

NSW Annual Immunisation Coverage Report, 2019

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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 2019. **Methods:** Data from the Australian Immunisation Register (AIR), the NSW School Vaccination Program and the NSW Population Health Survey were used to estimate vaccination coverage for the calendar year 2019, with particular focus on changes from 2018, and to document coverage trends from 2010 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 94.2% in 2019, an increase of 0.4 percentage points from 2018. Compared with 2018, 'fully vaccinated' coverage at 24 and 60 months of age has remained stable in 2019, 90.0% and 93.9%, respectively. 'Fully vaccinated' coverage for Aboriginal children at 12, 24 and 60 months of age increased slightly between 2018 and 2019 and remains higher than 'fully vaccinated' coverage in non-Aboriginal children in NSW, with the greatest difference (3.9 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 2019, 85% of Year 7 female students and 82% of Year 7 male students received the first dose of human papillomavirus (HPV) vaccine. For the first time in this series of reports, coverage of the HPV vaccine is assessed using AIR data and includes doses given both in and outside of the school-based vaccination program. Whilst the majority of HPV doses were given as part of the school-based program, between 5% and 12% of doses were recorded on the AIR as having been administered in the general practice setting. Completion of the two-dose schedule in adolescents commencing HPV vaccination before the age of 15 years was higher for females than males and for non-Aboriginal adolescents than Aboriginal adolescents (87.7% versus 81.9% for females and 85.8% versus 76.7% for males, respectively), with similar disparities in coverage by 15 years of age (84.1% versus 82.7% for Aboriginal and non-Aboriginal females and 81.3% versus 73.6% for males, respectively). Coverage of the adolescent diphtheria, tetanus and acellular pertussis-containing vaccine booster dose in Year 7 students decreased from 85% in 2018 to 84% in 2019. Coverage of meningococcal ACWY conjugate vaccine in Year 10 students increased by 5 percentage points to reach 75% in 2019. Influenza vaccine uptake as recorded on the AIR continued to improve in 2019, for both Aboriginal and non-Aboriginal children aged 6 months to less than 5 years, increasing by almost 10 percentage points compared to 2018. However, in adults aged 65 years and over, self-reported receipt of influenza vaccine in the previous 12 months decreased from 77.4% in 2018 to 75.1% in 2019. **Conclusion:** This report reflects the continued successful delivery of the vaccination program across the age spectrum in NSW. Improved vaccination coverage over the past decade has been achieved in NSW through a

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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 (further strengthened in 2018) and other strategies that have been implemented in low coverage areas. Now that high levels of vaccine coverage at the standard childhood milestone ages have been achieved, on-time vaccination, particularly for Aboriginal children, is an essential public health goal to be focused on. In addition, as more vaccinations given across the entire life course are reported to the AIR, it will become an increasingly valuable tool for continuing to monitor the successful delivery of the vaccination program across the age spectrum in NSW.

Introduction

This is the 11th annual immunisation coverage report for NSW, with analysis encompassing the years 2010–2019. 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. Its format is adapted from the 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 2019 for all ages are outlined in Table 1.

Methods

The Australian Immunisation Register

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 seventh 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 that 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 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 2019 using AIR data up to 31 March 2020 and where relevant, comparisons have been made to vaccination coverage as reported in the 2018 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 3-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 2018 and 31 December 2018 for the 12-month milestone, between 1 January 2017 and 31 December 2017 for the 24-month

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

April 2019: Meningococcal ACWY conjugate vaccine funded under the National Immunisation Program for adolescents aged 14–16 years delivered through a school-based program and adolescents aged 15–19 years delivered through primary care providers as part of an ongoing catch-up program.

March 2019: NSW ceased funding of meningococcal ACWY conjugate vaccine for adolescents.

February 2019: Annual seasonal influenza vaccination funded on the national childhood vaccination schedule for all Australian children aged 6 months to <5 years and all Aboriginal persons aged 6 months and over.

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, respectively.

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 to <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 15–19 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 17–18 years who no longer attend school.⁵

February 2017: Two-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

milestone, and between 1 January 2014 and 31 December 2014 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 the third dose of DTPa-containing vaccine, the third dose of polio/Hib/hepatitis B-containing vaccines (usually given as the combined DTPa-hepB-IPV-Hib vaccine) and the 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 the fourth dose of DTPa-containing vaccine, the third dose of polio/hepatitis B-containing vaccines, the fourth dose of Hib-containing vaccine (or the third dose of Hib-containing vaccine if given after 11.5 months of age), the second dose of measles–mumps–rubella (MMR)-containing vaccine, the

first dose of varicella-containing vaccine, the first dose of meningococcal C-containing vaccine and the third dose of 13vPCV. ‘Fully vaccinated’ at 60 months of age was defined as a child having a record on the AIR of the fourth or fifth dose of DTPa-containing vaccine and the 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 to <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 to <5 years age group.

Table 1. NSW Immunisation Program Schedule for children, adolescents and adults in 2019

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
18 months		DTPa	Hib ^e		MMRV	Flu ^c
4 years		DTPa ^f		IPV ^f		Flu ^c
Adolescents						
11–13 years (Year 7)	dTpa				HPV ^g	
15–17 years (Year 10)				Men ACWY		
15 years						Flu ^c Pneumo ^h
Adults						
≥50 years						Flu ^c Pneumo ⁱ
≥65 years						Flu ^c Pneumo
70 years				HZ ^j		
Pregnant women	dTpa ^k					Flu ^l
<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; MMRV: 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>^bChildren with medical risk factors require an additional dose at 6 months of age as well as the routine dose at 12 months of age.</p> <p>^cAnnual vaccination for all children aged ≥6 months to <5 years, all people with medical risk conditions and all Aboriginal people aged ≥6 months, and 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>^hAboriginal people aged 15 to <50 years with medical risk factors.</p> <p>ⁱAll Aboriginal adults aged ≥50 years.</p> <p>^jFrom 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>^kUsually given to pregnant women at 28 weeks gestation but can be given anytime between 20 and 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>^lAt any stage of pregnancy.</p> <p>Source: http://www.health.nsw.gov.au/immunisation/Publications/nsw-immunisation-schedule.pdf.</p>						

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 2010–2019.

Timeliness of the second dose of 13vPCV and the first and second dose of MMR-containing vaccine in 2019 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 to <3 months’, ‘delay of 3 to <7 months’ or ‘delay ≥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). 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.

Aboriginal status

Vaccination coverage estimates and vaccination delay estimates are presented in this report for all children in NSW and also by Aboriginal status. For the period covered by this report, Aboriginal status was recorded as ‘Indigenous’, ‘non-Indigenous’ or ‘unknown’, as reported by the person (or parent/carer) to Medicare. 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

Analysis of coverage was undertaken at small area level using the Australian Bureau of Statistics (ABS)-defined statistical area level 3 (SA3),¹⁷ chosen because each is small enough to show differences within areas and 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 104 to 2,859 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 version 15 of the 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 2016 was used to match residential postcodes to SA3s.¹⁹

Measuring adolescent vaccination coverage in the school-based program

Coverage data for vaccines given to adolescents in 2019 were provided by NSW Health from their School Vaccination Program.²⁰ Vaccination data for HPV vaccine and dTpa vaccine for Year 7 students and meningococcal ACWY vaccine for Year 10 students are recorded by school immunisation teams and collated by the LHDs and NSW Health. Coverage for each vaccine was calculated using the counts of students vaccinated as the numerator and the school population enrolments, as at the start of the year was used as the denominator. 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 to support course completion. Annual Year 7 HPV vaccination coverage estimates from 2012 to 2019 include school catch-up vaccinations given in Year 8 in the following year.

Measuring adolescent HPV vaccination uptake and coverage using the AIR

A National HPV Vaccination Program Register (HPV Register) was established in 2008 by the Victorian Cytology Service Foundation under contract to the Department of Health to capture all HPV vaccination encounters administered as part of the National HPV Vaccination Program. With the expansion of the ACIR to the AIR, all data held in the HPV Register were transferred to the AIR in late 2018. All HPV vaccinations given through school-based programs, as well as HPV vaccinations given by any other immunisation provider, are now reported directly to the AIR.²²

The number of dose 1 and dose 2 HPV vaccinations given during 2019 to NSW adolescents aged less than 15 years was determined by gender, Aboriginal status, provider type and LHD. Of the adolescents aged less than 15 years with the first dose of HPV vaccine recorded on the AIR, the proportion of adolescents who also received dose 2 by 31 December 2019 was calculated.

Cumulative HPV coverage estimates for NSW were also calculated using eligible year-wide birth cohorts for female and male adolescents aged 12 to <20 years as at 31 December 2019. The proportion of adolescents vaccinated was calculated using the number of NSW adolescents in each cohort with a record of a HPV vaccine encounter between 1 January 2007 and 31 December 2019 as the numerator and the number of Medicare-registered adolescents in NSW for each cohort as the denominator. Cumulative coverage was assessed separately for each dose of HPV vaccine by gender and Aboriginal status.

The World Health Organization recommends assessing coverage at 15 years of age for the purpose of international comparison over time.²³ HPV vaccination in NSW is delivered routinely in Year 7, usually around 12–13 years of age. Annual HPV vaccination coverage in NSW for females and males aged 15 years was calculated for 2015–2019 using the number of 15-year-olds recorded on the AIR to have received dose 1, dose 2 and dose 3 of the HPV vaccine as the numerator and the total number of Medicare registered adolescents turning 15 years old in the year of interest as the denominator. It is important to note that the HPV vaccination schedule transitioned from a three-dose schedule to a two-dose schedule in 2017 in NSW and in 2018 nationally.

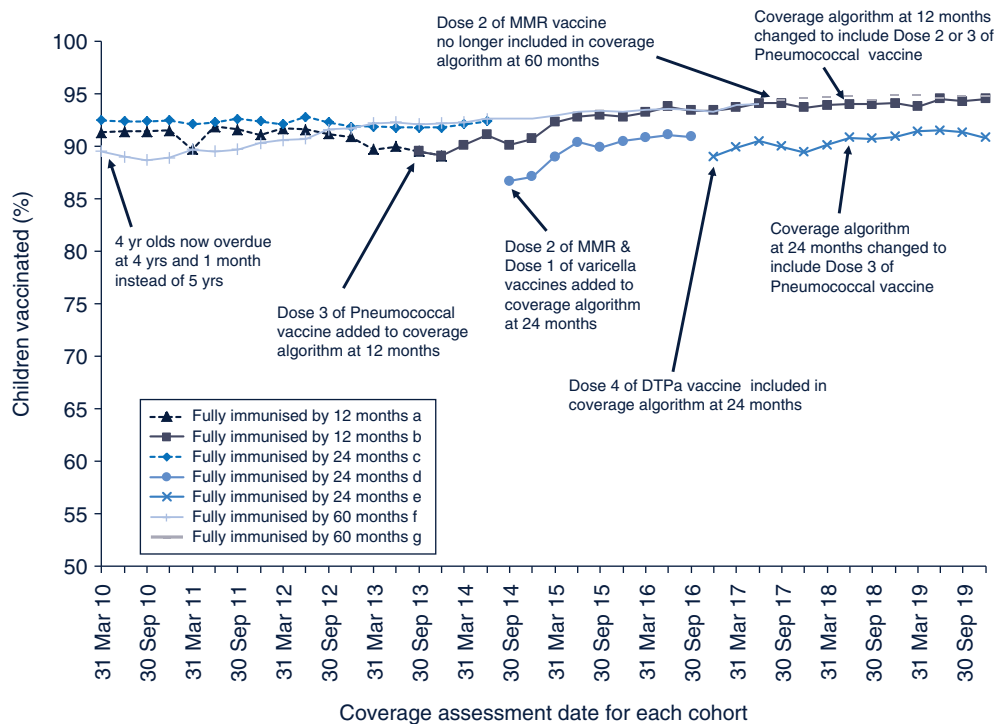


Figure 1. Trends in 'fully vaccinated' coverage, NSW, 2010–2019.

