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Annual Immunisation Coverage Report 2017

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Vaccine abbreviations

13vPCV – 13-valent pneumococcal conjugate vaccine

23vPPV – 23-valent pneumococcal polysaccharide vaccine

dT – diphtheria-tetanus (adults, adolescents and children aged over 10 years formulation)

dTpa – diphtheria-tetanus-acellular pertussis (adults, adolescents and children aged over 10 years formulation)

DTPa – diphtheria-tetanus-acellular pertussis (children aged under 10 years formulation)

Flu – influenza

Hep A – hepatitis A

Hep B – hepatitis B

Hib – *Haemophilus influenzae* type b

Hib-MenC – combined *Haemophilus influenzae* type b and meningococcal C

HPV – human papillomavirus

HZ – herpes zoster

MenACWY – quadrivalent (A, C, W, Y) meningococcal conjugate

MenC – meningococcal C

MMR – measles-mumps-rubella

MMRV – measles-mumps-rubella-varicella

PCV – pneumococcal conjugate vaccine

PPV – pneumococcal polysaccharide vaccine

PRP-OMP – *Haemophilus influenzae* type b conjugate (meningococcal outer membrane conjugate)

VZV – varicella-zoster virus

Abstract

This 11th annual immunisation coverage report shows data for the calendar year 2017 derived from the Australian Immunisation Register (AIR) and the National Human Papillomavirus (HPV) Vaccination Program Register. This is the first report to include data on HPV vaccine course completion in Aboriginal and Torres Strait Islander (Indigenous) adolescents. 'Fully immunised' coverage at the 12-month assessment age increased in 2017 to reach 93.8% and at the 60-month assessment age to reach 94.5% in December 2017. 'Fully immunised' coverage at the 24-month assessment age decreased slightly to 89.8% in December 2017 following amendment in December 2016 to reintroduce the fourth DTPa vaccine dose at 18 months. 'Fully immunised' coverage at 12 and 60 months of age in Indigenous children reached the highest ever recorded levels of 93.2% and 96.9%, respectively, in December 2017. Catch-up vaccination activity for the second dose of measles-mumps-rubella-containing vaccine was considerably higher among Indigenous adolescents compared to non-Indigenous adolescents aged 10–19 years (20.3% versus 6.4%, respectively, of those who had not previously received that dose). In 2017, 80.2% of females and 75.9% of males aged 15 years had received a full course of 3 doses of HPV vaccine. Of those who received dose one, 79% of Indigenous girls and 77% of Indigenous boys aged 15 years in 2017 completed 3 doses, compared to 91% and 90% of non-Indigenous girls and boys, respectively. A separate report is planned to present adult AIR data and assess the completeness of reporting.

Keywords: immunisation coverage, immunisation delay, Indigenous immunisation coverage, influenza vaccination, adolescent immunisation coverage, human papillomavirus vaccine coverage

Introduction

This is the 11th Annual Immunisation Coverage Report, with reports now covering the years 2007–2017.^{1–10} This report complements other reports providing data on immunisation coverage in Australia^{11–13} and highlights important trends, as well as policy and program changes in relation to these trends. It covers data for the calendar year 2017 as well as trend data from 2006 onwards. For the first time, this report also includes data from the National Human Papillomavirus (HPV) Vaccination Program Register on completion rates for the HPV vaccine course in Aboriginal and Torres Strait Islander adolescents. This report uses the longstanding international practice of reporting at key milestone ages for children to measure coverage against national targets and to track trends over time. Readers are referred to the first report in the series for a more detailed explanation of the methods used to analyse data.¹ Table 1 shows the Australian National Immunisation Program (NIP) Schedule for 2017.

The Australian Childhood Immunisation Register (ACIR) was established on 1 January 1996 by incorporating demographic data from Medicare on all enrolled children aged <7 years.¹⁴ On 30 September 2016, the ACIR expanded to become the AIR to collect data on vaccinations given from birth to death.¹⁵ All people registered with Medicare are automatically added to the AIR. Participation in the AIR is 'opt-out' and so constitutes a nearly complete population register for Australian residents.¹⁴ A person not enrolled in Medicare can also 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 could occur via medical practice management software, through direct data entry on the AIR website or by submitting paper encounter or history forms. High levels of reporting to the AIR for child vaccinations are maintained by a system of incentive payments for immunisation providers and carers. These have been discussed in detail elsewhere.^{1,6} All vaccination records for a person remain on the register indefinitely.

Important recent changes to immunisation policy, the incentive payment system and the 'fully immunised' coverage algorithms for children are highlighted in Box 1.¹⁶ New immunisation requirements for federal government family assistance payments (the 'No Jab, No Pay' policy) came into effect on 1 January 2016.¹⁷ Under this policy, only parents of children (aged <20 years, up from 9 years previously) who are 'fully immunised' or on a recognised catch-up schedule are eligible for 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 to certain diseases (as reported by their general practitioner, and based on guidance in The Australian Immunisation Handbook,¹⁸ a vaccination provider fact-sheet¹⁹ and the AIR Medical Exemption Form)¹⁷ continue to be exempt from the requirements, but 'conscientious' objection to vaccination on non-medical grounds is no longer a valid exemption from immunisation requirements from 1 January 2016 and, therefore, is no longer recorded on the AIR.¹⁹ In March 2016, a booster dose of diphtheria-tetanus-acellular pertussis (DTPa) vaccine was funded at 18 months of age, almost 13 years after it was removed from the NIP in 2003. A funded national herpes zoster (HZ) vaccine program commenced in November 2016, with a single dose of HZ vaccine at 70 years of age (with a 5-year catch up for 71–79 year olds) for people who have not previously received a dose of zoster vaccine.²⁰ Between February and September 2017, state-funded meningococcal ACWY conjugate vaccination programs were implemented in most jurisdictions for students in Years 10–12 as well as adolescents aged 15–19 years who no longer attend school. In July 2017, Queensland, South Australia, Victoria and Western Australia changed the rotavirus vaccine

Table 1. Australian National Immunisation Program Schedule for children, adolescents and adults in 2017

Age	Vaccine	
Childhood vaccines		
Birth	Hep B	
2 months	Hep B	DTPa
4 months	Hep B	DTPa
6 months	Hep B	DTPa
12 months	Hib-Men C	MMR
18 months		Hep A ^c
24 months		Hep A ^c
48 months	Polio	23vPPV ^e
Adolescent vaccines		
12–15 years	dTpa	HPV
15–49 years		23vPPV ^f
Adult vaccines		
≥50 years		Flu ^b
65 years		Flu ^b
Pregnant women (any age)	dTpa ^g	Flu ^b
70 years		Flu ^b
		Flu ^h
		HZ ⁱ
<p>^aQueensland, South Australia, Victoria and Western Australia changed from a 3-dose rotavirus vaccine schedule to a 2-dose schedule on 1 July 2017.</p> <p>^bAnnual vaccination – all Aboriginal and Torres Strait Islander children aged 6 months to <5 years, all children aged ≥6 months with medical risk factors, Aboriginal and Torres Strait Islander people aged ≥15 years, non-Indigenous adults aged ≥65 years.</p> <p>^cAboriginal and Torres Strait Islander children – doses at 12 months and 18 months of age in the Northern Territory, Western Australia, Queensland and South Australia.</p> <p>^dBooster dose for all medically at risk children at 12 months of age, and Aboriginal and Torres Strait Islander children aged 12 months (South Australia and Western Australia) and 18 months (Northern Territory and Queensland).</p> <p>^eMedically at-risk children.</p> <p>^fOne dose every 5 years – Aboriginal and Torres Strait Islander people aged ≥15 years with medical risk factors; Aboriginal and Torres Strait Islander adults aged ≥50 years and all adults aged ≥65 years.</p> <p>^gDuring the third trimester of pregnancy.</p> <p>^hAt any stage of pregnancy.</p> <p>ⁱA single dose of HZ vaccine is funded for adults aged 70 years (with a 5-year catch up for 71–79 year olds) who have not previously received a dose of HZ vaccine.</p>		

Box 1. Significant changes in immunisation policy, immunisation incentives and coverage calculation algorithms, Australia, 2013 to 2017

July 2017 – Queensland, South Australia, Victoria and Western Australia changed from the 3-dose RotaTeq[®] rotavirus vaccine schedule to the 2-dose Rotarix[®] schedule.

Coverage for the second dose of MMR-containing vaccine was no longer assessed at 60 months of age.

February – September 2017 – state-funded meningococcal ACWY conjugate vaccine programs implemented in most jurisdictions for students in Years 10–12, as well as for adolescents aged 15–19 years who no longer attend school.

November 2016 – Funded national HZ vaccine program commenced, with a single dose of HZ vaccine at 70 years of age for people who have not previously received a dose of zoster vaccine and a catch-up program for people aged 71–79 years.

March 2016 – A booster dose of DTPa funded at 18 months of age.

January 2016 – New immunisation requirements for federal government family assistance payments (the 'No Jab, No Pay' policy) came into effect. Only parents of children (aged <20 years, up from 9 years previously) who are 'fully immunised' or on a recognised catch-up schedule are eligible 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, objection on non-medical grounds is no longer a valid exemption.

July 2014 – June 2015 – state/territory funded dTpa programs for women during the third trimester of pregnancy commenced in all jurisdictions.

March 2015 – Advice provided that first dose of 13vPCV could be given as early as 6 weeks of age.

Seasonal influenza vaccine funded for Aboriginal and Torres Strait Islander children aged 6 months to <5 years. The recommended upper age for children requiring 2 doses in the first year they receive influenza vaccine changed from <10 years to <9 years.

December 2014 – Immunisation coverage assessment algorithm for 'fully immunised' at the 24-month milestone amended to require 1 dose of MenC vaccine and 1 dose of varicella vaccine, along with the second dose of MMR vaccine instead of the first dose as previously. The second dose of MMR vaccine remained in the coverage assessment algorithm for the 60-month milestone age.

December 2013 – Immunisation coverage assessment algorithm for 'fully immunised' at the 12-month milestone amended to include a third dose of pneumococcal conjugate vaccine (PCV).

