HAEMOPHILUS INFLUENZAE TYPE B VACCINATION COVERAGE IN THE AUSTRALIAN CAPITAL TERRITORY FOR CHILDREN AGED NINE MONTHS AND TWO YEARS

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Abstract

Haemophilus influenzae type b (Hib) infection is an important cause of morbidity and mortality, particularly in children under five years of age. Immunisation can significantly reduce the impact of the disease. In order to allow for adequate public health planning, it is necessary to know the rate of immunisation in the population at risk. The Australian Capital Territory maintains a database which records the majority of vaccination events occurring in the Territory. Examination of these data allows accurate estimation of children's immunisation status. Using criteria based on the National Health and Medical Research Council's *Australian Immunisation Procedures Handbook*, 68% of nine month old children and 34% of two year old children were considered to be fully immunised at 31 March 1995. The Australian Childhood Immunisation Register should allow similar accurate estimation of immunisation rates in the future.

Introduction

Prior to the widespread availability of vaccines, Hib was a major cause of morbidity and mortality in children under five years of age[1]. In 1993 the National Health and Medical Research Council (NHMRC) published recommendations concerning the use of Hib vaccines in Australian children. The number of reports and notification rates for Hib in Australia and in the Australian Capital Territory have fallen markedly in the last four years (Table 1)[2]. This fall can also be seen in the 0-4 years age group (table 2) (National Notifiable Diseases Surveillance System, Communicable Diseases Network Australia-New Zealand, personal communication, 1996).

This article presents an estimate of Hib vaccine uptake in the Australian Capital Territory between 1 April 1994 and 31 March 1995, based on the Australian Capital Territory's central vaccination register.

Methods

The Australian Capital Territory uses a system of 'vaccines for data' whereby general practitioners are provided with free vaccines in exchange for their provision of vaccination data to the Immunisation Section of the Australian Capital Territory Department of Health and Community Care (ACT Health). Ninety-seven per cent of Australian Capital Territory general practices are supplied with their vaccines through this scheme. The private sector administers 30% of all childhood vaccines in the Australian Capital Territory and community nursing staff in Australian Capital Territory government health centres administer the remaining 70%.

All vaccine data from both these sources are sent to ACT Health and recorded in the central vaccination database. The Australian Capital Territory immunisation data for Hib vaccine administration were imported from the central register into a relational database for processing.

Definitions

Age

All vaccination data to 31 March 1995 have been entered into the database. This study uses these data to provide an estimate of vaccination status of the children born between 1 July 1993 and 30 June 1994. These children had therefore attained the age of nine months in the year to 31 March 1995. The study also provided data on children who were born between 1 April 1992

Table 1. Number and rates of *Haemophilus influenzae* type b infection for all age groups, in Australia and the Australian Capital Territory by year, 1991-1995

	Number of notifications (rate per 100,000) by year				
Area	1991	1992	1993	1994	1995
Australia	549 (3.5)	501 (3.0)	396 (2.2)	169 (1.0)	78 (0.43)*
ACT	10 (3.5)	10 (3.4)	9 (3.0)	1 (0.3)	1 (0.3)

* preliminary figure

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Table 2. Number and rates of *Haemophilus influenzae* type b infection in children aged 0-4 years, in Australia and the Australian Capital Territory, 1991-1995

Number of notifications (rate per 100,000) by year, children aged 0-4 years					
Area	1991	**1992**	**1993**	**1994**	**1995**
Australia	420 (33.0)	431 (33.7)	320 (24.9)	103 (7.99)	52 (4.0)*
ACT	10 (44)	8 (35)	7 (31)	1 (4)	1 (4)

* preliminary figure

and 31 March 1993 and who had reached two years of age in the year to 31 March 1995.

Immunisation status

Children whose receipt of vaccine is recorded on the database may be fully or partially immunised. In the context of this paper, fully immunised means immunised according to the current NHMRC schedule and does not make any statement about serological status. 'Age appropriate' may be a better description than 'fully immunised'. *The Australian Immunisation Procedures Handbook* describes various vaccination schedules depending on the type of vaccine used and the age of the child[3]. Depending on the age at first vaccination, a nine month old child must have had one, two or three doses of vaccine to be considered age-appropriately immunised. A child who reached nine months of age in the early part of the year of interest (April to June 1994) would have reached 18 months of age by the end of the year and would therefore have been due for the booster vaccination. Children in the two year age group may require up to four doses for full immunisation. In addition, we applied the criteria that the child must have been aged at least 45 days (1.5 months) at the time of receiving the first dose and that there should be no less than 30 days between doses.

Children who are outside the defined age ranges are excluded. Children whose dose schedule falls outside the criteria for fully immunised, through too few doses or incorrectly timed doses, are counted as partially immunised. Any child who is included on the database has had at least one Hib vaccination and is therefore at least 'partially' immunised.

