

# Human papillomavirus vaccine coverage among female Australian adolescents: success of the school-based approach

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In November 2006, a government-funded vaccination program using quadrivalent prophylactic human papillomavirus (HPV) vaccine (Gardasil; Merck Sharp and Dohme) was announced for Australian females. The program included routine school-based vaccination of 12–13-year-olds and a time-limited “catch-up program” for females aged up to 17 years at school and for those aged up to 26 years (as at 2007) through general practitioners and community providers. From 2013, HPV vaccination was extended to boys (aged 12–13 years, and two catch-up cohorts aged 14–15 years). The four HPV types against which the vaccine provides protection (when administered before infection) cause almost 80% of cervical cancers in Australia (types 16 and 18)<sup>1</sup> and nearly all genital warts (types 6 and 11).<sup>2</sup> The vaccine is a three-dose course given over 6 months, delivered to girls at school (aged 12–17 years) between April 2007 and December 2008, with courses to be completed by end December 2009.

Program promotion was coordinated nationally. States and territories delivered the program in their schools using methods already in use for other adolescent vaccines, except for Queensland, which commenced school-based vaccination programs in 2007. In each jurisdiction, the state health department was responsible for vaccine purchasing and distribution, developing consent forms and information, vaccination protocols and central coordination of the school-based program. It should be noted that education and health departments have distinct and separate functions, and that immunisation is permitted in schools on a goodwill basis rather than through specific legislative arrangements or mandated shared responsibility for student health. Thus the administration of the program within individual schools was negotiated at the school level.

All jurisdictions used qualified school-based immunisation teams, usually including nurses. In rural and

## Abstract

**Objective:** To describe quadrivalent human papillomavirus (HPV) vaccination coverage achieved in the HPV vaccination catch-up program for girls aged 12–17 years.

**Design:** Analysis of data from the Australian National HPV Vaccination Program Register.

**Participants:** Girls aged 12–17 years as at 30 June 2007.

**Main outcome measures:** HPV vaccine coverage by dose (1, 2 and 3), age and state of residence, using Australian Bureau of Statistics estimates of resident populations as the denominator.

**Results:** Notified vaccination coverage for girls aged 12–17 years nationally was 83% for dose 1, 78% for dose 2 and 70% for dose 3. The Australian Capital Territory and Victoria recorded the highest three-dose coverage for the 12–17-year-old cohort overall at 75%. The highest national three-dose coverage rate by age was achieved in 12-year-olds (74%). In Queensland, coverage among Indigenous girls compared with non-Indigenous girls was lower with each dose (lower by 4% for dose 1, 10% for dose 2 and 15% for dose 3). This pattern was not seen in the NT, where initial coverage was 17% lower among Indigenous girls, but the course completion rate among those who started vaccination was identical (84%).

**Conclusions:** The catch-up HPV vaccination program delivered over 1.9 million doses of HPV vaccine to girls aged 12–17 years, resulting in 70% of girls in this age group being fully vaccinated. The range in coverage achieved and the lower uptake documented among Indigenous girls suggest that HPV vaccination programs can be further improved.

remote areas, some used contracted GPs or community health providers and, in the Northern Territory, program nurses supported delivery by remote area staff. Responsibility for the local coordination of the school teams differs by jurisdiction, with Victoria, Tasmania, South Australia and Qld predominantly using councils, Western Australia using councils and the Child and Adolescent Health Service in Perth, and an area health service model in the seven regional areas. New South Wales and the Australian Capital Territory use an area health service model.

School attendance among adolescent girls in Australia is high, with 98.5% of those aged 14 years enrolled in school, and 83% of those enrolled completing the final year of high school (range 56% in the NT to 93% in the ACT).<sup>3</sup> School-based HPV vaccinations were delivered in high school with two exceptions: in WA, and in some local government areas of Tas, girls were vaccinated in the final year of primary school at age 11–12 years. In Tas parents were given the option of obtaining vaccination from their GP.