July 2013 – Combined *Haemophilus influenzae* type b (Hib) and MenC conjugate vaccine, Menitorix[®], funded in the NIP Schedule at 12 months of age, replacing the single dose of monovalent MenC vaccine and booster dose of monovalent Hib vaccine previously scheduled at 12 months of age.

Combination measles-mumps-rubella-varicella (MMRV) vaccine funded in the NIP at 18 months of age, replacing MMR dose previously scheduled at 4 years of age, and varicella vaccine dose previously scheduled at 18 months of age. MMR vaccination at 4 years of age continued in parallel until first cohort eligible for MMRV vaccine reached 4 years of age.

Hepatitis A vaccination schedule for Indigenous children changed so that dose 1 administered at 12 months of age and dose 2 at 18 months of age in all four relevant jurisdictions (the Northern Territory, Western Australia, Queensland and South Australia).

February 2013 – HPV vaccine funded under the NIP for males aged 12–13 years, delivered in school-based programs. Catch up to age 15 to end of 2014.

Source: NCIRS History of Vaccination.¹⁶

schedule from the 3-dose RotaTeq[®] schedule to the 2-dose Rotarix[®] schedule, in line with the other jurisdictions.²¹

While 2017 represents the first full year of data of the expanded whole-of-life register, adult vaccination data from the AIR are not included in this report. A separate report is planned to present adult AIR data and assess the completeness of reporting.

Methods

Coverage in young children aged <10 years

This report details national immunisation coverage using AIR data as at 31 March 2018. The cohort method has been used for calculating coverage at the population level (national and state/territory since the ACIR's inception).²² Cohort immunisation status was assessed at 12 months of age (for vaccines due at 6 months), 24 months of age

(for vaccines due at 12 and 18 months) and 60 months of age (for vaccines due at 48 months). A minimum three-month lag period was allowed for late notification of vaccinations to the AIR, but only vaccines given on or before a child's first, second or fifth birthdays, respectively, were included in coverage calculations.²² If a child's records indicated receipt of the last dose of a vaccine that required more than 1 dose to complete the series, it was assumed that earlier vaccines in the sequence had been given. This assumption has been shown to be valid in the past.^{23,24}

Three-month wide birth cohorts were used for most of the time-trend analyses, with children aged 12 to <15 months for the 12-month assessment age, children aged 24 to <27 months for the 24-month assessment age and children aged 60 to <63 months for the 60-month assessment age. Both 3-month wide and 12-month wide cohorts were used for all other analyses in this report. The 12-month wide cohorts used in this report were children born between 1 January 2016 and 31 December 2016 for the 12-month milestone; between 1 January 2015 and 31 December 2015 for the 24-month milestone; and between 1 January 2012 and 31 December 2012 for the 60-month (5-year) milestone.

The proportion of children designated as 'fully immunised' was calculated using the number of children completely immunised with the vaccines of interest by the designated age as the numerator and the total number of Medicare-registered children in the age cohort as the denominator. 'Fully immunised' at 12 months of age was defined as a child having a record on the AIR of a third dose of a diphtheria (D), tetanus (T) and acellular pertussis (Pa) vaccine, a third dose of polio vaccine, a second or third dose of PRP-OMP-containing *Haemophilus influenzae* type b (Hib) vaccine or a third dose of any other Hib-containing vaccine, a third dose of hepatitis B vaccine, and a third dose of 13-valent pneumococcal conjugate vaccine (13vPCV). 'Fully immunised' at 24 months of age was defined as a child having a record on the AIR of a fourth dose of DTPa – vaccine, third doses of hepatitis B and polio vaccines, a third or fourth dose of PRP-OMP Hib-containing vaccine, Infanrix Hexa or Hiberix (a third dose only of Infanrix Hexa or Hiberix if given after 11.5 months of age), or a fourth dose of any other Hib-containing vaccine, a dose of MenC vaccine, a dose of varicella vaccine and a second dose of measles-containing vaccine (given as either MMR or MMRV). 'Fully immunised' at 60 months of age was defined as a child having a record on the AIR of a fifth dose of a DTPa vaccine, a fourth dose of polio vaccine and second dose of an MMR vaccine.

Immunisation coverage estimates were also calculated for individual NIP vaccines, including the three NIP vaccines given in early childhood but not routinely reported on

and not part of 'fully immunised' calculations at 12, 24 and 60 months of age. These are a second or third dose of rotavirus vaccine by 12 months of age; a second dose of hepatitis A vaccine in Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) children by 30 months of age; and a fourth (booster) dose of PCV in Indigenous children by 30 months of age.

Timeliness of vaccination

On-time vaccination was assessed for children aged <2 years, defined as receipt of a scheduled vaccine dose within 30 days of the recommended age. For example, a child who received the first dose of DTPa vaccine (due at 60 days of age), when he or she was more than 90 days of age, was classified as late for that dose. For descriptive purposes, we categorised the delay outcome measure for each dose as either 'delay of 1 to <3 months', delay of 3 to <7 months or 'delay of ≥7 months'. On-time vaccination was measured in 12-month birth wide cohorts. Therefore, these cohorts are not the same as those assessed for coverage milestones. Trends in on-time vaccination were also assessed for the first, second and third doses of DTPa vaccine and the first and second doses of MMR vaccine. The interval between doses was not evaluated.

Remoteness status

The area of residence of children aged <2 years was defined as 'Major cities', 'Inner regional', 'Outer regional', 'Remote' and 'Very remote' using the Accessibility/Remoteness Index of Australia (ARIA++).²⁵ ARIA++ is a continuous varying index with values ranging from 0 (high accessibility) to 15 (high remoteness), and is based on road distance measurements from over 12,000 populated localities to the nearest Service Centres in five categories based on population size. For analysis in this report, we combined the two 'Regional' categories ('Inner Regional' and 'Outer Regional') into one category and the two 'Remote' categories ('Remote' and 'Very Remote') into one category. ARIA Accessibility/Remoteness categories were assigned for each child using their current recorded postcode of residence on the AIR.

Small area analysis

Analysis of coverage in children aged ≤2 years was undertaken at small area level using the ABS-defined Statistical Area 3 (SA3),²⁶ chosen because each is small enough to show differences within jurisdictions but not too small to render maps unreadable. For both privacy and precision reasons, SA3s with denominators of less than 26 children were not included in any small area analysis. Maps were created using version 15 of the MapInfo mapping software²⁷ and the ABS Census Boundary Information. As postcode is the only geographical indicator available from the AIR, the ABS Postal Area to SA3 Concordance 2011 was used to match AIR postcodes to SA3s.²⁸

Medical contraindication exemptions

We examined trends in medical contraindication exemptions to assess any potential effect of recent policy changes such as 'No Jab, No Pay' and the associated removal of the conscientious objector exemption.¹⁷ The trends in the number of children aged 6 months to 10 years with at least one new vaccination exemption due to a medical contraindication entered into the AIR during each year was calculated by state/territory for the years 2011–2017. AIR data are also available on natural immunity exemptions for certain diseases; however, we did not report on these data as the numbers involved are very small.

Coverage in adolescents

AIR data

Vaccination coverage estimates calculated using data recorded on the AIR for catch-up doses of the second dose of MMR vaccine and the third dose of dTpa/dT vaccine for adolescents (10–19 years of age) not recorded as having received these doses of vaccines before 1 January 2017 were assessed by jurisdiction and Indigenous status. The cohort of children assessed were those born from 1 July 1997 to 30 June 2007, aged 10–19 years of age as at 30 June 2017.

HPV Register data

Data on HPV vaccination were provided by the National HPV Vaccination Program Register, which is operated by VCS Foundation. Coverage for a full course of HPV vaccine (defined as 3 doses of quadrivalent HPV vaccine at acceptable minimum dose intervals) was assessed for females and males aged 15 years (as recommended by the World Health Organization for the purposes of international comparison) in 2017. As HPV vaccination is delivered routinely in early high school, usually at the age of 12–13 years, all children in each cohort have had the opportunity to complete the vaccination course by 15 years of age. Numerator data comprise valid doses allocated to the child's state/territory of residence and denominator data comprise Australian Bureau of Statistics (ABS) Estimated Resident Population (ERP) data, based on the 2016 census, in contrast to the Medicare enrolment data used as the denominator for AIR reporting in the rest of this report. A previous study has found that ABS ERP denominator data produce coverage estimates comparable to Medicare enrolment data when applied to the early adolescent age group.²⁹ HPV coverage estimates were also provided separately for doses 1, 2 and 3 and by four age groups: 14–15 years; 16–17 years; 18–19 years; and 20–26 years of age.

The proportion of adolescents completing the HPV vaccine course (3 doses received) and proportion receiving only 1 or 2 doses were calculated by Indigenous status for year of birth cohorts turning 15 years of age for each year from 2007 through 2017. None of the 15-year olds assessed in this report were on the new 2-dose schedule. To assess whether

timeliness is also an issue for HPV vaccination course completion among Indigenous adolescents, the median time between receipt of dose 1 and dose 3 was also estimated by year of birth cohort and Indigenous status for those who completed the course, as well as the proportion who took more than 12 months to complete.

Indigenous status

Indigenous status on the AIR 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 we considered two categories: 'Indigenous' and 'non-Indigenous'. Individuals whose Indigenous status was not specified were deemed to be non-Indigenous for the purposes of our analysis. It is noteworthy while Indigenous status is available in the AIR, other parameters such as country of birth, ethnicity and medical condition (including pregnancy) are not.

Results

Highlights

'Fully immunised' coverage at the 12-month and 60-month age assessment milestones reached their highest ever recorded levels in 2017, at 94.3% and 94.5%, respectively.

Coverage for the third dose of PCV by 12 months of age reached 94.7% at the end of June 2017, its highest ever recorded level.