^aUp until 30 June 2013, 'fully vaccinated' at 12 months of age was defined as a child having a record of the 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 the third dose of DTPa-containing vaccine, third doses of polio-containing, Hib-containing and Hep B-containing vaccines, and the third dose of 13-valent PCV. Since 1 April 2018, the definition was changed to include the 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 the third dose of DTPa-containing vaccine, third doses of polio-containing and Hep B-containing vaccines, the fourth dose of Hib-containing vaccine, and the 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 the third dose of DTPa-containing vaccine, third doses of polio-containing and Hep B-containing vaccines, the fourth dose of Hib-containing vaccine, the second dose of MMR-containing vaccine, the first dose of varicella-containing vaccine and the 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 the fourth dose of DTPa-containing vaccine, third doses of polio-containing and Hep B-containing vaccines, the fourth dose of Hib-containing vaccine, the second dose of MMR-containing vaccine, the first dose of varicella-containing vaccine and the first dose of Men C-containing vaccine. Since 1 April 2018, the definition was changed to include the 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 the fourth dose of DTPa-containing vaccine, the fourth dose of polio-containing vaccine and the 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 the fourth or fifth dose of DTPa-containing vaccine and the 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 2020.

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.²⁴ 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?'

Annual influenza vaccination coverage data by LHD was not available as a single calendar year for 2019. Due to unforeseen events, the target number of completed surveys was not met across all LHDs. As such, influenza vaccination coverage in adults aged 65 years and older is reported by LHD as combined 2018–2019 data and compared to the combined 2017–2018 data. Data were obtained from the NSW HealthStats website.²⁵

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, 2019

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 3	96.5	96.4	96.0	96.0	93.2	96.2	95.5	97.6	89.1	95.6	94.8	94.3	95.0	95.4	96.8	95.2	95.1	95.0
Poliomyelitis Dose 3	96.5	96.4	96.0	96.0	93.2	96.2	95.5	97.6	89.1	95.6	94.7	94.2	95.0	95.4	96.8	95.2	95.1	95.0
<i>Haemophilus influenzae</i> type b Dose 3	96.5	96.4	96.0	96.0	93.2	96.1	95.3	97.6	89.0	95.4	94.7	94.2	95.0	95.1	96.8	95.0	95.0	94.9
Hepatitis B Dose 3	96.5	96.7	95.9	95.8	93.1	95.9	95.4	97.6	89.0	95.2	94.6	94.1	94.9	95.0	96.8	94.7	94.9	94.8
Rotavirus Dose 2	93.3	93.4	93.4	93.4	89.2	93.2	93.1	94.4	85.5	93.0	92.8	90.9	91.9	92.4	94.8	92.6	92.3	91.9
13-valent pneumococcal conjugate Dose 2 or 3 ^c	97.2	97.9	96.9	96.9	94.1	96.8	96.6	98.0	90.3	96.4	95.6	95.3	96.1	95.9	98.3	95.9	96.0	96.1
Fully vaccinated ^c	96.2	96.4	95.4	95.3	92.5	95.4	94.8	97.3	88.5	94.7	93.8	93.2	94.7	94.1	96.7	93.8	94.2	94.3
Total number of children	3994	332	10,680	4736	1810	2940	5131	752	3578	9647	9515	15 054	2127	7572	3630	14 487	96 518	301 044

^aCohort born 1 January 2018–31 December 2018.

^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.

^cFully vaccinated^c at 12 months of age was defined as a child having a record on the AIR of the 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 the second or third dose of 13-valent pneumococcal conjugate vaccine. Source: Australian Immunisation Register, data as at 31 March 2020.

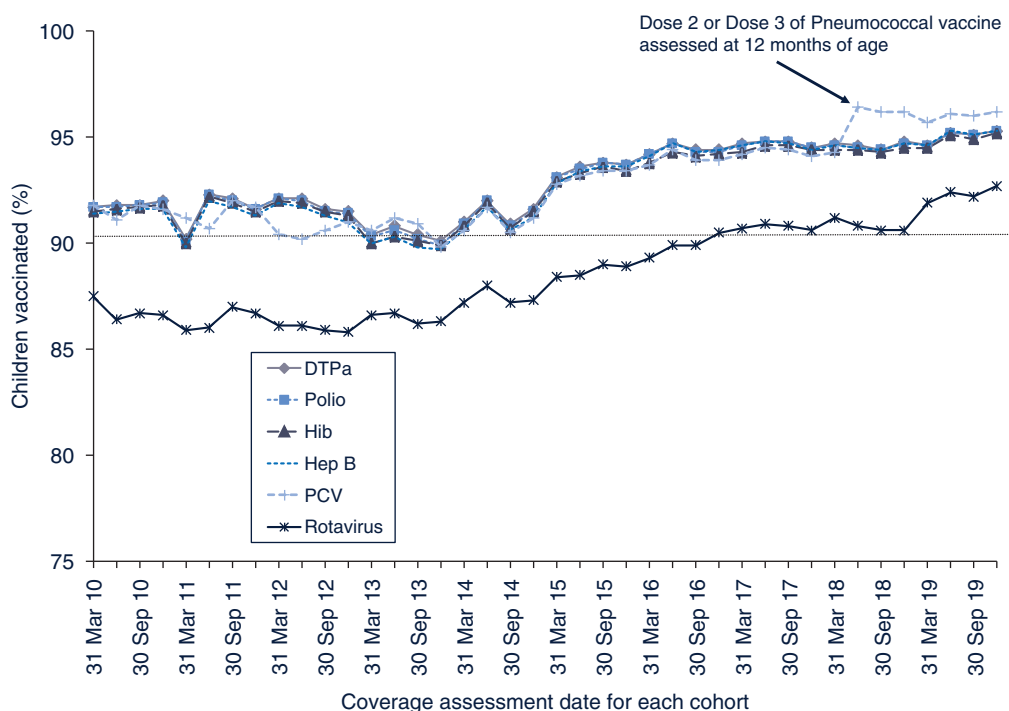


Figure 2. Trends in vaccination coverage estimates at 12 months of age by vaccine/antigen^a, NSW, 2010–2019.

By 3-month birth cohorts born between 1 January 2009 and 31 December 2018. 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, the third dose of 13-valent PCV (second or third dose as of 1 April 2018) and the 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 2020.

Summary of Results

Childhood vaccination coverage

- Quarterly ‘fully vaccinated’ coverage estimates in NSW, assessed at 12, 24 and 60 months of age were 94.5%, 90.8% and 94.7%, respectively, in the December 2019 quarter (Figure 1).
- The annual NSW coverage estimate of ‘fully vaccinated’ at the 12-month milestone was 94.2% in 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, 2019

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	94.3	95.6	94.8	93.9	91.5	94.7	94.0	93.9	86.6	93.3	91.7	92.3	93.5	92.4	95.2	92.5	93.0	93.1
Poliomyelitis Dose 3	96.7	98.5	97.1	96.7	94.1	97.1	96.9	97.1	90.3	96.3	95.5	96.2	96.9	96.4	97.7	96.2	96.2	96.4
<i>Haemophilus influenzae</i> type b (Hib) Dose 4	95.4	96.2	95.7	95.0	93.1	95.6	95.0	96.0	88.4	94.1	93.0	93.7	94.9	93.3	96.2	93.6	94.0	94.1
Meningococcal C Dose 1	96.2	98.0	96.4	95.9	93.5	96.5	96.0	96.5	89.1	94.6	94.1	94.9	96.0	94.2	97.1	94.4	94.9	95.2
Hepatitis B Dose 3	96.5	98.5	96.9	96.6	93.9	96.9	96.7	96.7	90.0	94.8	94.8	96.0	96.8	95.6	97.6	95.2	95.7	95.9
Measles–mumps–rubella Dose 1	96.1	98.0	96.4	95.9	93.8	96.5	95.9	96.4	89.4	94.5	94.0	94.9	95.9	94.2	97.3	94.8	95.0	95.3
Measles–mumps–rubella Dose 2	94.3	96.2	94.9	94.0	91.7	95.1	94.2	94.7	87.2	92.9	91.8	92.8	93.6	92.4	95.5	92.7	93.1	93.3
Varicella Dose 1	94.3	95.9	94.5	93.5	91.4	94.5	93.8	94.4	86.8	92.7	91.4	92.2	93.2	92.1	95.0	92.1	92.7	93.0
13-valent pneumococcal conjugate Dose 3	96.0	97.7	96.3	95.8	93.0	96.5	96.2	95.9	88.9	95.0	94.6	94.9	96.4	95.1	97.0	94.6	95.1	95.2
Fully vaccinated ^c	92.6	94.8	92.9	91.9	89.5	92.8	92.1	91.7	85.0	89.2	88.3	89.6	91.8	88.9	93.6	88.1	90.0	90.2
Total number of children	4,088	343	10,971	4,745	1,865	3,015	5,179	750	3,674	10,270	9,455	14,726	2,186	7,505	3,701	15,016	98,075	308,864

^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.

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

Source: Australian Immunisation Register, data as at 31 March 2020.

(Table 2), an increase of 0.4 of a percentage point from 2018.

- 'Fully vaccinated' coverage at 12 months of age increased slightly in 2019 compared with 2018 in the majority of NSW LHDs and was greater than 93% in all LHDs except Mid North Coast and Northern NSW (Table 2).
- Compared with 2018, state-level coverage for all individual vaccines/antigens at 12 months of age increased in 2019. The greatest increase was seen in rotavirus vaccine coverage, which increased by 1.5 percentage points to reach 92.3%. State-level coverage for all other individual vaccines/antigens at 12 months of age remained greater than 94% (Figure 2, Table 2). 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.
- Coverage for all individual vaccines/antigens at the 12-month milestone, except rotavirus vaccine, was greater than 93% in all LHDs except Northern NSW (Table 2).
- At state level, 'fully vaccinated' coverage at the 24-month milestone was 90.0% in 2019 (Table 3), a decrease of 0.1 of a percentage point from 2018.
- Compared to 2018, 'fully vaccinated' coverage at 24 months of age decreased slightly in the majority of NSW LHDs in 2019 and was below 90% for almost half—Mid North Coast, Northern NSW, Northern Sydney, South Eastern Sydney, South Western Sydney, Sydney and Western Sydney (Table 3).
- Coverage for all vaccines/antigens at the 24-month milestone (except the fourth dose of DTPa-containing vaccine and MMRV vaccine) was greater than 94.0% at state level in 2019 (Figure 3) and greater than 93.0% for all LHDs except for Northern NSW (Table 3).
- Coverage of the fourth dose of DTPa-containing vaccine at 24 months of age increased at state level from 92.6% in 2018 to 93.0% in 2019, with coverage above 92% in all LHDs except for Mid North Coast, Northern NSW and South Eastern Sydney (Table 3).
- Coverage of MMR-containing vaccine at 24 months of age at state level in 2019 remained stable at 95.0% for dose 1 and increased by 0.3 of a percentage point to 93.1% for dose 2 (Table 3). Coverage for the second dose of MMR-containing vaccine was greater than 91.5% for all LHDs except for Northern NSW (Table 3).
- Varicella-containing vaccine coverage at 24 months of age was 92.7% at state level in 2019 with coverage above 91% for all LHDs except for Northern NSW (Table 3).
- The state-level estimate of 'fully vaccinated' coverage at the 60-month milestone remained stable in 2019 at 93.9% and was greater than 93% in all LHDs except Northern NSW, Northern Sydney, South Eastern Sydney and Sydney (Table 4).
- Coverage for all vaccines/antigens at the 60-month milestone was above 94% at state level in 2019

