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Childhood immunisation and vaccine preventable diseases in the ACT 1993-1997

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SUMMARY OF MAIN FINDINGS

The main aim of this publication is to present a profile of the ACT in relation to immunisation and vaccine preventable childhood diseases, using the data available. Such information is valuable for those working or interested in Public Health. It is envisaged that this will be the first of regular reports on immunisation and vaccine preventable childhood diseases. For this first publication we provide baseline information only. This information will be used for future trend analysis and monitoring.

The following are the main findings:

Vaccine preventable disease and hospitalisation due to vaccine preventable diseases in the ACT

- There was a marked increase in the notifications of pertussis and measles in the ACT from 1996 to 1997.

- In 1996 there were 33 cases of pertussis notified at an annual notification rate of 10.73 per 100,000. There was one hospitalisation with a primary diagnosis of *Bordetella pertussis* (*B.pertussis*) in ACT public hospitals in 1996 and 2 cases of whooping cough due to unspecified organism. In 1997 there were 117 cases reported at an annual notification rate of 37.13. In 1997 there were 3 hospitalisations due to *B.pertussis* and 8 cases of whooping cough due to an unspecified organism.

- There were 10 cases of measles reported in 1996 at the annual notification rate of 3.25 per 100,000 population. There were no public hospital separations with a primary diagnosis of measles in 1996. In 1997 there were 79 cases of measles notified with the annual notification rate of 25.50 per 100,000 population. There were 9 public hospital separations with a primary diagnosis measles in the ACT in 1997 (all cases were admitted between August and December 1997).

- In the ACT there were 7 cases of mumps notified and one ACT public hospital separation with a primary diagnosis of mumps in 1996. In 1997 there were 7 cases of mumps notified and no hospitalisation due to mumps was reported.

- There were 85 cases of rubella notified (at an annual notification rate of 27.64 per 100,000 population) and one public hospital separation with a primary diagnosis of rubella in 1996. In 1997, there were 32 cases of rubella notified (at a annual notification rate of 10.33 per 100,000 population) and no hospital separartions due to rubella reported by ACT public hospitals.

- There was one public hospital separation with a primary diagnosis of *Haemophilus influenzae* type b meningitis in 1996 and also in 1997. In both cases the children were under 1 year of age.

Vaccination coverage in the ACT (birth cohort 1993-1997)

- For the period of 1993-1997, the coverage rate for children who were fully vaccinated to the NHMRC schedule was 82% at 2 months, 78% at 4 months, 67% at 6 months and 74% at 12 months (MMR only).

- The proportion of children who were fully vaccinated at 2 months of age varied between 80-87% for the period 1994-1997. It appears that there was an slight reduction (about 5%) in the proportion of children who fully vaccinated from the schedule 1 (2 months of age) to schedule 2 (4 months of age). For schedule 3 (at 6 months of age), the proportion of children who were fully vaccinated ranged between 65% and 70% between 1994-1997. The reduction in the proportion of children who were fully vaccinated for schedule 2 and schedule 3 was about 8% over the period 1994-1997.

- The proportion of children vaccinated 'on time' (within 30 days of scheduled due date) was 73% at 2 months, 62% at 4 months, 50% at 6 months and 50% at 12 months for the 1993-1997 birth cohort. It appears there is a decreased proportion of 'on time' vaccinations as children get older. The 1997 birth cohort results were 84% at 2 months, 70% at 4 months, 60% at 6 months and 43% at 12 months.

- In comparing between fully vaccinated and 'on time' fully vaccinated children, the results show that the majority of fully vaccinated children had their vaccinations within one month of the due date. For example, amongst the fully vaccinated children the proportion of 'on time' vaccinated children was 88%, 80%, 74% and 67% at 2 months, 4 months, 6 months and 12 months respectively.

- Encouragingly there is a trend of increased vaccination rate over time for all schedules in the ACT over the period of 1993-1997, with a steady increase in the proportion of children vaccinated on time since 1995.

- The coverage rate for Measles-Mumps-Rubella (MMR) vaccine was stable around 70% over the period of 1993-1996. Except for 1996, less than 50% of 12-months MMR vaccinations were on time between 1993 and 1996. On the other hand, the difference between the proportion of children who were fully vaccinated and the proportion vaccinated on time for MMR had been reduced from 30% in 1993 to 16% in 1996.

- In relation to geographical variation within the ACT areas, there were significant differences in immunisation coverage rates across all of the statistical subdivisions between 1993-1997. Overall, it appears that even though South Canberra had a better catch up rate (between 3rd and 4th dose of 'on time' immunised), the coverage rate in this area was relatively low compared to others areas. Gungahlin, Belconnen and Tuggeranong seem to have better coverage rate than other areas, especially for the 2 months and MMR 'on time' immunisation.

1. INTRODUCTION

Over the last two hundred years the developed world has seen a dramatic change in its patterns of disease. Early this century, the primary causes of death were infectious diseases such as tuberculosis or diphtheria. Nowadays, people are more likely to die from chronic or 'lifestyle' diseases such as cancer or heart disease[1].

One of the main drives behind this shift has been an understanding of how different infectious agents are transmitted. We have seen the implementation of effective public health measures which help ensure safe water and food supplies.

Another extremely important public health measure has been the development of vaccines which protect against infectious diseases. It has been over two hundred years since Edward Jenner first demonstrated that vaccination provided immunity against Smallpox[2]. Since then we have seen the development of vaccines for a number of different diseases.

Vaccines and Immunity

What is a vaccine? A vaccine can be defined as *'a product often made from extracts of killed viruses or bacteria or from live or weakened viruses or bacteria; the vaccine is capable of stimulating an immune response that protects against infection'*[3]. The administered dead or weakened virus is attacked by the immune system. Should it come in contact with the real (and more noxious) virus, the immune system recognises the virus and has antibodies to attack it.

How does vaccination differ from immunity? Immunity is *'the ability to fight off a particular infectious agent by either coming in contact with the virus or by being vaccinated'*[4]. Immunity can be gained by contracting the condition or by vaccination.

Immunity does not always result from contact with a particular virus/bacteria. Recovery from an infectious diseases does not always produce lasting protection against later attacks, or attacks from different strains of the same disease. Active immunity does not always result from vaccination either. Occasionally, because of an individual's biological makeup, a vaccine does not result in immunity for the person.

Childhood Vaccination and The NHMRC Schedule

The National Health and Medical Research Council (NHMRC) has a recommended vaccination schedule for children. The schedule recommends children be vaccinated against diphtheria, tetanus, poliomyelitis (polio), pertussis (whooping cough), measles, mumps, rubella, *Haemophilus influenzae* type b and recently hepatitis B (refer Appendix 1).

Some of the diseases included in the schedule, (e.g. measles and pertussis), are prevalent and children are likely to experience them as a normal part of childhood unless they are immunised against them. Others on the schedule, such as tetanus and polio, are considered rare. This judgement may be understandable as there has been a dramatic decrease in the incidence of polio since 1952[5].

Nevertheless, all of the diseases listed in the schedule have the potential to result in severe morbidity (illness) and mortality (death). We are often reminded of their severity by reports of increased hospitalisations and deaths due to them. In 1996 there were 137 notifications of vaccine preventable diseases in the ACT and 6 persons were admitted to ACT public hospitals with a primary diagnosis of a vaccine preventable disease.

Active immunity against infectious diseases has benefits for the individual and society. People are less susceptible to the conditions for which they are vaccinated. If they come in contact with the infectious agent, they are protected or suffer milder forms of the condition[6]. Immunised people help protect unimmunised people by breaking the disease's cycle of transmission[7]. In order to break the cycle, there needs to be a high level of effective immunity in the community. This is often referred to as 'crowd' or 'herd' immunity. For most diseases the level of effective immunity needs to be greater than 90% in a community in order to protect unimmunised people[8].

Common side effects of immunisation are redness and soreness at the site of immunisation and low grade fever. While these symptoms may distress mothers and their child at the time, the benefits of immunisation are protection from serious disease. Side effects can be reduced by using paracetamol (refer Appendix 2).

1.1 Aim Of The Publication

The main aim of this publication is to present a profile of the ACT in relation to immunisation and vaccine preventable childhood diseases, using the data available. Such information is valuable for those working or interested in Public Health. It is envisaged that this will be the first of regular reports on immunisation and vaccine preventable childhood diseases. For this first publication we provide baseline information only. It is hoped this information will be used for future trend analysis and monitoring.

1.2 Data Sources

The publication will draw on a number of different data sources. They represent both ACT and national data collections. A brief description of each collection is provided.

1.2.1 ACT Data sources

ACT Immunisation Database

The ACT immunisation database is a computerised immunisation register based on the Victorian system (VACCS) and has been operating since 1992. The VACCS database used by the ACT Department of Health and Community Care holds several years of records of vaccinations in the ACT carried out by community nurses and general practitioners (GPs). All vaccinations by community nurses are recorded and it is believed that most of the vaccinations from the GPs are also recorded in the VACCS system. Because of its complexities, the VACCS system only became fully operational after the appointment of an immunisation coordinator in late 1993.

ACT Communicable Disease Control Unit Database

Public Health Regulations requiring the notification of certain diseases have been in place in the ACT since December 1930. Unfortunately not all vaccine preventable diseases have been notifiable during this time. Mumps has only been notifiable since 1992. Measles and pertussis were on the 1930 list, but were not notifiable between 1954 and 1992. The ACT Notifiable Disease List has been consistent with the national list since 1992 but also includes food poisoning, psittacosis and anthrax [9] (refer Appendix 3). Medical practitioners, laboratories and hospitals are required to notify particular diseases to the Medical Officer of Health who holds the position of Chief Health Officer.

Notification for many diseases was inconsistent prior to the early 1990s, but since then various strategies have been implemented to improve notification data. The ACT Communicable Disease Surveillance System has been computerised since 1st July 1990. ACT 'case definitions' of notifiable diseases are consistent with the Communicable Disease Network of Australia and New Zealand (CDNANZ).

The ACT Hospital Morbidity data

The majority of hospital services in the ACT are provided by The Canberra Hospital (TCH) and Calvary Public Hospital. In addition, there are two major private hospitals - Calvary Private Hospital and John James Memorial Hospital. The morbidity data collected from these hospitals provides information on sex, age, usual place of residence, medical conditions/procedures and length of stay in hospital. Hospital morbidity data are generally expressed in terms of hospital separations, that is, those who have left the hospital in the given time period.

Hospital separation data primarily describes treatment of those with acute or chronic disease who have been hospitalised. It does not fully describe the pattern of disease within the wider community. It has been recognised that caution needs to be applied when using hospital service utilisation as a proxy to plan resource allocation without examining the appropriateness for the conditions being studied[10]. Additionally, ACT hospital separation data are unique in their coverage in that approximately 20 % of all hospital separations are by non-ACT residents[11]. The majority of interstate patients come from large NSW towns in close proximity to the ACT.

1.2.2 National Databases

Australian Childhood Immunisation Register

Prior to 1996, GPs and immunisation service providers supplied information about vaccination encounters in exchange for vaccines provided without charge to the patient. From 1 January 1996 the Australian Childhood Immunisation Register (ACIR) started to collect the details of children immunised in Australia. The ACIR is a component of the National Childhood Immunisation Program and is administered by the Health Insurance Commission. The ACIR is designed to provide immunisation coverage rates and to form the basis of an optional recall and reminder system to parents. The ACIR provides payment per encounter to immunisation service providers and GPs, on receipt of data relating to the vaccination. In the ACT all GPs provide this information directly to the ACT Department of Health and Community Care where it is entered into the VACCS system.

Information from the VACCS system is then sent to the Health Insurance Commission to be added to the ACIR database.

National Notifiable Disease Surveillance System (NNDSS)

The National Notifiable Diseases Surveillance System (NNDSS) was established in 1991 under the auspices of the Communicable Diseases Network of Australia and New Zealand (CDNANZ). It coordinates the national surveillance of more than 40 communicable diseases or disease groups endorsed by the National Health and Medical Research Council (NHMRC). Under this scheme, notifications are made to State and Territory health authorities under the provisions of the public health legislation in their jurisdiction.

The quality and completeness of data compiled in the National Notifiable Diseases Surveillance System is influenced by various factors. Each State or Territory health authority determines which diseases will be notifiable within its jurisdiction, and which notifications are accepted as satisfying criteria, which in some cases, may differ from the NHMRC case definition. In addition, the mechanism for notification varies between States and Territories. Notifications may be required from treating clinicians, diagnostic laboratories and hospitals. Different diseases are notifiable by different mechanisms. The proportion of cases seen by health care providers which are the subject of notification to health authorities is not known with certainty for any disease, and may vary with the disease, between jurisdictions and over time.

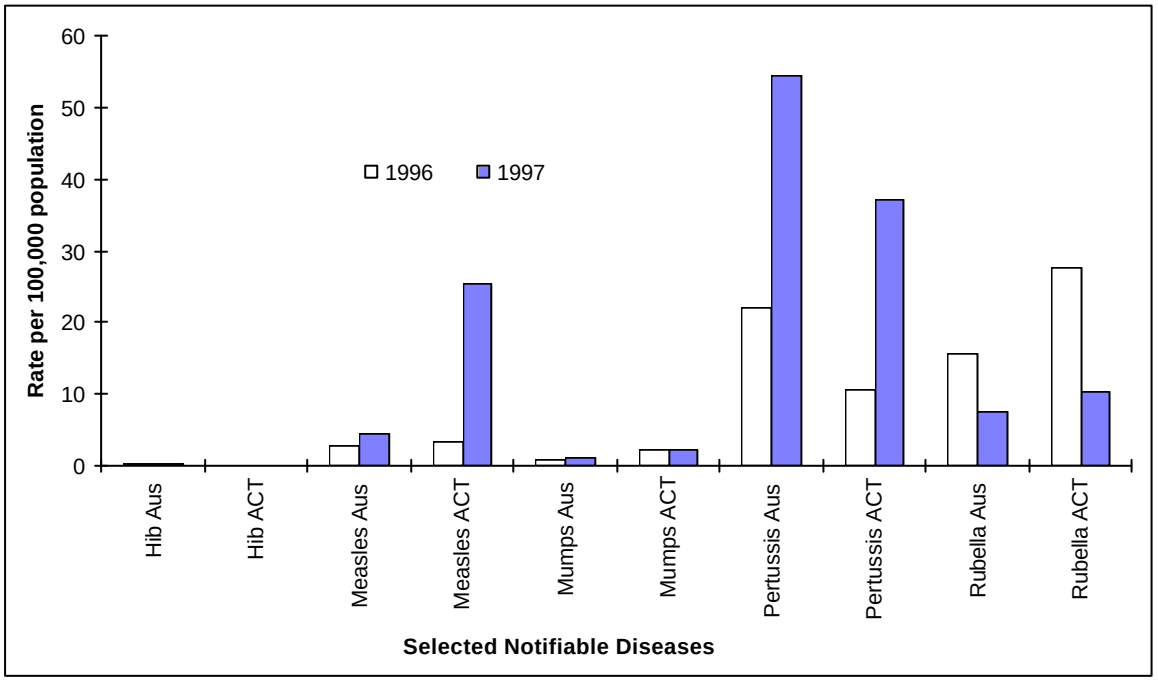
2. Vaccine Preventable Diseases in the ACT

All the conditions vaccinated against in the NHMRC schedule are notifiable (refer Appendix 3). The ACT Department of Health and Community Care must be informed by general practitioners, pathologists and for some conditions child care coordinators and school principals if they come across the condition.

In this section we provide a description of the vaccine preventable childhood diseases and show, where possible, the rates of notification of those conditions for the ACT and Australia. The number of ACT public hospital separations due to a primary diagnosis of these conditions are shown. In most cases there are very few who are hospitalised for the diseases.

It must be noted that hospitalisations are often due to complications associated with the disease. It is not easy to identify those hospitalisations. Annual notification rates and hospitalisation separations due to vaccine preventable disease for Australia and ACT are presented in Figure 1 and Table 1. Only the hospital codes that name the condition as the primary diagnosis are reported (refer Appendix 4).

Figure 1: Annual notification rate for selected diseases 1996-1997 for ACT and Australia



Source: Communicable Disease Network-Australia and New Zealand- National Notifiable Diseases Surveillance System, Personal communication.
Note: ABS 1997 preminilary data of Estimated Residential Population was used to calculate 1997 rate.