Young children

'Fully immunised' coverage

Figure 1 shows time trends in quarterly 'fully immunised' vaccination coverage estimates in Australia, assessed at 12 months, 24 months and 60 months of age, for 3-month wide cohorts born from 1 January 2000 to 31 December 2016. 'Fully immunised' coverage at the 12-month assessment age milestone was largely stable at around 90–92% through until 2014, but then increased to 93.8% at the age assessment quarterly data point in December 2017. 'Fully immunised' coverage at the 24-month assessment age milestone was also largely stable at around 92–93% through until 2014, but then declined by 5.5 percentage points in the latter half of 2014. The bulk of this decrease was likely due to the assessment algorithm being amended in July 2014 to include additional requirements: 1 dose of MenC vaccine, 1 dose of varicella vaccine and a second dose of MMR vaccine. 'Fully immunised' coverage at 24 months increased to 90.8% in December 2015 but decreased marginally to 89.6% at the age assessment quarterly data point in December 2016. This was likely due to the coverage

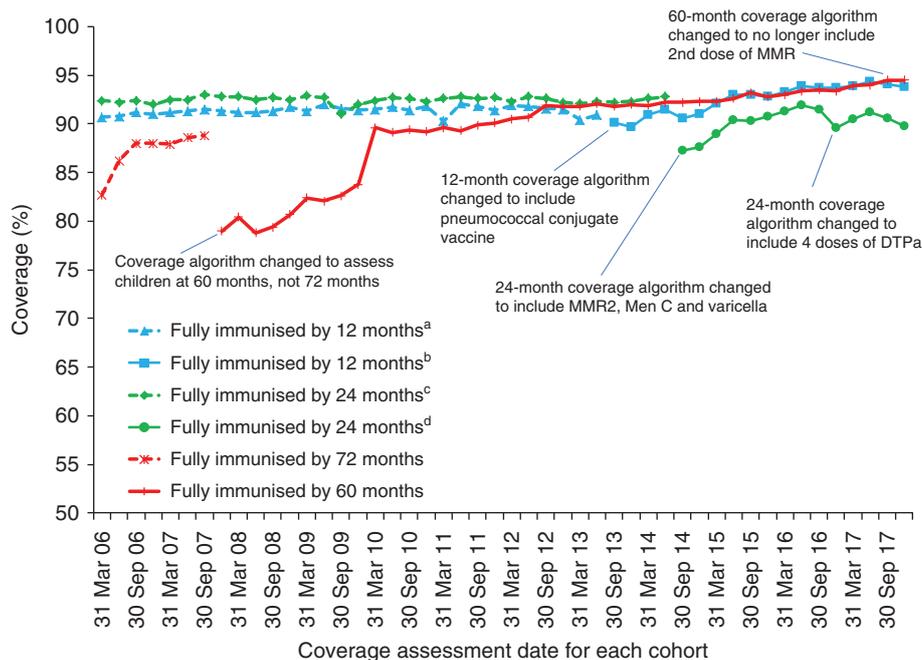


Figure 1. Trends in 'fully immunised' vaccination coverage estimates by quarter, Australia, 2006 to 2017.

By 3-month birth cohorts born between 1 January 2005 and 31 December 2016. Coverage assessment date was 12 months after the last birth date of each cohort. Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

^aCoverage algorithm before 1 July 2013.

^bCoverage algorithm from 1 July 2013.

^cCoverage algorithm before 1 July 2014.

^dCoverage algorithm from 1 July 2014.

MMR2 = 2nd dose of MMR vaccine

MenC = meningococcal C

DTPa = diphtheria-tetanus-acellular pertussis

Source: Australian Immunisation Register, data as at 31 March 2018.

assessment algorithm being amended in December 2016 to require a fourth dose of DTPa vaccine, following inclusion of a dose at 18 months of age in the NIP. 'Fully immunised' coverage at 24 months of age increased to 91.2% in the first half of 2017 but decreased in the second half of the year to 89.8%. In contrast, 'fully immunised' coverage at the 60-month assessment age milestone increased steadily from 2009, reaching 94.5% at the age assessment quarterly data point in December 2017.

Coverage by vaccine/antigen

12 months of age

Coverage at the 12-month age assessment milestone for antigens in the relevant combination vaccine (DTPa-hepB-polio-Hib) remained relatively stable throughout 2017 following the increase of around three percentage points between late 2014 and the end of 2016 (91.6% to 94.5%) (refer to Figure 2). Coverage for the third dose of PCV by 12 months of age reached 94.7% at the end of June 2017, its highest ever level and similar to the level of coverage for all other vaccines/antigens assessed at this age except for rotavirus vaccine. While rotavirus vaccine coverage was

lower, due to strict upper age limits for administration, it increased from late 2014 onwards and was at 86.3% in December 2017 (refer to Figure 2).

24 months of age

In 2017, coverage at the 24-month age assessment milestone increased for all vaccines/antigens (refer to Figure 3). Coverage estimates for the age assessment quarterly data points in December 2017 were 95% or greater for all vaccines/antigens, except DTPa (93.0%) and MMRV (92.0%) (refer to Figure 3). Following the decline in MMR vaccine coverage in the latter half of 2014, because of the second dose of MMR vaccine being assessed at 24 months of age for the first time instead of the first dose as previously assessed, coverage steadily increased over 2015 and 2016, but decreased at the beginning of 2017.

60 months of age

For vaccines/antigens due at 48 months of age, trends in coverage were similar to those seen for 'fully immunised' coverage (refer to Figure 4). Coverage for DTPa and polio vaccines increased in 2017 to 94.5% at the age assessment

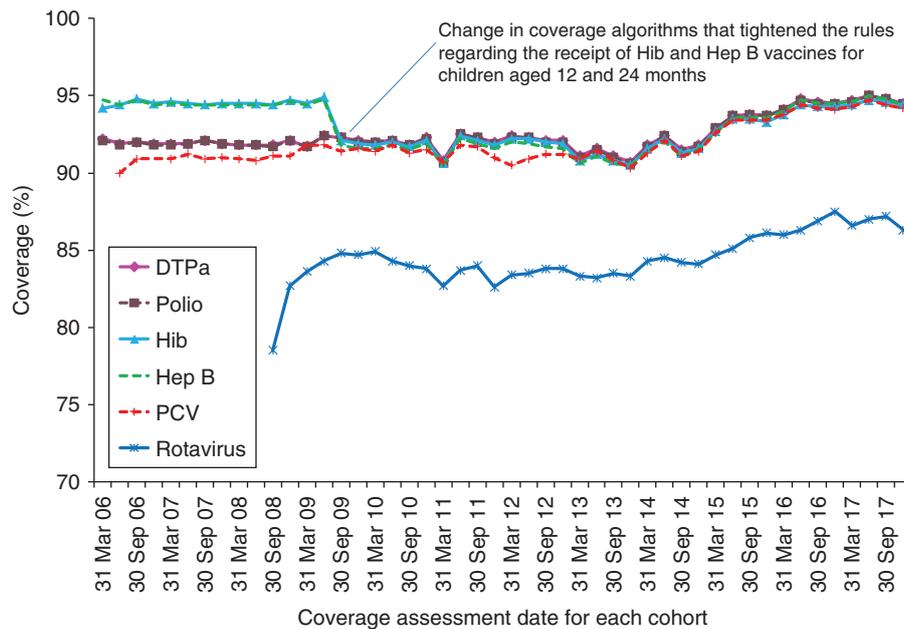


Figure 2. Trends in vaccination coverage estimates at 12 months of age, by vaccine/antigen^a and quarter, Australia, 2006 to 2017.

By 3-month birth cohorts born between 1 January 2005 and 31 December 2016. Coverage assessment date was 12 months after the last birth date of each cohort. Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

^a3rd dose of DTPa vaccine, polio vaccine and PCV, 2nd or 3rd dose of Hib and rotavirus vaccines, and 3rd dose of hepatitis B vaccine.

DTPa = diphtheria-tetanus-acellular pertussis

Hib = *Haemophilus influenzae* type b

Hep B = hepatitis B

PCV = pneumococcal conjugate vaccine

Source: Australian Immunisation Register, data as at 31 March 2018.

quarterly data points in December 2017 (refer to Figure 4). During the first half of 2017, coverage for the second dose of MMR increased by almost 2 percentage points to 96.3%. From July 2017, the second dose of MMR was no longer assessed at 60 months of age.

Coverage estimates by Indigenous status

Highlights

In 2017, 'fully immunised' coverage at 12 and 60 months of age in Indigenous children reached highest ever recorded levels of 93.2% and 96.9%, respectively.

The gap in 'fully immunised' coverage between Indigenous and non-Indigenous children at 12 months of age has closed considerably, from 6.7 percentage points in 2013 to 0.7 percentage points in 2017.

Recorded coverage in the influenza immunisation program for Indigenous children aged 6 months to <5 years remained low in 2017, with overall national coverage of 14.9%. Only the Northern Territory (60.6%) achieved coverage above 20%.

'Fully immunised'

'Fully immunised' coverage at 12 and 60 months in Indigenous children steadily increased reaching 93.2% and 96.9%, respectively, by the end of 2017. Figure 5 shows 'fully immunised' coverage at 12 months of age for Indigenous children compared to non-Indigenous children. From 2006, coverage for Indigenous children tracked well below coverage for non-Indigenous children. However, from mid-2013 the gap in coverage (Indigenous versus non-Indigenous) has progressively decreased, from 6.7 percentage points in March 2013 to only 0.7 percentage points in December 2017.

