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HAEMOPHILUS INFLUENZAE TYPE B CASES IN AUSTRALIA FROM 1 JULY 1993 TO 30 JUNE 1994 - RESULTS OF THE HIB CASE REPORTING SCHEME INCLUDING IMMUNISATION STATUS AND VACCINE FAILURES

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Introduction

Haemophilus influenzae type b (Hib) has been documented as a major cause of morbidity and mortality in children under the age of five years. Before the introduction of Hib vaccines invasive Hib disease was reported to occur at rates of between 38.5 and 63.2 per 100,000 Australian children under the age of five years, with much higher rates being reported in the Northern Territory[1,2,3]. Around 500 cases occurred annually and there were 10 to 15 deaths per year[4].

Vaccines against Hib first became available in Australia in 1992, with the introduction of the conjugate PRP-D vaccine, recommended for use only in children aged 18 months or older. In 1993 another three conjugate vaccines, PRP-OMP, HbOC and PRP-T became available for use in children under the age of 18 months. In mid-1993 the Commonwealth Government made funding available to make Hib vaccines free to all children under the age of five years. While immunisation coverage has not been measured on a large scale, in Sydney Hib immunisation coverage was estimated to have increased to around 45% of children under the age of five years by August 1993[5].

The Hib Case Reporting Scheme was created in 1993 to obtain information on cases of invasive Hib disease which is not available in the National Notifiable Diseases Surveillance System (NNDSS), including type of illness, method of diagnosis and outcome. The scheme was also specifically created to obtain information on the immunisation status of cases and to record vaccine failures which occurred with these new vaccines.

Methods

The Hib Case Reporting Scheme commenced in January 1994, with reports backdated to 1 July 1993. A paper form was completed by a State or Territory health authority officer for every case of invasive Hib disease reported. The form contained questions on the age and sex of the case, the date of onset of illness, type of illness, method of diagnosis, outcome and immunisation status. Forms were entered into a database at the Commonwealth Department of Human Services and Health. Data entry and analysis were performed in Epi Info Version 6[6].

A case of invasive Hib disease was defined as:

1. isolation of *Haemophilus influenzae* type b (Hib) from any normally sterile site,

and/or

2. identification of Hib antigen in cerebrospinal fluid, urine or joint fluid with clinical features compatible with invasive Hib disease,

and/or

3. a confident diagnosis of epiglottitis by direct vision, laryngoscopy or X-ray.

Cases of Hib disease were also reported by States and Territories through the NNDSS, and reports to this scheme have been compared with the results of the Hib Case Reporting Scheme.

For the purposes of this analysis a Hib vaccine failure was defined as:

1. A child aged less than 15 months who received
   a. three doses of HbOC or PRP-T, or
   b. two doses of PRP-OMP, or
   c. two doses of HbOC or PRP-T where the first dose was given between 7 and 11 months of age, or
   d. a single dose of HbOC or PRP-T or PRP-OMP where the first dose was given at 12 months of age or older.
2. A child who received a single dose of HbOC or PRP-T or PRP-OMP at the age of 15 months or older.
3. A child who received a single dose of PRP-D at the age of 18 months or older.

Estimates of immunisation coverage rates and vaccine efficacy were calculated in Epi Info using the relationship between vaccine efficacy (VE), the percentage of cases vaccinated (PCV) and the percentage of the population vaccinated (PPV) which has been described by Orenstein et al[7]:

$$VE = \frac{PPV - PCV}{PPV(1 - PCV)}$$

Table 1. Hib reports in the Hib Case Reporting Scheme and notifications in the National Notifiable Diseases Surveillance System, 1 July 1993 to 30 June 1994, by State or Territory

State or Territory	Hib Case Reporting Scheme	National Notifiable Diseases Surveillance System
ACT	7	7
NSW	78	91
NT	7	7
Qld	40	49
SA	31	33
Tas	6	5
Vic	61	52
WA	16	17
Total	246	261

Results

The Hib Case Reporting Scheme recorded 246 cases of invasive Hib disease with onset of illness between 1 July 1993 and 30 June 1994 inclusive. This was fewer than the 261 cases reported through the NNDSS, with reporting varying by State and Territory (Table 1).

More cases occurred in the last six months of 1993 (153 cases) than occurred in the first six months of 1994 (93 cases). The majority of cases (186 or 76%) occurred in children aged less than five years, with 119 occurring in the last six months of 1993 and 67 occurring in the first six months of 1994 (Figure 1). The NNDSS reported 187 cases of Hib disease in children aged less than five years for the same period.

More males than females were reported with invasive Hib disease: the male to female ratio was 1.4:1.0 and this ratio was consistent across all age groups. Seven per cent of cases were reported as Aboriginals or Torres Strait Islanders, with 85% of cases reported as non-Aboriginal or Torres Strait Islander; for 8% Aboriginality was not recorded. In the NNDSS 49% of cases had Aboriginality reported as unknown and 4% were reported as Aboriginal.

The most common form of invasive Hib disease reported was meningitis, with 109 cases (44%). Other illness included epiglottitis, with 69 cases (28%), septicaemia, cellulitis, pneumonia, septic arthritis, osteoarthritis, pericarditis and sinusitis (Figure 2). Seventy-two per cent of the 61 children under the age of one year were reported as having had meningitis, 5% epiglottitis, and 23% other or unknown. In contrast, in the 125 children aged one to four years, 45% had meningitis, 32% epiglottitis and 13% other or unknown. For the 60 persons over the age of four years, epiglottitis was the most commonly reported diagnosis (40%), followed by septicaemia (28%).

There were 10 deaths (4% of cases) and outcome was not reported for nine cases (4%). Deaths occurred in five males and five females, and five were children under the age of five years. In those who died there were four cases of meningitis, five cases of septicaemia and one case of pneumonia.

One hundred and thirty cases (53%) were diagnosed by blood culture, 88 (36%) by CSF culture and five (2%) by culture from other sites (Table 2). Others were diagnosed by CSF and serum antigens, and two were diagnosed by the clinical presentation and urinary antigen alone. In 10 cases (4%) the laboratory method of diagnosis was not recorded.

In the 61 cases of epiglottitis where additional information was recorded 49 (80%) had the inflamed epiglottis directly visualised, 45 (74%) were intubated and 12 (20%) had X-ray evidence of epiglottitis.

Information on immunisation status was available for all but six cases (98%). Thirty-three cases (18% of cases

Figure 1. Cases of invasive Hib disease, 1 July 1993 to 30 June 1994, by month of onset and age group

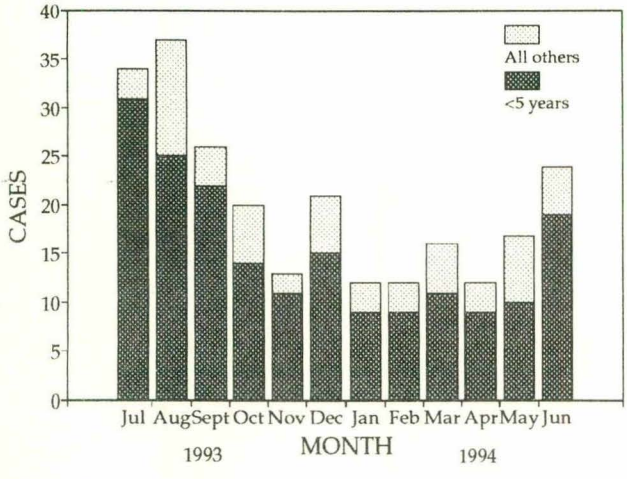

Figure 2. Cases of invasive Hib disease, 1 July 1993 to 30 June 1994, by type of illness

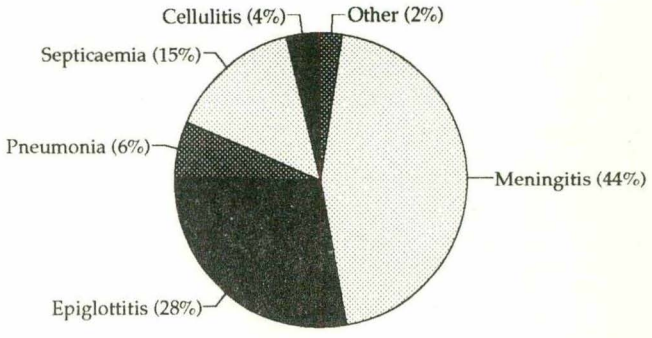

Table 2. Laboratory method of diagnosis for cases of invasive Hib disease, 1 July 1993 to 30 June 1994, by illness type

	Meningitis	Epiglottitis	Septicaemia	Cellulitis	Pneumonia	Other	Unknown	Total
Blood culture	15	55	36	6	12	4	2	130
CSF culture	86	2						88
Endotracheal swab culture		2						2
Other culture				1		2		3
CSF antigen	5							5
Serum antigen				2				2
Urinary antigen		1			1			2
No isolate/antigen found		4						4
Unknown	3	5			2			10
Total	109	69	36	9	15	6	2	246

under the age of five years) were reported to have received one or more doses of Hib vaccine, and of these, nine fulfilled the case definition of a vaccine failure. Vaccine failures involved five cases who had received a single dose over the age of 18 months (two PRP-D, two HbOC, one PRP-OMP), two who were under the age of 12 months and who had received three doses of HbOC and two who were under the age of 12 months and who had received two doses of PRP-OMP. All cases became ill more than 60 days after their last dose of vaccine. One additional case met the case definition of a vaccine failure but became ill only one day after vaccination, and was excluded for this reason.

Vaccine failures occurred in New South Wales (one), Queensland (three), South Australia (one), Victoria (one) and Western Australia (three). Five were cases of meningitis, two septicaemia, one epiglottitis and one cellulitis; all survived. Three cases were diagnosed by CSF culture, four by blood culture, one by culture from another site and one by CSF antigen. One failure occurred in July 1993 with the remaining eight occurring in the first six months of 1994.

The nine vaccine failures identified comprised 5% of cases under the age of five years, and this is consistent with an immunisation coverage rate of 50%, assuming the vaccine efficacy is 95%. The proportion of cases that were vaccine failures rose from 1% (one of 119) in the last six months of 1993 to 12% (8 of 67) in the first six months of 1994.

Cases who had received Hib vaccine but who did not fulfil the case definition of a vaccine failure included 16 who had received a single dose under the age of 12 months (four PRP-OMP, 10 HbOC, two unknown), five who had received two doses of HbOC under the age of 12 months with the first dose given before seven months and two who had received a single dose between the ages of 12 and 18 months (one PRP-D, one HbOC) and had not received the booster dose. Two cases were due for another dose of vaccine at the time of onset of the illness, and four cases were more than one month overdue. Four cases became ill within 21 days of their last dose of Hib vaccine and another two became ill between 22 and 28 days after their last dose. There was one death in a four month old child who had received a single dose of Hib vaccine 10 days prior to the onset of illness.

All children (vaccine failures and others) who had received more than one dose of Hib vaccine received the same brand of vaccine at each dose. Batch numbers were recorded for only 21 vaccine doses administered (47%). Batch numbers were all different except for three children in one area who had all received only one dose of HbOC of the same batch within two months of each other. One of these cases became ill four days after immunisation and the other two became ill 10 days apart, more than a month after immunisation. These cases were investigated and are not known to have been linked.

