

NSW Annual Immunisation Coverage Report, 2014

**Brynley Hull^{A,D}, Aditi Dey^{A,C},
Sue Campbell-Lloyd^B, Frank Beard^{A,C}
and Peter B. McIntyre^{A,C}**

^ANational Centre for Immunisation Research and Surveillance,
The Children's Hospital at Westmead

^BHealth Protection NSW

^CSydney Medical School, The University of Sydney

^DCorresponding author. Email: brynley.hull@health.nsw.gov.au

improvement. Completion of the recommended immunisation schedule at the earliest appropriate age should be the public health goal at both the state and local health district level where high levels of vaccine coverage at milestone ages have been achieved.

Abstract: Introduction: This annual report documents trends in immunisation coverage in NSW for children, adolescents and the elderly, up to and including data for 2014. **Methods:** Data from the Australian Childhood Immunisation Register, the NSW School Vaccination Program and the NSW Population Health Survey were used to calculate various measures of population coverage, and vaccination timeliness for Aboriginal and non-Aboriginal children. **Results:** Greater than 90% coverage has been reached for children at 12 and 60 months of age. The inclusion of the 13-valent pneumococcal conjugate vaccine in the 12-month 'fully immunised' coverage algorithm did not lead to any changes in coverage at 12 months of age. However, the inclusion of the meningococcal vaccine, the varicella vaccine, and the second dose of the MMR vaccine in the 24-month 'fully immunised' coverage algorithm did lead to a decrease in 'fully immunised' coverage at 24 months of age. Delayed receipt of vaccines is still an issue for Aboriginal children. For adolescents, coverage for the third dose of HPV vaccine for females in 2013 through the school program was 79%, an increase of 6 percentage points from 2012 (73%). For males it was 56%. Pneumococcal vaccination in the elderly remains lower than the influenza coverage estimates. **Conclusion:** This report documents trends in immunisation coverage in NSW across the age spectrum. Data provided in this report reflect continuing successful delivery of the vaccination program in New South Wales, while identifying some areas for

Introduction

This series of *New South Wales (NSW) Annual Immunisation Coverage Reports* provides important information on trends and issues in immunisation coverage to facilitate the monitoring of NSW immunisation programs.

This report uses the longstanding international practice of reporting coverage at key milestone ages to measure coverage against national benchmarks and to track trends over time. It is adapted from annual national immunisation reports published since 2009.¹

High levels of reporting to the Australian Childhood Immunisation Register (ACIR) are maintained by a system of incentive payments for immunisation providers and parents/guardians.² However, changes to immunisation policy, the incentive payment system and changes to the 'fully immunised' coverage algorithms may have an impact on reported vaccination coverage; some recent changes are highlighted in Box 1 and also referred to in this report.

The ACIR was established on 1 January 1996 by incorporating demographic data from Medicare on all enrolled children aged less than 7 years.³ Participation in the ACIR is opt-out so it constitutes a nearly complete population register, as approximately 99% of children are registered with Medicare by 12 months of age.² Children not enrolled in Medicare can also be added to the ACIR via a supplementary number. Since 2001, immunisations given overseas may be recorded if a provider endorses their validity. Data are transferred to the ACIR when a recognised immunisation provider supplies details of an eligible immunisation either automatically from medical practice software or through the internet using the Medicare Australia website or by submitting paper encounter forms. The existence of medical contraindications and conscientious objection to immunisation is also recorded

Box 1. Recent significant changes in immunisation policy, immunisation incentives and coverage calculation algorithms for NSW

December 2013 – Secondary school Year 7 and age-equivalent hepatitis B vaccine catch-up program ceased.

July 2013 – The combined *Haemophilus influenzae* type b (Hib) and meningococcal serogroup C (MenC) vaccine, Menitorix[®], was added to the National Immunisation Program (NIP) schedule at 12 months of age. This combination vaccine replaces the single dose of monovalent meningococcal C conjugate vaccine (MenCCV) and booster dose of monovalent Hib vaccine previously scheduled at 12 months of age.

A combination measles, mumps, rubella, varicella (MMRV) vaccine for children aged 18 months was also added to the NIP in July 2013. The MMRV vaccine replaces the separate measles, mumps, rubella (MMR) vaccine previously given to 4 year olds, and the varicella vaccine (for chickenpox) previously given to 18 month olds.

The meningococcal C, pneumococcal and varicella ('chickenpox') vaccines were also added to the list of immunisations that children need to receive to be assessed as 'fully immunised' in July 2013. The expansion of the definition of 'fully immunised' reinforces the importance of these vaccines by linking them to payments to families and immunisation providers.¹³

February 2013 – Males aged 12–13 years received the HPV vaccine at school. Males aged 14–15 years also received the vaccine as part of a catch-up program until the end of the 2014 school year.

July 2012 – Eligibility for the Family Tax Benefit Part A supplement requires that children are assessed as fully immunised in the year they turn 1, 2 or 5. This replaced the Maternity Immunisation Allowance.

December 2011 – For non-Indigenous adults aged ≥ 65 years who do not have any condition that predisposes them to an increased risk of invasive pneumococcal disease (IPD), a repeat dose of 23-valent pneumococcal polysaccharide vaccine (Pneumovax 23[®]) is no longer recommended.

July 2011 – Prevenar 13[®] (13-valent pneumococcal conjugate vaccine, 13vPCV) replaced Prevenar[®] (7-valent pneumococcal conjugate vaccine, 7vPCV) on the NIP for children at 2, 4 and 6 months of age in all states and territories except Northern Territory (adopted 13vPCV from 1 October 2011).

on the ACIR. All vaccination records for a child remain on the register indefinitely, but no during the period covered by this report new immunisation encounter records are added after the seventh birthday.²

Table 1 presents the NSW Immunisation Program in 2014. During 2014 the only change to the Program from 2013 was the removal of the hepatitis B vaccine dose for adolescents in Year 7 following the completion of that catch-up program.

Methods

Measuring immunisation coverage using the Australian Childhood Immunisation Register

The cohort method has been used for calculating coverage at the population level (national and state/territory)⁴ since the inception of the ACIR. Cohort immunisation status is assessed at 12 months of age (for vaccines due at 6 months), 24 months of age (for vaccines due at 12 and 18 months), and 5 years of age (for vaccines due at 4 years). A 3-month lag period is allowed for the late notification of immunisations to the ACIR.⁴ If a child's record indicates receipt of the last dose of a vaccine that requires more than one dose to complete the series, it is assumed that earlier vaccinations in the sequence have been given. This assumption has been shown to be valid.^{5,6}

The proportion of children designated as 'fully immunised' is calculated using the number of children completely immunised with the vaccines of interest by the designated age as the numerator, and the total number of Medicare-registered children in the age cohort as the denominator. 'Fully immunised' at 12 months of age was defined as a child having a record on the ACIR of a third dose of the combined DTPa-hepB-IPV-Hib vaccine and a third dose of the 13-valent pneumococcal conjugate vaccine. 'Fully immunised' at 24 months of age was defined as a child having a record on the ACIR of a third dose of the combined DTPa-hepB-IPV-Hib vaccine, a fourth dose of *Haemophilus influenzae* type b (PRP-T) vaccine, and a first dose of a measles, mumps and rubella-containing (MMR) vaccine. However, from July 2014, a record of a first dose of varicella-containing vaccine, a first dose of meningococcal C-containing vaccine, and a second dose of MMR-containing vaccine was added to the 'fully immunised' coverage algorithm. 'Fully immunised' at 60 months of age was defined as a child having a record on the ACIR of a fourth dose of a DTPa-IPV-containing vaccine, and a second dose of an MMR-containing vaccine.

Immunisation coverage estimates were also calculated at the 12 months of age milestone for the second dose of

Table 1. Schedule of vaccines delivered through the NSW Immunisation Program, 2014

Age	Vaccine							
Childhood vaccines								
Birth	Hep B							
6–8 weeks	Hep B	DTPa	Hib	Polio		13vPCV	Rotavirus	
4 months	Hep B	DTPa	Hib	Polio		13vPCV	Rotavirus	
6 months	Hep B	DTPa	Hib	Polio		13vPCV	Flu ^f	
12 months			Hib-MenC ^a		MMR			
18 months						MMRV ^b		
4 years		DTPa		Polio	MMR ^c			
Adolescent vaccines								
12 years		dTpa			VZV ^d	HPV ^e		
15 years						HPV ^d	Flu ^f	Pneumo ^g
Adult vaccines								
≥50 years							Flu ^f	Pneumo ^h
≥65 years							Flu ^f	Pneumo
<p>Hep B: hepatitis B vaccine; DTPa: diphtheria, tetanus, and acellular pertussis-containing vaccine; Hib: <i>Haemophilus influenzae</i> type b vaccine; MMR: measles–mumps–rubella vaccine; VZV: varicella zoster virus vaccine; PCV: pneumococcal conjugate vaccine; Men C: meningococcal C vaccine; HPV: human papilloma virus vaccine (females only); Flu: influenza vaccine; Pneumo: Pneumovax 23 vaccine.</p> <p>^aIn July 2013, the combined <i>Haemophilus influenzae</i> type b (Hib) and meningococcal C vaccine, Menitorix®, was added to the National Immunisation Program schedule at 12 months of age. This combination vaccine replaces the single dose of monovalent meningococcal C conjugate vaccine and booster dose of monovalent Hib vaccine previously scheduled at 12 months of age.</p> <p>^bMeasles, mumps, rubella, varicella introduced onto Schedule on 1 July 2013.</p> <p>^cThe dose of measles, mumps, rubella at 4 years of age will cease on 1 January 2016.</p> <p>^dCatch-up only for males.</p> <p>^eFemales and males.</p> <p>^fAnnual vaccination, all aged ≥6 months with medical risk factors, Aboriginal people 6 months <5 years and ≥15 years, non-Aboriginal adults ≥65 years.</p> <p>^gAboriginal adults with medical risk factors.</p> <p>^hAll Aboriginal adults only.</p> <p>Source: National Immunisation Program Schedule.</p>								

rotavirus vaccine, a National Immunisation Program vaccine not included in calculations for incentive payments and ‘fully immunised’ status.

