

NSW Annual Immunisation Coverage Report, 2018

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Abstract: Introduction: This annual report documents vaccination coverage in NSW for children, adolescents and the elderly, up to and including data for 2018. **Methods:** Data from the Australian Immunisation Register (AIR), the NSW School Vaccination Program and the NSW Population Health Survey were used to calculate measures of population vaccination coverage for the calendar year 2018, with particular focus on changes from 2017, and to document coverage trends from 2009 onwards. Vaccination timeliness and trends in on-time vaccination for Aboriginal and non-Aboriginal children were also assessed using AIR data. **Results:** 'Fully vaccinated' coverage at 12 months of age was 93.8% in 2018, stable compared with 2017. Following the decrease in 'fully vaccinated' coverage at 24 months of age in 2017 to just below 90% (likely due to the change in algorithm to include the fourth dose of diphtheria, tetanus, and acellular pertussis-containing vaccine given at 18 months of age), coverage at this milestone increased in 2018 to be just above 90%. 'Fully vaccinated' coverage at 60 months of age increased from 93.5% in 2017 to 93.9% in 2018. Although 'fully vaccinated' coverage for Aboriginal children at 12 and 24 months of age decreased slightly between 2017 and 2018, coverage at 60 months of age increased from 97.0% in

2017 to 97.5% in 2018. At each milestone, 'fully vaccinated' coverage was higher in Aboriginal children compared with non-Aboriginal children in NSW, with the greatest difference (3.7 percentage points) seen at the 60-month milestone. However, on-time vaccination (within 30 days of the schedule point) for the second dose of 13-valent pneumococcal conjugate vaccine, the third dose of diphtheria, tetanus, and acellular pertussis-containing vaccine and the first and second dose of measles, mumps and rubella-containing vaccine remained less optimal in Aboriginal children in 2018. In 2018, 85% of Year 7 female students and 83% of Year 7 male students received a first dose of human papillomavirus vaccine (one percentage point lower than in 2017 for both). Coverage of the adolescent diphtheria, tetanus, and acellular pertussis-containing vaccine booster dose in Year 7 students has remained stable at 85% for the past 3 years. Coverage of meningococcal ACWY conjugate vaccine in Year 10 and 11 students was 70% in 2018, three percentage points lower than in 2017 for Year 11. In 2018, self-reported receipt of the influenza vaccine in the previous 12 months in persons aged 65 years and over increased by 5 percentage points from 72.6% in 2017 to 77.4% in 2018. **Conclusion:** Improved vaccination coverage over the past decade has been achieved in NSW through a number of strategies including the Save the Date to Vaccinate campaign and smartphone app, the Aboriginal Immunisation Healthcare Worker Program, the introduction of early childhood education and care enrolment requirements in 2014 that were further strengthened in 2018, and other strategies implemented in low coverage areas. This report reflects the continued successful delivery of the vaccination program across the age spectrum in NSW.

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Box 1. Selected recent and significant changes in immunisation policy relevant to NSW³

July 2018: Schedule for routine childhood vaccination with 13-valent pneumococcal conjugate vaccine (13vPCV) changed from 2, 4 and 6 months of age to 2, 4 and 12 months of age.

Meningococcal ACWY conjugate vaccine funded for all children at 12 months of age, replacing the combined *Haemophilus influenzae type b (Hib)* and meningococcal C vaccine, with the Hib component moved to 18 months of age and given as monovalent vaccine.

April 2018: Annual seasonal influenza vaccination funded by NSW Health for all children aged 6 months – <5 years and enhanced trivalent influenza vaccines (high-dose and adjuvanted) funded nationally for all adults aged ≥65 years.

January 2018: Further strengthening of the vaccination requirements for childcare enrolment in NSW.⁴

Meningococcal ACWY school-based vaccination program funded for all NSW secondary school students in Years 10 and 11, as well as adolescents aged 15 to 19 years who have not received the vaccine at school.⁵

May 2017: Meningococcal ACWY school-based vaccination program funded for all NSW secondary school students in Years 11 and 12, as well as adolescents aged 17 to 18 years who no longer attend school.⁵

February 2017: 2-dose human papillomavirus (HPV) vaccine schedule adopted in NSW for Year 7 students in line with World Health Organization recommendations.⁶

November 2016: National herpes zoster (HZ) vaccination program commenced with a single dose of HZ vaccine at 70 years of age and a catch-up program for people aged 71–79 years.

April 2016: A booster (fourth) dose of diphtheria–tetanus–acellular pertussis (DTPa)-containing vaccine at 18 months of age re-introduced onto the national childhood vaccination schedule.

January 2016: New national immunisation requirements for federal government family assistance payments (the ‘No Jab, No Pay’ policy⁷) came into effect. Only parents of children (aged less than 20 years) who are ‘fully vaccinated’ or on a recognised catch-up schedule continue to receive the Child Care Benefit, Child Care Rebate, and/or the Family Tax Benefit Part A end-of-year supplement. Children with medical contraindications or natural immunity for certain diseases continue to be exempt from the requirements. However, conscientious objection is no longer a valid exemption from immunisation requirements.

March 2015: A booster (fourth) dose of DTPa vaccine recommended at 18 months of age.

January 2014: Implementation of strengthened vaccination requirements for childcare enrolment in NSW.⁴

Introduction

This is the 10th annual immunisation coverage report for NSW, with analysis encompassing the years 2009–2018. These annual reports provide important information on trends and issues in vaccination coverage and facilitate the monitoring of NSW vaccination 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 by the National Centre for Immunisation Research and Surveillance (NCIRS) since 2009.¹

High levels of reporting to the Australian Immunisation Register (AIR) are maintained for childhood vaccinations by a system of incentive payments for immunisation providers and parents/guardians.² Reported vaccination coverage may be impacted by changes to immunisation policy, the incentive payment system and changes to the ‘fully vaccinated’ coverage algorithms. Some of the key changes in immunisation policy are highlighted in Box 1. The vaccines delivered through the NSW Immunisation Program in 2018 for all ages are outlined in Table 1.

Methods

The Australian Immunisation Register (AIR)

The Australian Childhood Immunisation Register (ACIR) was established on 1 January 1996 by incorporating demographic data from Medicare on all enrolled children aged less than 7 years.⁸ Up to 31 December 2015, all vaccination records for a child remained on the register indefinitely, but no new vaccination encounter records were added after the 7th birthday.² From 1 January 2016, the immunisation register was changed to include records of vaccinations given up to less than 20 years of age and was further expanded from 30 September 2016 to become the AIR, which captures records of vaccinations given to eligible individuals in Australia throughout their life.⁹

Participation in the AIR is opt-out so it constitutes a nearly complete population register. Persons not enrolled in Medicare can be added to the AIR via a supplementary number. Since 2001, vaccinations given overseas may be recorded if a provider endorses their validity. Data are transferred to the AIR when a recognised immunisation provider supplies details of an eligible vaccination. This can be done electronically (e.g. via medical practice software or through direct data entry on the AIR website) or by submitting paper encounter or history forms. Medical contraindications or

Table 1. NSW Immunisation Program Schedule for children, adolescents and adults in 2018

Age	Vaccine						
Children							
Birth	Hep B						
6 weeks	Hep B ^a	DTPa ^a	Hib ^a	IPV ^a		13vPCV	Rotavirus
4 months	Hep B ^a	DTPa ^a	Hib ^a	IPV ^a		13vPCV	Rotavirus
6 months	Hep B ^a	DTPa ^a	Hib ^a	IPV ^a		13vPCV ^b	Flu ^c
12 months					MMR	Men ACWY ^d	13vPCV ^b
18 months		DTPa	Hib ^e		MMRV		Flu ^c
4 years		DTPa ^f		IPV ^f			Flu ^c
Adolescents							
12 years (Year 7)	dTpa					HPV ^g	
16–17 years (Year 10–11)					Men ACWY ^h		
15 years							Flu ^c Pneumo ⁱ
Adults							
≥50 years							Flu ^c Pneumo ^j
≥65 years							Flu ^c Pneumo
70 years					HZ ^k		
Pregnant women	dTpa ^l						Flu ^m
<p>Hep B: hepatitis B; DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation; Hib: <i>Haemophilus influenzae</i> type b; IPV: inactivated polio vaccine; 13vPCV: 13-valent pneumococcal conjugate vaccine; Flu: influenza; MMR: measles-mumps-rubella; Men ACWY: meningococcal ACWY conjugate vaccine; MMR: measles-mumps-rubella-varicella; dTpa: diphtheria–tetanus–pertussis (acellular) – adolescent/adult formulation; HPV: human papilloma virus; Pneumo: Pneumovax 23 vaccine; HZ: herpes zoster.</p> <p>^aUsually given as combined DTPa-HepB-IPV-Hib vaccine.</p> <p>^bThird dose of 13vPCV vaccine given at 12 months of age as of 1 July 2018 instead of 6 months of age. Children with medical risk factors will still receive a dose at 6 months of age as well as a dose at 12 months of age.</p> <p>^cAnnual vaccination, all aged ≥6 months with medical risk factors, all children aged ≥6 months – 5 years, Aboriginal people aged ≥15 years, non-Aboriginal adults aged ≥65 years.</p> <p>^dAs of 1 July 2018, MenACWY vaccine replaced Hib-MenC vaccine given at 12 months of age.</p> <p>^eAs of 1 July 2018, a monovalent Hib vaccine given at 18 months of age.</p> <p>^fUsually given as combined DTPa-IPV vaccine.</p> <p>^gTwo-dose schedule.</p> <p>^hNSW Meningococcal W Response Program implemented meningococcal ACWY vaccination targeted at older adolescents (students in Year 10 and 11).</p> <p>ⁱAboriginal people aged ≥15 years with medical risk factors.</p> <p>^jAll Aboriginal adults only.</p> <p>^kFrom 1 November 2016, a single dose of HZ vaccine is recommended and funded for adults at 70 years of age. Adults aged 71–79 years are eligible under a five-year catch up program until 31 October 2021.</p> <p>^lUsually given to pregnant women at 28 weeks gestation but can be given anytime between 20–32 weeks gestation of each pregnancy and should be given as early as possible (from 20 weeks) to women identified as being at risk of early delivery.</p> <p>^mAt any stage of pregnancy.</p> <p>Source: http://www.health.nsw.gov.au/immunisation/Publications/nsw-immunisation-schedule.pdf.</p>							

natural immunity to certain diseases, based on guidance from the Australian Immunisation Handbook¹⁰ and a vaccination provider factsheet,⁷ can only be reported by general practitioners using the AIR Medical Exemption Form.¹¹ All vaccination records for a person remain on the register indefinitely. As of 1 January 2016, conscientious objection to vaccination was no longer recorded on the AIR.

Measuring childhood vaccination coverage using the AIR

This report details vaccination coverage for 2018 using AIR data up to 31 March 2019 and where relevant,

comparisons have been made to vaccination coverage as reported in the 2017 NSW annual immunisation report.¹² The cohort method has been used for calculating coverage at the population level (national and state/territory)¹³ since the inception of the register. Cohort vaccination status was assessed at 12 months of age (for vaccines due at 6 months), 24 months of age (for vaccines due at 6, 12 and 18 months), and 60 months of age (for vaccines due at 48 months). A minimum three-month lag period was allowed for the late notification of vaccinations to the AIR, but only vaccines given on or before a child's first, second or fifth birthday, respectively, were included in

coverage calculations.¹³ 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 was assumed that earlier vaccinations in the sequence had been given. This assumption has been shown to be valid.^{14,15}

The proportion of children designated as 'fully vaccinated' was calculated using 12-month-wide cohorts with the number of children completely vaccinated with the vaccines of interest by the designated age as the numerator, and the total number of AIR-registered children in the age cohort as the denominator. The 12-month-wide cohorts used were children born between 1 January 2017 and 31 December 2017 for the 12-month milestone, between 1 January 2016 and 31 December 2016 for the 24-month milestone, and between 1 January 2013 and 31 December 2013 for the 5-year (60-month) milestone.

