What do we know about 7vPCV coverage in Aboriginal and Torres Strait Islander children?

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Abstract

In 2001, a publicly funded pneumococcal conjugate vaccine (7vPCV) program commenced for Aboriginal and Torres Strait Islander children aged under two years. At present, there is very little knowledge about the uptake of 7vPCV vaccine amongst Aboriginal and Torres Strait Islander children. This study examined the rollout and use of 7vPCV vaccine in Australia and estimated immunisation coverage for Indigenous children at the age of 12 months for 7vPCV vaccine. To calculate 7vPCV coverage we chose four consecutive 3-month birth cohorts born between 1 October 2001 and 30 September 2002. The immunisation status of children in each birth cohort was assessed at 12 months for the third dose of 7vPCV vaccine. The largest absolute number of 7vPCV doses was given in Queensland, the Northern Territory and New South Wales. As the 7vPCV program matured, a progressively higher proportion of total doses was administered to children under the age of 12 months consistent with the introduction of the program. For all jurisdictions except the Northern Territory and Western Australia, where it has remained reasonably constant, estimated coverage increased over the most recent birth cohorts but was still less than 50 per cent for all states except the Northern Territory, Queensland, and Western Australia. This study provides the first national measure of 7vPCV immunisation coverage among Indigenous children in Australia. With the likely improvement over time in the recording of 7vPCV vaccinations and Indigenous status on the Australian Childhood Immunisation Register, the validity of coverage estimates is likely to increase. *Commun Dis Intell* 2004;28:238–243.

Keywords: pneumococcal, vaccine, vaccination, indigenous children, Aboriginal, Torres Strait Islander

Introduction

Invasive pneumococcal disease became largely preventable in Australian children aged less than two years, for the first time, with the approval in December 2000, of the use of a pneumococcal conjugate vaccine to protect against the seven most common serotypes. Indigenous children in Central Australia have the highest documented incidence of invasive pneumococcal disease in the world, with high rates also seen in Indigenous children in other parts of northern Australia.[1,2,3] In 2001, a publicly funded pneumococcal conjugate vaccine (7vPCV) program commenced for children at high risk (Indigenous children under two years, Indigenous children in Central Australia aged up to five years, non-Indigenous children living in Central Australia aged up to two years, and all children with predisposing medical conditions aged under five years). The 7vPCV vaccine was first used in the Northern Territory, from June 2001, with a progressive rollout in other jurisdictions. At present, there are few data on the uptake of 7vPCV vaccine amongst Aboriginal and Torres Strait Islander children, especially in regions outside the Northern Territory.

Since May 2001, 7vPCV vaccination encounters have been recorded on the Australian Childhood Immunisation Register (ACIR). From the immunisation data finally entered onto the ACIR, the Health Insurance Commission (HIC) provides regular quarterly coverage reports at the national and state and

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territory level, calculated using the cohort method.[4] A cohort of children is defined by date of birth in three-month groups, assessed at the three key ages of 12 months, 24 months, and six years of age.

Initially, the field for recording Aboriginal and Torres Strait Islander status on the ACIR was incomplete and not used for official reports. However, since mid-2001, as completeness has improved, calculation of immunisation coverage estimates for Indigenous children using the ACIR has been made available to state and territory health departments.

The aims of the study were to:

1. Describe the rollout and use of 7vPCV vaccine in Australia since May 2001 by state, remoteness index, date of administration, and number of doses.

2. Calculate the number of children in a 12-month birth cohort assessed as Aboriginal or Torres Strait Islander on the ACIR, by state, and to compare these figures with the Australian Bureau of Statistics (ABS) estimates of the numbers of Aboriginal and Torres Strait Islander children by state.

3. Estimate immunisation coverage for four cohorts of Aboriginal and Torres Strait Islander children at the age of 12 months for 7vPCV vaccine and compare it with 'fully immunised' coverage at 12 months of age.