Timeliness

Delayed vaccination was categorised as 1–6 months and greater than 6 months delay. All children included in the analysis were old enough to potentially experience delays in immunisation greater than 6 months for immunisations assessed at 24 months of age or earlier. Timeliness of different vaccines and doses was also compared by plotting the cumulative percentage receiving each vaccine dose by age.

Local health districts

Immunisation coverage estimates and vaccination delay estimates are presented in this report by NSW local health district (LHD). LHDs were introduced in January 2011, replacing area health services. There are 15 LHDs in NSW – eight in metropolitan NSW and seven in rural and regional NSW.

Aboriginal status

Indigenous status on the ACIR is recorded nationally as ‘Indigenous’, ‘non-Indigenous’ or ‘unknown’, as reported by the child’s carer to Medicare, or by the immunisation provider to the ACIR. For this report, two categories of children were considered: ‘Aboriginal’ (Indigenous) and ‘non-Aboriginal’ (non-Indigenous). Children with unknown Aboriginal status were presumed to be ‘non-Aboriginal’. Coverage estimate time trends are presented from 2004 only, due to poor rates of reporting of Aboriginal status prior to that time.⁷

Small area coverage

Coverage was calculated for the Australian Bureau of Statistics (ABS)-defined SA3s (statistical area level 3), which form part of the new Australian Statistical Geography Standard (ASGS).⁸ SA3s were chosen as areas to be mapped because they provide more detail than LHDs but are not too small to render maps unreadable (population sizes for a year-wide birth cohort of children for SA3s in NSW range from 7 to 2700 children). SA3s with a

population size for a year-wide birth cohort of children less than 26 were excluded from any mapping due to the imprecision of any coverage estimates calculated for these areas. Maps were created using MapInfo mapping software⁹ and the ABS Census Boundary Information. As postcode is the only geographical indicator on the ACIR, the ABS Postal Area to Statistical Area Level 3 Concordance 2011 was used to match ACIR residential postcodes of the children to SA3s.¹⁰

Vaccine objection status

Parents who object to vaccination could lodge a conscientious objection to immunisation form with the ACIR until 31 December 2015. This rendered them eligible for relevant federal government family assistance payments despite their children not being vaccinated. Other parents may also object to immunisation but not register an objection. Among children recorded as not fully immunised on the ACIR, we examined three subgroups, defined by the following information recorded on the ACIR: registered vaccine objection and no vaccines recorded on the ACIR; registered vaccine objection and at least one vaccine recorded on the ACIR; and no registered vaccine objection and no vaccines recorded on the ACIR (some, but not all, of whom may be unvaccinated due to unregistered objection). Proportions of children in these subgroups were calculated for all LHDs from the cohort of children registered with Medicare and born between 1 January 2008 and 31 December 2013. At the time of data extraction these children were aged between 1 year and less than 7 years. We chose this cohort when calculating proportions so that children under the age of 1 year were not included, to allow sufficient time for registration of objection.

Coverage in the elderly and adolescents

Influenza and pneumococcal vaccination coverage estimates in the elderly were from the 2014 NSW Population Health Survey. This is a rolling random digit-dialled telephone survey, with vaccination status determined from patient recall at the time of the interview. Influenza and pneumococcal vaccination coverage estimates are based on 4552 and 4463 respondents in NSW, respectively.¹¹ Coverage for vaccines given to adolescents was collected from the NSW School Vaccination Program. Vaccination status is recorded by school immunisation teams and the counts of children vaccinated are collated by LHDs and Health Protection NSW. The denominator is the school population, start of year enrolments. The coverage rates may underestimate the true vaccination coverage as they represent only those vaccinations received through the school program and do not include doses received from general practitioners or other immunisation providers.¹²

Summary of results

Coverage (all children)

- Overall in NSW ‘fully immunised’ coverage measured at 12 months was 91.3% during 2014 (Table 2).
- ‘Fully immunised’ coverage measured at 24 months (89.3%) decreased by 2.8 percentage points from 2013 due to the coverage algorithm change (Table 3), and coverage at 5 years of age continues to improve (92.4% in 2014) (Table 4 and Figure 1).
- For all LHDs in NSW except Mid North Coast, Northern NSW, and Western Sydney ‘fully immunised’ coverage at 12 months of age and coverage for all individual vaccines (except rotavirus) in 2014 was greater than 90% (Table 2 and Figure 2).

Table 2. Percentage of children immunised at 12 months of age, by vaccine for each local health district in NSW, compared with NSW and Australia, 2014

Vaccine	Local Health District ^a																	
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	Australia %
Diphtheria, tetanus, pertussis	94.4	93.1	94.0	93.9	90.2	93.6	91.9	93.7	87.0	92.8	92.5	92.0	91.8	93.4	93.2	91.0	92.4	92.6
Poliomyelitis	94.3	93.1	94.0	93.9	90.2	93.6	91.7	93.9	86.9	92.8	92.4	91.9	91.8	93.3	93.2	90.9	92.3	92.5
Haemophilus influenzae type b	94.3	92.8	93.9	93.8	89.9	93.5	91.6	93.9	86.7	91.8	92.1	91.7	91.6	92.9	93.1	90.5	92.0	92.3
Hepatitis B	94.2	93.4	93.8	93.6	90.1	93.4	91.6	93.7	86.7	91.9	92.0	91.7	91.7	92.7	93.0	90.4	92.0	92.2
Rotavirus	89.8	89.0	89.5	88.4	85.5	87.9	87.1	89.8	82.0	87.0	87.8	87.0	87.8	88.0	88.0	86.2	87.4	88.7
13vPCV	94.2	93.4	93.7	93.5	89.8	93.4	91.4	93.6	86.2	91.9	91.8	91.4	91.7	92.5	93.0	90.2	91.8	92.0
Fully immunised ^b	93.8	92.8	93.4	93.3	89.4	93.1	91.1	93.4	86.0	90.5	91.3	91.1	91.3	91.8	92.9	89.4	91.3	91.5
Total number of children	4110	363	11 174	4576	2341	2917	4944	669	3230	10 564	10 846	13 543	2144	7760	3740	14 507	98 101	303 789

Birth cohort = children born in 2013.

^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.

^bThree doses of the combined DTPa-hepB-IPV-Hib vaccine plus 13vPCV. The third dose assumption is applied.

Source: Australian Childhood Immunisation Register.

- Coverage for rotavirus is lower than other vaccines as catch-up cannot be given once infants turn 15 weeks (dose 1) and 25 weeks (dose 2) of age.
- At 24 months, coverage for the first dose of MMR was 93.7% (Table 3). MMR dose 2 coverage at the 24-month milestone (89.5%) was lower than at 5 years (92.9%; Tables 3 and 4).
- For all LHDs except Hunter New England, Murrumbidgee, and Network with Victoria 'fully immunised' coverage at 24 months of age was below 90%. Excluding the second dose of MMR and the dose of varicella, coverage for all individual vaccines was greater than 90% for all LHDs except Northern NSW (Table 3 and Figure 3).
- Varicella coverage increased 5.2 percentage points from 84.4% in 2013 to 89.6% in 2014. This is likely due to the introduction of MMRV vaccine during the latter half of 2013.

Table 3. Percentage of children immunised at 24 months of age, by vaccine for each local health district in NSW, compared with NSW and Australia, 2014

Vaccine	Local Health District ^a																	
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	Australia %
Diphtheria, tetanus, pertussis	96.5	96.7	96.6	95.3	93.3	96.6	95.7	96.0	90.3	94.4	94.4	95.3	96.3	94.8	96.4	94.9	95.1	95.2
Poliomyelitis	96.5	96.7	96.6	95.3	93.2	96.6	95.6	96.0	90.3	94.4	94.3	95.2	96.3	94.7	96.4	94.8	95.1	95.1
<i>Haemophilus influenzae</i> type b (Hib) ^b	96.6	97.2	97.0	95.6	93.8	96.9	96.4	96.2	90.5	94.7	94.7	95.9	96.4	94.8	97.2	95.4	95.5	95.4
Meningococcal C (MenC) ^b	95.2	95.4	95.6	94.5	92.6	95.6	94.2	94.7	88.8	92.2	92.6	93.5	95.7	92.9	95.8	92.5	93.5	93.6
Hepatitis B	96.2	96.7	96.3	95.0	92.8	96.4	95.4	95.9	90.1	93.3	93.5	95.0	96.0	93.9	96.4	94.2	94.6	94.6
Measles–mumps–rubella (MMR) Dose 1	95.3	94.9	95.7	94.4	92.3	95.2	94.3	94.6	89.0	92.6	92.7	93.7	95.3	93.3	95.5	93.1	93.7	93.9
Measles–mumps–rubella (MMR) Dose 2 ^b	91.1	89.0	91.9	90.8	89.4	92.4	89.5	93.1	84.6	88.8	88.3	88.4	90.6	90.3	90.4	88.7	89.5	89.6
Varicella	91.3	90.1	91.8	89.6	87.6	92.3	89.9	90.3	83.3	88.9	88.8	89.0	91.2	90.3	91.3	89.3	89.6	89.6
Fully immunised ^c	89.3	89.0	90.0	88.8	86.8	90.9	85.9	91.5	83.0	85.8	86.1	85.7	89.4	87.8	88.4	85.3	89.3	89.0
Total number of children	4142	393	11 677	4814	2386	3132	5090	704	3299	11 507	11 093	13 997	2266	7877	3953	14 910	101 937	312 515

