in Spring and Summer (Figure 10).

Figure 10. Trends in notifications of campylobacteriosis, Australia, 1991 to 2000, by month of onset



Hepatitis A

Overall hepatitis A in Australia has declined significantly over the past 30 years although levels in Indigenous communities have remained high. National notifications of hepatitis A have declined considerably since the peak rate recorded in the NNDSS in 1997 (16.4 cases per 100,000 population). The impact of control measures, including vaccination of susceptible populations and improvements in hygiene, have clearly had an impact on the incidence of hepatitis A in Australia (Tables 11 and 12).

In Australia, three patterns of hepatitis A epidemiology are recognised.[25] Firstly, there are large, slowly evolving community outbreaks, occurring at intervals of 5 years. Community outbreaks affect groups of people prone to infection, who are susceptible to intense levels of transmission within their groups. Infected individuals are also a potential source for infection for the wider community. Settings for community outbreaks include child care centres and pre-schools, communities of men who have sex with men, schools and residential facilities for the intellectually disabled and communities of injecting drug users. Secondly, sporadic cases of hepatitis A may arise in people without obvious risk factors although some may be associated with overseas travel or travel to Indigenous communities. Thirdly, point-source outbreaks of hepatitis A may arise from contaminated food or water or an infected food-handler. These are relatively rare in Australia. The last major point-source outbreak of hepatitis A arose from contaminated oysters in New South Wales in 1997.[26]

Vaccination against hepatitis A in Australia is recommended for travellers to endemic areas, visitors to remote Indigenous communities, childcare and pre-school personnel, the intellectually disabled and their carers, healthcare workers, sewerage workers, men who have sex with men, injecting drug users, patients with chronic liver disease (or with hepatitis C), haemophiliacs who may have received pooled plasma concentrates, and food handlers.[25]

There were 812 cases of hepatitis A notified to the NNDSS with symptom onset in 2000, which was a decrease of 48 per cent from the 1,554 cases notified in 1999 (Figure 11). The highest age-specific rate was in the 25–29 year age group (8.4 cases per 100,000 population) (Figure 12) and the male to female ratio was 1.5:1.

Figure 11. Trends in notification rates of hepatitis A, Australia, 1994 to 2000, by year of onset

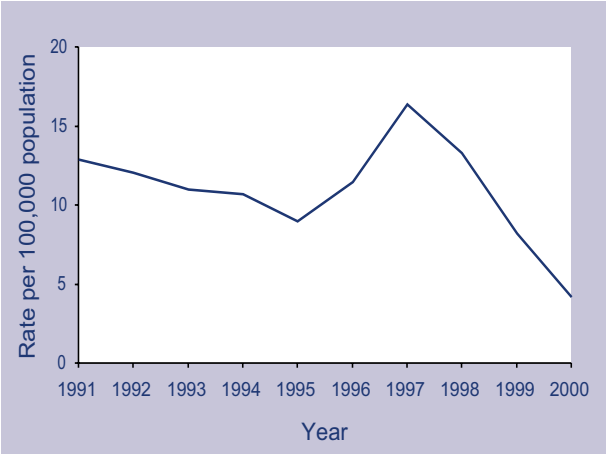
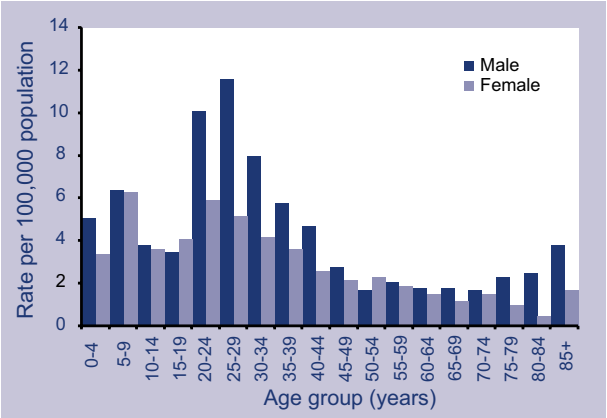


Figure 12. Notification rates of hepatitis A, Australia, 2000, by age and sex



The highest notification rate was in the Northern Territory (22.5 cases per 100,000 population) and the lowest rate was in Tasmania (0.6 cases per 100,000 population). There has been a marked decline in notifications of hepatitis A throughout north Queensland since hepatitis A vaccination was introduced for Indigenous children in the region in early 1999 (J. Hanna, personal communication).

Hepatitis E

Hepatitis E is endemic in many countries of Asia but is rarely reported in Australia. Women in the third trimester of pregnancy are susceptible to fulminant hepatitis E disease, with a case fatality rate as high as 20 per cent.[27] Outbreaks in South Asia pose a risk to Australian travellers to these regions. There were 10 cases of hepatitis E notified to the NNDSS in 2000, 9 from New South Wales and one from Tasmania. Of the 10 cases, one was associated with travel to India. There was no travel history available for the remaining cases.

Listeriosis

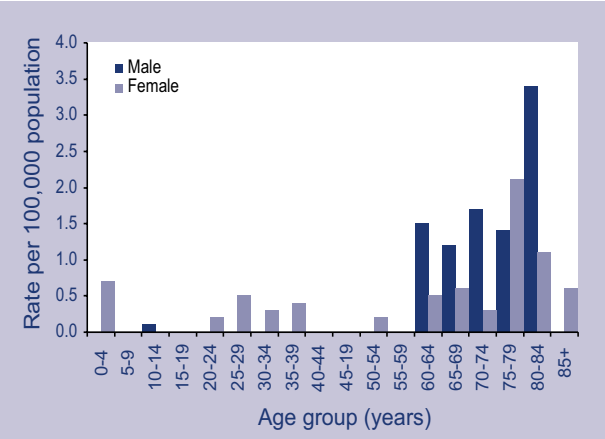
Listeriosis is a serious but relatively rare foodborne disease to which neonates, pregnant women, the immuno-compromised and the elderly are particularly susceptible. In pregnant women the infection can be passed to the foetus. Infants may be stillborn, born with septicaemia or develop meningitis in the neonatal period. Clusters of cases of listeriosis have been noted in hospitals, nurseries and aged care facilities.[27]

The notification rate of listeriosis in Australia has remained steady over the past 10 years (Tables 11 and 12). As food preparation practices change a variety of products have been found to be vehicles for *Listeria* spp. The Australian Quarantine Inspection Service (AQIS) and the Australia New Zealand Food Authority are responsible for the laboratory testing of food imported into Australia. Between 1995 and 1998, *Listeria* contamination of foods such as smoked fish and soft cheeses, constituted the most frequent findings.[28]

Listeriosis was notifiable in all Australian jurisdictions in 2000; however practices varied as to whether a materno-fetal case constituted one or two cases. There were 67 cases of listeriosis reported to the NNDSS in 2000, which was a similar number to previous years (Table 11). The highest age-specific rate of listeriosis was 2.0 cases per 100,000 population in the 80–84 year age group (Figure 13) and the male to female ratio was 0.7:1.

The highest notification rate was in the Northern Territory (1.5 cases per 100,000 population) There were no cases reported from the Australian Capital Territory. There was no clustering of cases of listeriosis. Five materno-foetal pairs were reported which resulted in three foetal deaths.

Figure 13. Notification rates of listeriosis, Australia, 2000, by age and sex

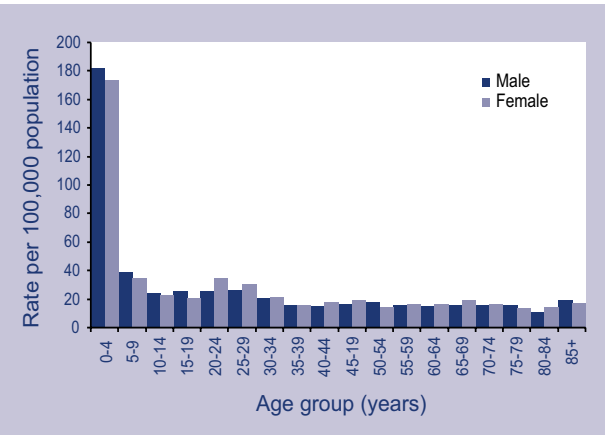


Salmonellosis (excluding typhoid)

Salmonellosis remains the second most common cause of gastroenteritis in Australia and the most important cause of bacterial foodborne disease outbreaks. In 2000, rates of *Salmonella* notifications fell for the second year running, to 32.1 cases per 100,000 population.

There were 6,151 cases of salmonellosis reported to the NNDSS with symptom onset in 2000, which was a decrease of 13.9 per cent from the 7,147 cases reported in 1999 (Table 11). The highest age-specific rate was 179.2 cases per 100,000 population in 0–4 year-old children (Figure 14) and the male to female ratio was 1:1. The highest notification rate was in the Northern Territory (155.5 cases per 100,000 population) and the lowest rate was reported from Victoria (21.4 cases per 100,000 population).

Figure 14. Notification rates of salmonellosis, Australia, 2000, by age and sex



The Kimberley Statistical Division in Western Australia had the highest rate of salmonellosis, in excess of 399 cases per 100,000 population, which was comparable to previous years (Map 2). Reports of salmonellosis were greatest in the months of January to March (Figure 15).

Map 2. Notification rates of salmonellosis, Australia, 2000, by Statistical Division of residence

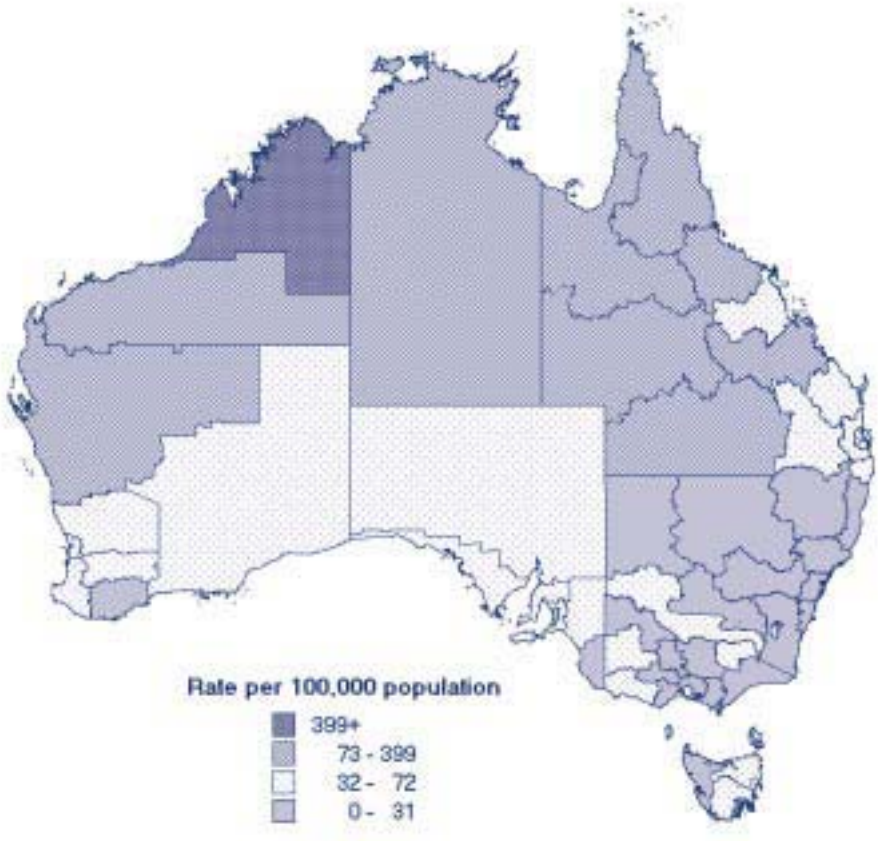
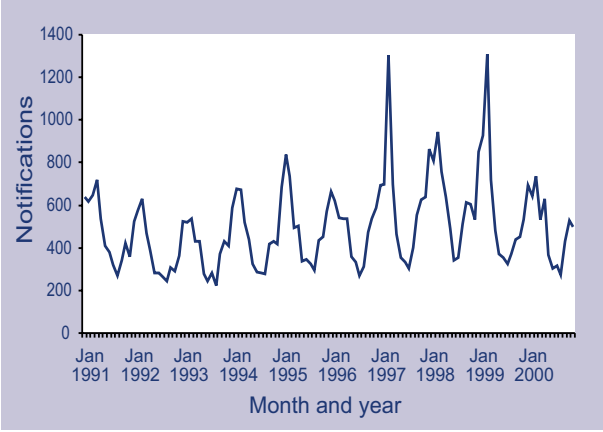


Figure 15. Trends in notifications of salmonellosis, Australia, 1991 to 2000, by month of onset



The NEPSS reported 6,121 cases of *Salmonella* in 2000.[29] The top 10 *Salmonella* infections reported to NEPSS are shown in Table 13.

NEPSS recorded 19 outbreaks of *Salmonella* in Australia in 2000. One outbreak, which was S. Paratyphi B bv Java RDNC/AUS2 associated with fish tanks, was Australia-wide while all others were confined to a single jurisdiction. Six outbreaks were recorded in South Australia, three each in New South Wales and Western Australia, two each in Queensland and Victoria and one each in the Australian Capital Territory and the Northern Territory. No *Salmonella* outbreaks were reported from Tasmania. The largest outbreak was of *Salmonella* Typhimurium PT135 in Western Australia. This outbreak continued through the year with peaks of reports in February, April and May. All age groups were affected but no food vehicle or common source was identified.

South Australia reported an outbreak of *Salmonella* Typhimurium PT44 in October 2000.[30] Ten cases were associated with eating at an Adelaide restaurant and although an investigation found lapses in hygienic practices, no food source for this outbreak was identified.

An outbreak of *Salmonella* Mgulani involving 42 laboratory-confirmed cases in December 1999 to January 2000 occurred in New South Wales.[31] No environmental or food source was identified and DNA 'fingerprinting' suggested the strains had been circulating in Australia for some years.

Salmonella Enteriditis was the most common salmonella infection among travellers returning from overseas in 2000. Of 142 cases, there were 85 cases of S. Enteriditis phage type 4.

Table 13. Top 10 isolates of *Salmonella*, Australia, 2000 (data from the National Enteric Pathogen Surveillance Scheme)*

Isolate	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust	% of total
S. Typhimurium PT 135†	10	148	2	143	6	6	69	221	**605**	**9.9**
S. Typhimurium PT 9†	32	187	3	57	24	22	178	47	**550**	**9.0**
S. Virchow†	8	56	4	256	16	2	110	6	**458**	**7.5**
S. Saintpaul†	6	39	20	186	26	2	15	47	**341**	**5.6**
S. Enteriditis	5	55	5	72	14	9	32	56	**248**	**4.0**
S. Typhimurium PT 64	1	101	1	19	16	1	77	10	**226**	**3.7**
S. Birkenhead†	1	77	0	100	4	1	13	0	**196**	**3.2**
S. Muenchen†	2	21	10	40	11	0	7	29	**120**	**2.0**
S. Chester	0	13	17	38	18	0	5	17	**108**	**1.8**
S. Bovismorbificans	0	45	2	13	7	1	27	10	**105**	**1.7**
Others	0	0	0	0	0	0	0	0	**3,164**	**51.6**
Total	**65**	**742**	**64**	**924**	**142**	**44**	**533**	**443**	**2,957**	**48.3**

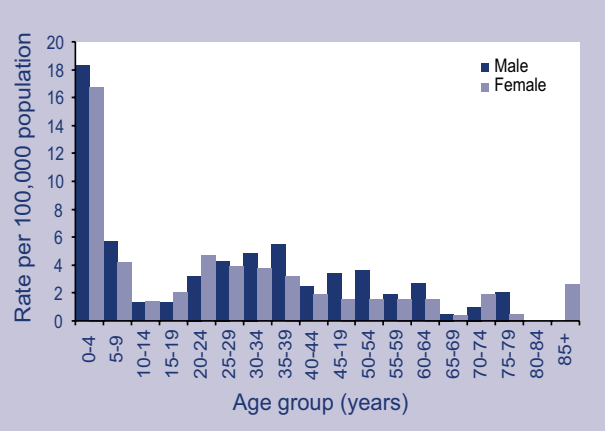
* Adapted from NEPSS annual report, 2000

† Associated with an identified outbreak

Shigellosis

In 2000, the NNDSS notification rate of shigellosis fell for the third year running, and was the lowest rate recorded since the surveillance system began. There were 487 cases of shigellosis reported to the NNDSS with onset of symptoms in 2000, which was an 11 per cent decrease from 547 cases reported in 1999. The highest age-specific rate was 18 cases per 100,000 population in 0–4 year-old children (Figure 16) and the male to female ratio was 1.2:1.

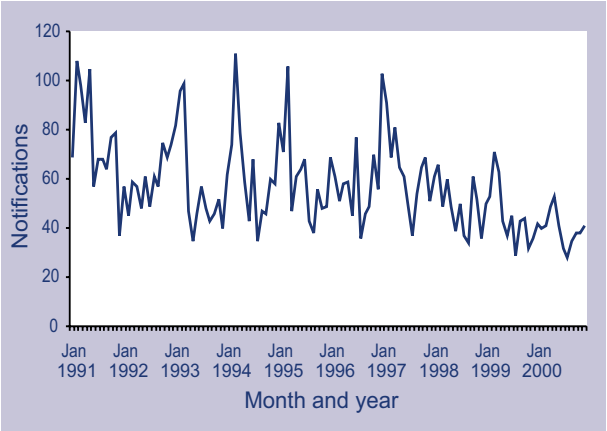
Figure 16. Notification rates of shigellosis, Australia, 2000, by age and sex



Reports were received from every jurisdiction except New South Wales where cases are included in the categories 'foodborne disease' or 'gastroenteritis in an institution'. The highest notification rate was in the Northern Territory (58.3 cases per 100,000 population) and the lowest rate was reported from Tasmania (0.4 cases per 100,000 population). Cases were more commonly notified during the months of January to April (Figure 17).

Reports of *Shigella* to the NEPSS identified 147 cases of *S. sonnei* biotype g among gay men in inner city Sydney. This outbreak was associated with casual sex at sex-on-premises-venues.[32] (O'Sullivan et al Communicable Diseases Control Conference 2001, Abstract No.31)

Figure 17. Trends in notifications of shigellosis, Australia, 1991 to 2000, by month of onset



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

There were 33 cases of STEC/VTEC reported to the NNDSS with symptom onset in 2000, which was a 24 per cent decrease from 43 cases reported in 1999. SLTEC/VTEC was a notifiable disease in 2000 in all jurisdictions except Queensland and Western Australia. In 2000, all of the 33 cases of SLTEC/VTEC were reported from South Australia. This reflects the practice in South Australia of screening faecal specimens from all cases of bloody diarrhoea for toxin genes, by PCR.

The highest age-specific rate was 0.9 cases per 100,000 population in the 80–84 year age group and the male to female ratio was 1.8:1.

Haemolytic uraemic syndrome

Infections with SLTEC/VTEC have the potential to cause severe and life-threatening illness including haemolytic uraemic syndrome (HUS). Haemolytic uraemic syndrome will generally be diagnosed on the basis of microangiopathic haemolytic anaemia, acute renal impairment and thrombocytopaenia (reduced platelet counts). Children aged less than 5 years are at increased risk of haemolytic uraemic syndrome. In an outbreak of HUS associated with the consumption of mettwurst in South Australia in 1994/1995 there was one death and 18 children required dialysis.[33]

There were 15 cases of HUS notified to the NNDSS with symptom onset in 2000 (Table 11). There was no evidence of clustering among HUS cases.

The highest age-specific rate was 0.6 cases per 100,000 population in 0–4 year-old children and the male to female ratio was 1.1:1.

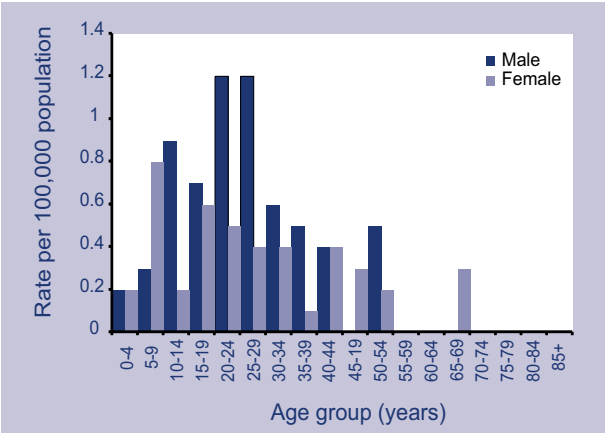
Typhoid

Typhoid notifications in Australia are strongly associated with overseas travel. Since the majority of cases are imported, the education of overseas travellers, especially young people travelling in Asia, is the most important public health action to control typhoid in Australia.

There were 58 cases of typhoid reported to the NNDSS with symptom onset in 2000, a reduction of nearly 15 per cent compared with the 68 cases reported in 1999. Of the 56 isolations of S. Typhi by NEPSS in 2000, all but 2 cases had a history of travel (mostly in Asia) prior to onset.

The highest age-specific rate of typhoid was 0.7 cases per 100,000 population in the 20–29 year age group (Figure 18) and the male to female ratio was 1.5:1. The highest notification rate was in Western Australia (0.6 cases per 100,000 population).

Figure 18. Notification rates of typhoid, Australia, 2000, by age and sex



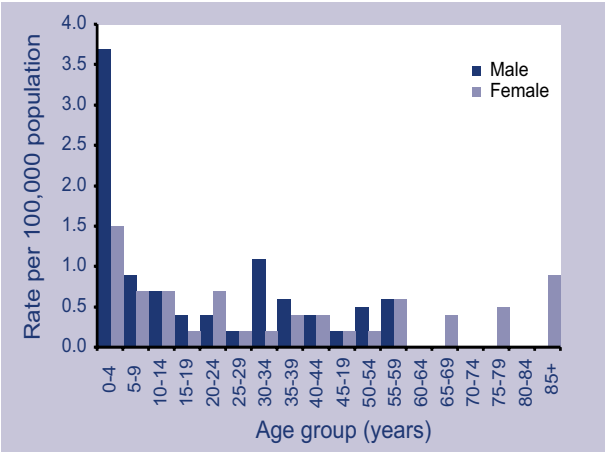
Yersiniosis

The notification rate for yersiniosis has fallen over the 10-year period from 1991 to 2000. These declines are a worldwide phenomenon and may relate to changes in laboratory testing of faeces and improvements in animal slaughtering practice (M. Barton, personal communication). The steady decline in the incidence of this disease and a lack of outbreaks lead the CDNA to remove yersiniosis from the national notifiable diseases list in January 2001.

Yersinia enterocolitica, the causative organism of yersiniosis, causes both sporadic cases and disease outbreaks, with pork a frequently incriminated food.[27] Person-to-person transmission has been documented in outbreak settings and direct transmission from dogs to humans has been postulated.