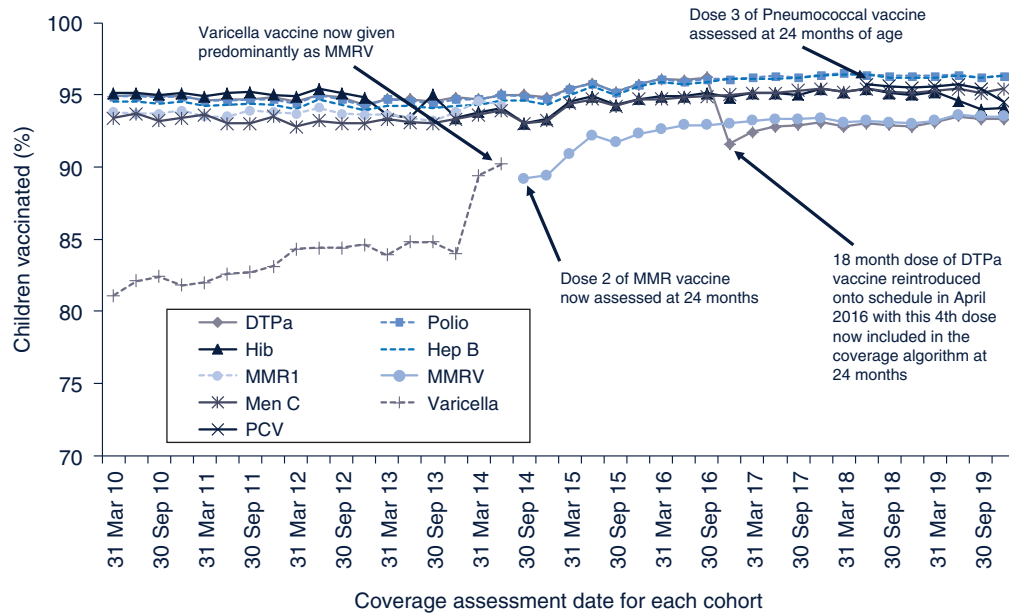


Figure 3. Trends in vaccination coverage estimates at 24 months of age by vaccine/antigen^a, NSW, 2010–2019.

By 3-month birth cohorts born between 1 January 2008 and 31 December 2017. 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, the fourth dose of Hib-containing vaccine, MMR-containing vaccine (first dose assessed up until 30 June 2014, second dose assessed from 1 July 2014), the first dose of varicella-containing vaccine, the first dose of Men C-containing vaccine, and the 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 2020.

(Figure 4) and greater than 91% in all LHDs except Northern NSW (Table 4).

- Although not included in the 60-month ‘fully vaccinated’ coverage algorithm, coverage of the second dose of MMR-containing vaccine at 60 months of age was 96.2% at state level in 2019 and was above 95.0% in all LHDs except Mid North Coast, Northern NSW and South Eastern Sydney (Table 4).
- Recorded uptake of influenza vaccination in children aged 6 months to <5 years at state level continued to improve in 2019, increasing by 9.3 percentage points from 25.6% in 2018 to 34.9% in 2019 (Figure 5).

Aboriginal coverage

- ‘Fully vaccinated’ coverage for NSW Aboriginal children at the 12-month milestone increased from 94.0% in 2018 to 94.4% in 2019 and remained higher than for non-Aboriginal children at the same age, in whom coverage also increased from 93.8% in 2018 to 94.2% in 2019 (Table 5).
- ‘Fully vaccinated’ coverage for Aboriginal children at the 12-month milestone in 2019 varied by LHD – ranging

from 89.6% in South Eastern Sydney to 98.7% in Network with Victoria – and was the same or higher than for non-Aboriginal children in Mid North Coast, Murrumbidgee, Network with Victoria, Northern NSW, Northern Sydney, Southern NSW and Western Sydney LHDs but lower in the other LHDs (Table 5).

- 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 in 2019 (Table 6). These estimates were approximately half a percentage point higher than the 2018 estimates, except for rotavirus vaccine that increased by 1.7 percentage points for Aboriginal children and 1.5 percentage points for non-Aboriginal children.
- Coverage estimates for individual vaccines/antigens assessed at the 12-month milestone in 2019 were marginally lower (less than 1 percentage point) for Aboriginal children compared to non-Aboriginal children except for the pneumococcal conjugate vaccine, which was 1 percentage point higher in Aboriginal children.
- ‘Fully vaccinated’ coverage for NSW Aboriginal children at the 24-month milestone increased from 90.8% in 2018 to 91.2% in 2019, 1.2 percentage points higher

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, 2019

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	95.9	98.4	96.6	96.5	93.9	95.6	95.7	95.2	90.5	92.9	91.6	95.3	95.2	92.6	96.9	94.9	94.5	94.8
Poliomyelitis Dose 4	95.5	98.1	96.3	96.2	93.5	95.5	95.3	95.0	90.1	92.7	91.0	95.0	94.6	91.8	96.6	94.7	94.2	94.3
Measles–mumps–rubella Dose 2 ^c	97.2	99.5	97.6	97.3	94.9	96.6	96.9	97.1	92.2	95.5	94.6	96.8	96.4	95.2	97.9	96.5	96.2	96.4
<i>Haemophilus influenzae</i> type b (Hib) Dose 4 ^d	97.5	98.7	97.7	97.4	95.3	96.9	97.3	97.2	92.8	95.8	95.1	96.8	96.5	95.6	98.0	96.4	96.4	96.6
Hepatitis B Dose 3 ^d	97.5	98.9	97.7	97.5	95.2	96.8	97.3	97.5	92.7	93.8	95.3	97.0	96.9	95.5	98.2	95.2	96.1	96.4
Meningococcal C Dose 1 ^d	97.6	99.5	97.9	97.6	95.2	97.0	97.2	97.5	93.0	95.8	95.4	96.9	96.7	95.8	98.1	96.8	96.6	96.7
Varicella Dose 1 ^d	96.4	98.9	97.0	96.6	93.7	95.7	96.1	97.3	91.0	94.4	93.7	94.9	95.6	93.9	97.0	95.0	95.1	95.3
13-valent pneumococcal conjugate Dose 3 ^d	96.4	96.5	96.5	96.1	93.2	94.9	96.1	95.7	89.5	93.5	94.2	93.3	95.3	93.5	96.5	93.2	94.3	94.4
Fully vaccinated ^e	95.4	98.1	96.2	96.1	93.4	95.4	95.2	94.9	90.0	92.1	90.8	94.7	94.6	91.6	96.5	94.3	93.9	94.2
Total number of children	4,379	375	11,903	4,958	1,962	3,119	5,413	746	4,170	11,963	9,615	15,353	2,371	7,321	3,986	16,006	104,459	331,235

^aCohort born 1 January 2014–31 December 2014.

^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 the fourth or fifth dose of diphtheria, tetanus and acellular pertussis-containing vaccine and the fourth dose of polio-containing vaccine.

Source: Australian Immunisation Register, data as at 31 March 2020.

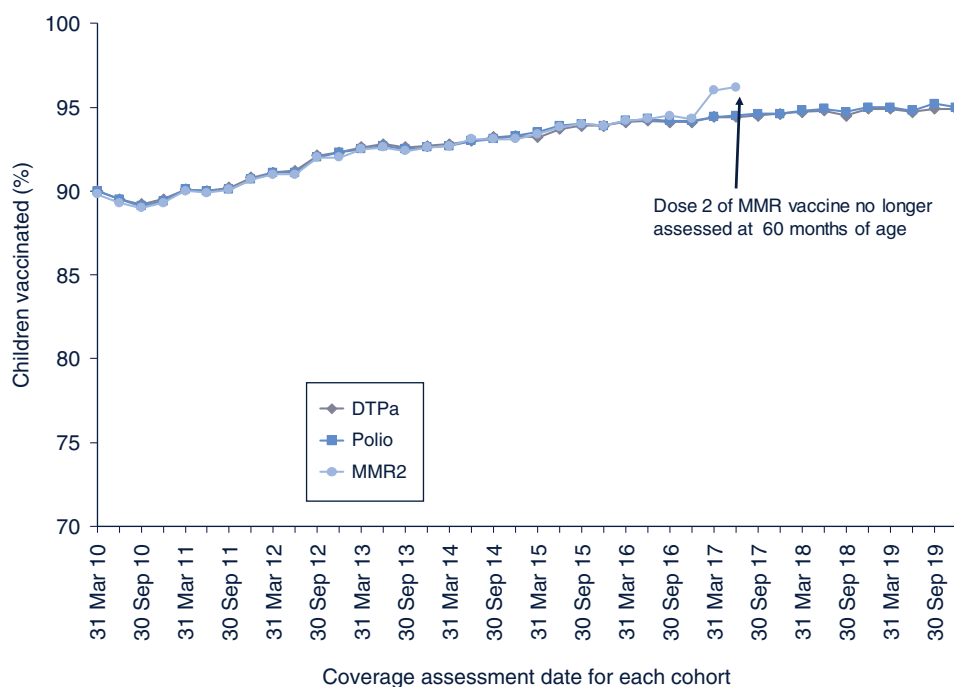


Figure 4. Trends in vaccination coverage estimates at 60 months of age by vaccine/antigen^a, NSW, 2010–2019.

By 3-month birth cohorts born between 1 January 2005 and 31 December 2014. 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), the fourth dose of polio-containing vaccine, and up until 30 June 2017, the 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 2020.

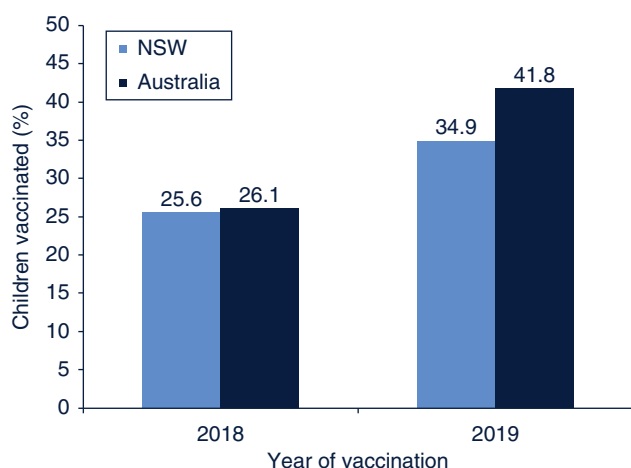


Figure 5. Percentage of children aged 6 months to <5 years with at least one dose of influenza vaccine recorded on the AIR, NSW and Australia, 2018 versus 2019.

Source: Australian Immunisation Register, data as at 31 March 2020.

than for non-Aboriginal children at the same age (Table 5).

- ‘Fully vaccinated’ coverage for Aboriginal children at the 24-month milestone in 2019 varied by LHD – ranging from 88.3% in Northern NSW to 96.0% in Sydney and was higher than for non-Aboriginal children in Nepean Blue Mountains, Network with Victoria, Northern NSW, Northern Sydney, Sydney and Western NSW LHDs but lower in the other LHDs (Table 5).
- Coverage of individual vaccines/antigens assessed at the 24-month milestone in 2019 was above 95% for Aboriginal children, except for DTPa, MMR dose 2 and varicella that were 93%–94%, with these estimates and higher than for non-Aboriginal children (Table 6).
- ‘Fully vaccinated’ coverage for NSW Aboriginal children at the 60-month milestone remained relatively stable between 2018 and 2019 (97.5% and 97.6%, respectively). This was 3.9 percentage points higher than coverage for non-Aboriginal children at the same age (Table 5).
- ‘Fully vaccinated’ coverage for Aboriginal children at the 60-month milestone in 2019 was 96% or above in all LHDs except for Northern Sydney and higher than for non-Aboriginal children in all LHDs except Far West and Northern Sydney (Table 5).
- Coverage estimates for individual vaccines/antigens assessed at the 60-month milestone in 2019 were considerably higher in Aboriginal children than non-Aboriginal children (Table 6).
- Influenza vaccine coverage in children aged 6 months to <5 years increased substantially from 25.6% and 26.4% in non-Aboriginal and Aboriginal children in 2018 (the first year of the NSW Health funded program for all children in this age group) to 34.0% and 35.0%, respectively, in 2019 (Table 7).
- Influenza vaccine coverage for children aged 6 months to <5 years in 2019 varied by LHD, with coverage ranging

from 23.6% in South Western Sydney to 45.2% in Network with Victoria for Aboriginal children and from 22.0% in South Western Sydney to 46.8% in Network with Victoria for non-Aboriginal children (Table 7).