Birth cohort = children born in 2012.
^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.
^bCohort born 1 July to 31 December 2012. In July 2013, the combined *Haemophilus influenzae* type b (Hib) and meningococcal serogroup C (MenC) vaccine, Menitorix®, was added to the National Immunisation Program (NIP) schedule at 12 months of age. Also, the combination measles, mumps, rubella, varicella (MMRV) vaccine for children aged 18 months was added to the NIP during the same time. The birth cohort selected includes children who were eligible for the combination vaccines.
^cCohort born 1 July to 31 December 2012. A third dose of the combined DTPa-hepB-IPV-Hib vaccine, a fourth dose of *Haemophilus influenzae* type b (PRP-T) vaccine, and a second dose of a measles, mumps and rubella-containing (MMR) vaccine, first dose of meningococcal and first dose of varicella.
Source: Australian Childhood Immunisation Register.

Table 4. Percentage of children immunised at 5 years of age, by vaccine for each local health district in NSW, compared with NSW and Australia, 2014

Disease	Local Health District ^a																	
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	Australia %
Diphtheria, tetanus, pertussis	94.4	95.2	95.2	94.1	92.1	95.7	94.0	94.9	87.9	90.7	91.5	93.8	93.1	91.4	95.5	92.8	92.9	92.6
Poliomyelitis	94.4	95.2	95.1	94.0	92.2	95.7	94.0	94.9	87.9	90.7	91.5	93.8	93.0	91.4	95.4	92.8	92.9	92.6
Measles–mumps–rubella	94.5	95.5	95.1	94.2	92.2	95.6	93.8	94.6	87.9	90.5	91.4	93.9	92.9	91.1	95.5	92.8	92.9	92.5
Fully immunised ^b	94.0	95.2	94.7	93.7	91.7	95.3	93.4	94.4	87.5	89.9	90.9	93.4	92.5	90.7	95.0	92.2	92.4	92.0
Total number of children	4372	396	11 538	4976	2636	3262	5252	644	3646	11 695	10 377	13 707	2444	6895	3934	14 173	100 617	310 447

Birth cohort = children born in 2009.
^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.
^bA fourth dose of combined DTPa-IPV vaccine, and a second dose of an MMR-containing vaccine.
Source: Australian Childhood Immunisation Register.

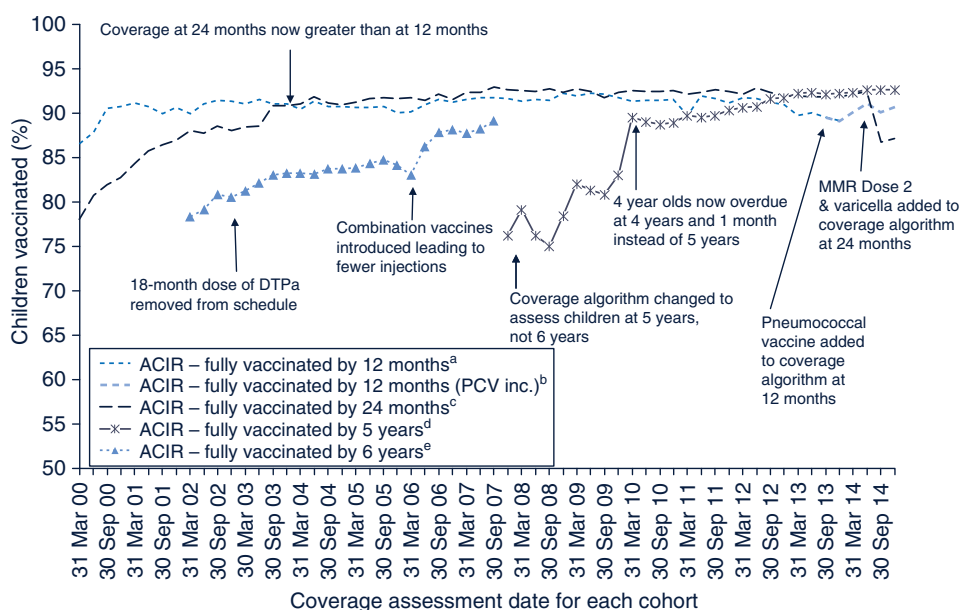


Figure 1. Trends in 'fully immunised'^{a,b,c,d,e} vaccination coverage, NSW, 2000–2014.

^aA third dose of the combined DTPa-hepB-IPV-Hib vaccine up until July 2013.

^bA third dose of the combined DTPa-hepB-IPV-Hib vaccine and a third dose of pneumococcal conjugate vaccine since July 2013.

^cA third dose of the combined DTPa-hepB-IPV-Hib vaccine, a fourth dose of *Haemophilus influenzae* type b (PRP-T) vaccine, and a first dose of a measles, mumps and rubella-containing (MMR) vaccine.

^dA fourth dose of combined DTPa-IPV vaccine, and a second dose of an MMR-containing vaccine by 5 years of age.

^eA fourth dose of combined DTPa-IPV vaccine, and a second dose of an MMR-containing vaccine by 6 years of age.

Source: Australian Childhood Immunisation Register.

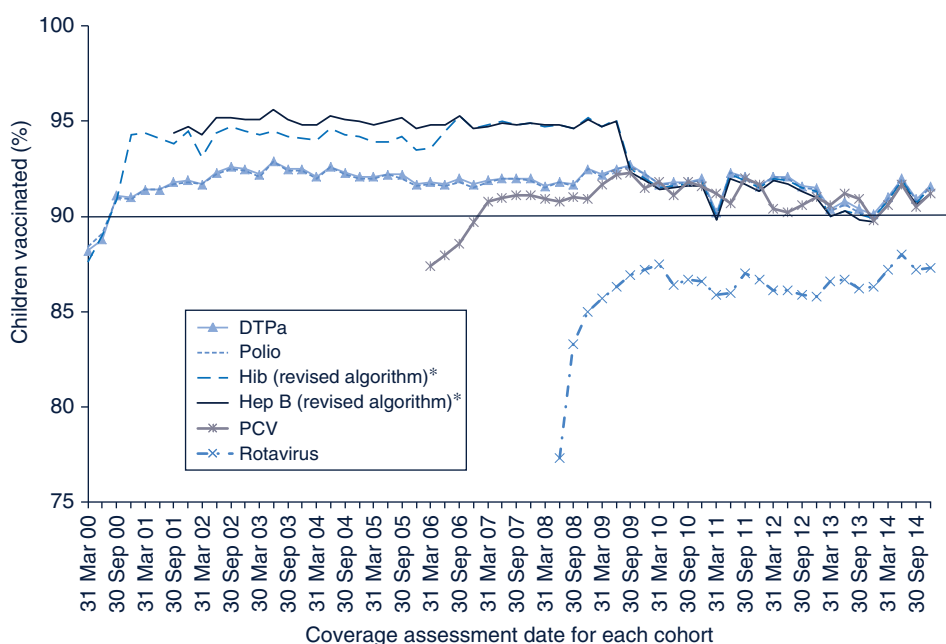


Figure 2. Trends in vaccination coverage estimates by vaccine at 12 months of age (third dose of DTPa, polio, hepatitis B, Hib, rotavirus and 13vPCV), NSW, 2000–2014.

By 3-month birth cohorts born between 1 January 1999 and 31 December 2013. Coverage assessment date was 12 months after the last birth date of each cohort.

*Prior to September 2009, the algorithm stated that receipt of two or three doses of *Haemophilus influenzae* type b (Hib) and hepatitis B vaccines rendered a child 'fully immunised' for these vaccines. After September 2009, changes to the algorithm were made to tighten the rules regarding 'fully immunised' for Hib and hepatitis B vaccines. The new algorithm assessed two or three doses of PRP-OMP containing Hib vaccine or three doses of any other Hib vaccine, and two or three doses of Comvax® hepatitis B vaccine or three doses of all other hepatitis B vaccines.

13vPCV: 13-valent pneumococcal conjugate vaccine

DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation

Source: Australian Childhood Immunisation Register.