There were 73 cases of yersiniosis reported to the NNDSS with dates of symptom onset in 2000, which was a 42 per cent decrease from the 125 cases reported in 1999. The highest age-specific rate was 2.6 cases per 100,000 population in 0–4 year old children (Figure 19) and the male to female ratio was 1.5:1. Reports were received from every jurisdiction except New South Wales where cases are included in the categories 'foodborne disease' or 'gastroenteritis in an institution'. The highest notification rates were in Queensland (1.7 cases per 100,000 population) and the Northern Territory (1.0 cases per 100,000 population).

Figure 19. Notification rates of yersiniosis, Australia, 2000, by age and sex



Policy initiatives in foodborne disease surveillance and control in 2000

A Food Policy Unit was formed within the Commonwealth Department of Health and Ageing in 2000. The Unit aims to coordinate policy development with a focus on food safety; strengthening the evidence base for decision making; fostering collaboration between government, consumers and the food industry; and promoting nationally consistent policy regulation and action.[34]

In the latter part of 2000, the Commonwealth Department of Health and Ageing established and funded a collaborative network called 'OzFoodNet' to enhance surveillance mechanisms for foodborne disease across Australia. The aims of OzFoodNet are to:

- estimate the incidence of foodborne disease in Australia;
- learn more about the causes and determinants of foodborne disease;
- identify risky practices associated with food preparation and handling;
- train foodborne disease epidemiologists.

The work of OzFoodNet will improve surveillance of foodborne disease across Australia. Collaborators of OzFoodNet include State and Territory health authorities, the National Centre for Epidemiology and Population Health, the Public Health Laboratory Network and national government agencies.[35]

Quarantinable diseases

In Australia, the human diseases proclaimed to be quarantinable under the *Quarantine Act 1908* are cholera, plague, rabies, yellow fever, and four viral haemorrhagic fevers (Ebola, Marburg, Lassa and Crimean-Congo). Cholera, plague, yellow fever and the viral haemorrhagic fevers are of international public health significance with mandatory reporting to the WHO under international health regulations (http://www.who.int/m/topics/international_health_regulations/en/index.html). Rabies is a disease of both human and animal quarantine importance in Australia. All States and Territories are required by law to notify the quarantinable diseases to the NNDSS.

The only case of quarantinable disease reported in Australia in 2000 was a case of cholera (*V. cholerae 0139*). The disease was acquired in Bali, Indonesia. The continued reporting of cholera in travellers returning from foreign countries demonstrates the importance of travellers consuming safe food and drink in areas where cholera is known to occur, including many Asian and South Pacific countries.

Although no cases of rabies or yellow fever were reported in Australia, 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 Website at: http://www.health.gov.au/pubhlth/strateg/quaranti/index.htm.

Sexually transmitted infections

A number of systems are involved in sexually transmitted infection (STI) surveillance in Australia, including the NNDSS, the Laboratory Virology and Serology Reporting Scheme (LabVISE) and specialist laboratory networks such as the Australian Gonococcal Surveillance Programme (AGSP). 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.

In 2000, STI reports accounted for 24,319 notifications to the NNDSS, which was 27 per cent of all notifications.

STIs reported to the NNDSS in 2000 included chancroid, chlamydial infection, donovanosis, gonococcal infection, lymphogranuloma venereum and syphilis. Laboratory diagnoses of chlamydia and syphilis were also reported via LabVISE. Other STIs not subject to national surveillance through the NNDSS or via LabVISE include genital herpes (herpes simplex virus type I and II), genital warts (human papilloma virus, several types), trichomoniasis and parasitic infestations such as pubic lice and scabies.

The trends in the number and rates of STI notifications reported to the NNDSS between 1991 and 2000 are shown in Tables 14 and 15. Notification rates for chancroid, lymphogranuloma venereum and syphilis remained relatively stable over the decade. The number of donovanosis notifications decreased over time, while increased numbers of chlamydia and gonococcal infections were reported. Some of the increases may be due to higher levels of infections. Changes in surveillance methods and laboratory tests (particularly the use of nucleic acid testing) may also account for some of the observed increases.

Table 14. Trends in notifications of sexually transmitted infections, Australia, 1991 to 2000*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Chancroid	1	4	0	0	2	1	1	1	0	0
Chlamydial infection	–	–	–	6,153	6,407	8,366	9,239	10,927	14,045	16,866
Donovanosis	72	80	71	121	87	51	49	31	17	12
Gonococcal infection	2,705	2,889	2,811	2,968	3,308	4,144	4,684	5,469	5,644	5,686
Lymphogranuloma venereum	0	3	1	2	1	0	0	0	0	0
Syphilis	1,974	2,683	2,260	2,275	1,735	1,449	1,296	1,683	1,844	1,755

* All jurisdictions reported for all years with the following exceptions:
Chlamydial infection not reported from New South Wales (1994 to 1998).
Donovanosis not reported from New South Wales or South Australia (all years) or Tasmania (1991 to 1992).
Lymphogranuloma venereum not reported from Western Australia.

Table 15. Trends in notification rates of sexually transmitted infections, Australia, 1991 to 2000* (rate per 100,000 population)

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Chancroid	< 0.1	< 0.1	0.0	0.0	< 0.1	< 0.1	< 0.1	< 0.1	0.0	0.0
Chlamydial infection	–	–	–	52.2	53.7	69.1	75.4	88.2	74.1	88.0
Donovanosis	0.8	0.8	0.7	1.2	0.8	0.5	0.5	0.3	0.2	0.1
Gonococcal infection	15.7	16.5	15.9	16.6	18.3	22.6	25.3	29.2	29.8	29.7
Lymphogranuloma venereum	0.0	< 0.1	< 0.1	< 0.1	< 0.1	0.0	0.0	0.0	0.0	0.0
Syphilis	11.4	15.3	12.8	12.7	9.6	7.9	7.0	9.0	9.7	9.2

* All jurisdictions reported for all years with the following exceptions:
Chlamydial infection not reported from New South Wales (1994 to 1998).
Donovanosis not reported from New South Wales or South Australia (all years) or Tasmania (1991 to 1992).
Lymphogranuloma venereum not reported from Western Australia.

Chancroid

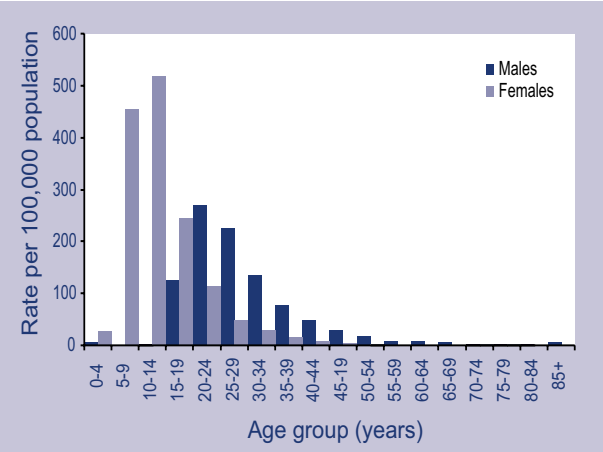
Cases of chancroid (a bacterial infection causing genital ulcers) have rarely been reported to the NNDSS since 1991. No cases of chancroid were reported in Australia in 2000, and in 2001 this disease was removed from the list of nationally notifiable diseases.

Chlamydial infection

Chlamydial infections were the most commonly reported STI and the second most commonly reported notifiable disease in Australia in 2000. In this year 16,866 notifications of chlamydial infection were reported, an increase on the 14,045 cases reported in 1999 (Table 14). There were 81 cases reported in children aged less than 10 years. Notifications reported in young children may be cases of chlamydial conjunctivitis. In 2000, Queensland had a campaign of screening for chlamydial infections, including PCR testing of samples from young women and Indigenous people.

The notification rate for chlamydial infections in 2000 was 88 cases per 100,000 population, while in 1999 the rate was 74.1 cases per 100,000 population. This reflects an upward trend in the number of syphilis notifications reported to the NNDSS since 1997. In 2000, the male to female ratio was 0.7:1. In both males and females the highest rate of disease was recorded for the 20–24 year age group (Figure 20). High rates of notification were reported from northern Australia (including the Northern Territory, Western Australia and Queensland), with rates over 490 cases per 100,000 population in the Northern Territory in 2000 (Map 3).

Figure 20. Notification rates of chlamydia, Australia, 2000, by age and sex



Some important surveillance issues must be taken into account when analysing the trends in chlamydia notification rates. Firstly, in New South Wales, reporting of genital chlamydial infection commenced in September 1998, so that the reporting of this infection was national for the first time in 1999. Secondly, chlamydial infections may be under-reported because of the high proportion of asymptomatic infections, particularly among women.[27] The introduction of screening programs can have a marked effect on notification rates over time. Thirdly, the use of nucleic acid tests for chlamydia may also explain increases in notifications.

Based on NNDSS data, the NCHECR reported rates of chlamydial disease in Indigenous Australians.[36] Using data from the Northern Territory, South Australia and Western Australia (the only jurisdictions to report Indigenous status in more than half of notifications), the estimated crude rate of chlamydial infection among Indigenous Australians in 2000 was 1,207 cases per 100,000 population compared with a rate of 95 cases per 100,000 population in non-Indigenous Australians. For these jurisdictions, 831 of notifications did not have Indigenous status reported. Trends in notification rates of chlamydia in Indigenous and non-Indigenous Australians between 1993 and 2000 are shown in Figure 21.

Map 3. Notification rates of chlamydial infection, Australia, 2000, by Statistical Division of residence

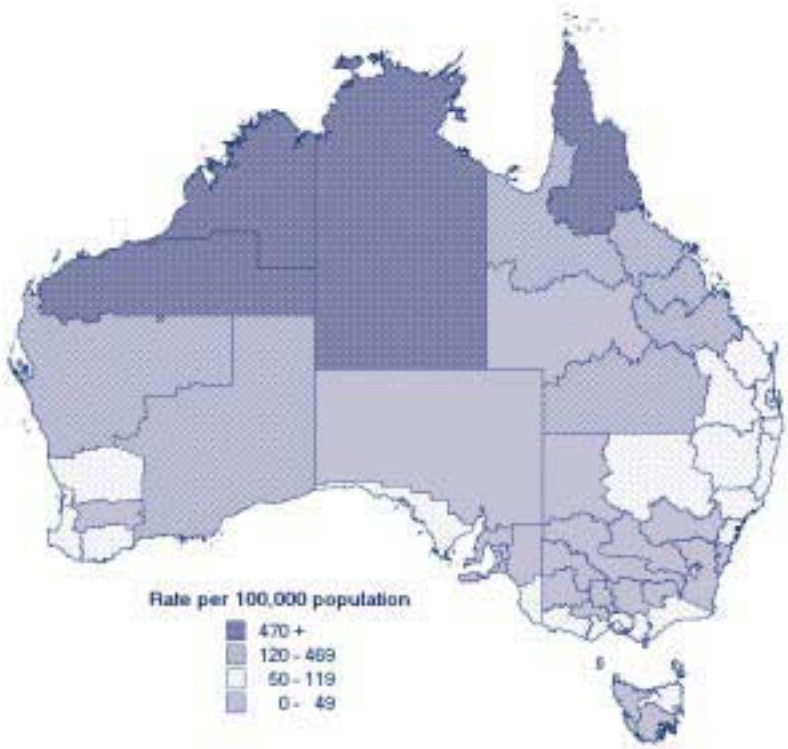
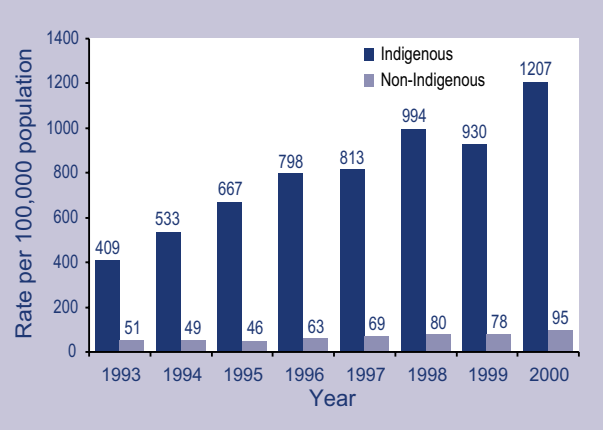


Figure 21. Trends in notification rates of chlamydia, the Northern Territory, South Australia and Western Australia, 1993 to 2000, by Indigenous status



Lymphogranuloma venereum

Lymphogranuloma venereum is a sexually acquired chlamydial infection caused by certain serovars of *Chlamydia trachomatis*. There were no cases of lymphogranuloma venereum reported from any State or Territory in 2000. In Australia, there have only been 7 reports of lymphogranuloma venereum to the NNDSS since 1991 and none since 1995. In 2001 lymphogranuloma venereum was removed from the list of nationally notifiable diseases in Australia.

Donovanosis

Donovanosis is a relatively uncommon STI, characterised by genital ulceration which may develop into a chronic ulcerative disease if untreated. Lesions may be extensive and extra-genital in some cases, and may be associated with secondary bacterial infection. Donovanosis is generally found in tropical countries, and in Australia occurs mostly in Indigenous people in rural and remote communities. The causative organism, formerly known as *Calymmatobacterium granulomatis*, has been redesignated *Klebsiella granulomatis.*

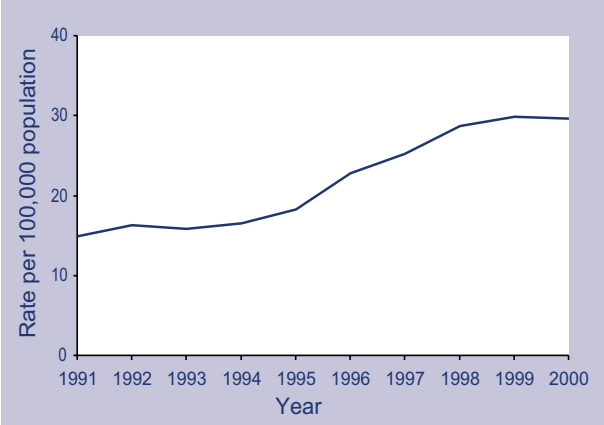
Donovanosis is a notifiable disease in all jurisdictions except New South Wales and South Australia. Notifications of donovanosis have fallen over the past 10 years, and particularly since 1994. Eradication of donovanosis was proposed as part of the 1997 National Indigenous Australians' Sexual Health Strategy, and since then significant advances have been made in the control of this disease in Indigenous Australians.[37] The decreases in notifications are due to earlier diagnosis and treatment (including the introduction of more sensitive and acceptable testing methods and more effective treatment with azithromycin), better education strategies, with a partnership approach encompassing Aboriginal and Torres Strait Islander people.

A total of 12 notifications of donovanosis were received in 2000, including five from the Northern Territory, six from Queensland and one from Western Australia. This represents a decrease from 1999, when 17 notifications were received nationally. In 2000, the highest rate of notifications was in the 25–34 year age range. The male to female ratio was 1:1, a change from 1999, when the male to female ratio was 1:7.

Gonococcal infection

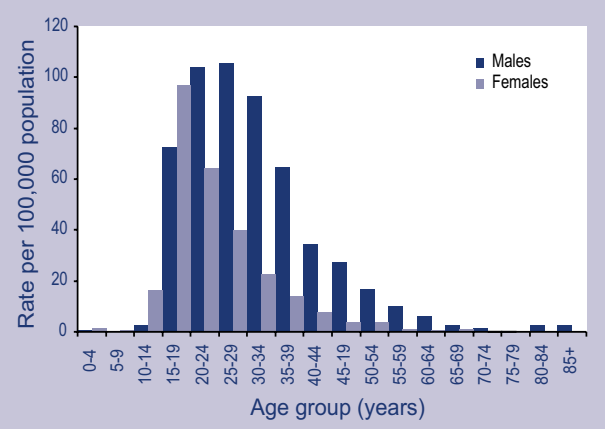
The number of notifications of gonococcal infection in Australia has increased over the past decade. In 2000, a total of 5,686 notifications of gonococcal infection were received nationally (Table 14), similar to the 5,644 received in 1999. The notification rate of gonococcal infection has increased steadily from around 16 cases per 100,000 population in 1993 to around 30 cases per 100,000 population in 1998 to 2000 (Figure 22). This rate remains far below the very high rates recorded in the 1970s and early 1980s, which peaked at 84.4 cases per 100,000 population in 1982.[38] In 2000, Queensland and the Northern Territory had screening programs for gonococcal infection in Indigenous communities.

Figure 22. Trends in notification rates of gonococcal infections, Australia, 1991 to 2000



In 2000, the male to female ratio for gonococcal notifications was 2:1, similar to the ratio in previous years (in 1999 the ratio was 2.2:1). Peak notification rates for females (97 cases per 100,000 population) occurred in the 15–19 year age group. For males the corresponding group was the 25–29 year age group, where the notification rate was 105 cases per 100,000 population (Figure 23). There was a wide geographical variation in the rate of notification of gonococcal infection (Map 4). The highest rates of notification were from the Northern Territory (577 cases per 100,000 population) and from northern Statistical Divisions in Western Australia (Map 4).

Figure 23. Notification rates of gonococcal infection, Australia, 2000, by age and sex

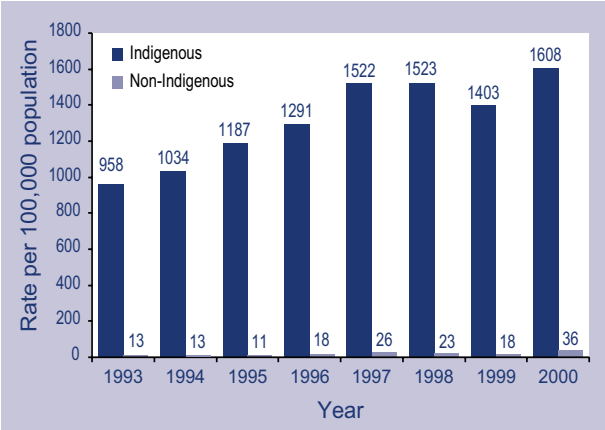


Division of residence

The increase in the number of gonococcal notifications is due in part to an ongoing outbreak of gonorrhoea among men who have sex with men.[39] The proportion of male cases of gonococcal infection associated with homosexual contact was reported in four jurisdictions and varied from 28 per cent in metropolitan Western Australia to 75 per cent in Tasmania. Increased acceptance of non-invasive sample collection for nucleic acid testing may also increase testing rates and encourage opportunistic screening, leading to increased diagnoses. Increased testing may also result from the introduction of sexual health programs and other health promotion activities.

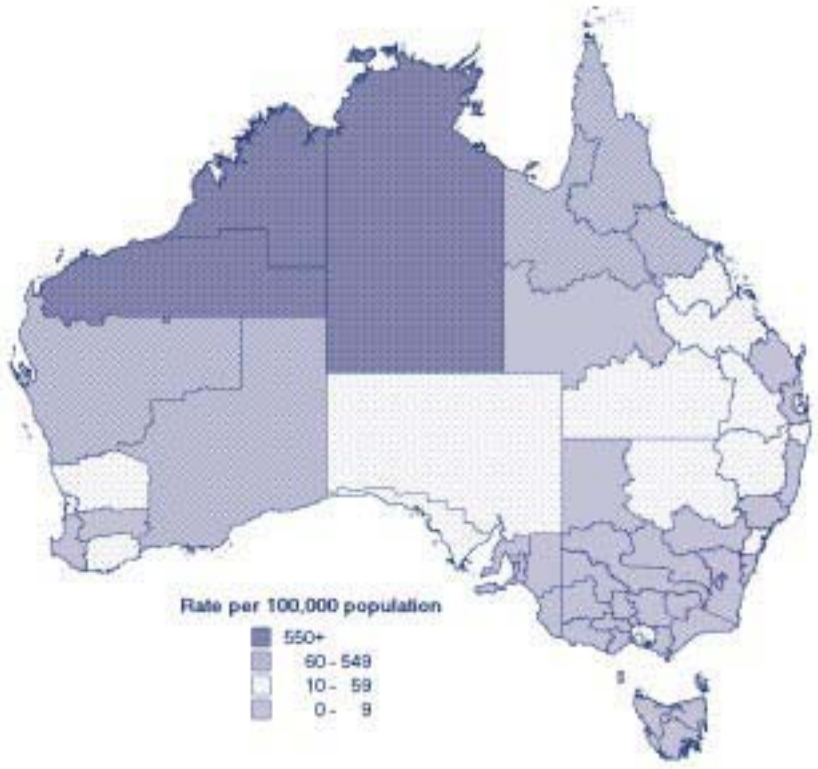
The NCHECR reported rates of gonococcal disease in Indigenous Australians, based on the NNDSS data.[36] These analyses are based on data from the Northern Territory, South Australia and Western Australia, which were the only jurisdictions to report Indigenous status in more than half of notifications. From these three jurisdictions, 11 per cent of notifications did not have Indigenous status recorded. It is estimated that in 2000 the rate of gonococcal infections among Indigenous Australians was 1,608 per 100,000 population, compared with a rate of 36 per 100,000 population in non-Indigenous Australians, largely explaining the geographic variation in notifications of gonococcal infection. This represents an increase in gonococcal notification rates since 1993 for Indigenous Australians (Figure 24). Small increases were also observed in non-Indigenous Australians.

Figure 24. Trends in notification rates of gonococcal infections, the Northern Territory, South Australia and Western Australia, 1993 to 2000, by Indigenous status



The Australian Gonococcal Surveillance Programme is the national laboratory-based surveillance system that documents the antibiotic sensitivity of gonococcal isolates. 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 gonococci to a core group of antibiotics. Surveillance of antibiotic resistance in gonococci is important, as resistance rates can be quite volatile, and it is recommended that a particular treatment regime be discontinued once 5 per cent of isolates are resistant to that agent.

Map 4. Notification rates of gonococcal infections, Australia, 2000, by Statistical Division of residence



A survey of the antibiotic susceptibility of *Neisseria gonorrhoeae* by the AGSP in 2000, has been published.[40] The proportion of *Neisseria gonorrhoea* isolates with antibiotic resistance in the WHO Western Pacific Region for 2000 have been compared.[41] Table 16 shows the trends in antibiotic resistance in Australia between 1998 and 2000. As in previous years, antibiotic susceptibility patterns in 2000 varied significantly between regions. Generally, rates of resistance to penicillin and quinolone groups of antibiotics were higher in urban than in rural areas. Quinolone resistance became more widespread in 2000, with increases in Queensland, Western Australia and South Australia. A high rate of quinolone resistant gonococci isolated from homosexually active men was observed in 1999 in New South Wales and Victoria. High rates were again seen in 2000 in Victoria, but not in New South Wales.