The proportion of Indigenous children 'fully immunised' by 24 months of age was consistently higher than at either the 12- or 60-month milestones until 2012, when coverage at 60 months rose to comparable levels (Figures 5–7). Figure 6 shows 'fully immunised' coverage at 24 months of age for Indigenous children compared to non-Indigenous children. From 2006 to early 2011, coverage for Indigenous children tracked 1–4 percentage points below coverage for non-Indigenous children. From 2011 to mid-2014 coverage was similar for both groups. Following the amendment of the 24-month coverage algorithm in 2014 to include a second dose of MMR vaccine, 1 dose of MenC vaccine

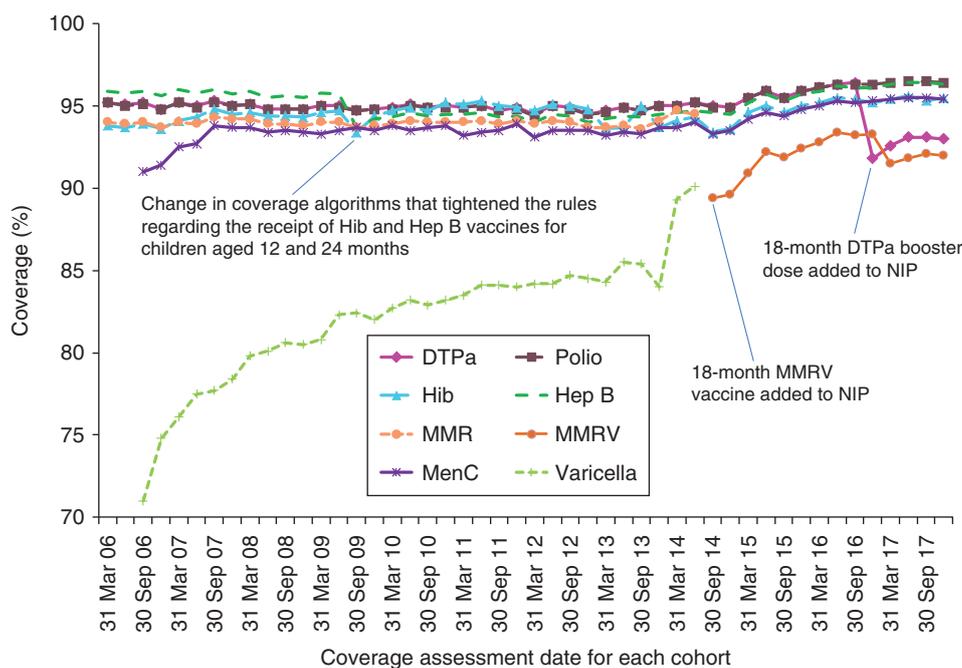


Figure 3. Trends in vaccination coverage estimates at 24 months of age by vaccine/antigen^a and quarter, Australia, 2006 to 2017.

By 3-month birth cohorts born between 1 January 2004 and 31 December 2015. Coverage assessment date was 12 months after the last birth date of each cohort. Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

^a4th dose of DTPa vaccine (from October 2016), 3rd dose of polio vaccine, 3rd or 4th dose of Hib vaccine, 3rd dose of hepatitis B vaccine, 2nd dose of MMRV (from September 2014), 1st dose of MenC vaccine.

DTPa = diphtheria-tetanus-acellular pertussis

Hib = *Haemophilus influenzae* type b

Hep B = hepatitis B

MMR = measles-mumps-rubella

MenC = meningococcal C

MMRV = measles-mumps-rubella-varicella

Source: Australian Immunisation Register, data as at 31 March 2018.

and 1 dose of varicella vaccine, coverage has been considerably lower for Indigenous children. 'Fully immunised' coverage at 24 months in Indigenous children increased to 90.4% in mid-2016 but fell to 87.2% at the end of 2016, when the coverage assessment algorithm was amended in the last quarter of 2016 to include a fourth dose of DTPa vaccine instead of a third dose (refer to Figure 6). However, coverage increased marginally to 87.9% in December 2017.

Figure 7 compares 'fully immunised' vaccination coverage at 60 months of age for Indigenous children and non-Indigenous children. From 2007 to 2011 coverage for Indigenous children tracked 1–5 percentage points below the coverage for non-Indigenous children. However, from late 2012 onwards, coverage for Indigenous children has been higher than for non-Indigenous children, reaching 2.5 percentage points higher in December 2017.

Coverage by vaccine/antigen

Immunisation coverage estimates in 2017 for the three age milestones by vaccine/antigen and Indigenous status are

provided in Table 2. Coverage for Indigenous children was lower than that for non-Indigenous children for all vaccines/antigens at 12 months of age, but was higher at 24 months of age for polio, Hib, hepatitis B and MenC vaccines, and was higher at 60 months of age for DTPa, polio and MMR vaccines.

Hepatitis A vaccine for Indigenous children

For the four jurisdictions in which hepatitis A vaccine is funded for Indigenous children (the Northern Territory, Queensland, South Australia and Western Australia), combined coverage of the second dose of hepatitis A vaccine by 30 months of age was stable at close to 60% from 2010 to 2014 but then increased to 74.7% by the end of 2017 (refer to Figure 8). Coverage has consistently been highest in the Northern Territory (86% at the end of 2017). By late 2017, coverage was greater than 65% in all jurisdictions (refer to Figure 8).

Pneumococcal vaccine for Indigenous children

For the four jurisdictions (the Northern Territory, Queensland, South Australia and Western Australia) in

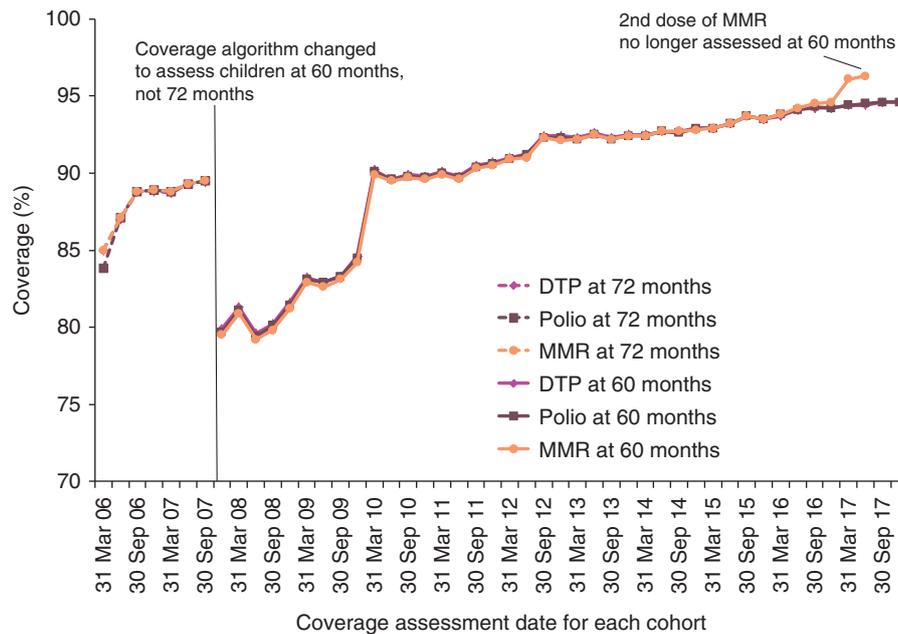


Figure 4. Trends in vaccination coverage estimates at 60 months of age (72 months prior to December 2007) by vaccine/antigen^a and quarter, Australia, 2006 to 2017.

By 3-month birth cohorts born between 1 January 2000 and 31 December 2012. Coverage assessment date was 72 months after the last birth date of each cohort up to December 2007 and then 60 months after the last birth date of each cohort. Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

^a4th dose of DTPa and polio vaccines, 2nd dose of MMR vaccine.

DTPa = diphtheria-tetanus-acellular pertussis

MMR = measles-mumps-rubella

Source: Australian Immunisation Register, data as at 31 March 2018.

which an 18-month booster dose of PCV is funded for Indigenous children), combined coverage increased following the 13vPCV catch-up campaign in 2012, fell in 2013, but then increased to 74.7% by the end of 2017 (refer to Figure 9). Coverage has consistently been highest in the Northern Territory (87.8% at the end of 2017). By late 2017, coverage was greater than 63% in all jurisdictions (refer to Figure 9).

Influenza vaccine coverage for Indigenous children aged 6 months to <5 years

Recorded influenza vaccine coverage in Indigenous children aged 6 months to <5 years was generally low across Australia in 2017, with overall national coverage of 14.9%. There was substantial variation in recorded coverage by jurisdiction (refer to Figure 10). Apart from the Northern Territory (60.1%), coverage was only above 10% in the Australian Capital Territory, Queensland and Western Australia (10.7%, 14.9% and 15.3%, respectively). For non-Indigenous children aged 6 months to <5 years, coverage of seasonal influenza vaccine in 2017 was recorded as 5.0% in Australia, and coverage was below 10% in all

jurisdictions, except Western Australia where it was 11.8% (refer to Figure 10).

Figure 11 shows the time trends of seasonal influenza vaccine coverage recorded on the AIR between 2007 and 2017 for Indigenous children aged 6 months to <5 years, by jurisdiction. Coverage in WA peaked at 28% in 2009 following the introduction of a state-funded universal immunisation program for all children aged 6 months to <5 years in 2008. However, coverage was substantially lower in subsequent years following the temporary suspension of the program in 2010 due to an increase in febrile reactions, later shown to be related to a single brand of influenza vaccine. Following the commencement of the nationally funded program for Indigenous children aged 6 months to <5 years in 2015, seasonal influenza vaccine coverage in Indigenous children rose 4-fold to 12.1% nationally in 2015, and reached 14.9% in 2017 (refer to Figure 11). Upward trends in coverage over time were seen for all jurisdictions, with coverage markedly highest in the Northern Territory from 2015 onwards, followed by Western Australia and Queensland. Compared with 2014, flu vaccine coverage in 2017 increased 13-fold in the Northern Territory and almost 7-fold in Queensland.

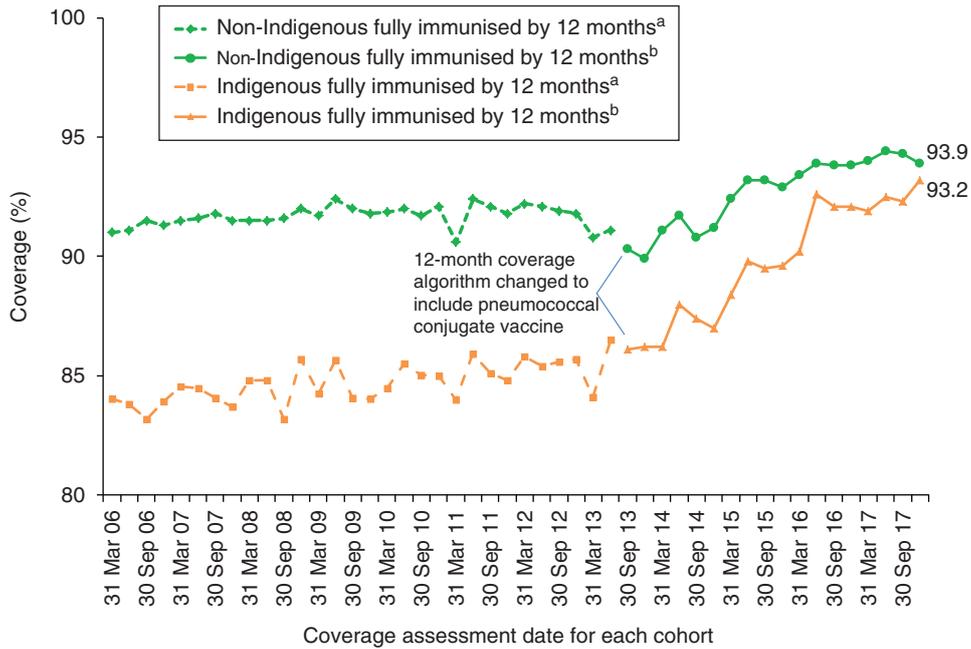


Figure 5. Trends in 'fully immunised' vaccination coverage at 12 months of age by Indigenous status and quarter, Australia, 2006 to 2017.

Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

^aCoverage algorithm before 1 July 2013.

^bCoverage algorithm from 1 July 2013.

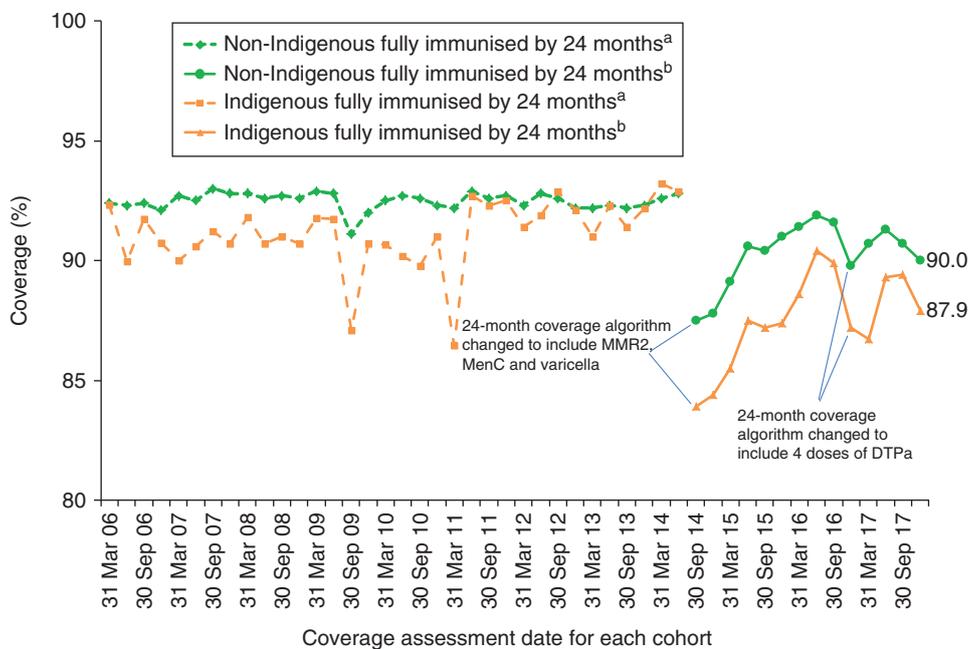


Figure 6. Trends in 'fully immunised' vaccination coverage at 24 months of age by Indigenous status and quarter, Australia, 2006 to 2017.

Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

^aCoverage algorithm before 1 July 2014.

^bCoverage algorithm from 1 July 2014.

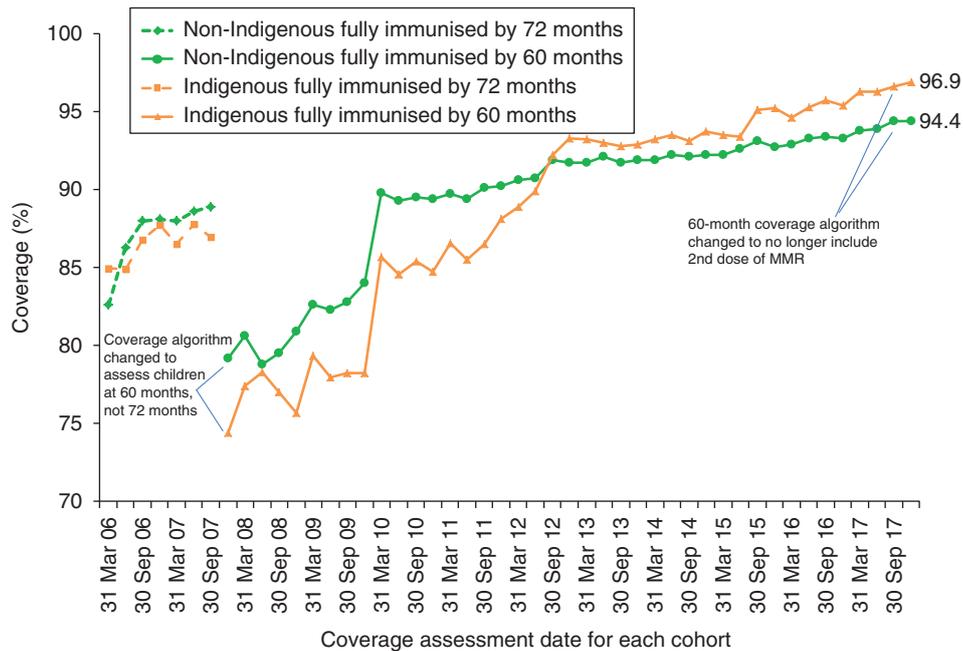


Figure 7. Trends in 'fully immunised' vaccination coverage at 60 months of age by Indigenous status and quarter, Australia, 2006 to 2017.

Vaccination coverage estimates are calculated by quarter and may differ slightly from estimates published elsewhere using rolling annualised data.

Timeliness of immunisation

Highlights

The disparity in on-time vaccination of the first, second and third doses of DTPa vaccine between Indigenous and non-Indigenous children in Australia decreased by 2.4–5.8 percentage points from 2008 to 2017.

Moving the second dose of MMR vaccine in mid-2014 to being due at 18 months of age resulted in an immediate improvement in on-time vaccination for this vaccine, for both Indigenous and non-Indigenous children, although the disparity for this vaccine dose between Indigenous and non-Indigenous children increased from 2.9 percentage points to 14.2 percentage points.

For both Indigenous and non-Indigenous children, the majority of delayed vaccination occurred 1 to <3 months after the schedule point for all four vaccine doses assessed and across all remoteness categories.

In this section, both on-time vaccination and delay in vaccination are presented. On-time vaccination provides a measure of the percentage of children receiving vaccinations within 30 days of the recommended age, while delay in vaccination provides more detailed information on the length of vaccination delay occurring. Trends in on-time vaccination for the first dose of DTPa vaccine from 2008 to

2017 by Indigenous status are shown in Figure 12. Between 2008 and 2017, the disparity in on-time vaccination of the first dose of DTPa vaccine between Indigenous and non-Indigenous children in Australia decreased from almost 10 percentage points in 2008 to 4.2 percentage points in 2017 (refer to Figure 12).

Trends in on-time vaccination for the second dose of DTPa vaccine from 2008 to 2017 by Indigenous status are shown in Figure 13. Between 2008 and 2017, the disparity in on-time vaccination of the second dose of DTPa vaccine between Indigenous and non-Indigenous children in Australia decreased from 15.4 percentage points in 2008 to 11.1 percentage points in 2017.

Trends in on-time vaccination for the third dose of DTPa vaccine from 2008 to 2017 by Indigenous status are shown in Figure 14. Between 2008 and 2017, the disparity in on-time vaccination of the third dose of DTPa vaccine between Indigenous and non-Indigenous children in Australia decreased from 18.0 percentage points in 2008 to 15.6 percentage points in 2017.

Trends in on-time vaccination for the first dose of MMR vaccine from 2008 to 2017 by Indigenous status are shown in Figure 15. Between 2008 and 2017, the disparity in on-time vaccination of the first dose of MMR vaccine between Indigenous and non-Indigenous children in Australia remained stable at around 10 percentage points.

Table 2. Vaccination coverage estimates (%) by age assessment milestone, vaccine/antigen and Indigenous status, Australia, 12-month wide cohorts assessed during 2017^a

Vaccine/antigen	Milestone age	Indigenous (%)	Non-Indigenous (%)
Diphtheria, tetanus, acellular pertussis	12 months ^b	92.5	94.9
	24 months ^c	90.3	92.5
	60 months ^d	96.5	93.5
Polio	12 months ^b	92.5	94.8
	24 months ^c	97.1	96.3
	60 months ^d	96.4	93.6
<i>Haemophilus influenzae</i> type b	12 months ^b	92.5	94.7
	24 months ^c	95.7	94.7
	60 months	N/I	N/I
Hepatitis B	12 months ^b	92.5	94.5
	24 months ^c	97.1	95.6
	60 months	N/I	N/I
Measles, mumps, rubella	12 months	N/I	N/I
	24 months ^c	91.9	93.0
	60 months ^d	98.4	95.6
Varicella	12 months	N/I	N/I
	24 months ^c	91.1	92.7
	60 months	N/I	N/I
Meningococcal C conjugate	12 months	N/I	N/I
	24 months ^c	96.4	94.9
	60 months	N/I	N/I
Pneumococcal conjugate	12 months ^b	92.5	94.3
	24 months	N/I	N/I
	60 months	N/I	N/I
Rotavirus	12 months ^b	83.5	89.5
	24 months	N/I	N/I
	60 months	N/I	N/I

^aVaccination coverage estimates in this table are calculated using 12-month wide cohorts and may differ slightly from estimates published elsewhere using rolling annualised cohorts.

^bCohort born 1 January 2016 – 31 December 2016.

^cCohort born 1 January 2015 – 31 December 2015.

^dCohort born 1 January 2012 – 31 December 2012.

N/I Not included in coverage estimates for that group.

Source: Australian Immunisation Register, data as at 31 March 2018.