Discussion

The National Notifiable Diseases Surveillance System (NNDSS) has reported a dramatic fall in the number of Hib cases between 1992 and 1994[8]. The greatest decrease, of more than 60%, has occurred in children under the age of five years, and this has followed the introduction of vaccines against the disease. The Hib Case Reporting Scheme shows a decrease in the number of cases of invasive Hib disease consistent with the NNDSS, as well as other changes consistent with an increase in Hib vaccine coverage.

In the first six months of 1994 there were 44% fewer cases of invasive Hib disease in children under the age of five years reported through the Hib Case Reporting Scheme than in the last six months of 1993. In the same period the NNDSS showed a 39% reduction in cases. While it is likely that both surveillance schemes have some under-reporting, the Hib Case Reporting Scheme is more likely to have omissions because it is a newer scheme, is not covered by legislation and it requires a specific paper form to be completed. Reporting to the Hib Case Reporting Scheme also varies by State and Territory. Case definitions differ between States and Territories when reporting to the NNDSS, so the cases reported in the two schemes have not always been identical. Immunisation practices and, it is most likely, immunisation coverage rates also vary by State and Territory so the general conclusions made from this scheme may not be applicable to local areas, and could differ if reporting were complete.

The rapid decrease in the number of Hib cases reported can only be attributed to the introduction and widespread use of Hib vaccines. This decrease in cases with the introduction of vaccines has been demonstrated in other countries around the world and in Finland Hib appears to have been eradicated completely[9]. The increasing number of Hib vaccine failures identified during the study period is also consistent with an increase in Hib immunisation coverage, because as coverage levels increase the proportion of cases who have been immunised also increases[7].

Vaccine failures in the Hib Case Reporting Scheme occurred with different brands and batch numbers of vaccines, so there is no reason to suspect any one vaccine to be a problem. In the United Kingdom two factors have been identified associated with Hib vaccine failures: prematurity and Down's syndrome (Norman Begg, personal communication). The only Hib vaccine currently used in the United Kingdom is PRP-T, a vaccine not commonly used in Australia. Further information on risk factors in Australian Hib vaccine failures is currently being sought.

The definition of a vaccine failure used for this study was created using the NHMRC recommendations on Hib immunisation from April 1993[10]. The British however use a different case definition of a vaccine failure: a case occurring after at least two doses of vaccine given in the first year of life or after a single vaccination given to children at the age of 12 months or more[12]. Using this definition, Australia would have had 16 vaccine failures, or 9% of cases under the age of five years. This rate of failure would be consistent with an immunisation coverage rate of 68% if the vaccine efficacy is 95%, or a vaccine efficacy of 90% if the immunisation coverage rate is 50%. The most recent estimate of Hib vaccine coverage in Australia, a study conducted by McIntyre et al in Sydney, found coverage to be around 45%[5]. If this coverage is assumed nationally and the British case definition is used, it could be concluded that vaccine efficacy is suboptimal.

To determine Hib vaccine efficacy in Australia accurately there is a need to have both a standard definition of a Hib vaccine failure and an accurate measure of immunisation coverage levels. The definition of a vaccine failure currently used can be improved to define a failure more accurately. The definition should exclude children who become ill within a set time period (say 21 days) after vaccination, as immunity would not yet have developed.

The four cases who were more than a month overdue for their immunisations and who then developed invasive Hib disease demonstrate the importance of immunising children on time. Cases which have occurred within the first 21 days following immunisation have been reported previously in Australia[12] and these are not regarded as vaccine failures because a protective immune response to Hib is only established three to seven weeks after vaccination[13].

The 10 deaths in one year recorded in the Hib Case Reporting Scheme demonstrate the seriousness of invasive Hib disease. Meningitis and epiglottitis continue to be the major illnesses reported; both of these cause significant morbidity and can result in long term disabilities which are not documented by this surveillance scheme.

While the majority of cases were diagnosed by culture of the organism from a normally sterile site, for epiglottitis in particular the organism was not always identified. Because some State and Territory notification systems are laboratory-based, and diagnoses of epiglottitis are not always laboratory confirmed as due to *Haemophilus influenzae* type b, it is therefore likely that epiglottitis is under-notified. Epiglottitis can also be caused by other organisms and it is possible that with decreasing numbers of cases of invasive Hib disease, increasing proportions of epiglottitis will be caused by other organisms, and thus there may also be a possibility of over-reporting.

Invasive *Haemophilus influenzae* type b is a serious illness of childhood which is being rapidly reduced by the use of Hib vaccines. Despite the reduction in case numbers, the disease still causes significant illness and mortality in Australia. The increase in Hib vaccine failures during the surveillance period is consistent with an increase in Hib vaccine coverage, but more information is required to exclude the possibility of reduced vaccine efficacy. Immunisation providers should aim to immunise all children on time and to increase Hib immunisation coverage to a level where invasive Hib disease disappears completely.

Acknowledgments

I would like to thank the State and Territory health authority officers who regularly completed the Hib Case Reporting Scheme, Michelle Wood for her help with data entry, Rob Condon for his advice on the report form and Helen Longbottom and Mahomed Patel for their advice on this document.

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CDI editorial comment

Notifications of invasive Hib disease have been compiled by the National Notifiable Diseases Surveillance System (NNDSS) since 1991. As mentioned above, the NNDSS has documented a marked decline in Hib notifications since the approval of Hib vaccines in 1992 and the commencement of the National Hib Immunisation Program in 1993.

In 1991, there were 549 notifications from six States and Territories, for an annual notification rate of 3.5 per 100,000. In 1992, there were 501 notifications from seven States and Territories, for a rate of 3.2 per 100,000. The notification rate dropped markedly in 1993, to 2.2 per 100,000 (396 notifications from all States and Territories), and in 1994, to 1.0 per 100,000 (a provisional total of 176 notifications).

The notification rate in children under the age of five years dropped by over 70% between 1991 and 1994. In 1991, there were 415 notifications for a notification rate of 36.8 per 100,000. There was a small increase in notification rate in 1992, to 37.3 per 100,000 (432 notifications). In 1993, there was a notification rate of 24.8 per 100,000 (319 notifications) and in 1994, the rate was 8.8 per 100,000 (a provisional total of 114 notifications). During the four year period, there were Hib notifications for 726 males and 548 females under the age of five years (male:female ratio 1.00:0.75). A total of 378 was for children under the age of one year, 220 males and 154 females (four unknown).

Children aged five to nine years have had the second highest Hib notification rate each year. There have been 135 notifications for this age group in the four years, 79 males and 56 females (male:female ratio 1.00:0.71). The notification rate was 3.1 per 100,000 each year in 1991, 1992 and 1993, but fell to 2.0 per 100,000 in 1994.

HAEMOPHILUS INFLUENZAE TYPE B MENINGITIS IN FAR NORTH QUEENSLAND, 1989 TO 1994

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Over the four years 1989 to 1992 there were 36 cases of *Haemophilus influenzae* type b (Hib) meningitis in children in Far North Queensland. One case occurred in a Caucasian child aged 72.0 months; the remainder (described in detail below) were all under five years of age. There were no deaths attributed to Hib meningitis, but two of the (Aboriginal) survivors are known to be profoundly neurologically impaired.

Of the 35 cases in children under five years of age, 11 (31.5%) occurred in Aboriginal children, six (17%) in Torres Strait Island children and 18 (51.5%) occurred in non-indigenous children. Based upon 1991 national census data, the annual incidence of Hib meningitis for Aboriginal and Torres Strait Island children was 127 cases/100,000 children under five years, whereas for non-indigenous children it was 33 cases/100,000 under five years of age.

The mean age of onset of Hib meningitis in Aboriginal and Torres Strait Island children was 9.5 months (median 7.0; range 4.5 - 34.5 months) whereas for non-indigenous children it was 15.5 months (median 15.0; range 1.5 - 43.0 months). Nearly 25% of the Hib meningitis in Aboriginal and Torres Strait Island children occurred below six months of age, compared with 11% of the non-indigenous cases. Of the 17 Aboriginal and Torres Strait Island cases 15 were girls, whereas of the 18 non-indigenous cases 11 were girls.

There were no cases of Hib meningitis in 1993 until April, when three cases occurred in Aboriginal children over a four day interval (Figure 1). All three children were from remote communities, two being from the same community. A conjugate Hib vaccine (Pedvax-HIB) suitable for use in infancy in Aboriginal and Torres Strait Island children was approved in Australia in September 1992. Because (at the time) it was uncertain when Commonwealth funding would become available to enable conjugate Hib vaccines to be incorporated into the childhood immunisation program, the Peninsula and Torres Strait Regional Health Authority provided funds to make the vaccine available to remote community Aboriginal and Torres Strait Island children under two years of age. This local initiative commenced in May 1993; the last case of Hib meningitis in an Aboriginal or Torres Strait Island child in Far North Queensland occurred in June 1993. That child was 10.0 months of age and was unimmunised at the time of illness.

The Commonwealth funded National Hib Immunisation Program began in mid-1993 for children born after 1 February 1993, and in September 1993 for older children. This program provided conjugate Hib vaccines (PedvaxHIB for Aboriginal and Torres Strait Islander children and HibTITER for all other children) for all Australian children under five years of age as part of the routine childhood immunisation schedule. The last case of Hib meningitis in a non-indigenous child in Far North Queensland occurred in September 1993. That child was 6.5 months of age and was unimmunised at the time of illness.

There were no cases of Hib meningitis in Far North Queensland during 1994 (Figure 2).

Figure 1. Hib meningitis, Far North Queensland, 1989 to 1994, by month and year

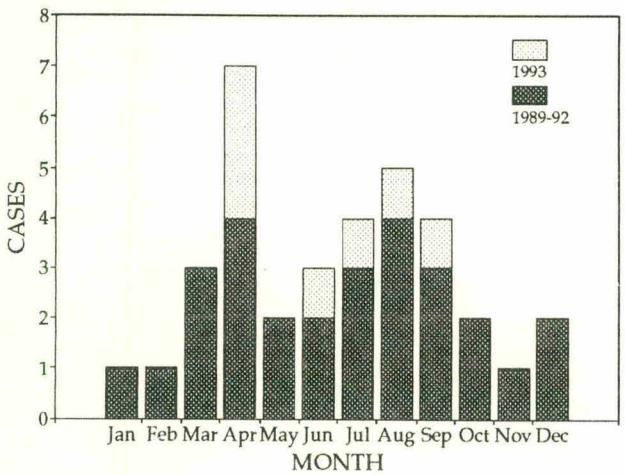
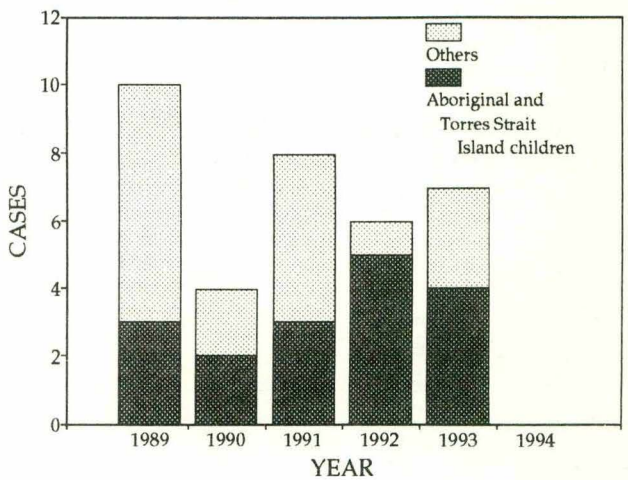


Figure 2. Hib meningitis, Far North Queensland, 1989 to 1994, by year



Comment

The epidemiology of Hib meningitis in Far North Queensland in the pre-vaccine years demonstrated, as expected[1], the higher incidence of Hib meningitis in Aboriginals and Torres Strait Islanders compared with other Australian children. Aboriginal and Torres Strait Island children in Far North Queensland were not only at a nearly four-fold greater risk of developing Hib meningitis, but they were also likely to develop it at an earlier age. The increased severity of Hib meningitis in Aboriginal children is well recognised[2].