Syphilis

In 2000, all jurisdictions reported syphilis (including primary, secondary and latent syphilis) and congenital syphilis to the NNDSS. A total of 1,755 notifications of syphilis were received in 2000 (Tables 14 and 15) with a rate of 9.2 cases per 100,000 population, consistent the rate in 1999 (1,844 notifications, a rate of 9.7 cases per 100,000 population). The peak notification rate occurred in 1992. Rates have since decreased and been relatively stable since 1998 (Table 15).

In 2000, there was wide geographical variation in the notification rate for syphilis (Table 14, Map 5). The highest rate was described in the Northern Territory (89.5 cases per 100,000 population). The male to female ratio for syphilis notifications was 1.2:1. Notification rates were higher among females in the 25–29 year age group (21.8 cases per 100,000 population). In comparison, the corresponding peak age group for males was the 50–54 year age group, where the rate was 17.4 cases per 100,000 population, although the reporting rates in all age groups for adult males is generally quite similar (Figure 25).

Table 16. Proportion of gonococcal isolates showing antibiotic resistance, Australia, 1998 to 2000

Year	Penicillin (% 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

Map 5. Notification rates of syphilis, Australia, 2000, by Statistical Division of residence

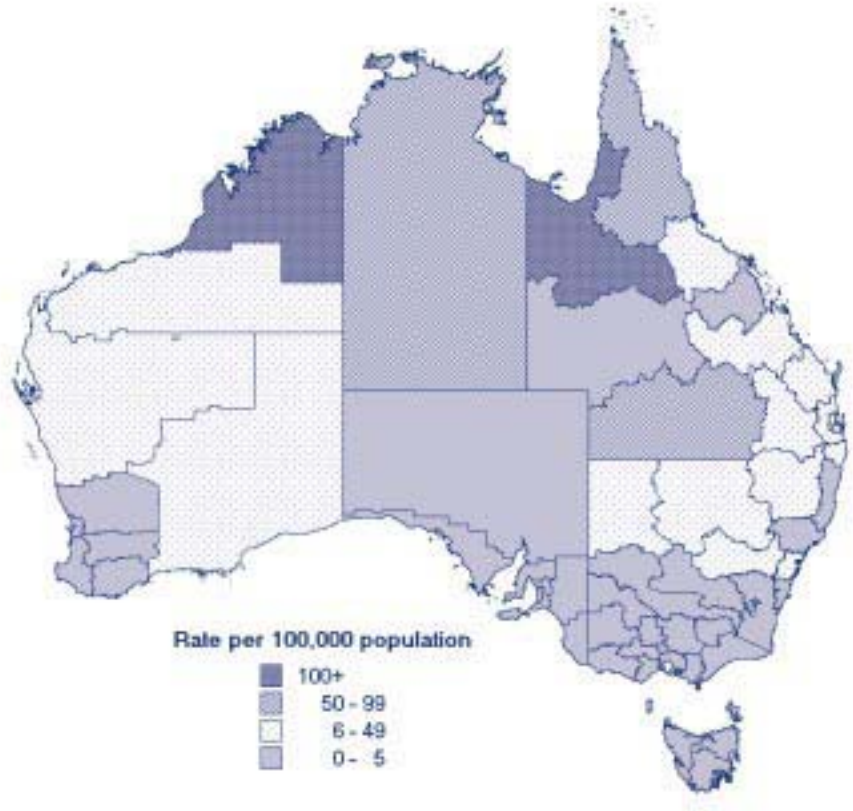
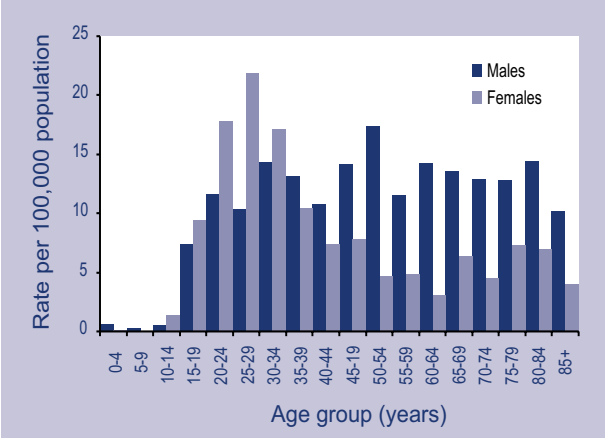


Figure 25. Notification rates of syphilis, Australia, 2000, by age and sex

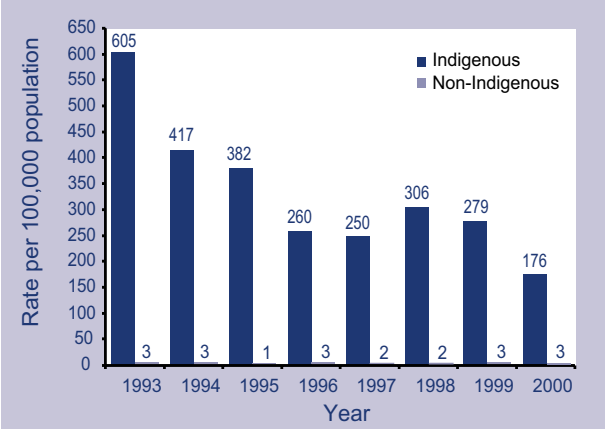


In 2000, there were 5 cases of syphilis reported in the 0–4 year age group, and 2 cases in 5–9 year age group. Of these, 2 cases (one each in New South Wales and Queensland) were confirmed as congenital syphilis.

The NCHECR has reported rates of syphilis in Indigenous Australians based on NNDSS data.[36] These estimates are based on data from the Northern Territory, South Australia and Western Australia, which were the only jurisdictions to report Indigenous status in more than half of notifications. Of the reports from these jurisdictions, only 4 per cent did not have Indigenous status identified. The estimated rate of syphilis among Indigenous Australians in 2000 was 176 per 100,000 population compared with a rate of 2.8 per 100,000 population in non-Indigenous Australians.

Trends in notification rates of syphilis in Indigenous and non-Indigenous Australians from these states and territories between 1993 and 2000 are shown in Figure 26.

Figure 26. Notification rates of syphilis, the Northern Territory, South Australia and Western Australia, 1993 to 2000, by Indigenous status



Vaccine preventable diseases

Introduction

This section summarises the national notification data for diseases targeted by the Australian Standard Childhood Vaccination Schedule in 2000. This includes diphtheria, *Haemophilus influenzae* type b infection, measles, mumps, pertussis, poliomyelitis, rubella and tetanus.

There were 6,617 notifications of vaccine preventable diseases (VPDs) in 2000; 7.4 per cent of the total notifications. Pertussis was by far the most common accounting for 5,942 notifications or 89.8 per cent of all VPD notifications. Notifications of vaccine preventable diseases to the NNDSS and notification rates for vaccine preventable diseases in Australia are shown in Tables 17 and 18.

Table 17. Trends in notifications of vaccine preventable diseases, Australia, 1991 to 2000*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Diphtheria	1	12	0	0	0	0	0	0	0	0
Haemophilus influenzae type b	533	465	370	163	77	49	51	35	40	28
Measles	1,438	1,452	4,693	4,805	1,185	481	838	288	238	107
Mumps	–	–	–	–	156	125	191	182	172	212
Pertussis	343	795	4,413	5,441	4,230	4,545	10,825	5,791	4,417	5,942
Polio	0	0	0	0	0	0	0	0	0	0
Rubella	–	–	4,006	3,488	5,751	2,933	1,387	753	377	322
Tetanus	13	13	10	13	7	3	7	8	2	6

* All jurisdictions reported for all years with the following exceptions:

Haemophilus influenzae type b not reported from Western Australia (1991 to 1993).

Mumps not reported from Queensland (1995,1996, 1999 and 2000).

Rubella not reported from Tasmania (1993 to 1994).

Tetanus not reported from Queensland (1991 to 1993).

Table 18. Trends in notification rates of vaccine preventable diseases, Australia, 1991 to 2000* (rate per 100,000 population)

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Diphtheria	< 0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae type b	3.4	2.9	2.3	0.9	0.4	0.3	0.3	0.2	0.2	0.1
Measles	8.3	8.3	26.6	26.9	6.6	2.6	4.5	1.5	1.3	0.6
Mumps	–	–	–	–	1.1	0.8	1.0	1.0	1.1	1.4
Pertussis	2.0	4.5	25.0	30.5	23.4	24.8	58.4	30.9	23.3	31.0
Polio	0	0	0	0	0	0	0	0	0	0
Rubella	–	–	23.3	20.1	31.8	16.0	7.5	4.0	2.0	1.7
Tetanus	0.1	0.1	0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

* All jurisdictions reported for all years with the following exceptions:

Haemophilus influenzae type b not reported from Western Australia (1991 to 1993).

Mumps not reported from Queensland (1995,1996, 1999 and 2000).

Rubella not reported from Tasmania (1993 to 1994).

Tetanus not reported from Queensland (1991 to 1993).

In 2000, the following changes to the childhood immunisation schedule25 occurred:

New vaccines

New combination vaccines for:

- diphtheria-tetanus-acellular pertussis-hepatitis B (DTPa-hepB); and
- *Haemophilus influenzae* type b — hepatitis B (Hib (PRP-OMP)-hep B),

for all three doses in the primary vaccination schedule. This allowed the introduction of universal hepatitis B vaccination (commencing at birth) without requiring an extra injection.

New schedule

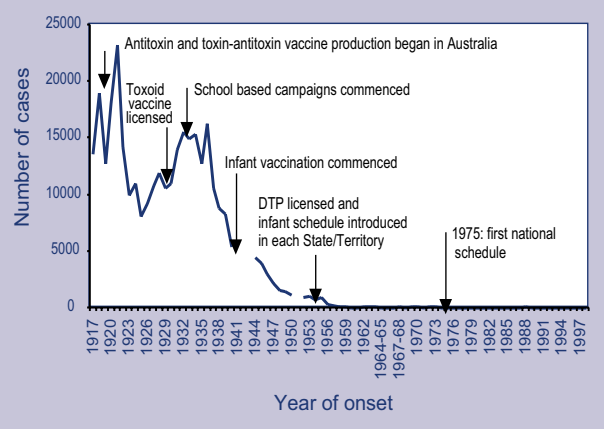
- Two alternative schedules depending on which of the above combination vaccines is used and differing only in the timing of the 4th dose of these vaccines.
- All Australian children recommended to receive the same Hib vaccine (PRP-OMP), which reduces the number of injections and the complexity of the schedule.
- Introduction of universal vaccination for hepatitis B beginning at birth. Infants born to hepatitis B carrier mothers receive hepatitis B immunoglobulin and vaccine at birth. Preadolescent hepatitis B vaccination now recommended at 10–13 years. Booster doses of hepatitis B vaccine no longer recommended.
- Second booster of DTPa now recommended at 4 years, instead of 4–5 years.
- Second dose of MMR now given at 4 years instead of 10–16 years.
- Tetanus and diphtheria boosters no longer recommended every 10 years. A tetanus booster at age 50 is recommended if no boosters have been given within the last 10 years.
- Inactivated poliomyelitis vaccine is an acceptable alternative to live, oral poliomyelitis vaccine (OPV) in the primary vaccination schedule. However, OPV will remain the publicly funded vaccine.
- Influenza vaccine recommended for children with cystic fibrosis, people with severe asthma and pregnant women in the second or third trimester of pregnancy during the influenza season.

The annual report of vaccination coverage estimates for children aged 12 months and the second annual report for children aged 24 months (using data extracted from the Australian Childhood Immunisation Register-ACIR) are also included in this section. A full description of the methodology used for calculating these estimates have been described previously.[42]

Diphtheria

There were no cases of diphtheria notified in 2000. The last known case occurred in 1992 and was notified in 1993. There has been a dramatic decline in the incidence of diphtheria in Australia since the first half of the 20th century (Figure 27).

Figure 27. Trends in notifications of diphtheria, Australia, 1917 to 1998

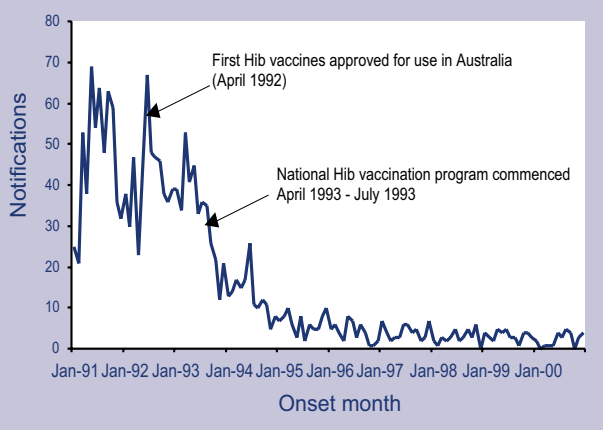


At the height of the 1921 diphtheria outbreak in Australia, there were 23,199 notifications giving a notification rate of 426 cases per 100,000 population.[43] Although diphtheria hasn't been found in Australia since 1992, a recent case in New Zealand[44] and the extensive outbreak in the former states of the Soviet Union in the 1990s[45] highlight the potential for diphtheria to re-emerge.

Haemophilus influenzae type b disease

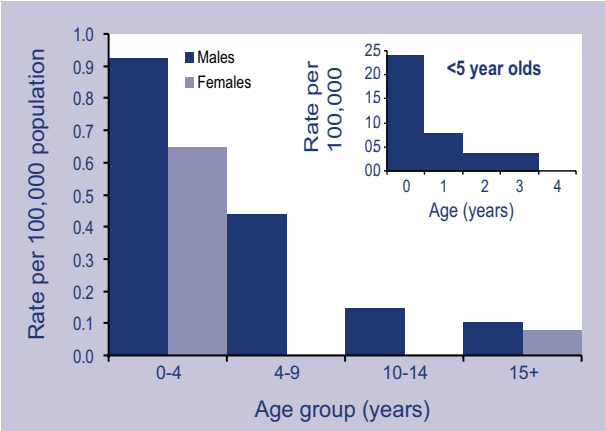
Notifications of *Haemophilus influenzae* type b (Hib) have fallen more than 30-fold since 1991 due to the impact of Hib conjugate vaccines (Figure 28). An assessment of the impact of conjugate vaccines on the global incidence of Hib disease concluded that few vaccines have induced such dramatic declines in disease incidence in such a short time. The prevention of nasopharyngeal colonisation by Hib in vaccinated individuals under most circumstances may explain the dramatic impact on Hib disease.[46]

Figure 28. Trends in notifications of *Haemophilus influenzae* type b infection, Australia, 1991 to 2000



There were 28 notifications of Hib disease in 2000, a rate of 0.1 cases per 100,000 population. This is 30 per cent less than in 1999, and the lowest number of notifications recorded since national surveillance began in 1991. As in previous years most notified cases (10, 36%) were less than 5 years of age. However the number and proportion of all cases in this age group has been declining. The most dramatic decreases have been in those aged less than two years. Infants aged less than 1 year, however, continued to have the highest rate in 2000 (2.4 cases per 100,000 population) (Figure 29). There were more males than females (male:female ratio 1.8:1) notified with Hib disease in 2000.

Figure 29. Notification rates of *Haemophilus influenzae* type b infection, Australia, 2000, by age and sex



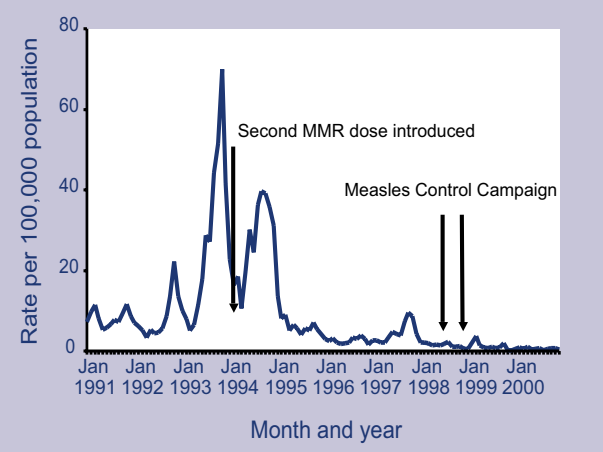
The Northern Territory had the highest notification rate (1 case per 100,000 population, 2 cases) although most cases (12/28) were from Queensland. Two cases occurred in fully vaccinated individuals, seven in partially vaccinated and five in unvaccinated individuals. The vaccination status for the other 14 cases was unknown.

Measles

Measles is the most important cause of vaccine preventable death in the world. In 1998, there were an estimated 30 million measles cases and 880,000 measles-associated deaths worldwide with 85 per cent of deaths occurring in Africa and South East Asia.[47] In recent years there has been a dramatic reduction in measles incidence and endemic measles transmission has been eliminated in a number of countries using a variety of vaccination strategies.[48]

In Australia, measles reports to the NNDSS are at the lowest levels ever recorded (Figure 30). This is the result of a series of successful vaccination initiatives over the past few years. One such initiative was the Australian Measles Control Campaign (August to November 1998) which involved vaccinating 1.7 million primary school children with the Measles-Mumps-Rubella vaccine (MMR) regardless of their past vaccination history. As a result, immunity to measles among these children increased from 84 per cent to 94 per cent.[49]

Figure 30. Trends in notification rates of measles, Australia, 1991 to 2000, by month of onset

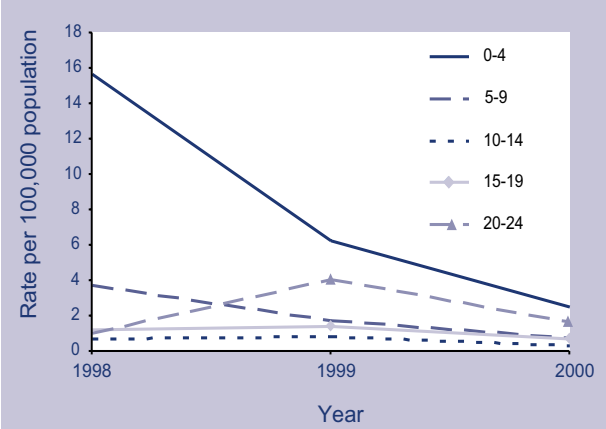


There is evidence that endemic transmission of measles in some parts of Australia is being interrupted. All measles cases in Western Australia in 1999/2000 were imported from overseas or epidemiologically linked to imported cases. (Dowse, Communicable Diseases Control Conference, April 2001, Abstract 58). Using measles virus genotyping, Lambert and colleagues have shown that endemic measles virus strains are no longer circulating in Victoria. Instead, sporadic introduction of imported strains is responsible for limited focal spread. (Lambert, Communicable Diseases Conference, April 2001, Abstract 60). If one accepts that measles elimination should be defined as a situation in which endemic transmission has stopped, sustained transmission cannot occur (because the proportion of susceptible people is sufficiently low), and secondary spread from importations will end naturally without intervention,[50] then Australia may have already achieved measles elimination.

There were 107 cases of measles notified in 2000, a national rate of 0.6 cases per 100,000 population. This is less than half the number reported in 1999 and is the lowest annual rate for Australia since national surveillance began in 1991. In 2000, Western Australia and the Australian Capital Territory began laboratory testing of all notified cases and initiated improved contact tracing. The highest rates of notification were in the Australian Capital Territory (1 case per 100,000 population; 3 cases), Queensland (0.7 cases per 100,000 population; 26 cases) and South Australia (0.7 cases per 100,000 population; 11 cases) (Tables 2 and 3). Twenty-two cases were documented as acquired overseas and 21 cases resulted from seven identified outbreaks in which the index case had acquired measles outside Australia. The source of infection for the remaining 85 cases was not recorded.

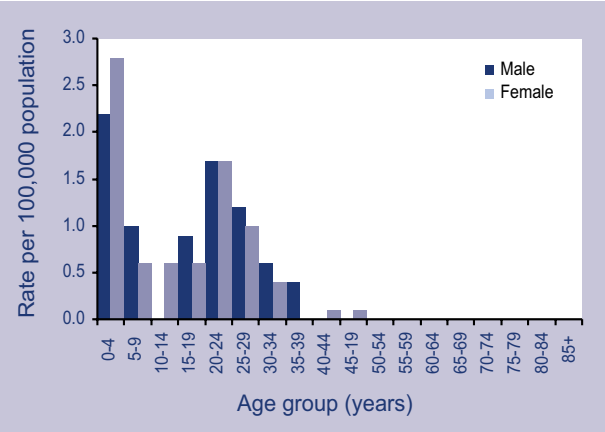
As in recent years, age-specific notification rates were highest for the 0–4 year age group (2.5 cases per 100,000 population) especially those aged less than one year (3.6 cases per 100,000 population) and one year of age (5.2 cases per 100,000 population). Rates for this age group were, however, considerably lower than in the past (Figure 31). Rates for the 5–9 year age group (0.8 cases per 100,000 population) were also the lowest on record.

Figure 31. Trends in notification rates of measles, Australia, 1998 to 2000, by age group



The 20–24 year age group had the second highest age-specific rate (1.7 cases per 100,000 population) and accounted for 21 per cent (23/107) of the reported cases in 2000 (similar to the 20% of cases this age group contributed in 1999). This age group is a 'missed middle' of young adults born in the second half of the 1970s, who have neither been vaccinated nor exposed to the wild measles virus. In the past few years, Australia has recorded measles outbreaks among young adults, often associated with an index case who has travelled to countries with high endemic levels of measles.[51,52,53] As in past years there were similar numbers of males and females with measles reported in 2000 (male:female ratio 1.1:1, Figure 32).