Table 1: Hospital separations, number caused by selected communicable disease and age groups, ACT financial years 1991-1997, children under 16

	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	July-Dec 97
Diphtheria/tetanus							
Males	0	0	0	0	0	0	
Females	0	0	0	0	0	0	
Pertussis							
Males - < 1year	0	1	0	4	0	1	2
1 year	2	0	1	0	0	0	0
7 years	0	0	1	0	0	0	0
11 years	0	0	0	1	0	0	0
Females - < 1 year	0	1	0	4	0	1	2
1-8 years	0	0	0	1	0	1	0
Total	**2**	**2**	**2**	**10**	**0**	**3**	**4**
Polio							
Males	0	0	0	0	0	0	
Females	0	0	0	0	0	0	
Measles							
Males - < 1 year	0	0	2	2	0	0	1
1 year	2	0	0	0	0	0	0
6 years	1	0	0	0	0	0	0
8 years	0	0	1	0	0	0	0
Females - <1 year	0	0	0	0	1	0	0
1 year	0	0	1	1	0	0	0
5 years	0	0	0	1	0	0	1
8 years	1	0	0	0	0	0	0
10 years	0	0	0	1	0	0	0
12 years	1	0	0	0	0	0	0
13 years	0	1	0	0	0	0	0
Total	**5**	**1**	**4**	**5**	**1**	**0**	**2**
Mumps							
Males	0	0	0	0	1	0	
Females	0	0	0	0	0	0	
Total					**1**		
Rubella							
Males - <1 year	0	1	0	3	0	0	0
Females	0	0	0	0	0	0	0
Congenital rubella							
Males	0	0	0	0		0	0
1 year	0	0	0	1		0	0
2 years	0	0	0	0	2	0	0
Females - <1 year	0	0	0	0	1	0	0
Total	**0**	**0**	**0**	**1**	**3**	**0**	**0**
Hib							
Males - <1 year	6	6	1	5	1	0	0
1 year	1	2	0	0	2	0	0
2 years	1	1	0	1	0	0	0
3 years		1	0	0	0	0	0
4 years	1	0	0	1	1	0	0
6 years	1	1	0	0	0	0	0
14 years	0	0	0	0	1	0	0
Females - <1 year	5	5	1	6	2	0	0
1 year	3	4	1	0	0	0	0
2 years	3	1	0	0	0	0	0
3 years	1	0	0	1	0	0	0
11 years	1	0	0	0	0	0	0
Total	**23**	**21**	**3**	**14**	**7**	**0**	**0**

Source : ACT Hospital Morbidity Data Collection

2.1 Diphtheria

Description

Diphtheria is an acute bacterial illness. It affects the tonsils, larynx, pharynx, nose and occasionally skin. The infection is characterised by greyish patches with surrounding inflammation. The inflammation and swelling in the upper respiratory tract can cause severe breathing problems[12]. A powerful poison (toxin) is produced by the diphtheria bacteria and may spread throughout the body. The toxin can cause serious complications such as paralysis and heart failure. About 7% of people who contract diphtheria die from it[13].

DIPHTHERIA[14]	
Infectious agent:	*Corynebacterium diphtheriae*
Area Affected:	Upper respiratory tract, occasionally skin.
Incubation Period:	Usually 2-5 days.
Mode of Transmission:	Contact with infected person or carrier or with articles soiled by discharge from lesions.
Communicable Period:	Variable: Until virulent bacilli have disappeared from discharges and lesions.
Immunity & Resistance:	Recovery from diphtheria does not necessarily lead to lasting immunity. Vaccination against diphtheria can induce prolonged active immunity.

The number of cases of diphtheria has declined greatly since the introduction of the diphtheria vaccine in the 1890's and it's increased use since World War II. Diphtheria killed more people than any other infectious disease in Australia in the early part of this century but now there are only sporadic cases that occur in non-immunised individuals[15]. Vaccination is important because recovering from the clinical condition of diphtheria does not always result in lasting immunity[16].

Notification/Hospitalisation

The last notification of diphtheria was in 1993[17]. Diphtheria has almost been eliminated from Australia - but sporadic cases do still occur in unimmunised individuals. Because there is now little chance of aquiring natural immunity (from contracting diphtheria), high levels of immunisation are necessary for the protection of the community against a resurgence of diphtheria[18]

2.2 Tetanus

Description

Tetanus is an acute disease induced by a toxin from the tetanus bacillus. The bacteria are found in the intestine of horses and other animals, including humans. It is also found in soil contaminated with animal or human faeces. In the intestine the bacteria is harmless. Clinical signs occur when the tetanus spores are able to enter the body. This is most commonly via a puncture wound (even a trivial or unnoticed one), especially if it is contaminated with soil or faeces[19].

TETANUS[20]

Infectious agent:	*Clostridium tetani*
Area Affected:	Generalised.
Incubation Period:	Usually 3-21 days - can depend on the area of the wound.
Mode of Transmission:	Entry of tetanus spores into the body via a wound, especially those contaminated with soil or faeces.
Communicable Period:	Not transmitted from person to person.
Immunity & Resistance:	Recovery from tetanus does not necessarily lead to lasting immunity. It is reported that second attacks can occur. The best form of protection is active immunity[21]

The disease is characterised by painful muscle rigidity followed by spasms. Death is from respiratory failure, hypotension, hypertension or cardiac arrthmyia (abnormal heart rhythm). In Australia, an average of 10 cases are reported a year, 10% of which are fatal[22].

Notification/Hospitalisation

In 1996, there were 2 notifications of tetanus in Australia. There were no notifications for the ACT[23].

2.3 Pertussis (whooping cough)

Description

Pertussis is a highly infectious bacterial disease which affects the respiratory tract. The common name for the condition, whooping cough, comes from the 'whoop-like' noise sufferers make between coughs. The coughs are sudden in onset and increase in severity. They can last for up to three months and vomiting is common. The overall mortality (death) rate from pertussis is high for young children. It is particularly high for children under 6 months at 0.5%. The cause of death is often pneumonia or hypoxic encephalopathy (brain damage due to lack of oxygen to the brain)[24].

PERTUSSIS[25]	
Infectious agent:	*Bordetella pertussis* .
Area Affected:	Respiratory tract.
Incubation Period:	Usually 6-20 days
Mode of Transmission:	Direct contact with infected person Airborne droplets carry the infectious agent. Older siblings and occasionally parents are a source of infection for younger more susceptible children.
Communicable Period:	Highly communicable in early stages before cough when mucous membranes are inflamed. Individual infectious until 3 weeks after coughing phase or until 5 days after treatment with erythromycin.
Immunity & Resistance:	One attack can offer prolonged immunity, although second attacks can occur. Waning immunity in previously immunised adults is a source of infection for young unimmunised children.

In Australia between 1993 and 1996 there was a prolonged epidemic of pertussis[26]. During these epidemics, it was young school-aged children who were notified as having contracted pertussis. These children can then become a source of infection for younger children who are much more at risk. Evidence suggests that there is waning immunity amongst previously immunised adults. These adults can also be a source of infection for susceptible young children[27].

Notification/Hospitalisation

According to the NNDSS there has been an increase in the number of pertussis notifications from 1993 to 1996 with over 4000 notifications each year. A peak late in 1996 marked a resurgence in the epidemic which continued into 1997[28]. There were 4,031 cases reported in 1996 at an annual notification rate of 22 per 100,000 population. In the ACT there were 33 cases of pertussis notified at an annual notification rate of 10.73 per 100,000[29]. There was one hospitalisation with a primary diagnosis of whooping cough due to *Bordetella pertussis* in ACT public hospitals in 1996 and two cases of a primary diagnosis of whooping cough due to an unspecified organism. There was a marked increase in notifications of pertussis from 1996 to 1997 in the ACT. There were 117 cases of pertussis reported in the ACT in 1997 at an annual notification rate of 37.13[30]. In 1997 there were 3 hospitalisations with a primary diagnosis of whooping cough due to *B.pertussis* in ACT public hospitals and eight cases of a primary diagnosis of whooping cough due to an unspecified organism[31].

2.4 Poliomyelitis (Polio)

Description

Poliomyelitis (Polio) is the result of infection with the poliovirus. This highly infectious virus may not result in any clinical symptoms or in severe illness. It can cause fever, vomiting, muscle stiffness, and can effect the nerves and cause permanent paralysis. Polio can paralyse the breathing and swallowing muscles, leading to death. About 5% of people hospitalised with polio die from it, and about half of those who survive suffer permanent paralysis[32].

POLIOMYELITIS[33]	
Infectious agent:	Poliovirus (genus *Enterovirus*) types 1, 2 or 3. All can cause paralysis.
Area Affected:	Gastrointestinal tract, spreading to regional nodes and, rarely, the nervous system. Flaccid paralysis occurs in less than 1% of infections.
Incubation Period:	7 to possibly 35 days for paralytic cases.
Mode of Transmission:	Person to person by oral-faecal route.
Communicable Period:	Undefined. Possible as long as virus excreted.
Immunity & Resistance:	Immunity is apparently life-long. Second attacks are rare and result from infection with a poliovirus of a different strain.

Although polio is endemic in the developing world, the World Health Organisation plans to see polio eradicated by the year 2000. Australia had its highest rate of polio in 1938 (39.1 cases/1000,000 persons). This rate has dropped dramatically since 1952 - with the exception of epidemics in 1956 and 1961-62.

Notification/Hospitalisation

The last reported case of polio in Australia was in 1986[34].

2.5 Measles

Description

Measles is a highly contagious viral illness which causes fever, rash, runny nose, coughing and conjunctivitis. Complications following measles can be very serious and pneumonia occurs in 4% of cases. Approximately one child in every 2,000 who contracts measles will develop inflammation of the brain (encephalitis) and for every 10 children who contract measles with encephalitis, one will die and up to 4 will have permanent brain damage[35].

Measles has caused more deaths in Australia in the past 15 years than diphtheria, pertussis and rubella combined. A rare illness called subacute sclerosing panencephalitis (SSPE) can occur in

children several years after a measles infection. SSPE rapidly destroys the brain and always result in death[36]. It occurs at a rate of about one case in every 25,000 cases of measles.

MEASLES[37]	
Infectious agent:	Measles virus (genus *Morbillivirus*).
Area Affected:	Generalised - possible fever, cough and conjunctivitis. Characteristic blotchy red rash.
Incubation Period:	Around 10 days (up to 18).
Mode of Transmission:	Direct contact with infected individual - airborne droplets carry the infected nasal and throat secretions (highly communicable).
Communicable Period:	From just before symptoms are exhibited to 4 days after the appearance of the rash.
Immunity & Resistance:	Those who have not been immunised or have not had the disease are susceptible.

Notification/Hospitalisation

Notifications of measles in Australia have remained low since 1993-1994. There were 498 cases reported to the NNDSS in 1996 with an annual notification rate of 2.7 per 100,000 population. Notification was highest in the months from August to October. The highest notification rate was for children age 0-4 years (19.3 per 100,000 population). Within this age group the highest notification rate was for children one year or less. In the ACT there were 10 cases of measles reported in 1996 with an annual notification rate of 3.25 per 100,000 population[38]. There were no hospital admissions with a primary diagnosis of measles in ACT public hospitals in 1996[39]. There was an increase in notifications of measles in the ACT from 1996 to 1997. In 1997 there were 79 cases of measles notified with the annual notification rate of 25.50 per 100,000 population[40]. There were 9 hospitalisations with a primary diagnosis of measles in ACT public hospitals in 1997 (all cases were admitted between August and December 1997)[41].

2.6 Mumps

Description

Mumps is a viral disease which cause fever, headache and inflammation of the salivary glands. Occasionally it causes an infection of the membranes covering the brain (meningitis) but permanent effects are rare. It can also cause inflammation of the brain (encephalitis) and permanent deafness. About one in five adolescent or adult males who contracts mumps develops painful inflammation and swelling of the testicles. While the person with this condition usually recovers completely, on rare occasions it may cause sterility[42].

MUMPS[43]	
Infectious agent:	Mumps virus (Family *Paramyxoviridae*)
Area Affected:	Generalised - characterised by fever and swelling of one or more salivary glands.
Incubation Period:	About 12-25 days. 18 days on average.
Mode of Transmission:	By droplet spread or contact with saliva of infected person.
Communicable Period:	12th day to 25th day after exposure.
Immunity & Resistance:	Lifelong immunity after contact with the virus.

Notification/Hospitalisation

There were 128 cases reported in Australia in 1996 with an annual adjusted rate of 0.86 per 100,000 population (excluding Queensland). Of these notified cases 40% were reported from Victoria and there was no seasonal pattern observed. Mumps became notifiable in the ACT in June 1992. In 1997 there were 7 cases of mumps notified[44] and one hospitalisation at ACT public hospitals with a primary diagnosis of mumps.

2.7 Rubella

Description

Rubella, also known as German measles, is usually a mild childhood disease but it can also affect teenagers and adults. The usual symptoms are slight fever, swollen glands, joint pain and a rash which appears on the face and neck and lasts for two or three days. The most dangerous form is congenital rubella, where infection occurs during the first 20 weeks of pregnancy, and can result in devastating abnormalities in the baby. Deafness, blindness, heart defects and mental retardation can occur.

RUBELLA[45]	
Infectious agent:	Rubella virus (Family *Togaviridae*).
Area Affected:	Generalised - mild fever with a rash.
Incubation Period:	16-18 days.
Mode of Transmission:	By droplet spread or by direct contact with infected person.
Communicable Period:	One week before to at least 4 days after rash.
Immunity & Resistance:	Lifelong active immunity after natural immunisation and long term, possibly lifelong immunity after vaccination.

Notification/Hospitalisation

There were 2,845 cases of rubella notified in Australia in 1996. There was a markedly seasonal pattern with most cases having onset during the months of September and October. This pattern was consistent with the previous year. The male to female ratio was 2.2:1. The highest notification rate was for the 15-19 years age group at 56.7 per 100,000 population. There was a marked predominance of male cases in this age group[46].

In the ACT there were 85 cases of rubella notified (at annual notification rate of 27.64 per 100,000 population) and 1 hospital admission with a primary diagnosis of rubella in ACT public hospitals in 1996[47]. In 1997, there were 32 cases of rubella notified (at an annual notification rate of 10.33 per 100,000 population)[48].

2.8 Haemophilus influenzae type b (HiB)

Description

Haemophilus influenzae type b was the most frequent cause of life threatening infection in children under five years of age before the introduction of HiB vaccines. Despite its name, it is not related in any way to influenza ('the flu'). It may cause infection of the membranes covering the brain (meningitis), swelling the throat which can block breathing (epiglottitis), pneumonia and infection of the tissue under the skin (cellulitis). Both meningitis and epiglottitis can develop quickly and if left untreated, can rapidly cause death.

HAEMOPHILUS INFLUENZAE B [49]

Infectious agent:	*Haemophilus influenzae* serotype b (HiB).
Area Affected:	Generalised- can cause meningitis, epiglottitis, pneumonia, pericarditis, septic arthritis, empyema and osteomylitis.
Incubation Period:	Unknown. Probably 2-4 days.
Mode of Transmission:	By droplet infection and discharges from nose and throat during the infectious period.
Communicable Period:	As long as organism is present. Noncommunicable within 24-48 hours after starting effective antibiotic therapy.
Immunity & Resistance:	Susceptibility is universal. Immunity associated with the presence of circulating bactericidal and/or anticapsular antibody - acquired from prior infection or immunisation.

Notification/Hospitalisation

Notifications of *Haemophilus influenzae* type b infection in Australia have been low since 1995. There were 51 cases of Hib infection notified in 1996, an annual rate of 0.3 per 100,000 population. Since the introduction of Hib vaccine in 1992, the notification rate for children under the age of 5 has dropped from 33.6 per 100,000 population in 1992 to 2.2 per 100,000 population in 1996[50].

There was 1 hospital admission with a primary diagnosis of Hib meningitis in ACT public hospitals in both 1996 and 1997. In both cases the children were under 1 year of age.

2.9 Hepatitis B

Description

Hepatitis B is endemic worldwide. Although children under one do not seem to suffer many symptoms, in adults infection frequently results in acute hepatitis[51]. Following acute infection, a small percentage of adults and most infants are infectious for years. These carriers have a greater risk for liver cancer later on and act as an infectious source for others[52].

HEPATITIS B[53]

Infectious agent:	Hepatitis B (HBV) virus (Family *Hepadnaviridaeus*).
Area Affected:	Mainly liver. Diagnosis confirmed by demonstration of specific antigens and/or antibodies (e.g.: hepatitis B surface antigen: HBsAg).
Incubation Period:	Usually between 45-180 days.
Mode of Transmission:	HBsAg has been found in virtually all body secretions and excretions; however, only blood (and serum derived fluids), saliva, semen and vaginal fluids have been shown to be infectious.
Communicable Period:	All persons who are HgsAg positive are potentially infectious.
Immunity & Resistance:	Susceptibility is general. Usually milder in children. Protective immunity follows infection if antibody to HBsAg develops and is HBsAg negative.

Carrier rates for hepatitis B in some Australian Aboriginal and Torres Strait Islander communities are greater than 10%. For the rest of the Australian community the rate is 0.1-0.2%[54]. The NHMRC has recommended hepatitis B vaccination for infants (refer Appendix 1).