Methods

Immunisation status assessment

The National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases receives downloads of ACIR immunisation data from the HIC each quarter. This analysis was undertaken using ACIR data as at 31 December 2003. As pneumococcal conjugate vaccines were first recorded on the ACIR from May 2001, we analysed all vaccine encounters from this date onwards. We chose four 3-month birth cohorts, the first born between 1 October 2001 and 31 December 2001, the second born on 1 January 2002 to 31 March 2002, the third born on 1 April 2002 to 30 June 2002, and the fourth born on 1 July 2002 to 30 September 2002. The immunisation status of children, identified on the ACIR as Aboriginal and Torres Strait Islander, in the four birth cohorts was assessed at 12 months of age for pneumococcal conjugate vaccine. The third dose assumption was applied in this analysis.[5] The analysis was undertaken using the SAS software system.[6]

Aboriginal and Torres Strait Islander population denominators

In addition to ACIR Indigenous denominator data, data on the number of Aboriginal and Torres Strait Islander births in all Australian states and territories for the year 2002 was also obtained from the Australian Bureau of Statistics.[7] There are four estimates of the number of Aboriginal and Torres Strait Islander births in Australia calculated each year by the ABS. Each is based on a different collection, with a different propensity to identify Aboriginal or Torres Strait Islander status.[7,8] In this study, we used the expected Aboriginal and Torres Strait Islander births from 1996 Census-based experimental estimates and projections. These use the number of Aboriginal and Torres Strait Islander children in the 1996 Census to estimate fertility rates for 1996. Assuming this fertility rate to continue, and making other assumptions about mortality and interstate migration, the number of births in subsequent years was projected.

Accessibility/remoteness status

Based on the residential address postcode recorded on the ACIR, the residential status of children was defined as accessible or remote using the Accessibility/Remoteness Index of Australia (ARIA) developed by the then Department of Health and Aged Care.[9] There are five ARIA categories:

highly accessible – relatively unrestricted accessibility to a wide range of goods and services;

accessible – some restrictions to accessibility of some goods and services;

moderately accessible – significantly restricted accessibility of goods and services;

remote – very restricted accessibility of goods and services; and

very remote – very little accessibility of goods and services.

The ABS views the ARIA methodology as a suitable means to determine the remoteness of any part of Australia. The ARIA is being used for a variety of policy, administrative and statistical purposes and is used by a number of government agencies as a definition of remoteness. It is becoming a 'de-facto standard' on remoteness and was proposed as the national standard measure of remoteness for inclusion in the ABS 2001 census.[10]

Sensitivity analysis

A sensitivity analysis of the 7vPCV coverage estimates was also undertaken to assess the effects on coverage of using ABS population estimates as the denominator and using all doses of 7vPCV given to children on the ACIR as the numerator, with the assumption that only Indigenous children receive 7vPCV vaccine.

Results

The total number of 7vPCV doses recorded in Australia since mid-2001 are shown in Table 1. The largest absolute number of doses was given in Queensland, the Northern Territory, New South Wales and Western Australia. Three of these jurisdictions have the largest rural and remote Aboriginal and Torres Strait Islander populations and had the largest proportion of doses given to children residing in remote areas (Table 1). More than 80 per cent of 7vPCV doses were given to children residing in remote or very remote areas in the Northern Territory, although only 53 per cent of the total 0–4 year ACIR child population in the Northern Territory resides in these areas (not shown). Indeed, all jurisdictions where there is a substantial population residing in remote or very remote areas had a disproportionate amount of 7vPCV administered to children residing in these areas, in keeping with it being given predominantly to Indigenous children (Table 1).

An indication of the rollout of 7vPCV vaccination in each jurisdiction of Australia from May 2001 to December 2003 is provided in Table 2. For Australia as a whole there has been a steady increase in the number of 7vPCV doses administered over time with a large increase in the most recent 6-month period to December 2003 (Table 2). The Northern Territory, Western Australia and Queensland were the first jurisdictions to implement their 7vPCV programs and vaccinate significant numbers of children with 7vPCV. New South Wales, Victoria, South Australia and Tasmania were much later in rolling out their programs and have only begun to vaccinate significant numbers of children in the past year.