To estimate proportions of immunisation, denominator data were obtained from the estimates of the number of births in each year and the population in each age group, as published by the Australian Bureau of Statistics for the year ended 30 June 1993[4].

Results

The database includes 36,238 records, representing vaccinations given to 18,352 children. Excluded from the analysis were records which appear to have erroneous information (n=2), children whose postcode of residence is outside the Australian Capital Territory (n=482) and children outside the age ranges of interest (n=9,827).

Using the criteria outlined above, 3,170 children in the nine-months age group were considered to be fully immunised and 1,449 children were partially immunised. In the group turning two during the period of interest, 1,751 were considered to be fully immunised and 1,671 were partially immunised. Of those described as partially immunised in each age group, more than 96% were classified thus because of too few vaccinations rather than having vaccinations which were too closely spaced or given at too early an age.

The estimated number of children who turned nine months old in the period of this study is 4,485. The number of two year old children is estimated at 4,690 (at 30 June 1993). An estimate of the number of migrations into and out of the Australian Capital Territory by children in the age groups of interest was obtained from the Australian Bureau of Statistics (T. Power, personal communication, 1995). The migrating children may have received vaccination and are therefore included in the denominators. We were thus able to calculate numbers and proportions for fully and partially immunised children (Table 3).

Discussion

The figures presented here represent a minimum estimate of the number of children in the nine months and two years age groups immunised against Hib in the Australian Capital Territory during the 12 months to 31 March 1995. It represents an underestimate of the number of children immunised for several reasons. A small

Table 3. Estimates of *Haemophilus influenzae* type b immunisation coverage by age at 31 March 1995, Australian Capital Territory

Age group	Number of children in population	Fully immunised Number (proportion)	Partially immunised Number (proportion)
9 months old	4660	3170 (68%)	1449 (31.1%)
2 years old	5130	1751 (34.1%)	1671 (32.6%)

number of general practitioners do not take part in the 'vaccines for data' scheme; the database does not contain records for children receiving vaccination from these practitioners. In addition, children who migrated into or out of the Australian Capital Territory during the period of interest may have been immunised in another area and their vaccination history would not be fully represented on the database.

Earlier estimates of coverage for vaccination against Hib have been published for several regions in Australia. A telephone survey in the Australian Capital Territory in 1993 estimated that 17% of children under five years of age had been vaccinated against Hib[5]. In February 1995, C*ommunicable Diseases Intelligence* carried articles that gave estimates of the vaccine coverage in the Northern Territory and South Australia[6, 7]. These estimates were based on a sample survey of parents and, for South Australia, audits of vaccines given at two months of age. The Northern Territory estimated 73% coverage for children aged eight months to two years. South Australia reported first-dose coverage in infants aged up to two months of age as 75%.

A survey carried out in Sydney estimated the proportion of children vaccinated in August 1993 at 48% for those under 18 months and 45% for children aged 19-60 months[8]. Statistical techniques were used to show that the decrease in the incidence of Hib seen then was an effect of vaccination. In Australia generally, and the Australian Capital Territory in particular, the notification rate for Hib disease continues to fall as vaccination coverage improves.

In April 1995, the Australian Bureau of Statistics carried out a survey throughout Australia to obtain information on children's immunisation[9]. The Australian Bureau of Statistics survey found that 68.9% of Australian Capital Territory children were fully immunised against Hib at one year old. This compares well with this study's estimate that 68.0% of nine month old children are fully immunised. The Australian Bureau of Statistics survey estimated the proportion of fully immunised children at two years of age to be 55.6%, whereas this study estimates that 34.1% of two year old children are fully immunised.

There may be several reasons to explain this difference. This study uses a conservative estimate for the population, which includes an allowance for migration (thus inflating the denominator) but does not have data relating to vaccines given outside the Australian Capital Territory to migrating children (data missing from the numerator). The Australian Bureau of Statistics survey included such external vaccination data by reference to the parents' memory or vaccination record card. There may be some overestimate of the completeness of vaccination by parents who are relying on memory. When asked what vaccinations the child had completed, a common response was 'all of them' (B. Richings, Australian Bureau of Statistics, personal communication, 1996). Lastly, the Australian Bureau of Statistics used a small sample (approximately 40 children) for the Australian Capital Territory survey which has a relatively large associated standard error.

The method described here to calculate Hib immunisation rates uses data which represent a virtual census of vaccines given in the Australian Capital Territory. The system of providing a reward to general practitioners in exchange for notification is an efficient method of compiling high quality surveillance data. A similar system has now been implemented on an Australia-wide basis as the Australian Childhood Immunisation Register, administered by the Health Insurance Commission.

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