Notification/Hospitalisation

According to the NNDSS, there were 225 cases of hepatitis B reported in Australia in 1996 (at an annual notification rate of 1.2 per 100,000 population). In the ACT there were 2 and 4 hepatitis B notifications for 1996 and 1997 respectively[55]. There was 1 ACT public hospital admission with a primary diagnosis of viral hepatitis B in 1996 and 2 in 1997. All cases were over 18 years of age.

3. IMMUNISATION IN THE ACT

3.1 Brief History Of Immunisation in the ACT

Between 1978-1993 the ACT Community Nursing Service (CNS) was responsible for the delivery of immunisation services. The CNS nurses were both child and domiciliary nurses brought together under the CNS banner in 1978. The nurses performed immunisations at the major health centres. General Practitioners were also performing immunisations at this time but there was no monitoring of adherence to the NHMRC schedule.

In 1988 the ACT took part in a successful national measles campaign. The success was based on the increased number of vaccines distributed at the time. This measure was used because at this stage no register existed, so the increased rate of children vaccinated was not known .

In 1991 a credentialling course for immunisation nurses was developed. This was in response to the education and training unit of Community Nursing recognising the need for continuing education of nurse immunisers. In the same year extended hours for the health clinics on Thursday nights were trialled but proved unsuccessful.

A computerised immunisation register, based on the Victorian system was introduced in 1992. The computerised system (VACCS), because of its complexities, was only taken full advantage of after the appointment of an immunisation coordinator in 1993.

In 1994 the VACCS system's records became more complete. Up until this time the data was mainly a record of immunisations given by community nurses. The introduction of the 'Vaccines for Data' scheme meant that immunisation providers in the public and private sector received free vaccines for information on immunisation encounters.

A special immunisation clinic was established in the Accident and Emergency Department of the then Woden Valley Hospital (now The Canberra Hospital) in 1994. It is now located in the Outpatients Department. This clinic provides immunisation services for children with moderate to severe reactions to immunisations in the past and those children with specific medical conditions. This was the first clinic of its type in Australia. Similar clinics exist now at the New Children's Hospital in Sydney and the Royal Children's Hospitals in Melbourne and Adelaide.

Since January 1996, the ACT has fully participated in the work of the Australian Childhood Immunisation Register.

3.2 Current NHMRC Vaccination Schedule

The National Health and Medical Research Council (NHMRC) promotes vaccination and the correct use of vaccines though its publication of the Australian Immunisation Handbook[56]. As part of the regularly updated publication, the NHMRC outlines the current Australian Standard Vaccination Schedule.

The schedule is a list of suggested vaccinations along with the ages that those vaccinations should be given. It is regularly updated as new knowledge, technologies and vaccines become available. The current schedule acknowledges the efficacy of the new acellular pertussis vaccine. The acellular vaccine, which will be used at 18 months and 4-5 years in the form of the DTPa vaccine, has fewer side effects than the whole cell pertussis vaccine. The current schedule is as of November 1997. It replaces the previous schedule of August 1994.

The NHMRC has recommended the introduction of universal hepatitis B vaccination for infants to eliminate acute hepatitis B and reduce the number of carriers in the community. It has not been made part of the schedule to date as it involves another injection. When it can be combined with other vaccines hepatitis B vaccination will become part of the standard schedule (refer Appendix 1).

3.3 School, Parent and Health Department Responsibilities

Parent & School responsibilities

ACT Public Health Regulations are used to reduce the spread of vaccine preventable childhood diseases in school, pre-school and child care facilities and to encourage catch-up immunisation. Parents of children who have started school, preschool or child care from 1994 in the ACT have been asked to present a copy of the child's immunisation record. Table 1 lists the progressive implementation of this requirement.

Table 1: Progressive implementation of enrollment requirements from 1994-2000

Year of School	*Year*
Kindergarten	1994
Kindergarten and Year 1	1995
Kindergarten, Year 1 and Year 2	1996
Kindergarten Year, Year 2 and Year 3	1997
Kindergarten Year1, Year 2, Year 3 and Year 4	1998
Kindergarten Year1, Year 2, Year 3, Year 4 and Year 5	1999
All years	2000

Note: Kindergarten includes preparatory class

The immunisation record shows all the immunisations the child has received. The record has 3 pages which must remain intact until the child goes to primary school. The first copy is for the parents. The second copy is for the Department of Health and Community Care and the third copy is for the school (refer Appendix 5).

An immunisation record can only be filled in by a medical practitioner, registered nurse or a person authorised by the ACT Medical Officer of Health. If a child does not have an Immunisation Record there are a number of ways of obtaining one (refer Appendix 6).

The school, preschool or child care centre needs immunisation records to be able to quickly identify children who are not immunised in the event of an outbreak of an infectious disease.

If there is an outbreak, children who are not immunised against the disease may be asked by the Chief Health Officer, School Principal or child care coordinator to stay at home until the outbreak is over. This is for the child's protection and to stop the spreading of the disease. If a child contracts an infectious disease they may also be excluded from school (refer Appendix 7). This list is currently being updated but there will be no changes to the vaccine-preventable childhood diseases.

The Health Department

The ACT Department of Health and Community Care mission states that: *'In partnership with customers, service providers, and the community, continuously improve health and community care services to maximise both community and individual health and well-being'*[57]. The Department supports the National Immunisation Campaign. It is committed to improving immunisation coverage rates and protecting the community, particularly its youngest members, against vaccine preventable diseases. To this end the ACT has its own five point immunisation plan which enhances the Commonwealth Government's seven point immunisation plan (Refer Section 5.1).

As part of its role in health protection, the Department co-ordinates the ACT immunisation program and purchases immunisation services from ACT Community Care. Vaccines are predominantly funded by the the Commonwealth, including the School Immunisation Program. The ACT funds the first dose of the Measles-Mumps-Rubella (MMR) vaccine, all Oral Poliomyelitis Vaccine (OPV), Adult Diptheria and Tetanus (ADT) and Child Diptheria and Tetanus (CDT) vaccinations.

Vaccinations are available through the health centres (run by maternal and child nurses) and general practitioners (GPs). They are also available through primary schools as part of the School Immunisation Program. This program has recently been expanded to include all pre-schools in the ACT. The intention is to further extend this service by offering vaccinations through all child care centres. In recent times hospital immunisation liason officers have been appointed to promote opportunistic immunisations to children who come in contact with the three major hospitals in the ACT.

Free hepatitis B vaccinations are offered to 'at risk' individuals. For the first time this year, the ACT - in line with other states and territories - has offered free hepatitis B vaccine to all year 6 children.

The provision of immunisation services includes the recording of information. Under Public Health Regulation the Department maintains both an immunisation and an infectious disease notifications database. The secure information kept on these databases is used for disease surveillance and trend monitoring by the Department. As noted earlier, immunisation records allow quick public health action to be taken in the event of outbreaks of infectious disease. De-identified information is provided to the national databases for national surveillance and monitoring.

The Department promotes immunisation and educates health providers and the community on issues relating to immunisation and collaborates with the Commonwealth on matters relating to immunisation.

4. Immunisation Coverage rates in the ACT

4.1 Methodology

Information in this publication is based on the immunisation status of a cohort of children taken from the ACT immunisation database (VACCS system). The cohort included 25,574 births from 1/1/1993 to 31/12/1997 (1/4/98 was the cut off point for censoring of 1997 birth cohorts, and 31/12/97 was the cut off points for other birth cohorts). More information about the methodology used in this report and how it compares with coverage rates reported by the ACIR are outlined in appendix 8.

Data was extracted from the VACCS database in ASCII delimited format and imported into a Microsoft Access[58] database. Data editing and error checking was performed using Access and Statistical Package for Social Scientists (SPSS)[59] software package. Initial analysis used Access program to calculate the number of children who had had the appropriate number of each type of vaccination by the time they reached particular ages. SPSS was used to find the appropriate coverage rates and test for statistical significance using the chi-square (χ^2) statistic. A significant result was defined as a probability (p) value less than 0.05. Of the records selected (1993-1997 birth cohort), 8% of erecords were for non-ACT children or had incomplete residential data.

4.2 Definitions

For this analysis, a child was defined as fully vaccinated if he or she had received all the NHMRC recommended vaccines for their age. Before April 1993 the recommended schedule was Diphtheria-Tetanus-Pertussis vaccine (DTP or Triple Antigen); Oral Polio Vaccine (OPV or Sabin) and Measles-Mumps-Rubella (MMR). After April 1993 *Haemophilus influenzae* type b (Hib) vaccination was included. Vaccination was defined as early if it occurred at any time prior to the due date and late if it was more than one month after the due date.

The timing of vaccinations was calculated using the date when the vaccine was given and the date of birth of the child. It is important that the first 3 scheduled immunisations are spaced at least 2 months apart and that MMR vaccine is given at 12 months or slightly later. Children immunised 'on time' were defined as those vaccinated within the following time limits:

Schedule No	Vaccines	Recommended Age	Grace Period For Providing Vaccine
1	DTP1 Triple Antigen OPV1 Sabin Vaccine Hib1	2 months (61 days)	up to 30 days late (e.g.. 91 days after birth)
2	DTP2 Triple Antigen OPV2 Sabin Vaccine Hib2	4 months (122 days)	up to 30 days late (e.g.. 152 days after birth)
3	DTP3 Triple Antigen OPV3 Sabin Vaccine Hib3	6 months (183 days)	up to 30 days late (e.g.. 213 days after birth)
4	MMR	12 months (365 days)	up to 30 days late (e.g.. 395 days after birth)
5	DTP4 Triple Antigen Hib Booster	18 months (548 days)	up to 30 days late (e.g.. 578 days after birth)

4.3 Coverage Rates

There were slightly more male (51%) than female children (49%) in the 1993-1997 ACT birth cohort. Based on the recorded date of immunisation, coverage rates for individual vaccines varied from 50% (for Hib booster at 18 months of age) to 95% (for Hib dose 1 at 2 months of age) for vaccinated children and from 39% (Hib booster at 18 months of age) to 78% (Sabin dose 1 at 2 months of age) for 'on time' vaccinated children (see Table 2). The results of this analysis suggest that the coverage rate for both fully vaccinated and fully vaccinated on time children decreased steadily as the children got older.

Table 2: Numbers and proportion of children vaccinated, ACT 1993-1997 birth cohort by individual vaccine

Vaccines	Count (%) fully vaccinated	Count (%) fully vaccinated on time
DTP Triple Antigen Vaccine		
Dose1	19835 (80)	18422 (74)
Dose2	18539 (77)	15938 (66)
Dose3	17198 (74)	13204 (57)
Dose4	12051 (65)	7280 (39)
OPV Sabin Vaccine		
Dose1	20824 (84)	19327 (78)
Dose2	19660 (81)	16952 (70)
Dose3	18361 (79)	15151 (65)
Hib Vaccine		
Dose1	23605 (95)	18251 (73)
Dose2	19836 (82)	14987 (62)
Dose3	16569 (71)	11839 (49)
Booster	9341 (50)	5992 (39)
MMR	15642 (74)	10448 (50)

Source: ACT Communicable Disease Unit, 1997

Table 3: Numbers (proportion) of children vaccinated, ACT 1993-1997 birth cohort by NHMRC recommended schedules

Schedules	Count (%) fully vaccinated	Count (%) fully vaccinated 'on time'
1 at 2 months (TA1 and Sabin1 and Hib1)	20535 (82)	18138 (73)
2 at 4 months (TA2 and Sabin2 and Hib2)	18795 (78)	14961 (62)
3 at 6 months (TA3 and Sabin1 and Hib1)	15743 (67)	11662 (50)
4 at 12 months (Measles-Mumps-Rubella)	15642 (74)	10448 (50)

Source: ACT Communicable Disease Unit, February 1997

For the period 1993-1997, the coverage rate for children who were fully vaccinated to the NHMRC schedule was 82% at 2 months, 78% at 4 months, 67% at 6 months and 74% at 12 months (see Table 3). Despite the high coverage rate at 2 months of age, less than 75% of children received the third dose of triple antigen and Hib vaccine (Table 2), and only 67% of children had received the full three dose series of triple antigen, Hib and Sabin vaccine at the 6 months of age.

The proportion of children who received their vaccinations within one month of their schedule due date was relatively low for all schedules. The proportion of children vaccinated 'on time' was 73% at 2 months, 62% at 4 months, 50% at 6 months and 50% at 12 months (see Table 3). It appears there is a decreased proportion of 'on time' vaccinations as children get older.

In comparing between fully vaccinated and 'on time' fully vaccinated children, the results show that of those children who were fully vaccinated the majority of them had their vaccinations within one month of the due date. That is, amongst the fully vaccinated children the proportion of 'on time' vaccinated children was 88%, 80%, 74% and 67% at 2 months, 4 months, 6 months and 12 months respectively (see Table 4).

Table 4: Proportion of vaccinated 'on time' and vaccinated late among fully vaccinated children, ACT 1993-1997 birth cohort by NHMRC recommended schedules

Schedules	Vaccinated on time	Vaccinated late
1 at 2 months (TA1 and Sabin1 and Hib1)	88%	12%
2 at 4 months (TA2 and Sabin2 and Hib2)	80%	20%
3 at 6 months (TA3 and Sabin3 and Hib3)	74%	26%
4 at 12 months (Measles-Mumps -Rubella)	67%	33%

Source: ACT Communicable Disease Unit, February 1997

4.4 Pattern of immunisation over time

Table 5 shows the number and proportion of children born in each of the years between 1993-1997 who were considered vaccinated and vaccinated 'on time' at the ages specified. The proportion of children fully vaccinated for the 1st schedule (at 2 months of age) ranges from 70% in 1993 to 88% in 1997. These proportions decrease steadily for schedules 2 and 3.

There was a slight increase in the proportion of vaccinated children from schedule 3 to schedule 4 in the years of 1993, 1995, 1996 and 1997 (Figure 1). This increase may be explained by the fact that there were no new vaccines added to the schedule and some 'catch up' vaccinations by non-fully vaccinated children may have occurred.

Table 5: Count and proportion of children vaccinated, ACT 1993-1997 by year of birth and NHMRC recommended schedules

Year of Birth	Schedules (Cutoff age)	Count (%) fully vaccinated	Count (%) fully vaccinated on time
1993 (N=5560)	1 (at 2 months)	3491 (70)	2912 (49)
	2 (at 4 months)	3623 (65)	2265 (41)
	3 (at 6 months)	2765 (50)	1652 (30)
	4 (at 12 months)	4049 (73)	2395 (43)
	5 (at 18 months)	2209 (40)	1208 (22)
1994 (N=5255)	1 (at 2 months)	4306 (82)	3916 (75)
	2 (at 4 months)	4026 (77)	3288 (63)
	3 (at 6 months)	3628 (69)	2653 (51)
	4 (at 12 months)	3565 (68)	2217 (42)
	5 (at 18 months)	2753 (52)	1647 (31)
1995 (N=5251)	1 (at 2 months)	4168 (79)	3787 (72)
	2 (at 4 months)	3931 (75)	3120 (59)
	3 (at 6 months)	3502 (67)	2533 (48)
	4 (at 12 months)	3837 (73)	2488 (47)
	5 (at 18 months)	2518 (50)	1710 (33)
1996 (N=4996)	1 (at 2 months)	4170 (84)	3894 (78)
	2 (at 4 months)	3951 (80)	3337 (67)
	3 (at 6 months)	3547 (71)	2754 (56)
	4 (at 12 months)	3671 (74)	2853 (56)
	5 (at 18 months)	----NA----	----NA----
1997 (N=4542)*	1 (at 2 months)	3976 (88)	2830 (84)
	2 (at 4 months)	3264 (77)	2951 (70)
	3 (at 6 months)	2301 (65)	2070 (60)
	4 (at 12 months)	520 (45)	495 (43)**
	5 (at 18 months)	----NA----	----NA----