Approximately 40 per cent of all 7vPCV vaccine administered was given only as a single dose, suggesting that it was part of a catch-up campaign (not shown). This is consistent with 90 per cent of children who were aged between 12 and 32 months as at 31 December 2003 and aged 18 months or more at their first dose of 7vPCV having received just the one dose, and 43 per cent of children who were aged between 12 and 32 months as at 31 December 2003 and aged 7–17 months at their first dose of 7VPCV having received two doses of 7VPCV vaccine (Table 3). As the program has matured, a progressively higher proportion of total doses was administered to children under the age of 12 months, consistent with the tailing off of catch-up programs, the introduction of the program and the birth of new babies (not shown).

Table 1. Receipt of 7vPCV vaccine doses administered from May 2001 to December 2003 and recorded on the Australian Childhood Immunisation Register as at December 2003, by state or territory and accessibility/remoteness status

State	Highly accessible		Accessible		Moderately accessible		Remote		Very remote		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
ACT	983	73.5	111	8.3	53	4.0	53	4.0	137	10.2	1,337	1.7
NSW	9,200	56.9	4,374	27.0	1,430	8.8	934	5.8	242	1.5	16,180	20.3
NT	450	2.7	4,781	10.7	752	4.5	3,445	20.7	10,185	61.3	16,613	20.9
Qld	7,166	28.6	6,690	26.9	3,852	15.5	1,456	5.9	5,752	23.1	24,866	31.2
SA	2,209	65.0	591	17.4	131	3.9	154	4.5	312	9.2	3,397	4.3
Tas	278	65.6	122	28.8	23	5.4	0	0.0	1	0.2	424	0.5
Vic	6,162	92.2	446	6.7	67	1.0	6	0.09	4	0.06	6,685	8.4
WA	2,436	24.1	1,069	10.6	1,216	12.0	893	8.8	4483	44.4	10,097	12.7
Aust	28,834	36.2	15,184	19.1	7,524	9.5	6,941	8.7	21,116	26.5	79,599	

Table 2. The roll-out of 7vPCV vaccination doses administered from May 2001 to December 2003 and recorded on the Australian Childhood Immunisation Register as at December 2003, by state or territory

State	May to December 2001		January to June 2002		July to December 2002		January to June 2003		July to December 2003		Total
	n	%	n	%	n	%	n	%	n	%	n
ACT	160	11.4	232	16.5	289	20.5	253	18.0	474	33.7	1,408
NT	5,043	28.2	3,840	21.5	3,290	18.4	2,960	16.6	2,742	15.3	17,875
NSW	195	1.2	1,987	12.0	3,700	22.3	4,038	24.4	6,638	40.1	16,558
Qld	3,834	15.1	4,544	17.9	5,080	20.0	5,383	21.1	6,612	26.0	25,453
SA	9	0.3	688	20.0	623	18.1	688	20.0	1,434	41.7	3,442
Tas	20	4.6	27	6.2	44	10.1	78	17.9	266	61.1	435
Vic	85	1.3	480	7.1	1,243	18.4	1,415	20.9	3,536	52.3	6,759
WA	2,576	24.2	2,310	21.7	2,020	19.0	1,842	17.3	1,906	17.9	10,654
Aust	11,922	14.4	14,108	17.1	16,289	19.7	16,657	20.2	23,608	28.6	82,584

Table 3. Age at the first dose of 7vPCV vaccination administered to children aged 12 to 32 months and recorded on the Australian Childhood Immunisation Register as at December 2003, by the total number of 7vPCV doses received

Age at first dose of 7vPCV	Number of total 7vPCV doses received		
	1 dose (%)	2 doses (%)	3 doses (%)
0–3 months	3.8	7.9	88.3
3–5 months	6.2	16.5	77.3
5–7 months	16.2	24.8	58.9
7–17 months	47.6	42.7	9.7
18+ months	90.0	10.2	0.2

Table 4 shows the number of Indigenous children recorded in Australia using two measures. The first was the number of children as measured by the Indigenous indicator on the ACIR in 2002, and the second, the best available estimates from the ABS. In most jurisdictions the numbers of children identified as Indigenous by the ACIR compared quite favourably with the ABS estimates. The numbers of children in the Northern Territory identified as Indigenous by the ACIR almost mirrored that of the ABS estimates, and the ACIR estimated greater than 68 per cent of the ABS numbers of Indigenous children in five other jurisdictions: Western Australia (85%), New South Wales (76%), South Australia (75%), Victoria (73%) and the Australian Capital Territory (69%).