An excess of cases of Hib meningitis in Aboriginal girls compared with boys has been previously documented[1], and the Far North Queensland data support the trend. However, updated compiled information from larger populations suggests that the gender differential may not have been nearly as marked as initially thought (Table). If there were a true excess of Hib meningitis in Aboriginal girls, it was probably a consequence of subtle cultural and social factors[1].

If the average annual number of cases (7.0; 95% confidence interval 2.8 - 14.4) of Hib meningitis in Far North Queensland in the pre-vaccine years (1989 to 1992) can be assumed to be the expected number of cases that would have occurred in 1994 if there had been no vaccines, then the observed absence of any cases was a significant decrease. A rapid decline in the incidence of Hib meningitis following the introduction of Hib vaccines has been documented in large populations in Europe[3] and North America[4], validating the high efficacy of the conjugate vaccines demonstrated in clinical trials.

However, the surveillance reports from the United States indicate that the decline in cases in children under one year of age began after licensure of conjugate Hib vaccines for 18 months old children but before licensure for infants[4]. The probable explanation for this unexpected phenomenon is that conjugate Hib vaccines reduce the nasopharyngeal carriage of Hib, and therefore reduce the exposure of unvaccinated children to Hib[5]. This effect has also been demonstrated in indigenous children in the United States[6]; in the pre-vaccine era these children had a high prevalence of nasopharyngeal carriage of Hib at a very early age leading to a high incidence and an early onset of invasive Hib disease.

Table. Hib meningitis cases in Aboriginal children in central Australia 1986 to 1992, Western Australia 1984 to 1992 and Far North Queensland 1989 to 1992, by region and sex[1]

Region	Boys	Girls
Central Australia	11	21
Western Australia	41	43
Far North Queensland	2	15
Total	54	79
Male:female ratio	1.00 : 1.46	

Although there are no data yet available about the uptake of Hib vaccines in Far North Queensland, it is known that the uptake of other childhood vaccines, at least in urban children, is suboptimal[7]. Therefore the decline in Hib meningitis in Far North Queensland is probably greater than could be expected from vaccine uptake alone, reflecting a likely decline in the prevalence of nasopharyngeal carriage of Hib in the region. A preliminary report from the Northern Territory has documented a marked decline in the prevalence of carriage of Hib in fully-vaccinated Aboriginal children[8].

The dramatic impact of Hib vaccines, with an indirect herd immunity effect and rapid decline in disease incidence, allows speculation that invasive Hib disease could soon be eradicated[4]. The challenge however will be to improve and maintain high Hib vaccine uptake levels in an era of well controlled, and possibly eradicated, Hib disease. Combination vaccines, with multiple antigens in the one syringe, would be a major advance; a combination tetravalent DTP-conjugate Hib vaccine is now routinely administered to infants in New Zealand[9]. We would welcome a pentavalent DTP-conjugate Hib-hepatitis B vaccine.

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Fran Morey, Alice Springs Hospital, and Jan Payne, Institute for Child Health Research, Perth, generously provided the data used to update and compile the Table.

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EVALUATION OF THE NORTHERN TERRITORY'S *HAEMOPHILUS INFLUENZAE* TYPE B (HIB) VACCINE PROMOTION CAMPAIGN

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In April 1993 the Northern Territory government implemented a program of *Haemophilus influenzae* type b (Hib) vaccination for all Northern Territory children born after December 1992. By June 1993 the program was extended to include all children born after 1 July 1988. This 'catch up program' was to cover all children up to the age of five years as well as those receiving the routine vaccination starting at two months of age. In September 1993 the program became Commonwealth funded.

A vaccine usage audit of all Northern Territory health regions in October 1993 suggested that the Hib program had achieved uptake rates of greater than 70% in most rural areas, with some smaller rural areas approaching 100%. Coverage reports from communities indicated uptake rates exceeding 90% amongst rural Aboriginal children. In contrast, uptake rates from urban Darwin were estimated from vaccine usage to be at best 50%. A Hib vaccine promotional campaign was therefore planned for the Darwin urban and Palmerston areas, as were surveys of coverage and vaccine awareness prior to and following the promotional activities.

Pre-campaign survey

To validate the vaccine audit and anecdotal estimates of vaccine coverage in the urban area, a random telephone survey was conducted in November 1993 targeting parents of children aged eight months to five years in the Darwin urban and Palmerston areas. Telephone numbers were randomly selected from the current Northern Territory telephone directory for Darwin and Palmerston addresses. Up to four calls were made to each telephone number at different times during the day and evening in order to obtain an interview.

The survey aimed to determine 1) the awareness of the Hib vaccine and 2) the Hib vaccination rate. This information would be used to determine the need for a promotional campaign to raise Hib vaccination coverage levels.

Pre-campaign results

A total of 442 households was contacted, with 63 respondents (14%) satisfying the target criterion of having children aged eight months to five years.

Although 62% of the target group could name Hib in response to the question 'Can you name a new vaccine, immunisation or needle for young children released this year?', increasing to 79% when prompted, only 46% (95% confidence interval (CI) 34 - 58%) indicated that their children had been vaccinated with the Hib vaccine (Table 1). This overall coverage rate was consistent with a small study of vaccination documentation amongst Darwin child-care centres conducted during this period. Ninety-seven per cent of the parents of vaccinated children could name the vaccine but 28% of parents who could name the vaccine had not vaccinated their children.

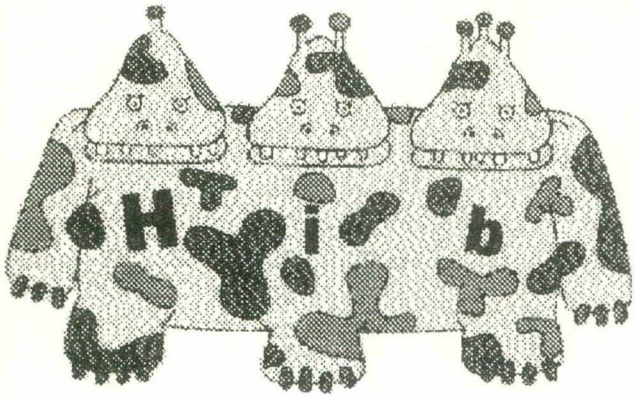
This result confirmed the earlier indications of a low urban Hib vaccine uptake and initiated the development of a promotional campaign aimed at increasing the uptake of Hib vaccine in urban children in the catch up target group.

The campaign

A multi-faceted media campaign was launched on 5 December 1993. This initial campaign was conducted over a three week period and included television, radio and newspaper advertising. The campaign's impact was concentrated in December, immediately following television news coverage of the launch, with a further two week repeat campaign conducted at the end of January 1994.

The main and unique feature of this promotional campaign was the introduction of a cartoon character, the Horrible Hib Monster (Figure 1), appealing directly to the target group of young children. The Horrible Hib Monster featured as the central logo on all visual components of the promotional material including television advertising, posters, postcards, information flyers, stickers and a banner. The main publicity ele-

Figure 1. The Horrible Hib Monster



ment was a 30 second television commercial played during prime time. The television and radio promotional material was pitched at an emotive level, to be construed as fun for children, rather than at an instructive or rational level for parents. At the end of the commercial a positive action tag was included directed at parents. This provided information on the disease and availability of the Hib vaccine. These promotional elements sought a consumer focus as used in commercial marketing strategies.

Posters were sent to all general practitioners and pharmacies in the Darwin urban area. This tabloid-style poster announced the Hib campaign with the headline 'Horrible Hib Monster in NT'. In addition, a postcard for parents, featuring the Horrible Hib Monster, was mailed to all Darwin households. It stressed the potential dangers of Hib disease and provided information on where parents could have their children vaccinated. All campaign items also provided details of the Hib Infoline, which sought to further reduce barriers to access, by allowing parents to obtain further information on Hib disease and vaccine and locations where vaccination was available. Special clinics were set up at school and child-care centres and extended hours clinics were made available at existing health centres.

Post-campaign survey

The post-campaign survey was conducted in March 1994, utilising the same random telephone survey method as used for the pre-campaign survey.

This survey aimed to evaluate the promotional campaign's influence on Hib vaccine uptake. In addition, the survey sought to determine post-campaign rates for

Table 1. Hib vaccine pre- and post-campaign knowledge of parents with children aged 8 months to 5 years, and Hib vaccination rates in their children[1]

	Pre-campaign n=63	Post-campaign n=74	Difference	*p* value
Parent could name the vaccine	62% CI 50 - 74%	77% CI 69 - 86%	+15%	$p=0.05$
Parent had heard of the vaccine	79% CI 67 - 89%	97% CI 91 - 100%	+18% CI 7 - 29%	$p<0.01$
Child received vaccine	46% CI 34 - 58%	73% CI 61 - 83%	+27% CI 11 - 43%	$p<0.002$

1. CI, 95% confidence interval.

Table 2. Post-campaign recall of adults with and without children aged 8 months to 5 years

	All respondents n=406, %	Target group parents n=88, %	Other adults n=318, %	*p* value for difference between target group parents and others
Unprompted recall				
Television commercial	39	52	36	$p<0.01$
Newspaper advertisement	25	26	25	$p>0.05$
Other campaign items1	19	33	15	$p<0.0002$
Campaign message	24	30	23	$p>0.05$
Hib Monster logo	17	26	14	$p<0.01$
Prompted recall				
Television	58	73	54	$p<0.001$
Newspaper	44	51	42	$p>0.05$
Postcard	23	35	20	$p<0.01$
Radio	16	22	14	$p>0.05$
News other	20	33	16	$p<0.001$

1. Other campaign items were radio advertisement, direct mail postcard, poster, pamphlet and banner.

the awareness of Hib vaccine and the Hib vaccination rate specifically in the catch up target group for comparison with pre-campaign rates. Further, it aimed to assess whether the target audience was exposed to and recalled the campaign's messages. The post-campaign survey queried campaign recall in all interviewees, including both target group parents and others.

Post-campaign results

A total of 406 respondents was contacted, with 74 (18%) satisfying the target criterion of having children aged eight months to five years. Target group respondents were queried about Hib vaccine awareness and Hib vaccination (Table 1). All 406 respondents were queried on the Horrible Hib Monster campaign and campaign element recall (Table 2).