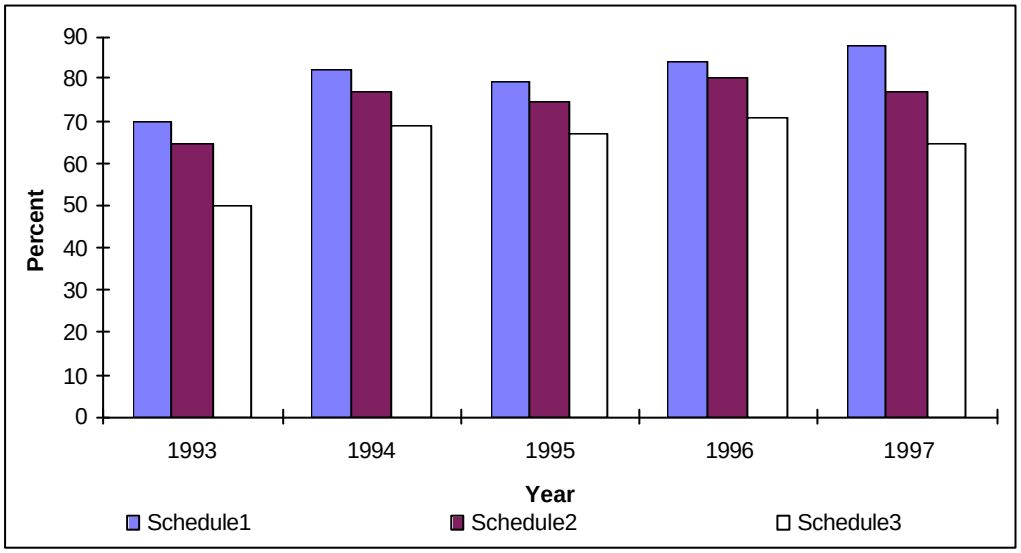
Source: ACT Communicable Disease Unit, February 1997

** Note: Censoring performed using 1/4/1998 as the cut off date for the 1997 birth cohort*

** Refer text

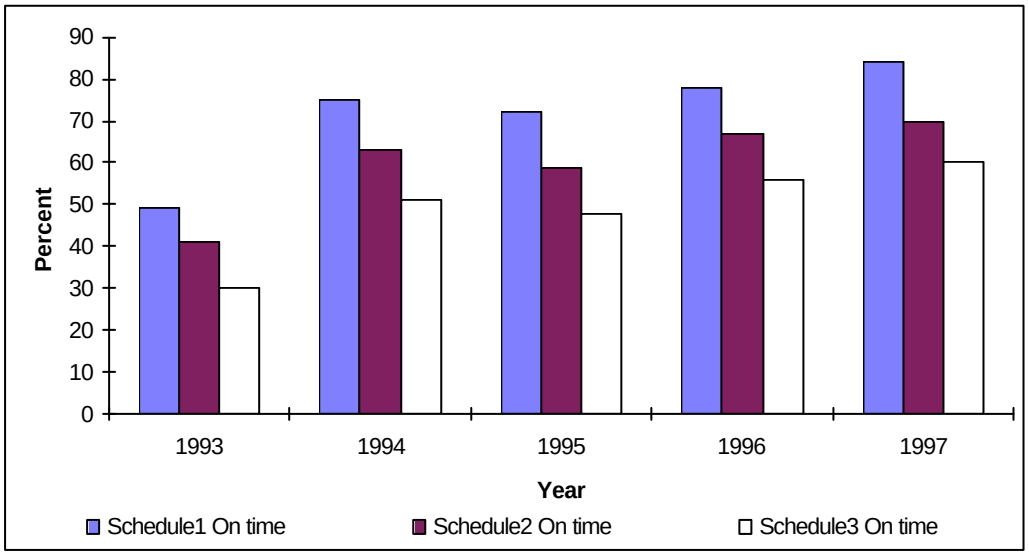
The relatively low proportion of children who were fully vaccinated (for schedule 1, 2 and 3) in 1993 compared to other years may be due to the fact that the ACT computerised immunisation information system (VACCS) was only fully operational in late 1993. The VACCS database became more complete in early 1994 (see Figures 1 and 2). In addition, the low proportion of children who were vaccinated at schedule 3 in 1997 could be explained by the fact that some children born in late 1997 had not reached 6 months at the time data was extracted from the VACCS system (January/February, 1998). Also some vaccination data had not been entered to the database due to the delay in submission of data from immunisation service providers to the ACT Department of Health and Community Care.

Figure 2: Percentage of children fully vaccinated, ACT 1993-1997 birth cohort by NHMRC recommended schedules



Source: ACT Communicable Disease Unit, February 1997

Figure 3: Percentage of children fully vaccinated on time, ACT 1993-1997 birth cohort by NHMRC recommended schedules



Source: ACT Communicable Disease Unit, February 1997

Looking at the trend over time, between 1993 and 1997 there were significant differences in immunisation coverage rate. For schedule 1 (at 2 months of age) there was a significant difference in the proportion of children who were fully vaccinated over the time period (χ^2=1165.63, df=4 P<0.00001). The highest coverage rate was reported in 1997 (88%). 1993 reported the lowest rate (63%) (refer Figure 3).

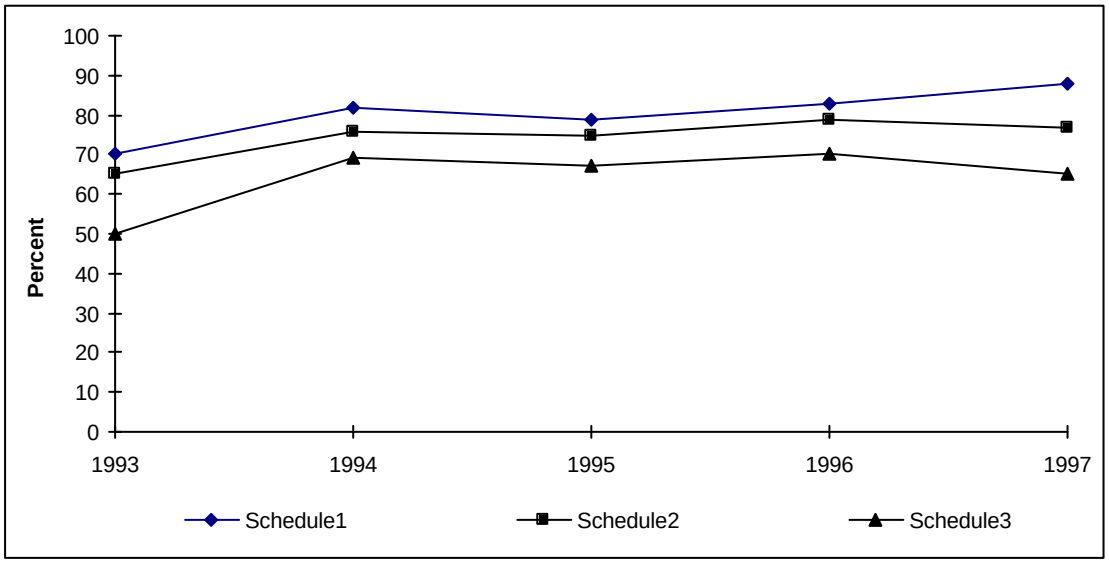
As mentioned earlier, due to the complexity and the completeness of the VACCS system the lower rate for 1993 needs to be interpreted with caution. It should also be noted that for the first few years following the introduction of the Hib vaccine in 1993, children only needed one shot between 3 and 5 to be considered to be fully immunised. A child is now considered to be fully immunised if they have recieved four doses of the Hib Titer.

There were also significant differences in the proportion of children who were fully vaccinated for schedule 2 (at 4 months of age) (χ^2=329.46, df=4, P<0.00001) and schedule 3 (at 6 months of age) (χ^2=943.74, df=4, P<0.00001) over the 1993-1997 period.

The proportion of children who were fully vaccinated at 2 months of age varied between 80-87% for the period 1994-1997. It appears that there was an slight reduction (about 5%) in the proportion of children who were fully vaccinated from the schedule 1 (2 months) to schedule 2 (4 months of age).

For schedule 3 (at 6 months of age), the proportion of children who were fully vaccinated was stable at around 70% between 1994-1996 (1993 and 1997 were excluded due to incomplete data). The reduction in the proportion of children who were fully vaccinated for schedule 2 and schedule 3 was about 8% over the period 1994-1997.

Figure 4: Percentage of children fully vaccinated, ACT 1993-1997 birth cohort by NHMRC recommended schedules and year of birth

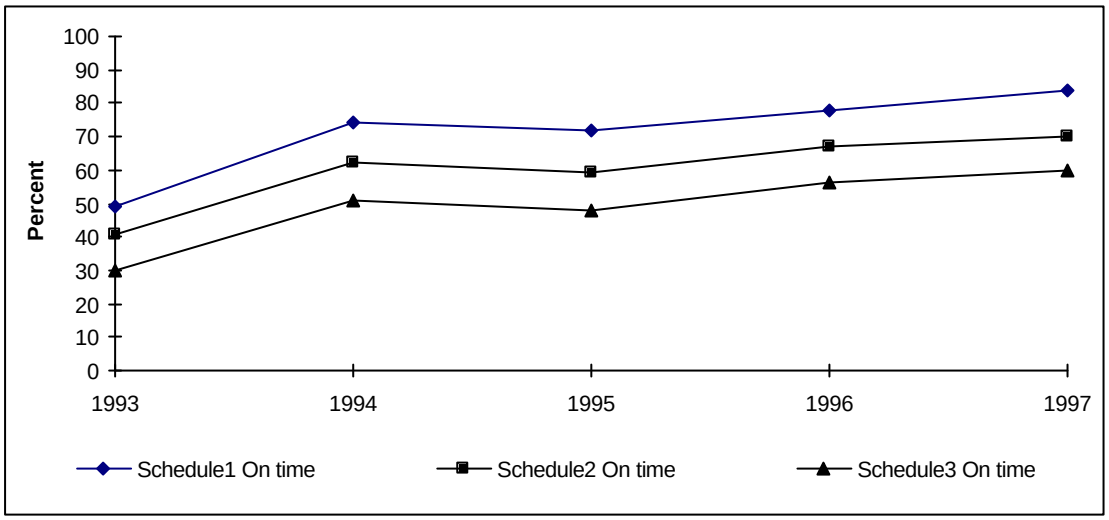


Source: ACT Communicable Disease Unit, February 1997

The proportion of age-appropriately immunised ('on time' immunised) children increased steadily from 49% in 1993 to 84% in 1997 for schedule 1. However, results from this analysis suggested that less than 50% of children in the 1993-1997 birth cohort had their third dose of vaccination on

time (Figure 4). There was a trend of increasing 'on time' immunisation at 2 months (χ^2=1078.56, df=4, P<0.00001), 4 months (χ^2=993.09, df=4, P<0.00001), and 6 months (χ^2=825.57, df=4, P<0.00001) over the time period 1993-1997.

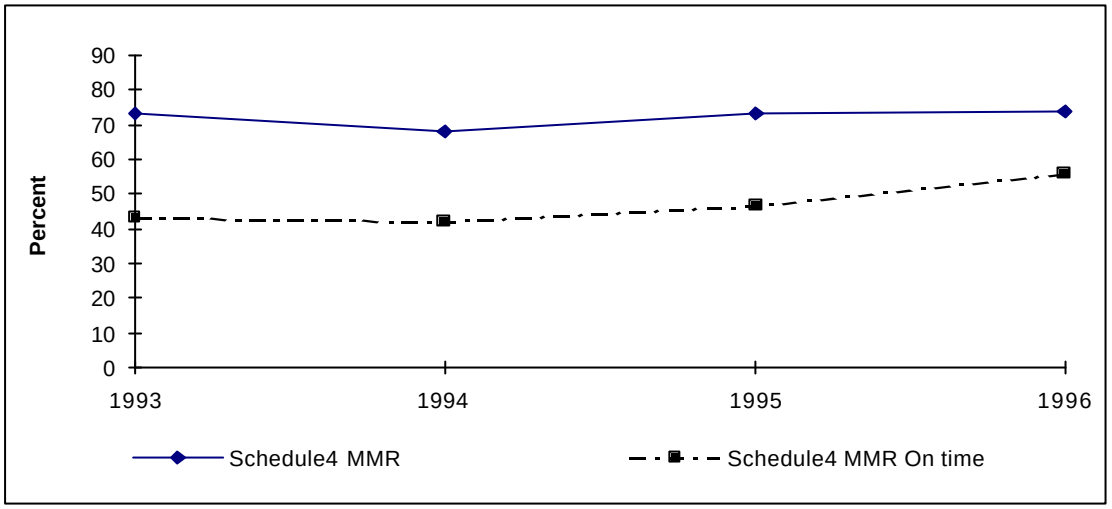
Figure 5: Percentage of children fully vaccinated on time, ACT 1993-1997 birth cohort by NHMRC recommended schedules and year of birth



Source: ACT Communicable Disease Unit, February 1997

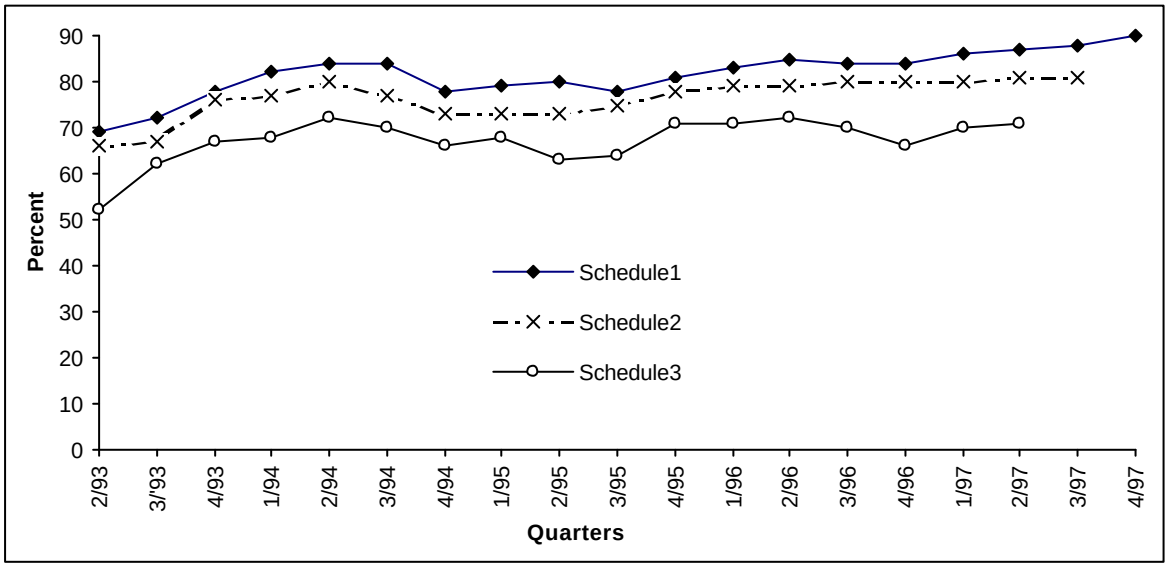
Analysis of the immunisation status of children at their 1st birthday (MMR at 12 months of age), showed a slight increase in the fully vaccinated and 'on time' vaccinated rate over the period 1993-1996 (χ^2=5796.61, df=4, P<0.00001). The coverage rate for MMR vaccine was stable around 70% over the period of 1993-1996. Of particular concern is the finding that between 1993-1995 less than 50% of 12-months MMR vaccinations were on time (χ^2=5796.61, df=4, P<0.00001) (see Figure 6). This delay in receiving vaccinations creates a situation in which children remain at high risk of infection of these vaccine preventable diseases for an unnecessarily prolonged period of time. On the other hand, the difference between the proportion of children who were fully vaccinated and the proportion of vaccinated on time for MMR had been reduced from 30% in 1993 to 16% in 1996.