Timeliness

- In 2019, 95.9% of children in NSW were vaccinated on time with the first dose of DTPa-containing vaccine, 0.1 percentage points higher than in 2018. The disparity in on-time vaccination between Aboriginal and non-Aboriginal children in NSW has steadily decreased from 13 percentage points in 2010 to just over 1 percentage point in 2019 (Figure 6).
- In 2019, 92.3% of children in NSW were vaccinated on time with the second dose of 13vPCV vaccine, 0.1 percentage points higher than in 2018, with the proportion higher for non-Aboriginal (92.6%) than Aboriginal (86.8%) children (Figure 7). Compared to 2018, on-time vaccination for the second dose of 13vPCV increased in 2019 by 0.2 of a percentage point for Aboriginal children but decreased by 0.2 of a percentage point for non-Aboriginal children.
- In 2019, 84.5% of children in NSW were vaccinated on time with the third dose of DTPa-containing vaccine, 0.3 percentage points lower than in 2018, with the proportion higher for non-Aboriginal (85.2%) than Aboriginal (74.5%) children (Figure 8, Table 8). The disparity between Aboriginal and non-Aboriginal children in on-time vaccination for the third dose of DTPa-containing vaccine has fallen from 17.4 percentage points in 2010 to 10.7 percentage points in 2019 (Figure 8).
- On-time vaccination for the third dose of DTPa-containing vaccine in 2019 varied by LHD, ranging from 80.3% in South Western Sydney to 88.4% in Northern Sydney and Sydney for non-Aboriginal children and from 68.7% in Mid North Coast to 84.2% in Northern Sydney for Aboriginal children (Table 8).
- In 2019, 78.5% of all children in NSW were vaccinated on time with the first dose of MMR-containing vaccine, a decrease of almost 1 percentage point from 2018, with the proportion higher for non-Aboriginal (79.0%) than Aboriginal (70.0%) children (Figure 9). Compared to 2018, on-time vaccination for the first dose of MMR-containing vaccine decreased in 2019 by 0.9 of a percentage point for non-Aboriginal children and by 1.1 percentage points for Aboriginal children.
- In 2019, 71.3% of children in NSW were vaccinated on time with the second dose of MMR-containing vaccine, 0.1 of a percentage point lower than in 2018, with the proportion 10.4 percentage points higher in non-Aboriginal (72.0%) than Aboriginal (61.6%) children (Figure 10, Table 9). On-time vaccination for the second dose of MMR-containing vaccine increased in 2019 by 0.1 of a percentage point for non-Aboriginal children and decreased by 0.2 of a percentage point for Aboriginal children.

Table 5. Percentage of children fully vaccinated at 12, 24 and 60 months of age by Aboriginal status and local health district, NSW, compared with NSW overall and Australia, 2019

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	95.7	96.0	95.0	94.8	93.5	95.8	93.8	98.7	92.5	97.1	89.6	92.8	94.7	91.9	95.0	94.0	94.4	92.9							
Non-Aboriginal	96.2	96.5	95.5	95.3	92.3	95.3	94.9	97.2	88.1	94.7	93.8	93.3	94.7	94.1	97.2	93.8	94.2	94.4							
24 months – fully vaccinated^c																									
Aboriginal	92.5	90.5	91.8	90.9	89.0	92.6	94.4	92.2	88.3	90.2	84.0	89.5	88.4	96.0	92.4	90.0	91.2	88.9							
Non-Aboriginal	92.6	95.9	93.0	92.0	89.6	92.8	91.9	91.7	84.6	89.2	88.4	89.6	92.0	88.9	94.0	88.1	90.0	90.3							
60 months – fully vaccinated^d																									
Aboriginal	98.9	96.0	97.8	97.3	98.0	97.7	99.3	98.4	96.7	90.0	96.7	96.3	98.3	98.9	97.7	96.3	97.6	96.9							
Non-Aboriginal	95.2	98.7	96.0	96.0	92.6	95.1	95.0	94.6	89.4	92.2	90.7	94.7	94.3	91.5	96.3	94.2	93.7	94.0							

^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; WS: New South Wales.

^bCohort born 1 January 2018–31 December 2018: 'Fully vaccinated' at 12 months of age defined as a child having a record on the AIR of the 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 the second or third dose of 13-valent pneumococcal conjugate vaccine.

^cCohort born 1 January 2017–31 December 2017: 'Fully vaccinated' at 24 months of age defined as a child having a record on the AIR of the fourth dose of diphtheria, tetanus and acellular pertussis-containing vaccine, third doses of polio-containing and hepatitis B-containing vaccines, the fourth dose of *Haemophilus influenzae* type b-containing vaccine (or the third dose of the Haemophilus B conjugate (PRP-T) vaccine if given after 11.5 months of age), the second dose of measles, mumps and rubella-containing vaccine, the first dose of varicella-containing vaccine, the first dose of meningococcal C-containing vaccine and the third dose of 13-valent pneumococcal conjugate vaccine.

^dCohort born 1 January 2014–31 December 2014: 'Fully vaccinated' at 60 months of age defined as a child having a record on the AIR of the fourth or fifth dose of diphtheria, tetanus and acellular pertussis-containing vaccine and the fourth dose of polio-containing vaccine.

Source: Australian Immunisation Register, data as at 31 March 2020.

Table 6. Vaccination coverage estimates by age, vaccine/antigen and Aboriginal status, NSW, 2019

Vaccine/Antigen	Milestone age	Aboriginal	Non-Aboriginal
Diphtheria–tetanus–pertussis	12 months ^a (Dose 3)	94.7	95.1
	24 months ^b (Dose 4)	93.1	92.9
	60 months ^c (Dose 4 or 5)	98.0	94.3
Poliomyelitis	12 months ^a (Dose 3)	94.7	95.1
	24 months ^b (Dose 3)	97.1	96.2
	60 months ^c (Dose 4)	97.6	94.0
<i>Haemophilus influenzae</i> type b	12 months ^a (Dose 3)	94.7	95.0
	24 months ^b (Dose 4)	95.5	94.0
	60 months ^c (Dose 4)	98.9	96.3
Hepatitis B	12 months ^a (Dose 3)	94.7	94.9
	24 months ^b (Dose 3)	97.1	95.6
	60 months ^c (Dose 3)	98.9	95.9
Measles-mumps-rubella	12 months	NA	NA
	24 months ^b (Dose 1)	96.5	94.9
	24 months ^b (Dose 2)	93.9	93.1
	60 months ^c (Dose 2)	99.0	96.1
Meningococcal C	12 months	NA	NA
	24 months ^b (Dose 1)	96.8	94.8
	60 months ^c (Dose 1)	99.0	96.5
Varicella	12 months	NA	NA
	24 months ^b (Dose 1)	93.3	92.6
	60 months ^c (Dose 1)	97.8	94.9
Pneumococcal conjugate vaccine	12 months ^a (Dose 2 or 3)	97.1	95.9
	24 months ^b (Dose 3)	95.9	95.0
	60 months ^c (Dose 3)	96.8	94.1
Rotavirus	12 months ^a (Dose 2)	91.1	92.4
	24 months	NA	NA
	60 months	NA	NA

^aCohort born 1 January 2018–31 December 2018.
^bCohort born 1 January 2017–31 December 2017.
^cCohort born 1 January 2014–31 December 2014.
NA: not assessed.
Source: Australian Immunisation Register, data as at 31 March 2020.

Table 7. Percentage of children aged 6 months to <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, 2018 versus 2019

Aboriginal status and year	Local Health District ^a																	Australia	
	CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Aboriginal																			
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	
2019	30.8	41.4	39.3	29.1	33.4	38.8	28.3	45.2	31.0	37.1	30.2	23.6	31.6	33.3	38.4	25.0	34.0	42.7	
Non-Aboriginal																			
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	
2019	36.3	44.8	45.7	35.3	24.1	39.1	30.1	46.8	26.0	44.0	37.4	22.0	39.5	38.8	43.5	31.2	35.0	41.7	

^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 2020.

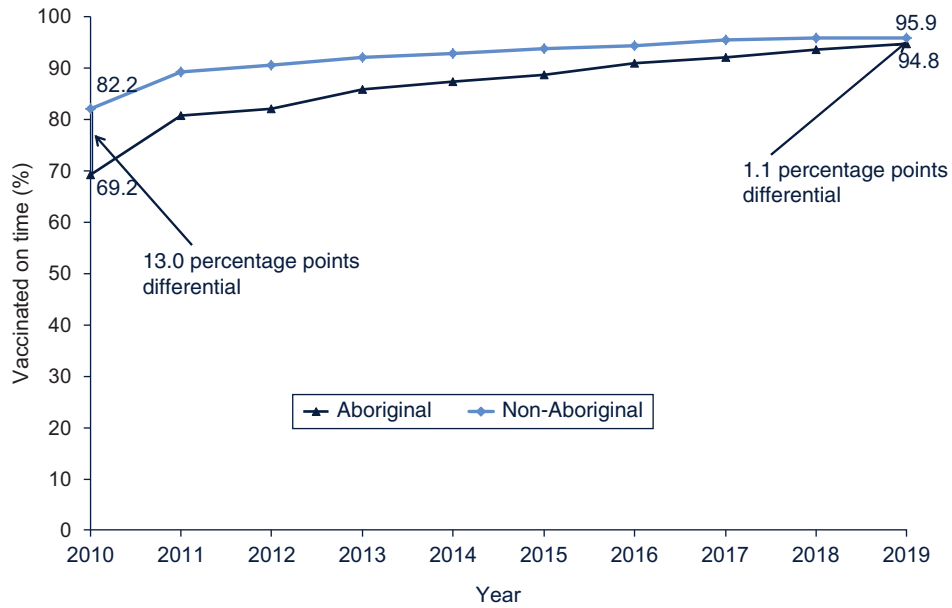


Figure 6. Trends in on-time^a vaccination for the first dose of DTPa-containing vaccine, NSW, 2010–2019.

^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 2020.

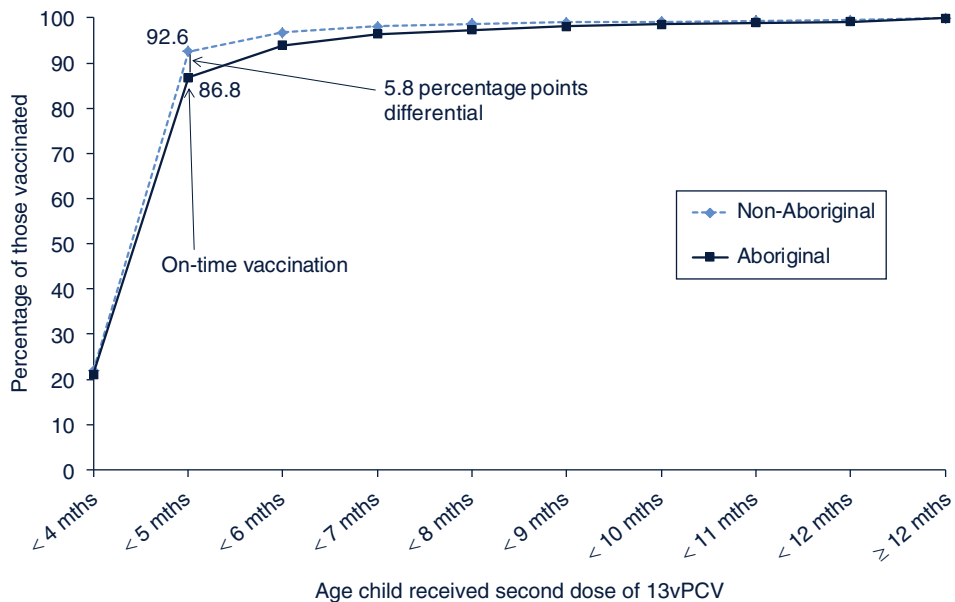


Figure 7. Cumulative percentage of children^a vaccinated with the second dose of 13vPCV^b by age in months and Aboriginal status, NSW, 2019.