Trends in on-time vaccination for the second dose of MMR vaccine from 2008 to 2017 by Indigenous status are shown in Figure 16. Between 2008 and 2014, the percentage of children in Australia who received their second dose of MMR vaccine on time (i.e. between 47 and <49 months of age) rose from 27.7% to 47.1% for non-Indigenous children and from 29.3 to 44.2% for Indigenous children. Moving the second dose of MMR vaccine in mid-2014 to being due at 18 months of age resulted in an immediate improvement in on-time vaccination for the second dose of MMR vaccine for both Indigenous and non-Indigenous children. However, the disparity in on-time vaccination between Indigenous and non-Indigenous children for this vaccine dose increased from 2.9 percentage points (disparity of second dose of MMR vaccine when given on time between 47 and <49 months of age) to 14.2 percentage points (disparity of

second dose of MMR vaccine when given on time between 17 and <19 months of age). Between 2014 and 2017, the percentage of children who received their second dose of MMR vaccine on time (i.e. between 17 and <19 months of age) decreased from 73.9% to 70.1% for non-Indigenous children and from 59.1% to 55.9% for Indigenous children.

Vaccination delay in 2017 for the first and second doses of DTPa vaccines, and the first and second doses of MMR vaccines by length of delay, Indigenous status and remoteness category is shown in Table 3. For both Indigenous and non-Indigenous children, the majority of delayed vaccination occurred 1 to <3 months after the schedule point for all four vaccine doses assessed and across all remoteness categories. The proportion of Indigenous children living in major cities with a delay of 1 to <3 months for the first and

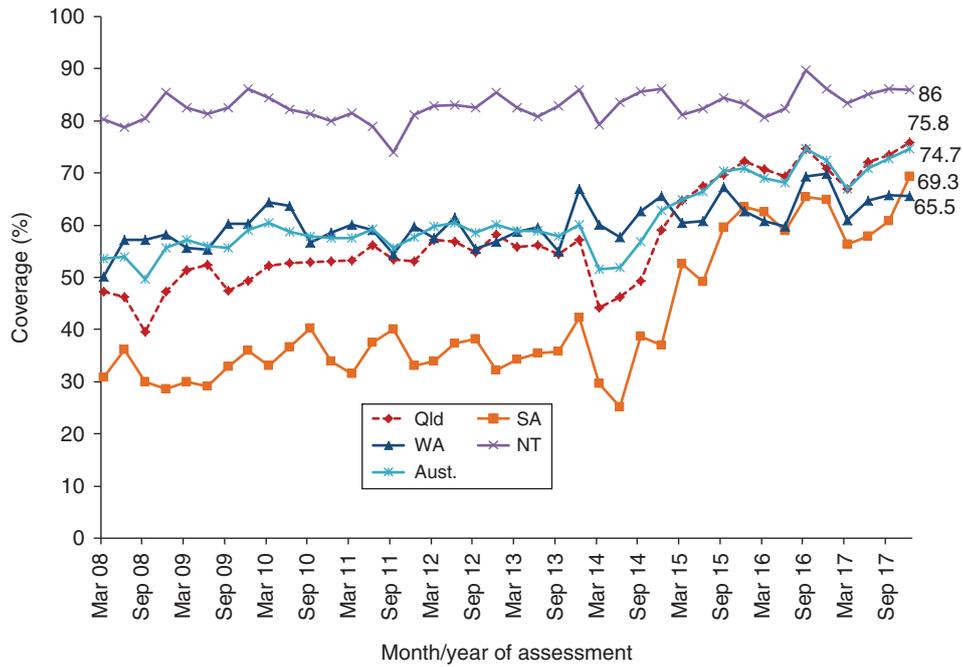


Figure 8. Trends in coverage estimates for hepatitis A^a vaccine for Indigenous children by jurisdiction, Australia,^b 2008 to 2017.

^a18-month dose assessed at 30 months of age in all four jurisdictions.

^bNorthern Territory (NT), Queensland (Qld), South Australia (SA) and Western Australia (WA) only. Aust. = Australia

Source: Australian Immunisation Register, data as at 31 March 2018.

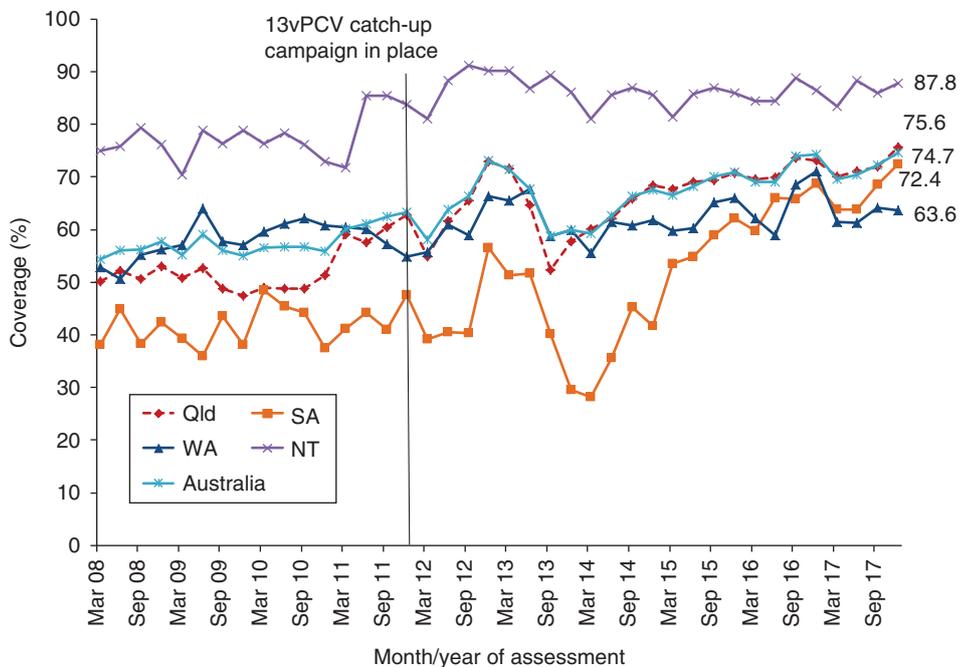


Figure 9. Trends in coverage estimates for pneumococcal^a vaccine for Indigenous children by jurisdiction,^b Australia, 2008 to 2017.

^a18-month booster dose assessed at 30 months of age in all four jurisdictions.

^bNorthern Territory (NT), Queensland (Qld), South Australia (SA) and Western Australia (WA) only. 13vPCV = 13-valent pneumococcal conjugate vaccine

Source: Australian Immunisation Register, data as at 31 March 2018.

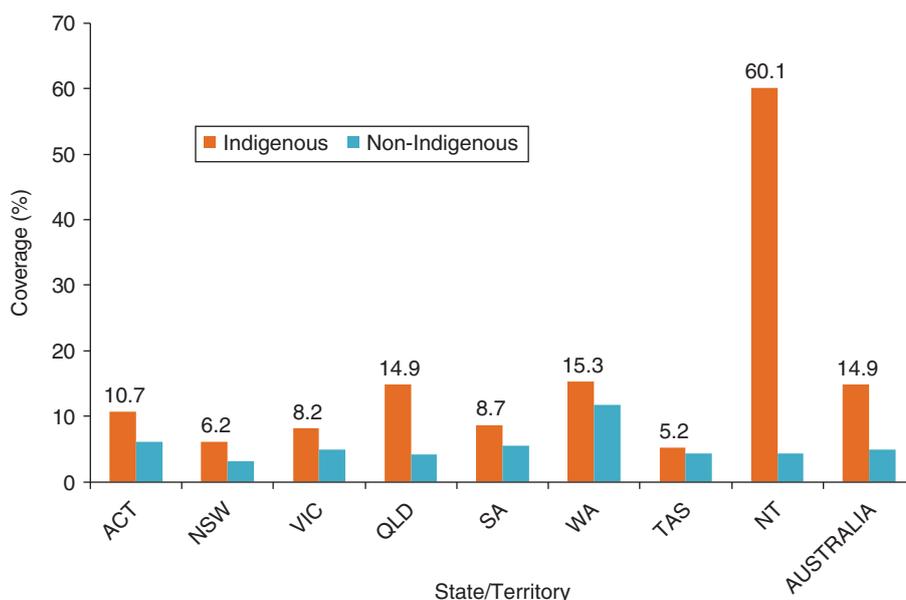


Figure 10. Recorded coverage of any dose of seasonal influenza vaccine^a administered during 2017 to children aged 6 months to <5 years, by Indigenous status and jurisdiction, Australia.

^aAny influenza vaccine dose.

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

Source: Australian Immunisation Register, data as at 31 March 2018.

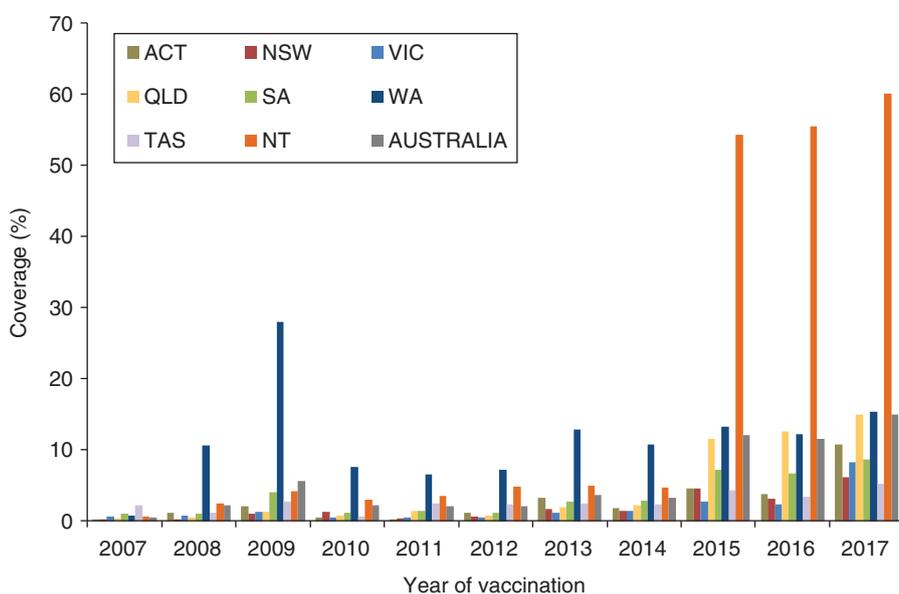


Figure 11. Trends in recorded coverage of any dose of seasonal influenza vaccine^a among Indigenous children aged 6 months to <5 years, by jurisdiction, Australia, 2007-2017.