Nationally agreed definitions of 'fully vaccinated' coverage for the purpose of standardised reporting were used as follows: 'Fully vaccinated' at 12 months of age was defined as a child having a record on the AIR of a third dose of DTPa-containing vaccine, a third dose of polio/Hib/hepatitis B-containing vaccines (usually given as the combined DTPa-hepB-IPV-Hib vaccine), and a second or third dose of 13vPCV.

'Fully vaccinated' at 24 months of age was defined as a child having a record on the AIR of a fourth dose of DTPa-containing vaccine, a third dose of polio/hepatitis B-containing vaccines, a fourth dose of Hib-containing vaccine (or a third dose of Hib-containing vaccine if given after 11.5 months of age), a second dose of measles-mumps-rubella (MMR)-containing vaccine, a first dose of varicella-containing vaccine, a first dose of meningococcal C-containing vaccine, and a third dose of 13vPCV. 'Fully vaccinated' at 60 months of age was defined as a child having a record on the AIR of a fourth or fifth dose of DTPa-containing vaccine and a fourth dose of polio-containing vaccine.

Vaccination coverage estimates were also calculated separately at the 12-month milestone for the second dose of rotavirus vaccine, a National Immunisation Program (NIP) vaccine that is not included in calculations for incentive payments and 'fully vaccinated' status.

Influenza vaccination coverage for children aged 6 months – <5 years was calculated by dividing the number of children with at least one dose of influenza vaccine recorded on the AIR in a calendar year by the total number of children registered on the AIR in the 6 months – <5 years age group.

Timeliness

On-time vaccination was defined as receipt of a scheduled vaccine dose within 30 days of the recommended age for

administration. Timeliness of the second dose of 13vPCV, the first and third dose of DTPa-containing vaccine, and the first and second dose of MMR-containing vaccine was measured using 12-month-wide birth cohorts. To allow time for very late vaccinations to be included, children in the timeliness analysis were assessed up to 3 years after doses were due, and therefore these cohorts were not the same as those assessed for coverage milestones.

Trends in the percentage of Aboriginal and non-Aboriginal children vaccinated on time for the first and third dose of DTPa-containing vaccine were plotted for 2009–2018. Timeliness of the second dose of 13vPCV and the first and second dose of MMR-containing vaccine in 2018 was compared in Aboriginal and non-Aboriginal children by plotting the cumulative percentage receiving the dose by age. Timeliness of the third dose of DTPa-containing vaccine and the second dose of MMR-containing vaccine was also assessed by Aboriginal status using a vaccination delay measure categorised as 'no delay', 'delay of 1–<3 months', 'delay of 3–<7 months' or 'delay \geq 7 months'.

Local health districts

Vaccination coverage estimates and vaccination delay estimates are presented in this report for NSW and by NSW local health district (LHD). LHDs were introduced in January 2011, replacing area health services. There are 15 geographically-based LHDs in NSW – eight in metropolitan NSW and seven in rural and regional NSW. Data for an additional LHD (Network with Victoria) is also reported on.

Aboriginal status

Vaccination coverage estimates and vaccination delay estimates are presented in this report for all children in NSW and also by Aboriginal status. On the AIR Aboriginal status is recorded as 'Indigenous', 'non-Indigenous' or 'unknown', as reported by the person (or parent/carer) to Medicare, or by the immunisation provider to the AIR. For this report, two categories of children were considered: 'Aboriginal' (Indigenous) and 'non-Aboriginal' (non-Indigenous). As the completeness of Aboriginal identification in the register has increased substantially since 2005,¹⁶ individuals whose Aboriginal status was not specified (approximately 0.5% of the NSW childhood population on the AIR) were classified as non-Aboriginal for the purposes of the analyses conducted for this report.

Small area coverage

Coverage by small area was calculated using Australian Bureau of Statistics (ABS)-defined statistical area level 3 (SA3), which forms part of the Australian Statistical Geography Standard (ASGS).¹⁷ 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 110 to 2799 children). SA3s with a population size less than 26 for a year-wide birth cohort of children were excluded from any mapping due to the imprecision of any coverage estimates calculated for these areas. Maps were created using MapInfo mapping software¹⁸ and the ABS Census Boundary Information. As postcode is the only geographical indicator on the AIR, the ABS Postal Area to SA3 Concordance 2011 was used to match children's residential postcodes to SA3s.¹⁹

Measuring adolescent vaccination coverage in the School-based program

Coverage data for vaccines given to adolescents in 2018 was provided by NSW Health from their School Vaccination Program,²⁰ which included HPV vaccine and dTpa vaccine for Year 7 students, as well as meningococcal ACWY vaccine for Year 10 and 11 students. Vaccination status is recorded by school immunisation teams and the counts of children vaccinated are collated by LHDs and NSW Health. The denominator is school population enrolments, as at the start of year. Coverage estimates may be an underestimate of 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.²¹ For HPV vaccination, school catch-up vaccination has been offered since 2012 to Year 8 students who commenced the course of HPV vaccine in Year 7 in order to support course completion. Annual Year 7 HPV vaccination coverage from 2012 to 2018 includes school catch-up vaccination given in Year 8 in the following year.

Measuring vaccination coverage in adults aged 65 years and over

Adult influenza vaccination data have been collected since 1997 through the NSW Adult Population Health Survey.²² This is a rolling telephone survey utilising random digit dialling, with vaccination status determined from patient recall to the interview question asking 'Were you vaccinated or immunised against flu in the last 12 months?' Influenza vaccination coverage data from 2002 to 2018 are reported for adults aged 65 years and older. Data were provided by NSW Health.

Summary of results

Childhood vaccination coverage

- Quarterly 'fully vaccinated' coverage estimates in NSW, assessed at 12 months, 24 months and 60 months of age reached 94.1%, 90.9% and 94.8% respectively in the December 2018 quarter (Figure 1).
- The annual NSW coverage estimate of 'fully vaccinated' at the 12-month milestone was 93.8% in 2018 (Table 2), which remained stable from 2017.
- 'Fully vaccinated' coverage at 12 months of age was greater than 93% in all LHDs except Mid North Coast, Northern NSW, and Western Sydney (Table 2).
- NSW coverage for all individual vaccines/antigens at 12 months of age remained greater than 94% for all vaccines except rotavirus during 2018 (Figure 2).
- Coverage for rotavirus vaccine in NSW was 90.8% in 2018 (Table 2), which remained stable from 2017. Coverage for rotavirus vaccine remained lower than other vaccines as catch-up vaccination cannot be given once infants turn 15 weeks (dose 1) and 25 weeks (dose 2) of age.
- Between the March 2018 quarter and the June 2018 quarter, coverage for the 13vPCV at 12 months of age increased from 94.3% to 96.4% in NSW (Figure 2), likely due to the coverage calculation being changed to assess either the second or third dose, instead of just the third dose.
- The annual NSW coverage estimate for 13vPCV at 12 months of age increased from 94.2% (3 doses) in 2017 to 95.6% (2 or 3 doses) in 2018 (Table 2).
- Coverage for all individual vaccines/antigens at the 12-month milestone, except rotavirus vaccine, was greater than 93% in all LHDs except Mid North Coast and Northern NSW (Table 2).
- The annual NSW coverage estimate of 'fully vaccinated' at the 24-month milestone increased slightly from 89.9% in 2017 to 90.1% in 2018 (Table 3).
- 'Fully vaccinated' coverage at 24 months of age remained below 90% for Mid North Coast, Northern NSW, Northern Sydney, South Eastern Sydney, South Western Sydney, Sydney and Western Sydney (Table 3).
- Coverage in NSW for all vaccines/antigens at the 24-month milestone (except the fourth dose of DTPa-containing vaccine and MMRV vaccine) was greater than 94.5% in 2018 (Table 3, Figure 3) and greater than 93.5% for all LHDs except for Northern NSW (Table 3).
- Coverage of the fourth dose of DTPa-containing vaccine in NSW at 24 months of age increased from 92.3% in 2017 to 92.6% in 2018, with coverage above 92% in all LHDs except for Far West, Mid North Coast, Northern NSW, South Eastern Sydney, South Western Sydney and Western Sydney (Table 3).
- Coverage of MMR-containing vaccine in NSW at 24 months of age was 95% for the first dose and 92.8% for the second dose in 2018 (Table 3). Coverage for the second dose of MMR-containing vaccine was greater than 91% for all LHDs except for Northern NSW.
- Varicella-containing vaccine coverage at 24 months of age in NSW was 92.5% in 2018 with coverage above 91% for all LHDs except for Northern NSW (Table 3).
- The annual NSW coverage estimate of 'fully vaccinated' at the 60-month milestone increased from 93.5% in 2017 to 93.9% in 2018 and was greater than 90% in all LHDs except Northern NSW (Table 4).
- Coverage for all vaccines/antigens for the 60-month milestone in NSW was 94% or above during 2018

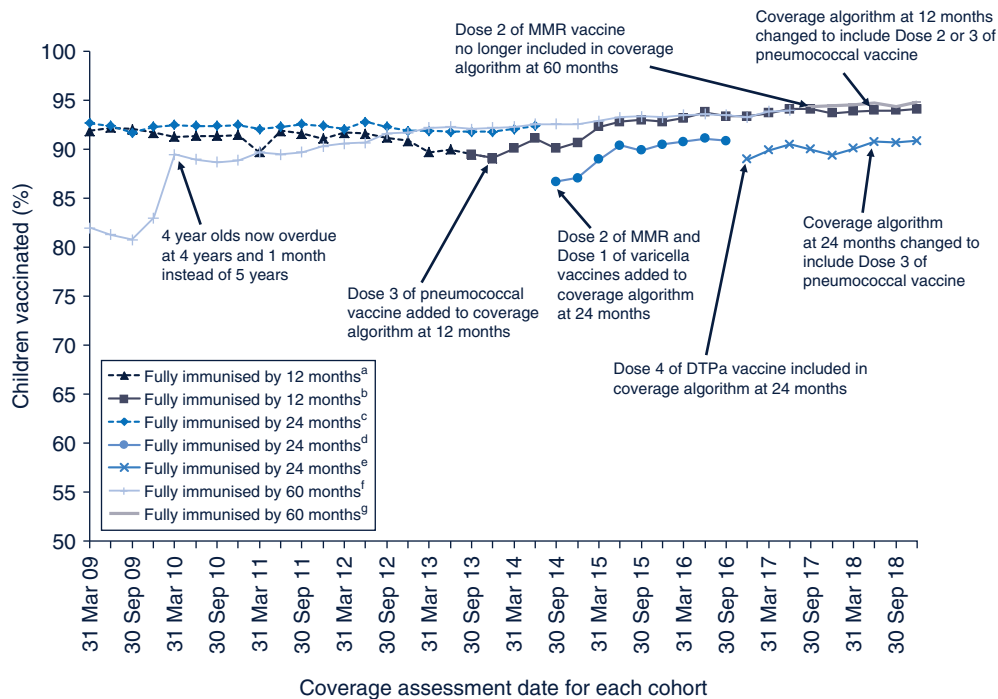


Figure 1. Trends in 'fully vaccinated' coverage, NSW, 2009–2018.