^aCohort born 1 January 2017–31 December 2017.

^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 2020.

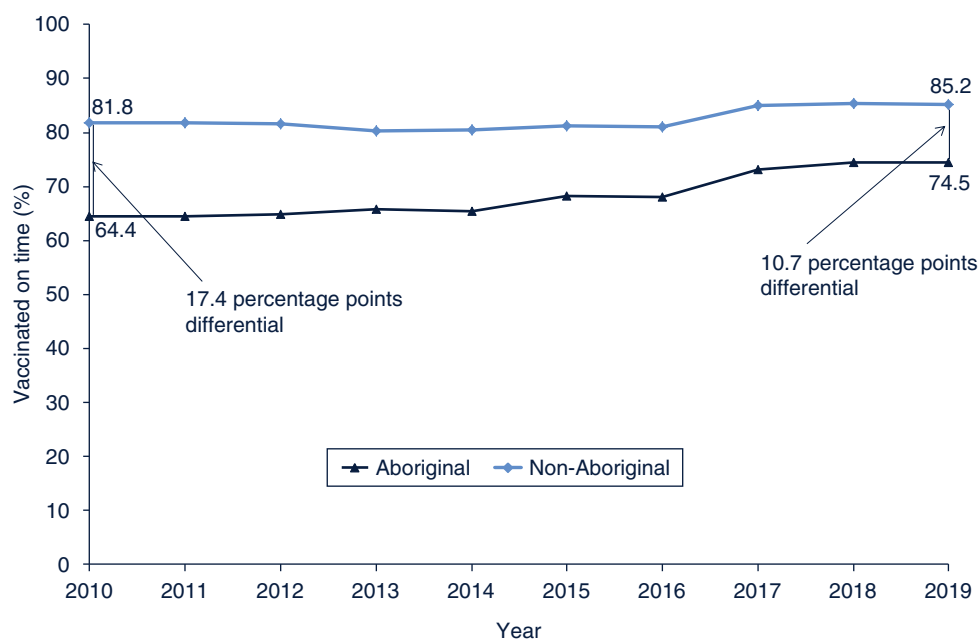


Figure 8. Trends in on-time^a vaccination for the third dose of DTPa-containing vaccine, NSW, 2010–2019.

^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 2020.

Table 8. Coverage for the third dose of DTP^a-containing vaccine by vaccination delay category, Aboriginal status and local health district, NSW, compared with NSW overall and Australia, 2019

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 (%)	76.0	79.2	78.6	71.9	68.7	73.4	76.1	73.4	69.8	84.2	72.9	75.3	72.0	79.6	71.6	72.3	74.5	66.3
Non-Aboriginal (%)	84.1	87.2	88.0	85.1	81.8	84.8	84.7	84.2	81.4	88.4	86.9	80.3	85.1	88.4	86.5	84.4	85.2	81.9
1 to <3 months late																		
Aboriginal (%)	17.3	12.5	14.0	18.9	19.2	16.7	17.3	21.9	19.6	13.2	20.3	15.1	12.2	10.2	17.6	15.3	16.3	20.8
Non-Aboriginal (%)	11.7	8.7	8.6	10.9	12.8	11.5	11.2	11.1	12.2	8.6	9.6	13.4	10.7	8.1	9.2	10.6	10.5	13.2
3 to <7 months late																		
Aboriginal (%)	6.0	6.9	4.8	5.8	7.4	6.8	4.3	4.7	7.4	0.0	3.4	5.2	11.6	6.1	7.2	8.5	6.1	8.5
Non-Aboriginal (%)	3.0	3.0	2.5	2.8	3.6	2.5	2.9	2.7	3.8	2.1	2.4	4.5	2.9	2.5	2.8	3.2	3.0	3.4
≥7 months late																		
Aboriginal (%)	0.7	1.4	2.7	3.4	4.7	3.1	2.3	0.0	3.3	2.6	3.4	4.4	4.3	4.1	3.6	4.0	3.1	4.5
Non-Aboriginal (%)	1.2	1.1	1.0	1.2	1.8	1.2	1.3	2.0	2.6	0.9	1.1	1.8	1.3	1.1	1.4	1.8	1.4	1.5

^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.

^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 2020.

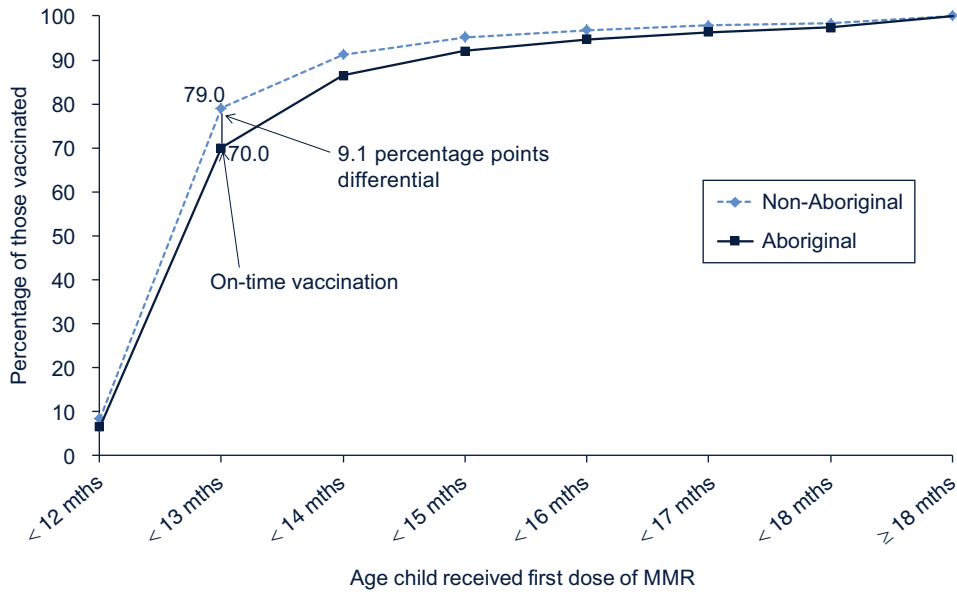


Figure 9. Cumulative percentage of children^a vaccinated with the first dose of MMR-containing vaccine^b by age in months and Aboriginal status, NSW, 2019.

^aCohort born 1 January 2017–31 December 2017.

^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 2020.

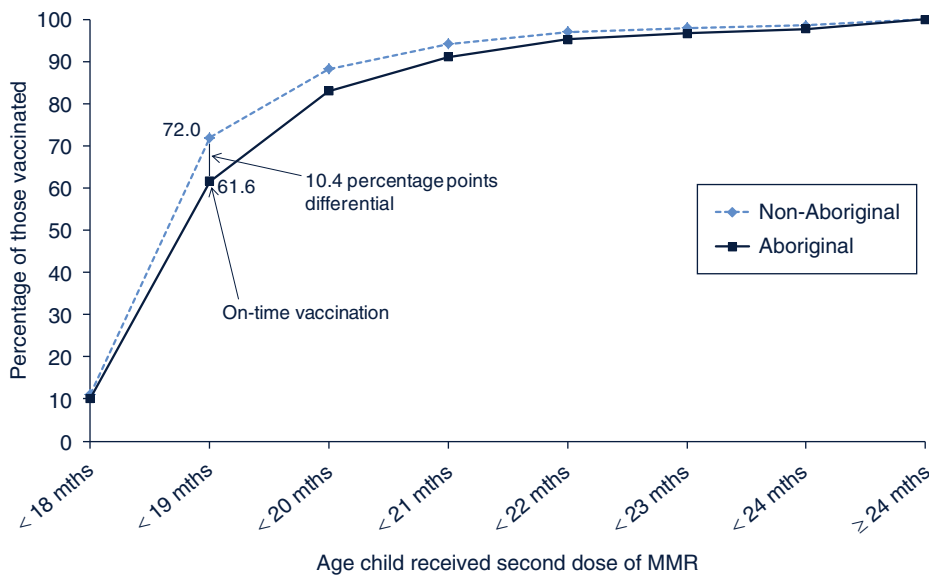


Figure 10. Cumulative percentage of children^a vaccinated with the second dose of MMR-containing vaccine^b by age in months and Aboriginal status, NSW, 2019.

^aCohort born 1 January 2017–31 December 2017.

^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 2020.

Table 9. Coverage 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, 2019

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 (%)	62.6	73.6	65.7	58.5	60.5	59.7	64.2	73.0	53.5	76.3	64.7	58.4	58.2	66.7	58.7	58.9	61.6	54.4
Non-Aboriginal (%)	70.0	73.9	74.6	71.3	69.6	70.9	70.7	72.3	66.0	76.3	73.8	66.5	72.4	75.7	73.1	71.9	72.0	69.7
1 to <3 months late																		
Aboriginal (%)	29.3	22.2	25.6	31.7	34.0	31.1	25.8	20.6	35.7	21.1	27.6	31.4	30.4	29.2	31.1	32.4	29.4	33.8
Non-Aboriginal (%)	24.3	20.1	20.4	23.1	24.6	24.3	23.3	22.3	26.8	18.2	20.0	26.3	22.6	18.9	22.3	22.0	22.1	24.2
3 to <7 months late																		
Aboriginal (%)	6.5	1.4	7.5	9.0	2.8	7.4	9.4	4.8	8.6	2.6	5.2	7.8	9.5	4.2	8.8	8.4	7.5	9.7
Non-Aboriginal (%)	4.9	4.6	4.2	4.7	4.6	3.9	5.1	4.2	5.7	4.5	5.0	5.9	4.0	4.4	3.8	4.9	4.9	5.0
≥7 months late																		
Aboriginal (%)	1.7	2.8	1.2	0.7	2.8	1.7	0.7	1.6	2.2	0.0	2.6	2.4	1.9	0.0	1.4	0.3	1.5	2.2
Non-Aboriginal (%)	0.8	1.5	0.8	0.8	1.2	0.9	0.8	1.2	1.4	1.0	1.1	1.3	1.1	1.0	0.8	1.2	1.1	1.1

^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.

^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 2020.

- On-time vaccination for the second dose of MMR-containing vaccine varied by LHD in 2019, ranging from 66.0% in Northern NSW to 76.3% in Northern Sydney for non-Aboriginal children and from 53.5% in Northern NSW to 76.3% 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 non-Aboriginal children in 2019 (Tables 8 and 9), with the majority of delayed vaccination in the 1 to <3 months delay category across all LHDs.

Small area coverage

- Coverage for rotavirus vaccine varied by SA3 in 2019 (Figure 11), ranging from 77.5% in Richmond Valley-Coastal to 96.1% in Bathurst. Seven SA3s had rotavirus coverage above 95% in 2019 compared to only one in 2018. A further 67 SA3s had rotavirus coverage of 90 to <95% and 11 had rotavirus coverage of 85 to <90%. Richmond Valley-Coastal was the only SA3 with rotavirus vaccine coverage below 85%.
- Coverage for the fourth dose of DTPa-containing vaccine measured at the 24-month milestone varied by SA3 in 2019 (Figure 12), ranging from 77.6% in Richmond Valley-Coastal to 97.9% in Broken Hill and Far West. Only 7 SA3s had coverage below 90% in 2019, compared to 10 in 2018, whilst 18 SA3s had coverage above 95%, compared to 14 in 2018. Richmond Valley-Coastal was the only SA3 with coverage for the fourth dose of DTPa-containing vaccine below 85%.
- Coverage for the second dose of MMR-containing vaccine measured at the 24-month milestone varied

by SA3 in 2019 (Figure 13), ranging from 78.6% in Richmond Valley-Coastal to 97.9% in Broken Hill and Far West. Only six SA3s had coverage below 90% in 2019, compared to 10 in 2018, whilst 19 SA3s were above 95%, one more than in 2018. Richmond Valley-Coastal was the only SA3 with coverage for the second dose of MMR-containing vaccine below 85%.