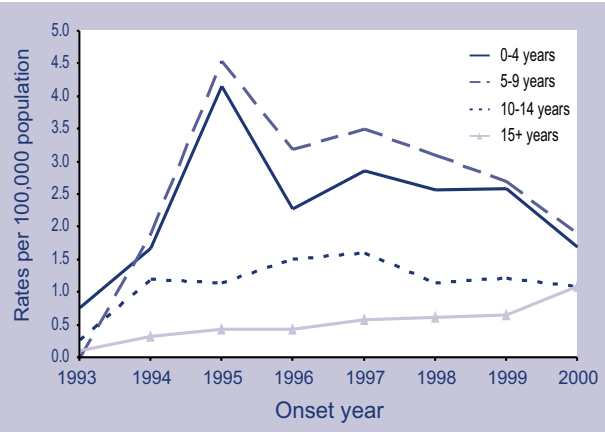
Figure 32. Notification rates of measles, Australia, 2000, by age and sex



Mumps

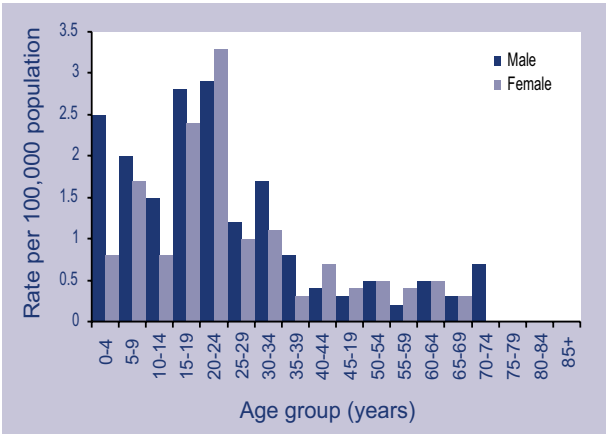
Mumps notification rates in Australia have been close to 1.0 cases per 100,000 population since 1997 (Table 18). Increased coverage of the Australian population with the MMR vaccine has not had the dramatic impact on mumps incidence that has been seen for measles and rubella. Moreover, in recent years the notification rates for mumps have increased in older age groups, in whom mumps morbidity is more severe (Figure 33). Increased use of the MMR vaccine in adolescents and adults over the next few years and ongoing surveillance are essential for mumps control and elimination in Australia. (Gidding, Communicable Diseases Control Conference, April 2001, Abstract 57)

Figure 33. Trends in notification rates of mumps, Australia, 1993 to 2000, by age group



In 2000, there were 212 notifications of mumps, a rate of 1.4 cases per 100,000 population. This is above the WHO elimination target of <1 case per 100,000 population and is a 23% increase on the 172 cases reported in 1999. There were cases in most age groups with the majority (151, 71%) aged 15 years or more (Figure 34). In contrast with previous years the highest notification rates were in the 20–24 year age group (3.1 cases per 100,000 population) and the 15–19 year age group (2.6 cases per 100,000 population). This pattern was apparent even in New South Wales where only laboratory-confirmed cases are notifiable. Overall, there was a slight preponderance of mumps notifications from males (male:female ratio 1.3:1). Mumps was not notifiable in Queensland from July 1999 to December 2000.

Figure 34. Notification rates of mumps, Australia, 2000, by age 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 35).[54] As a result of infant immunisation against pertussis in Australia (five doses given at 2, 4, 6, 18 and 48 months) the peak notification rate is now found among young adolescents (aged 10–14) (Figure 36).

Figure 35. Trends in notification rates of pertussis, Australia, 1991 to 2000, by month of onset

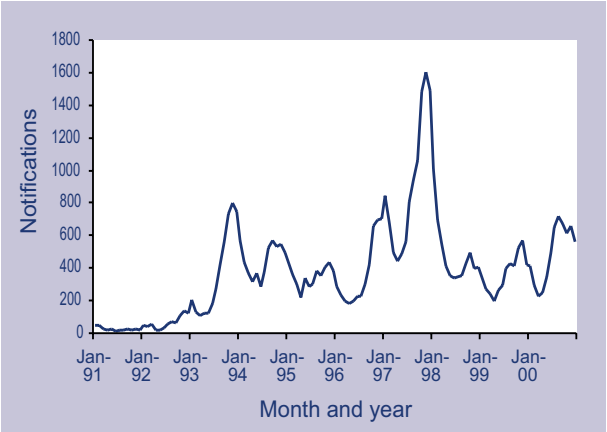
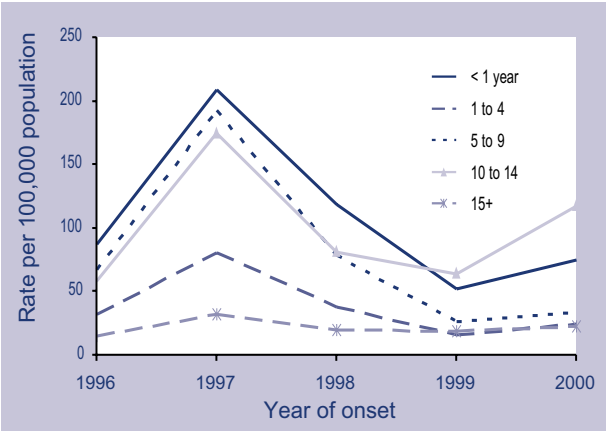


Figure 36. Trends in notification rates of pertussis, Australia, 1996 to 2000, by age group



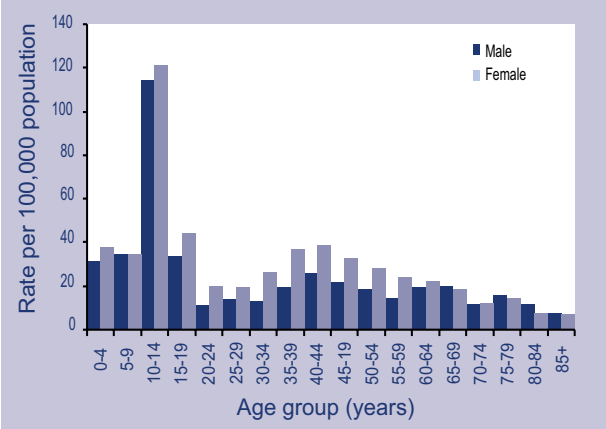
Despite high levels of vaccination, pertussis has increased in a number of countries since 1997. This has prompted investigations into the evolution of variants of *Bordetella pertussis*. Mooi and colleagues have observed antigenic divergence between vaccine strains and clinical isolates of *Bordetella pertussis* specifically in the surface-associated protein pertactin and the pertussis toxin.[55] Replacement of vaccine with non-vaccine strains as a result of herd immunity has not yet had any measurable effect on pertussis vaccine efficacy, but surveillance of variant strains of the bacteria may be important for the control of pertussis in the future.

Several recent studies have examined the importance of pertussis as a cause of prolonged coughing in adults and adolescents. A recent study in Canada suggests that up to 20 per cent of prolonged coughs are associated with laboratory evidence of pertussis infection.[56] The nature of that evidence is controversial, however, as only 2.3 per cent of symptomatic cases were confirmed by culture, PCR or a fourfold increase in pertussis antibody. The remainder were diagnosed on the basis of a single high pertussis antibody titre.

Since it is well established that adolescents and adults are frequently the source of pertussis infection for infants and children, and adolescents now have the highest rates of disease, vaccination of adolescents with acellular pertussis vaccines has been instituted in France, Germany and Canada. It remains to be seen how this will impact on the epidemiology of pertussis in these countries. Implementation of an adolescent vaccination program in Australia is currently being considered by a working party of the Australian Technical Advisory Group on Immunisation (ATAGI).

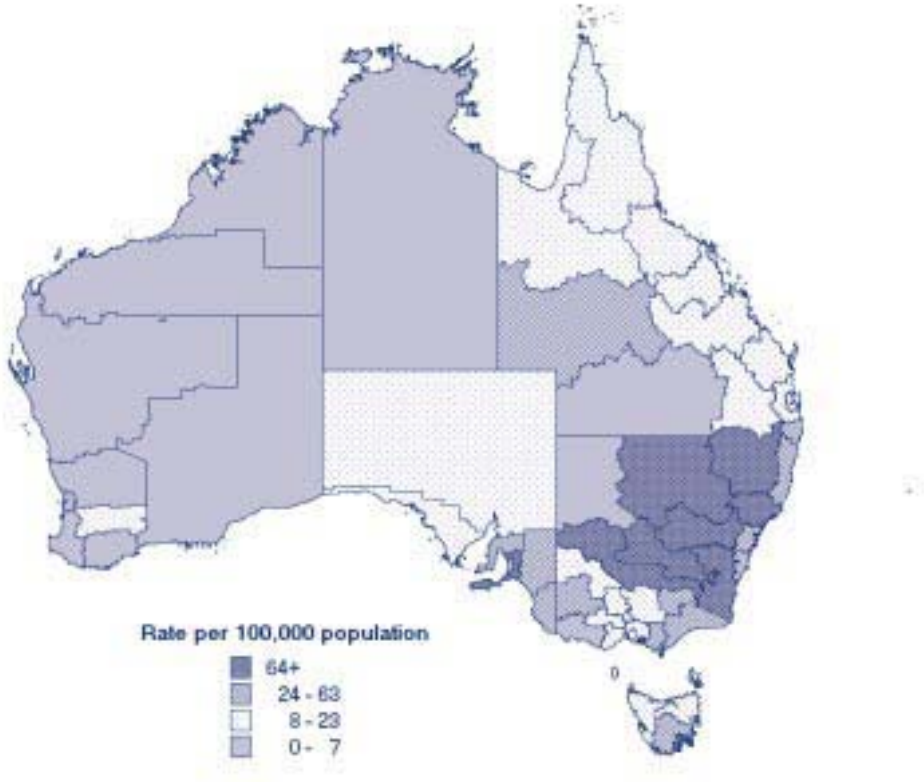
There were 5,942 notified cases of pertussis in 2000, 1,525 more than in 1999. The annual notification rate was 31.0 cases per 100,000 population. Pertussis notifications peaked in August, when 721 cases were notified. As in 1999, the 10–14 year age group had the highest notification rate of pertussis (117.7 cases per 100,000 population) (Figure 37).

Figure 37. Notification rates of pertussis, Australia, 2000, by age and sex



Notification rates of pertussis varied considerably by geographic location (Map 6). At the State/Territory level, rates were highest in the Australian Capital Territory (66.2 cases per 100,000 population) and lowest in the Northern Territory (2.6 cases per 100,000 population), where only 5 cases were notified. In 2000, South Australia included pertussis cases diagnosed by PCR for the first time.

Map 6. Notification rates of pertussis, Australia, 2000, by Statistical Division of residence



Poliomyelitis

No cases of poliomyelitis were reported in Australia in 2000. It is difficult to determine exactly when the last case of locally acquired poliomyelitis occurred in Australia. However, the last laboratory confirmed case was in 1967 and there were three clinically compatible cases notified in 1972 with no additional information currently available.[57] All cases notified since 1972 have been investigated further and this has led them to be re-classified as cases of vaccine-associated poliomyelitis. The last known imported case of poliomyelitis was due to wild poliovirus type 1 in 1977.

On 29 October 2000, the WHO certified the Western Pacific Region polio-free.[58] The last recorded case in the region was reported in Cambodia in 1997.

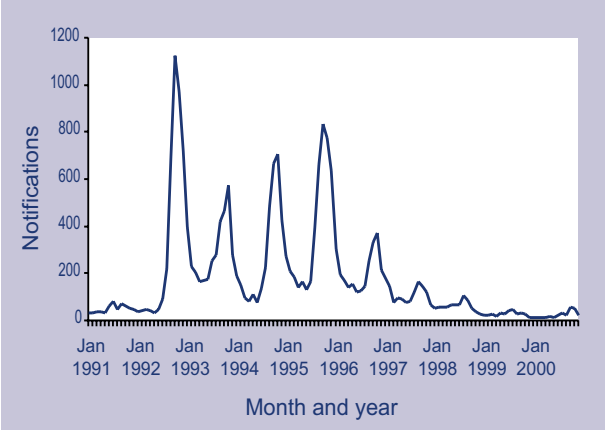
Since the live oral polio vaccine has the potential to cause vaccine associated disease, the USA has recently replaced this vaccine with an inactivated polio vaccine. This issue is under consideration in Australia by ATAGI

A report on the Australian National Polio Reference Laboratory is given later in this report (p188).

Rubella

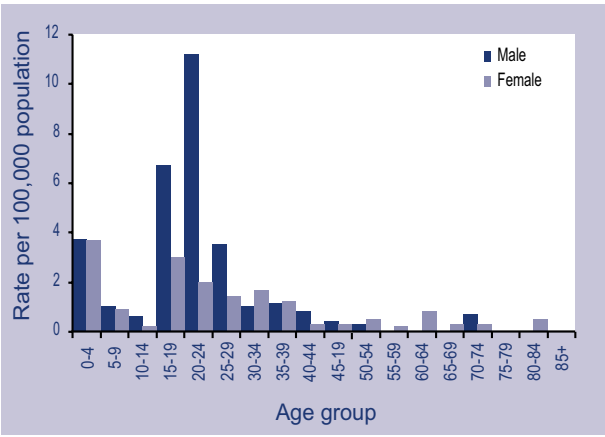
Since 1995, annual numbers of rubella notifications have been declining (Figure 38). This decrease has occurred at the same time as MMR vaccine usage has been increasing. In 2000, there were 322 notifications, a notification rate of 1.7 cases per 100,000 population. This is the lowest on record both nationally and in each State or Territory. As in previous years, the highest number of notified cases occurred in October, reflecting the expected seasonal increase in Spring months. The highest notification rate was from New South Wales (3.0 cases per 100,000 population), where all cases were laboratory-confirmed.

Figure 38. Trends in notification rates of rubella, Australia, 1991 to 2000, by month of onset



In 2000, the notification rate of rubella was highest in males in the 20–24 year age group (11.2 cases per 100,000 population, Figure 39). However, rates for this group have been decreasing in recent years due to the replacement of the schoolgirl rubella program with adolescent vaccination of both males and females between 1994 and 1998. Overall, there were more males than females notified with rubella (male:female ratio 2.0:1) in 2000.

Figure 39. Notification rates of rubella, Australia, 2000, by age and sex



There were 68 notifications of rubella from women of childbearing age (15–49 years) in 2000, a rate of 1.4 cases per 100,000 population. No notifications of congenital rubella were received in 2000 (Annual Report of the Australian Paediatric Surveillance Unit). Only 6 cases of congenital rubella have been reported since 1995, with the last case notified in 1999.

Tetanus

In 2000, there were 6 cases of tetanus notified to the NNDSS. Five of these were in adults aged 50 years or greater and one was in an infant. Of the 6 cases, 1 was partially vaccinated, 2 were unvaccinated (including the 2-year-old infant) and the vaccination status of the other three was unknown. Five of the 6 cases were females.

Childhood vaccination coverage reports

Estimates of vaccination coverage for both 'fully vaccinated' and individual vaccines for children at 12 months of age continued to improve in 2000 (Table 19). This trend was also evident in each State and Territory. Vaccination coverage at 12 months of age for Australia as a whole has now surpassed the Immunise Australia Program target of 90 per cent coverage for the first milestone vaccines.

Vaccination coverage at 2 years of age was first reported in 1998. Coverage estimates for individual vaccines recommended at 12 months and 18 months of age were higher in 2000 compared with the previous year, as were the estimates for being 'fully vaccinated' at 2 years of age (Table 20). 'Fully vaccinated' coverage estimates were reported to be considerably lower than estimates for individual vaccines. One likely factor is poor identification of children on immunisation encounter forms, which leads to difficulties matching new and existing vaccination records on the ACIR. Further, in their regular parent surveys, the Health Insurance Commission have found some parents have an objection to particular vaccines, although not always the same vaccines. It is important to note that in countries such as the United Kingdom, three doses of diphtheria-tetanus-poliomeylitis vaccine (DTP) and Hib vaccine constitute full vaccination with these vaccines at 2 years of age.

Table 19. Percentage of Australian children born in 1999 vaccinated at one year of age for four consecutive birth cohorts assessed during 2000 using the Australian Childhood Immunisation Register

Vaccine group	% vaccinated in birth cohort			
	1 Jan to 31 Mar 1999	1 Apr to 30 Jun 1999	1 Jul to 30 Sep 1999	1 Oct to 31 Dec 1999
DTP	89.8	89.8	91.8	91.5
OPV	89.8	90.2	91.8	91.4
Hib	89.3	90.3	91.7	94.6
Fully vaccinated	**88.4**	**89.0**	**91.3**	**91.2**

Table 20. Percentage of Australian children born in 1998 vaccinated at 2 years of age for four consecutive birth cohorts, assessed during 2000 using the Australian Childhood Immunisation Register

Vaccine group	% vaccinated in birth cohort			
	1 Jan to 31 Mar 1998	1 Apr to 30 Jun 1998	1 Jul to 30 Sep 1998	1 Oct to 31 Dec 1998
DTP	87.5	88.9	89.6	88.3
OPV	91.9	92.2	92.7	93.1
Hib	87.2	89.2	89.6	94.7
MMR	91.0	91.3	92.3	92.4
Fully vaccinated	**88.4**	**89.0**	**91.3**	**91.2**

Vectorborne diseases

Vectorborne diseases under surveillance in Australia in 2000 included arboviruses (arthropod borne viruses) and malaria. In this year the NNDSS collected information on 2 alpha viruses (Barmah Forest virus and Ross River virus), and one flavivirus (dengue) as well as malaria. Other arboviruses not including Barmah Forest, Ross River and dengue viruses were designated 'arbovirus not elsewhere classified (NEC)'. This category included infections with the flaviviruses Murray Valley encephalitis (MVE) virus, Kunjin virus, Japanese encephalitis (JE) virus, Kokobera virus and Stratford virus, as well as the alphavirus Sindbis. In 2000, there were 6,069 notifications of vectorborne diseases to the NNDSS (6.8% of total notifications).

Surveillance of human infection with MVE and Kunjin viruses is supplemented by sentinel chicken surveillance. Animal surveillance measuring seroconversions to JE in pigs is also used to complement surveillance in humans. Vector data, virus isolations and meteorological data are used to predict conditions suitable for an outbreak of arbovirus disease, and complement animal and human surveillance mechanisms.

Trends in the reporting of arboviruses over the period 1991 to 2000 are shown in Tables 21 and 22. The number of notifications classified as arbovirus (NEC) has decreased since 1995, when Barmah Forest virus became notified separately. Since then, notification rates for Barmah Forrest virus have remained stable. In comparison, dengue and Ross River virus notification rates have showed periods of increased disease activity over this time frame. The number of notifications of malaria have remained consistent over the decade. The notification rate of vectorborne disease depends on annual rainfall patterns, the mosquito populations and the exposure of humans to mosquitoes.

Control of mosquito populations and interception of exotic mosquito species, which may be disease vectors are important control strategies for vectorborne disease. Media warnings to residents during times of increased risk emphasise personal protection and risk reduction by reducing potential mosquito breeding sites.[59]

Table 21. Trends in number of notifications of arboviral infections, Australia, 1991 to 2000*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Arbovirus infection NEC	196	64	173	31	43	12	19	88	62	69
Barmah Forest virus infection	–	–	–	–	762	876	691	529	638	634
Dengue	18	373	681	17	39	123	174	579	132	215
Malaria	787	731	669	706	618	853	749	660	732	951
Ross River virus infection	–	5,701	5,254	3,828	2,644	7,783	6,596	3,151	4,416	4,200

* All jurisdictions reported for all years with the following exception
Dengue not reported from Australian Capital Territory (1991 to 1992).

Table 22. Trends in notification rates of arboviral infections, Australia, 1991 to 2000* (rate per 100,000 population)

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Arbovirus infection NEC	1.1	0.4	1.0	0.2	0.2	0.1	0.1	0.5	0.3	0.4
Barmah Forest virus infection	–	–	–	–	4.2	4.8	3.7	2.8	3.4	3.3
Dengue	0.1	2.2	3.9	0.1	0.2	0.7	0.9	3.1	0.7	1.1
Malaria	4.6	4.2	3.8	4.0	3.4	4.7	4.0	3.5	3.9	5.0
Ross River virus infection	–	32.6	29.7	21.4	14.6	42.5	35.6	16.8	23.3	21.9

* All jurisdictions reported for all years with the following exception
Dengue not reported from Australian Capital Territory (1991 to 1992).

Alphavirus Infections

Barmah Forest virus infection

This virus was first isolated from mosquitoes trapped in the Barmah Forest in Victoria in 1974. Outbreaks of Barmah Forest disease have been described since the virus was first shown to cause human disease in 1988. Barmah Forest virus infection is characterised by polyarthritis, myalgia, rash, fever, lethargy and malaise and may cause a chronic disease in some patients.[60] *Aedes* and *Culex* mosquitoes are the major mosquito vectors, while marsupials are suspected vertebrate hosts.

In 2000, 634 notifications of Barmah Forest virus infection were reported, similar to the 638 cases reported in 1999. The highest rates were reported in the Northern Territory (4.6 cases per 100,000 population) and Queensland (9.7 cases per 100,000 population). Rates were very low in southern states; no cases were reported from the Australian Capital Territory and Tasmania (Map 7). The male to female ratio was 1.4:1. The highest rate of infection (6.6. cases per 100,000 population) was in those aged 50–54 years, although the notification rates across the 35–69 age range were similar (Figure 40). Peak notifications were in the period January to April and followed previously observed seasonal trends (Figure 41).