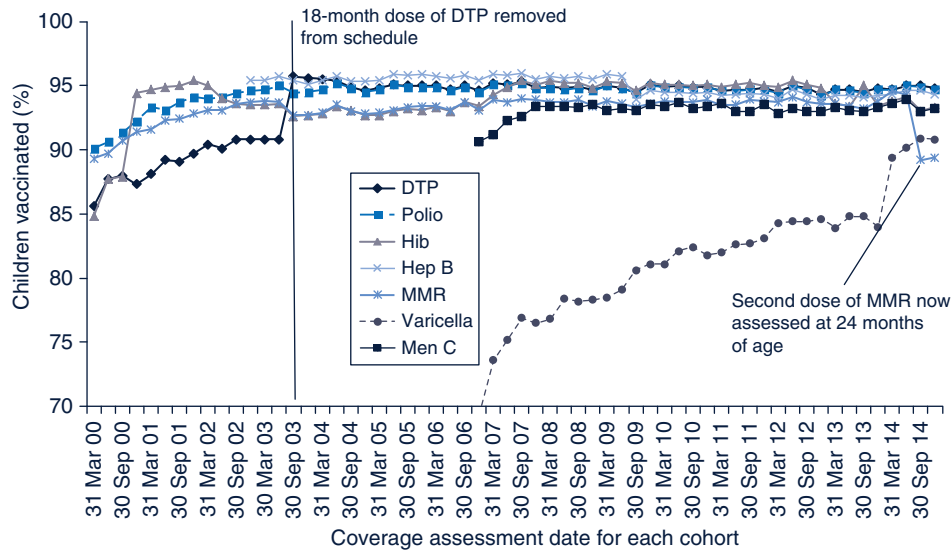


Figure 3. Trends in vaccination coverage estimates by vaccine at 24 months of age (third dose of DTPa [fourth dose – pre-September 2003], third dose of polio, third dose of hepatitis B, fourth dose of Hib, first dose of MMR^a, one dose of varicella and one dose of Men C), NSW 2000–2014.

By 3-month birth cohorts born between 1 January 1998 and 31 December 2012. Coverage assessment date was 24 months after the last birth date of each cohort.

^aA second dose of MMR vaccine assessed from July 2014.

DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation

Hep B: hepatitis B

Hib: *Haemophilus influenzae* type b

Men C: meningococcal C

MMR: measles–mumps–rubella

Source: Australian Childhood Immunisation Register.

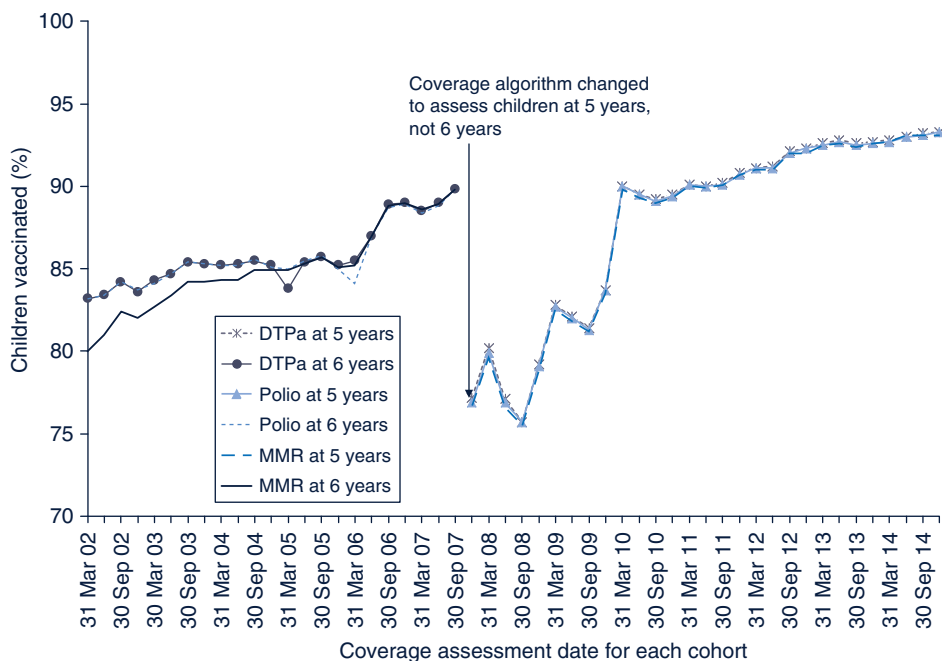


Figure 4. Trends in vaccination coverage estimates by vaccine (fourth dose of DTPa and polio and second dose of MMR) at 5 years of age (6 years up to December 2007), NSW, 2002–2014.

By 3-month birth cohorts born between 1 January 1996 and 31 December 2009. Coverage assessment date was 72 months after the last birth date of each cohort up to December 2007 and then 60 months after the last birth date of each cohort.

DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation

MMR: measles–mumps–rubella

Source: Australian Childhood Immunisation Register.

Table 5. Percentage of children fully immunised at 12 months, 24 months and 5 years of age, by Aboriginal status for each local health district in NSW, compared with NSW and Australia, 2014

Child age and Aboriginal status	Local Health District ^a														Australia %			
	CC %	FW %	HNE %	IS %	MIN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %		WN %	WS %	NSW %
12 months – fully immunised^{b*}																		
Aboriginal	94.1	91.3	93.1	92.7	90.3	90.9	89.4	96.6	87.9	93.8	89.6	89.5	85.0	91.9	88.6	84.8	90.5	88.0
Non-Aboriginal	93.8	93.4	93.5	93.4	89.2	93.3	91.2	93.1	85.8	90.5	91.3	91.1	91.8	91.8	93.9	89.5	91.3	91.7
24 months – fully immunised^{c*}																		
Aboriginal	88.3	90.3	89.7	87.0	81.9	86.2	84.0	91.7	88.6	94.4	86.8	88.5	81.5	93.7	85.4	82.8	87.0	84.1
Non-Aboriginal	89.3	88.7	90.0	88.9	87.4	91.4	86.0	91.5	82.3	85.8	86.1	85.7	90.0	87.7	89.0	85.3	86.9	87.5
5 years – fully immunised^d																		
Aboriginal	97.8	97.7	95.6	95.2	94.9	94.0	94.8	97.3	95.5	87.5	95.1	94.2	90.7	91.1	96.1	94.5	95.2	93.6
Non-Aboriginal	93.8	94.5	94.6	93.6	91.3	95.4	93.4	94.2	86.8	89.9	90.9	93.4	92.6	90.7	94.8	92.2	92.3	92.0

^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.

^bThree doses of the combined DTPa-hepB-IPV-Hib vaccine plus 13vPCV. The third dose assumption is applied.

^cThree or four doses of a DTP-containing vaccine, three doses of polio vaccine, three or four doses of PRP-OMP containing Hib vaccine or four doses of any other Hib vaccine, three or four doses of Comvax[®] hepatitis B vaccine or four doses of all other hepatitis B vaccines, and two doses of a measles, mumps and rubella-containing (MMR) vaccine, one dose of a varicella vaccine and one dose of a meningococcal C vaccine.

^dFour or five doses of a DTP-containing vaccine, four doses of polio vaccine, and two doses of an MMR-containing vaccine.

*Cohort born 1 July to 31 December 2012. In July 2013, the combined *Haemophilus influenzae* type b (Hib) and meningococcal serogroup C vaccine, Menitorix[®], was added to the National Immunisation Program (NIP) schedule at 12 months of age. Also, the combination measles, mumps, rubella, varicella (MMRV) vaccine for children aged 18 months was added to the NIP during the same time.

Source: Australian Childhood Immunisation Register.

Table 6. Vaccination coverage estimates by age, disease and Aboriginal status in NSW, 2014

Disease	Milestone age	Aboriginal	Non-Aboriginal
Diphtheria–tetanus–pertussis	12 months ^a	90.7	92.5
	24 months ^b	95.7	95.1
	5 years ^c	95.5	92.8
Poliomyelitis	12 months ^a	90.7	92.4
	24 months ^b	95.7	95.0
	5 years ^c	95.5	92.8
<i>Haemophilus influenzae</i> type b	12 months ^a	90.7	92.1
	24 months ^b	96.7	95.4
	5 years ^c	NI	NI
Hepatitis B	12 months ^a	90.7	92.0
	24 months ^b	95.7	94.5
	5 years ^c	NI	NI
Measles–mumps–rubella	12 months ^a	NI	NI
	24 months Dose 1 ^b	95.2	93.6
	24 months Dose 2 ^d	89.8	89.5
	5 years ^c	95.8	92.8
Meningococcal C	12 months ^a	NI	NI
	24 months ^b	95.4	93.4
	5 years ^c	NI	NI
Varicella	12 months ^a	NI	NI
	24 months ^b	88.2	89.7
	5 years ^c	NI	NI
Pneumococcal conjugate vaccine	12 months ^a	90.6	91.9
	24 months ^b	NI	NI
	5 years ^c	NI	NI
Rotavirus	12 months ^a	84.1	87.6
	24 months ^b	NI	NI
	5 years ^c	NI	NI

^aBirth cohort born 1 January 2013–31 December 2013.
^bBirth cohort born 1 January 2012–31 December 2012.
^cBirth cohort born 1 January 2009–31 December 2009.
^dBirth cohort born 1 July 2012–31 December 2012.
NI: this vaccine at this age milestone is not included in the calculation of coverage estimates

- Recorded ‘fully immunised’ coverage for the 5-year age group and coverage for all individual vaccines was greater than 90% in all but two LHDs (Northern NSW and Northern Sydney) (Table 4) (Figure 5).

Indigenous coverage

- In 2014, ‘fully immunised’ coverage was lower for Aboriginal children than non-Aboriginal children at the 12-month milestone (90.5% versus 91.3%), but higher at the 24- and 60-month milestones (87.0% versus 86.9% and 95.2% versus 92.3%, respectively; Table 5).
- ‘Fully immunised’ coverage for Aboriginal children at the 12-month milestone was lower, compared with non-Aboriginal children, in some LHDs (e.g. Western NSW, Western Sydney, Southern NSW, and Murrumbidgee) but higher in others (e.g. Northern Sydney, Mid North Coast, Northern NSW, Sydney and Central Coast).