^aAny influenza vaccine dose.

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

Source: Australian Immunisation Register, data as at 31 March 2018.

second doses of DTPa vaccines, and the first and second doses of MMR vaccines was lower compared to the proportion of Indigenous children living in remote and very

remote areas (3.4% versus 7.5%, 11.6% versus 17.9%, 22.9% versus 24.6% and 28% versus 30.7%, respectively). However, the proportion with very late vaccination (≥ 7 months after

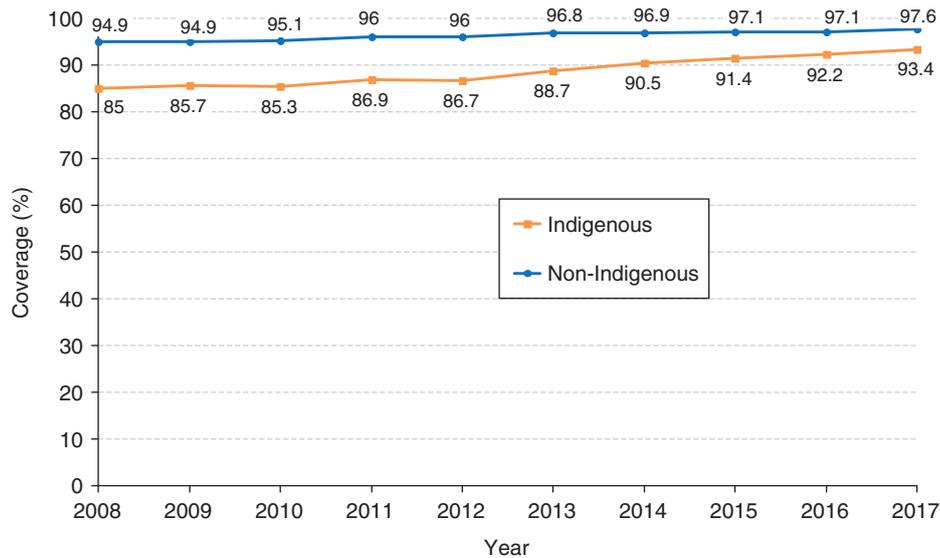


Figure 12. Trends^a in on-time vaccination for the first dose of DTPa, by Indigenous status, Australia, 2008-2017.

^aAll data points are calculated for a 12-month wide birth cohort using AIR data.

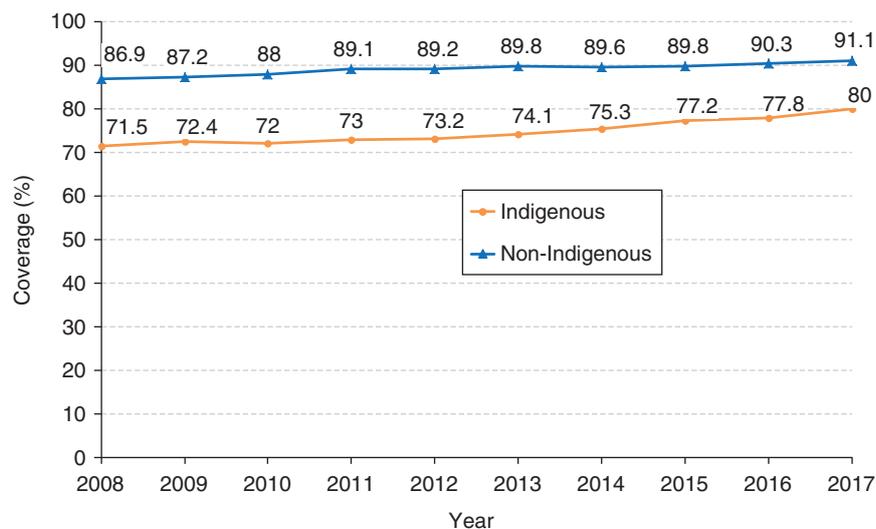


Figure 13. Trends^a in on-time vaccination for the second dose of DTPa, by Indigenous status, Australia, 2008-2017.

^aAll data points are calculated for a 12-month wide birth cohort using AIR data.

the schedule point) was higher for Indigenous children residing in major cities for the second dose of DTPa vaccine and the first dose of MMR vaccine (2.4% versus 1.3% and 2.5 versus 2.3%, respectively).

Small area coverage analysis

Vaccination coverage in Australia in 2017 varied substantially within jurisdictions and major capital cities, with some areas substantially below the national averages (Figures 17–19). A total of 249 (over 75%) Statistical Area 3

(SA3) level areas in Australia had coverage for the third dose of PCV higher than 93% (Figure 17). A total of 170 (52%) SA3 areas had coverage for the second dose of MMR vaccine higher than 93% (Figure 18). A total of 51 (16%) SA3 areas had coverage below 90% for the fourth dose of DTPa vaccine by 24 months of age (Figure 19).

Medical contraindication exemptions

The trends in the number of children aged 6 months to 10 years with at least one new vaccination exemption due

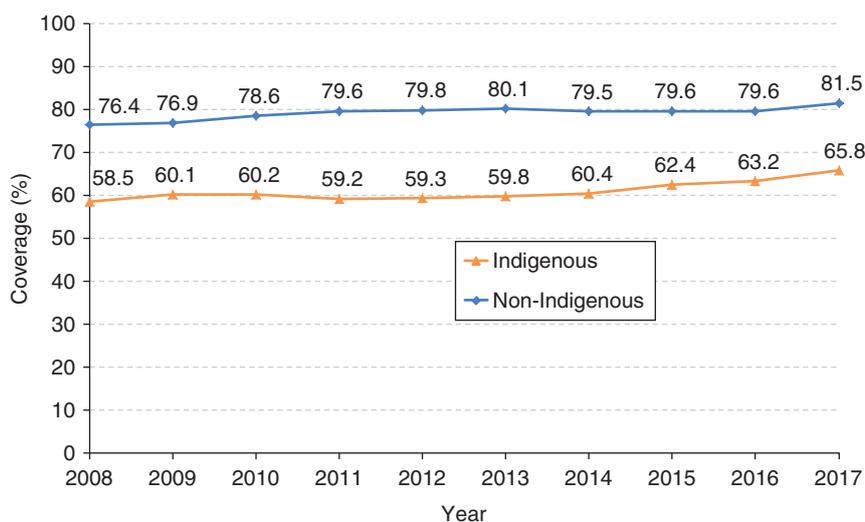


Figure 14. Trends^a in on-time vaccination for the third dose of DTPa, by Indigenous status, Australia, 2008-2017.

^aAll data points are calculated for a 12-month wide birth cohort using AIR data.

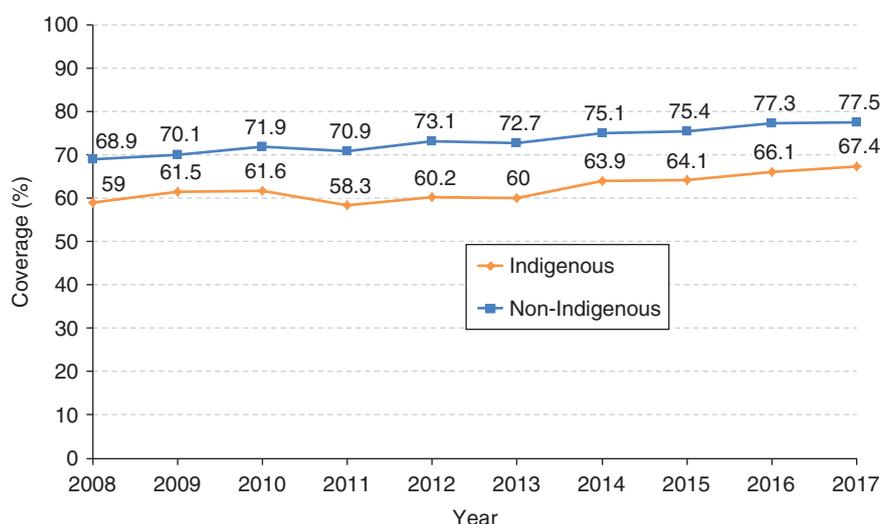


Figure 15. Trends^a in on-time vaccination for the first dose of MMR, by Indigenous status, Australia, 2008-2017.

^aAll data points are calculated for a 12-month wide birth cohort using AIR data.

to a medical contraindication entered into the AIR during each year from 2011 to 2017, by state/territory, are shown in Figure 20. From 2011 to 2015 there was a clear trend of increasing numbers of new exemptions. New exemptions more than doubled in 2015 compared with 2014 (635 to 1401), but then decreased markedly in both 2016 and 2017.

Provider type/setting where vaccination occurred

In 2017, the large majority of vaccinations given to children aged <7 years in Australia were administered in general practice settings (80.6%, up from 78.8% in 2016) (Figure 21). Local councils delivered 7.9%, and Community and

Indigenous Health Services delivered 7.1%. In the Northern Territory, 46.8% of vaccinations were administered by a community health service, while in Victoria, 23% of vaccinations were administered in local government/council clinics.

Mechanism of reporting to the AIR

In 2017, 75.5% of vaccination encounter notifications for children aged <7 years in Australia were reported to the AIR electronically via practice management software, 16.4% via direct entry on the AIR website, 6.2% by internet data interchange and only 1.9% by paper forms (Figure 22).