This article documents the coverage achieved in girls aged 12–17 years during the catch-up program, including the first estimates of Indigenous coverage, as estimated by the National HPV Vaccination Program Register (NHVPR). The NHVPR was established under Commonwealth legislation, which mandates what information can be collected (with consent), and commenced in mid 2008. Its main functions are to support the program through monitoring of coverage and to provide information to vaccine providers and those receiving the vaccine.<sup>4</sup>

## Methods

The NHVPR systematically collects school program HPV vaccination data from every state and territory. Two jurisdictions (Qld and the NT) have state-based immunisation registers, which provide regular electronic data uploads. Initially, both Tas and SA collected data centrally and provided it to the NHVPR when it became operational. Thereafter, as was the case in Vic throughout, each council

### Australian HPV vaccination coverage on the National HPV Vaccination Program Register as at 30 June 2011

State	Total doses	Dose	Age in years (as at 30 June 2007)						
			12	13	14	15	16	17	12–17
Australian Capital Territory	32 319	1	89%	91%	89%	88%	87%	85%	88%
		2	87%	87%	85%	83%	81%	79%	84%
		3	79%	80%	77%	76%	72%	68%	75%
New South Wales	628 101	1	82%	83%	83%	85%	82%	80%	82%
		2	79%	79%	79%	81%	77%	74%	78%
		3	73%	73%	72%	75%	70%	65%	71%
Northern Territory	23 036	1	92%	88%	82%	86%	87%	81%	86%
		2	87%	83%	77%	81%	80%	73%	80%
		3	81%	76%	70%	74%	72%	63%	73%
Queensland	402 516	1	84%	84%	85%	86%	85%	80%	84%
		2	80%	79%	81%	81%	79%	71%	79%
		3	73%	72%	72%	73%	71%	58%	70%
South Australia	137 085	1	82%	84%	83%	82%	81%	78%	82%
		2	79%	80%	79%	77%	75%	70%	77%
		3	70%	73%	70%	67%	65%	59%	67%
Tasmania	42 084	1	79%	77%	79%	81%	74%	72%	77%
		2	75%	71%	72%	74%	66%	62%	70%
		3	68%	64%	63%	65%	57%	52%	62%
Victoria	490 586	1	87%	86%	86%	87%	87%	84%	86%
		2	84%	83%	82%	83%	82%	79%	82%
		3	79%	76%	74%	75%	75%	71%	75%
Western Australia	173 206	1	77%	78%	78%	75%	72%	64%	74%
		2	73%	74%	73%	69%	66%	56%	68%
		3	66%	65%	64%	61%	56%	46%	60%
All Australia	1 928 933	1	83%	83%	84%	84%	83%	79%	83%
		2	80%	80%	79%	80%	77%	72%	78%
		3	74%	73%	71%	72%	69%	62%	70%

reported data to the NHVPR directly. Most councils use electronic immunisation databases from which they extract HPV vaccination data. In NSW, centralised annual data were uploaded to the NHVPR after batched scanning of consent forms. In WA, electronic data were uploaded annually from centrally collated data. In the ACT, a temporary database was used until the NHVPR was established — thereafter data were entered directly through the web portal.

Throughout the catch-up program, females could receive doses missed at school, or the complete course if they were not in school, from their GP or community health provider. GPs were paid \$6 per dose notified, but notifications were not compulsory. Doses could be notified by posting hard copy records or printouts from practice management software, or electronically through the web portal.<sup>4</sup>

Coverage was calculated by dose for Australian girls aged 12–17 years as at 2007. Only valid doses were included (ie, doses meeting recommended mini-

imum intervals or forming part of a clinically complete course as per the Australian Government's Chief Medical Officer's guidelines).<sup>5</sup> Doses notified from all provider types were included (school immunisation program providers and other providers such as GPs). Data were extracted from the NHVPR as at 30 June 2011. The denominator population used was the Australian Bureau of Statistics (ABS) estimate of resident population for girls aged 12–17 years as at 30 June 2007. Although the NHVPR collects Indigenous status, this is not a mandatory field, as per the underlying legislation, and not all jurisdictions included this field on their consent forms. Only in Qld and the NT was Indigenous status reported with sufficient completeness to use NHVPR data to assess coverage. In Qld, 5.8% identified as Indigenous and 14% had unknown or unreported status; and in the NT, 38.8% identified as Indigenous and 3.7% had unknown or unreported status. The denominator was estimated for Indigenous girls in Qld and the NT using experimental

ABS estimates based on 2006 census data. From these data, 6% of girls aged 12–17 years in Qld and 43.5% in the NT identified as Indigenous.

NHVPR data were approved for release by the data custodian, the Commonwealth Department of Health and Ageing. No ethics approval was required for this study: data are collected by the NHVPR under legislation that allows for their use in monitoring and evaluation.