- At the 24-month milestone, some LHDs have higher ‘fully immunised’ coverage for Aboriginal children (e.g. Far West, Northern NSW, Northern Sydney, South Western Sydney, South Eastern Sydney, and Sydney), but some have lower coverage (e.g. Central Coast, Hunter New England, Mid North Coast, Murrumbidgee, Southern NSW, Western NSW and Western Sydney) (Table 5).
- At the 60-month milestone, ‘fully immunised’ coverage was higher for Aboriginal than non-Aboriginal children in all LHDs except Murrumbidgee, Northern NSW, Northern Sydney, and Southern NSW (Table 5).
- At the NSW level, differences in coverage estimates for individual vaccines by Aboriginal status were similar to those for ‘fully immunised’ status at the three age milestones (Tables 5 and 6).

Table 7. Percentage of children with vaccination delay for the second dose of measles-mumps-rubella due at 48 months of age by Aboriginal status for each local health district for the cohort of children born in NSW in 2008

Vaccination delay and Aboriginal status	Local Health District ^a																
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW
1–6 months late																	
Aboriginal (%)	49.3	32.6	35.2	33.7	44.2	44.6	39.8	15.6	39.6	34.8	47.0	43.9	40.0	46.5	37.1	42.9	39.1
Non-Aboriginal (%)	42.2	38.4	36.8	42.6	40.4	39.7	41.5	31.3	43.5	38.7	39.3	35.1	41.7	36.8	40.1	34.1	38.1
>6 months late																	
Aboriginal (%)	7.3	6.5	9.7	9.9	8.7	7.0	8.9	3.1	10.4	4.4	15.2	12.3	11.6	11.3	13.0	9.5	10.1
Non-Aboriginal (%)	4.5	6.6	4.7	5.4	5.6	5.0	5.8	4.7	6.8	6.5	5.5	6.1	5.8	6.0	5.8	6.1	5.8

^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.

Source: Australian Childhood Immunisation Register.

Table 8. Percentage of children with vaccination delay for the second dose of measles-mumps-rubella due at 18 months of age by Aboriginal status for each local health district for the cohort of children born 1 July – 31 December 2012 in NSW

Vaccination delay and Aboriginal status	Local Health District ^a																
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW
1–6 months late																	
Aboriginal (%)	29.6	33.3	28.8	33.9	38.9	23.3	30.6	33.3	34.0	33.3	42.9	36.6	32.5	33.9	36.1	31.3	32.4
Non-Aboriginal (%)	24.6	25.4	18.9	22.3	22.3	21.9	22.5	20.7	24.2	20.5	21.1	23.0	23.4	19.7	22.4	21.0	21.4
>6 months late																	
Aboriginal (%)	2.6	6.7	3.0	2.4	2.3	0.8	3.7	8.3	3.1	5.6	2.0	1.4	5.0	3.4	4.6	2.7	3.1
Non-Aboriginal (%)	1.9	1.5	1.3	2.1	1.0	1.5	2.2	1.8	2.0	1.8	1.8	2.1	1.8	1.9	1.6	2.1	1.9

^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.

Source: Australian Childhood Immunisation Register.

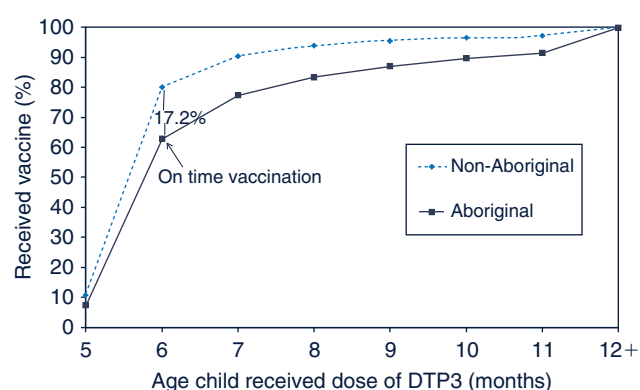


Figure 5. Timeliness of the third dose of DTPa vaccine (DTP3) by Aboriginal status for the cohort of children born in 2012 in NSW.

Percentage covered = number of children who received vaccine dose at particular ages/the total number of children who received the vaccine dose

DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation

Source: Australian Childhood Immunisation Register.

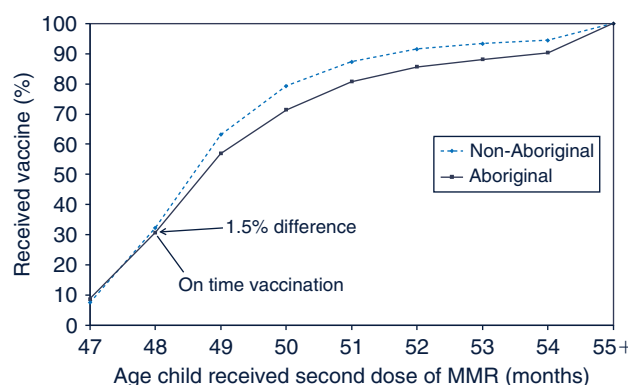


Figure 6. Timeliness of the second dose of MMR vaccine due at 48 months of age by Aboriginal status for the cohort of children born in 2008 in NSW.

Percentage covered = number of children who received vaccine dose at particular ages/the total number of children who received the vaccine dose.

MMR: measles–mumps–rubella

Source: Australian Childhood Immunisation Register.

Timeliness

- For the third dose of DTPa and second dose of MMR vaccines, there is greater delay in immunisation for

Aboriginal children than non-Aboriginal children (Tables 7 and 8; Figures 5, 6 and 7). For DTPa coverage measured at the 12-month milestone, the disparity in ‘on time vaccination’ has increased slightly from the 2013

report (by 0.7 of a percentage point to 17.2%) and decreased for MMR due at 48 months (by 1.7 percentage points to 1.5%).

- With the second dose of MMR vaccine being due at 18 months of age for half the cohort in 2014, we examined timeliness of this dose and found great improvements in ‘on time’ immunisation for both Aboriginal and non-Aboriginal children compared with the second dose of MMR due at 48 months (Figures 6 and 7).
- The disparity in vaccination delay for the third dose of DTPa between Aboriginal children and non-Aboriginal children varies between LHDs (Table 9). For almost all LHDs in NSW, Aboriginal children experience higher levels of vaccination delay, at both 1–6 months and greater than 6 months delay (Table 9).
- During most of 2014, more than 75% of children in NSW received their first dose of hexavalent

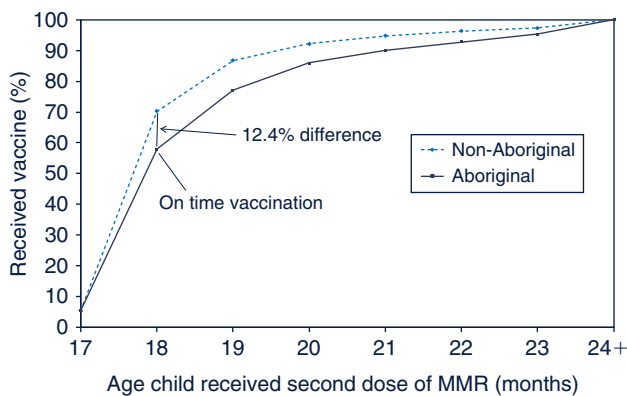


Figure 7. Timeliness of the second dose of MMR vaccine due at 18 months of age by Aboriginal status for the cohort of children born 1 July – 31 December 2012 in NSW (data as at 30 June 2015).

Percentage covered = number of children who received vaccine dose at particular ages/the total number of children who received the vaccine dose.
MMR: measles–mumps–rubella

Source: Australian Childhood Immunisation Register.

combination vaccine between 6 and less than 8 weeks (Figure 8). This percentage has been increasing since 2009 when vaccination at 6 weeks was encouraged to provide early protection against whooping cough.

Small area coverage

- Coverage by small area (SA3) varied across the state for rotavirus (77.2–93.2%) and pneumococcal conjugate vaccine (81.2–97.4%) measured at the 12-month milestone, the second dose of MMR measured at the 24-month milestone (79.4–94.9%), and the second dose of MMR measured at the 60-month milestone (81.1–96.5%; Figures 9–12).

Vaccine objection status

The percentage of children with a registered vaccine objection varied by LHD, from a high of 7.6% in Northern NSW to a low of 0.8% in the Far West (Table 10). Further, the percentage of children with no vaccines recorded and with no registered objection also varied by LHD (Table 10).

Adolescent coverage

- Coverage in adolescents varied by vaccine and dose with better coverage for the first and second doses of human papillomavirus (HPV) vaccine, compared with the third dose, in both females and males, (Table 11).
- Across the four years 2011–2014, there was an increase in coverage for adolescents for most vaccines. In particular, coverage for the third dose of HPV vaccine for females increased 10 percentage points from 2011 to 2014 (71% to 81%). Varicella coverage decreased from 45% in 2011 to 42% in 2014 (Table 11) however, this vaccine is only recommended for children who were not vaccinated in infancy or who have not had the disease.
- Coverage estimates are for school attendees and do not include doses administered in general practice.