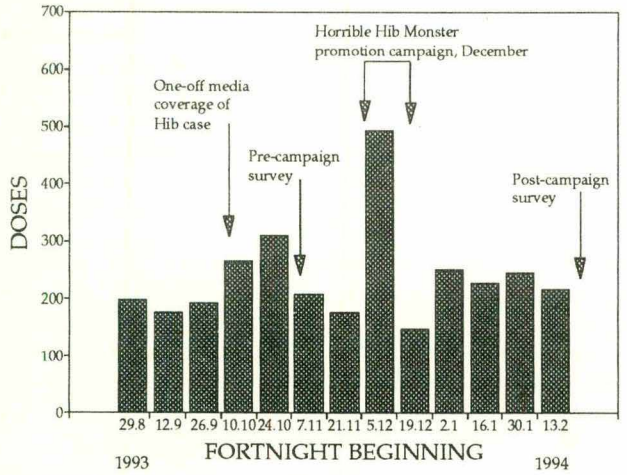
Awareness and coverage

Parental awareness of the Hib vaccine, as indicated by the unprompted naming of the Hib vaccine increased from 62% (95% CI 50 - 74%) at pre-campaign to 77% at post-campaign (95% CI 69 - 86%, $p = 0.05$) (Table 1). Those having heard of the vaccine after prompting showed a significant increase ($p < 0.01$) from 79% (95% CI 67 - 89%) to 97% (95% CI 91 - 100%).

Hib vaccination coverage increased significantly from the pre-campaign survey with an increase from 46% to 73% (95% CI 61 - 83%) ($p < 0.002$).

Figure 2 shows the fortnightly Hib vaccination activity in two Darwin community care centres for the period 29 August 1993 to 27 February 1994. It provides some indication that the mass media campaign of December enhanced Hib vaccination activity. Although a short-term effect, with vaccination activity declining rapidly after the initial intervention, the increase in activity occurred during a period when vaccination activity is usually at its lowest (pre-Christmas and holidays).

Figure 2. Hib vaccine usage for two Darwin community care centres, 29 August 1993 to 27 February 1994, by fortnight



There was also a small increase in activity in October following television news publicity of a Darwin child hospitalised with invasive Hib disease.

In the post-campaign survey parents were asked about their reasons for vaccinating or not vaccinating their children: 'What prompted you to have your child immunised against Hib?' or 'Is there a reason we could not why your child did not receive the Hib immunisation?' Among those whose child was vaccinated, the most frequently cited reasons in order of frequency were: 1) publicity (including the availability of special immunisation clinics), 2) on the advice of a doctor, 3) routinely immunised, and 4) advice from others (including nurses).

Only a small proportion of vaccinations in the Northern Territory is administered by general practitioners, however a large number of parents reported 'on the advice of a doctor' as a basis for their decision to have their child vaccinated against Hib.

Reasons for non-vaccination reported by parents of non-vaccinated children included: 'child ill at the time', 'insufficient information available', 'child close to five years, didn't feel it was necessary', and 'haven't got around to it yet'. Two parents felt that 'immunisation has too many side effects'.

Campaign recall

Of all campaign elements the television commercial was the most frequently remembered (Table 2). Fifty-two per cent of target group parents recalled the commercial spontaneously and 73% recalled it after prompting. Newspaper advertisements elicited the next highest recall after prompting at 51%. Radio was the least memorable (22%), ranking behind the direct-mail postcard (35%) and other 'news' items such as editorial stories on Hib (33%).

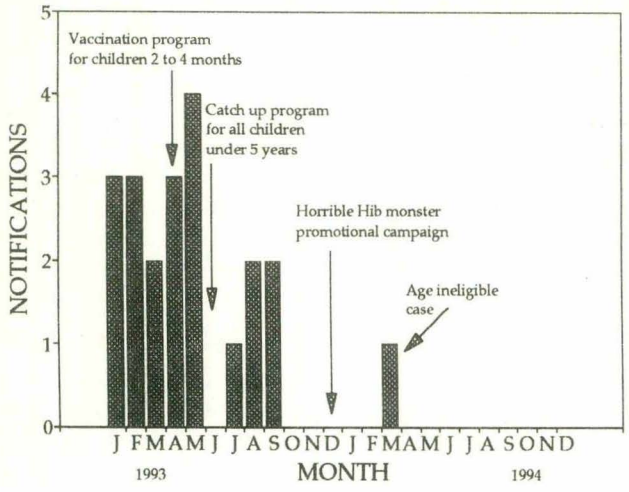
Target group parents generally recalled most campaign elements at higher rates than non-target group parents and the difference in recall was statistically significant in the case of the television commercial (prompted and unprompted), the Horrible Hib Monster logo (unprompted), other 'news' items (prompted) and other campaign items such as the postcard and posters.

Although detailed knowledge of elements was not explicitly addressed, recall of campaign messages appeared to be good. Of the target group, 30% recalled a campaign message without prompting, for example, 'the Hib vaccine is free to all children under five years' or 'Hib disease can cause meningitis in young children'. The Horrible Hib Monster logo was spontaneously recalled by 26% of the target group either by name or indirectly, for example, as 'a colourful monster with spots'.

Hib notifications

There were 20 notifications of Hib in the Northern Territory in 1993, all occurring prior to the Horrible Hib Monster campaign. Only one case of invasive Hib disease has been reported in the Northern Territory

Figure 3. *Haemophilus influenzae* type b infection notifications, Northern Territory, January



since September 1993. This case was in a Hib vaccine age-ineligible child (under two months of age) (Figure 3).

Conclusion

A significant increase occurred in Hib vaccine coverage following the Horrible Hib Monster campaign and 73% coverage was achieved. Hib vaccine not only protects the individual but also decreases carriage and thereby decreases the Hib circulating in a community.

The Horrible Hib Monster campaign demonstrated that the mass media are effective in acting as a reminder service or a 'cue for action'. The campaign successfully sought to secure children and parent's attention, set an agenda which promoted the Hib vaccine as an important part of the regular childhood vaccination schedule, and reduced vaccination barriers by providing access to information.

The campaign emphasised positive action messages. Mass media campaigns may be further enhanced by recognising the role of general practitioners and other health professionals in their role as a referral agent or vaccine promoter for many parents.

HIB VACCINE - INTRODUCTION AND IMPACT IN SOUTH AUSTRALIA, 1 JULY 1993 TO 31 DECEMBER 1994

John Carrangis, Communicable Disease Control Unit, South Australian Health Commission; adapted from Communicable Disease Control Bulletin 1994;(3):303-304.

The introduction of free Hib vaccines across South Australia on 1 July 1993 was a terrific opportunity for another public health intervention. It was also an opportunity to promote all vaccines recommended by the National Health and Medical Research Council for routine childhood immunisation, improve management of the State immunisation program and increase immunisation cover, particularly in children. The new vaccines increased workloads but their saving grace was the dramatic reduction in Hib infections.

Vaccine supply and campaign

The State Vaccine Distribution Centre (VDC) received both Hib vaccines (PedvaxHIB for Aboriginal and Torres Strait Islander children and HibTITRE for other children) direct from the suppliers. VDC distributed the vaccine to each local council who acted as agents, arranging distribution of the Hib vaccine(s) to all immunisation service providers in their area. In exchange for vaccines, information on those who received the vaccine was reported. An audit in the period September to December 1993 asked for details of immunisation cover, vaccine wastage, vaccine storage monitoring and comments. Wastage overall was found to be 1.5%. After this survey, ordering was requested monthly so that smaller quantities were held and losses would be less if the cold chain failed. Between 5 and 10% of the vaccine is kept on hand by councils. All other childhood vaccines were distributed direct to the immunisation service providers. There are 119 councils in South Australia and with sharing/regionalisation, 104 distribution outlets. There are about 1100 doctor's surgeries providing vaccines across the State.

PedvaxHIB vaccine was distributed from February 1993, predominantly to rural Aboriginal communities from Port Augusta and to the north, funded by the South Australian Health Commission.

A total of 94,116 doses of HibTITRE was distributed to local councils between 1 July 1993 and 30 June 1994 (value $649,400) for the 20,000 births per annum. In the same period, 1480 doses of PedvaxHib (value $22,422) were distributed for the 256 Aboriginal births in the rural area mainly north and west from Port Augusta.

Continuous exposure by the media from April 1993, including statements that free vaccines were promised, set the agenda for the public and health workers. Health workers were informed in writing about the new vaccine via the South Australian *Communicable Disease Control Bulletin* and direct mail to local councils, who then contacted most general practitioners in their areas. Printed materials produced by the South Australian Health Commission and later by the Commonwealth Department of Human Services and Health were distributed for health workers and the public.

Advertisements were placed in several newsletters directed to child-care organisations, and plans for vaccine distribution were publicised in medical journals and the daily State paper. Enquiries from the public and health workers were many and continuous for several months.

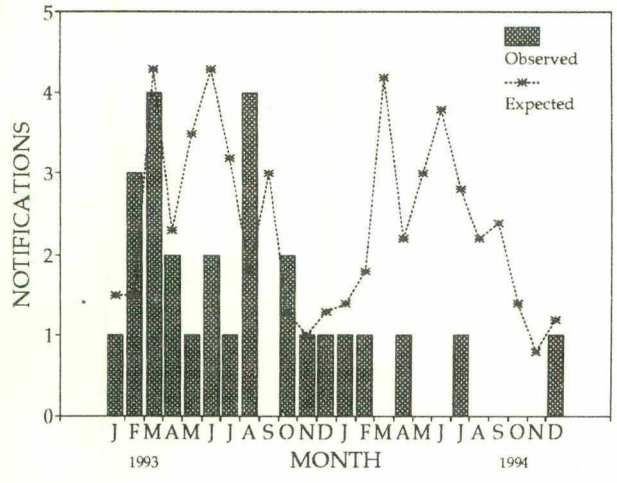
Coverage achieved and disease incidence

Coverage for the first dose for infants at the age of two months was estimated from audits at 75% for the period 1 July to 31 December 1993.

Surveys of vaccination levels across South Australia were conducted in 1994. A total of 14,545 pre-schoolers (aged four years) was surveyed, with 48.3% having been vaccinated against Hib (59.7% of records validated). Coverage was also determined for 620 five year old children; 33.9% had been vaccinated (60.3% of records validated). Two hundred and thirty Aboriginal children were also surveyed and 44% found to be fully vacinated against Hib (37% of records validated).

There were 22 cases of Hib meningitis in South Australia in 1993 in persons under the age of 20 years, 13 in the first six months and nine in the second six months (Figure). In contrast, there were only five cases notified in 1994. One case was aged less than 12 months, three were one year old and one was three years old. There have been no cases reported this year so far.

Figure. Hib meningitis in persons aged less than 20 years, 1993 to 1994, and expected[1], by month



1. Expected in 1993 is the 1989-1992 average, and in 1994, the 1989-1993 average.

Three infants aged five, 12 and 45 months were reported with Hib disease following Hib vaccination. They had received two, two and one doses of HibTITER respectively. Illnesses reported were meningitis, periorbital cellulitis and bacteraemia. All infants recovered.