Adolescent coverage

School-based program

- Coverage of the first and second dose of HPV vaccine, for vaccines delivered through the NSW school-based vaccination program in 2019 to NSW Year 7 students only, was 83% and 80%, respectively.
- Coverage for the first and second doses of HPV vaccine in the school-based program remained consistently higher in female than male Year 7 students. In 2019, 85% of female and 82% of male Year 7 students commenced the two-dose HPV schedule, with 81% of females and 79% of males completing the course (Table 10).
- Despite being stable at 85%–86% since 2015, coverage of the adolescent dTpa booster vaccine given to Year 7 students decreased slightly in 2019 to 84% (Table 10).
- Coverage of the meningococcal ACWY conjugate vaccine in NSW Year 10 students increased by 5 percentage points to 75% in 2019 (Table 10).

Australian Immunisation Register

- AIR data (i.e. vaccinations in all settings not just schools) showed that 42,670 female and 43,181 male adolescents aged less than 15 years had the first dose of HPV vaccine recorded as administered in 2019. Of these, 87.4% of

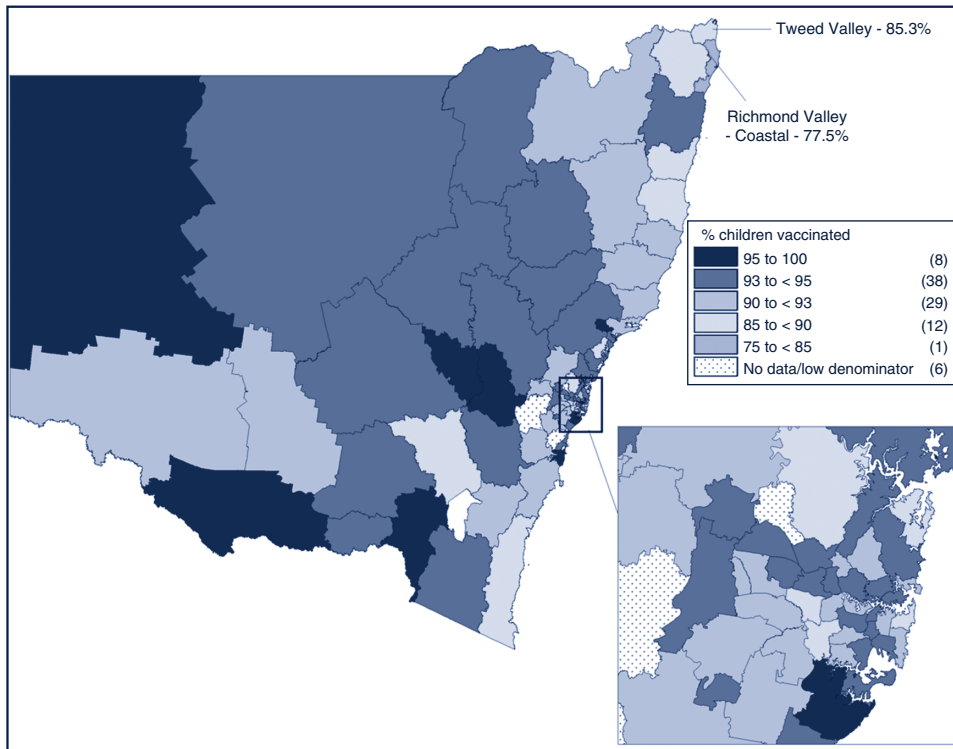


Figure 11. Coverage for second dose of rotavirus vaccine at 12 months of age^a by Statistical Area level 3^b, NSW, 2019.

^aCohort born 1 January 2018–31 December 2018.

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

Source: Australian Immunisation Register, data as at 31 March 2020.

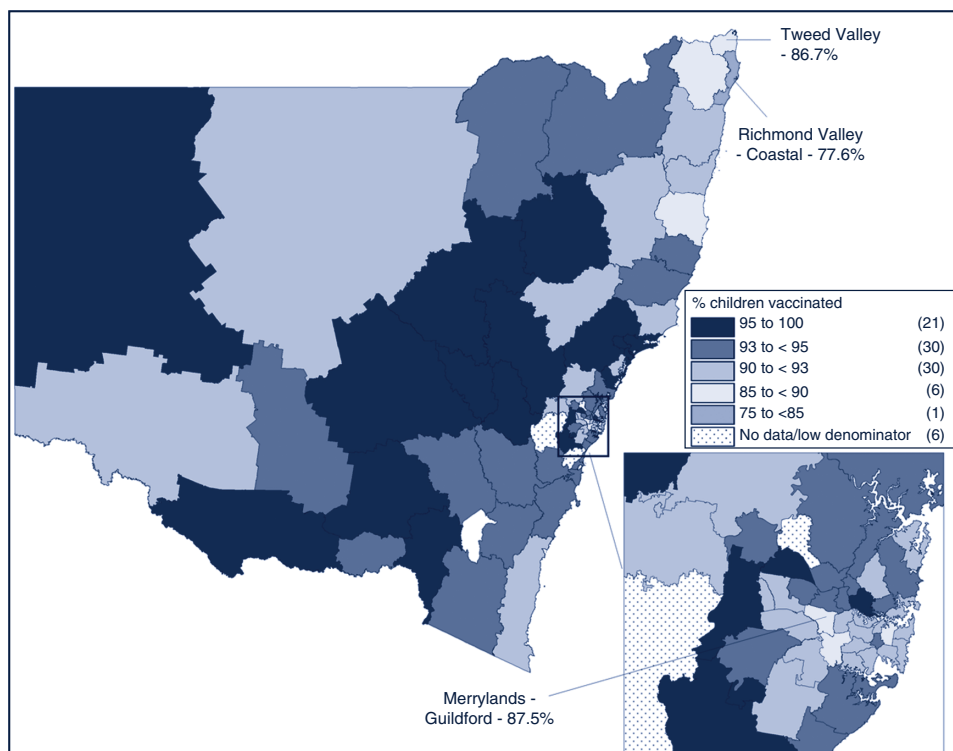


Figure 12. Coverage for the fourth dose of DTPa-containing vaccine at 24 months of age^a by Statistical Area level 3^b, NSW, 2019.

^aCohort born 1 January 2017–31 December 2017.

^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 2020.

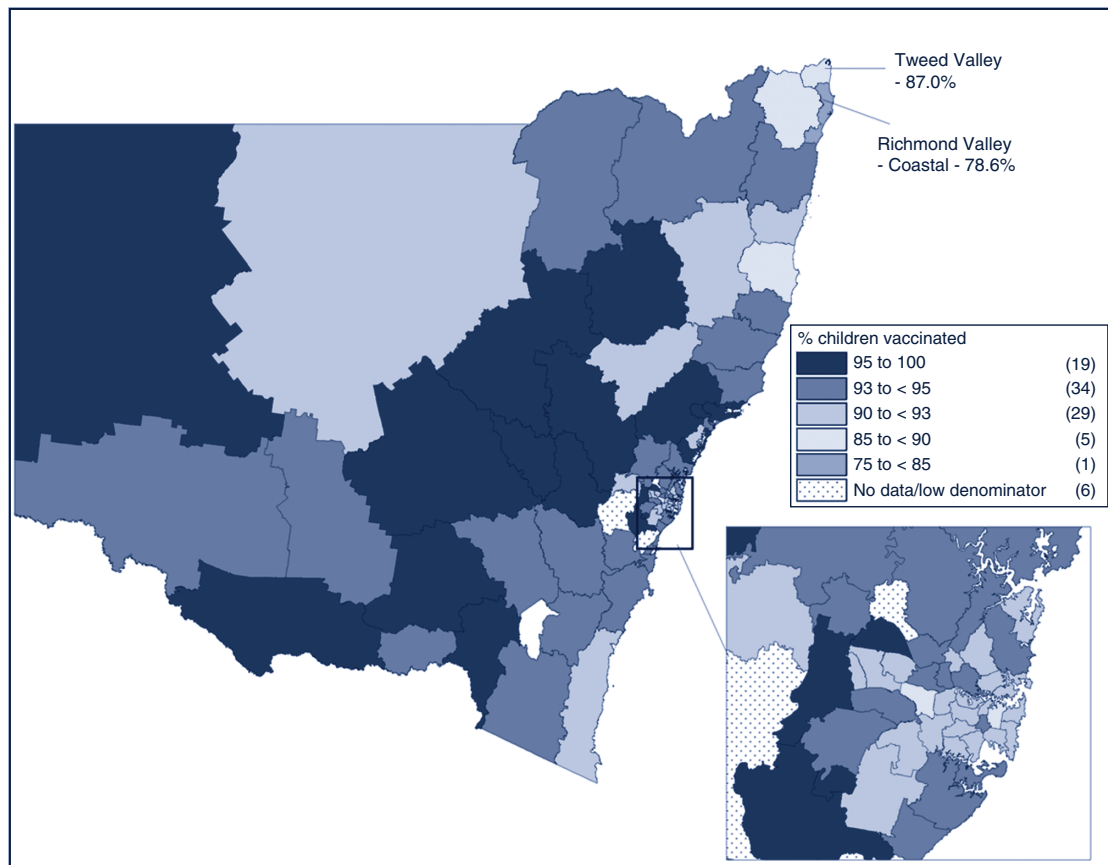


Figure 13. Coverage for the second dose of MMR-containing vaccine at 24 months of age^a by Statistical Area level 3^b, NSW, 2019.

^aCohort born 1 January 2017–31 December 2017.

^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 2020.

females and 85.4% of males also had the second dose recorded as administered in 2019 (Table 11).

- The proportion of adolescents both commencing and completing the two-dose schedule in 2019 varied by LHD – from 79.2% in Far West to 92.1% in Murrumbidgee for females and from 77.0% in Illawarra Shoalhaven to 91.7% in Murrumbidgee for males (Table 11).
- In 2019, 2,294 Aboriginal and 40,376 non-Aboriginal females aged less than 15 years had the first dose of HPV vaccine recorded. Of these, 81.9% and 87.7%, respectively, also had the second dose of HPV vaccine recorded by 31 December 2019 (Table 12). Of the 2,107 Aboriginal males and 41,074 non-Aboriginal males aged less than 15 years with the first dose of HPV vaccine recorded in 2019, the proportion completing the two-dose schedule in 2019 was 76.7% for Aboriginal and 85.8% for non-Aboriginal (Table 12).
- In NSW, Public Health Units in each LHD are responsible for implementing the school-based vaccination program.^{26,27} However, the majority of HPV vaccinations recorded in 2019 for NSW adolescents aged less than 15 years were recorded as administered in

- Community Health settings (Table 13). This high number may be due to a data issue associated with some Public Health Units being incorrectly categorised as community health on the AIR. A higher percentage of Aboriginal than non-Aboriginal adolescents were recorded to have received HPV vaccination in the general practice setting, more so for dose 1. The proportion of adolescents receiving dose 2 in the general practice setting is substantially lower than for dose 1 (Table 13).
- Estimated cumulative coverage, for HPV vaccine doses recorded as administered up to 31 December 2019, is several percentage points higher in females than males across all age cohorts (Table 14).
- Cumulative coverage of dose 1 in Aboriginal adolescents is mostly higher than or equivalent to their non-Aboriginal peers, except in males aged 13, 18 and 19 years (Table 14). Cumulative coverage of dose 2 and/or dose 3 is however consistently lower in Aboriginal adolescents, indicating lower course completion rates.
- HPV vaccine coverage for NSW adolescents aged 15 years has increased steadily since 2015 (Figure 14). In 2019, coverage for females and males was 86.7% and

Table 10. Adolescent^a vaccination coverage estimates, and doses given, for individual vaccines, NSW, 2015–2019

Gender	Vaccine	2019 Coverage (%)	2019 Doses given	2018 Coverage (%)	2018 Doses given	2017 Coverage (%)	2017 Doses given	2016 Coverage (%)	2016 Doses given	2015 Coverage (%)	2015 Doses given
Females	HPV schedule initiated ^{b,c}	85	40,185	85	38,961	86	37,692	86	37,061	87	37,572
	HPV schedule completed ^{b,d}	81	38,377	82	37,421	82	35,941	82	35,291	82	35,512
Males	HPV schedule initiated ^{b,c}	82	40,880	83	39,983	84	38,610	83	38,505	84	37,945
	HPV schedule completed ^{b,d}	79	39,249	80	38,575	79	36,657	80	36,878	80	35,950
	dTpa ^b	84	81,218	85	79,333	85	76,531	86	76,342	86	75,633
	Varicella ^b	na	na	na	na	66	59,721	70	62,429	66	58,630
	4vMenCV ^e	75	67,157	70	61,797	na	na	na	na	na	na
	4vMenCV ^f	na	na	70	58,114	73	58,615	na	na	na	na
	4vMenCV ^g	na	na	na	na	76	55,638	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 two-dose HPV schedule in line with the World Health Organization recommendations. HPV vaccination coverage 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 27 January 2021.