Table 4. Comparison of the number of Aboriginal and Torres Strait Islander children, Australian Childhood Immunisation Register (ACIR) data versus Australian Bureau of Statistics (ABS)

State	Indigenous population		Accuracy of ACIR Indigenous data (%)‡
	ACIR data 2002*	ABS 2002 – (births)†	
ACT	72	105	68.6
NSW	2,714	3,568	76.1
NT	1,422	1,445	98.4
Qld	489	3,493	14.0
SA	498	665	74.9
Tas	109	482	22.6
Vic	495	680	72.8
WA	1411	1,653	85.4
Aust	7,210	12,094	59.6

* Numbers for the 12-month birth cohort born 1 January to 31 December 2002).

† Australian Bureau of Statistics. Births Australia 2002. Canberra: Australian Bureau of Statistics. Projected indigenous births from the 1996 Census.

‡ (The number of children estimated by the ACIR/the number of Census projection births)*100.

Table 5 shows a comparison of 7vPCV vaccine coverage estimates for Indigenous children for the four study birth cohorts. Data from Queensland on the Indigenous indicator had not been transmitted to the ACIR but coverage estimates were available from a Vaccine Information and Vaccine Administration System (VIVAS) analysis in 2002. For many jurisdictions, estimated coverage increased from the earliest cohort presented but was still less than 50 per cent in five jurisdictions. The Northern Territory was the best performer with greater than 74 per cent coverage for all four cohorts, well above other jurisdictions. With the exception of the Northern Territory, 7vPCV vaccine coverage estimates in all jurisdictions were considerably lower than 'fully immunised' coverage estimates for all scheduled vaccines at 12 months (Table 5). In a sensitivity analysis, estimated 7vPCV coverage was lower if the denominator was the ABS estimates and the numerator was Indigenous children receiving 7vPCV (not shown). Coverage increased considerably if *all* doses of 7vPCV on the ACIR were included (assuming only Indigenous children receive 7vPCV). Overall, it is difficult to estimate the relative contribution of under-immunisation of Indigenous children and under-enumeration of Indigenous status, but coverage appears unlikely to be greater than 60 per cent in any jurisdiction other than the Northern Territory.

Discussion

This analysis of recent ACIR data provides the first national measure of pneumococcal conjugate vaccine immunisation coverage among Indigenous children in Australia and, also provides the first examination of the rollout and pattern of use of 7vPCV vaccine in Australia by state, remoteness index, and number of doses. The main finding is that 7vPCV coverage amongst Indigenous children in Australia increased over the most recent birth cohorts but, although differing substantially, was sub-optimal in all states and territories except the Northern Territory. Using the more accurate Indigenous child denominator from ABS data rather than the ACIR denominator, coverage was even lower. Of particular note was that the proportion of Indigenous children in the four cohorts 'fully immunised' for age was considerably greater than 7vPCV coverage in all jurisdictions except the Northern Territory, and only slightly lower than for all children at 12 months of age.[11] This suggests that either 7vPCV is being administered to Indigenous children, but not being reported by providers in most jurisdictions, or 7vPCV is not being administered despite children being identified as Indigenous on the ACIR (although not necessarily at the point of immunisation service). Differential reporting is quite likely as the ACIR encounter form does not have a specific box for

Table 5. A comparison of 7vPCV and 'fully immunised' coverage estimates calculated from the Australian Childhood Immunisation Register for Aboriginal and Torres Strait Islander children born in four 3-month birth cohorts