^aUp until 30 June 2013, 'fully vaccinated' at 12 months of age was defined as a child having a record of a third dose of DTPa-containing vaccine, and third doses of polio-containing, Hib-containing and Hep B-containing vaccines.

^bBetween 1 July 2013 and 31 March 2018, 'fully vaccinated' at 12 months of age was defined as a child having a record of a third dose of DTPa-containing vaccine, third doses of polio-containing, Hib-containing and Hep B-containing vaccines, and a third dose of 13-valent PCV. Since 1 April 2018, the definition was changed to include a second or third dose of 13-valent PCV.

^cUp until 30 June 2014, 'fully vaccinated' at 24 months of age was defined as a child having a record of a third dose of DTPa-containing vaccine, third doses of polio-containing and Hep B-containing vaccines, a fourth dose of Hib-containing vaccine, and a first dose of MMR-containing vaccine.

^dBetween 1 July 2014 and 30 September 2016, 'fully vaccinated' at 24 months of age was defined as a child having a record of a third dose of DTPa-containing vaccine, third doses of polio-containing and Hep B-containing vaccines, a fourth dose of Hib-containing vaccine, a second dose of MMR-containing vaccine, a first dose of varicella-containing vaccine and a first dose of Men C-containing vaccine.

^eBetween 1 October 2016 and 31 March 2018, 'fully vaccinated' at 24 months of age was defined as a child having a record of a fourth dose of DTPa-containing vaccine, third doses of polio-containing and Hep B-containing vaccines, a fourth dose of Hib-containing vaccine, a second dose of MMR-containing vaccine, a first dose of varicella-containing vaccine and a first dose of Men C-containing vaccine. Since 1 April 2018, the definition was changed to include a third dose of 13-valent PCV.

^fBetween 1 October 2007 and 30 June 2017 'fully vaccinated' at 60 months of age was defined as a child having a record of a fourth dose of DTPa-containing vaccine, a fourth dose of polio-containing vaccine and a second dose of MMR-containing vaccine.

^gSince 1 July 2017, 'fully vaccinated' at 60 months of age was defined as a child having a record of a fourth or fifth dose of DTPa-containing vaccine and a fourth dose of polio-containing vaccine.

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

Hep B: hepatitis B.

Hib: *Haemophilus influenzae* type b.

Men C: meningococcal C.

MMR: measles-mumps-rubella.

PCV: pneumococcal conjugate vaccine.

Source: Australian Immunisation Register, data as at 31 March 2019.

- (Figure 4) and greater than 90% in all LHDs except Northern NSW (Table 4).
- Although no longer included in the 60-month 'fully vaccinated' coverage algorithm, coverage in NSW of the second dose of MMR-containing vaccine at 60 months of age increased from 95.7% in 2017 to 96.3% in 2018 and was above 94.5% in all LHDs except Northern NSW (Table 4).
- Following implementation of the NSW Health funded influenza vaccination program for all children aged

6 months – <5 years in 2018, influenza vaccine coverage increased almost 8-fold in NSW, from 3.4% in 2017 to 25.6% in 2018 (Figure 5).

Aboriginal coverage

- 'Fully vaccinated' coverage for NSW Aboriginal children at the 12-month milestone decreased from 94.6% in 2017 to 94.0% in 2018 (Table 5), but remained higher than for non-Aboriginal children at the same age (93.8%).

Table 2. Percentage of children vaccinated at 12 months of age^a by antigen/dose and local health district, NSW, compared with NSW overall and Australia, 2018

Antigen/Dose	Local Health District ^b																	Australia %
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	
Diphtheria–tetanus–pertussis Dose 3	95.6	97.7	95.9	95.2	92.7	96.4	95.3	94.9	88.1	95.0	94.4	94.1	95.5	94.9	96.0	94.2	94.6	94.7
Poliomyelitis Dose 3	95.3	97.7	95.8	95.2	92.6	96.4	95.2	94.9	88.0	95.0	94.3	94.1	95.5	94.9	96.0	94.1	94.6	94.6
<i>Haemophilus influenzae</i> type b Dose 3	95.6	97.4	95.7	95.1	92.4	96.3	95.2	95.1	87.9	94.7	94.1	94.0	95.5	94.6	95.9	93.9	94.4	94.5
Hepatitis B Dose 3	95.5	97.7	95.7	95.1	92.5	96.1	95.1	94.9	87.7	94.0	93.9	94.0	95.3	94.3	96.0	93.4	94.3	94.3
Rotavirus Dose 2	92.2	90.9	92.1	91.6	88.5	92.4	91.7	92.4	84.3	91.3	91.0	89.7	92.0	91.0	92.4	90.2	90.8	90.9
13-valent pneumococcal conjugate Dose 2 or 3 ^c	96.3	98.5	96.9	96.1	93.8	97.1	96.7	96.0	89.6	95.4	95.1	95.3	96.6	95.6	97.0	95.3	95.6	95.7
Fully vaccinated^d	95.3	96.8	95.5	94.8	92.2	96.0	94.8	94.8	87.6	93.5	93.3	93.5	94.9	93.7	95.8	92.7	93.8	93.9
Total number of children	3986	342	10 744	4648	2306	3015	5124	727	3098	10 107	10 216	14 351	2265	7303	3677	14 739	97 287	304 493

^aCohort born 1 January 2017 – 31 December 2017.

^bCC: 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.

^cDose 3 for cohort born 1 January 2017 – 31 March 2017 and then Dose 2 or Dose 3 for cohort born 1 April 2017 – 31 December 2017.

^d'Fully vaccinated' at 12 months of age was defined as a child having a record on the AIR of a third dose of diphtheria, tetanus and acellular pertussis-containing vaccine, third doses of polio-containing, *Haemophilus influenzae* type b-containing and hepatitis B-containing vaccines and a second or third dose of 13-valent pneumococcal conjugate vaccine (third dose for the cohort born 1 January 2017 – 31 March 2017 and a second or third dose for the cohort born 1 April 2017 – 31 December 2017).

Source: Australian Immunisation Register, data as at 31 March 2019.

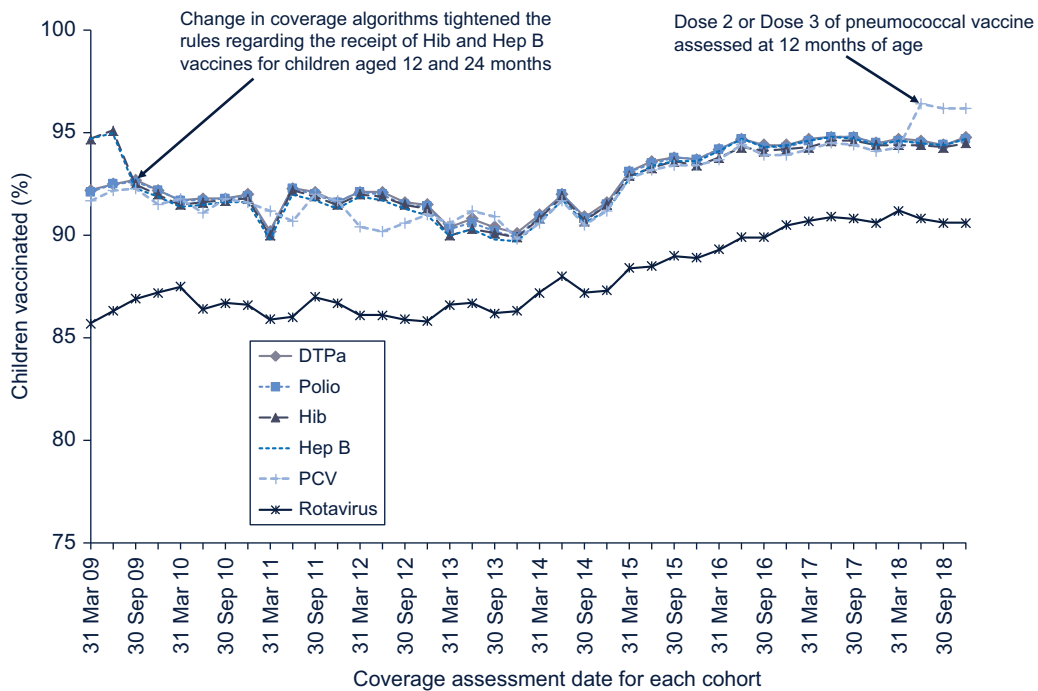


Figure 2. Trends in vaccination coverage estimates at 12 months of age by vaccine/antigen^a, NSW, 2009–2018.

By 3-month birth cohorts born between 1 January 2008 and 31 December 2017. Coverage assessment date was 12 months after the last birth date of each cohort.

^aThird doses of DTPa-containing, polio-containing, Hib-containing and Hep B-containing vaccines, a third dose of 13-valent PCV (second or third dose as of 1 April 2018) and a second dose of rotavirus vaccine.

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

Hep B: hepatitis B.

Hib: *Haemophilus influenzae* type b.

PCV: pneumococcal conjugate vaccine.

Source: Australian Immunisation Register, data as at 31 March 2019.

Table 3. Percentage of children vaccinated at 24 months of age^a by antigen/dose and local health district, NSW, compared with NSW overall and Australia, 2018

Antigen/Dose	Local Health District ^b																	
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	Australia %
Diphtheria–tetanus–pertussis Dose 4	94.1	91.9	94.2	94.0	91.7	94.6	93.3	93.8	87.6	92.9	91.6	91.8	94.8	92.0	94.5	91.7	92.6	92.8
Poliomyelitis Dose 3	97.0	97.3	97.1	97.4	94.9	96.9	96.7	96.1	91.4	96.6	95.9	96.3	97.2	96.1	97.8	95.9	96.3	96.4
<i>Haemophilus influenzae</i> type b (Hib) Dose 4	96.0	97.9	96.2	96.4	94.0	96.3	95.8	95.4	90.4	94.5	93.9	95.1	96.4	94.3	97.0	94.1	94.9	94.7
Meningococcal C Dose 1	95.8	98.1	96.3	96.2	93.9	96.3	95.9	96.1	90.2	94.5	94.3	95.0	96.5	94.3	97.0	93.6	94.9	95.1
Hepatitis B Dose 3	96.7	97.3	97.0	97.2	94.6	96.7	96.6	95.9	91.1	95.1	95.2	96.2	97.0	95.0	97.6	94.6	95.7	95.9
Measles-mumps-rubella Dose 1	95.8	97.3	96.4	96.4	94.0	96.8	95.9	96.2	90.1	94.9	94.2	95.2	96.7	94.4	97.1	94.5	95.1	95.4
Measles-mumps-rubella Dose 2	94.2	92.5	94.4	94.5	92.3	95.2	93.8	94.3	87.7	92.4	91.7	92.5	95.1	92.1	94.9	91.6	92.8	93.0
Varicella Dose 1	94.0	91.7	94.2	94.3	91.8	95.0	93.4	94.3	87.2	92.4	91.4	92.0	94.9	91.8	94.6	91.4	92.5	92.8
13-valent pneumococcal conjugate Dose 3	96.6	97.0	96.7	96.9	94.0	96.5	96.5	95.4	90.4	95.4	95.2	95.4	96.9	94.9	97.5	94.7	95.5	95.7
Fully vaccinated^c	92.8	90.3	93.0	92.6	89.9	93.5	91.8	92.4	86.1	89.0	88.6	89.7	93.5	88.7	93.4	87.5	90.1	90.1
Total number of children	4138	372	11 477	4884	2415	3019	5445	739	3301	10 939	10 442	14 973	2312	7381	3850	15 414	101 803	319 553

^aCohort born 1 January 2016 – 31 December 2016.