Table 11. Number of NSW adolescents aged less than 15 years commencing HPV vaccination in 2019 and the percentage completing the two-dose schedule by 31 December 2019, by gender, local health district, NSW and Australia

Gender	HPV Dose	Local Health District ^a																	
		CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW	AUS
Females	Number receiving dose 1 in 2019	1,988	168	4,961	2,297	872	1,340	2,186	264	1,560	5,079	3,892	6,471	1,013	2,742	1,564	5,866	42,670	149,636
	% of dose 1 recipients also receiving dose 2 in 2019	86.4	79.2	90.8	81.2	83.3	92.1	83.1	89.4	89.1	87.8	87.4	86.3	88.3	90.0	90.7	86.9	87.4%	86.4%
Males	Number receiving dose 1 in 2019	2,021	137	4,858	2,390	851	1,312	2,276	293	1,486	5,293	3,910	6,598	1,013	2,822	1,516	6,028	43,181	153,676
	% of dose 1 recipients also receiving dose 2 in 2019	82.5	82.5	89.2	77.0	85.3	91.7	78.6	84.6	87.1	86.7	85.6	83.4	86.7	88.3	90.6	85.5	85.4%	84.7%

^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 2020.

84.0% for dose 1 and 83.5% and 80.6% for dose 2, respectively. Coverage varied by LHD and was higher in NSW than Australia for both females and males (Table 15).

Coverage in adults aged 65 years and over

- The 2019 adult influenza vaccination coverage estimates are based on 6,605 NSW Population Health Survey respondents aged 65 years and over.

Table 12. Number of NSW adolescents aged less than 15 years commencing HPV vaccination in 2019 and the percentage completing the two-dose schedule by 31 December 2019, by gender and Aboriginal status

	Females		Males	
	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal
Number receiving dose 1 in 2019	2,294	40,376	2,107	41,074
% of dose 1 recipients also receiving dose 2 in 2019	81.9%	87.7%	76.7%	85.8%

Source: Australian Immunisation Register, data as at 31 March 2020.

Table 13. Number and percentage of HPV vaccinations administered in 2019 to NSW adolescents aged less than 15 years^a by gender, dose number, Aboriginal status and provider type

Dose Number	Gender	Aboriginal Status	Number of Doses	% of doses administered in					
				Community Health	Council	General Practice	Public/Private Hospital	State Health/PHU	Aboriginal Health Service
Dose 1	Females	Aboriginal	2294	73.9	1.1	12.8	0.5	9.7	2.1
		Non-Aboriginal	40376	62.6	1.0	9.5	0.1	26.7	0.2
	Males	Aboriginal	2107	71.1	1.0	15.3	0.2	11.3	1.2
		Non-Aboriginal	41074	63.0	1.0	9.2	0.1	26.5	0.1
Dose 2	Females	Aboriginal	1879	81.7	0.9	6.7	0.2	9.6	0.9
		Non-Aboriginal	35421	65.7	0.9	5.9	0.1	27.3	0.2
	Males	Aboriginal	1616	80.9	0.8	6.3	0.0	11.5	0.6
		Non-Aboriginal	35259	67.0	0.9	4.8	0.1	27.1	0.1

^aAdolescents aged less than 15 years of age at time of dose 1 receipt.
Note: In NSW, Public Health Units in each LHD are responsible for implementing the school-based vaccination program.^{26,27} The high number of doses administered in community health may be a data issue associated with some PHUs being incorrectly categorised as community health (versus State Health/PHU) on AIR.
Source: Australian Immunisation Register, data as at 31 March 2020.

Table 14. Cumulative coverage for HPV vaccine in NSW adolescents by dose number^a, gender, Aboriginal status and birth cohort/age^b for vaccinations encounters recorded up to 31 December 2019

Gender	Aboriginal Status	Age at 31 Dec 2019 (Birth Cohort)													
		13yrs (1 Jan – 31 Dec 2006)		14yrs (1 Jan – 31 Dec 2005)		15yrs ^c (1 Jan – 31 Dec 2004)		16yrs (1 Jan – 31 Dec 2003)		17yrs (1 Jan – 31 Dec 2002)		18yrs (1 Jan – 31 Dec 2001)		19yrs (1 Jan – 31 Dec 2000)	
		Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 3	Dose 1	Dose 3	Dose 1	Dose 3	Dose 1	Dose 3
Females	Aboriginal	81.5	70.5	89.6	81.7	91.1	82.7	90.6	77.9	88.9	75.4	85.4	73.7	84.1	71.2
	Non-Aboriginal	82.9	76.0	86.6	82.9	86.9	84.1	86.9	80.6	86.1	80.4	84.6	78.5	82.4	76.5
Males	Aboriginal	75.6	63.0	85.4	75.3	83.5	73.6	85.8	69.5	81.7	69.0	77.9	64.8	68.6	53.9
	Non-Aboriginal	79.0	71.2	84.4	80.1	84.5	81.3	83.7	76.6	82.8	76.7	79.3	73.1	73.4	66.3

^aCumulative coverage for Dose 1 and Dose 3 reported for adolescents aged 16-19 years. Cumulative coverage for Dose 1 and Dose 2 reported for adolescents aged 13-15 years following the HPV vaccination program changing from a 3-dose schedule to a 2-dose schedule in 2017 in NSW.

^bAge assessed at 31 December 2019. Birth cohort for adolescents aged 12 years not included as 12 year olds are not eligible for HPV vaccination in some states/territories.

^c15 year old coverage is the recommended time point for coverage reporting between jurisdictions and over time.

Source: Australian Immunisation Register, data as at 31 March 2020.

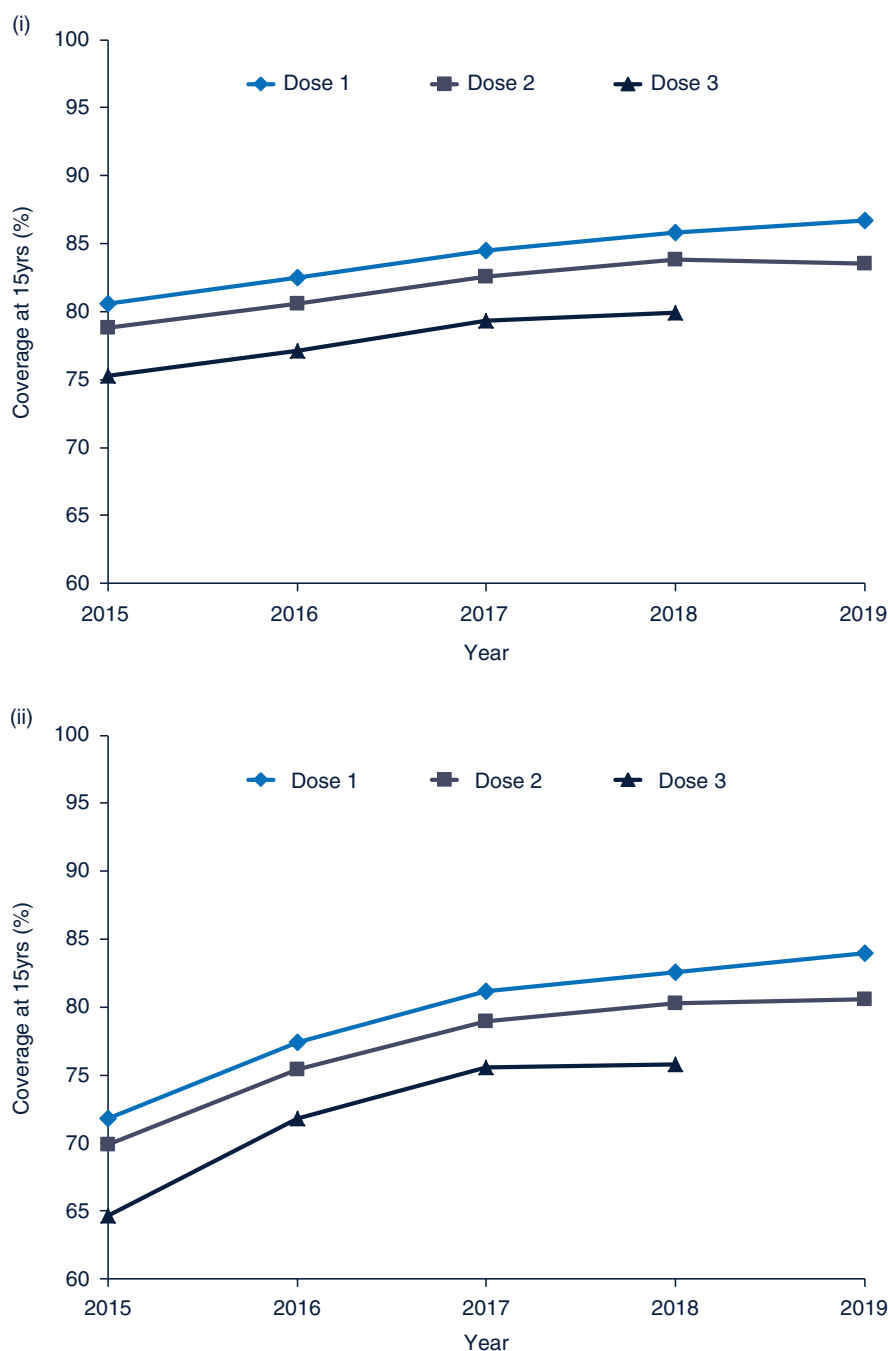


Figure 14. Trends in coverage of Dose 1, Dose 2 and Dose 3^a HPV vaccination for female (i) and male (ii) adolescents aged 15 years^b in NSW, 2015–2019.

^aIn 2017, HPV vaccination changed from a three-dose schedule to a two-dose schedule.

^bHPV vaccine coverage at 15 years of age based on vaccinations given in the first year of high school, usually at 12–13 years of age.

Source: Australian Immunisation Register, data as at 31 March 2020.

- The proportion of surveyed adults reporting vaccination for influenza in the previous 12 months decreased at state level by just over 2 percentage points between 2018 and 2019 – from 77.4% to 75.1%.
- Self-reported influenza vaccination coverage in adults aged 65 years and over varied by LHD for the 2018–2019 period – ranging from 71.3% in Western NSW to 81.7% in Hunter New England (Table 16). Compared to the 2017–2018 period, self-reported coverage was

higher in all LHDs in 2018–2019 except in Northern NSW, South Western Sydney and Sydney LHD.

Conclusions

Successful delivery of the NSW Immunisation Program has continued throughout 2019 with NSW ‘fully vaccinated’ coverage at 12 months of age reaching a high of 94.5% by the end of the year and remaining relatively stable at 24 and 60 months of age at 90.8% and 94.7%, respectively.