Other benefits

The introduction of the Hib vaccines provided other opportunities for review of vaccination activities in South Australia:

1. The vaccine cold chain monitoring program was expanded, with local councils requested to increase involvement in surveillance of vaccine refrigerators in surgeries.
2. The immunisation computer program was enahanced to accommodate the Hib schedule. It is now in 60 locations (mainly local councils), after several new installations were made in the past 12 months.
3. Several additional doctors have started offering vaccines.
4. Increased education about disease control and promotion of immunisation in child care facilities was achieved.
5. A new segment about Hib has been incorporated into the immunisation information video *Goodbye to the plague - immunisation.*

Conclusion

Hib vaccination increased and disease incidence decreased in South Australia between the beginning of 1993 and the end of 1994. Better planning and coordination of the new vaccination program would have ensured less frustration, excessive time loss and anxiety with perhaps even better results but surveillance and auditing of the distribution arrangements has resulted in improved program management.

OVERSEAS BRIEFS

In the last two weeks, the following information has been supplied by the World Health Organization and the United States' Centers for Disease Control and Prevention.

Dengue 3 in Nicaragua and Panama

In October-November 1994, dengue 3 was isolated from two children hospitalised with minor haemorrhagic manifestations in Managua in Nicaragua. The virus was subsequently also isolated from two persons with dengue fever in Panama, one in the province of Chiriqui and the other in the province of Panama[1].

These were the first isolations of dengue 3 from autochthonous cases in the Americas since the period 1963 to 1977, when this serotype caused epidemics in areas including Jamaica and the eastern Caribbean. The recent isolations have important public health implications because most residents of the American tropics are susceptible to the serotype, and the introduction of a different serotype may increase the risk of dengue haemorrhagic fever resulting from secondary heterotypic infection. Genetic typing of the first Panama isolate has indicated that the virus belongs to the Sri Lanka/India genotype, which caused major dengue haemorrhagic fever epidemics in Sri Lanka and India during 1989-1992.

A multifaceted response to control *Aedes aegypti*, the mosquito vector of dengue, was initiated in October and November in Nicaragua. Control activities included ultra-low volume application of insecticides, indoor application of larvicide and a national, community based campaign to eliminate mosquito breeding sites and educate the community about the disease. By the end of November, the weekly number of reported cases had decreased substantially.

The geographic range and incidence of dengue virus activity in the Americas increased from 1980 to 1994, but all activity until recently has been associated with dengue 1, dengue 2 and dengue 4. During 1994, a countrywide dengue epidemic occurred in Nicaragua, with over 20,000 cases recorded (4.8 per 1000 population). Of those, 1247 had haemorrhagic manifestations, 900 were hospitalised, 35 met the diagnostic criteria for dengue haemorrhagic fever and six died. The outbreak of dengue in Panama began in July 1994. Dengue 1 was the predominant virus serotype isolated, and there was a total of 716 laboratory diagnosed cases to 28 December. There were also outbreaks in 1994 in Brazil, Costa Rica, Dominican Republic, Haiti, Mexico, Puerto Rico and Venezuela.

Influenza in the Northern Hemisphere

Influenza A H_3N_2 and influenza B are spreading in North America and Europe. In Europe, most isolates have been associated with sporadic cases but there have been outbreaks and some epidemic activity in Spain, with numerous isolations of influenza A H_3N_2. This virus has also been isolated in France, Italy, Netherlands, the Russian Federation, Spain, Sweden, Switzerland and the United Kingdom. There have been a few outbreaks of influenza B in Portugal and Spain, and the virus has been isolated in Finland, France, Germany, Portugal, Romania, the Russian Federation, Spain, Sweden, Switzerland and the United Kingdom.

In North America, eleven of the United States have reported regional or widespread influenza activity. Influenza viruses have been detected in 41 States and in the District of Columbia. Influenza A H_3N_2 predominates in all regions except the south Atlantic and mountain regions where influenza B is equally as common. Spreading and increasing influenza has also been reported from Canada, with mostly influenza A isolates.

Plague in India

The last case of bubonic plague in the outbreak in India occurred in Beed District (Maharashtra State) on 2 October 1994 and the last case of pneumonic plague in Surat City (Gujarat State) on 11 October 1994[2]. No cases have occurred since in any part of the country and no cases of suspected plague have been reported. Intensive insecticidal spraying combined with other anti-plague measures were carried out in both affected areas, and as a precaution, in many other areas, without evidence of secondary transmission. Continuous surveillance has been maintained and epidemiological investigations have not shown any sign of active transmission in rodents in the outbreak areas.

Specimens from suspected cases have been tested serologically and 876 characterised as presumptive cases, of which 54 were fatal. Most (596) of the presumptive cases occurred in Maharastra State, 151 in Gujarat, 68 in Delhi, 50 in Karnataka, 10 in Uttar Pradesh and one in Madhya Pradesh. Fifty-two of the 54 fatal cases occurred in Gujarat, one in Delhi and one in Karnataka. None of the suspected cases in other areas of India had serological evidence of infection.

Cholera update

Nanumea Island and Nuitao Island in Tuvalu have been removed from the list of cholera infected areas.

Cholera cases have been reported for November, December and January from Albania, Benin, Cambodia, Cape Verde, Chile, Costa Rica, Djibouti, Ecuador. El Salvador, Gaza, Ghana, Guinea, Guinea Bissau, Guyana, India, Italy, Niger, Philippines, Sierra Leone, Tanzania (in Rwandan refugee camps), Ukraine and Zaire (in Rwandan refugee camps).

Reference

1. Centers for Disease Control and Prevention. Dengue type 3 infection - Nicaragua and Panama, October-November 1994. *MMWR Morb Mortal Wkly Rep* 1995;**44**:21-24.

2. Plague. *Wkly Epidemiol Rec* 1995;**70**:35.

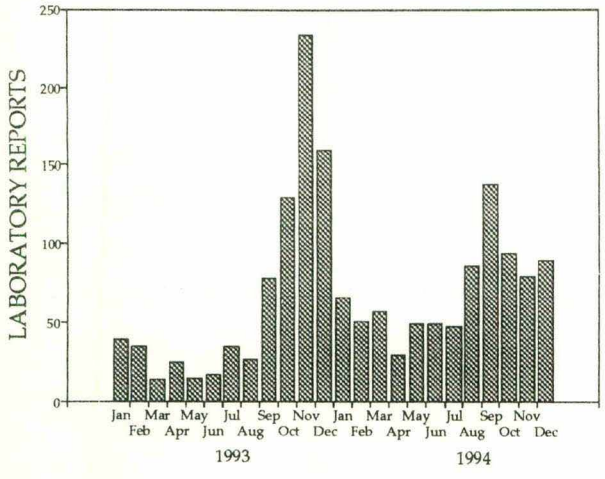
COMMUNICABLE DISEASES SURVEILLANCE

Virology and Serology Reporting Scheme

There were 1137 reports received in the *CDI* Virology and Serology Reporting Scheme this fortnight (Tables 6, 7 and 8).

- Ten reports of **measles** were received this period, for 3 males and 7 females. Diagnosis was by IgM detection (9) and single high titre (one). The number of reports remains below that for this time last year (Figure 1).
- **Rubella** was reported for 58 patients this fortnight including 17 females (13 in the 15 to 44 year age group) and 40 males (one sex not stated). Fifty diagnoses were by IgM detection, four by fourfold rise in titre, three by single high titre and one virus isolation. The number of reports has declined after peaking in November.
- Twenty-two reports of **hepatitis A** were received, 10 males and 12 females, age range one to 64 years.
- Positive **hepatitis B** serology was reported for 49 patients this fortnight, 29 males and 19 females (one sex not stated). Twenty-four patients were in the 25 to 44 year age group, and 14 in the 15 to 24 year age group.
- Positive **hepatitis C** serology was reported for 137 patients this fortnight including 91 males and 46 females. One hundred and eleven reports were for the 25 to 44 year age group. Included were 13 injecting drug users and one patient who was the index case in a needlestick injury.
- **Heptatitis D** was reported for 22 and 35 year old males from Victoria.

Figure 1. Measles laboratory reports, 1993 to 1994, by month of specimen collection



- **Hepatitis E** was reported for a 25 year old Victorian male, diagnosed by ELISA IgG detection and western blot.
- **Ross river virus** was reported for 58 patients this fortnight, 23 from Queensland, 33 from the Northern Territory, one from Tasmania and one from Victoria. The diagnosis was confirmed (fourfold rise in titre) for four patients from the Northern Territory; the remainder were presumptive diagnoses (IgM detected). Specimen collection dates ranged from early to late January. The number of reports has risen in recent months but remains average for the time of year.
- One report of **Barmah Forest virus** was received this period for a 32 year old Queensland female. Diagnsosis was by IgM detection in a specimen collected in mid-January.
- **Untyped flavivirus** was reported for a 17 year old female and a 35 year old male both from Queensland. Diagnosis was by IgM detection.
- Thirty reports of **adenovirus** were received this fortnight, diagnosed by virus isolation (16) and antigen detection (14). Included were 3 reports each of **adenovirus type 3** and **adenovirus type 7.** Also included was **adenovirus type 46**, isolated from the nasopharynx of a 42 year old HIV positive male with an upper respiratory tract infection.
- **Herpes simplex virus type 1** was reported for 146 patients this fortnight, 137 isolations and 9 antigen detections. Included was isolation from the urine of a 5 year old cardiac transplant recipient.
- **Human herpes virus type 6** was diagnosed by IgM detection for a 3 month old New South Wales male with a suspected virus infection.
- There were 33 reports of **cytomegalovirus** (CMV) this fortnight, 12 virus isolations, one antigen detection, one single high titre and 19 IgM detections. Included were 2 transplant recipients, one patient with a malignancy and one pregnant female.
- **Varicella-zoster virus** was reported for 42 patients this period. Method of diagnosis included virus isolation (10), antigen detection (24), fourfold rise in titre (2) and IgM detection (6). Included was a pregnant female at 35 weeks' gestation.
- Sixty-six reports of **Epstein-Barr virus** were received this period. Included were 31 males and 35 females, 28 in the 15 to 24 year age group.
- Four reports of **parvovirus** were received this fortnight, all diagnosed by IgM detection. Included were 2 females, both of childbearing age, and 2 males.
- **Coxsackievirus B3** was reported for 2 patients this fortnight, a 16 year old female and a 7 month old

male. An increased number of reports of this virus has been received in recent months.