Table 9. Percentage of children with vaccination delay for the third dose of DTPa by Aboriginal status for each local health district for the cohort of children born in NSW in 2012

Vaccination delay and Aboriginal status	Local Health District ^a																
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW
1–6 months late																	
Aboriginal (%)	29.4	25.0	24.9	28.8	31.9	23.2	27.9	28.6	25.5	28.1	19.8	28.9	28.5	25.9	28.5	30.8	27.1
Non-Aboriginal (%)	18.6	18.9	13.9	17.0	17.4	16.1	17.3	16.7	17.9	11.9	12.9	17.0	14.9	12.0	15.3	13.9	14.7
>6 months late																	
Aboriginal (%)	4.8	8.8	5.6	6.0	7.2	7.0	4.5	4.8	7.5	0.0	1.9	5.2	4.2	8.0	9.2	8.1	6.5
Non-Aboriginal (%)	2.1	2.3	1.9	2.6	3.6	2.7	2.2	3.0	3.7	2.0	2.0	3.0	2.2	2.0	2.4	2.7	2.4

^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.
DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation
Source: Australian Childhood Immunisation Register.

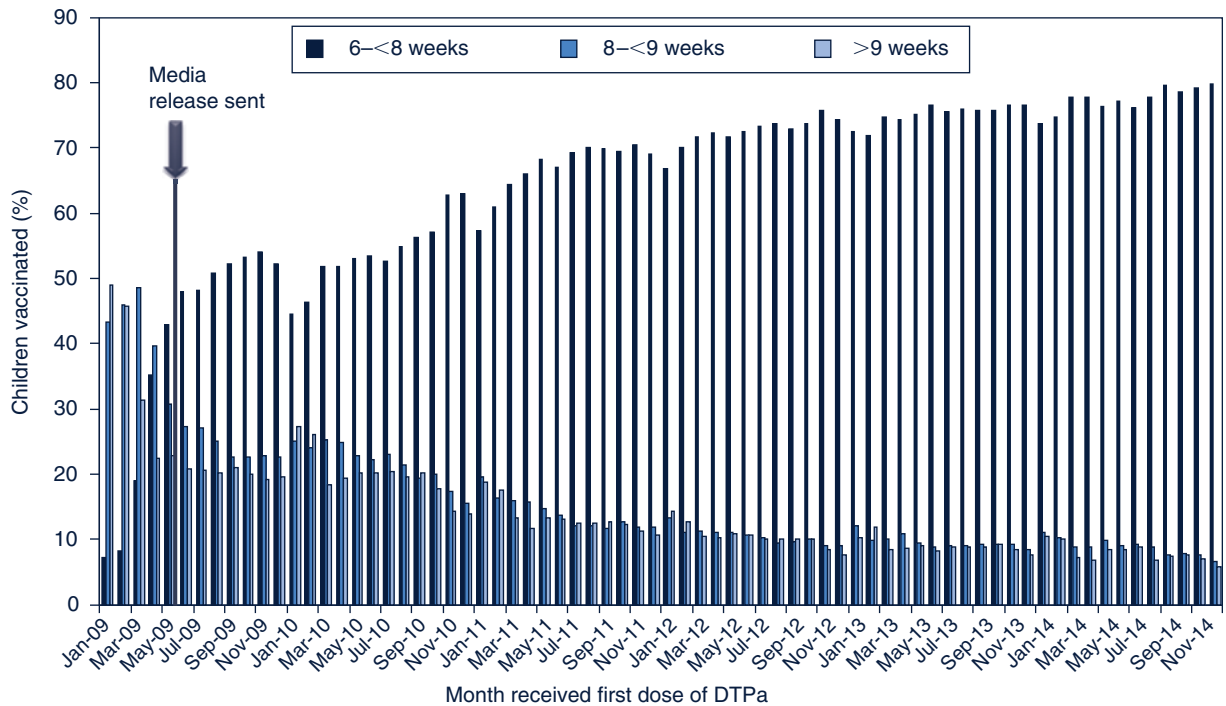


Figure 8. Age at which children in NSW received their first dose of hexavalent combination vaccine by month of receipt, January 2009–December 2014.

The media release was a message for providers and the public on 10 March 2009 that asked parents and providers to consider bringing the first dose of pertussis-containing vaccine forward to 6 weeks of age to provide earlier protection. Hexavalent combination: diphtheria–tetanus–pertussis (acellular), polio, Hib, hepatitis B – paediatric formulation

Source: Australian Childhood Immunisation Register.

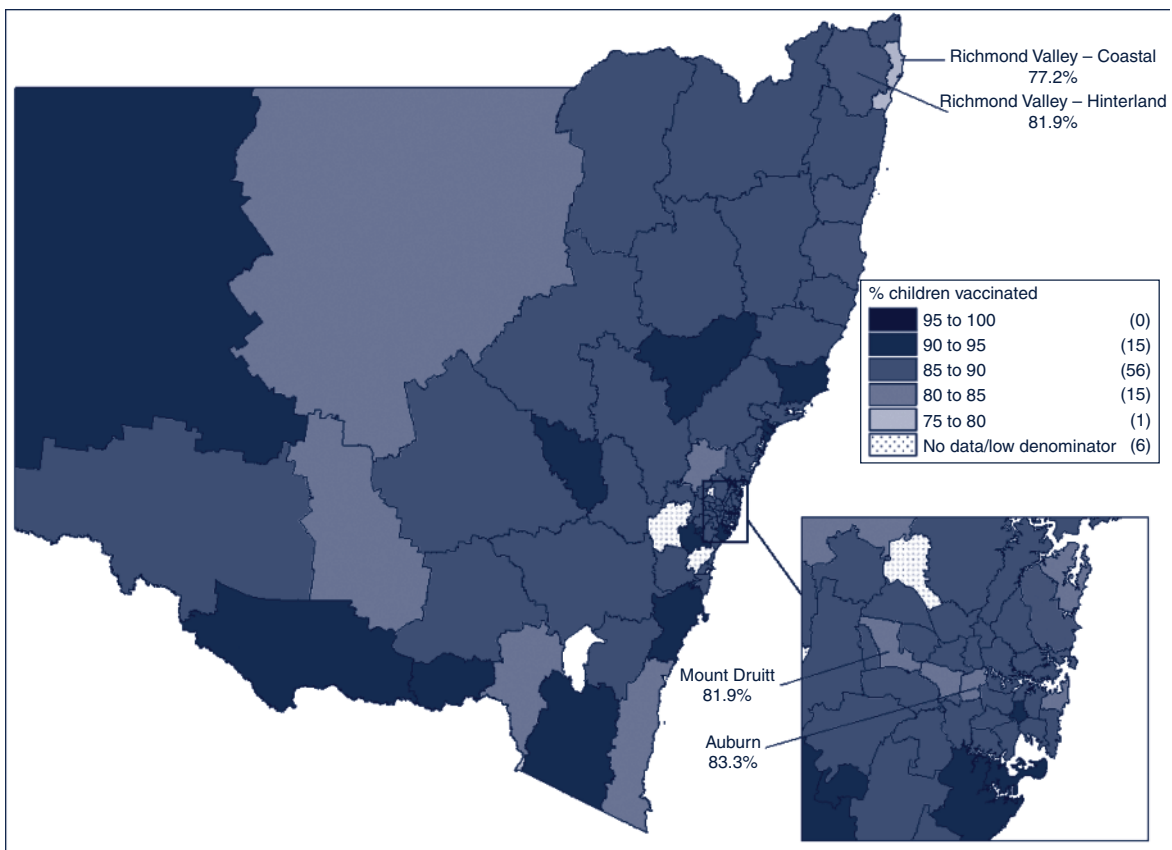


Figure 9. Rotavirus vaccine coverage at 12 months of age, by statistical areas level 3, NSW, for the cohort of children born in 2013. Source: Australian Childhood Immunisation Register.

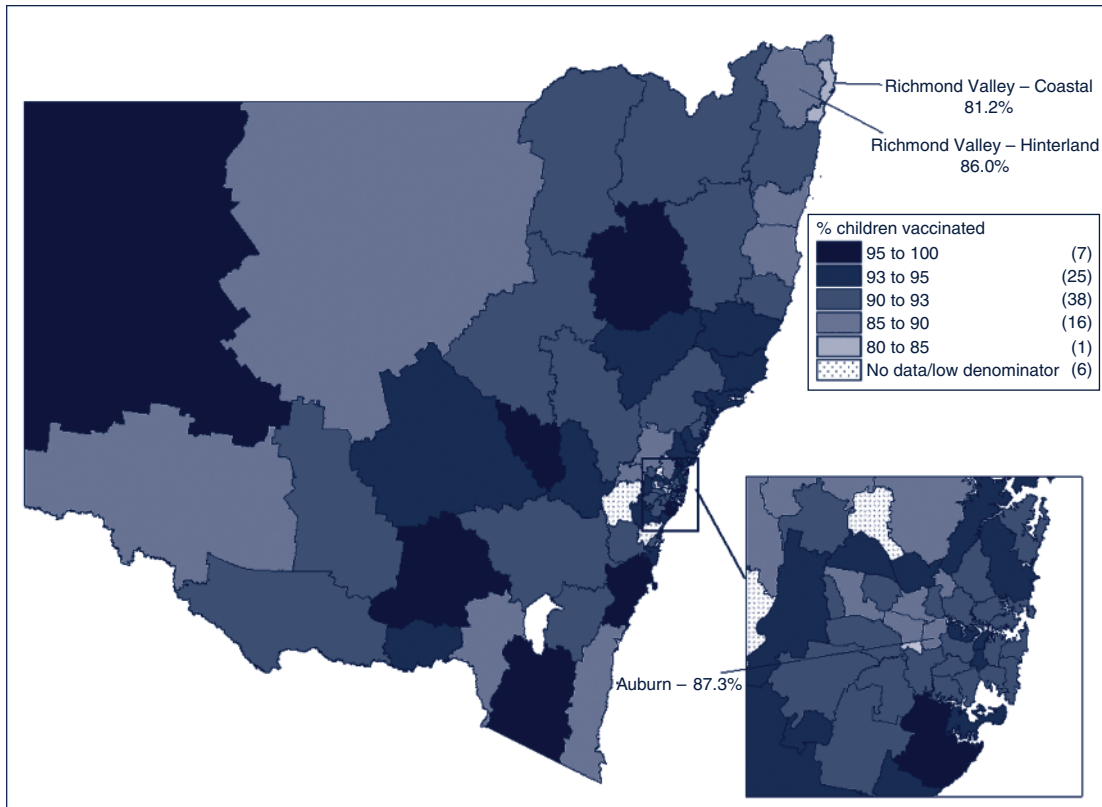


Figure 10. Pneumococcal conjugate vaccine coverage at 12 months of age, by statistical area level 3, NSW, for the cohort of children born in 2013.