Table 15. Coverage for the first and second dose of HPV vaccine in female and male adolescents at age 15 years^a by local health district, NSW and Australia, 2019

Gender	HPV Dose	Local Health District ^b																	
		CC	FW	HNE	IS	MN	MM	NBM	NV	NN	NS	SES	SWS	SN	SYD	WN	WS	NSW	AUS
Females	Dose 1	89.0	86.9	90.4	89.6	86.5	91.3	88.4	87.8	80.4	83.9	85.2	86.0	88.7	83.2	91.7	86.3	86.7	85.7
	Dose 2	86.4	81.3	87.0	82.0	82.8	87.7	85.5	83.3	76.6	81.9	82.8	83.1	85.7	81.1	87.4	83.2	83.5	81.8
Males	Dose 1	88.6	83.6	88.4	87.0	82.7	89.2	86.1	84.7	74.2	82.7	83.3	82.1	85.0	81.4	86.5	83.2	84.0	83.5
	Dose 2	84.9	74.3	83.7	81.4	78.2	84.5	82.3	79.5	71.2	80.6	81.0	78.8	80.8	79.5	81.5	80.0	80.6	79.2

^aHPV vaccine coverage at 15 years of age based on vaccinations given in the first year of high school, usually at 12–13 years of age.
^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.
Source: Australian Immunisation Register, data as at 31 March 2020.

Table 16. Percentage of older adults reporting influenza vaccination^a by local health district, 2017–2018 versus 2018–2019

Year reporting influenza vaccination	Local Health District ^b																All LHDs
	CC	FW	HNE	IS	MNC	MM	NBM	NNSW	NS	SES	SWS	SNSW	SYD	WNSW	WS		
2017–2018	76.0	77.0	80.0	73.6	75.4	76.7	72.6	72.0	75.0	72.4	75.1	71.1	74.6	67.8	77.3	75.1	
2018–2019	77.8	78.2	81.7	77.2	76.1	78.5	77.5	71.8	76.7	74.3	75.1	73.2	71.7	71.3	76.6	76.2	

^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 31 August 2020

‘Fully vaccinated’ coverage at the 24-month milestone is several percentage points below ‘fully vaccinated’ coverage at 12 and 60 months of age, most likely due to the increase in number of antigens required to be classified as ‘fully vaccinated’ at 24 months.

Gains continue to be seen in the immunisation of Aboriginal children across NSW with ‘fully vaccinated’ coverage at each milestone age in 2019 being higher, by between 0.1 and 0.4 of a percentage point, than in 2018. Whilst ‘fully vaccinated’ coverage at each milestone age is higher for Aboriginal children in NSW compared to their non-Aboriginal peers, timely vaccination remains a concern. The percentage of Aboriginal children vaccinated on time remained lower in 2019 than in non-Aboriginal children, for all vaccine/antigens assessed. However, the disparity in timeliness has continued to decrease, likely contributed to by the NSW Aboriginal Immunisation Healthcare Worker Program, funded by NSW Health since July 2012.²⁸ Now that high levels of vaccine coverage at the standard milestone ages have been achieved, on-time vaccination for Aboriginal children is an essential public health goal as Aboriginal children remain at higher risk of vaccine preventable diseases at a young age.

Adolescent HPV vaccination coverage through the NSW School Vaccination Program remained relatively stable in

2019 with 85% of females and 82% of males in Year 7 receiving the first dose of HPV, whereas coverage for the adolescent dTpa vaccine decreased by 1 percentage points to 84%. Seventy-five percent of Year 10 students were vaccinated with meningococcal ACWY conjugate vaccine through the school program in 2019, up 5 percentage points from 2018.

For the first time, HPV vaccination coverage is also presented in this report using data from the AIR, therefore including doses given outside the school program. Of NSW adolescents aged less than 15 years recorded on AIR to have commenced HPV vaccination in 2019, over 85% completed the two-dose schedule. The proportion completing the course is lower in males compared to females, as well as in Aboriginal compared to non-Aboriginal adolescents. Whilst the majority of HPV vaccinations are given as part of the school-based program, 9.2%–12.8% of first doses and 4.8%–6.7% of second doses are recorded as having been administered in the general practice setting.

NSW Influenza vaccine coverage as recorded on the AIR continued to improve in 2019 for Aboriginal and non-Aboriginal children aged 6 months to <5 years, increasing for both by almost 10 percentage points compared to 2018. This improvement may be partly due to increased reporting to the AIR. The proportion of adults aged

65 years and over who reported receiving influenza vaccination in the previous 12 months decreased in 2019 from 77.4% to 75.1%.

Vaccine coverage estimates for children presented in this report may underestimate the 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.²⁹ Data entry, data transfer and duplicate record issues contribute to this under-reporting.^{29,30} The level of under-reporting may be higher for influenza vaccine as, unlike most other childhood vaccines, immunisation providers do not receive payment for influenza vaccination notifications to the AIR. Conversely, 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.³¹

This report demonstrates continuing improvements across a range of immunisation indicators in NSW in 2019, leading to greater protection for NSW residents from vaccine-preventable diseases. All immunisation providers need to be encouraged to ensure that all vaccinations given across the entire life course are reported to the AIR. As more vaccination encounters, particularly those of adolescents and adults, are captured, it will become an increasingly valuable tool for monitoring the successful delivery of the vaccination program across the age spectrum in NSW.

References

1. Hull B., Deeks S., Menzies R., McIntyre P. Immunisation coverage annual report, 2007. *Communicable Diseases Intelligence* 2009; 33: 170–87.
2. Hull B. P., Deeks S. L., McIntyre P. B. The Australian Childhood Immunisation Register – a model for universal immunisation registers? *Vaccine* 2009; 27: 5054–60. doi:10.1016/J.VACCINE.2009.06.056
3. National Centre for Immunisation Research and Surveillance. History of vaccination in Australia. Available from: <http://www.ncirs.org.au/health-professionals/history-immunisation-australia> (Accessed 25 June 2020).
4. NSW Health. Strengthening vaccination requirements for child care. 2018. Available from: https://www.health.nsw.gov.au/immunisation/pages/vaccination_enrolment.aspx (Accessed 16 August 2020).
5. NSW Health. NSW Meningococcal W Response Program. 2018. Available from: <https://www.health.nsw.gov.au/Infectious/diseases/Pages/meningococcal-w.aspx> (Accessed 22 August 2020).
6. World Health Organization. Human papillomavirus vaccines: WHO position paper. *Weekly Epidemiological Record* 2017; 92: 241–68.
7. Australian Government Department of Health. No Jab, No Pay - New Immunisation Requirements for Family Assistance Payments: Fact sheet for vaccination providers. 2016. Available from: <https://www.health.gov.au/sites/default/files/no-jab-no-pay-fsheet.pdf> (Accessed 25 July 2020).
8. Hull B. P., McIntyre P. B., Heath T. C., Sayer G. P. Measuring immunisation coverage in Australia: a review of the Australian Childhood Immunisation Register. *Australian Family Physician* 1999; 28: 55–60.
9. Australian Government Federal Register of Legislation. Australian Immunisation Register (Consequential and Transitional Provisions) Bill. 2015. Available from: <https://www.legislation.gov.au/Details/C2015B00147/Explanatory%20Memorandum/Text> (Accessed 25 June 2020).
10. Australian Technical Advisory Group on Immunisation (ATAGI). Australian Immunisation Handbook. Canberra: Australian Government Department of Health and Ageing; 2018. Available from: <https://immunisationhandbook.health.gov.au/> (Accessed 26 July 2020).
11. Australian Government Services Australia. Australian Immunisation Register (AIR) – Immunisation medical exemption form (IM011). Available from: <https://www.servicesaustralia.gov.au/organisations/health-professionals/forms/im011> (Accessed 24 August 2020).
12. Hendry A., Hull B., Dey A., et al. NSW Annual Immunisation Coverage Report, 2018. NSW Health 2019.
13. O'Brien E. D., Sam G. A., Mead C. Methodology for measuring Australia's childhood immunisation coverage. *Communicable Diseases Intelligence* 1998; 22: 36–7.
14. Hull B. P., McIntyre P. B. Immunisation coverage reporting through the Australian Childhood Immunisation Register – an evaluation of the third-dose assumption. *Australian and New Zealand Journal of Public Health* 2000; 24: 17–21. doi:10.1111/J.1467-842X.2000.TB00717.X
15. Hull B. P., Lawrence G. L., MacIntyre C. R., McIntyre P. B. Estimating immunisation coverage: is the 'third dose assumption' still valid? *Communicable Diseases Intelligence* 2003; 27: 357–61.
16. Rank C., Menzies R. I. How reliable are Australian Childhood Immunisation Register coverage estimates for Indigenous children? An assessment of data quality and coverage. *Communicable Diseases Intelligence* 2007; 31: 283–7.
17. Australian Bureau of Statistics. Australian Statistical Geography Standard (ASGS). 2011. Available from: <http://www.abs.gov.au/websitedbs/d3310114.nsf/home/australian+statistical+geography+standard+%28asgs%29>. (Accessed 17 April 2020).
18. MapInfo Pro version 15.0. Stamford, Connecticut, USA. 2015.
19. Australian Bureau of Statistics. Australian Statistical Geography Standard (ASGS): Correspondences, July 2016. 2018. Available from: <https://data.gov.au/dataset/ds-dga-23fe168c-09a7-42d2-a2f9-fd08fbd0a4ce/details> (Accessed 3 August 2020).
20. NSW Health. NSW School Vaccination Program. Available from: <https://www.health.nsw.gov.au/immunisation/Pages/schoolvaccination.aspx> (Accessed 3 August 2020).
21. Ward K., Menzies R., Quinn H. School-based vaccination in NSW. *New South Wales Public Health Bulletin* 2010; 21: 237–42.
22. Australian Government Department of Health. HPV vaccination records are moving to the Australian Immunisation Register. 2018. Available from: <https://www.health.gov.au/news/hpv-vaccination-records-are-moving-to-the-australian-immunisation-register> (Accessed 19 July 2020).

23. World Health Organization. Human papillomavirus (HPV) vaccine coverage monitoring manual. Licence: CC BY-NC-SA 3.0 IGO.2020. Available from: <https://apps.who.int/iris/bitstream/handle/10665/331807/9789240002746-eng.pdf?ua=1> (Accessed 24 August 2020).
24. NSW Health Centre for Epidemiology and Evidence. NSW Adult Population Health Survey – Overview. Available from: <https://www.health.nsw.gov.au/surveys/adult/Pages/overview-of-survey.aspx> (Accessed 26 June 2020).
25. NSW Health. HealthStats NSW. Available from: <http://www.healthstats.nsw.gov.au/> (Accessed 31 August 2020).
26. Ward K., Quinn H., Bachelor M. et al. Adolescent School-Based Vaccination in Australia. *Communicable Diseases Intelligence* 2013; 37: E156–E67.
27. NSW Health. HealthStats NSW – Immunisation in adolescent students. Available from: http://www.healthstats.nsw.gov.au/Indicator/com_immustud_cat/com_immustud_cat_lhn_trend?&topic=Immunisation&topic1=topic_immunis&code=immu (Accessed 21 September 2020).
28. Hendry A. J., Beard F. H., Dey A. et al. Closing the vaccination coverage gap in New South Wales: the Aboriginal Immunisation Healthcare Worker Program. *Med J Aust* 2018; 209: 24–8. doi:10.5694/MJA18.00063
29. Menzies R., Andrews R. Immunisation issues for Indigenous Australian children. *Journal of Paediatrics & Child Health* 2014; 50: E21–5. doi:10.1111/J.1440-1754.2011.02079.X
30. Dalton L., Meder K., Beard F., et al. Australian Immunisation Register Data Transfer Study - Stage 2 Final Report. 2018. Available from.
31. Jackson M. L. Use of self reported vaccination status can bias vaccine effectiveness estimates from test-negative studies. *Vaccine: X* 2019; 1: 100003. doi:10.1016/J.JVACX.2018.100003