Figure 6: Percentage of children who had MMR vaccination, ACT 1993-1997 birth cohort by year of birth



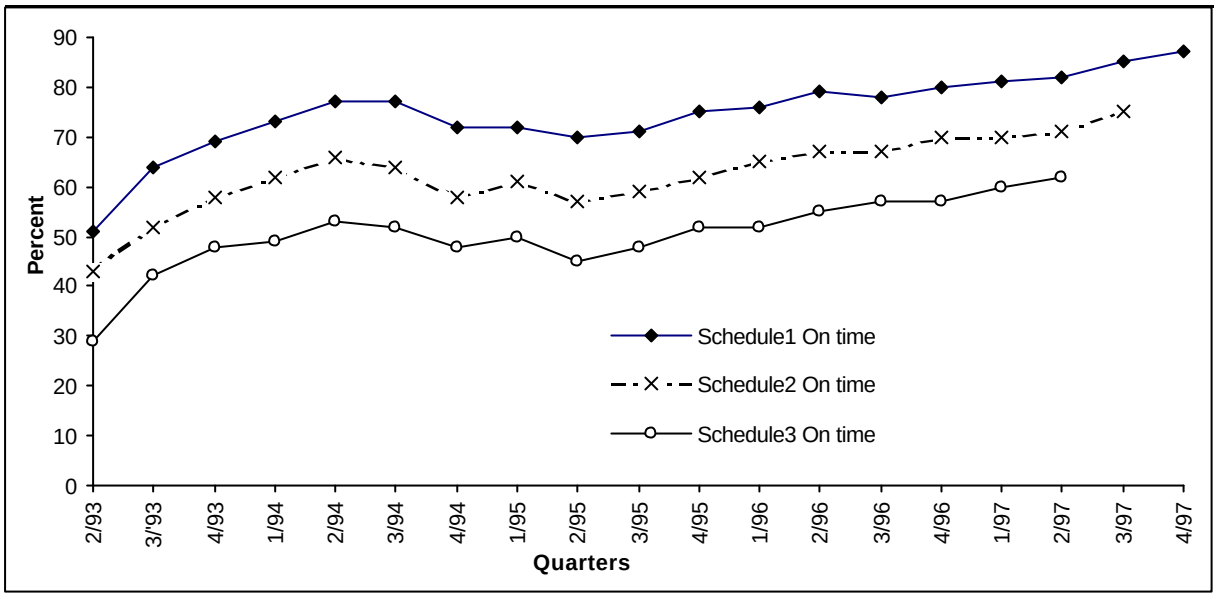
Source: ACT Communicable Disease Unit, February 1997

Figure 7: Percentage of children fully vaccinated, ACT 1993-1997 birth cohort by NHMRC recommended schedules and year quarters



Source: ACT Communicable Disease Unit, February 1997

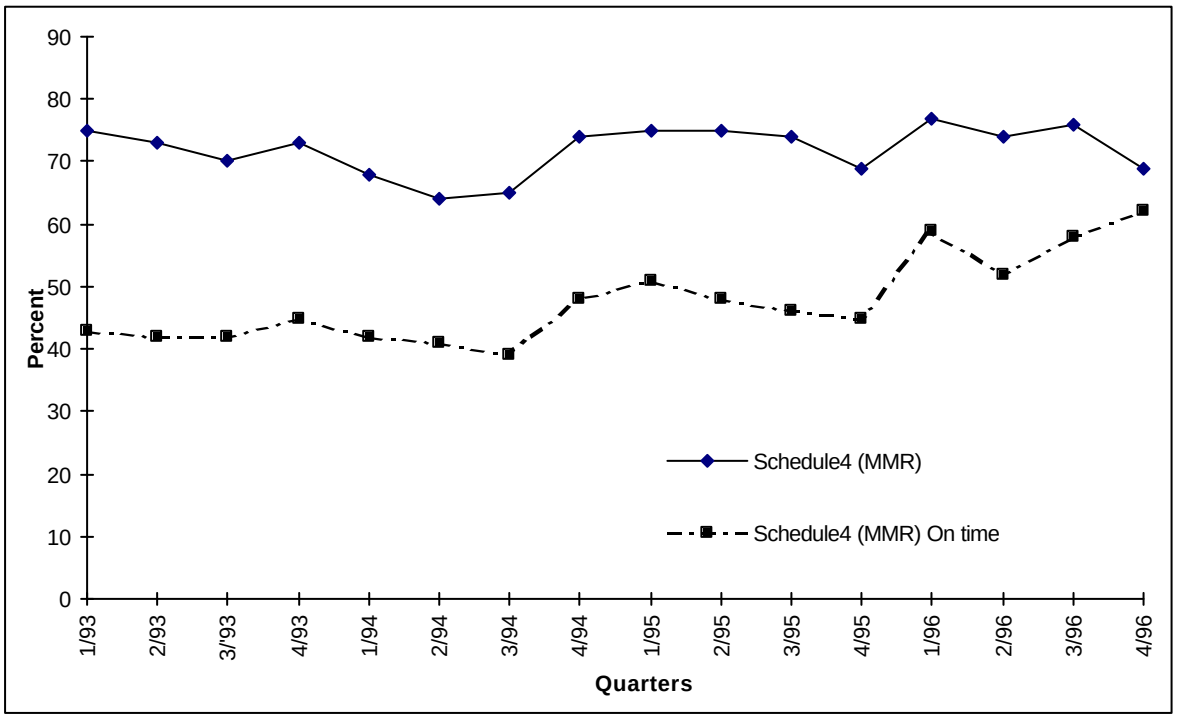
Figure 8: Percentage of children fully vaccinated on time, ACT 1993-1997 birth cohort by NHMRC recommended schedules and year quarters



Source: ACT Communicable Disease Unit, February 1997

Figures 7 and 8 show the immunisation pattern in the ACT over the period of 1993-1997. There were significant differences between immunisation coverage rates over time in the ACT. Overall, it appears that the coverage rate improved significantly from the 1st quarter of 1993 to the 4th quarter of 1994, then leveled off or slightly decreased during 1995. There was a trend of increasing coverage rate from 1995 to 1997, especially for the 2nd and 3rd schedule.

Figure 9: Percentage of children fully vaccinated on time, ACT 1993-1997 birth cohort by NHMRC recommended schedules and year quarters



Source: ACT Communicable Disease Unit, February 1997

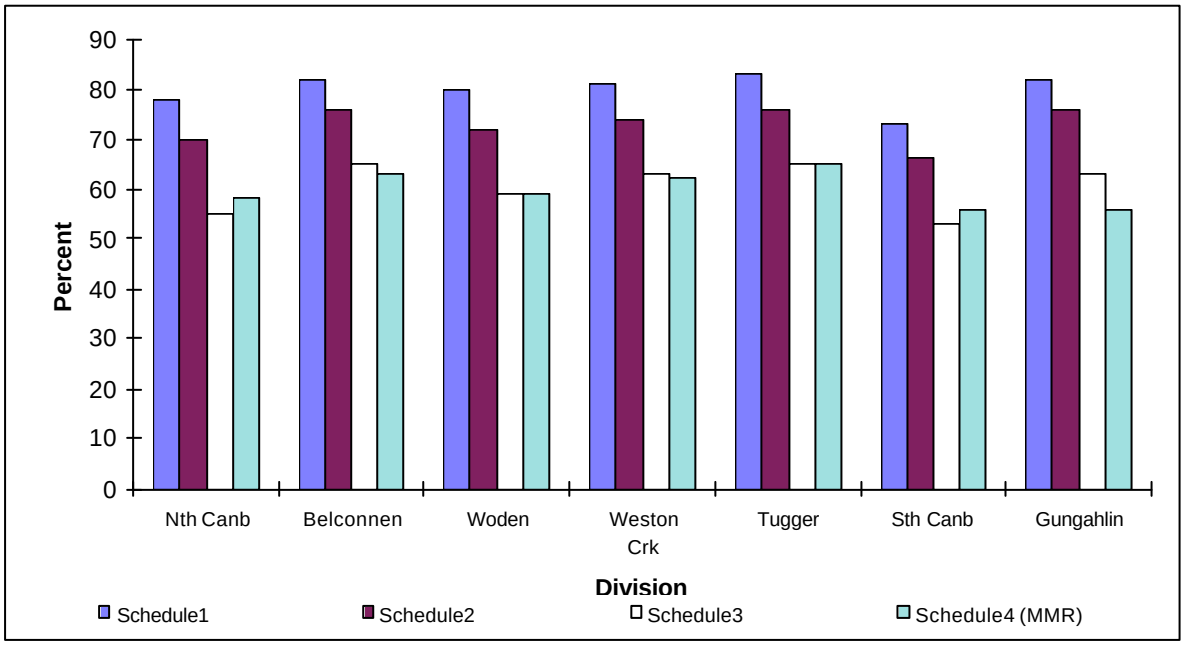
Detailed analysis of MMR vaccinations presents an interesting pattern. There were significant differences in coverage rate of MMR vaccinations over the period of 1993-1997. It appeared that there was a marked decrease in MMR uptake from the end of 1993 to the beginning of 1994 and towards the end of 1995 (Figure 9). Despite low coverage rate of 'on time' MMR vaccination, there was an increasing trend in the proportion of children who had the MMR vaccination 'on time'.

4.5 Geographical variation in immunisation status

The Australian Bureau of Statistics uses the Australian Standard Geographical Classification which is a hierachically structured classification of spatial units by geographic areas within Australia. In this publication the statistical subdivision was used as the standard geographical unit. In the ACT the statistical subdivisions were defined as North Canberra, Belconnen, Woden Valley, Weston Creek-Stromlo, Tuggeranong, South Canberra, Gungahlin-Hall and the ACT Balance (consisting the bulk of the ACT's non-urban areas). Details of suburbs within a particular statistical subdivision are outlined in Appendix 9.

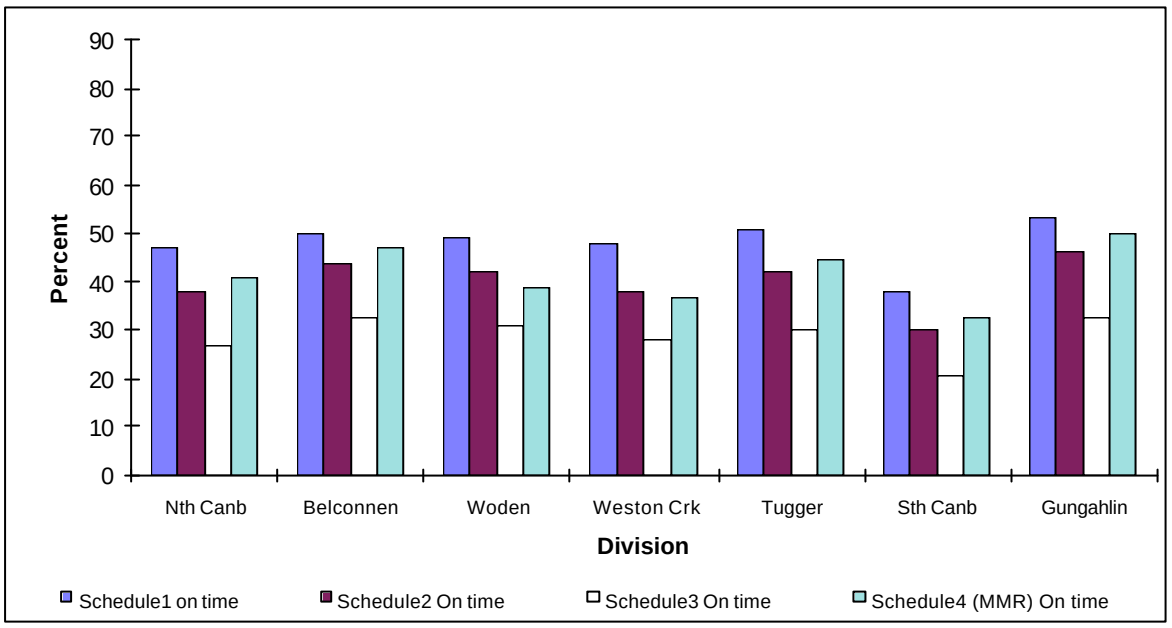
Figures 10 and 11 show the geographical distribution of fully immunised children in the ACT for the period 1993-1997. There were significant differences in immunisation coverage rates across all of the statistical subdivisions in the ACT between 1993-1997. Overall, it appears that even though South Canberra had a better catch up rate (between 3rd and 4th dose of 'on time' immunised), the coverage rate in this area was relatively low in comparison to other areas. Gungahlin, Belconnen and Tuggeranong seem to have better coverage rates than other areas, especially for the 12 months MMR 'on time' immunisation.

Figure 10: Percentage of children fully vaccinated, ACT 1993-1997 birth cohort by NHMRC recommended schedules and statistical subdivision



Source: ACT Communicable Disease Unit, February 1997

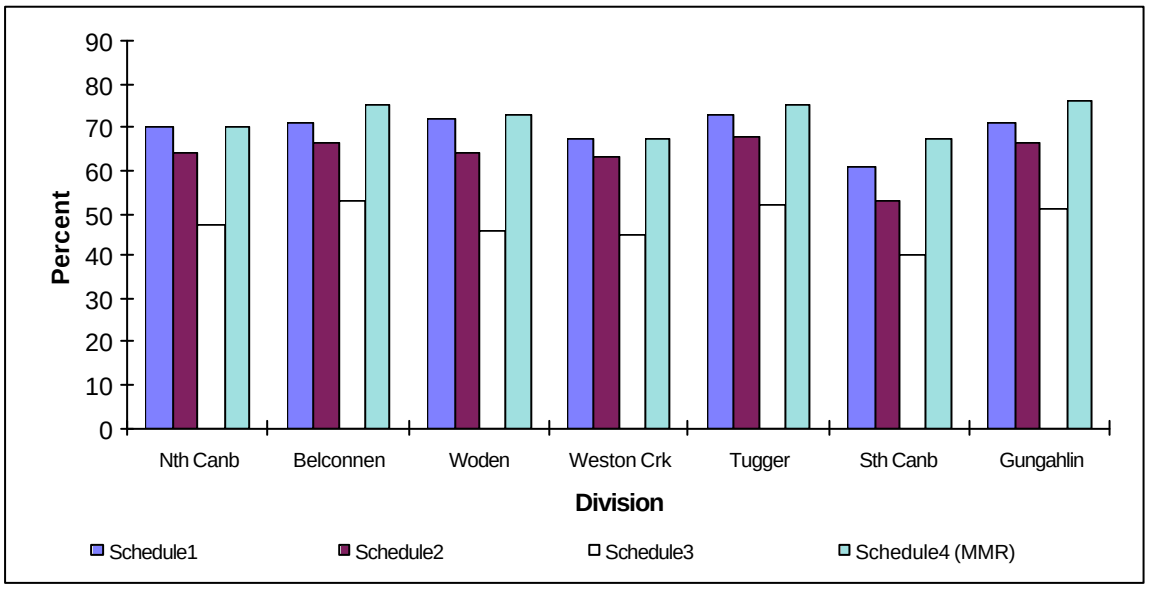
Figure 11: Percentage of children fully vaccinated on time, ACT 1993-1997 birth cohort by NHMRC recommended schedules and statistical subdivision



Source: ACT Communicable Disease Unit, February 1997

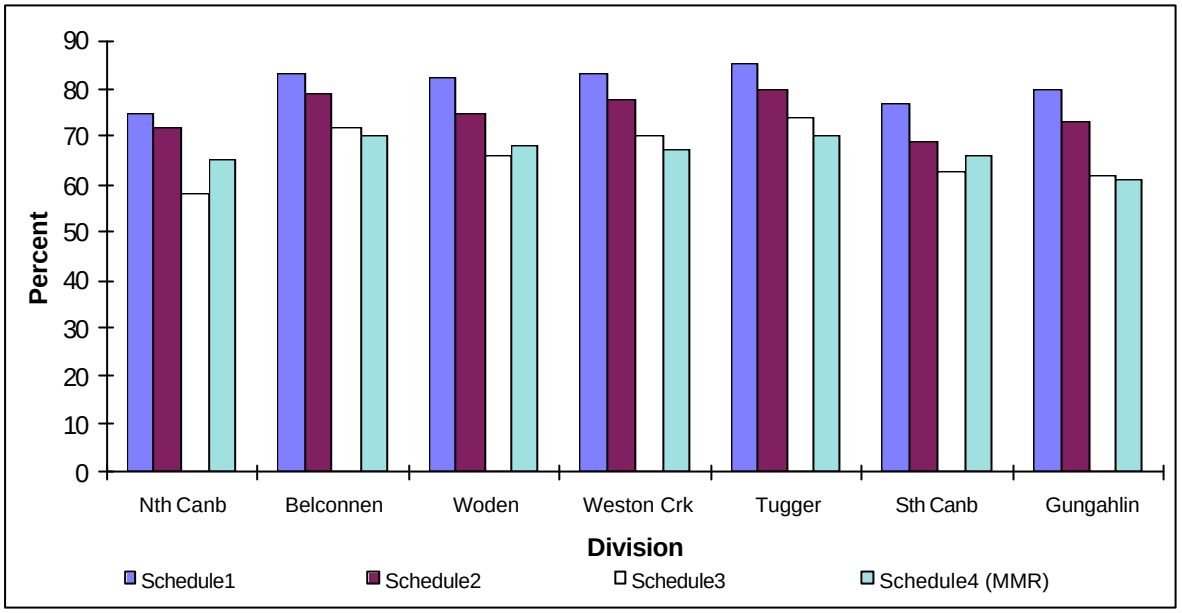
Figures 12 to 16 show the distribution of coverage rates of full vaccination by NHMRC recommended schedules and by statistical subdivision of the 1993-1997 birth cohorts.