## Results

### Coverage

Of doses notified in girls aged 12–17 years, GPs delivered 14% of doses, ranging by age from 8% in 12-year-olds to 28% in 17-year-olds, and by state from 5% in the NT to 24% in Tas. National and jurisdictional coverage estimates by age are presented in the Box and show high coverage in the overall cohort of dose 1 (83%), dose 2 (78%) and dose 3 (70%). The highest 1-dose coverage achieved, by state, was in 13-year-olds in the ACT (91%) and in 12-year-olds in the NT (92%). The highest three-dose coverage by age group nationally was in 12-year-olds (74%). The ACT and Vic recorded the highest three-dose coverage for the 12–17-year-old cohort at 75%.

### Estimates of Indigenous coverage

In Qld, coverage by dose among girls aged 12–17 years who identified as being of Aboriginal or Torres Strait Islander background was 80% for dose 1, 69% for dose 2 and 54% for dose 3, while in the NT it was 76% for dose 1, 71% for dose 2 and 64% for dose 3. Although in Qld dose 1 coverage was only slightly lower than that notified for Qld girls overall, with each dose a larger disparity in coverage was evident (4%, 10% and 15% gap). In the NT there was a larger discrepancy in the number of Indigenous girls starting the course compared with non-Indigenous girls (17%). However, the completion rate once started was the same for both groups (84%). Local-level data and experience in the NT showed that vaccine uptake in schools with a high proportion of Indigenous boarding students was significantly lower because of difficulties returning consent forms.

## Discussion

While the requirement to rapidly implement the program was challenging,<sup>6</sup> the coverage achieved in adolescents through the predominantly school-based HPV vaccination catch-up program represents a remarkable achievement with 70% of 12–17-year-old girls Australia-wide completely vaccinated. Combined with the coverage achieved in the 18–26-year-old catch-up cohort,<sup>7</sup> at least half of Australia's females who were aged 12–26 years on 30 June 2007 are fully vaccinated. This significant and rapidly achieved coverage has been correlated with a marked decline in genital warts,<sup>8</sup> vaccine-type HPV prevalence<sup>9</sup> and high-grade cervical disease in young women.<sup>10</sup>

Doses delivered in school programs should be completely recorded, except where an individual did not consent for data to be provided to the NHVPR. The number of individuals opting off the Register in this way is unknown but thought to be very low (NHVPR received 27 requests to opt off the Register from females aged 12–18 years between 2007 and 2011). Data completeness for non-school-delivered doses may vary across the country. In Tas, which had the highest percentage of the cohort with GP notifications, under-notification from general practice may be contributing to the apparently lower-than-average coverage. Some states, such as NSW, did not use the NHVPR's history statements, but sent a letter to girls with incomplete courses, or released overdue-dose reports to general practices. Where these functions were used, in some states they resulted in large numbers of additional notifications.

Our data suggest that coverage achieved among Indigenous girls is substantial but probably lower than in non-Indigenous girls. School retention and attendance rates are lower for Indigenous students in Qld compared with non-Indigenous students. For example, in 2008, 47.5% of Indigenous students attended 90%–100% of the school year compared with 71.2% of non-Indigenous students.<sup>11</sup> Poorer attendance makes delivering a three-dose vaccine schedule substantially more challenging. It is important therefore that culturally appropriate information (developed before such a

campaign and developed with communities), and a vaccine supply, are available in community health services that are attended by adolescent Indigenous girls, and that flexibility of age at administration allows vaccination either in later primary school or potentially in the future by allowing funded catch-up to older ages in areas where age incidence rates for HPV-related disease are above national rates, eg, East Arnhem Land, NT. In the NT, the program used a combination of school and community clinics in order to reach Indigenous girls, allocated additional resources for remote areas and developed appropriate communication resources supported by local language community radio announcements. Particular challenges in ensuring equity of coverage, especially for remote-dwelling girls, included busy school and community schedules, competing priorities such as the federal government NT National Emergency Response affecting the timeliness of vaccination, unforeseen events such as funerals and failure of vaccine delivery, a lack of accommodation and limited community resources in some remote communities. However, women in many communities embraced the program and developed their own initiatives to encourage girls to complete the course. HPV program nurses assisted schools by raising awareness and actively seeking consent from parents of boarding students when visiting remote communities.<sup>12</sup>