^bCC: 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.

^c'Fully vaccinated' at 24 months of age defined as a child having a record on the AIR of a fourth dose of diphtheria, tetanus and acellular pertussis-containing vaccine, third doses of polio-containing and hepatitis B-containing vaccines, a fourth dose of *Haemophilus influenzae* type b-containing vaccine (or a third dose of the *Haemophilus B* conjugate (PRP-T) vaccine if given after 11.5 months of age), a second dose of measles, mumps and rubella-containing vaccine, a first dose of varicella-containing vaccine and a first dose of meningococcal C-containing vaccine. A third dose of 13-valent pneumococcal conjugate vaccine also included in the definition of 'Fully vaccinated' at 24 months of age for cohort born 1 April 2016 – 31 December 2016.

Source: Australian Immunisation Register, data as at 31 March 2019.

- 'Fully vaccinated' coverage for Aboriginal children at the 12-month milestone in 2018 varied by LHD – ranging from 90.6% in South Eastern Sydney to 98.4% in Network with Victoria (Table 5).
- Compared with non-Aboriginal children, 'fully vaccinated' coverage at the 12-month milestone in 2018 was higher for Aboriginal children in Nepean Blue Mountains, Network with Victoria, Northern NSW, Northern Sydney and Western Sydney LHDs but lower in the other LHDs (Table 5).
- 'Fully vaccinated' coverage for NSW Aboriginal children at the 24-month milestone decreased from 91.4% in 2017 to 90.8% in 2018 (Table 5), but remained higher than for non-Aboriginal children at the same age (90.1%).
- 'Fully vaccinated' coverage for Aboriginal children at the 24-month milestone in 2018 varied by LHD – ranging from 88.1% in Illawarra Shoalhaven to 94.3% in Far West (Table 5).
- Compared with non-Aboriginal children, 'fully vaccinated' coverage at the 24-month milestone in 2018 was higher for Aboriginal children in Far West, Mid North Coast, Network with Victoria, Northern NSW, Northern Sydney, South Eastern Sydney, South Western Sydney, Sydney and Western LHDs but lower in the other LHDs (Table 5).
- 'Fully vaccinated' coverage for NSW Aboriginal children at the 60-month milestone continued to improve, increasing from 97.0% in 2017 to 97.5% in 2018 (Table 5). This was 3.7 percentage points higher than coverage for non-Aboriginal children at the same age, which also increased by 0.5 of a percentage point to 93.8%.
- 'Fully vaccinated' coverage for Aboriginal children at the 60-month milestone in 2018 was above 95% in all LHDs except for Northern Sydney and South Eastern Sydney (Table 5).
- At the 60-month milestone, 'fully vaccinated' coverage was higher in 2018 for Aboriginal compared with non-Aboriginal children in all LHDs (Table 5), with coverage in the Far West LHD reaching 99%.
- In 2018, coverage estimates for individual vaccines/antigens assessed at the 12-month milestone, excluding rotavirus vaccine, were above 94% for both Aboriginal and non-Aboriginal children (Table 6). These estimates were all marginally lower (less than 1 percentage point) for Aboriginal children compared with non-Aboriginal children except for the pneumococcal conjugate

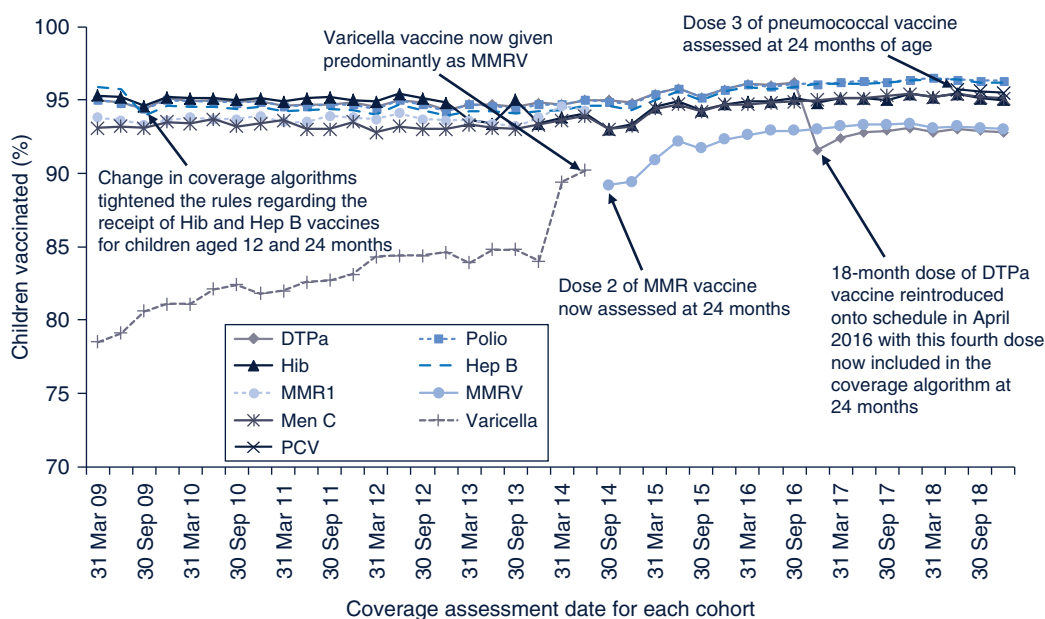


Figure 3. Trends in vaccination coverage estimates at 24 months of age by vaccine/antigen^a, NSW, 2009–2018.

By 3-month birth cohorts born between 1 January 2007 and 31 December 2016. Coverage assessment date was 24 months after the last birth date of each cohort.

^aDTPa-containing vaccine (third dose assessed up until 30 September 2016, fourth dose assessed from 1 October 2016), third doses of polio-containing and Hep B-containing vaccines, a fourth dose of Hib-containing vaccine, MMR-containing vaccine (first dose assessed up until 30 June 2014, second dose assessed from 1 July 2014), a first dose of varicella-containing vaccine, a first dose of Men C-containing vaccine, and a third dose of 13-valent PCV (assessed from 1 April 2018).

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

Hep B: hepatitis B.

Hib: *Haemophilus influenzae* type b.

Men C: meningococcal C.

MMR: measles-mumps-rubella.

MMRV: measles-mumps-rubella-varicella.

PCV: pneumococcal conjugate vaccine.

Source: Australian Immunisation Register, data as at 31 March 2019.

vaccine, which was 1 percentage point higher in Aboriginal children.

- Coverage estimates of DTPa-containing vaccine, second dose of MMR-containing vaccine and varicella-containing vaccine assessed at the 24-month milestone in 2018 were below 93% for both Aboriginal and non-Aboriginal children, with these estimates marginally lower for Aboriginal children compared with non-Aboriginal children (Table 6). All other coverage estimates for individual vaccines/antigens assessed at this milestone were above 94% and higher for Aboriginal children compared with non-Aboriginal children.
- Coverage estimates for individual vaccines/antigens assessed at the 60-month milestone in 2018 were considerably higher in Aboriginal children compared with non-Aboriginal children (Table 6).
- Despite there being a national funded influenza vaccination program for Aboriginal children aged 6 months–<5 years since 2015, influenza vaccine coverage in 2017 was low in Aboriginal children in NSW. Following implementation of the NSW Health funded influenza vaccination program for all children aged

6 months – <5 years in 2018, influenza vaccine coverage increased more than 4-fold in Aboriginal children, from 6.2% in 2017 to 26.4% in 2018, and increased 8-fold in non-Aboriginal children, from 3.2% in 2017 to 25.6% in 2018 (Table 7).

- In 2018, influenza vaccine coverage for children aged 6 months – <5 years varied by LHD, with coverage ranging from 21.0% in Western Sydney to 38.2% in Network with Victoria for Aboriginal children, and from 15.6% in South Western Sydney to 34.6% in Hunter New England for non-Aboriginal children (Table 7).

Timeliness

- In 2018, 95.8% of all children in NSW were vaccinated on time with the first dose of DTPa-containing vaccine. The disparity in on-time vaccination between Aboriginal and non-Aboriginal children in NSW has steadily decreased from almost 14 percentage points in 2009 to just over 2 percentage points in 2018 (Figure 6).
- In 2018, 92.4% of all children in NSW were vaccinated on time with the second dose of 13vPCV vaccine. The percentage of non-Aboriginal children in NSW who received their second dose of 13vPCV on time was

Table 4. Percentage of children vaccinated at 60 months of age^a by antigen/dose and local health district, NSW, compared with NSW overall and Australia, 2018

Antigen/Dose	Local Health District ^b																	
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	Australia %
Diphtheria–tetanus– pertussis Dose 4 or 5	95.6	98.3	96.6	96.4	93.1	95.6	95.9	95.2	90.0	91.3	90.9	95.0	94.8	92.0	97.5	93.7	94.0	94.1
Poliomyelitis Dose 4	95.6	98.3	96.5	96.4	93.1	95.6	96.0	95.5	90.0	91.8	91.1	95.0	94.8	92.4	97.4	94.0	94.1	94.2
Measles–mumps– rubella Dose 2 ^c	97.5	99.2	97.9	97.5	94.9	97.3	97.4	97.3	92.4	94.6	94.6	96.8	96.3	95.5	98.6	96.2	96.3	96.3
<i>Haemophilus influen- zae</i> type b (Hib) Dose 4 ^d	97.3	99.4	97.8	97.1	94.8	97.2	97.1	97.3	92.4	93.8	94.6	96.7	96.5	95.0	98.8	95.6	96.0	95.9
Hepatitis B Dose 3 ^d	97.6	99.2	97.9	97.5	95.2	97.6	97.3	97.6	93.0	93.7	95.3	97.0	96.5	96.0	98.8	95.2	96.2	96.4
Meningococcal C Dose 1 ^d	97.5	99.2	98.1	97.8	94.9	97.4	97.4	97.4	92.5	95.1	95.4	97.0	96.7	95.8	98.8	95.8	96.4	96.4
Varicella Dose 1 ^d	96.7	96.9	96.9	96.6	93.9	96.3	96.2	96.2	91.3	93.4	93.5	95.3	95.3	93.9	95.7	94.9	95.0	95.1
13-valent pneumo- coccal conjugate Dose 3 ^d	96.2	98.3	96.4	95.5	92.1	95.3	95.4	95.2	89.8	92.5	94.0	93.3	95.5	93.4	97.3	92.1	94.0	93.9
Fully vaccinated^e	95.6	98.3	96.5	96.3	93.0	95.6	95.9	95.0	89.9	91.2	90.8	94.8	94.8	91.9	97.4	93.5	93.9	94.0
Total number of children	4444	357	12 184	5049	2716	3148	5340	763	3640	11 912	10 083	15 083	2455	6645	3961	15 526	104 134	327 890

^aCohort born 1 January 2013 – 31 December 2013.

^bCC: 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.

^cAs of mid-2017, the second dose of MMR no longer included in the definition of 'Fully vaccinated' at 60 months of age.

^dNot included in definition of 'Fully vaccinated' at 60 months of age.

^e'Fully vaccinated' at 60 months of age defined as a child having a record on the AIR of a fourth or fifth dose of diphtheria, tetanus and acellular pertussis-containing vaccine and a fourth dose of polio-containing vaccine.

Source: Australian Immunisation Register, data as at 31 March 2019.

92.8% compared with 86.6% of Aboriginal children (Figure 7).