Map 7. Notification rates of Barmah Forest virus infection, Australia, 2000, by Statistical Division of residence

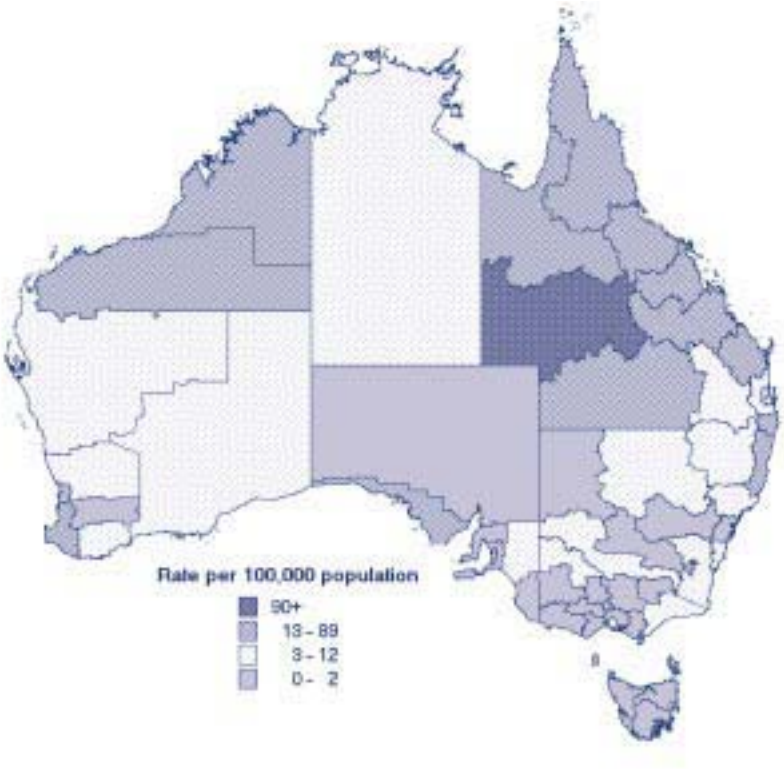


Figure 40. Notification rates of Barmah Forest virus infection, Australia, 2000, by age and sex

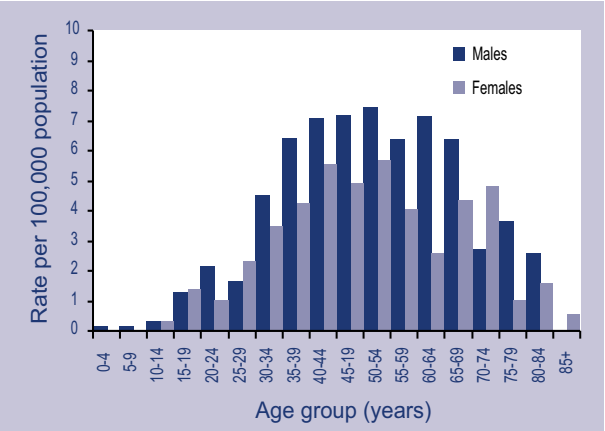
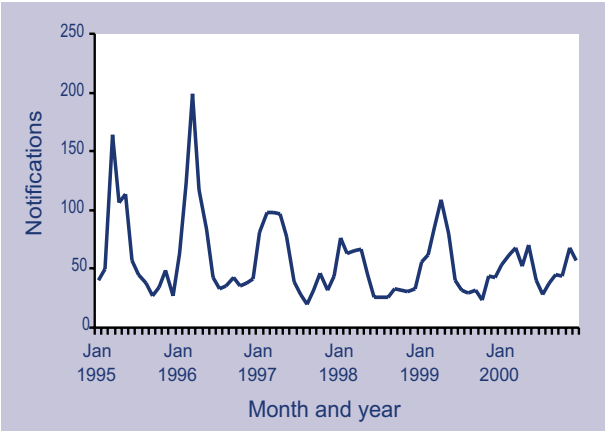


Figure 41. Trends in notification rates of Barmah Forest virus infection, Australia, 1995 to 2000, by month of onset



Ross River virus

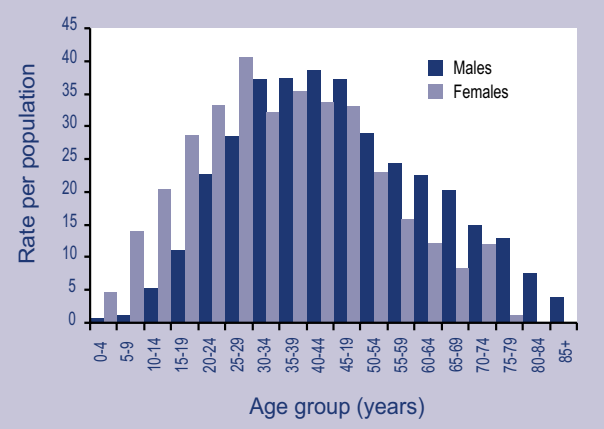
Ross River virus is the most common cause of arbovirus disease notified in Australia. While sporadic cases occur throughout Australia, epidemics occur in temperate regions and in tropical north-eastern Australia throughout the year. Epidemics in temperate regions are associated with heavy rainfall. Evidence indicates that the virus may persist in desiccation-resistant eggs of the *Aedes* spp mosquito, which would explain the rapid onset of cases after heavy rain and flooding. Marsupials and horses have been implicated as hosts for the virus and flying foxes may be responsible for the wide spread dispersal of different genetic types of the virus.[61]

Major outbreaks have been recorded in Western Australia (1991/1992 and 1995/1996), Victoria and South Australia (1993 and 1997), New South Wales (1996 and 1997) and Queensland (1996). Queensland has had the largest number of cases of Ross River virus infection for the past 3 years (1998 to 2000).

Clinical Ross River virus disease occurs most commonly in adults, marked by arthralgia and myalgia (joint and muscle pain). True arthritis occurs in over 40 per cent of patients, while about 50 per cent of patients have a fever or rash.[62]

There were 4,200 notifications of Ross River virus infections in 2000, giving a rate of 21.9 cases per 100,000 population, a slight decrease from the 23.3 cases per 100,000 population observed in 1999. Rates were highest in the Northern Territory (65.5 cases per 100,000 population), Western Australia (57.5 cases per 100,000 population) and Queensland (41.4 cases per 100,000 population) (Map 8). The male to female ratio was 1:1. The highest notification rate for females (40.6 cases per 100,000 population) was in the 35–39 year age group. The highest rate for men (38.5 cases per 100,000 population) was in the 40–44 year age group (Figure 42). Peak reporting was in the first and second quarters of the year (Figure 43).

Figure 42. Notification rates of Ross River virus infection, Australia, 2000, by age and sex



Map 8. Notification rates of Ross River virus infection, Australia, 2000, by Statistical Division of residence

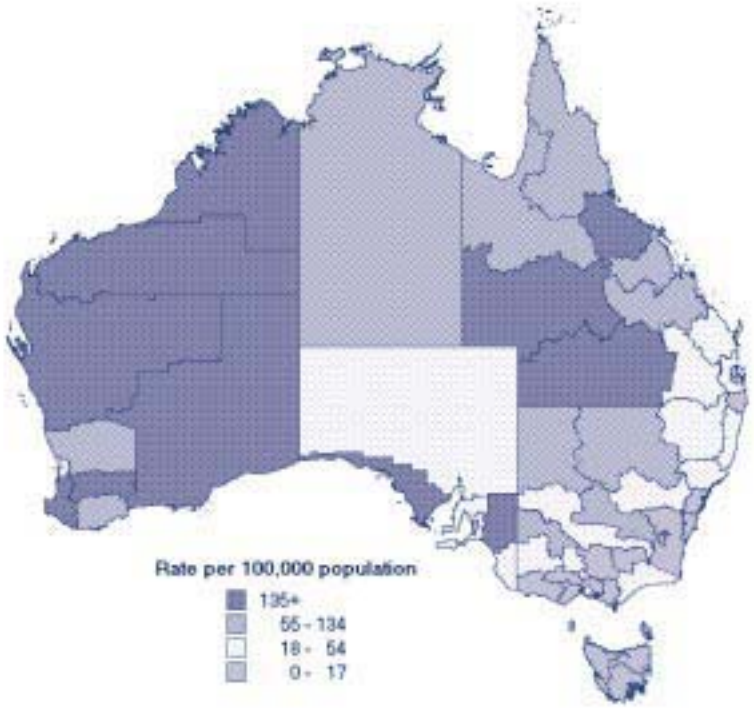
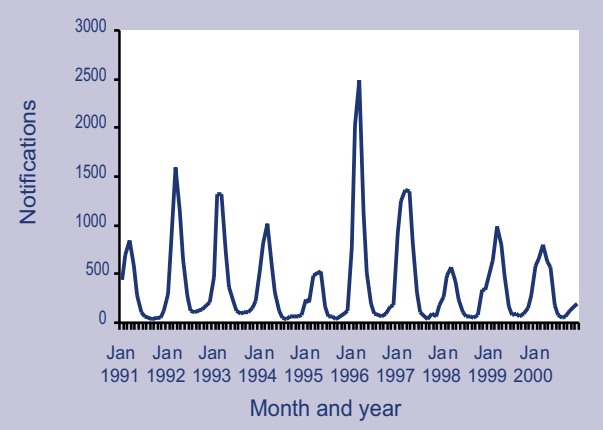


Figure 43. Trends in notification rates of Ross River virus infection, Australia, 1991 to 2000 by month of onset



Flavivirus infections

Dengue fever

Historical trends of dengue in Australia

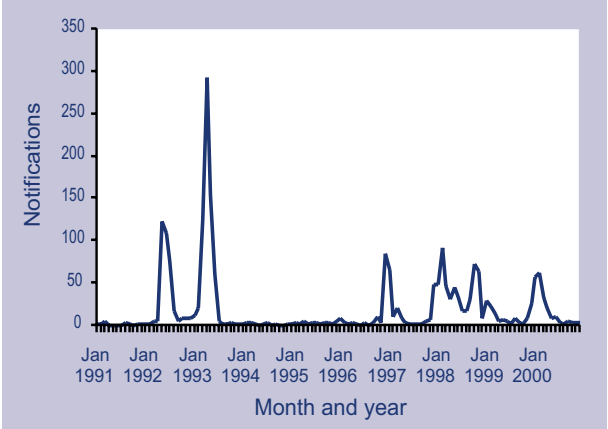
Dengue fever is an acute febrile illness characterised by sudden onset, fever, headache and rash. Dengue haemorrhagic fever is a major complication arising from secondary infection with heterologous serotypes of the dengue virus.[63] This complication has a high fatality rate. Two cases of dengue haemorrhagic fever have been reported in Australia, one in 1992 and another in 1997.[62] There is a concern that introduction of other dengue serotypes into northern Australia could increase the risk of dengue haemorrhagic fever.

Dengue virus is not endemic in Australia and the spread of dengue in Australia is limited to the range of the mosquito vector *Aedes aegypti* which spans the Torres Strait Islands and north Queensland.[62] An outbreak caused by dengue type 2 of more than 900 confirmed cases occurred in Townsville and Charters Towers in 1992 to 1993. In 1996/1997 another outbreak of dengue type 2 occurred in the Torres Strait. In 1997/1998 165 cases of dengue type 3 and 12 of dengue type 2 were reported from Cairns.[62]

Dengue occurrence in 2000

There were 215 notifications of dengue in 2000, a rate of 1.1 cases per 100,000 population, an increase on the 1999 rate of 0.7 cases per 100,000 population. The highest rates were found in the Northern Territory (47.6 cases per 100,000 population) and Queensland (2.4 cases per 100,000 population). The male to female ratio was 1.6:1. The highest notification rates among men were in the 35–39 and 50–54 year age groups (3.2 cases per 100,000 population). The highest notification rate for women, at 2.4 cases per 100,000 population, was in the 30–34 year age group. Notifications of dengue for 2000 peaked in Summer (first and fourth quarters of the year, Figure 44).

Figure 44. Trends in notification rates of dengue fever, Australia, 1991 to 2000, by month of onset



In all jurisdictions except Queensland, dengue cases were acquired overseas (n=131). In Queensland, 11 (13%) cases were identified as acquired within Australia, 22 (26%) acquired overseas and the source of infection was unknown in the remaining 51 cases.

The Western Pacific Region, which includes countries in East Asia and the Pacific, reported 45,603 cases of dengue in 2000. The number of cases in the region has decreased since 1998, when there was a pandemic of dengue across the region. In 2000, cases increased on 1999 figures in only 2 countries — Cambodia and Palau — and in both countries increases were seen in the numbers of all serotypes (WPR/WHO. Summary of the dengue situation in the Western Pacific Region an update:2001. http://www.wpro.who.int/document/DENGUE_SITUATION_IN_WPR_Aug01.doc).

Arbovirus: not elsewhere classified

In 2000, there were 69 notifications of arboviruses 'not elsewhere classified' reported to the NNDSS, giving a rate of 0.4 cases per 100,000 population. This rate was similar to that in 1999 (0.3 cases per 100,000 population). The jurisdiction reporting the largest number of cases of arbovirus infections NEC in 2000 was Victoria, notifying 26 (38%) of the 69 cases in that year. The male to female ratio was 1.4:1. The highest rate for women (0.8 cases per 100,000 population) was in the 50–54 year age group and for men the highest rate (1.2 cases per 100,000 population) was in the 65–69 year age group.

While cases of infection with Murray Valley encephalitis virus were only separately reported by Western Australia in 2000, information provided by the individual jurisdictions indicated there were 16 cases in the year (Table 23). Exceptional weather conditions in 2000 provided ideal conditions for mosquito breeding and MVE virus transmission. The activity in Western Australia was unusual as there was a new southerly extension into the Mid-west region.[64]

Data from sentinel chicken surveillance (Figure 45) provided an early warning of disease activity in 2000. In Western Australia, seroconversions in sentinel chickens preceded likely dates of exposure in human cases by 4–18 weeks in all but one case.[65]

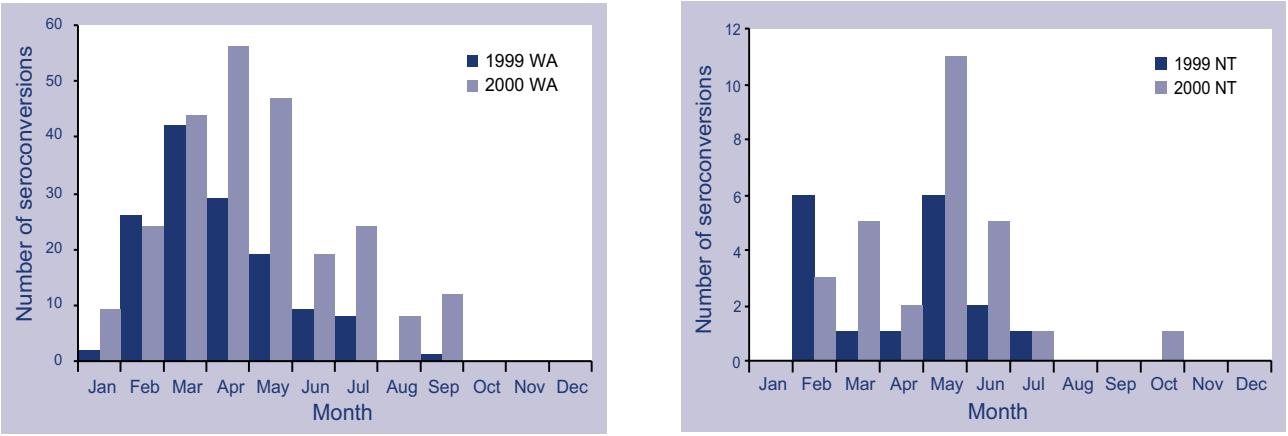
While not specifically identified in the NNDSS, there were 4 cases of Kunjin virus infection identified in 2000. No cases of Japanese encephalitis were reported in 2000. The last case of Japanese encephalitis in Australia was reported in 1998.

Table 23. Confirmed cases of Murray Valley encephalitis virus infection, Australia, 2000

Jurisdiction where diagnosis was made	Likely place of disease acquisition	Cases (Deaths)
Northern Territory	Darwin	1
	Alice Springs	3
	WA*	2(1)
	SA	1
Western Australia	Pilbara	2
	Mid-west	3
	Gascoyne	1
	Murchison	1
Total		**16**

* includes one case acquired in the Kimberley and a second case acquired in Mid-west/Kimberley region.

Figure 45. Seroconversions to Murray Valley encephalitis virus in sentinel chickens, Western Australia and Northern Territory, 1999 to 2000



Malaria

While Australia has been free of endemic malaria since 1983, sporadic cases are reported among travellers returning from malaria endemic countries. The three requirements for malaria transmission exist in Australia: infected humans carrying gametocytes in their blood, mosquito vectors and suitable climate. Thus, surveillance of human cases of malaria and the rapid entomological response to prevent infection of local *Anopheles* mosquitoes are important public health activities in northern Australia.[66]

In 2000, there were 951 cases of malaria reported to the NNDSS, giving a rate of 5.0 cases per 100,000 population. This represented an increase in the notification rate, compared with the 3.9 cases per 100,000 population reported in 1999. Among the jurisdictions, the highest rates were reported from the Northern Territory (38.9 cases per 100,000 population), Queensland (11.5 cases per 100,000 population) and the Australian Capital Territory (5.7 cases per 100,000 population). The male to female ratio was 3.7:1, an increase on the ratio for 1999 (2.6:1). The peak notification rates for men (29.2 cases per 100,000 population) and for women (4.5 cases per 100,000 population) were in the 20–24 year age group.

Malarial parasites were identified and reported in 943 (99%) of the 951 cases reported to the NNDSS. *Plasmodium vivax* was the most common isolate (717 cases, 75% of the total), followed by *P. falciparum* (194 cases, 20%).

Travel to malaria endemic countries was documented in all cases in New South Wales, the Northern Territory, South Australia, Tasmania, Victoria and Western Australia. The travel data were also recorded for 96 of 409 notifications in Queensland. The data were not collected in the Australian Capital Territory. Data on the use of anti-malaria prophylaxis were available from Victoria and the Northern Territory. In Victoria 50 per cent of cases had not taken prophylaxis and a majority of these were either newly arrived migrants or Australian residents visiting relatives in their country of birth. In the Northern Territory, 53 (70%) had received prophylaxis, 21 (28%) had not, while the status of the remaining 2 patients was unknown.

Malaria in the Australian Defence Forces returning to Australia from duty in East Timor in 2000 accounted for 267 cases. While all of the 5,500 troops were given prophylaxis with doxycycline, 64 developed symptoms of malaria during their 4–5 months in East Timor and a further 212 soldiers developed symptoms on return to Australia. Of soldiers developing malaria while in East Timor, two-thirds were infected with *P. falciparum*, all of which were successfully treated with mefloquine and doxycycline. By contrast all but two of the soldiers who developed malaria on return to Australia were infected with *P. vivax.* When these soldiers were treated with primaquine, 44 soldiers had relapses, which suggested that *P. vivax* in East Timor was primaquine tolerant.[67]

Other vectorborne disease surveillance

AQIS exotic mosquito interceptions in 2000

In 2000, the Australian Quarantine and Inspection Service reported 41 interceptions of mosquitoes on various imported goods. Of the 41 interceptions, 22 species were considered unknown to Australia, or of limited distribution, including 15 interceptions of *Aedes aegypti*, six of *Aedes albopictus* and one *Culex spathifurca*. Thus, in 2000 there remained a constant threat of importation of exotic mosquito species, some of which may be vectors of human disease.

Zoonoses

Zoonoses are diseases of humans acquired from an animal source. Although there are many recognised zoonoses in Australia, only five zoonotic infections were reported at the national level in 2000. These were brucellosis, hydatid infection, leptospirosis, ornithosis and Q fever. All notifiable zoonoses have epidemic potential and are often associated with particular occupations. Zoonotic infection may present with non-specific clinical symptoms and a definitive diagnosis depends on appropriate laboratory investigations. The trend in the number and rates of zoonoses disease notifications reported to the NNDSS between 1991 and 2000 are shown in Tables 24 and 25.

A total of 969 notifiable zoonotic infection cases were received by the NNDSS in 2000, which accounted for 1.1 per cent of all notifications. The number of notifications remained at almost the same level as in previous years.

Table 24. Trends in notifications of zoonotic disease, Australia, 1991 to 2000*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Brucellosis	25	32	13	38	24	39	39	45	52	27
Hydatid infection	25	34	25	33	31	28	56	37	26	26
Leptospirosis	163	170	174	122	164	214	114	202	323	243
Ornithosis	136	110	83	87	185	86	35	64	84	100
Q fever	544	561	870	656	456	544	545	560	515	573

* All jurisdictions reported for all years with the following exceptions:
Hydatid infection not reported from New South Wales (1991–2000).
Ornithosis not reported from New South Wales (1991 to 2000) and only reported from Queensland during the period of 1992 to 1996.

Table 25. Trends in notification rates of zoonotic disease, Australia, 1991 to 2000* (rate per 100,000 population)

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Brucellosis	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.1
Hydatid infection	0.2	0.3	0.2	0.3	0.3	0.2	0.5	0.3	0.2	0.2
Leptospirosis	0.9	1.0	1.0	0.7	0.9	1.2	0.6	1.1	1.7	1.3
Ornithosis	1.6	1.0	0.7	0.7	1.5	0.7	0.4	0.7	0.9	1.1
Q fever	3.1	3.2	4.9	3.7	2.5	3.0	2.9	3.0	2.7	3.0

* All jurisdictions reported for all years with the following exceptions:
Hydatid infection not reported from New South Wales (1991–2000).
Ornithosis not reported from New South Wales (1991 to 2000) and only reported from Queensland during the period of 1992 to 1996.

All States and Territories reported brucellosis, leptospirosis and Q fever to the NNDSS in 2000. In New South Wales neither hydatid infection nor ornithosis were notifiable diseases in 2000 and ornithosis was not notifiable in Queensland. Zoonotic diseases are not found in all jurisdictions in Australia. The Northern Territory has not reported any cases of brucellosis or Q fever and only a single case of hydatid disease between 1991 and 2000, and Tasmania has not reported any cases of brucellosis during the same period.

The majority of zoonotic infections were reported from Queensland (558, 58%), followed by New South Wales (184, 19%). Queensland had the highest notification rate of Q fever (10.9 cases per 100,000 population), the Northern Territory had the highest notification rate of leptospirosis (4.1 cases per 100,000 population) while Victoria had the highest notification rate of ornithosis (1.8 cases per 100,000 population) (Table 25).

Brucellosis

Brucella are small aerobic gram-negative bacilli. Human brucellosis is caused by any of four species: *Brucella melitensis* (primarily from goats, sheep, and camels), *Brucella abortus* (from cattle), *Brucella suis* (from pigs) and *Brucella canis* (from dogs). *B. melitensis* and *B. abortus* are exotic to Australia and cases of *B. melitensis* are usually imported into Australia from overseas travellers who have consumed unpasteurised dairy products. *B. suis* is restricted to localised populations of feral pigs in Queensland.

Brucella remains one of the world's major zoonotic pathogens, and is responsible for enormous economic losses as well as considerable human morbidity in endemic areas, especially in developing areas of the Mediterranean Region, Middle East, western Asia and parts of Africa and Latin America. The *Brucella* organism is transmitted from *Brucella*-infected animals to humans by direct contact with blood, tissues and urine of infected animals. Infection is through breaks in the skin or through consumption of contaminated animal products, such as milk. Airborne transmission from animal to humans is also possible. The organism may also be transmitted from human to human via blood transfusion and bone marrow or organ transplantation, through the placenta, during breast-feeding, and during sexual activity.[68,69,70] The disease usually presents within weeks of exposure, but in some exceptional cases, the incubation period may be as long as several years.[71] The pathogen could also be a potential agent of biological terrorism, particularly *B. melitensis* and *B. suis*. The bacteria are highly infectious by aerosol and could be delivered as a slurry in bomblets which may survive for 6 weeks in dust and 10 weeks in soil or water.[72,73,74]

There were 27 notifications of brucellosis in 2000, a rate of 0.1 cases per 100,000 population, a decrease from 1999 (52 cases; 0.3 cases per 100,000 population). This is the lowest national notification rate on record since 1994.

The majority of notifications (20, 74%) occurred between August and December. The age-specific rate was highest in the 40–44 year age group at 0.5 cases per 100,000 population. Men were more often infected than women with the overall male to female ratio being 8:1.