- Two reports of **echovirus type 3** were received, for a one month old female (isolation from CSF) and a one year old male (isolation from eye).
- **Echovirus type 6** was reported isolated from a biopsy specimen from a 16 year old Victorian transplant recipient. This virus was also isolated from the CSF of a one month old male from Tasmania who had meningitis. An increased number of reports has been received in recent months.
- **Echovirus type 30** was reported for 3 patients this period, 2 from Victoria and one from New South Wales. Included was a 2 year old male and a 31 year old female, both with meningitis, and a 6 month old female. The number of reports remains low compared to this time last year (Figure 2).
- Eleven reports of **rhinovirus** were received this period, all diagnosed by virus isolation. Ten patients were under the age of 4 years. The number of reports received for the end of 1994 was about the same as the average for recent years (Figure 3).
- **Influenza A** was reported for 8 patients this fortnight, 2 males and 6 females. Included was an 81 year old Victorian male with suspected myocarditis (fourfold rise in titre). Other diagnoses were by virus isolation (a 53 year old female, specimen collected late January) and single high titre (6).
- Two reports of **influenza B** were received this period, for one male and one female, both over the age of 65 years.
- Eight reports of **parainfluenza virus type 3** were received this fortnight. All were for patients under the age of 4 years, with 4 in the under one year age group. Diagnosis was by virus isolation (3) and antigen detection (5).
- Fifteen reports of **respiratory syncytial virus (RSV)** were received this fortnight, 10 for patients under one year of age. Diagnosis was by virus isolation (7), antigen detection (7) and single high titre (one).
- **Rotavirus** was reported for 17 patients this period including 9 males and 7 females (one sex not stated). Sixteen patients were under the age of 4 years.
- Ninety-three reports of ***Chlamydia trachomatis*** were received this fortnight, for 34 males and 59 females. Eighty-six patients were in the 15 to 44 year age group. Diagnosis was by culture (24), antigen detection (38), nucleic acid detection (29) and serology (2).
- **Q fever** was reported for 11 patients this period including 2 females and 9 males all in the 17 to 58 year age range. Diagnosis was by fourfold rise in titre (8) and IgM detection (3).
- Fifteen reports of ***Bordetella*** were received this fortnight, 8 ***Bordetella pertussis*** and 7 ***Bordetella*** species. Eight patients were male and 7 female.

Figure 2. Echovirus type 30 laboratory reports, 1993 to 1994, by month of specimen collection

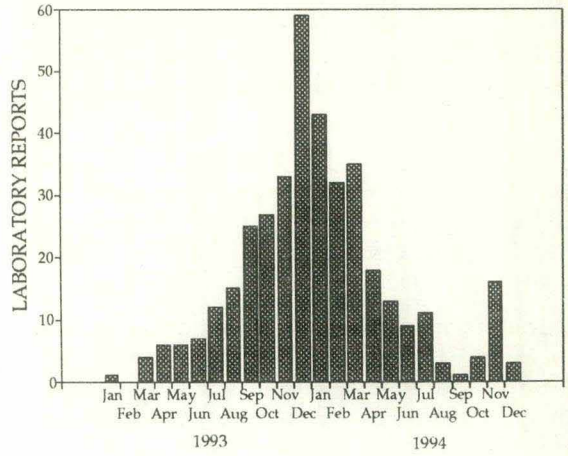
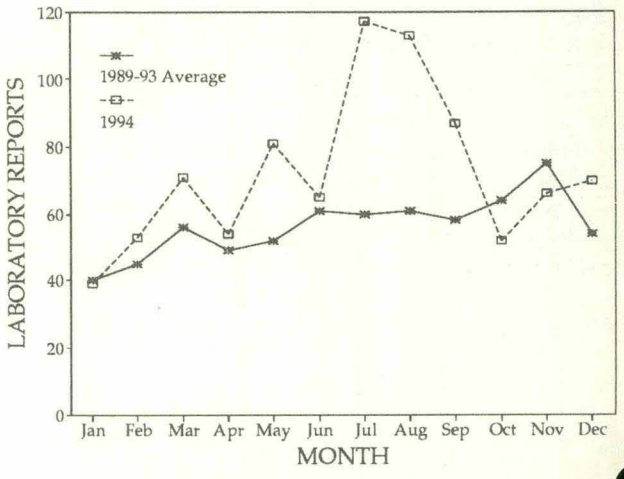


Figure 3. Rhinovirus laboratory reports, 1989-93 average and 1994, by month of specimen collection



Australian Sentinel Practice Research Network

Data for week 4 (ending 29 January) and week 5 (ending 5 February) are included in this issue of *CDI* (Table 1). There were 7601 and 8145 consultations reported, respectively. The rate of reporting of chickenpox has declined in the last few weeks after peaking at almost 5 reports per 1000 consultations in late December.

Table 1. Australian Sentinel Practice Research Network, weeks 4 and 5 1995

Condition	Week 4, to 29 January 1995		Week 5, to 5 February 1995	
	Reports	Rate per 1000 encounters	Reports	Rate per 1000 encounters
Influenza	18	2.2	14	1.7
Rubella	6	0.7	8	1.0
Measles	1	0.1	1	0.1
Chickenpox	19	2.3	9	1.1
Pertussis	4	0.5	1	0.1
Gastroenteritis	12	13.7	124	15.2

Sterile Sites Surveillance (LabDOSS)

Data for this fortnight have been provided by 8 laboratories. There were 220 reports of recent significant sepsis:

New South Wales: Liverpool Hospital 50; Prince of Wales Hospital 26; Royal Prince Alfred Hospital 29.
Queensland: Sullivan, Nicolaides and Partners 18.
South Australia: Institute of Medical and Veterinary Science 43.
Tasmania: Northern Tasmanian Pathology Service 3; Royal Hobart Hospital 11.
Western Australia: Sir Charles Gairdner Hospital 40.

An additional 78 reports of sepsis in October to December 1994 were reported, including one *Neisseria meningitidis* serogroup B in a 30 year old female, and six isolates of *Streptococcus pneumoniae*. Reports with specimen collection dates prior to the first day of the previous month are not reported fortnightly in *CDI* however these reports are added to the annual data.

Organisms reported 5 or more times from blood are detailed in Table 2. Other blood isolates not included in Table 2 were:

Gram positive: 1 *Clostridium perfringens*, 1 *Corynebacterium jeikeium*, 1 *Corynebacterium* species, 1 *Enterococcus faecalis*, 1 *Enterococcus faecium*, 4 *Streptococcus* group A, 2 *Streptococcus* group B, 1 *Streptococcus* group G, 1 *Streptococcus* 'milleri', 1 *Streptococcus sanguis*, 4 *Streptococcus* species, 3 *Streptococcus* 'viridans'.

Gram negative: 1 *Acinetobacter* species, 1 *Aeromonas hydrophila* (reported in a 70 year old male with a malignancy from Queensland), 1 *Aeromonas* species, 1 *Alcaligenes* species, 1 *Citrobacter diversus*, 2 *Citrobacter freundii*, 1 *Enterobacter aerogenes*, 1 *Haemophilus influenzae* type b (reported in a six year old male with epiglottitis, from Tasmania), 4 *Klebsiella oxytoca*, 4 *Klebsiella* species, 1 *Morganella* species, 4 *Proteus mirabilis*, 1 *Proteus* species, 1 *Proteus vulgaris*, 1 *Pseudomonas putida* (reported in a 69 year old male with phlebitis and a central intravenous line, from New South Wales), 1

Table 2. LabDOSS reports of blood isolates, by organism and clinical information

Organism	Clinical information						Risk factors				Total[1]
	Bone/joint	Lower respiratory	Endocarditis	Gastrointestinal	Urinary tract	Skin	Surgery	Immunosuppressed	IV line	Neonatal	
Staphylococcus aureus	1	2	2		2	5	2	6	7		31[2]
Staphylococcus epidermidis						1		1	2	2	7
Staphylococcus coagulase negative	1						1	1	2	2	18
Streptococcus pneumoniae		3						1			6
Enterobacter cloacae						1	1		1		5
Enterobacter species				2			1	4	3		9
Escherichia coli		1		14	15		3	12	1	1	47
Klebsiella pneumoniae		1		3	1			4	2		10
Pseudomonas aeruginosa		2			3		1	5	1		8
Candida albicans				1	1			3	2		6
Candida species					1			2	3		5

1. Only organisms with 5 or more reports are included in this table.
2. MRSA 1.

Pseudomonas fluorescens (*Klebsiella* species was also isolated, in a 68 year old male who died, from New South Wales), 1 *Pseudomonas* species, 1 *Salmonella* Paratyphi A (reported in a 29 year old female with a history of overseas travel, from New South Wales), 1 *Salmonella* species serogroup D (reported in a one year old female from Queensland), 1 *Serratia marcescens*, 2 *Xanthomonas maltophilia*.

Anaerobes: 1 *Bacteroides fragilis*, 1 *Bacteroides* species, 1 *Clostridium perfringens*, 1 *Fusobacterium* species (reported in a 16 year old male with gastrointestinal disease, from South Australia), 1 *Propionibacterium acnes*, 1 *Propionibacterium species*.

There were eleven blood isolates from patients aged less than one year and 123 from patients aged 55 years and over (Figure 4).

Hospital acquired blood isolates

A total of 45 isolates was reported as hospital acquired. The seven most commonly reported organisms were: 12 *Staphylococcus aureus*, 9 *Escherichia coli*, 8 *Staphylococcus* coagulase negative (including 2 *Staphylococcus epidermidis*), 4 *Enterobacter cloacae*, 3 *Enterobacter* species, 2 *Pseudomonas aeruginosa*, 2 *Candida* species.

Meningitis and/or CSF isolate reports

There were 2 reports of meningitis and/or CSF isolates. One isolate, from blood and CSF, was MRSA reported in a 79 year old male with a skin infection. The other isolate was reported as *Staphylococcus aureus*, from CSF, in a six year old female with a risk factor of neurosurgery. Both cases were from New South Wales.

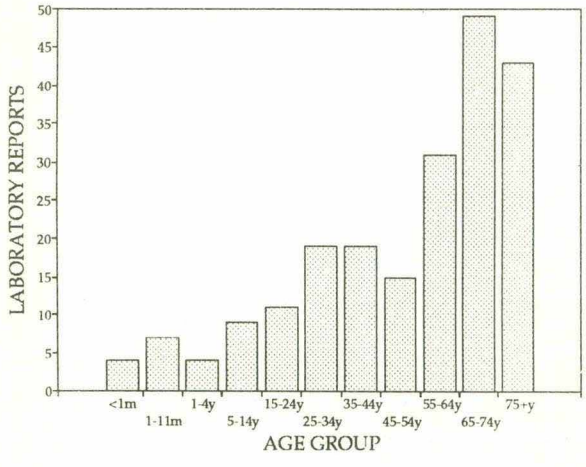
Isolates from sites other than blood or CSF

Joint fluid: 3 *Staphylococcus aureus*.

Peritoneal dialysate: 1 *Staphylococcus aureus*, 1 *Staphylococcus* coagulase negative, 1 *Streptococcus* 'viridans'.

Other: 1 *Streptococcus* 'viridans'.

Figure 4. LabDOSS reports of blood isolates, by age group



National Notifiable Disease Surveillance System, 22 January to 4 February 1995

There were 1966 notifications received in the period (Figure 6 and Tables 3, 4 and 5).