- In 2018, 84.8% of all children in NSW were vaccinated on time with the third dose of DTPa-containing vaccine. The percentage of non-Aboriginal children in NSW who received their third dose of DTPa-containing vaccine on time was 85.4% compared with 74.4% of Aboriginal children (Figure 8, Table 8). The disparity in on-time vaccination between Aboriginal and non-Aboriginal children has continued to decrease in NSW, with the disparity falling from 16.4 percentage points in 2009 to 11.0 percentage points in 2018 (Figure 8).
- On-time vaccination for the third dose of DTPa-containing vaccine in 2018 varied by LHD, ranging from 81.0% in South Western Sydney to 87.9% in Sydney for non-Aboriginal children, and from 65.6% in Network with Victoria to 91.7% in Northern Sydney for Aboriginal children (Table 8).
- In 2018, 79.4% of all children in NSW were vaccinated on time with the first dose of MMR-containing vaccine. The percentage of non-Aboriginal children in NSW who received their first dose of MMR-containing vaccine on time was 79.9% compared with 71.1% of Aboriginal children (Figure 9).
- In 2018, 71.4% of all children in NSW were vaccinated on time with the second dose of MMR-containing

vaccine. The percentage of non-Aboriginal children in NSW who received their second dose of MMR-containing vaccine on time was 71.9%, compared with 61.8% of Aboriginal children (Figure 10).

- On-time vaccination for the second dose of MMR-containing vaccine varied by LHD in 2018, ranging from 67.0% in Northern NSW to 75.1% in Northern Sydney for non-Aboriginal children, and from 45.9% in Network with Victoria to 77.8% in Northern Sydney for Aboriginal children (Table 9).
- For both the third dose of DTPa-containing vaccine and second dose of MMR-containing vaccine, there were greater delays in vaccination for Aboriginal children than for non-Aboriginal children in 2018 (Tables 8 and 9), with the majority of delayed vaccination in the 1–<3 months delay category for both Aboriginal and non-Aboriginal children across all LHDs.

Small area coverage

- Coverage for rotavirus vaccine varied by SA3 across the state in 2018 (Figure 11), ranging from 76.9% to 96.8%. Only one SA3 (Upper Murray) had rotavirus coverage above 95%, with a further 64 SA3s above 90%. One SA3 (Richmond Valley-Coastal) had rotavirus vaccine coverage below 80%.

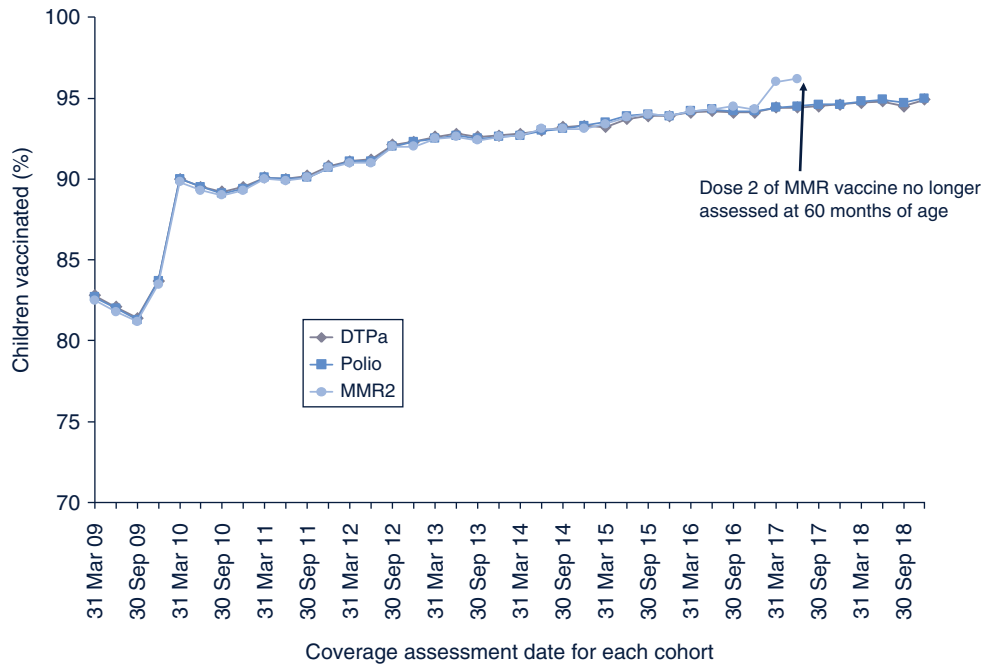


Figure 4. Trends in vaccination coverage estimates at 60 months of age by vaccine/antigen^a, NSW, 2009–2018.

By 3-month birth cohorts born between 1 January 2004 and 31 December 2013. Coverage assessment date was 60 months after the last birth date of each cohort.

^aDTPa-containing vaccine (fourth dose assessed up until 30 September 2016, fourth or fifth doses assessed from 1 October 2016), a fourth dose of polio-containing vaccine, and up until 30 June 2017, a second dose of MMR-containing vaccine.

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

MMR: measles-mumps-rubella.

Source: Australian Immunisation Register, data as at 31 March 2019.

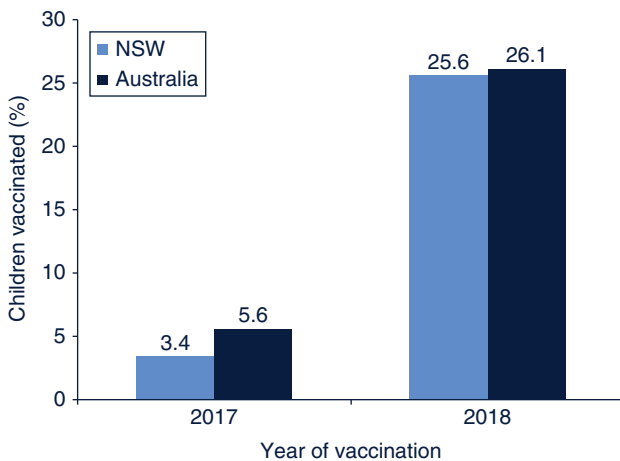


Figure 5. Percentage of children aged 6 months – <5 years with at least one dose of influenza vaccine recorded on the AIR, NSW and Australia, 2017 versus 2018.

Source: Australian Immunisation Register, data as at 31 March 2019.

- Coverage for the fourth dose of DTPa-containing vaccine measured at the 24-month milestone varied by SA3 in 2018 (Figure 12), ranging from 80.1% to 96.8%. Ten SA3s had coverage below 90% while 14 SA3s were above 95%.
- Coverage for the second dose of MMR-containing vaccine measured at the 24-month milestone varied by

SA3 in 2018 (Figure 13), ranging from 80.3% to 97.2%. Ten SA3s had coverage below 90%, while 18 SA3s were above 95%.

Adolescent coverage

- Overall coverage of the first and second dose of HPV for all NSW Year 7 students in 2018 was 84% and 81% respectively. Coverage for each of the two doses of HPV vaccine remained consistently higher in female Year 7 students compared with male students. In 2018, 85% of female Year 7 students and 83% of male Year 7 students commenced the two-dose HPV schedule, with 82% of females and 80% of males completing the course (Table 10).
- Coverage of the adolescent dTpa booster vaccine has remained stable at 85% for the past 3 years (Table 10).
- Coverage of the meningococcal ACWY conjugate vaccine in 2018 was 70% in both NSW Year 10 and 11 students (Table 10). Compared with the 2017 Year 11 cohort, coverage was 3 percentage points lower in the 2018 Year 11 cohort (73% versus 70%).

Coverage in adults aged 65 years and over

- The 2018 adult influenza vaccination coverage estimates are based on 6,454 NSW Population Health Survey respondents aged 65 years and over.

Table 5. Percentage of children fully vaccinated at 12 months, 24 months and 60 months of age by Aboriginal status and local health district, NSW, compared with NSW overall and Australia, 2018

Child age and Aboriginal status	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	Local Health District ^a										NSW %	Australia %
									NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %				
12 months – fully vaccinated^b																				
Aboriginal	95.2	94.9	95.2	93.4	91.2	95.2	95.8	98.4	91.5	95.1	90.6	92.3	92.0	91.0	94.6	93.9	94.0	92.4		
Non-Aboriginal	95.3	97.3	95.5	95.0	92.3	96.1	94.7	94.4	87.1	93.5	93.3	93.5	95.2	93.7	96.1	92.7	93.8	94.0		
24 months – fully vaccinated^c																				
Aboriginal	92.4	94.3	91.4	88.1	90.4	92.6	89.7	93.7	89.4	92.1	91.5	90.4	91.5	91.4	90.7	89.2	90.8	87.8		
Non-Aboriginal	92.9	89.1	93.2	93.0	89.9	93.6	91.9	92.3	85.7	89.0	88.6	89.7	93.7	88.6	94.1	87.5	90.1	90.3		
60 months – fully vaccinated^d																				
Aboriginal	98.0	99.0	98.0	98.3	97.2	96.7	98.6	95.5	96.0	93.8	91.6	97.5	96.1	96.7	98.0	96.8	97.5	96.4		
Non-Aboriginal	95.4	98.1	96.4	96.2	92.4	95.5	95.8	94.9	89.3	91.3	91.0	94.8	94.8	91.9	97.3	93.5	93.8	93.9		

^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.

^bCohort born 1 January 2017 – 31 December 2017: 'Fully vaccinated' at 12 months of age defined as a child having a record on the AIR of a third dose of diphtheria, tetanus and acellular pertussis-containing vaccine, third doses of polio-containing, *Haemophilus influenzae* type b-containing and hepatitis B-containing vaccines, and a second or third dose of 13-valent pneumococcal conjugate vaccine (third dose for the cohort born 1 January 2017 – 31 March 2017 and a second or third dose for the cohort born 1 April 2017 – 31 December 2017).

^cCohort born 1 January 2016 – 31 December 2016: 'Fully vaccinated' at 24 months of age defined as a child having a record on the AIR of a fourth dose of diphtheria, tetanus and acellular pertussis-containing vaccine, third doses of polio-containing and hepatitis B-containing vaccines, a fourth dose of *Haemophilus influenzae* type b-containing vaccine (or a third dose of the *Haemophilus B* conjugate (PRP-T) vaccine if given after 11.5 months of age), a second dose of measles, mumps and rubella-containing vaccine, a first dose of varicella-containing vaccine and a first dose of meningococcal C-containing vaccine. A third dose of 13-valent pneumococcal conjugate vaccine also included in the definition of 'Fully vaccinated' at 24 months of age for cohort born 1 April 2016 – 31 December 2016.

^dCohort born 1 January 2013 – 31 December 2013: 'Fully vaccinated' at 60 months of age defined as a child having a record on the AIR of a fourth or fifth dose of diphtheria, tetanus and acellular pertussis-containing vaccine and a fourth dose of polio-containing vaccine.

Source: Australian Immunisation Register, data as at 31 March 2019.