Almost all the cases of brucellosis were reported from Queensland, except for one case which was reported from New South Wales. The highest rates of disease were reported in the Central West (24.7 cases per 100,000 population) and the South West (15.6 cases per 100,000 population) Statistical Divisions of Queensland. A previous study has suggested that there is a high frequency of *B. suis* infections in Queensland among men who hunt and slaughter feral pigs.[75]

Hydatid infection

Hydatid infection, caused by the larval stage of the tapeworm *Echinococcus granulosus*, is generally found in rural Australia. Disease typically occurs where humans become infected by the ingestion of eggs passed in the faeces of dogs, dingoes or foxes.[76] Wallabies, wombats, feral pigs, sheep and kangaroos are all intermediate hosts that act as reservoirs of the disease. Dogs and foxes, feeding off the offal or other remains of these animals become infected, and can carry the disease into rural communities, or to the periphery of urban settlements.[77]

Symptoms of hydatid disease usually occur only in the advanced stages of disease, and the infection may remain asymptomatic for many years. In the past, hydatid disease has been shown to be under-reported in Australia.[78]

In 2000, hydatid infection was notifiable in all States and Territories in Australia, except New South Wales. Following a successful elimination program in the period 1965 to 1996, Tasmania was declared free from hydatid disease in 1996 and has remained this status since. A total of 26 cases were notified during 2000. This is the same number as reported in 1999. The annual notification rate was 0.2 cases per 100,000 population. The highest number of cases (n=13) was reported in Victoria, followed by Queensland (n=8) and Western Australia (n=5). The highest rate of hydatid infection as reported in the Kimberley region of Western Australia (3.3 cases per 100,000 population).

Of the 26 hydatid cases notified, 10 were men, 13 were women and three were of unknown gender. The male to female ratio was 0.8:1. The highest age-specific rates were in women aged 65–74 years (0.9 cases per 100,000 population) and in men aged 75–79 years (1.4 cases per 100,000 population).

Information on the country of birth was obtained for 13 of 26 hydatid notifications. There were 6 cases among Australian born people (including an Indigenous Australian) and 7 cases among overseas born persons (4 cases from Greece; 1 case each from Bosnia, China and England).

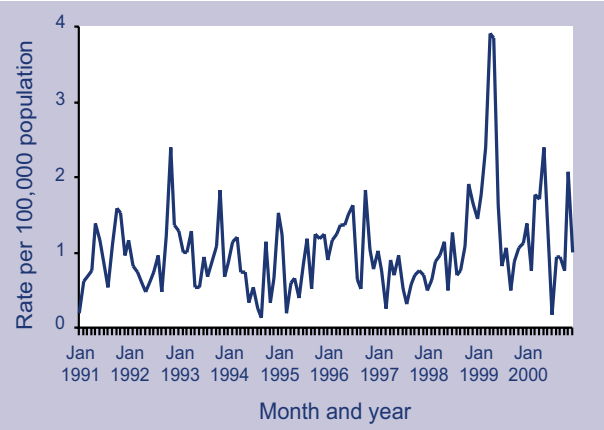
Leptospirosis

Leptospirosis is a zoonotic disease transmitted by wild and domestic animals. The causative organisms are the spirochetes of the *Leptospira* genus. The source of infection is often soil or water contaminated with the urine of domestic or wild animals. Farmers, veterinarians, abattoir workers and some recreational sporting athletes are recognised to be at high risk of infection.[27]

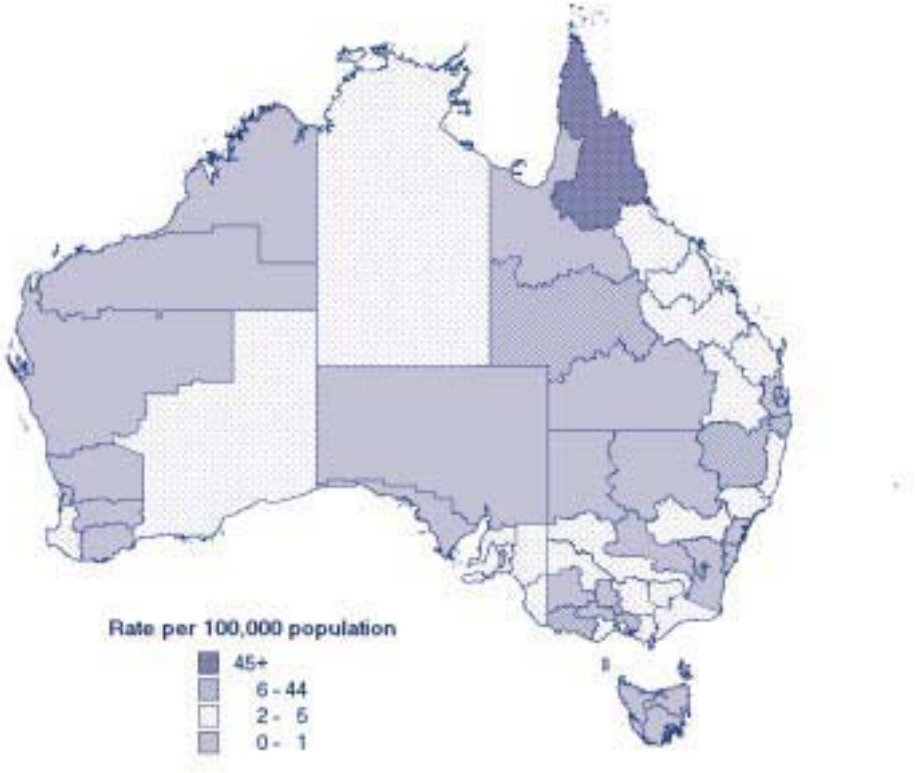
Leptospirosis was first recognised in Australia in 1934,[79] and occurs in all parts of Australia today. The disease may be asymptomatic, mild or severe and can cause death. The clinical manifestations of the disease include a variety of symptoms, but the most common presentations include fever, myalgia, meningitis, rash, haemolytic anaemia and jaundice.[27]

Leptospirosis is a notifiable disease in all States and Territories of Australia. There were 243 notifications of leptospirosis reported to the NNDSS in 2000, with an annual notification rate of 1.3 cases per 100,000 population (Figure 46). This represents a decrease in the number of notifications relative to 1999 (323 cases, 1.7 per 100,000 population). The majority of notifications (55%) were reported in Queensland, followed by New South Wales (22%) and Victoria (14%). The highest rates of disease were localised to the Far North Statistical Division of Queensland (43.9 cases per 100,000 population) and the Western District of Victoria (13.2 cases per 100,000 population) (Map 9).

Figure 46. Trends in notification rates of leptospirosis, Australia, 1991 to 2000, by month of onset

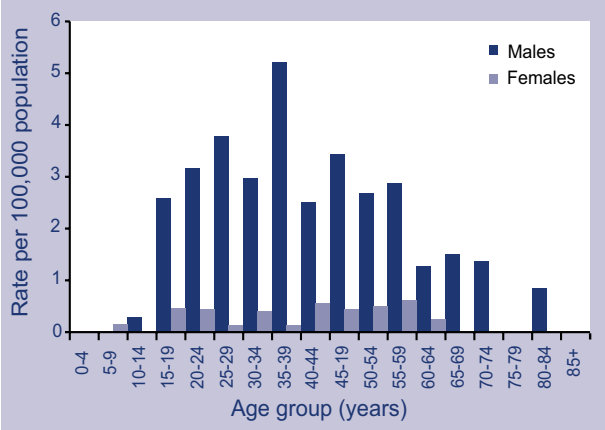


Map 9. Notification rates of leptospirosis, Australia, 2000, by Statistical Division of residence



The seasonal trends show two distinct peaks of leptospirosis in 2000. The first peak of 38 notifications occurred in May and the second peak of 33 notifications was in November (Figure 46). The majority of notifications were male, with a male to female ratio of 8.3:1. The highest age-specific rate for men was in those in the 35–39 year age group (5.2 cases per 100,000 population) (Figure 47).

Figure 47. Notification rates of leptospirosis, Australia, 2000, by age and sex



In early September, the Centers for Disease Control and Prevention (CDC) in United States of America alerted the DoHA to an outbreak of leptospirosis among participants of the Eco Challenge Race that was held in Sabah, Malaysia from 20 August to 3 September 2000. The event attracted a total of 304 athletes from 27 countries, which included 12 Australian athletes from New South Wales, Queensland, Tasmania and Victoria. The Surveillance and Epidemiology Section, DoHA, cooperated with the directors and epidemiologists of the health authorities in these jurisdictions to conduct the outbreak investigation. All of the athletes (except one who resided in the USA at the time of the investigation) were contacted by jurisdictional health authorities. Public health officers conducted interviews using a structured questionnaire collecting information on symptoms and possible exposures. The questionnaire was sent to the CDC via the Surveillance and Epidemiology Section. Blood samples were collected from some of athletes and sent to the Collaborating Centre for Reference and Research on Leptospirosis, WHO/FAO Western Pacific Region in Queensland.

There was no case of leptospirosis identified among the Australian participants in the overall investigation. During the international investigation, 158 (52%) the participating athletes were contacted by the CDC. Of the 158 respondents, 109 reported illness, including chills, myalgias, headache, diarrhoea, dark urine and arthralgias; 68 (44%) had illness that met the case definition of leptospirosis of the CDC.[80] The age of cases ranged from 22 to 50 years (median: 34 years) and 73 per cent were male. The median duration of illness was 6 days (range: 1–19 days) and 25 (34%) case-patients were hospitalised for the illness.[80]

An outbreak of leptospirosis was reported in the Northern Territory in November and December 2000.[81] Six cases of leptospirosis were notified to the Northern Territory Department of Health and Community Services. Two men and 3 women were involved in hunting during the time they acquired the disease. The third male case lived on a rural block where there are many animals and reported regularly going barefoot. In response to the outbreak a media release was issued by the Northern Territory health department, to highlight the risk for contracting this potentially fatal infection.

Other leptospirosis surveillance

The Collaborating Centre for Reference and Research on Leptospirosis, WHO/FAO Western Pacific Region report for 2000

This report summarises the leptospirosis notification data for 2000. The information has been collated from questionnaires distributed to all human cases in Australia and collected by the collaborating centre. In total, 204 cases of leptospirosis were investigated in 2000.

There was an elevated number of cases during the first 6 months of the year but not at the level reported in 1999. The increased number of notifications in the early part of the year reflects an increasing level of awareness of the disease among clinicians and a higher than average rainfall. The latter resulted in optimal conditions for the survival of the organism in the environment and favourable conditions for an increase in rodent populations.

Of the 204 cases, 179 reported illness, and the most frequently reported symptoms included headache (68.7%), followed by myalgia (60.9%), severe fever (57.0%), sweats (56.4%), chills (53.1%) and arthralgia (49.7%). The hospitalisation rate for leptospirosis remained high (56.3%) in 2000, and the average hospital stay for the patients was 5 days.

Data on occupation were available for 169 of the 204 leptospirosis cases. Animal associated occupations (63/169; 37%) and agricultural based occupations (61/169; 36%) accounted for the majority of the notifications nationally. The most frequently reported animal contacts were cattle (44.4%) and rats (38%). In Queensland however, agricultural related occupations were reported more commonly among the 115 leptospirosis cases (45.2%), specifically, banana farms accounted for 35.7 per cent of the total leptospirosis cases in Queensland.

Serovar information was recorded for 203 of 204 leptospirosis cases in 2000. Commonly identified serovars were *L. hardjo* (67/203; 33.0%), followed by *L. zanoni* (44 cases; 21.6%) and *L. australis* (37 cases; 18%).

The full report *Leptospirosis: surveillance report for 2000* can be found on the Queensland Health Website at: http://www.health.qld.gov.au/qhpss/qhss/lepto_report2000.htm

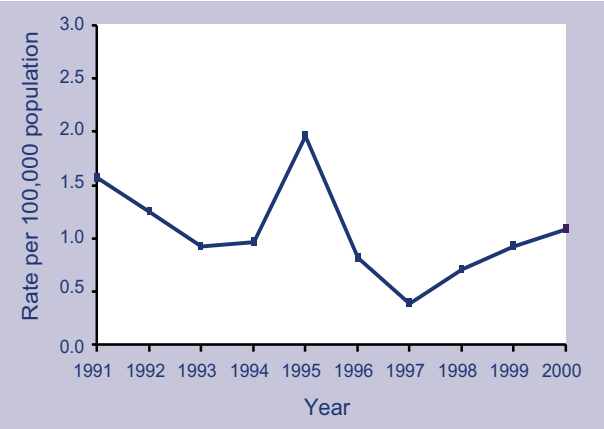
Ornithosis

Ornithosis, also known as psittacosis, is an acute generalised infection with *Chlamydia psittaci*. The disease in humans is commonly associated with exposure to birds, particularly parrots, although some studies showed an association with lawn mowing and gardening in areas with high numbers of native birds.[82] Shedding of *C. psittaci* into the environment by sick birds and subsequent inhalation of aerosolised dust and bird excreta may also lead to human infection.

In 2000, ornithosis was notifiable in all States and Territories in Australia, except New South Wales and Queensland. The NNDSS received 100 notifications of ornithosis in 2000, representing the third consecutive annual increase in the number of notifications since 1998 (Figure 48). The national notification rate was 1.1 cases per 100,000 population, and the majority (85%) of cases occurred in Victoria.

All but one case of ornithosis was linked to exposure to birds. The male to female ratio of disease was 2.6:1. The highest age-specific rates were reported in the 60–64 year age group for both men (7.0 cases per 100,000 population) and women (2.7 cases per 100,000 population). Reported rates of ornithosis are highest in the older age groups, which may reflect increased investigation and laboratory testing for atypical community acquired pneumonia in this group.[82]

Figure 48. Trends in notification rates of ornithosis, Australia, 1991 to 2000, by year of onset



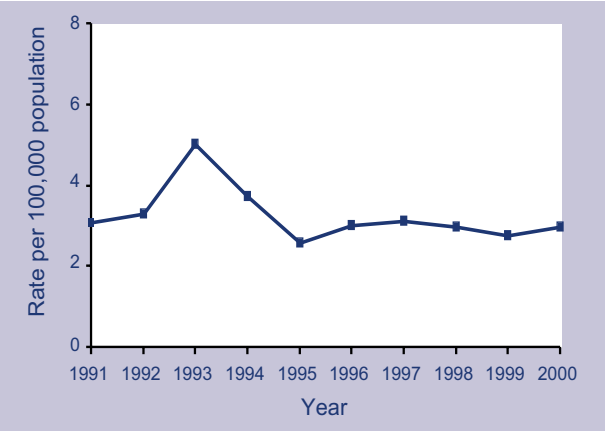
Q fever

Q fever is the most common zoonotic disease reported to the NNDSS in Australia. Q fever is a rickettsial illness caused by *Coxiella burnetii.* Livestock, such as sheep, cattle, goats, cats, dogs, some wild animals (bandicoots and many species of feral rodents), birds and ticks are natural reservoirs.[83] Risk occupations include stockyard workers, meat packing and rendering workers, abattoir and dairy workers, and medical and veterinary research facility workers.[84] An effective vaccine is available for Q fever in Australia[85] to protect the populations which are high at risk of this disease.

Transmission is usually through airborne dissemination of the organism in dust particles, through direct contact with contaminated material, ingestion of contaminated placentas or ingestion of milk. Ticks may also be involved in transmission of the organism. Cases have occurred in individuals with no direct contact with contaminated animals and their bodily fluids. These cases, however, have resided downwind from contaminated areas.[27]

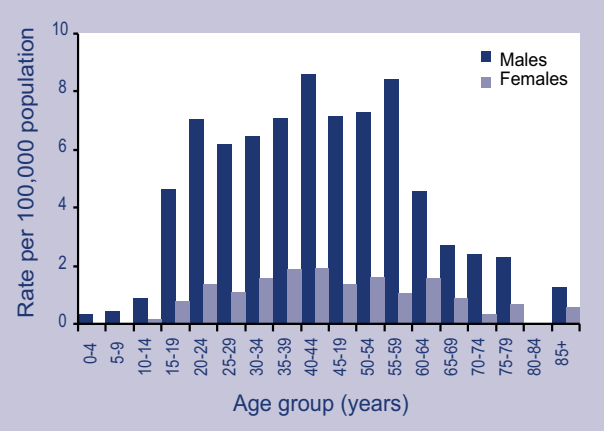
In 2000, 573 notifications of Q fever were reported to the NNDSS with an annual notification rate of 3.0 cases per 100,000 population, a slight increase from 2.7 cases per 100,000 population reported in 1999 (Figure 49). The majority of Q fever cases occurred in Queensland (68.1%), followed by New South Wales (22.7%). High notification rates were localised to the South West (250.0 cases per 100,000 population) and the Central West (164.8 cases per 100,000 population) of Queensland.

Figure 49. Trends in notification rates of Q fever, Australia, 1991 to 2000, by year of onset



The majority (92.8%) of the Q fever cases were adults in the 15–64 age range. The highest age-specific notification rates were in the 40–44 year age group for men (8.6 cases per 100,000 population) and in the 35-44 year age range for women (1.9 cases per 100,000 population) (Figure 50). The male to female ratio was 4.8:1. The true prevalence of the disease is likely to be under-estimated as the disease may be asymptomatic or self-limited.[86] Among 1,417 Australian abattoir staff tested for Q fever, 394 (27.8%) had serological evidence of exposure to Q fever.[87]

Figure 50. Notification rates of Q fever, Australia, 2000, by age and sex



Other bacterial infections

Legionellosis, leprosy, meningococcal infection and tuberculosis were notifiable in all States and Territories in 2000 and in the NNDSS are grouped as 'other bacterial infections'. A total of 2,121 notifications were classified as other bacterial infections in 2000, which accounted for 2.3 per cent of all notifications. Notifications of other bacterial infections reported to the NNDSS are shown in Tables 26 and 27.

Legionellosis

Legionellosis is an acute bacterial infection with two clinical manifestations: Legionnaires' disease and Pontiac fever. Legionellosis describes a group of diseases caused by various species of *Legionella* as well as the pneumonia of classical Legionnaires' disease caused by *Legionella pneumophila.*

L. pneumophila occurs in water sources, and can tolerate a wide range of temperatures, pH and dissolved oxygen contents. Depending on favourable temperatures, sediment accumulation and the presence of commensal microflora, the bacteria can proliferate in cooling towers and water systems, despite chlorination. Inhalation of aerosols containing the bacteria is the major mode of transmission. The risk of infection with *Legionella* is increased by age, chronic lung disease, immuno-suppression and cigarette smoking.[88]

L. longbeachae has been recognised for some years as a frequent cause of *Legionella* pneumonia in Australia.[89,90] A study found that 26 of 45 Australian potting soils were tested positive for *L. longbeachae*, suggesting this route of exposure may be important in the epidemiology of sporadic legionellosis in Australia.[91,92]

Legionellosis is notifiable in all the States and Territories in Australia, and includes notifications of infections caused by all *Legionella* species. There were 472 notifications of legionellosis in 2000 resulting in a notification rate of 2.5 cases per 100,000 population which has reached the highest level since 1991 (Figure 51). The seasonal trend showed a peak of 114 notifications in November 2000.

Table 26. Trends in notifications of other bacterial infections, Australia, 1991 to 2000*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Legionellosis	119	208	170	178	161	208	157	262	249	472
Leprosy	14	20	17	10	10	7	12	3	6	4
Meningococcal infection	347	308	377	385	377	420	494	480	591	621
Tuberculosis	661	904	986	994	1093	978	989	960	1,143	1,024

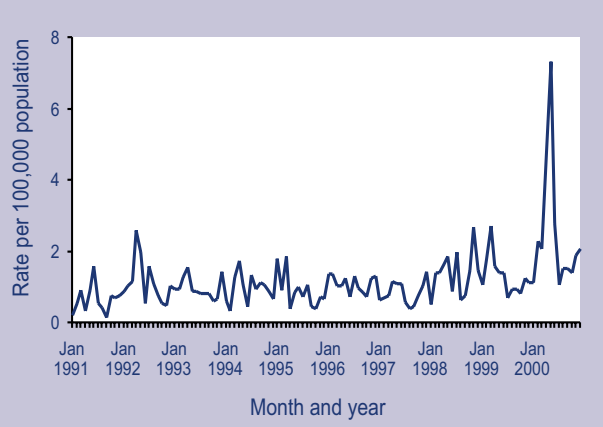
* All jurisdictions reputed for all years

Table 27. Trends in notification rates of other bacterial infections, Australia, 1991 to 2000 (rate per 100,000 population)*

Disease	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Legionellosis	0.7	1.2	1.0	1.0	0.9	1.1	0.8	1.4	1.3	2.5
Leprosy	0.1	0.1	0.1	0.1	0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Meningococcal infection	2.0	1.8	2.1	2.2	2.1	2.3	2.7	2.6	3.1	3.2
Tuberculosis	3.8	5.2	5.6	5.6	6.0	5.3	5.3	5.1	6.0	5.3

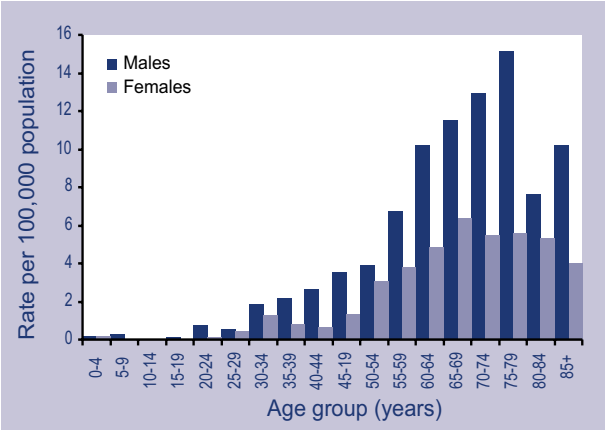
* All jurisdictions reputed for all years

Figure 51. Trends in notification rates of Legionellosis, Australia, 1991 to 2000, by month of onset



The reporting rates of legionellosis were highest in South Australia (5.9 cases per 100,000 population) and Victoria (5.2 cases per 100,000 population) (Tables 2 and 3). Men accounted for 65 per cent of reported cases. Cases occurred in almost all age groups, with a peak in the 75–79 year age group for men (15.1 cases per 100,000 population) and the 65–69 year age group for women (6.4 cases per 100,000 population) (Figure 52).

Figure 52. Notification rates of Legionellosis, Australia, 2000, by age and sex



Data on the causative species were available for 448 (95%) of the legionellosis cases. Of these, 311 (69%) cases were identified as *L. pneumophilia*, followed by *L. longbeachae* (131 cases, 29%), *L. micdadei* (4 cases) and *L. bozemannii* (2 cases).

In 2000, there was a total of 22 deaths as the result of legionellosis reported by States or Territories. Victoria reported 12 deaths (11 cases of *L. pneumophila* and 1 case of *L. micdadei*), South Australia reported 5 deaths (3 cases of *L. pneumophilia* and 2 cases of *L. longbeachae*), New South Wales reported 3 deaths (2 cases of *L. pneumophilia* and 1 case of *L. longbeachae*) and Western Australia reported 2 deaths (species data unavailable).