Source: Australian Childhood Immunisation Register.

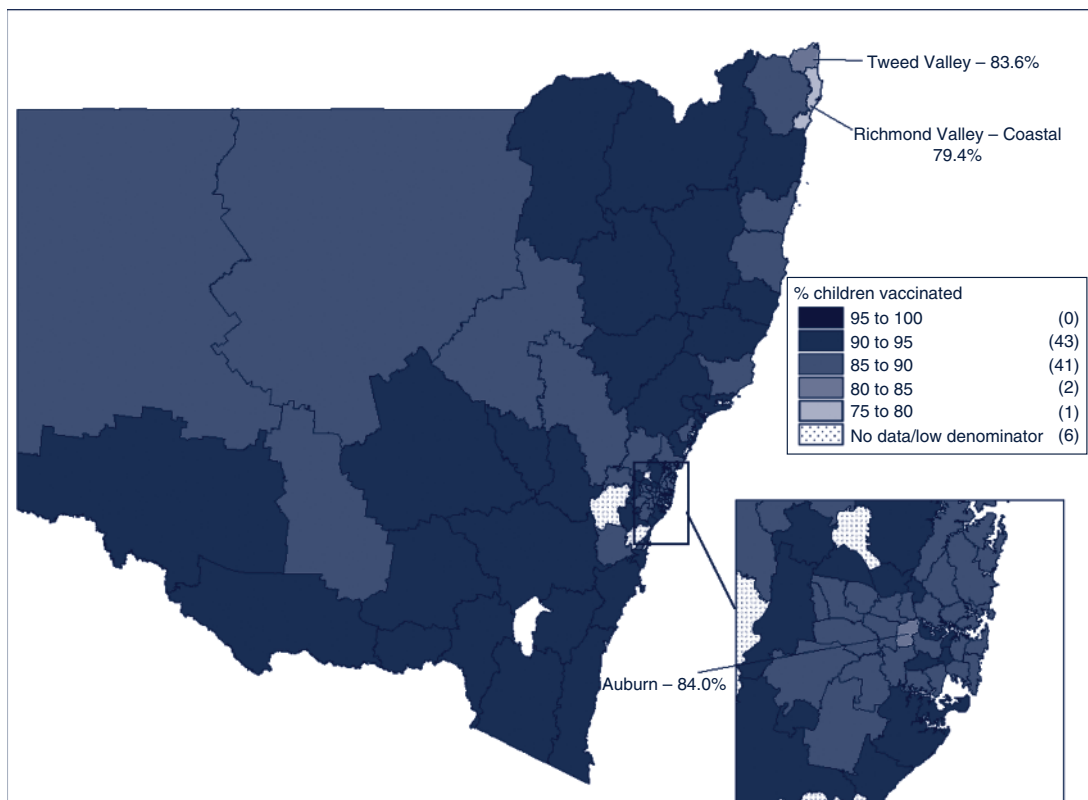


Figure 11. Second dose MMR vaccine coverage at 24 months of age, by statistical area level 3, NSW, for the cohort of children born July-December 2012.

Source: Australian Childhood Immunisation Register.

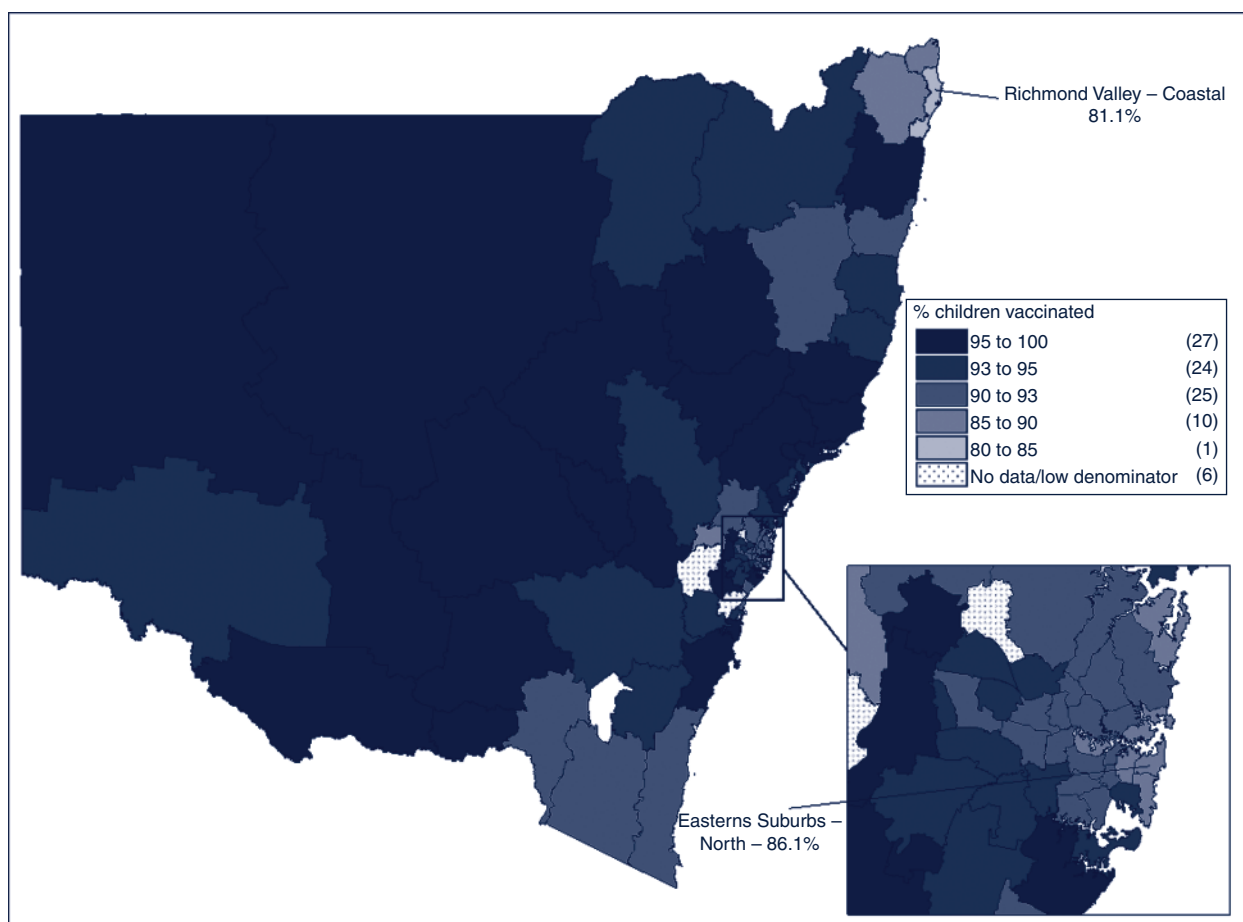


Figure 12. Second dose MMR vaccine coverage at 60 months of age, by statistical area level 3, NSW, for the cohort of children born in 2009.

Source: Australian Childhood Immunisation Register.

Table 10. Percentage of children by recorded vaccination objection status and immunisation status for the cohort born 1 January 2008 – 31 December 2013 and assessed in 2014, for each local health district in NSW, compared with NSW

Vaccine	Local Health District ^a																
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW
Objection with no vaccines recorded (%)	1.3	0.5	0.8	1.0	2.6	0.8	1.0	1.1	4.9	1.0	0.8	0.5	1.5	0.8	0.5	0.5	1.0
Objection with at least one vaccine recorded (%)	1.0	0.3	0.7	0.8	1.6	0.6	0.7	1.1	2.7	1.0	0.9	0.4	1.1	0.7	0.5	0.4	0.8
Total recorded objection	2.3	0.8	1.5	1.8	4.2	1.4	1.7	2.2	7.6	2.0	1.7	0.9	2.6	1.5	1.0	0.9	1.8
No objection and no vaccines recorded (%)	1.2	1.1	1.1	1.4	1.5	1.1	1.3	1.1	2.2	2.7	2.7	1.9	1.5	2.8	1.0	2.4	2.0

^aCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MN: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NV: Network with Victoria; NN: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SN: Southern NSW; SYD: Sydney; WN: Western NSW; WS: Western Sydney; NSW: New South Wales.

Source: Australian Childhood Immunisation Register.

Coverage in the elderly

- The proportion of people aged 65 years and over reporting vaccination for influenza in the past 12 months remained relatively stable and over 70% in NSW during the period 2002–2014 (Figure 13 and Table 12). However, the percentage reporting pneumococcal vaccination (23-valent pneumococcal polysaccharide vaccine)

in the previous 5 years is lower and decreased further in 2013 and 2014 (Figure 13 and Table 12). This is likely due to the changed recommendation that non-Indigenous adults aged 65 years and over that do not have any condition that predisposes them to an increased risk of invasive pneumococcal disease no longer require a repeat dose.