Table 6. Vaccination coverage estimates by age, vaccine/antigen and Aboriginal status, NSW, 2018

Vaccine/Antigen	Milestone age	Aboriginal	Non-Aboriginal
Diphtheria–tetanus–pertussis	12 months ^a (Dose 3)	94.2	94.7
	24 months ^b (Dose 4)	92.0	92.6
	60 months ^c (Dose 4 or 5)	97.6	93.9
Poliomyelitis	12 months ^a (Dose 3)	94.1	94.6
	24 months ^b (Dose 3)	97.4	96.3
	60 months ^c (Dose 4)	97.5	94.0
<i>Haemophilus influenzae</i> type b	12 months ^a (Dose 3)	94.1	94.5
	24 months ^b (Dose 4)	96.7	94.8
	60 months ^c (Dose 4)	98.8	95.9
Hepatitis B	12 months ^a (Dose 3)	94.2	94.3
	24 months ^b (Dose 3)	97.3	95.6
	60 months ^c (Dose 3)	98.9	96.1
Measles-mumps-rubella	12 months	NA	NA
	24 months ^b (Dose 1)	96.8	95.0
	24 months ^b (Dose 2)	92.6	92.8
	60 months ^c (Dose 2)	98.9	96.2
Meningococcal C	12 months	NA	NA
	24 months ^b (Dose 1)	96.5	94.8
	60 months ^c (Dose 1)	98.8	96.4
Varicella	12 months	NA	NA
	24 months ^b (Dose 1)	92.3	92.5
	60 months ^c (Dose 1)	97.7	94.9
Pneumococcal conjugate vaccine	12 months ^a (Dose 2 or 3)	96.5	95.5
	24 months ^b (Dose 3)	96.9	95.4
	60 months ^c (Dose 3)	96.7	93.8
Rotavirus	12 months ^a (Dose 2)	89.4	90.9
	24 months	NA	NA
	60 months	NA	NA

^aCohort born 1 January 2017–31 December 2017.
^bCohort born 1 January 2016–31 December 2016.
^cCohort born 1 January 2013–31 December 2013.
NA: not assessed.
Source: Australian Immunisation Register, data as at 31 March 2019.

Table 7. Percentage of children aged 6 months – <5 years with at least one dose of influenza vaccine recorded on the AIR by Aboriginal status and local health district, NSW, compared with NSW overall and Australia, 2017 versus 2018

Aboriginal status and year	Local Health District ^a																		
	CC %	FW %	HNE %	IS %	MN %	MM %	NBM %	NV %	NN %	NS %	SES %	SWS %	SN %	SYD %	WN %	WS %	NSW %	Australia %	
Aboriginal																			
2017	5.2	5.7	7.2	4.5	12.8	5.6	3.0	4.0	3.7	2.2	1.8	3.5	5.0	4.4	9.0	3.8	6.2	14.9	
2018	27.7	21.4	29.5	22.5	24.2	27.2	23.4	38.2	24.4	26.9	22.5	21.2	24.5	22.6	31.4	21.0	26.4	31.4	
Non-Aboriginal																			
2017	2.1	2.4	4.7	1.9	1.7	2.2	2.0	2.8	2.0	4.7	2.8	1.6	3.3	5.1	3.1	3.7	3.2	5.0	
2018	25.5	26.6	34.6	25.1	15.9	26.7	21.7	31.6	17.9	31.4	27.5	15.6	28.4	30.6	32.4	22.8	25.6	25.9	

^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 Immunisation Register, data as at 31 March 2019.

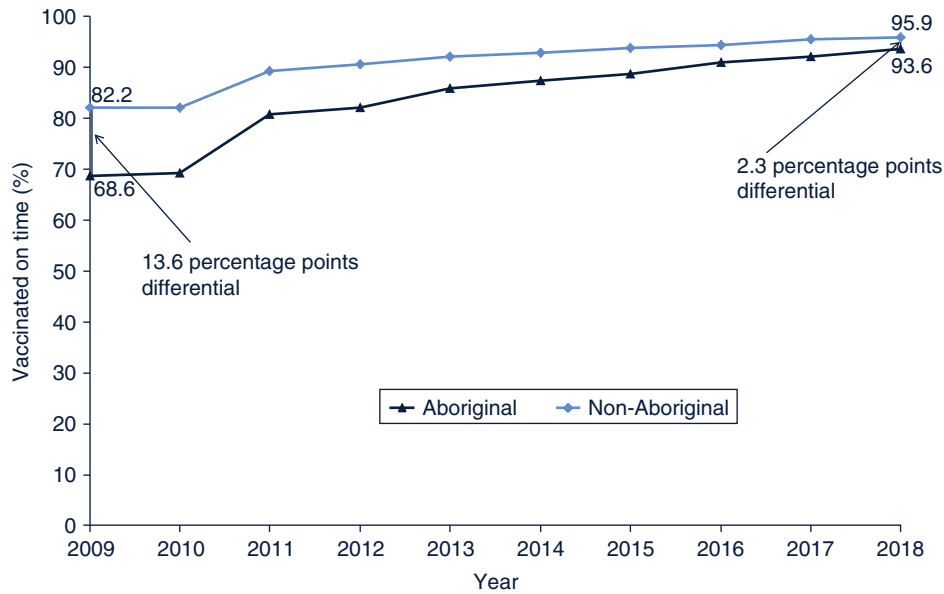


Figure 6. Trends in on-time^a vaccination for the first dose of DTPa-containing vaccine, NSW, 2009–2018.

^aOn-time vaccination defined as receipt of scheduled vaccine dose within 30 days of the recommended age of administration. Percentage vaccinated on time = number of children who received first dose of DTPa-containing vaccine before 10 weeks of age divided by the total number of children who received the dose in each year of interest. DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation.

Source: Australian Immunisation Register, data as at 31 March 2019.

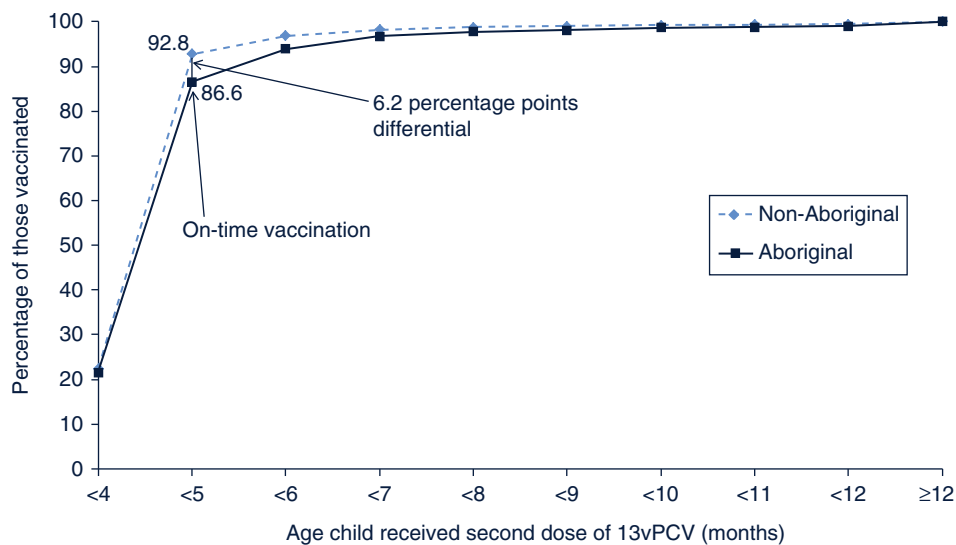


Figure 7. Cumulative percentage of children^a vaccinated with the second dose of 13vPCV^b by age in months and Aboriginal status, NSW, 2018.

^aCohort born 1 January 2016 – 31 December 2016.

^bShown as cumulative percentage of children vaccinated (number of children who received vaccine dose at particular age divided by the total number of children who received the vaccine dose, expressed as a percentage). 13vPCV: 13-valent pneumococcal conjugate vaccine.

Source: Australian Immunisation Register, data as at 31 March 2019.

- The proportion of surveyed adults reporting vaccination for influenza in the previous 12 months increased by almost 5 percentage points between 2017 and 2018 – from 72.6% to 77.4% (Table 11).
- Self-reported influenza vaccination coverage in 2018 varied by LHD – ranging from 66.4% in Western NSW to 82.0% in Hunter New England (Table 11).

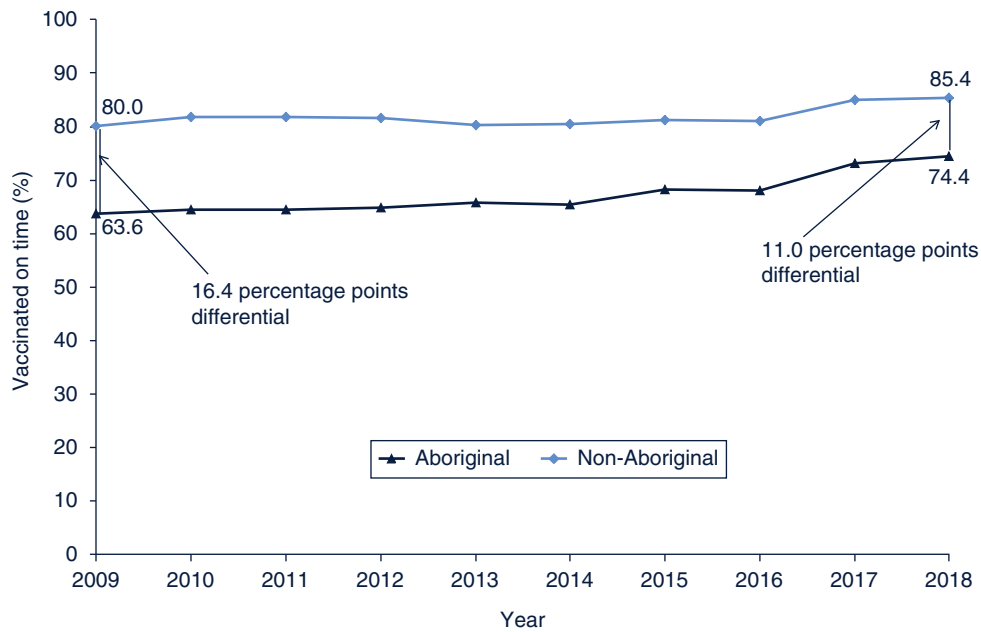


Figure 8. Trends in on-time^a vaccination for the third dose of DTPa-containing vaccine, NSW, 2009–2018.

^aOn-time vaccination defined as receipt of scheduled vaccine dose within 30 days of the recommended age of administration. Percentage vaccinated on time = number of children who received third dose of DTPa-containing vaccine before 7 months of age divided by the total number of children who received the dose in each year of interest. DTPa: diphtheria–tetanus–pertussis (acellular) – paediatric formulation.

Source: Australian Immunisation Register, data as at 31 March 2019.

Table 8. Coverage^a for the third dose of DTPa-containing vaccine by vaccination delay category, Aboriginal status and local health district, NSW, compared with NSW overall and Australia, 2018

Vaccination delay/ Aboriginal status	Local Health District ^b																NSW	AUS	
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS			
No delay^c																			
Aboriginal (%)	77.0	76.1	78.4	71.9	68.9	74.9	76.6	65.6	70.1	91.7	72.7	70.7	69.6	76.0	71.5	76.4	74.4	67.1	
Non-Aboriginal (%)	84.9	83.3	87.6	86.0	82.6	85.0	84.9	83.3	81.8	88.3	87.3	81.0	85.2	87.9	85.8	85.3	85.4	82.8	
1–<3 months late																			
Aboriginal (%)	15.3	14.8	13.8	17.7	21.9	15.3	14.9	31.2	19.5	5.6	17.1	18.0	22.2	19.0	17.5	13.9	16.5	20.3	
Non-Aboriginal (%)	11.0	11.2	9.2	10.3	12.5	11.7	11.1	10.9	13.1	8.4	9.4	13.2	10.8	8.8	11.0	10.4	10.5	12.8	
3–<7 months late																			
Aboriginal (%)	5.1	6.8	5.2	4.7	5.0	6.6	4.3	1.6	7.9	2.8	6.8	8.5	4.7	2.5	8.2	6.8	6.0	8.1	
Non-Aboriginal (%)	2.8	2.9	2.1	2.5	3.3	2.3	2.5	4.1	3.3	2.3	2.2	3.9	3.2	2.1	2.1	2.6	2.7	2.9	
≥7 months late																			
Aboriginal (%)	2.6	2.3	2.6	5.7	4.2	3.2	4.3	1.6	2.6	0.0	3.4	2.8	3.5	2.5	2.8	2.9	3.1	4.5	
Non-Aboriginal (%)	1.3	2.5	1.1	1.2	1.6	1.1	1.5	1.7	1.8	1.0	1.1	1.9	0.8	1.2	1.1	1.7	1.4	1.4	

^aCohort born 1 January 2016 – 31 December 2016.