Six outbreaks of legionellosis were identified in 2000 and all occurred in Victoria.[93,94,95] Australia's largest outbreak of legionellosis to date occurred in Melbourne in April 2000, with a total of 125 confirmed cases (J. Greig, Victoria Department of Human Services, personal communication). The outbreak was linked to the newly opened Melbourne Aquarium. Of the 125 cases, 110 occurred in visitors to the aquarium between 11 and 27 April, and the remainder were in people who were within 500m of the building. During this time period 83,500 people visited the tourist attraction, giving a crude attack rate of 0.13 per cent.

The median age of cases was 64 years, and 57 per cent were male. Of the cases, 76 per cent were hospitalised for an average of 12.8 days, and 17 per cent of cases required admission to intensive care at some time during their hospital stay. The overall case fatality rate was 3.2 per cent, including 2 aquarium visitors and 2 people who were in the vicinity during the risk period. Most cases (83%) were diagnosed by urinary antigen test for *L. pneumophila* serogroup 1. Use of the urinary antigen test for early diagnosis of cases and rapid public health action probably contributed to relatively low morbidity and case fatality rates.

Of the remaining 5 outbreaks identified in Australia in 2000, four were in metropolitan Melbourne and one was in rural Victoria. A total of 28 cases were involved in these 5 outbreaks.[95]

Leprosy

Leprosy is a chronic infection of skin and peripheral nerves with the bacterium *Mycobacterium leprae*. Leprosy is a rare disease in Australia, with the majority of cases occurring among migrants to Australia from leprosy-endemic countries.

There were 4 cases of leprosy notified nationally in 2000 compared with six in 1999. Two of the cases in 2000 occurred in New South Wales with one each in Queensland and South Australia. Of the 4 cases, one was male and three were female and the age range was 20–59 years. Information on country of birth was available for 3 cases, one was born in India, one in the Philippines and another in Viet Nam.

Invasive meningococcal disease

Neisseria meningitidis is the one cause of bacterial meningitis. Worldwide, invasive meningococcal disease accounts for at least 500,000 cases and 50,000 deaths per annum. Many of these occur in the sub-Saharan Africa 'meningitis belt'. Serogroup A is mainly associated with the pandemic of meningococcal disease in Africa.[96,97] Serogroups B and C are the major cause of both sporadic and epidemic meningococcal disease in industrialised countries, including Australia, while serogroups Y and W-135 are uncommon. New Zealand has experienced an on-going epidemic of meningococcal disease associated with serogroup B since 1991 which peaked at 16.9 cases per 100,000 population in 1997. The average rate for the period 1996 to 2000 was 13.9 cases per 100,000 population.[98]

Four distinct clinical situations are associated with meningococcal infection; asymptomatic nasopharyngeal colonisation, benign bacteremia, meningitis and meningococcemia. The organism is carried in the nose of up to 5–10 per cent of the population. A small minority of those colonised will progress to invasive disease. Meningococcal meningitis is the most common pathologic presentation, especially during epidemics. Meningococcal septicaemia is the most severe form of infection and has a high fatality rate.[99]

In Australia, there were 621 notifications of invasive meningococcal disease nationally in 2000. The annual notification rate of 3.2 cases per 100,000 population is the highest rate since 1991 (Figure 53). Of the total, 471 (75.8%) cases were culture-confirmed. Of these, 274 (58.2%) were serogroup B, 173 (36.7%) were serogroup C, 11 (2.3%) were serogroup W-135 and 13 (2.8%) were serogroup Y. Although serogroup B remains the predominant serogroup among the notifications, notifications of serogroup C have increased steadily during the period (Table 28).

Figure 53. Trends in notification rates of invasive meningococcal infection, Australia, 1991 to 2000, by month of onset

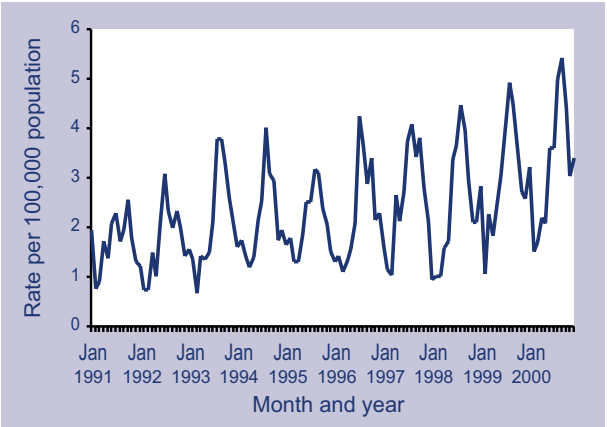
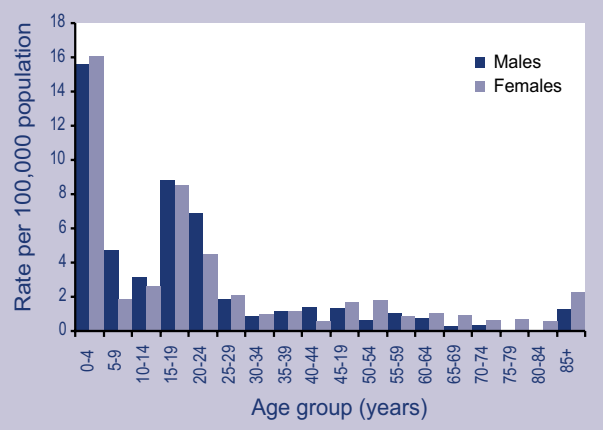


Table 28. Meningococcal notifications, Australia, 1995 to 2000, by serogroup

Year	B		C		Other or Unknown		Total
	n	%	n	%	n	%	
1995	31	8.1	15	4.0	335	87.9	**381**
1996	155	36.8	85	20.2	181	43.0	**421**
1997	96	19.8	57	11.8	331	68.4	**484**
1998	139	30.7	83	18.3	231	51.0	**453**
1999	212	37.3	143	25.2	213	37.5	**568**
2000	274	44.1	173	27.8	174	28.0	**621**

In 2000, the pattern of seasonal variation in meningococcal notifications continued, with the greatest number of cases occurring in late Winter or early Spring (Figure 53). The distribution of notifications by age shows the highest peak in children aged 0–4 years (15.8 cases per 100,000 population) and an additional peak in the 15–24 year age range (8.7 cases per 100,000 population) (Figure 54). The overall male to female ratio was 1.1:1.

Figure 54. Notification rates of invasive meningococcal infection, Australia, 2000, by age and sex



Forty-one deaths from meningococcal infections were reported in 2000, including 14 deaths in New South Wales, 13 deaths in Victoria, 6 deaths in Western Australia, 4 deaths in Queensland and 2 deaths in both South Australia and Tasmania. There were no major outbreaks of invasive meningococcal infection reported, and only three pairs of linked cases were identified.

The notification rate for meningococcal disease has been slowly, but consistently increasing over the past 10 years from 1.8 cases per 100,000 population in 1992 to 3.2 cases per 100,000 population in 2000 (Figure 53). It was suggested that the increase of meningococcal disease in Australia has been primarily due to the expansion of virulent phenotypes of serogroups B and C.[100,101,102,103] In addition, the case definition has been changed in some jurisdictions to include suspected cases and expanded laboratory diagnosis methods.[104] Despite rising public awareness and improvements in personal and environmental health measures, meningococcal disease remains the major life-threatening infection for children and adolescents in Australia.

Laboratory based meningococcal surveillance

The Australian Meningococcal Surveillance Programme annual report for 2000[105] summarised the phenotype and antibiotic susceptibility of *Neisseria meningitidis* from invasive cases of meningococcal disease. In 2000, a total of 388 isolates were examined by the National Neisseria Network laboratories, the highest number of isolates since the inception of the program in 1994.

Of the 388 isolates typed, serogroup B still predominated nationally (217 type B; 56% of total) and in all the jurisdictions, except Victoria. This was followed by serogroup C (143 isolates; 37% of total), serogroup Y (13 isolates; 3.2%) and serogroup W-135 (9 isolates; 2.3%). Serogroup C was the major serogroup in Victoria (58 isolates, 53.7% of total). Nationally the proportion of serogroup B of all strains was lower than in the previous 3 years. Phenotypes C:2a:P1.4(7),

C:2a:P1.2 and C:2a:P1.5 were first isolated in Australia in 1999. Phenotypes C:2a:P1.4(7) and C:2a:P1.2 were still commonly isolated in Victoria in 2000, but were occasionally encountered in other jurisdictions. Phenotype C:2a:P1.5 remained common in New South Wales. About two-thirds of all isolates showed decreased susceptibility to the penicillin group of antibiotics (MIC 0.06 to 0.5 mg/L). All isolates tested were susceptible to third generation cephalosporins and to the prophylactic agents rifampicin and ciprofloxacin.

In 2000, the number of non-culture diagnoses of invasive meningococcal disease increased to 147 cases from 92 cases in 1999. Of the 147 cases, 91 tested positive by PCR, 49 were positive by serology only and 7 tested positive by both PCR and serology.

Data on outcome (whether the patient survived or died) were available for 278 patients (71%). Of the 278, 25 (9%) patients died as a result of their infection. There were 13 deaths among cases with serogroup C infection, 9 deaths of serogroup B infection, 2 deaths of serogroup Y and 1 death of serogroup W-135.

Tuberculosis

There are three national surveillance systems for tuberculosis. The NNDSS provides the timeliest information on national TB notifications. The National Mycobacterial Surveillance System (NMSS), a surveillance system dedicated to tuberculosis and atypical mycobacterial infections, provides more detailed information on risk factors, diagnostic methods, drug therapy and relapse status.[106] The Australian Mycobacterial Reference Laboratory Network maintains national data on drug susceptibility profiles, site of disease, age, sex and laboratory method of diagnosis for all mycobacterial isolates. These data are published annually in conjunction with the NMSS surveillance report.[107]

In 2000, 1,024 TB notifications were received by the NNDSS, giving a reporting rate of 5.3 cases per 100,000 population. The highest rate was reported in the Northern Territory (22.0 cases per 100,000 population), followed by New South Wales (6.8 cases per 100,000 population) and Victoria (6.0 cases per 100,000 population).

There was little difference in notifications between the genders, with a male to female ratio of 1.1:1. While cases have occurred in all age groups, most cases occurred in the 20–24 year age group and older. The highest age-specific rates were in men in the 80–84 year age group (19.5 cases per 100,000 population) and in women in the 25–29 year age group (8.7 cases per 100,000 population).

Other communicable disease surveillance

Laboratory Virology and Serology Reporting Scheme

The Laboratory Virology and Serology Reporting Scheme is a passive surveillance scheme based on voluntary reports of infectious agents managed by the Commonwealth Department of Health and Ageing. LabVISE receives data from virology and serology laboratories around Australia. In 2000, reports from the scheme were analysed and published monthly 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 persons they infect. The scheme records information on some infectious agents that are not reported by other surveillance systems. The database currently holds over 500,000 records collected since 1982.

LabVISE data interpretation 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. For example, in 2000, there were 18 reports of Murray Valley encephalitis virus identification from Western Australia in LabVISE compared with 9 cases reported to the Western Australian health department. The LabVISE reports probably include positive screening test results from people without clinical disease, which falsely inflates the prevalence of clinical MVE disease.

In 2000, 14 laboratories contributed 23,655 reports to LabVISE. This was a decrease of 10.6 per cent compared with the number of reports in 1999 (26,452). Although there were no contributing laboratories in either the Northern Territory or the Australian Capital Territory, samples from these jurisdictions were included in the reports from reference laboratories (Table 29).

The breakdown of LabVISE reports in 2000 is shown in Table 29. Of the 23,663 reports received, 17,337 (73%) were of viral infections and 6,326 (27%) were bacterial, spirochaetes, fungal, protozoan or helminthic infections. Ortho/paramyxoviruses (including influenza A and B, parainfluenza and respiratory syncytial virus) represented the most commonly reported group of viral infections, accounting for 32 per cent of viral reports. Reports of herpesviruses (including herpes type 6, cytomegalovirus, varicella-zoster and Epstein Barr virus) accounted for 27 per cent of viral reports (Figure 55). Chlamydia accounted for more than half (52%) of all reports of non-viral infections.

Table 29. Infectious agents reported to LabVISE, Australia, 2000

Organism	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
Measles virus	3	4	0	0	8	0	19	10	**44**
Mumps virus	0	0	2	0	4	0	5	38	**49**
Rubella virus	1	6	3	16	7	0	10	8	**51**
Hepatitis A virus	2	4	11	28	29	0	3	69	**146**
Hepatitis D virus	0	1	0	3	0	0	4	1	**9**
Hepatitis E virus	0	0	1	0	0	2	0	1	**4**
Ross River virus	1	29	80	322	261	4	28	543	**1,268**
Barmah Forest virus	0	5	11	120	5	0	1	27	**169**
Dengue	1	4	62	1	0	1	0	112	**181**
Murray Valley encephalitis virus	0	0	2	0	0	0	0	18	**20**
Kunjin virus	0	0	1	0	0	0	0	3	**4**
Flavivirus (unspecified)	0	0	4	23	0	2	11	0	**40**
Adenovirus	8	162	9	15	378	6	192	435	**1,205**
Herpes virus	57	366	36	1,246	1,316	37	686	994	**4,738**
Other DNA viruses	9	6	5	78	37	2	79	198	**414**
Picornavirus family	12	369	10	26	30	7	582	491	**1,527**
Ortho/paramyxoviruses	89	1,272	12	239	1,234	48	761	1,949	**5,604**
Other RNA viruses	112	740	2	1	464	17	279	249	**1,864**
Chlamydia trachomatis	51	453	230	770	520	32	98	1,009	**3,163**
Chlamydia pneumoniae	30	6	0	0	0	0	0	0	**36**
Chlamydia psittaci	1	0	0	0	0	6	82	13	**102**
Mycoplasma species	3	49	13	203	128	4	207	87	**694**
Coxiella burnetii	1	8	0	34	11	0	24	23	**101**
Rickettsia species	0	0	1	0	0	6	4	11	**22**
Streptococcus group A	0	27	56	201	0	0	64	0	**348**
Yersinia enterocolitica	0	11	0	3	0	0	0	1	**15**
Brucella species	0	1	0	4	1	0	0	0	**6**
Bordetella pertussis	13	84	2	88	129	4	342	27	**689**
Legionella pneumophila	0	0	0	1	10	0	26	7	**44**
Legionella longbeachae	2	1	0	0	23	0	1	32	**59**
Legionella species	0	1	0	0	0	0	4	0	**5**
Cryptococcus species	0	6	0	0	11	0	1	0	**18**
Leptospira species	0	3	1	41	15	0	0	3	**63**
Treponema pallidum	0	68	222	262	331	0	0	27	**910**
Protozoa	1	2	0	5	5	0	13	7	**33**
Echinococcus granulosus	0	1	0	0	7	1	0	9	**18**
Total	**397**	**3,689**	**776**	**3,730**	**4,964**	**179**	**3,526**	**6,402**	**23,663**

Errata

The following corrections to *Communicable Diseases Intelligence* Vol 26 No 2 should be noted.

Page 187: Figure 55. Labvise reports, Australia, 2000.
The last point in the legend should read ‘Other RNA viruses’ instead of 'Ortho/paramyxoviruses'. The correct figure is reproduced below.

Figure 55. Labvise reports, Australia, 2000

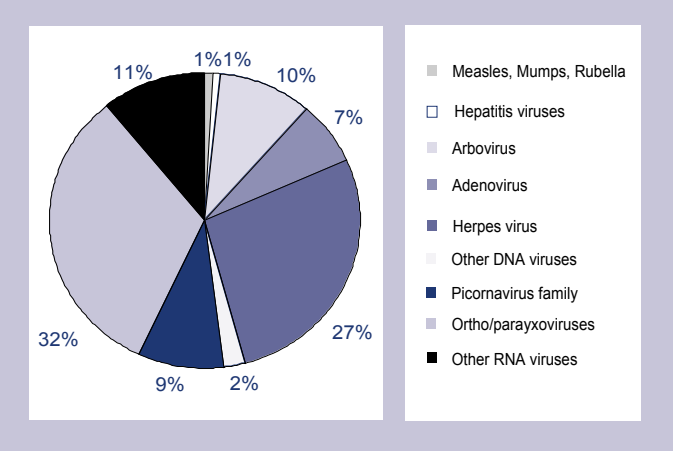
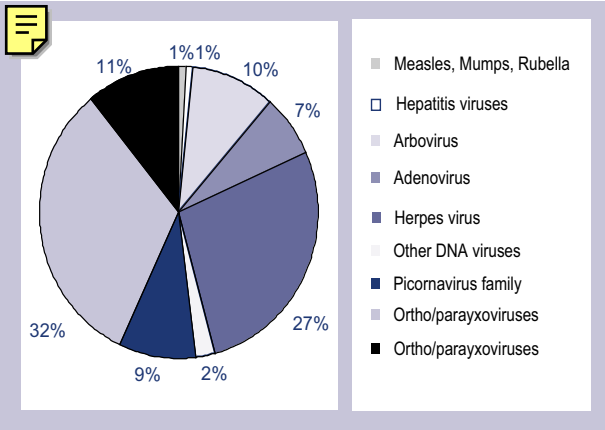
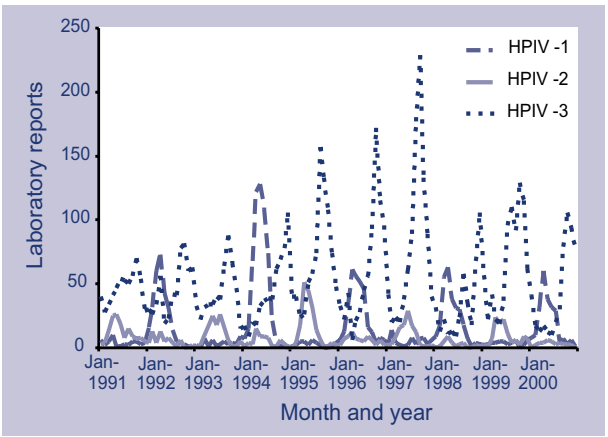


Figure 55. LabVISE reports, Australia, 2000



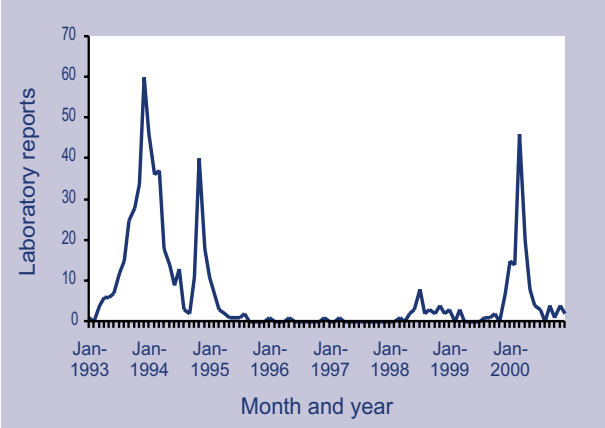
Parainfluenza viruses are an important cause of acute respiratory infection in infants and children. In March 2000, there was an outbreak of human parainfluenza type 1 (HPIV–1) in Australia. This is in keeping with biennial outbreaks of this parainfluenza strain in Autumn in Australia (Figure 56). Parainfluenza type 2 (HPIV–2) causes smaller outbreaks in alternate years to type 1, while there are annual outbreaks of parainfluenza type 3 (HPIV–3) annually in the Winter months. The majority of isolates (157/230, 68%) were from children aged 0–4 years.

Figure 56. Trends in laboratory reports of human parainfluenza virus strains 1, 2 and 3, Australia, 1991 to 2000, by month of report



Echovirus type 30 has caused large outbreaks of aseptic meningitis in many regions of the world in the past 40 years. LabVISE received 121 reports of echovirus 30 isolates in 2000. All but three of these were from New South Wales and Victoria. This is the first significant reporting of echovirus 30 to LabVISE since 1995 (Figure 57). Of the 121 cases 51 (42%) were in children under 10 years of age and 50/89 (56%) with diagnosis information were from individuals with a diagnosis of meningitis.

Figure 57. Trends in laboratory reports of Echovirus 30, Australia, 1991 to 2000 by month of report



An outbreak of pharyngoconjunctival fever occurred among school children in North Queensland in October 2000. Seven children who had attended a camp and presented with symptoms were investigated. Five of these children had positive viral cultures of adenovirus 3. An examination of the absenteeism rates at the school after the camp, however, suggested that 34 children had been infected. Fever, headache and sore throat were the most common symptoms.[108]

A review of LabVISE reports over the 10 years (1991 to 2000), examining data trends and quality will be published in the next issue of *Communicable Diseases Intelligence.*

Rotavirus Surveillance Programme 2000/2001[109]

A national rotavirus surveillance programme was commenced in June 1999 to undertake the surveillance and characterisation of rotavirus strains causing annual epidemics of severe diarrhoea in young children throughout Australia. Among 1,108 rotavirus isolates examined between June 2000 and May 2001, serotype G1 was the most common (49.5%) followed by serotypes G9 (18.1%), G2 (12.5%) and G4 (9.7%). Two outbreaks were detected, one of serotype G4 in Gove in the Northern Territory in September 2000 and another of serotype G9 in Alice Springs in May 2001.

Reports of the Australian National Polio Reference Laboratory[110,111]

Enterovirus testing of all cases of acute flaccid paralysis is an essential activity in the post-polio eradication era. The WPR, which includes Australia, was officially declared polio-free by the WHO in October 2000.

The Australian National Polio Reference Laboratory is responsible for processing and testing samples for poliovirus from all Australian patients with acute flaccid paralysis and for characterising polioviruses recovered from untyped enteroviruses submitted from Australian laboratories. Between 1 January and 31 December 2000, 35 specimens from 20 patients with acute flaccid paralysis were tested. Poliovirus type 3 Sabin-type was isolated from samples from 2 patients while the remaining samples from the other 18 patients were negative. In both AFP patients with positive culture for poliovirus, *Clostridium botulinum* toxin and/or other bacteria were detected in stool samples. The expert committee that reviews all cases did not consider polio to be the cause of the AFP.

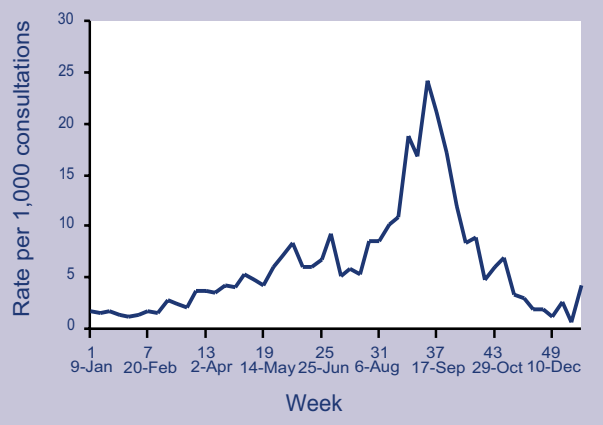
Australian Sentinel Practice Research Network

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 on a number of conditions each week. The aim of ASPREN is to provide an indicator of the burden of disease in the primary care setting and to detect trends in consultation rates.