Figure 12: Percentage of children fully vaccinated, ACT 1993 birth cohort by NHMRC recommended schedules and statistical subdivision



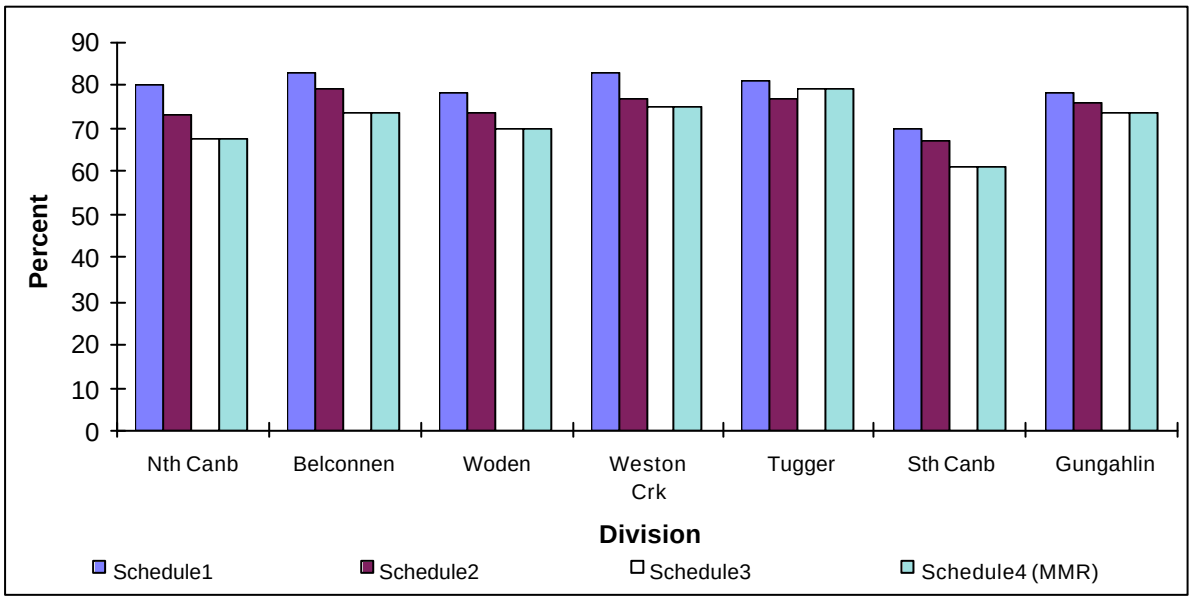
Source: ACT Communicable Disease Unit, February 1997

Figure 13: Percentage of children fully vaccinated, ACT 1994 birth cohort by NHMRC recommended schedules and statistical subdivision



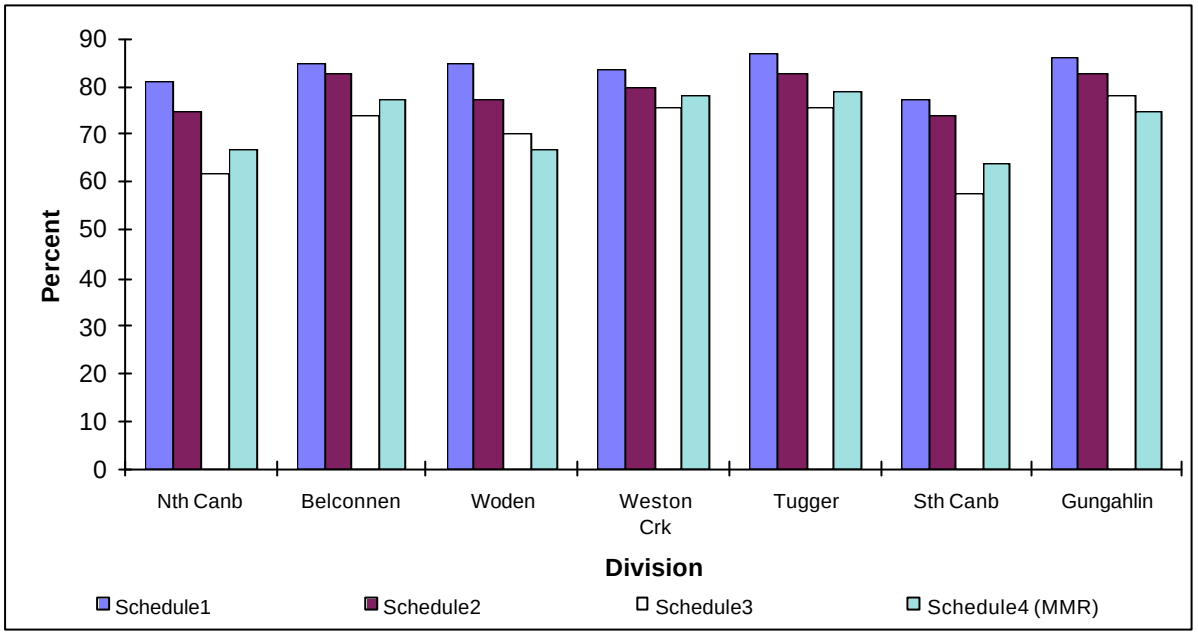
Source: ACT Communicable Disease Unit, February 1997

Figure 14: Percentage of children fully vaccinated, ACT 1995 birth cohort by NHMRC recommended schedules and statistical subdivision



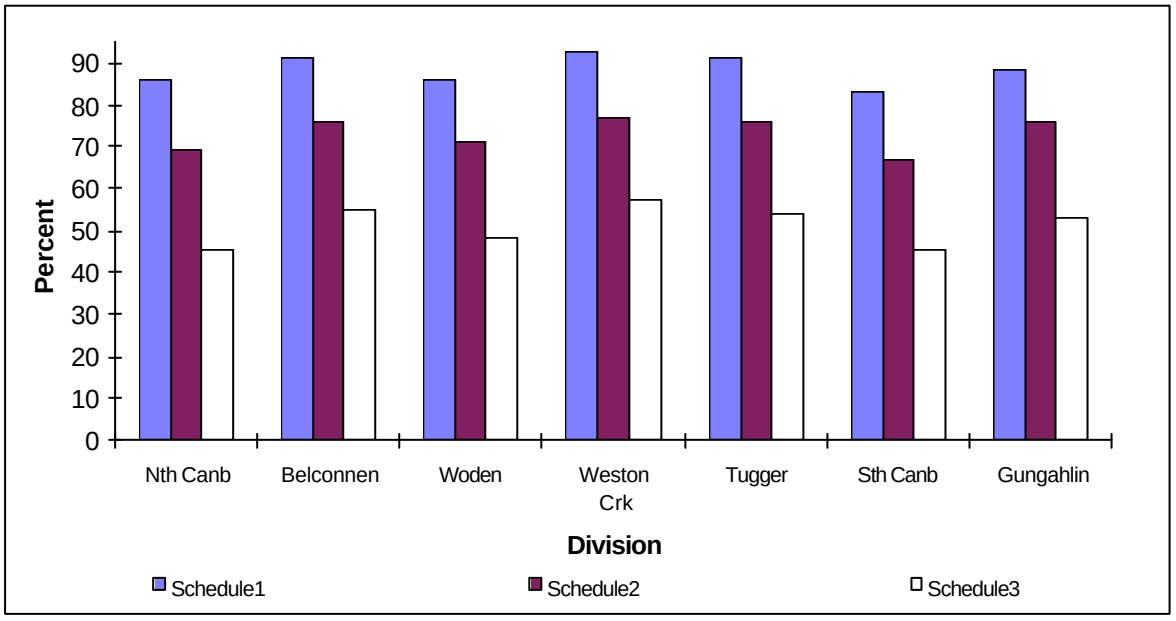
Source: ACT Communicable Disease Unit, February 1997

Figure 15: Percentage of children fully vaccinated, ACT 1996 birth cohort by NHMRC recommended schedules and statistical subdivision



Source: ACT Communicable Disease Unit, February 1997

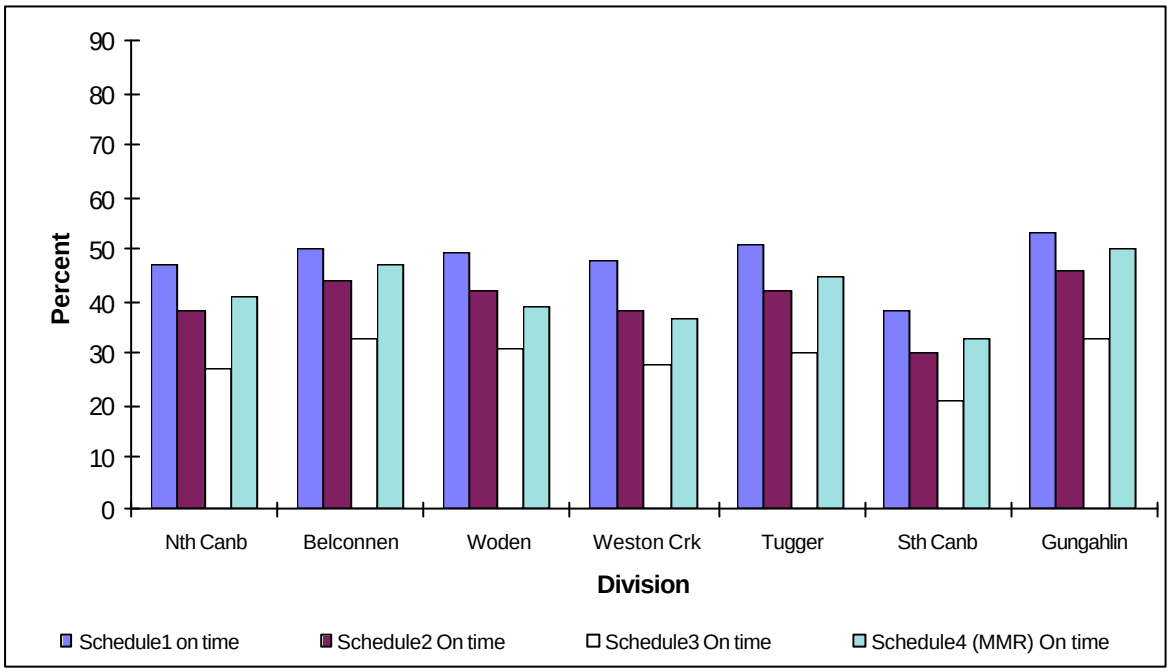
Figure 16: Percentage of children fully vaccinated, ACT 1997 birth cohort by NHMRC recommended schedules and statistical subdivision



Source: ACT Communicable Disease Unit, February 1997

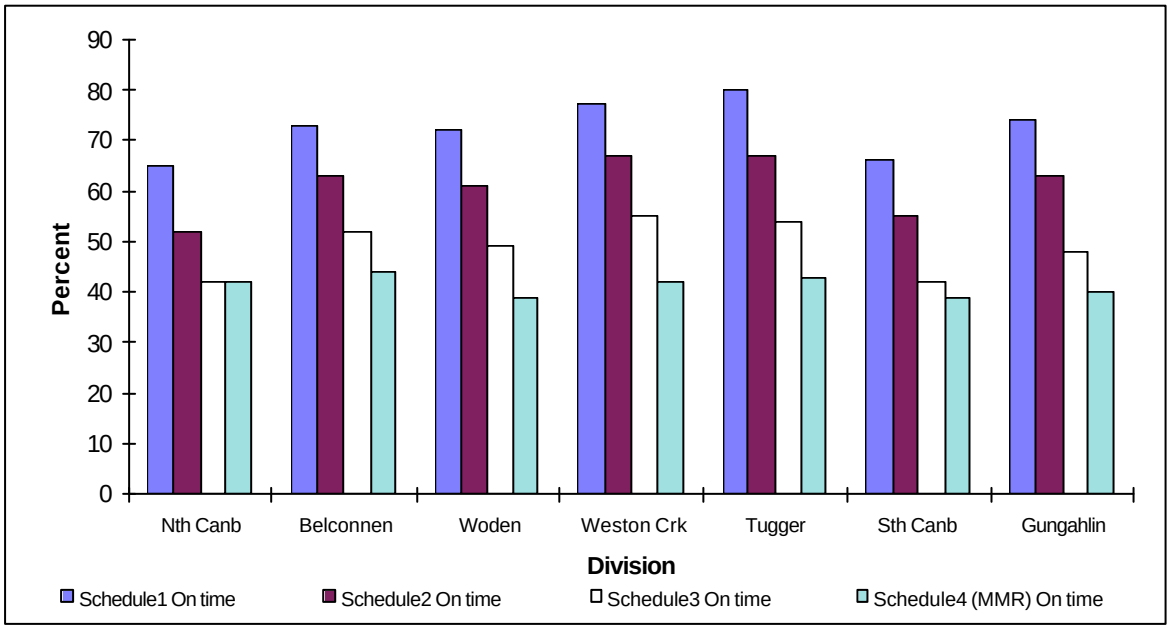
Figures 17 to 21 show the distribution of coverage rates of immunisation on time by NHMRC recommended schedules and by statistical subdivision of the 1993-1997 birth cohorts.

Figure 17: Percentage of children fully vaccinated on time, ACT 1993 birth cohort by NHMRC recommended schedules and statistical subdivision



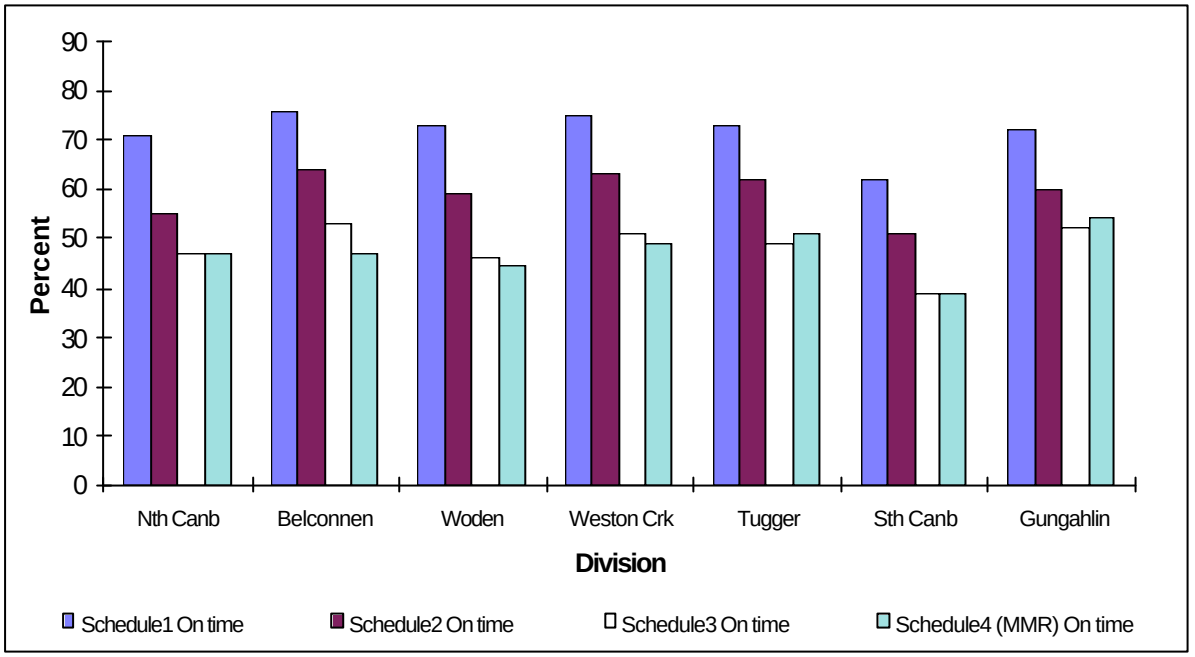
Source: ACT Communicable Disease Unit, February 1997

Figure 18 Percentage of children fully vaccinated on time, ACT 1994 birth cohort by NHMRC recommend schedules and statistical subdivision



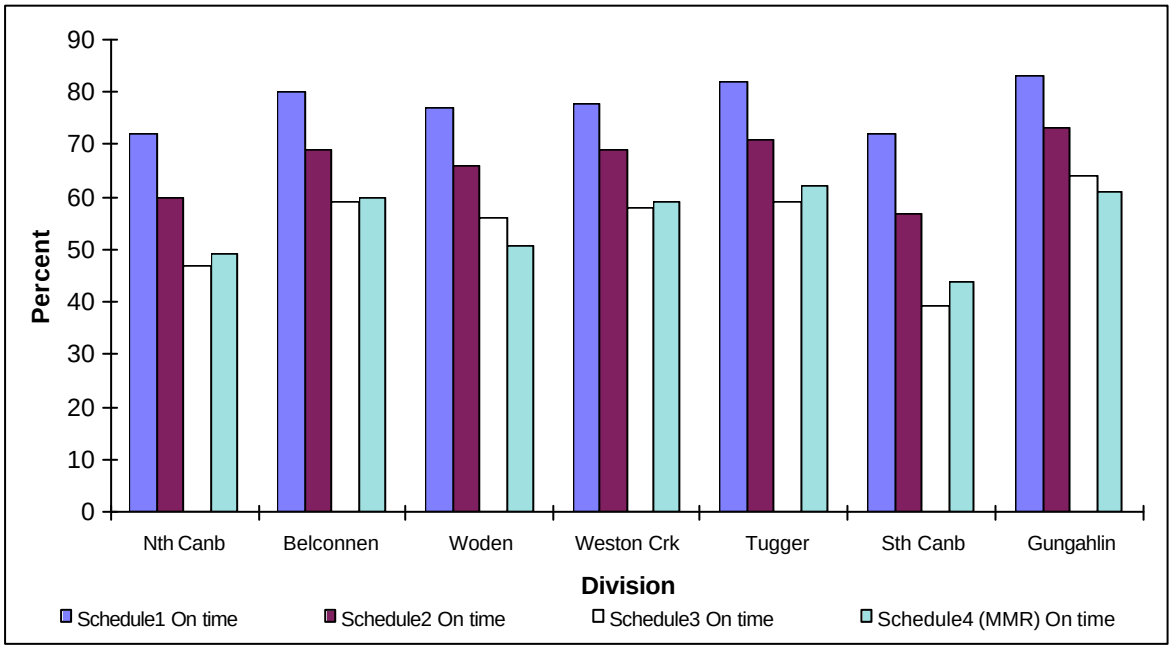
Source: ACT Communicable Disease Unit, February 1997