^bCC: 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.

^cNo delay = third dose of DTPa-containing vaccine given before 7 months of age.

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

Source: Australian Immunisation Register, data as at 31 March 2019.

Conclusions

Successful delivery of the NSW Immunisation Program has continued throughout 2018 with NSW ‘fully vaccinated’ coverage at 12 and 60 months of age reaching highs of 94.1% and 94.8%, respectively, by

the end of the year. Following the decrease in ‘fully vaccinated’ coverage at 24 months of age in 2017 (due to the change in algorithm to include the fourth dose of diphtheria, tetanus, and acellular pertussis-containing vaccine given at 18 months of age), coverage at

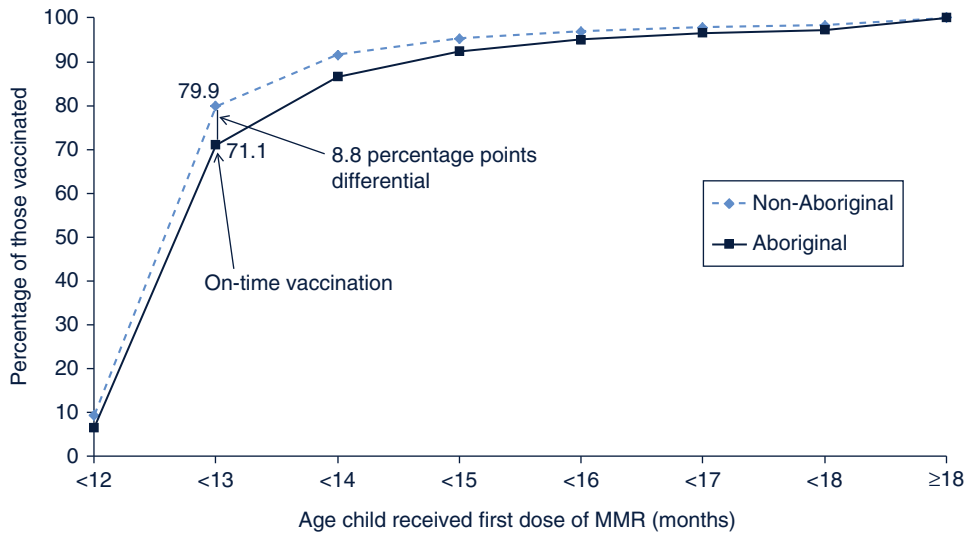


Figure 9. Cumulative percentage of children^a vaccinated with the first dose of MMR-containing vaccine^b by age in months and Aboriginal status, NSW, 2018.

^aCohort born 1 January 2016 – 31 December 2016.

^bShown as cumulative percentage of children vaccinated (number of children who received vaccine dose at particular age divided by the total number of children who received the vaccine dose, expressed as a percentage).
MMR: measles-mumps-rubella.

Source: Australian Immunisation Register, data as at 31 March 2019.

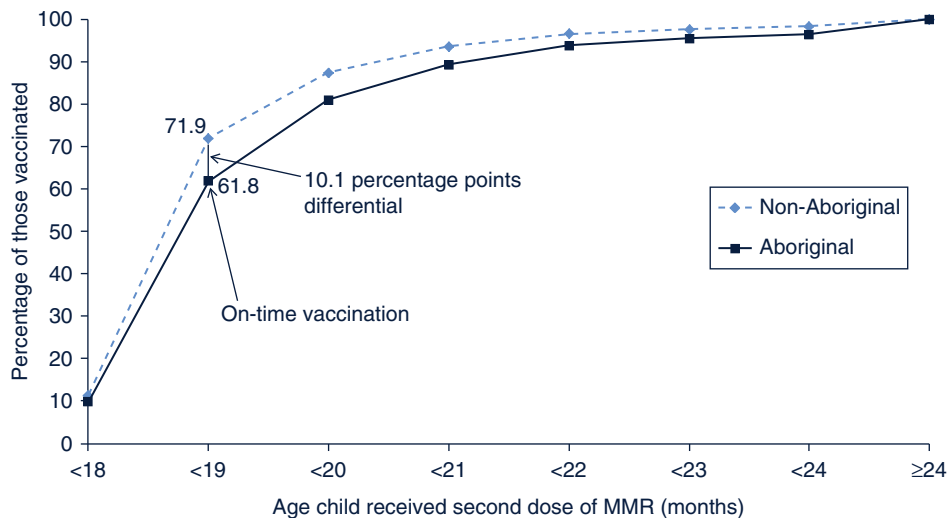


Figure 10. Cumulative percentage of children^a vaccinated with the second dose of MMR-containing vaccine^b by age in months and Aboriginal status, NSW, 2018.

^aCohort born 1 January 2016 – 31 December 2016.

^bShown as cumulative percentage of children vaccinated (number of children who received vaccine dose at particular age divided by the total number of children who received the vaccine dose, expressed as a percentage).
MMR: measles-mumps-rubella.

Source: Australian Immunisation Register, data as at 31 March 2019.

this milestone improved and reached 90.9% by the end of 2018.

Gains have been seen in the vaccination of Aboriginal children across NSW with ‘fully vaccinated’ coverage continuing to be higher at each milestone age compared with non-Aboriginal children. Despite this, timely

vaccination is still a concern in Aboriginal children. Compared with non-Aboriginal children, the percentage of Aboriginal children vaccinated on time remained lower in 2018, although the disparity continued to decrease in 2018. It is likely that the NSW Aboriginal Immunisation Healthcare Worker Program, funded by NSW Health since July 2012, continues to contribute to these improvements

Table 9. Coverage^a for the second dose of MMR-containing vaccine due at 18 months of age by vaccination delay category, Aboriginal status and local health district, NSW, compared with NSW overall and Australia, 2018

Vaccination delay/ Aboriginal status	Local Health District ^b																		
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW	AUS	
No delay^c																			
Aboriginal (%)	63.9	69.0	67.1	61.8	58.6	64.1	61.1	45.9	55.4	77.8	60.5	57.2	60.0	57.1	57.7	59.6	61.8	55.2	
Non-Aboriginal (%)	70.3	67.5	73.9	71.4	67.8	71.8	71.2	69.3	67.0	75.1	74.6	67.4	70.5	74.8	72.1	72.3	71.9	70.3	
1-<3 months late																			
Aboriginal (%)	25.9	24.1	23.5	26.9	29.3	26.5	28.7	45.9	30.5	19.4	29.0	32.6	22.9	37.7	29.5	28.8	27.4	30.9	
Non-Aboriginal (%)	23.9	22.1	20.4	23.0	25.5	22.5	21.9	23.9	24.0	19.3	19.6	24.7	23.3	19.6	21.9	20.4	21.5	23.2	
3-<7 months late																			
Aboriginal (%)	7.9	4.6	7.3	7.8	9.5	7.9	8.7	4.9	12.0	2.8	6.1	6.0	13.5	5.2	10.4	8.0	8.3	11.1	
Non-Aboriginal (%)	5.0	7.4	4.7	4.6	6.0	4.6	5.9	5.9	7.6	4.1	4.6	6.3	5.1	4.2	4.6	5.7	5.2	5.3	
≥7 months late																			
Aboriginal (%)	2.3	2.3	2.2	3.5	2.6	1.5	1.5	3.3	2.1	0.0	4.4	4.2	3.5	0.0	2.4	3.6	2.5	2.8	
Non-Aboriginal (%)	0.8	3.0	1.0	1.0	0.7	1.1	1.0	0.9	1.4	1.5	1.2	1.6	1.1	1.4	1.4	1.6	1.3	1.2	

^aCohort born 1 January 2016 – 31 December 2016.

^bCC: 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.

^cNo delay = second dose of MMR-containing vaccine given before 19 months of age.

MMR: measles-mumps-rubella.

Source: Australian Immunisation Register, data as at 31 March 2019.

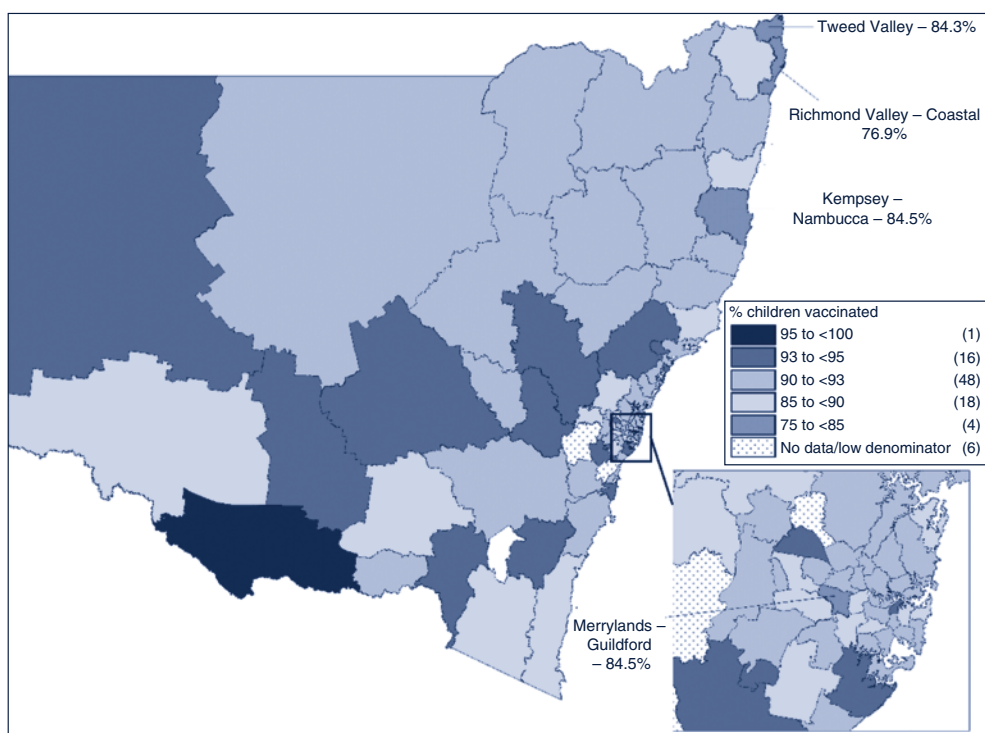


Figure 11. Coverage for second dose of rotavirus vaccine at 12 months of age^a by Statistical Area level 3^b, NSW, 2018.

^aCohort born 1 January 2017 – 31 December 2017.

^bNumbers in brackets = number of Statistical Area 3s in each coverage category.

Source: Australian Immunisation Register, data as at 31 March 2019.