State	Number*	% coverage for cohort born 1/10/01 – 31/12/01		% coverage for cohort born 1/1/02 – 31/3/02		% coverage for cohort born 1/4/02 – 30/6/02		% coverage for cohort born 1/7/02 – 30/9/02	
		7vPCV (median age at 3rd dose – months)	Fully immunised†	7vPCV (median age at 3rd dose – months)	Fully immunised	7vPCV (median age at 3rd dose – months)	Fully immunised	7vPCV (median age at 3rd dose – months)	Fully immunised
ACT	73	0.0 (na)	100.0	8.7 (8.1)	82.6	11.1 (9.6)	92.6	6.7 (11.5)	80.0
NSW	2,692	16.5 (8.8)	86.2	27.8 (6.8)	84.5	31.8 (7.1)	87.1	36.9 (6.8)	84.7
NT	1,424	79.8 (6.8)	88.9	75.0 (7.0)	85.9	80.2 (6.9)	85.3	74.1 (7.3)	79.2
Qld‡		58.0		58.0		58.0		58.0	
SA	513	39.1 (8.5)	80.9	46.5 (7.1)	84.5	37.9 (7.2)	81.9	44.9 (7.0)	81.1
Tas	122	9.1 (7.0)	87.9	9.7 (7.6)	90.3	3.2 (6.4)	87.1	7.4 (7.7)	88.9
Vic	519	12.0 (7.2)	86.5	15.2 (7.6)	86.2	14.8 (8.6)	88.3	16.7 (7.6)	88.3
WA	1,421	53.2 (7.2)	83.8	52.8 (7.1)	79.5	58.6 (7.1)	82.6	50.7 (6.9)	77.5
Aust	7,212	39.1	85.8	43.3	83.9	46.9	85.8	46.1	81.9

* Total number of Indigenous children in the four cohorts born 1 October 2001 to 30 September 2002.

† All of the third doses of diphtheria-tetanus-pertussis (DTP), poliomyelitis, and *Haemophilus influenzae* type b (Hibtiter) (or second dose Pedvax Hib) vaccines, and a 2nd or 3rd dose of hepatitis B vaccine used to assess whether a child is completely immunised at 12 months of age.

‡ Figure for Queensland calculated from VIVAS data. The proportion of Aboriginal and Torres Strait Islander children fully vaccinated for age for 7vPCV, for the period 1 July 2001 to 30 June 2002.

7vPCV vaccine reporting unlike other vaccines on the schedule, and general practitioners do not receive Service Incentive Payments for reporting administration of 7vPCV vaccine. However, non-administration of 7vPCV to children identified as Indigenous is also likely.

Interpretation of the data is made more difficult by being likely to be incomplete for many jurisdictions both for 7vPCV doses and Indigenous status. Firstly, it is known that the ACIR underestimates coverage for scheduled vaccines by 3–5 per cent because of failure of providers to report to it.[12] Failure to notify the ACIR is even more likely for 7vPCV vaccine, as it is not one of the vaccines assessed for the General Practice Immunisation Incentives scheme. Secondly, the reporting of Indigenous status to the ACIR is incomplete, varies by jurisdiction, and in some jurisdictions is not transferred to the ACIR as yet.

Despite these limitations, the data reported in this study are important given the lack of other data sources and, although incomplete, provide a basis for monitoring trends. The recording of 7vPCV vaccinations on the ACIR is likely to improve further over time as seen in the increase in coverage across the four cohorts examined. The completeness of Indigenous reporting on the ACIR is also likely to improve over time. The HIC is currently undertaking various Indigenous Access initiatives, which include an amended Medicare enrolment form that enables the voluntary recording of Indigenous status. As of July 2003, more than 800 notifications of Indigenous status had been lodged with the HIC through this amended Medicare form (K. Williams, personal communication, July 2003). Further, it is hoped that existing data transmission problems with the Indigenous field on VIVAS in Queensland will be resolved in the near future. This will have a significant impact on the numbers of Indigenous children being reported on the ACIR for Australia and will result in more accurate estimates of coverage of pneumococcal conjugate vaccine amongst Indigenous children in the future.

Additional data are also likely to made available from other sources against which these findings can be measured, in particular the recent 2001 ABS survey including Aboriginal and Torres Strait Islander children 0–6 years, released this year ,and improved data from the ACIR in many jurisdictions.

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