Figure 19: Percentage of children fully vaccinated on time, ACT 1995 birth cohort by NHMRC recommended schedules and statistical subdivision



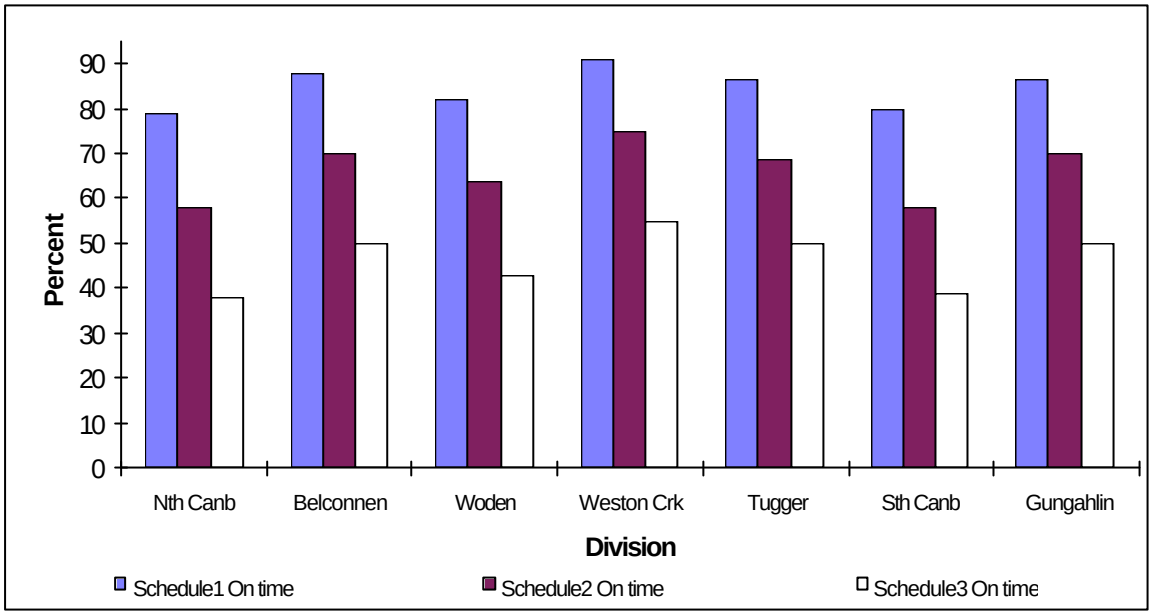
Source: ACT Communicable Disease Unit, February 1997

Figure 20: Percentage of children fully vaccinated on time, ACT 1996 birth cohort by NHMRC recommended schedules and statistical subdivision



Source: ACT Communicable Disease Unit, February 1997

Figure 21: Percentage of children fully vaccinated on time, ACT 1997 birth cohort by NHMRC recommended schedules and statistical subdivision



Source: ACT Communicable Disease Unit, February 1997

4.6 Immunisation Providers

Between 1 January 1996 and 31 May 1998; 145,779 valid vaccinations were provided in the ACT[60]. Of these, 55.79% were performed by Community Nurses, 42.41% by GPs, 1.22% by public hospitals, 0.11% by the Aboriginal Health Service and 0.47% by the Community Health Centres[61].

5. ACT AND NATIONAL INITIATIVES ON IMMUNISATION

The ACT and Commonwealth governments have recognised the value of immunisation as a public health measure. Both levels of government have set plans to increase immunisation levels and thereby decrease the harm caused by vaccine-preventable diseases.

The Commonwealth Government's seven point plan - 'Immunise Australia'[62], launched in 1997 is complemented by the ACT government's own 5 point plan launched late in 1997[63]. A brief outline of the plans follows.

5.1 Commonwealth 7 point plan (Immunise Australia)

The Immunise Australia report was released by Dr. Michael Woodridge, the Minister for Health and Human Services in 1997. The seven point plan aims to increase awareness of childhood immunisation and immunisation coverage rates by:

1. Incentives for Parents

To encourage parents to immunise their children, there has been a restructuring of the maternity allowance. An extra $68 will be provided on top of the current maternity allowance. Since January 1 1998, maternity allowance has been paid in two installments. The first at birth ($750) and then at 18 months ($200). There is a provision for parents who do not have their children immunised because of medical contraindications or because of conscientious objection.

A second incentive to parents is directed at those receiving the Child Care Assistance Rebate or the Child Care Cash Rebate. As of January 1, 1998 parents enrolling their children in child care will be required to provide proof of age-appropriate immunisation in order to receive these benefits. Again, there is a provision for parents who do not have their children immunised because of medical contraindications or because of contentious objection.

2. A bigger role for general practitioners

The Immunise Australia document reports that GPs see over 90% of children in the 0-6 age group seven times a year (on average). The role of the GP in immunisation is therefore recognised as an important one. Through the Australian Childhood Immunisation Register (ACIR) a GP can obtain the current immunisation status of children attending their practice. The information they receive from parents/guardians will also be able to be fed back to the ACIR to improve the accuracy of their records. The involvement of GPs is encouraged by the Better Practice Programme and the involvement of the Divisions of General Practice. The ACT Division of General Practice has appointed an immunisation spokesperson.

3. Monitoring and evaluation of Immunisation Targets

Coverage rates for immunisations will be published by the ACIR to show high and low levels of immunisation in geographical areas. It is hoped that this will encourage those areas with low rates to increase their immunisation coverage rates.

4. Immunisation days

The State, Territory and Federal Governments agreed to pilot 'Immunisation Days' during 1997. A National Day coordinator was appointed to coordinate the 3 Immunisation Awareness Days in the ACT. The days were a success with 260 children being immunised over the 3 days[64]. The results are higher if adult immunisations are included. Immunisations and promotional material were distributed at 5 sites (2 public, three private surgeries).

5. Measles eradication

A measles eradication program based on the experiences of a successful campaign run in 1995 in the UK, is being developed with input from the States and Territories. The ACT is participating fully in this process. It is anticipated that the program will start later this year.

6. Education and Research

The Federal Government has implemented a communication strategy which aims to "increase the level of full age appropriate childhood immunisation coverage by increasing understanding of the need for immunisation and creating a climate of acceptance and active support from both parents and service providers"[65].

It hopes to achieve this by:

- Increasing service providers' promotion of childhood immunisation.
- Educating providers on NHMRC guidelines and clarifing of the contraindications to vaccines. This would allow providers to more adequately answer parental concerns.
- Promoting immunisation through a multifaceted mass media campaign. In 1997 television commercials advertised the need for vaccination focusing on pertussis and measles. The community campaign also attempted to answer parental concerns about the side effects and risks of immunisation.

The Federal Government also investigated setting up a centre which would conduct epidemiological research and provide advice and assistance on immunisation. This resulted in the development of The Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases. The centre was opened mid 1997 and is located in the new Children's Hospital at Westmead in Sydney.

7. School Entry Requirements

The seventh point of the Immunise Australia plan relates to school entry requirements. It was suggested that parents be required to submit details of their child's immunisation history on entry to school.

This is already happening in the ACT, New South Wales and Victoria. The Federal government sees this as important as it will capture the last booster shot under the NHMRC guidelines. It will also act as a safety net, enabling the child who is not fully immunised to have 'catch up' shots.
At the last Schools Ministers' Conference and the last Health Ministers' Conference a proposal for school entry based legislation was supported nationally.

5.2 ACT 5 point plan (Simply Protecting Our Tots)

The ACT Immunisation Program's five point plan was launched by Chief Minister Kate Carnell in October 1997. It complements the Commonwealth strategy. Titled SPOT, the program goes under the slogan - 'Simply Protecting Our Tots'. The five initiatives, which extend the current ACT immunisation program, are as follows:

1. Mobile Immunisation Clinic

Commissioned in October 1997, the ACT's first mobile immunisation clinic is a purpose built mobile van. White with red spots, the mobile clinic aims to promote and provide 'on-the-spot' immunisations in public places. The bus is become known as SPOT - the acronym of the theme of the campaign.

2. Free vaccine delivery service to GP surgeries

Since February 1998, an ACT government funded program provides free vaccine delivery to GP surgeries. The existing stocks of vaccines are checked for their effectiveness. Information and advice is also given to GPs on the storage and maintenance of vaccines to help reduce wastage.

3. Access initiatives

A number of initiatives aimed at increasing the accessibility of immunisation services are being put in place. These include:

- Extended operating hours are being trialed for health care clinics. The aim is to find the most appropriate hours and locations for extended business hours.
- Community nurses are reaching pre-schoolers by offering immunisation services at all preschools.
- An immunisation nurse coordinator has been appointed within the Paediatrics and Maternity sections of The Canberra Hospital, Calvary Hospital and John James Hospital. This will increase the prevalence of opportunistic vaccinations.
- A GP spokesperson has been appointed by the ACT Division of General Practice.
- Collaboration is underway with a Commonwealth funded program about the proposed trialing of the provision of immunisation services by pharmacists.

4. Information, communication and awareness

The information and communication strategy supports all areas of the campaign and ensures that there is minimal duplication of the Commonwealth's efforts. The promotions for SPOT target GPs as family care practitioners. They also target families by using a television advertising campaign. During December 1997 and January 1998, 90,000 Canberra milk cartons promoting immunisation were released - just before the start of the school year.

5. Phone information/Inquiry line

A one-stop immunisation telephone number (02) 6205 2300 has been established and is attended during normal office hours.. Located in the Immunisation Records section of ACT Health and Community Care it provides secure information services to doctors, parents and guardians as well as promotional material.

APPENDICES

APPENDIX 1

Australian Standard Vaccination Schedule (November 1996)

Age	Disease	Vaccine	Milestone
2 months	Diphtheria, Tetanus, Pertussis Poliomyelitis Hib	DTPw* OPV-Sabin vaccine Hib vaccine (HbOC or PRP-OMP)**	
4 months	Diphtheria, Tetanus, Pertussis Poliomyelitis Hib	DTPw* OPV-Sabin vaccine Hib vaccine (HbOC or PRP-OMP)**	
6 months	Diphtheria, Tetanus, Pertussis Poliomyelitis Hib (HbOC schedule only)	DTPw* OPV-Sabin vaccine Hib vaccine (HbOC)	 first 6 months
12 months	Measles, Mumps, Rubella Hib (PRP-OMP schedule only)	MMR Hib Vaccine (PRP-OMP)	 Second 12 months
18 months	Diphtheria, Tetanus, Pertussis Hib (HbOC schedule only)	DTPa or DTPw Hib vaccine (HbOC)	 Third 18 months
Prior to school entry (4-5 yrs)	Diphtheria, Tetanus, Pertussis Poliomyelitis	DTPa or DTPw OPV-Sabin vaccine	
10-16 years	Measles, Mumps, Rubella Hepatitis B (1st dose)	MMR HBV	
1 month later	Hepatitis B (2nd dose)	HBV	
6 months after first dose	Hepatitis B (3rd dose)	HBV	
Prior to leaving school 15-19yrs	Diphtheria, Tetanus, Poliomyelitis	Td (ADT)*** OPV-Sabin vaccine	
Every 10 years	Diphtheria, Tetanus	Td (ADT)***	
Post-partum for non-immune women	Rubella	Rubella Vaccine or MMR	
Over 50 years (Aboriginal & Torres Strait Islander people)	Pneumococcal infections Influenza	Pneumococcal vaccine (every 5 yrs) Influenza vaccine (annual)	
Over 65 years	Pneumococcal infections Influenza	Pneumococcal vaccine (every 5 yrs) Influenza vaccine (annual)	

* DTP is the abbreviation for Diphtheria-Tetanus-Pertussis vaccine ** Abbreviations for Hib vaccines- HbOC is 'HibTITER'; PRP-OMP is 'PedvaxHIB'.HbOC (HibTITER) is given at 2,4,6 and 18 months. PRP-OMP (PedvaxHIB) is given at 2, 4 and 12 months. **PEDVAX is not used in the ACT.** *** Td is the combined Diphtheria-Tetanus vaccine. The DT formulation for children is often referred to by the trade name 'CDT'. The DT formulation for adults is often referred to by the trade name 'ADT'.

Hepatitis B schedule for adolescents - give the first dose at the same time as the MMR (10-16yrs), and the second dose about 1 month later, and the third dose 6 months after the first dose.

All of the vaccines in the standard schedule, except OPV, are given by intramuscular injection. MMR can also be given by deep subcutaneous injection. OPV is given orally. OPV must never be injected.

INTERIM HEPATITIS B SCHEDULE FOR INFANTS

The NHMRC has endorsed the use of hepatitis B vaccine (HBV) for all infants. HBV should be administered at birth, 1 month, and 6-12 months of age. Hepatitis B vaccine has not been included in the standard infant schedule because it is only available as an additional injection. Parents who express an interest in infant HBV should be encouraged to have their children vaccinated, as long as compliance with schedule vaccines is not jeopardised.

The NHMRC strongly recommends that HBV be offered to all infants born to HBsAg+ mothers and to all infants and young children from groups with a hepatitis B carrier rate of over 2%.

APPENDIX 2

Common side effects of immunisation and what to do about them.

DTP (diptheria-tetanus-pertussis vaccine triple antigen)	
Common reactions The following may occur soon after immunisation and may last up to 2 days • low grade fever • being grizzly, unsetlled and generally unhappy • soreness, swelling and redness in the area where the injection was given.	**What to do** • give extra fluids (e.g. more breast feeds or water) • do not over dress baby if hot • tepid sponge or tepid bath if hot • a cold, wet cloth on the sore spot at the injection site will help relive some discomfort • give paracetamol (dose for weight to lower temperature every 3-4 hours if needed-up to maximum 6 doses in 24 hours
MMR (measles-mumps-rubella-vaccine)	
Common reactions discomfort at the injection site may occur The following may occur 5-12 days after immunisation and may last less than 48 hours: low grade fever • faint rash (not infectious) • head cold and/or running nose • cough and/or puffy eyes • swelling of the facial glands may occur about 3 weeks after immunisation	**What to do** • give extra fluids (e.g. more breast feeds or water) • do not over dress baby if hot • tepid sponge or tepid bath if hot • a cold, wet cloth on the sore spot at the injection site will help relive some discomfort • give paracetamol (dose for weight to lower temperature every 3-4 hours if needed-up to maximum 6 doses in 24 hours
OPV (oral poliomyelitis vaccine)	
Possible reactions • very rarely any reaction	**What to do** • no treatment is usually needed

Hib (*haemophilus influenzae* type b) vaccine	
Possible reactions The following reaction are uncommon and if they occur, it is soon after the immunisation: • low grade fever • soreness, swelling and redness in the area where the injection was given.	**What to do** • give extra fluids (e.g. more breast feeds or water) • do not over dress baby if hot • tepid sponge or tepid bath if hot • a cold, wet cloth on the sore spot at the injection site will help relive some discomfort • give paracetamol (dose for weight to lower temperature every 3-4 hours if needed-up to maximum 6 doses in 24 hours
Hepatitis B vaccine	
Possible reactions The following reactions are uncommon and if they occur, it is soon after the immunisation: • low grade fever • soreness, swelling and redness in the area where the injection was given. • nausea, felling unwell, and joint pain	**What to do** • give extra fluids (e.g. more breast feeds or water) • do not over dress baby if hot • tepid sponge or tepid bath if hot • a cold, wet cloth on the sore spot at the injection site will help relive some discomfort • give paracetamol (dose for weight to lower temperature every 3-4 hours if needed-up to maximum 6 doses in 24 hours

APPENDIX 3

*Infectious and Notifiable Diseases under ACT Public Health Regulations**

Infectious diseases
Botulism
Campylobacteriosis
Clamydial disease (not elsewhere classifed)
Cholera
Cryptosporidiosis
Diphtheria
Haemophilus influenzae type b infection
Hepatitis A
Hepatitis B
Hepatitis C
Hepatitis (viral, not elsewhere classifed)
Legionellosis
Leprosy
Measles
Meningococcal infection
Mumps
Pertussis
Plague
Poliomyelitis
Rabies
Rubella
Salmonellosis (not elsewhere classifed)
Shingellosis
Tuberculosis
Typhoid and paratyphoid
Viral haemorrhagic fever
Yersiniosis

Notifiable Diseases
Anthrax
Arbovirus infection (not elsewhere classifed)
Brucellosis
Dengue
HIV (Category 1, 2 or 3)
HIV (Category 4 - Aquired Immune Deficency Syndrome)
Hydatid infection
Leptospirosis
Listeriosis
Malaria
Psittacosis and other froms of Ornithosis
Q fever
Ross River virus Infection
Tetanus
Yellow Fever

* Does not include diseases reportable under the sexually transmittted diseases Act (1956).