- One hundred notifications of **Ross River virus infection** were received. Fifty-four cases were male and 46 were female. Recorded ages were between the 5-9 and the 75-79 years age group. Onset dates were in December (8), January (86), and February (6). Fifty-seven per cent of the notifications were received for residents of the Northern Territory.
- There were 2 cases of **brucellosis** reported; one case was male and the sex of the other case was unrecorded. Cases were in the 15-19 and the 35-39 years age groups respectively.
- There were 302 notifications of **campylobacteriosis** received; 152 cases were male, 143 cases were female, and the sex of 7 cases was unrecorded. Cases were aged between the 0-4 and the 90-94 years age groups with 22.5% of cases in the 0-4 years age group.
- A single case of **diphtheria** was reported for a male in the 25-29 years age group resident in Western Australia.
- Eighty-seven cases of **gonococcal infection** were reported; 63 cases were male and 24 cases were female. Recorded ages were between the 0-4 and the 50-54 years age groups.
- Two notifications of ***Haemophilus influenzae* type b infection** were received. Both cases were females aged less than 2 years.
- There were 79 cases of **hepatitis A** reported; 39 cases were male, 38 cases were female, and the sex of 2 cases was unrecorded. The cases were aged between the 0-4 and the 80-84 years age group with 57% of cases in the 20-34 years age group.
- Three incident cases of **hepatitis B** were reported. Two cases were male and one case was female. All cases were in the 20-24 years age group.
- A single incident case of **hepatitis C** was reported for a male in the 20-24 years age group.
- A single notification of **hydatid infection** was reported for a male in the 65-69 years age group.
- Ten notifications of **legionellosis** were received; 7 cases were male and 3 cases were female. Recorded ages were between the 40-44 and the 80-84 years age groups. There was an apparent cluster of 7 cases who were resident in the Statistical Division of Sydney with recorded onset dates within 9 days in January.
- There were 3 cases of **leptospirosis** reported. All cases were male. Two cases were aged in the 40-49 years age group. The age of the remaining case was unrecorded.

- Three notifications of **listeriosis** were received; one case was male and two cases were female. Cases were aged between the 25-29 and the 45-49 years age group. There was an apparent cluster of 2 cases resident in contiguous postcode areas in Melbourne with the same recorded onset date.
- Eight cases of **malaria** were reported; 6 cases were male, one case was female, and the sex of one case was unrecorded. Cases were aged between the 0-4 and the 40-44 years age group.
- There were 96 notifications of **measles**. Fifty-six cases were male and 40 cases were female. Recorded ages were between the 0-4 and the 45-49 years age group with 81% of cases aged less than 20 years. Thirty-one per cent of cases were resident in New South Wales, 31% were resident in Queensland and 29% were resident in the Northern Territory.
- Twelve cases of **meningococcal infection** were reported; 7 cases were male, 4 were female, and the sex of one case was unrecorded. Cases were aged between the 0-4 and the 90-94 years age groups.
- The **pertussis** epidemic continues with 187 cases reported in the period. Eighty-eight cases were male, 97 cases were female, and the sex of 2 cases was unrecorded. Cases were aged between the 0-4 and the 80-84 years age group with 11 cases aged less than one year. There were 143 cases reported with onset dates in January. Pertussis cases were reported for residents of all jurisdictions with 34% of cases resident in Queensland, 18% resident in Western Australia, 18% resident in the Northern Territory, and 17% resident in New South Wales. Queensland has reported the largest number of notifications over the last few months (Figure 5).
- Eleven notifications of **Q fever** were received; 10 cases were male and one case was female. Recorded ages were between the 15-19 and the 55-59 years age group.
- There were 133 notifications of **rubella**; 76 cases were male, 55 were female, and the sex of 8 cases were unrecorded. The cases were aged between the 0-4 and the 60-64 years age group with 26 cases reported for females in the 15-44 years age group.
- There were 281 notifications of **salmonellosis (not elsewhere classified)** received; 140 cases were male, 126 were female, and the sex of 15 cases was unrecorded. Case were aged between the 0-4 and the 80-85 years age group with 38% of cases aged less than 5 years.
- There were 48 cases of **syphilis** reported; 21 cases were male, 25 cases were female, and the sex of 2 cases was unrecorded. Cases were aged between the 0-4 and the 70-74 years age group with a single case reported for a female aged less than one year.
- Twenty-seven notifications of **tuberculosis** were received; 15 cases were male and 12 cases were female. Recorded ages were between the 0-4 and the 80-84 years age group.
- A single case of **typhoid** was reported for a male in the 15-19 years age group resident in Perth.
- Twenty-six cases of **yersiniosis** were reported; 7 cases were male, 18 cases were female, and the sex of a single case was unrecorded. Cases were aged between the 0-4 and the 85-89 years age group with 36% of cases aged less than 5 years.

Figure 5. Notifications of pertussis, January 1993 to January 1995, by month of onset and State

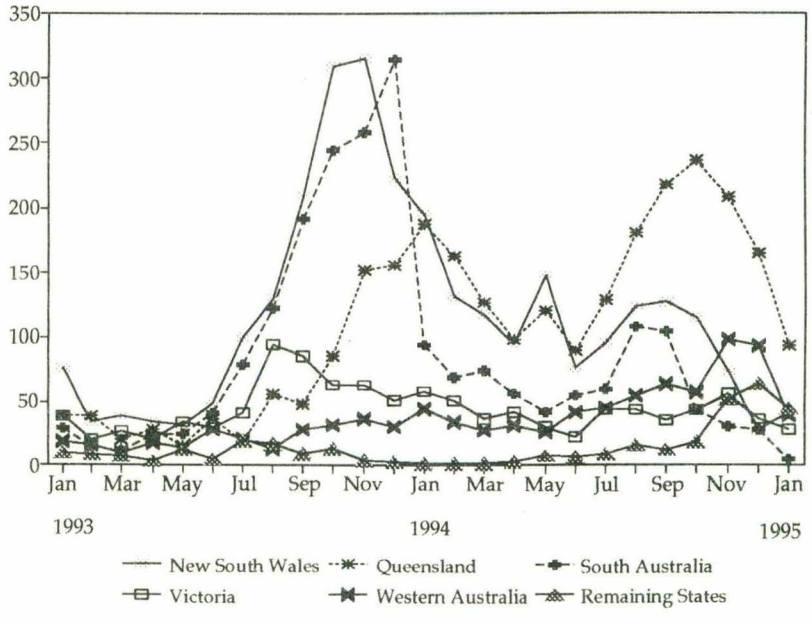
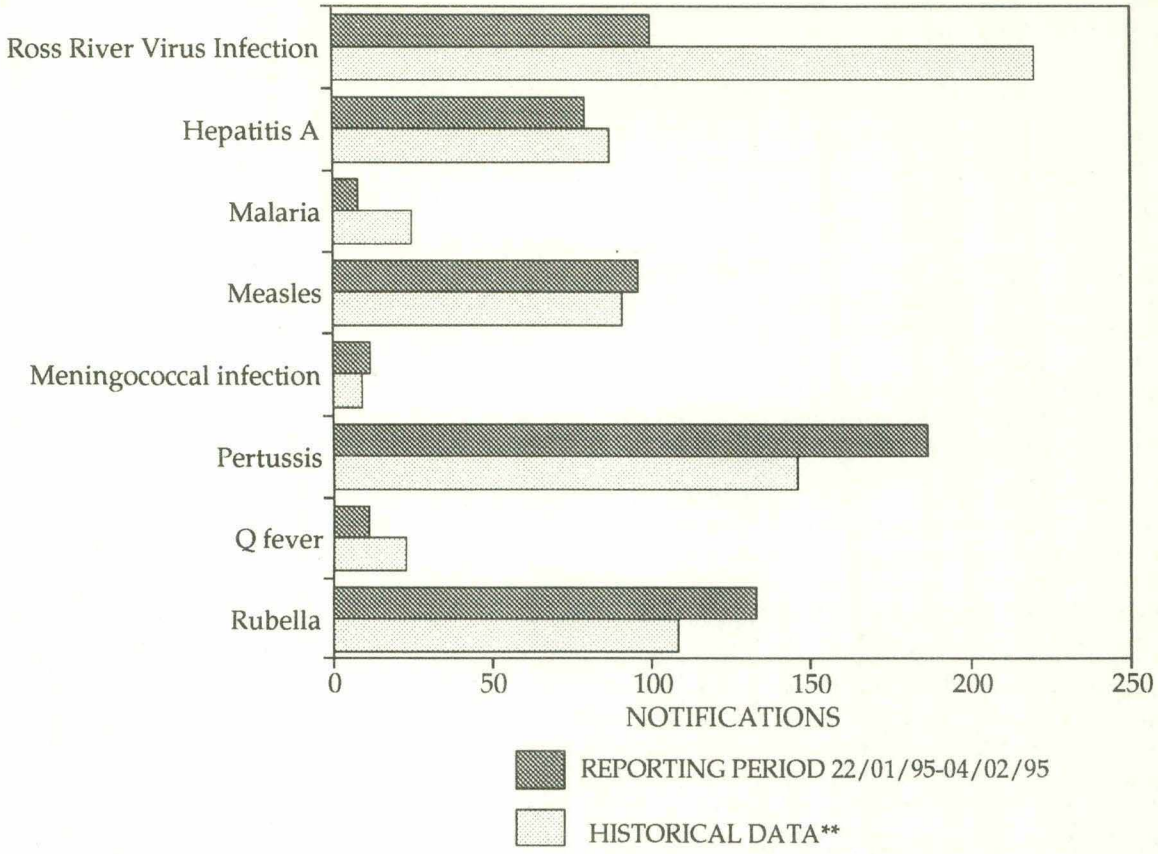


Figure 6. Selected National Notifiable Diseases Surveillance System reports, and historical data[1]



1. The historical data are the averages of the number of notifications in 9 previous 2-week reporting periods: the corresponding periods of the last 3 years and the periods immediately preceding and following those.

Table 3. Notifications of diseases preventable by vaccines recommended by the NHMRC for routine childhood immunisation, received by State and Territory health authorities in the period 22 January to 4 February 1995

DISEASES	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	TOTALS FOR AUSTRALIA[1]			
									This period 1995	This period 1994	Year to date 1995	Year to date 1994
Diphtheria	0	0	0	0	0	0	0	1	1	0	1	1
Haemophilus influenzae b infection	0	0	0	0	0	0	1	1	2	2	9	25
Measles	1	30	28	30	1	1	3	2	96	115	261	479
Mumps	0	1	NN	NN	0	NN	0	1	2	2	6	2
Pertussis	2	31	33	63	4	7	13	34	187	273	490	867
Poliomyelitis	0	0	0	0	0	0	0	0	0	0	0	0
Rubella[2]	1	2	1	99	4	0	12	14	133	90	349	269
Tetanus	0	0	0	NN	0	0	0	0	0	0	0	0

1. Totals comprise data from all States and Territories. Cumulative figures are subject to retrospective revision, so there may be discrepancies between the number of new notifications and the increment in the cumulative figure from the previous period.

2. Tas: CRS only.

NN Not Notifiable.