While it is likely that the program is cost-effective at 70% coverage, the model that informed the Pharmaceutical Benefits Advisory Committee decision used a base coverage of 80% in 12-year-olds.<sup>13</sup> While Australian coverage is high compared with countries using non-school-based approaches,<sup>14,15</sup> some countries with established school-based programs have achieved even higher coverage. Coverage in the target cohort in Scotland has exceeded 90% for three doses for over 4 years running.<sup>16</sup> The Scottish program was highly organised, taking a project management approach to program implementation, and using existing comprehensive community health data systems and registers, which are supported by a unique identification number for each person.<sup>17</sup> For Australia to

achieve higher coverage, a systems-based approach to identifying and minimising barriers may be required. Despite the program being national, implementation occurs at a state, and within-state level, with differing systems in place. For example, a Victorian survey of councils documented a wide variation in the number of schools per council, access to class lists, use of translated resources, follow-up of consent forms and pre-immunisation education.<sup>18</sup>

The high uptake of dose 1 suggests that the vaccine is widely acceptable to parents and adolescents. An evaluation in British Columbia of reasons for non-consent found that concern about the safety and newness of the vaccine and lack of information were important barriers in its school-based program.<sup>19</sup> Similar concerns about the vaccine being too new were reported during commissioned market research by parents whose children did not receive the vaccine at school in Qld (personal communication, Karen Peterson, Director, Qld Health Immunisation Program, 2011). Parents and girls in a qualitative NSW study also desired more information.<sup>20</sup>

It is unclear how many parents are not consenting to vaccination due to non-receipt of the consent form, which is usually given to the school-girl to take home. Not all states currently monitor consent form return rates, due to restrictions in the provision of student lists by schools. Research in Vic found that having a process to follow-up non-returned consent forms was a characteristic of councils with higher HPV vaccination coverage.<sup>18</sup> Qld market research showed that for 18% of missed vaccinations (all vaccines), parents reported never receiving the consent form. All these parents said they were not advised that the consent form was not returned (personal communication, Karen Peterson, Director, Qld Health Immunisation Program, 2011). In WA, research showed that sending a second consent form was more effective than a letter, phone call or school incentives for improving return rates.<sup>21</sup> Significant efforts to streamline such processes in WA have led to rising coverage: in 2010, coverage in 12-year-olds was 84% for dose 1, 82% for dose 2 and 75% for dose 3. In SA, increasing numbers of consent forms

have been returned since the catch-up, with 81% returned in 2010 and 89.6% in 2011.

Identifying the barriers to completing the three-dose series is important to allow the programs to overcome them. Research is ongoing, but some states have already identified key barriers. The main reasons for non-completion given by parents of Qld schoolgirls were school absence and receipt of vaccination elsewhere (personal communication, Karen Peterson, Director, Qld Health Immunisation Program, 2011). Similarly, an SA study, which contacted parents of under-immunised girls, found strong support for schedule completion but that absence from school, lack of awareness of vaccination status and difficulties in attending follow-up clinics impeded compliance.<sup>22</sup> International data and a study of Victorian women aged 18–26 years have also found that issues relating to lack of time and inconvenience or logistical barriers, rather than side effects or negative vaccination experiences, are major drivers of failure to complete the course.<sup>23,24</sup> Ideally, throughout the country, parents should be made aware when a dose is missed and provided with a specific, accessible way to ensure the dose is received.

In summary, the catch-up school-based HPV vaccination program delivered over 1.9 million doses of vaccine to girls aged 12–17 years, resulting in 70% being fully vaccinated. Given the rapid timelines for implementation of the program, this is a particularly remarkable achievement. Ongoing review and evaluation of school-based programs is occurring across Australia<sup>18,25,26</sup> and promises to further improve HPV vaccination coverage. The current campaign supporting the expansion of the program to boys incorporates some of the lessons learned to date and includes strong messages about the need to return the consent form and the importance of completing all three doses. The under-reporting of Indigenous status to the NHVPR requires engagement and analysis from all stakeholders and the development of a targeted strategy for improvement, acknowledging that some improvements have already occurred since the catch-up program.

Any strategy should be underpinned by best-practice guidelines, which strongly support the need to change the legislation to make reporting mandatory.<sup>27</sup> Hopefully the expansion of the program to include males will normalise receipt of HPV vaccination as just a routine part of the vaccination schedule.

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