APPENDIX 4

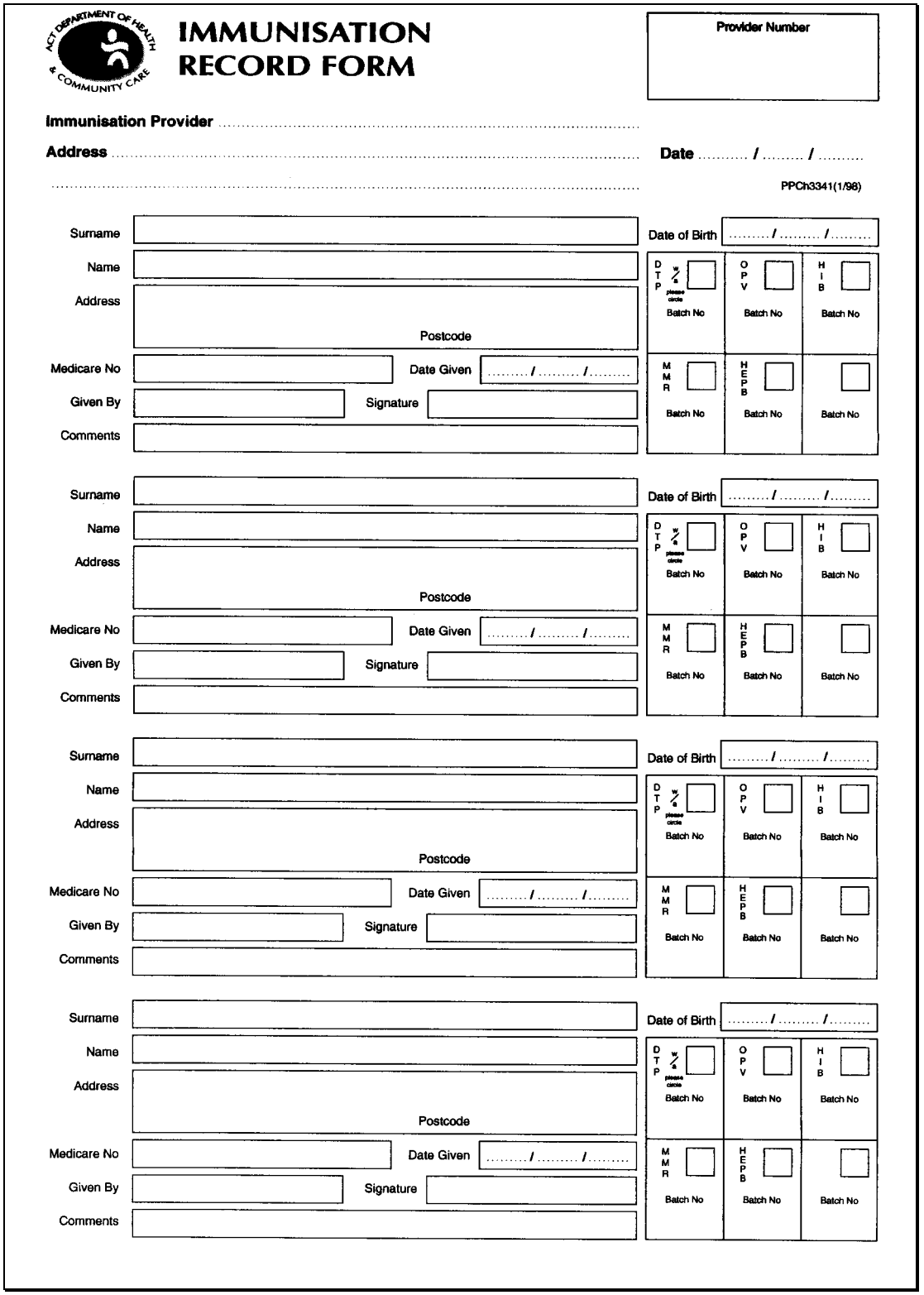
International Classification of Diseases 9 (ICD9) Codes

The following codes are those that were used to extract hospitalisations due to vaccine preventable diseases.

ICD-9 code	Condition
033.0, 033.9	*Bordetella pertussis*, Whooping cough - unspecified organism
032.0-032.9	Diphtheria
320.00	*Haemomphilus infuenzae* type b meningitis
070.3	Hepatitis B (viral)
055.0-55.9	Measles
072.0-072.9	Mumps
045.0-045.9	Poliomyelitis (acute)
056.0-056.9	Rubella
037.0	Tetanus

APPENDIX 5

ACT Immunisation Record (front page)



ACT DEPARTMENT OF HEALTH & COMMUNITY CARE

IMMUNISATION RECORD FORM

Provider Number

Immunisation Provider .....

Address .....

.....

Date ...../...../.....

PPCh3341(1/98)

Surname
Name
Address
Postcode
Medicare No
Date Given ...../...../.....
Given By
Signature
Comments
Date of Birth ...../...../.....

DTP w/a please circle Batch No
OPV Batch No
HIB Batch No
MMR Batch No
HEPB Batch No
Batch No

Surname
Name
Address
Postcode
Medicare No
Date Given ...../...../.....
Given By
Signature
Comments
Date of Birth ...../...../.....

DTP w/a please circle Batch No
OPV Batch No
HIB Batch No
MMR Batch No
HEPB Batch No
Batch No

Surname
Name
Address
Postcode
Medicare No
Date Given ...../...../.....
Given By
Signature
Comments
Date of Birth ...../...../.....

DTP w/a please circle Batch No
OPV Batch No
HIB Batch No
MMR Batch No
HEPB Batch No
Batch No

Surname
Name
Address
Postcode
Medicare No
Date Given ...../...../.....
Given By
Signature
Comments
Date of Birth ...../...../.....

DTP w/a please circle Batch No
OPV Batch No
HIB Batch No
MMR Batch No
HEPB Batch No
Batch No

APPENDIX 6

What to do if your child does not have an immunisation record

Situation	***What you should do***
Child immunised at ACT Department Of Health Immunisation Clinics	Write to immunisation records, ACT Department of Health, GPO Box 825 Canberra 2601 with details of the child's name and date of birth and a record will be sent to you. (Include your address and telephone number).
Child immunised by your doctor	Ask your doctor to complete an Immunisation Record form for your child.
Child immunised by several doctors and ACT Department of Health Immunisation Clinics	Contact each doctor and ACT Department of Health and get written documentation. When you have all the documents take them to one doctor, a registered nurse or Immunisation Clinic so an Immunisation Record can be completed.
If your child is not completely immunised and you would like to complete the immunisations.	Discuss with your doctor or clinic about completing immunisation. An Immunisation Record showing the immunisations your child has had can then be issued.
Child immunised overseas or interstate and records are not available or doctor has moved and cannot be contacted.	If your child is entering primary school you can sign a statutory declaration stating the immunisations your child has received and the ages they were given.
If you are unsure if your child has had all the recommended immunisations.	Ask your doctor or Immunisation Clinic for advice about immunisation or re-immunisation, or submit a letter to the school stating that you don't know if your child has been immunised.
Child cannot be immunised for medical reasons.	Submit a letter from your doctor to the school stating that your child has not been immunised for medical reasons.
You object to having your child immunised.	Submit a letter to the school stating you don't want your child immunised.
Any other situation.	Discuss your situation with the Immunisation Coordinator, ACT Department of Health and Community Care on 62050860.

APPENDIX 7

Exclusion Periods from School for Children with Infectious Diseases

Disease	Exclusion of cases	Exclusion of contacts
Chicken Pox (Varicella and Herpes Zooster)	Exclued until recovered or for at least 5 days after eruption first appears. (The child should not continue to be excluded by reason only of some remaining scabs).	Any child with an immune deficency (for example, leukaemia or recievng chemotherapy) should be excluded for their own protection. Otherwise, not excluded.
Conjunctivitis (acute infectious)	Exclude until discharge from from eyes ceases.	Not excluded.
Diarrhoes (Rotavirus, *Shigella, Giardia, *Salmonella, *Campylbacter	Exclude until Diarrhoea ceases.	Not excluded.
#* Diphtheria	Exclude until- (a) at least 2 negative throat swabs have been taken, the first not less tha 24 hrs after cessation of antibiotic treatment and the second not less than 48 hrs later) and (b) a certificate is furnished from a medical practitioner stating the person is no longer infectious.	Exclude family and household contacts until approval to return has been given by the Medical Officer of Health.
*Hepatitis A	Exclude for at least 7 days after the onset of jaundice and a certificate is furnished by a medical practitioner stating that the person is no longer infectious.	Not excluded.
Impetigo (School sores)	Exclude until appropriate treatment has commenced and sores on exposed surface are covered with a dressing.	Not excluded.
*Leprosy	Exclude until approval to return has been given by the Medical Officer of Health.	Not excluded.
#*Measles	Exclude for at least 4 days after the appearance of the rash.	Immunised contacts not excluded. Non-immunised contacts should be excluded until 14 days after the appearance of rash in last case. If non-immunised contacts are vaccinated within 72 hours of their first contact with the index case, they may return to school.
#*Meningitis (Bacterial)	Exclude until well.	Not excluded.
*Meningococcal Infection	Exclude until well	Not excluded.
#*Mumps	Exclude for at least 9 days after onset of symptoms.	Not excluded.
#*Poliomyelitis	Exclude for at least 14 days after onset and until a certificate is furnished by a medical practitioner stating that the person is no longer infectious.	Not excluded.
Ringworm, Scabies, Pediculosis (Lice), Trachoma	Exclude until the day after tratment has commenced.	Not excluded.
#*Rubella (German Measles)	Exclude until recovered or for at least 4 days after the appearance of the rash.	Not excluded. (Female staff of childbearing age should ensure that their immune status against rubella is adequate).
Streptococcal Infection (inc. Scarlet Fever)	Exclude until the person has recieved antibiotic treatment for at least 24 hours and has recovered from the illness.	Not excluded.
*Tuberculosis	Exclude until approval to return has been given by the Medical Officer of Health.	Not excluded.
*Typhoid and Paratyphoid Fever	Exclude until a certificate is furnished by a medical practitioner stating that the person is no longer infectious.	Not excluded.
#*Whooping Cough (Pertusis)	Exclude for at least 5 days after starting antibiotic treatment.	Exclude non-immunised household contacts, who have not attained 7 years of age, for 14 days after the last exposure to infection or until 5 days of a 14-day course of antibiotics has been administered to contacts.

A parent or guardian of a child with a disease listed in the table or a child who has been in contact with an infectious disease which stipulates the exclusion for contacts is required to notify the school principal as soon as possible.# These diseases must be notified by the school principal to the Medical Officer of Health. *These diseases must be notified by medical practitioners to the medical officer of health.

APPENDIX 8

Comparison of methodology with that used by the ACIR

The methodology used in this document and that used by the Australian Childhood Immunisation Register (ACIR) in the calculation of coverage rates are dissimilar.

Population Base

The current report uses as its population base those children entered on the ACT Department of Health and Community Care Immunisation Database. The ACIR uses the Medicare population as its population base. Information sent in by immunisation providers for children not registered with Medicare is also added to the ACIR database.

Methodological issues

This study uses a birth cohort of ACT children born between 1993 and 1997.

The methodology has not accounted for migration of children in and out of the ACT. Within the birth cohort, children may leave the ACT prior to receiving a scheduled vaccination, and therefore information on their immunisation status since departure is not recorded. Thus, these children are recorded as births, but their immunisation status is incomplete, which under-estimates immunisation rates. Also, children born outside the ACT may join a birth cohort when they migrated to the ACT. For these children there is a systematic measurement bias because complete immunisation histories are not recorded in the immunisation database for all children. Again, the bias causes under-estimation of immunisation rates.

Censoring for age was carried out to adjust for the period of data collection.

The ACIR takes a 3 month cohort of children, who are greater than or equal to 12 but less than 15 months of age. A child is considered vaccinated for:

- DTP if completed DTP3 or DTPa3 or CDT3 + P3
- OPV if completed OPV3 or IPV3
- HIB if completed HbOC3 or PRP-OMP2 .

A fully vaccinated child has received DTP + OPV + HIB. All previous vaccinations are assumed.

APPENDIX 9

Suburbs by Statistical Subdivision

North Canberra
Acton
Ainslie
Braddon
Campbell
City (Canberra)
Downer
Duntroon
Hackett
Kowen
Lyneham
Majura
O'Connor
Reid
Russell
Turner
Watson

Woden Valley
Chifley
Curtin
Farrer
Garran
Hughes
Isaacs
Lyons
Mawson
O'Malley
Pearce
Phillip
Torrens

Tuggeranong
Banks
Bonython
Calwell
Chisholm
Conder
Fadden
Gilmore
Gordon
Gowrie
Greenway
Issabella Plains
Kambah
Macarthur
Monash
Oxley
Richardson
Theodore
Waniassa

Gungahlin-Hall
Amaroo
Hall
Mitchell
Ngunnawal
Nicholls
Palmerston

Belconnen
Aranda
Belconned Town Centre
Bruce
Charnwood
Cook
Dunlop
Evatt
Florey
Flynn
Fraser
Giralang
Hawker
Higgins
Holt
Kaleen
Latham
Macgregor
Macquarie
McKellar
Melba
Page
Scullin
Spence
Weetangera

Weston Creek-Stromlo
Chapman
Duffy
Fisher
Holder
Rivett
Stirling
Stromlo
Waramanga
Weston

South Canberra
Barton
Deakin
Forrest
Fyshwick
Griffith
Harman
Hume
Jerrabomberra
Kingston
Narrabundah
Oaks Estate
Parkes
Pialligo
Red Hill
Symonston
Yarralumla

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Health Series Publications

The Epidemiology Unit of the Department of Health and Community Care has developed an on-going health series of publications to inform health professionals, policy developers and the community on health status in the Territory. Information contained therein will assist in the development of appropriate policy and service delivery models, the evaluation of programs, and an understanding of how the ACT compares with Australia as a whole with regard health status.

Number 1: *ACT's Health: A report on the health status of ACT residents*
Carol Gilbert, Ursula White, October 1995

Number 2: *The Epidemiology of Injury in the ACT*
Carol Gilbert, Chris Gordon, February 1996

Number 3: *Cancer in the Australian Capital Territory 1983-1992*
Norma Briscoe, April 1996

Number 4: *The Epidemiology of Asthma in the ACT*
Carol Gilbert, April 1996

Number 5: *The Epidemiology of Diabetes Mellitus in the ACT*
Carol Gilbert, Chris Gordon, July 1996

Number 6: *Developing a Strategic Plan for Cancer Services in the ACT*
Kate Burns, June 1996

Number 7: *The First Year of The Care Continuum and Health Outcomes Project*
Bruce Shadbolt, June 1996

Number 8: *The Epidemiology of Cardiovascular Disease in the ACT*
Carol Gilbert, Ursula White, January 1997

Number 9: *Health Related Quality of Life in the ACT: 1994-95*
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Number 10: *Disability and Ageing in the ACT: An Epidemiological Review*
Carol Gilbert, April 1997

Number 11: *Mental Health in the ACT*
Ursula White, Carol Gilbert, May 1997

Number 12: *Aboriginal and Torres Strait Islander Health in the ACT*
Norma Briscoe, Josie McConnell, Michelle Petersen, July 1997

Number 13: *Health Indicators in the ACT: Measures of health status and health services in the ACT*
Carol Kee (Gilbert), George Johansen, Ursula White, Josie McConnell
January 1998

Number 14 *Health status of the ACT by statistical sub-divisions*
Carol Kee, George Bodilson (Johansen), April 1998

Number 15: *Results from the 1996 ACT Secondary School Students' Survey*
Hai Phung, George Bodilsen, Allison Webb, Norma Briscoe
June 1998

Number 16 *Childhood immunisation and preventable diseases in the ACT 1993-1997*
Hai Phung, Michelle Petersen, June 1998