Table 4. Notifications of other diseases[1] received by State and Territory health authorities in the period 22 January to 4 February 1995

DISEASES	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	TOTALS FOR AUSTRALIA[2] This period 1995	This period 1994	Year to date 1995	Year to date 1994
Arbovirus infection												
Ross River virus infection	0	3	57	36	3	-	1	0	100	267	221	558
Dengue	0	0	0	0	0	-	0	0	0	1	1	3
NEC[3]	0	0	0	17	0	0	0	0	17	14	40	52
Campylobacteriosis[4]	9	-	23	70	78	9	84	29	302	327	953	983
Chlamydial infection (NEC)[5]	2	NN	8	153	19	4	0	22	208	220	445	616
Donovanosis	0	NN	1	0	NN	NN	0	0	1	4	3	6
Gonococcal infection[6]	0	10	13	38	11	0	0	15	87	83	190	255
Hepatitis A	0	21	4	23	5	1	12	13	79	79	175	183
Hepatitis B incident	0	0	1	1	0	0	0	1	3	16	15	30
Hepatitis C incident	-	0	1	-	0	-	-	-	1	1	1	3
Hepatitis C unspecified	2			117		0	91	38	248	247	655	770
Hepatitis (NEC)	0	0	0	0	0	0	4	NN	4	1	8	10
Legionellosis	0	8	0	0	1	0	1	0	10	4	18	22
Leptospirosis	0	0	0	0	0	0	2	1	3	9	11	22
Listeriosis	0	0	1	0	0	0	2	0	3	2	6	4
Malaria	0	0	0	2	1	0	5	0	8	13	35	30
Meningococcal infection	0	2	0	7	1	0	2	0	12	14	31	34
Ornithosis	0	NN	0	0	1	0	5	0	6	2	19	12
Q fever	0	5	0	5	0	0	1	0	11	27	29	65
Salmonellosis (NEC)	2	33	31	95	37	7	52	24	281	269	575	636
Shigellosis[4]	0	-	8	13	3	0	4	10	38	29	86	71
Syphilis	1	22	4	17	0	0	0	4	48	79	124	213
Tuberculosis	0	4	0	6	3	0	13	1	27	30	74	114
Typhoid[7]	0	0	0	0	0	0	0	1	1	1	2	3
Yersiniosis (NEC)[4]	0	-	0	18	6	0	2	0	26	23	62	61

1. For HIV and AIDS, see Tables 2 and 3 *CDI* 1995;19:17. For rarely notified diseases, see Table 5.
2. Totals comprise data from all States and Territories. Cumulative figures are subject to retrospective revision so there may be discrepancies between the number of new notifications and the increment in the cumulative figure from the previous period.
3. Tas: includes Ross River virus and dengue.
4. NSW: only as 'foodborne disease' or 'gastroenteritis in an institution'.
5. WA: genital only.
6. NT, Qld, SA and Vic: includes gonococcal neonatal ophthalmia.
7. NSW, Vic: includes paratyphoid.

NN Not Notifiable.

NEC Not Elsewhere Classified.

- Elsewhere Classified.

Table 5. Notifications of rare[1] diseases received by State and Territory health authorities in the period 22 January to 4 February 1995

DISEASES	Total this period	Reporting States or Territories	Year to date 1995
Botulism	0		0
Brucellosis	2	Qld	7
Chancroid	0		0
Cholera	0		0
Hydatid infection	1	Vic	1
Leprosy	0		0
Lymphogranuloma venereum	0		0
Plague	0		0
Rabies	0		0
Yellow fever	0		0
Other viral haemorrhagic fevers	0		0

1. Fewer than 50 cases of each of these diseases were notified each year during the period 1988 to 1993.

Table 6. Virology and serology laboratory reports by State or Territory[1] for the reporting period 26 January to 8 February 1995, historical data[2], and total reports for the year

	State or Territory [1]								Total this fortnight	Historical data [2]	Total reported this year
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA			
MEASLES, MUMPS, RUBELLA											
Measles virus		2		6			2		10	35.3	153
Mumps virus		1		1			1		3	2.5	12
Rubella virus		7		51					58	37.7	331
HEPATITIS VIRUSES											
Hepatitis A virus	1	9		6	1		5		22	20.3	83
Hepatitis B virus	2	19	2	13			13		49	85.0	307
Hepatitis C virus	12	11	1	52	46	13	2		137	154.2	860
Hepatitis D virus							2		2	1.3	2
Hepatitis E virus							1		1	.0	3
ARBOVIRUSES											
Ross River virus			33	23		1	1		58	79.3	150
Barmah Forest virus				1					1	9.0	39
Flavivirus (unspecified)				2					2	2.7	3
ADENOVIRUSES											
Adenovirus type 1					1		1		2	4.2	11
Adenovirus type 2							1		1	3.2	10
Adenovirus type 3					2		1		3	2.2	19
Adenovirus type 7					2		1		3	.2	7
Adenovirus type 8							1		1	3.3	2
Adenovirus type 46							1		1	.0	1
Adenovirus not typed/pending	1	5			9		3	1	19	35.0	183
HERPES VIRUSES											
Herpes simplex virus type 1		16	1	58	22	2	47		146	172.5	799
Herpes simplex virus type 2		30	2	69	32		31	1	165	187.8	689
Herpes simplex not typed/pending	6	2		2	1		1	3	15	26.5	89
Herpes virus type 6		1							1	.3	1
Cytomegalovirus		6		9	3	3	7	5	33	47.2	246
Varicella-zoster virus	2	8		19	2		9	2	42	42.2	173
Epstein-Barr virus		14	1	31	9		11		66	72.7	334
Herpes virus group - not typed							1		1	.8	4
OTHER DNA VIRUSES											
Parvovirus				1	2		1		4	5.3	27
PICORNA VIRUS FAMILY											
Coxsackievirus B3	1	1							2	.5	14
Coxsackievirus B5		1							1	3.2	5
Echovirus type 3		2							2	.0	5
Echovirus type 6						1	1		2	.3	17
Echovirus type 30		1					2		3	11.2	19
Rhinovirus (all types)	1	1		1			8		11	20.5	122
Enterovirus not typed/pending		8		7			6		21	21.8	147

Table 6. Virology and serology laboratory reports by State or Territory[1] for the reporting period 26 January to 8 February 1995, historical data[2], and total reports for the year, continued

	State or Territory [1]								Total this fortnight	Historical data [2]	Total reported this year
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA			
ORTHO/PARAMYXOVIRUSES											
Influenza A virus		4		1	1		2		8	9.2	31
Influenza B virus		2							2	1.7	5
Parainfluenza virus type 1							1		1	1.3	2
Parainfluenza virus type 3		1					7		8	11.0	128
Respiratory syncytial virus		4		1	1	3	6		15	10.7	75
OTHER RNA VIRUSES											
HIV-1				2					2	3.0	11
Rotavirus	5				4	2	3	3	17	26.0	197
OTHER											
Chlamydia trachomatis not typed	9	8	7	51	10	3	5		93	99.8	375
Chlamydia psittaci							7		7	3.7	36
Chlamydia species					1	1			2	.5	5
Mycoplasma pneumoniae		1		2			3		6	64.0	56
Coxiella burnetii (Q fever)		6		3			2		11	13.2	66
Streptococcus group A		1	1	12					14	11.8	61
Yersinia enterocolitica		3							3	.3	14
Brucella species				1					1	.5	3
Bordetella pertussis						1	7		8	13.5	110
Bordetella species			2	5					7	18.3	31
Cryptococcus species		1							1	.3	5
Leptospira species		1							1	.3	4
Treponema pallidum		20	9	3					32	19.3	101
Toxoplasma gondii		10							10	1.5	16
TOTAL	40	207	59	433	149	30	204	15	1,137	1,398.2	6,199

1. State or Territory of postcode, if reported, otherwise State or Territory of reporting laboratory.
2. The historical data are the averages of the numbers of reports in 6 previous 2 week reporting periods: the corresponding periods of the last 2 years and the periods immediately preceding and following those.

Table 7. Virology and serology laboratory reports by clinical information for the reporting period 26 January to 8 February 1995

	Meningitis	Other CNS	Congenital	Respiratory	Gastrointestinal	Hepatic	Skin	Eye	Muscle/joint	Genital	Other/unknown	Total
MEASLES, MUMPS, RUBELLA												
Measles virus				1			2				7	10
Mumps virus											3	3
Rubella virus				1			23		1		33	58
HEPATITIS VIRUSES												
Hepatitis A virus						7					15	22
Hepatitis B virus						4					45	49
Hepatitis C virus						14					123	137
Hepatitis D virus						1					1	2
Hepatitis E virus											1	1
ARBOVIRUSES												
Ross River virus							2		24		32	58
Barmah Forest virus									1			1
Flavivirus (unspecified)											2	2
ADENOVIRUSES												
Adenovirus type 1											2	2
Adenovirus type 2											1	1
Adenovirus type 3				1				2				3
Adenovirus type 7				1				2				3
Adenovirus type 8								1				1
Adenovirus type 46				1								1
Adenovirus not typed/pending				3	12						4	19
HERPES VIRUSES												
Herpes simplex virus type 1			1	6	1		69	7		51	11	146
Herpes simplex virus type 2							34			130	1	165
Herpes simplex not typed/pending				1			3			3	8	15
Herpes virus type 6							1					1
Cytomegalovirus		2		7		1					23	33
Varicella-zoster virus							33				9	42
Epstein-Barr virus				1	1						64	66
Herpes virus group - not typed							1					1
OTHER DNA VIRUSES												
Parvovirus							2		1		1	4
PICORNA VIRUS FAMILY												
Coxsackievirus B3				1							1	2
Coxsackievirus B5											1	1
Echovirus type 3								1			1	2
Echovirus type 6	1										1	2
Echovirus type 30	2			1								3
Rhinovirus (all types)				8							3	11
Enterovirus not typed/pending	5			3	2	1	2		1		7	21

Table 7. Virology and serology laboratory reports by clinical information for the reporting period 26 January to 8 February 1995, continued

	Meningitis	Other CNS	Congenital	Respiratory	Gastrointestinal	Hepatic	Skin	Eye	Muscle/joint	Genital	Other/unknown	Total
ORTHO/PARAMYXOVIRUSES												
Influenza A virus				1							7	8
Influenza B virus											2	2
Parainfluenza virus type 1				1								1
Parainfluenza virus type 3				8								8
Respiratory syncytial virus				13			1				1	15
OTHER RNA VIRUSES												
HIV-1											2	2
Rotavirus					17							17
OTHER												
Chlamydia trachomatis not typed							1	3		62	27	93
Chlamydia psittaci				4							3	7
Chlamydia species				2								2
Mycoplasma pneumoniae				3							3	6
Coxiella burnetii (Q fever)				1							10	11
Streptococcus group A				2			1		5		6	14
Yersinia enterocolitica											3	3
Brucella species											1	1
Bordetella pertussis				8								8
Bordetella species				5							2	7
Cryptococcus species											1	1
Leptospira species											1	1
Treponema pallidum											32	32
Toxoplasma gondii											10	10
TOTAL	8	2	3	87	33	28	175	16	33	246	506	1137

Table 8. Virology and serology laboratory reports by contributing laboratory for the reporting period 26 January to 8 February 1995

STATE OR TERRITORY	LABORATORY	REPORTS
Australian Capital Territory	Woden Valley Hospital, Canberra	40
New South Wales	Prince Henry/Prince of Wales Hospitals, Sydney	140
	Royal Alexandra Hospital for Children, Camperdown	13
	South West Area Pathology Service, Liverpool	25
Queensland	Queensland Medical Laboratory, West End	522
South Australia	Institute of Medical and Veterinary Science, Adelaide	150
Tasmania	Northern Tasmanian Pathology Service, Launceston	4
	Royal Hobart Hospital, Hobart	22
Victoria	Microbiological Diagnostic Unit, University of Melbourne	5
	Royal Children's Hospital, Melbourne	57
	Victorian Infectious Diseases Reference Laboratory, Fairfield Hospital	144
Western Australia	Princess Margaret Hospital, Perth	15
TOTAL		1137