Table 11. Vaccination coverage estimates for individual vaccines, NSW adolescent school attendees in NSW, 2011–2014

Vaccine	2014 coverage (%)	2014 doses given	2013 coverage (%)	2013 doses given	2012 coverage (%)	2012 doses given	2011 coverage (%)	2011 doses given
HPV dose 1 ^{a,b} – females	87	37119	86	36 911	86	36 811	81	34 524
HPV dose 2 ^{a,b} – females	85	36333	84	35 855	83	35 749	76	32 582
HPV dose 3 ^{a,b} – females	81	34594	79	34 090	73	31 562	71	30 426
HPV dose 1 ^{a,b} – males	83	37155	80	36 268	na	na	na	na
HPV dose 2 ^{a,b} – males	81	36424	78	35 406	na	na	na	na
HPV dose 3 ^{a,b} – males	77	34742	75	33 857	na	na	na	na
Hepatitis B dose 1 ^b	na	na	51	44 933	69	60 925	68	30 426
Hepatitis B dose 2 ^b	na	na	46	40 233	63	54 948	63	53 517
dTpa ^b	84	73856	81	71 918	81	70 997	77	65 756
dTpa ^c	na	na	na	na	67	58 065	66	57 633
Varicella ^b	42	37123	53	46 738	50	43 714	45	38 409
HPV dose 1 ^d – males	74	33714	70	31 940	na	na	na	na
HPV dose 2 ^d – males	71	32252	67	30 373	na	na	na	na
HPV dose 3 ^d – males	59	26669	56	25 277	na	na	na	na

^aHPV vaccination coverage includes dose 2 and 3 catch-up vaccination offered to students in Year 8 in Terms 1–2 in 2015 who commenced the three-dose course of HPV vaccine in Year 7 in 2014. Coverage for this cohort is preliminary as data are not yet available for catch-up doses given to students in Terms 3–4 in 2015.

^bYear 7 school attendees.

^cYear 10 school attendees.

^dYear 9 school attendees.

na: not applicable

HPV: human papillomavirus

dTpa: diphtheria–tetanus–pertussis (acellular) – adolescent and adult formulation

Source: NSW School Vaccination Program.

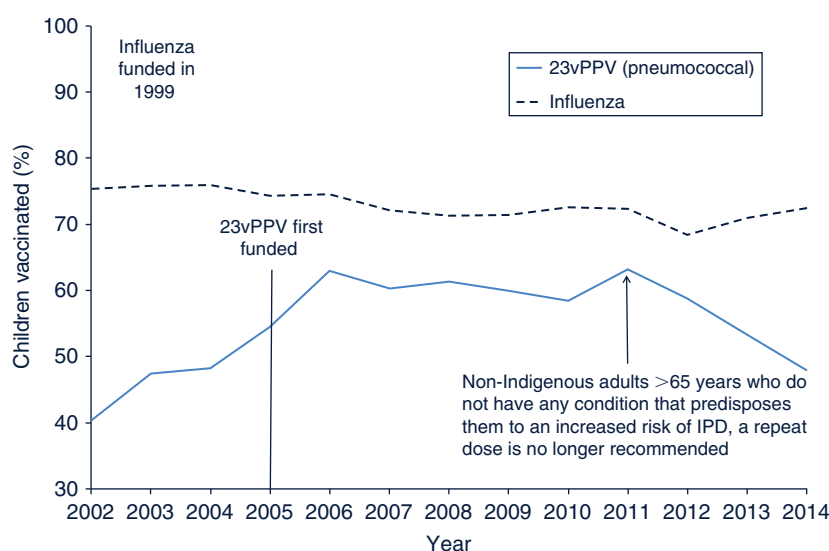


Figure 13. Trends in vaccination coverage estimates by vaccine for adults aged 65 years and over in NSW, vaccinated against pneumococcal disease in the past 5 years and vaccinated against influenza in the past 12 months, 2002–2014.

23vPPV: 23-valent pneumococcal polysaccharide vaccine

IPD: invasive pneumococcal disease

Source: NSW Population Health Survey 2014 (SAPHaRI). Centre for Epidemiology and Evidence, NSW Ministry of Health.

Conclusion

ACIR data presented in this report reflect the successful delivery of the National Immunisation Program in NSW, while identifying some areas for improvement, especially

with regard to vaccination delay in Aboriginal children. The continuing improvement of coverage at the 60-month milestone, especially for Aboriginal children, is welcome. ‘Fully immunised’ coverage for this age group and

Table 12. Percentage of adults aged 65 years and over reporting vaccination^a against pneumococcal disease and influenza for each local health district in NSW, and for NSW, 2014

Vaccine	Local Health District ^b															
	CC	FW	HNE	IS	MNC	MM	NBM	NNSW	NS	SES	SWS	SNSW	SYD	WNSW	WS	NSW
Pneumococcal % vaccinated	53.1	50.9	54.5	51.3	47.3	49.5	46.4	47.2	48.0	37.6	43.2	42.6	44.1	53.2	50.5	47.9
Influenza % vaccinated	78.0	74.4	79.2	74.5	69.8	65.9	68.3	69.0	73.7	68.3	66.4	70.7	69.3	75.9	77.1	72.5

^aVaccinated against pneumococcal disease in the past 5 years and vaccinated against influenza in the past 12 months.
^bCC: Central Coast; FW: Far West; HNE: Hunter New England; IS: Illawarra Shoalhaven; MNC: Mid North Coast; MM: Murrumbidgee; NBM: Nepean Blue Mountains; NNSW: Northern NSW; NS: Northern Sydney; SES: South Eastern Sydney; SWS: South Western Sydney; SNSW: Southern NSW; SYD: Sydney; WNSW: Western NSW; WS: Western Sydney; NSW: New South Wales.
Source: New South Wales Population Health Survey 2014 (SAPHaRI). Centre for Epidemiology and Evidence, NSW Ministry of Health.

coverage for all individual vaccines is now greater than 90% in most LHDs. Some improvements in timeliness of immunisation over time have also been observed, especially for the first dose of hexavalent vaccine, which demonstrates early protection for many young infants from pertussis infection. There has been a considerable increase in coverage for adolescents for most vaccines and particularly for the third dose of HPV vaccine. The ACIR, the NSW Population Health Survey and monitoring through the NSW School Vaccination Program continue to be very useful tools for administering the National Immunisation Program and monitoring its implementation in NSW.

References

- Hull B, Deeks S, Menzies R, McIntyre P. Immunisation coverage annual report, 2007. *Commun Dis Intell Q Rep* 2009; 33: 170–87.
- Hull BP, Deeks SL, McIntyre PB. The Australian Childhood Immunisation Register – a model for universal immunisation registers? *Vaccine* 2009; 27: 5054–60. doi:10.1016/j.vaccine.2009.06.056
- Hull BP, McIntyre PB, Heath TC, Sayer GP. Measuring immunisation coverage in Australia: a review of the Australian Childhood Immunisation Register. *Aust Fam Physician* 1999; 28: 55–60.
- O’Brien ED, Sam GA, Mead C. Methodology for measuring Australia’s childhood immunisation coverage. *Commun Dis Intell* 1998; 22: 36–7.
- Hull BP, McIntyre PB. Immunisation coverage reporting through the Australian Childhood Immunisation Register – an evaluation of the third-dose assumption. *Aust N Z J Public Health* 2000; 24: 17–21. doi:10.1111/j.1467-842X.2000.tb00717.x
- Hull BP, Lawrence GL, MacIntyre CR, MacIntyre PB. Estimating immunisation coverage: is the ‘third dose assumption’ still valid? *Commun Dis Intell Q Rep* 2003; 27: 357–61.
- Rank C, Menzies RI. How reliable are Australian Childhood Immunisation Register coverage estimates for Indigenous children? An assessment of data quality and coverage. *Commun Dis Intell Q Rep* 2007; 31: 283–7.
- Australian Bureau of Statistics (ABS). Australian Standard Geographical Classification (ASGC), 2001. Cat. no. 1216.0. Canberra: ABS; 2001.
- MapInfo. MapInfo Pro version 15.0. Stamford, Connecticut, USA: Pitney Bowes Software Inc.; 2015.
- Australian Bureau of Statistics (ABS). Australian Statistical Geography Standard (ASGS): Correspondences, July 2011. Canberra 2012. Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1270.0.55.006Main+Features1July%202011?OpenDocument> (Cited 17 November 2014).
- NSW Health. NSW Population Health Survey (SAPHaRI). Centre for Epidemiology and Evidence, NSW Ministry of Health. Sydney: NSW Ministry of Health; 2015. Available from: http://www.healthstats.nsw.gov.au/Indicator/com_flupneumoimmu_age/com_flupneumoimmu_lhn?&topic=Immunisation&topic1=topic_immu&code=immu (Cited 7 October 2015).
- Ward KF, Menzies RI, Quinn HE, Campbell-Lloyd S. School-based vaccination in NSW. *N S W Public Health Bull* 2010; 21: 237–42. doi:10.1071/NB10046
- Australian Government Department of Health. Frequently asked questions: changes to national immunisation schedule and related payments. [Web page] Canberra: Australian Government Department of Health; 2013. Available from: <http://www.humanservices.gov.au/customer/subjects/immunising-your-children#a5> (Cited 8 May 2015).