There were approximately 120 general practitioners participating in the scheme from all States and Territories in 2000. Approximately 75 per cent of these are located in metropolitan areas and the remainder are in rural areas. There were on average 5,000 consultations each week.

In 2000, 14 conditions were being monitored by the ASPREN management committee, and five of these conditions related to communicable diseases. These were influenza, chickenpox, gastroenteritis, gastroenteritis with stool culture and ADT immunisations. In total there were 392,896 consultations reported to ASPREN of which 9,005 (2.3%) were of communicable diseases related conditions. The majority of communicable diseases reported were gastroenteritis (4,000 presentations, 44% of the total), followed by influenza (2,481 presentations, 28%), ADT immunisations (2,005 presentations, 22%) and chickenpox (583 presentations, 6%) respectively. The weekly reporting of influenza as a rate per 1,000 consultations are shown in Figure 58. Presentations with symptoms of influenza-like illnesses peaked in the Winter months (week 36).

Figure 58. ASPREN Communicable disease surveillance presentations to GPs, 2000



National Influenza Surveillance Scheme

Based on Annual report of the National Influenza Surveillance Scheme 2000, (Communicable Diseases Intelligence 2000;25:107).

In 2000, influenza surveillance in Australia was based on three systems: laboratory diagnosis by virus isolation and serology from laboratories participating in LabVISE, consultation rates for clinically diagnosed influenza illness by sentinel general practitioners; and the absenteeism data of workers from a national employer. Sentinel general practice schemes were both State-based (in New South Wales, Victoria and the Northern Territory) and national through reporting to the Australian Sentinel Practice Research Network.

In 2000, participating laboratories of the LabVISE scheme reported a total of 1,916 laboratory isolations of influenza. These included 1,366 reports of influenza A and 550 reports of influenza B. The ratio of influenza A to B was 2.5:1. Total influenza reports showed a low level of activity until mid-June when there was an increase in reports to approximately 50 per week, followed by a major peak in mid-September, then a decline to baseline by late November. There were few temporal differences in the peaks of influenza A compared with influenza B activity through the year. The peak of influenza activity in 2000 was significantly later in the year than in 1999. The pattern in 2000 closely resembled that in 1997, when there was also a larger proportion of influenza B isolates (influenza A to B ratio of 1.5:1) and a later peak in disease reporting. The overall male to female ratio for influenza in 2000 was 1.2:1. The age and sex rates were highest among infants and children aged less than 5 years, with a second peak among men aged 70 years or more and women aged 75 years or more.

The Northern Territory Tropical Influenza Surveillance scheme data showed two peaks of influenza activity in March and October. The ASPREN data and that of New South Wales and Victorian sentinel schemes all showed a single peak in reporting in the week ending 17 September. Comparison of the ASPREN and LabVISE reports showed a similar pattern of activity, with the peak in laboratory reports one week later than that from general practitioner surveillance.

The WHO Collaborating Centre for Reference and Research on Influenza received a total of 1,116 influenza isolates of which 922 (83%) were suitable for analysis. Of these, 518 (56%) were influenza A (H3N2) subtype, 262 (28%) were influenza B and the remaining 142 (16%) were influenza A (H1N1) subtype.

The influenza A (H1N1) isolates were predominantly (73%) A/New Caledonia/20/99-like viruses with only 39 isolates characterised as A/Bayern/7/95-like. These two separate lineages of viruses have co-circulated in Australia for some time. Although 3 sporadic isolates of the A/New Caledonia lineage were isolated in 1999, this is the first year in which viruses of the lineage have been isolated in significant numbers in Australia. All but one of the 39 A/Bayern/7/95-like isolates came from an outbreak in South Australia.

The majority of the influenza A(H3N2) isolates (94%) were most closely related to the reference strain A/Moscow/10/99 and vaccine strain A/Panama/2007/99 and were distinguishable from the previous prototype and vaccine strain A/Sydney/5/97. Nevertheless, serological studies demonstrated that vaccines containing an A/Sydney/5/97-like strain used in the Australian 2000 Winter produced similar antibody responses to the Australian 2000 A (H3N2) isolates as vaccines containing an A/Moscow/10/99-like strain used in the 2000/2001 Northern Hemisphere Winter. Thus while some antigenic heterogeneity was observed in the influenza A (H3N2) isolates there was no evidence of significant antigenic drift beyond the A/Moscow/10/99 reference strain.

Influenza B strains isolated during the 2000 season showed a progressive drift away from the B/Beijing/184/93 strain. The majority (64%) were most closely related antigenitically to the new reference strain B/Sichuan/379/99.

In 1999/2000, there were a total of 2,591 admissions to Australian hospitals for influenza/pneumonia (Source: National Hospital Morbidity Database, 1990–2000: AIHW). Influenza virus was identified in 673 of these were cases. Altogether, influenza was responsible for 4,583 hospital patient days in 1999/2000.

Antibiotic resistance in Australia

The major event in the control of antibiotic resistance in Australia in 2000 was the publication of the *Commonwealth Government response to the report of the Joint Expert Technical Advisory Committee on Antibiotic Resistance*, August 2000 (the Government Response), which was endorsed by the then Minister for Health and Aged Care and the Minister for Agriculture, Fisheries and Forestries - Australia.

In October 1999, the JETACAR made 22 recommendations to the Commonwealth Government for an antibiotic resistance management program covering regulatory controls; monitoring and surveillance; infection prevention strategies; education; research; and communication. The Government Response acknowledges the threat from antibiotic resistant organisms to the health and economic prosperity of the Australian population, and supports the development of a national antibiotic resistance management program. The Government Response was to establish the Expert Advisory Group on Antimicrobial Resistance (EAGAR), to provide continuing advice on antibiotic resistance and related matters; and the Commonwealth Interdepartmental JETACAR Implementation Group (CIJIG) to oversee and coordinate the continuing government response to the JETACAR, to respond to the policy advice received from EAGAR; and to seek funding for implementation purposes.

CIJIG met for the first time in November 2000. CIJIG and EAGAR work collaboratively to further develop and implement the Government Response in consultation with stakeholders, including the States and Territories and industry, to ensure appropriate implementation. To assist formal consultation with the States and Territories and to monitor implementation, the Australian Health Minister's Conference (AHMC) appointed the AHMC JETACAR Taskforce in August 2000. To fill a similar role on the animal side and to aid consultation with industry, discussions are under way with the Department of Agriculture, Fisheries and Forestries — Australia to reactivate the Standing Committee on Agriculture and Resource Management JETACAR Taskforce.

As part of the implementation of the JETACAR recommendation DoHA commissioned a study of the current surveillance activities for healthcare associated infections. The National Surveillance of Healthcare Associated Infection in Australia study will provide vital information for future national planning for healthcare associated infection surveillance and inform public health action to alleviate the problem of antibiotic resistance. The report was made available for public consultation in early 2001 and was provided to the Australian Council for Safety and Quality in Healthcare for consideration and action.

Creutzfeldt-Jakob disease in Australia 2000

(Based on the report from the Australian CJD Registry, The University of Melbourne — update to January 2000)

The Australian Creutzfeldt-Jakob disease (CJD) Registry was established in October 1993 in response to the recognition of four probable human pituitary hormone related CJD deaths. The Registry is funded by the Commonwealth Department of Health and Ageing and is based in the Department of Pathology at the University of Melbourne. An inquiry into the use of human pituitary hormones under the Australian Human Pituitary Hormone Program suggested the expansion of some activities of the Registry.[112] These have been adopted, including retrospective case ascertainment from 1 January 1970. However, in parallel with monitoring possible iatrogenic cases of CJD, the Registry monitors all cases of transmissible spongiform encephalopathies, both sporadic and familial, within Australia. There is no systematic neuropathological or prion protein genetic assessment, but in line with non-domestic programs, evaluation of this type is now attempted in all prospective cases.

As of July 2001, Australia remains free of animal forms of prion disease, such as bovine spongiform encephalopathy and scrapie, and has no confirmed cases of variant CJD. As of the middle of 2001, there were 454 cases on the Registry, which included 237 definite cases, 168 probable cases and 49 incomplete cases (cases positive in an immunoassay but not finally classified).

In Australia, there has been a doubling of the average incidence of spongiform encephalopathies to one case per million since the mid-1980s. This mainly reflects case ascertainment bias due to improved recognition, confirmation and reporting. The composition of cases on the Registry is 90.4 per cent sporadic, 7.4 per cent familial and 2.2 per cent iatrogenic.

Appendices

All definitions from Surveillance Case Definitions, National Health and Medical Research Council, March 1994, except those marked * which are draft summary definitions from the Communicable Diseases Network Australia (January 2001). Some Australian States and Territories have their own case definitions for some diseases, which may vary from those shown here.

Appendix 1a. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, bloodborne diseases

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Hepatitis B (incident)	Demonstration of documented seroconversion to hepatitis B	B16
Hepatitis B (unspecified)	HBsAg positive AND *either*: anti-HBcIgM positive *or* demonstration of a clinical illness consistent with acute viral hepatitis (jaundice, elevated aminotransferases)	B18.0, B18.1
Hepatitis C (incident)	Demonstration of documented seroconversion to hepatitis C	B17.1
Hepatitis C (unspecified)	Demonstration of anti-hepatitis C positive or hepatitis C PCR positive AND a clinical illness consistent with acute viral hepatitis AND is not an acute case of hepatitis A, B, or D	B18.2
Hepatitis D*	Positive for anti-hepatitis D virus (HDV) or HDV Ag or seroconversion or rise in IgG in serum or liver AND HBsAg OR anti-HBc negative	B17.0, B16.1, B18.0
Hepatitis (NEC)	Any other viral hepatitis not classified here	B17.8

Appendix 1b. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, gastrointestinal diseases

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Botulism	A clinically compatible illness (diplopia, blurred vision, muscle weakness, paralysis or bulbar palsy) with a history of exposure to a probable food source in the absence of a contaminated wound AND one of the following: isolation of *Clostridium botulinum* from faeces or other clinical specimens, *or* detection of *C. botulinum* toxin in serum, faeces or probable food source, *or* epidemiological linkage to other cases of confirmed foodborne botulism	A05.1
Campylobacteriosis	Isolation of *Campylobacter* species from a clinical specimen	A04.5
Haemolytic uraemic syndrome	Acute microangiopathic anaemia on peripheral blood smear AND acute renal impairment AND/OR thrombocytopaenia	D59.3
Hepatitis A	Anti-HAV IgM positive in the absence of recent vaccination OR demonstration of a clinical case of hepatitis (jaundice and/or elevated aminotransferase levels) without a non-infectious cause	B15
Hepatitis E*	A person who demonstrates anti-HEV IgM in sera collected less than 4 weeks after onset of acute hepatitis OR IgG seroconversion in paired sera OR HEV identified by nucleic acid test OR HEV identified by electron microscopy on stool OR a hepatitis-like illness in the absence of other causes of hepatitis and detection of antibodies to HEV	B17.2
Listeriosis	Isolation of *Listeria monocytogenes* from a site which is normally sterile, including foetal gastrointestinal contents	A32
Salmonellosis	Isolation of *Salmonella* species (excluding S. Typhi) from any clinical specimen	A02
Shigellosis	Isolation of *Shigella* species from any clinical specimen	A03
SLTEC, VTEC*	A person with bloody diarrhoea or HUS from whom in a clinical specimen: Shiga-toxin producing *E. coli* are isolated OR isolation of Shiga toxin from an *E. coli* isolate OR identification of the gene associated with the production of Shiga toxin in *E. coli*	A4.1, A4.4
Typhoid	Isolation of *Salmonella* Typhi or S. Paratyphi serotype A, B, or C from any clinical specimen	A01.1
Yersiniosis	Isolation of *Yersinia enterocolitica* or *Y. pseudotuberculosis* from blood or faeces OR detection of circulating antigen by ELISA or agglutination test OR positive *Yersinia* serology in the presence of clinical compatible illness	A04.6

Appendix 1c. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, quarantinable diseases

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Cholera	An illness characterised by diarrhoea and/or vomiting AND isolation of toxigenic *Vibrio cholerae* serogroup 01 or 0139 from a clinical sample	A00
Plague	A fourfold or greater change in serum antibody titre for *Yersinia pestis* OR isolation of *Yersinia pestis* from a clinical specimen	A20
Rabies	Clinically compatible neurological illness AND *either* detection of viral antigens in tissue *or* isolation of rabies virus from saliva, skin snips, CSF or neural tissue	A82
Viral haemorrhagic fever	Sudden or insidious onset of fever, nausea, vomiting, diarrhoea, multifocal haemorrhages and shock. An appropriate travel history to an endemic country is supportive of diagnosis AND one of the following: demonstration of specific IgM antibody by ELISA, IFA or Western blot *or* isolation of the virus in cell culture *or* demonstration of viral antigen in a tissue specimen to Ebola virus, Lassa fever virus, Marburg virus or Crimean Congo virus.	A96, A98, A99
Yellow fever	A clinically compatible illness AND demonstration of yellow fever virus, antigen or genome in any clinical specimen OR a fourfold or greater change in serum antibody titre to yellow fever virus, OR a single elevated yellow fever specific IgM antibody titre, where cross-reaction with other flaviviruses has been ruled out and the patient has not received yellow fever vaccine during the previous 2 months	A95

Appendix 1d. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, sexually transmissible infections

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Chancroid	Isolation of *Haemophilus ducreyi* from a clinical specimen OR a clinically compatible illness characterised by painful genital ulceration and inflammatory inguinal adenopathy, where syphilis, granuloma inguinale and herpes simplex have been excluded OR a clinically compatible illness in a patient who is epidemiologically linked to a laboratory confirmed case	A57
Chlamydial infection	Isolation of *Chlamydia trachomatis* from a clinical (genital) specimen OR demonstration of *Chlamydia trachomatis* in a clinical (genital) specimen by antigen detection methods	A56
Donovanosis	Demonstration of intracytoplasmic Donovan bodies on Wright or Giemsa stained smears or biopsies of clinical specimens OR a clinically compatible illness characterised by usually painless, beefy red, granulomatous or ulcerative lesions with rolled edges and a tendency to form scar tissue, where syphilis has been excluded	A58
Gonococcal infection	Isolation of *Neisseria gonorrhoeae* from a clinical specimen	A54
Lymphogranuloma venereum	Isolation of *Chlamydia trachomatis* serotype L1, L2 or L3 from a clinical specimen OR demonstration (by immunofluorescence) of inclusion bodies in leucocytes aspirated from an inguinal lymph node (bubo) OR a positive serological test for lymphogranuloma venereum strain of *Chlamydia trachomatis* in the presence of a clinically compatible illness (one or more tender, fluctuant inguinal lymph nodes or characteristic proctogenital lesions)	A55
Syphilis	A compatible clinical illness or past history AND demonstration of *Treponema pallidum* by darkfield, fluorescent antibody or equivalent microscopic methods OR reactive treponemal tests (e.g.: FTA-ABS, TPHA)	A50, A51, A52

Appendix 1e. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, vaccine preventable diseases

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Diphtheria	Isolation of toxigenic *Corynebacterium diphtheriae* AND pharyngitis and/or laryngitis (with or without a membrane OR toxic (cardiac or neurological) symptoms	A36
***Haemophilus influenzae* type b**	An invasive clinically compatible illness (meningitis, epiglottitis, cellulitis, septic arthritis, osteomyelitis, pneumonia, pericarditis or septicaemia) AND *either* the isolation of *Haemophilus influenzae* type b (Hib) from blood *or* detection of Hib antigen (in a clinical case) or detection of Gram-negative bacteria where the organism fails to grow in a clinical case	A41.3, G00.0, J05.1
Measles	An illness characterised by all the following features: a generalised maculopapular rash lasting three or more days AND a fever (at least 38oC) AND cough or coryza or conjunctivitis or Koplik spots OR Demonstration of measles specific IgM antibody OR A fourfold or greater change in measles antibody titre between acute and convalescent-phase sera obtained at least 2 weeks apart, with tests preferably conducted at the same laboratory OR Isolation of the measles virus from a clinical specimen OR A clinically compatible case epidemiologically related to another case	B05
Mumps	Isolation of mumps virus from a clinical specimen OR significant rise in mumps antibody level by any standard serological assay, except following immunisation OR a clinically compatible illness (unilateral or bilateral swelling of the parotid or other salivary glands lasting 2 days or more without other apparent cause)	B26
Pertussis	Isolation of *Bordetella pertussis* from a clinical specimen OR elevated *Bordetella pertussis*-specific IgA in serum or *B. pertussis* antigen in a nasopharyngeal specimen using immunofluorescence with a history of clinically compatible illness	A37

Appendix 1e. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, vaccine preventable diseases continued

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Poliomyelitis	Acute onset of a flaccid paralysis of one or more limbs with decreased or absent tendon reflexes in the affected limbs without other apparent cause, without sensory or cognitive loss	A80
Rubella	A generalised maculopapular rash and fever AND one or more of: arthralgia/arthritis *or* lymphadenopathy *or* conjunctivitis AND an epidemiological link to a confirmed case OR demonstration of rubella-specific IgM antibody, except following immunisation OR a fourfold or greater change in rubella antibody titre between acute and convalescent-phase sera obtained at least 2 weeks apart	B06
Tetanus	A clinically compatible illness without other apparent cause, with or without a history of injury and with or without laboratory evidence of the organism or its toxin	A33

Appendix 1f. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, vectorborne diseases

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Arbovirus infection (NEC)	Demonstration of a fourfold or greater change in serum antibody titres between acute and convalescent-phase serum specimens obtained at least 2 weeks apart and preferable, conducted at the same laboratory OR demonstration of specific IgM antibodies in CSF or acute phase serum OR isolation of virus from blood, CSF or tissue specimens	A92, A93, A94
Barmah Forest virus infection	Demonstration of above criteria for Barmah Forest virus	A92.8
Ross River virus infection	Demonstration of criteria above for Arbovirus infection for Ross River virus	B33.1
Dengue	Demonstration of above criteria for dengue virus (all types)	A90
Malaria	Demonstration of malaria parasites (*Plasmodium* species) in a blood film	B50, B51, B52, B53

Appendix 1g. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, zoonoses

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Brucellosis	Isolation of *Brucella* species from a clinical specimen OR a fourfold or greater change in *Brucella* agglutination titres or complement-fixation titres between acute and convalescent-phase serum samples at least 2 weeks apart with the tests preferably conducted at the same laboratory	A23
Hydatid infection	Positive serological test for infection with *Echinococcus granulosus* in a patient with clinical, radiological or sonographic evidence of hydatid disease OR identification of *Echinococcus granulosus* in cyst fluid or sputum OR immunoelectrophoresis demonstrating arc 5 or three or more arcs	A28
Leptospirosis	Isolation of *Leptospira* species from clinical specimens OR a fourfold or greater change in *Leptospira* agglutination titres or complement-fixation titres between acute and convalescent-phase serum samples at least 2 weeks apart with the tests preferably conducted at the same laboratory OR demonstration of leptospiral antigen in a clinical specimen OR a single raised *Leptospira* agglutination titre with a clinically compatible illness	A27
Ornithosis (psittacosis)*	A clinically compatible illness (fever, headache, myalgia, dry cough, pneumonia) AND a fourfold or greater rise in serum antibody titres to *Chlamydia psittaci* between acute and convalescent phase sera OR detection of *C. psittaci* by nucleic acid test OR a single high titre of IgG to *C psittaci* after the onset of a clinically compatible illness and where other diseases are excluded	A70
Q fever	A fourfold or greater change in serum (CF) antibody titre to phase II antigen of *Coxiella burnetii* OR a fourfold or greater change in ELISA antibody titre to phase I or II antigens of *C. burnetii* OR an IgM fluorescent antibody titre of at least 1:160 during convalescent phase of the illness (i.e: 10 days or more after onset)	A78

Appendix 1h. Case definitions and mapping to ICD–10 code for notifiable diseases reported to NNDSS in 2000, other bacterial infections

Disease	Case definition (NHMRC 1994)	ICD–10 code(s)
Legionellosis	A clinically compatible illness (fever, cough or pneumonia) AND at least one of the following: isolation of *Legionella* species from lung tissues, respiratory secretions, pleural fluid, blood or other tissues OR demonstration of *Legionella* species antigens in lung tissue, respiratory secretions or pleural fluid OR a fourfold or greater rise in (IFA) titre against *Legionella* species to at least 128, between acute and convalescent phase sera OR a stable high *Legionella* titre (at least 512) in convalescent phase serum	A48.1
Leprosy	Enlarged dermal nerves with associated sensory loss OR demonstration of acid-fast bacilli or biopsy specimen OR a histological picture compatible with leprosy in a specimen	A30
Meningococcal infection	Isolation of *Neisseria meningitidis* from a normally sterile site OR detection of meningococcal antigen in joints, blood or CSF OR detection of Gram-negative intracellular diplococci in blood or CSF	A39
Tuberculosis	Isolation of *Mycobacterium tuberculosis, Mycobacterium bovis*, or *Mycobacterium africanum* from a clinical specimen OR demonstration of acid-fast bacilli in a clinical specimen or in a histopathological lesion, when culture is not available, in a person with signs or symptoms compatible with tuberculosis OR evidence of resolution of disease where treatment with two or more anti-tuberculosis medications have been prescribed and follow-up has been instigated	A15, A16, A17, A18, A19

Appendix 2. Completeness of National Notifiable Diseases Surveillance System data received from States and Territories, 2000

Field	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
No. missing age	0	12	51	0	107	8	150	12	**340**
% complete for age	100.0	100.0	98.5	100.0	98.3	99.5	99.3	99.9	**99.6**
No. missing sex	3	64	13	3	1	6	307	23	**420**
% complete for sex	99.8	99.7	99.6	100.0	100.0	99.6	98.5	99.8	**99.5**
No. missing Indigenous status	567	16,727	331	18,829	966	1,251	18,669	3,896	**61,236**
% complete for Indigenous status	56.7	31.2	90.5	9.3	84.8	23.6	9.1	65.8	**31.8**

Appendix 3. Population totals for States and Territories, 2000*

ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Australia
314,036	6,463,455	195,463	3,566,357	1,497,634	470,376	4,765,856	1,883,860	**19,157,037**

* Based on Australian Bureau of Statistics mid-year population estimates

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