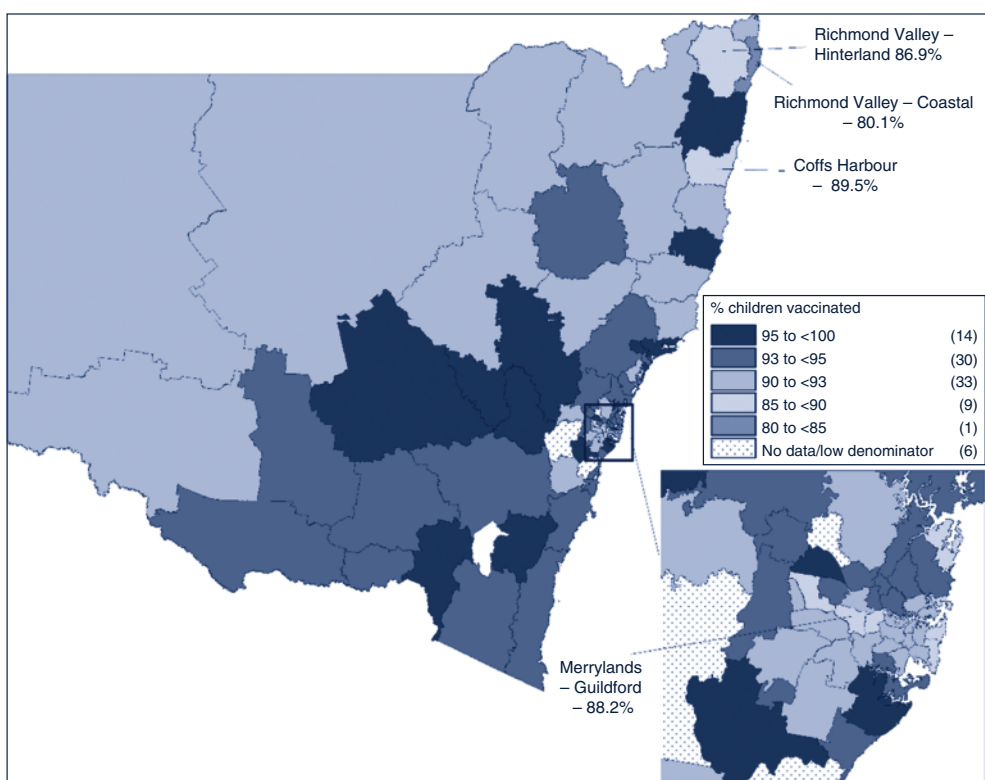


Figure 12. Coverage for the fourth dose of DTPa-containing vaccine at 24 months of age^a by Statistical Area level 3^b, NSW, 2018.

^aCohort born 1 January 2016 – 31 December 2016.

^bNumbers in brackets = number of Statistical Area 3s in each coverage category.

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

Source: Australian Immunisation Register, data as at 31 March 2019.

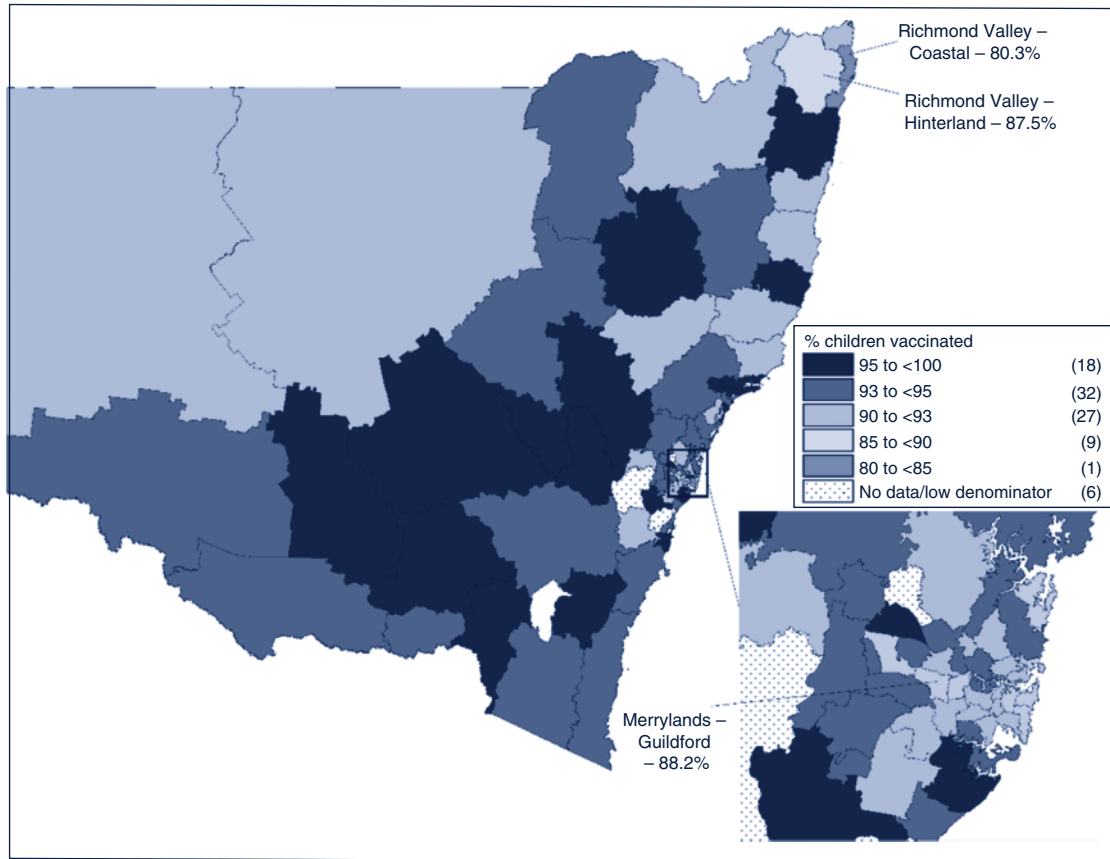


Figure 13. Coverage for the second dose of MMR-containing vaccine at 24 months of age^a by Statistical Area level 3^b, NSW, 2018.

^aCohort born 1 January 2016 – 31 December 2016.

^bNumbers in brackets = number of Statistical Area 3s in each coverage category.

MMR: measles-mumps-rubella.

Source: Australian Immunisation Register, data as at 31 March 2019.

in Aboriginal coverage and on-time vaccination.²³ Given the higher rates of vaccine preventable diseases in Aboriginal children, focusing on closing the gap in on-time vaccination should be a public health goal now that high levels of vaccine coverage at the standard milestone ages have been achieved.

Adolescent vaccination coverage through the NSW School Vaccination Program remained relatively stable in 2018 with 85% of females and 83% of males in Year 7 receiving the first dose of HPV and 85% of Year 7 students receiving the adolescent dTpa vaccine. As part of the NSW Meningococcal W Response Program, 70% of Year 10 and Year 11 students were vaccinated with the meningococcal ACWY conjugate vaccine.

Despite there being a national funded influenza vaccination program for Aboriginal children aged 6 months – <5 years since 2015, influenza vaccine coverage has been relatively low in NSW Aboriginal children. Following the severe influenza season experienced in 2017, NSW Health implemented a state-funded influenza vaccination program for all children aged 6 months – <5 years in

2018. This program saw influenza vaccine coverage in 2018 increase by over 4-fold in Aboriginal children and 8-fold in non-Aboriginal children, reaching 26.4% and 25.6% respectively. The proportion of adults aged 65 years and over who reported receiving influenza vaccination in the previous 12 months also increased in 2018, from 72.6% to 77.4%.

Continued improvements in overall vaccine coverage and timeliness have led to greater protection for NSW residents from vaccine-preventable diseases. The AIR, the NSW School Vaccination Register and the NSW Population Health Survey are essential tools for monitoring the implementation of the National Immunisation Program in NSW. Vaccine coverage estimates for children presented in this report may however underestimate true coverage, due to under-reporting to the AIR. A 2017 NSW study estimated true ‘fully vaccinated’ coverage at 12 months of age to be 2.1% higher than that recorded in the AIR.²⁴ Data entry, data transfer and duplicate record issues contribute to this under-reporting.^{24,25} The level of under-reporting may be higher for influenza vaccine as, unlike most other

Table 10. Adolescent^a vaccination coverage estimates, and doses given, for individual vaccines, NSW, 2014–2018

Gender	Vaccine	2018 Coverage (%)	2018 Doses given	2017 Coverage (%)	2017 Doses given	2016 Coverage (%)	2016 Doses given	2015 Coverage (%)	2015 Doses given	2014 Coverage (%)	2014 Doses given
Female	HPV schedule initiated ^{b,c}	85	38 961	86	37 692	86	37 061	87	37 572	87	37 119
	HPV schedule completed ^{b,d}	82	37 421	82	35 941	82	35 291	82	35 512	82	35 054
Male	HPV schedule initiated ^{b,c}	83	39 983	84	38 610	83	38 505	84	37 945	83	37 155
	HPV schedule completed ^{b,d}	80	38 575	79	36 657	80	36 878	80	35 950	78	35 311
	dTpa ^b	85	79 333	85	76 531	86	76 342	86	75 633	84	73 856
	Varicella ^b	na	na	66	59 721	70	62 429	66	58 630	42	37 123
	4vMenCV ^e	70	61 797	na	na	na	na	na	na	na	na
	4vMenCV ^f	70	58 114	73	58 615	na	na	na	na	na	na
	4vMenCV ^g	na	na	76	55 638	na	na	na	na	na	na

^aCoverage estimates are for school attendees only and do not include doses administered in general practice.

^bYear 7 school attendees.

^cSchedule initiated = the percentage of Year 7 students receiving their first dose of HPV vaccine.

^dSchedule completed = the percentage of Year 7 students completing the HPV vaccine schedule. Completion of HPV vaccination schedule required 3 doses up to end of 2016. In 2017 NSW adopted a 2-dose HPV schedule in line with the World Health Organization recommendations. HPV vaccination coverage in 2014–2018 includes the students who received the HPV vaccine in Year 7 in the year of interest, as well catch up vaccination offered to students in Year 8 in Terms 1–4 of the following year.

^eYear 10 school attendees.

^fYear 11 school attendees.

^gYear 12 school attendees.

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

HPV: human papillomavirus.

4vMenCV: meningococcal ACWY vaccine.

na: not applicable.

Source: NSW School Vaccination Program. Data as at 30 January 2020.

Table 11. Percentage of older adults reporting influenza vaccination^a by local health district, NSW, compared with NSW overall, 2017–2018

Year reporting influenza vaccination	Local Health District ^b															
	CC	FW	HNE	IS	MNC	MM	NBM	NNSW	NS	SES	SWS	SNSW	SYD	WNSW	WS	NSW
2017	67.9	76.1	78.3	72.4	73.4	71.2	66.2	71.1	68.4	68.2	73.2	71.9	74.2	71.0	76.0	72.6
2018	79.7	78.2	82.0	75.9	76.8	80.2	80.0	72.0	77.8	74.9	79.8	74.2	72.4	66.4	79.3	77.4

^aInfluenza vaccination coverage based on survey respondents aged 65 years and over who reported having been vaccinated against influenza in the previous 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 (SAPHaRI). Centre for Epidemiology and Evidence, NSW Ministry of Health. Data as at 26 July 2019.

childhood vaccines, immunisation providers do not receive payment for influenza vaccination notifications to the AIR. Additionally, the estimate of influenza vaccine coverage for adults aged 65 years and over in this report is based on self-report, which tends to overestimate coverage.²⁶

All immunisation providers need to be encouraged to ensure that all vaccinations given across the entire life course are reported to the AIR. As of 2019, adolescent vaccinations given as part of the school-based vaccination program will be reported directly to the AIR. As more vaccination encounters, particularly those of adolescents and adults,

are reported to the AIR, it will become increasingly valuable for monitoring the successful delivery of the vaccination program across the age spectrum in NSW.

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