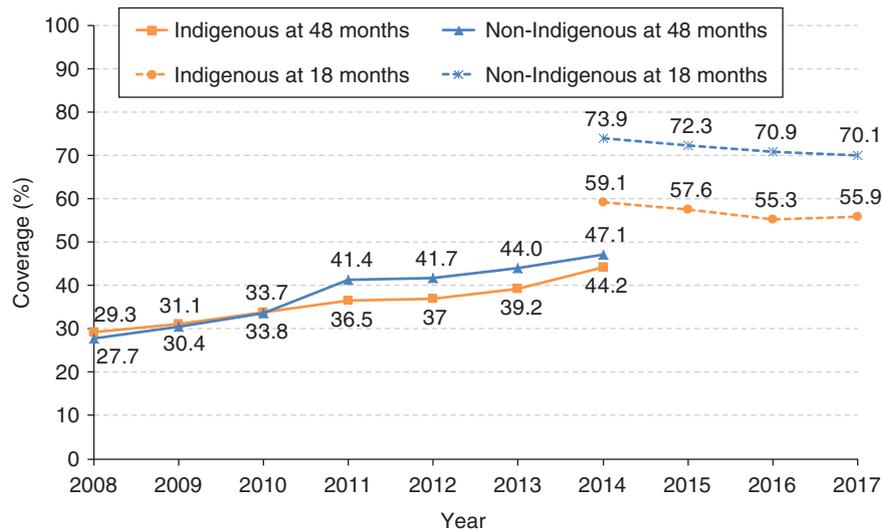


Figure 16. Trends^a in on-time vaccination for the second dose of MMR, by Indigenous status, Australia, 2008-2017.

^aAll data points are calculated for a 12-month wide birth cohort using AIR data.

Adolescents

Catch-up vaccination activity

Highlights

The proportion of adolescents recorded as not previously having received the relevant dose who received catch-up vaccination in 2017 was 6.8% for the second dose of MMR vaccine and 3.6% for the third dose of dTpa/dT vaccine.

Adolescent catch-up vaccination activity for the second dose of MMR vaccine during 2017 was considerably higher for Indigenous adolescents (20.3% of those recorded as not having received the dose) than non-Indigenous adolescents (6.4%).

Table 4 shows catch-up vaccination activity for adolescents aged 10–19 years recorded as not having received relevant doses of vaccines before 1 January 2017 who received a catch-up dose during 2017, by jurisdiction. In Australia, 22,743 (6.8%) of the 337,141 adolescents aged 10–19 years recorded as not having received a second dose of MMR (MMR2) vaccine before 1 January 2017 received a catch-up dose of MMR2 vaccine during 2017. The proportion varied from 6.0% in Western Australia to 11.3% in Tasmania. Adolescent catch-up vaccination activity for the third dose of dTpa/dT vaccine during 2017 was relatively low at 3.6% nationally but also varied by jurisdiction, from 2.3% in the Western Australia to 7.3% in Tasmania.

Table 5 shows catch-up activity by Indigenous status for adolescents aged 10–19 years recorded as not having

received relevant doses of vaccines before 1 January 2017 who received their catch-up doses during 2017. Adolescent catch-up vaccination activity for the second dose of MMR vaccine during 2017 was considerably higher for Indigenous adolescents than non-Indigenous adolescents (20.3% versus 6.4%). Adolescent catch-up vaccination activity for dTpa/dT3 vaccine during 2017 was also higher for Indigenous adolescents than non-Indigenous adolescents (8.0% versus 3.5%).

Human papillomavirus vaccine coverage

Highlights

In 2017, 80.2% of Australian girls aged 15 years completed a full 3-dose course of HPV vaccine, up from 79.7% in 2016.

In 2017, 75.9% of Australian boys aged 15 years completed a full 3-dose course of HPV vaccine, up from 73.8% in 2016.

In 2017, 79% of Indigenous girls (and 77% of Indigenous boys) aged 15 years who received dose one of HPV vaccine completed the 3-dose course, compared to 91% and 90% among non-Indigenous girls and boys, respectively.

Vaccination coverage, as notified to the National HPV Vaccination Program Register, for 3 doses of HPV vaccine, for girls and boys aged 15 years in 2017, is shown in Table 6. At the national level, 80.2% of girls completed a full course of the vaccine, up from 79.7% in 2016. Coverage in girls varied by jurisdiction, from 74.6% in Tasmania to 92.5% in

Table 3. Vaccination delay, by length of delay, Indigenous status and remoteness category, Australia, 2017

Vaccine dose	Indigenous status	Remoteness category	1-<3 months after schedule point (%)	3-<7 months after schedule point (%)	≥7 months after schedule point (%)
DTPa1^a	Indigenous	Major Cities	3.4	1.5	1.0
		Inner and Outer Regional	4.1	1.5	1.1
		Remote and Very Remote	7.5	1.3	No data
	Non-Indigenous	Major Cities	1.6	0.4	0.6
		Inner and Outer Regional	1.4	0.4	0.6
		Remote and Very Remote	1.1	No data	No data
DTPa2^a	Indigenous	Major Cities	11.6	4.3	2.4
		Inner and Outer Regional	13.4	4.9	2.3
		Remote and Very Remote	17.9	4.9	1.3
	Non-Indigenous	Major Cities	6.0	1.1	0.8
		Inner and Outer Regional	6.3	1.3	0.9
		Remote and Very Remote	5.5	1.0	No data
MMR1^a	Indigenous	Major Cities	22.9	6.9	2.5
		Inner and Outer Regional	23.6	7.4	2.5
		Remote and Very Remote	24.6	8.2	2.3
	Non-Indigenous	Major Cities	17.7	3.9	1.3
		Inner and Outer Regional	18.0	3.5	1.2
		Remote and Very Remote	18.6	3.7	0.8
MMR2^b	Indigenous	Major Cities	28	10.3	5.3
		Inner and Outer Regional	28.8	12.1	4.7
		Remote and Very Remote	30.7	13.3	5.5
	Non-Indigenous	Major Cities	20.4	5.2	3.4
		Inner and Outer Regional	22	5.7	2.4
		Remote and Very Remote	22.4	5.4	2.3

^aThe cohort of children born in 2015 and assessed in 2017.

^bThe cohort of children born in 2014 and assessed in 2017.

DTPa1 = 1st dose of diphtheria-tetanus-acellular vaccine

DTPa2 = 2nd dose of diphtheria-tetanus-acellular pertussis vaccine

MMR1 = 1st dose of measles, mumps, rubella vaccine

MMR2 = 2nd dose of measles, mumps, rubella vaccine

No data = cell sizes smaller than 25 children

Source: Australian Immunisation Register, data as at 31 March 2018.

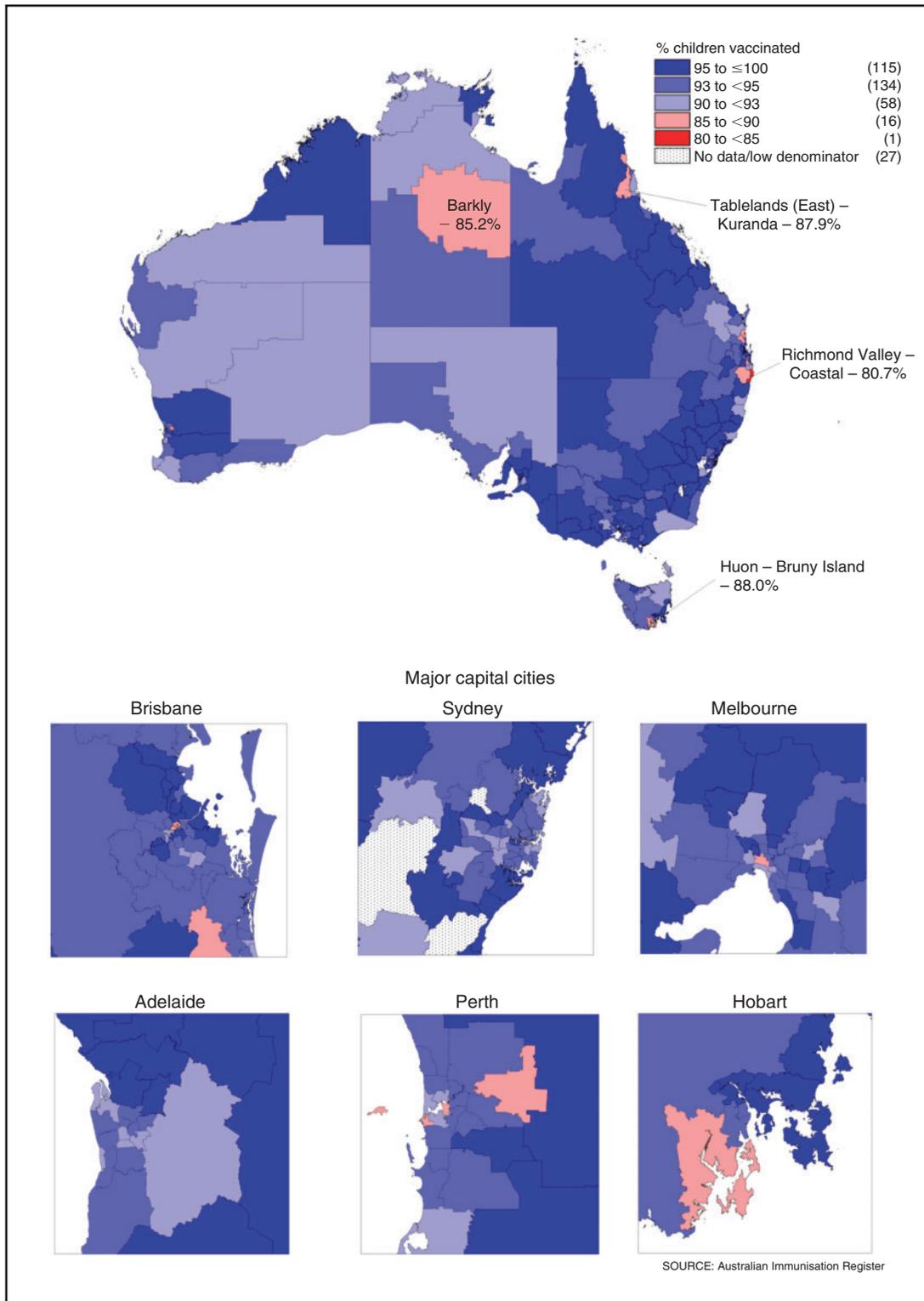


Figure 17. Pneumococcal conjugate vaccine (PCV) coverage at 12 months of age (3 doses) by Statistical Area 3, Australia and major capital cities, 2017.

the Northern Territory. All jurisdictions except Western Australia recorded an increase in HPV coverage between 2016 and 2017. At the national level, 75.9% of boys completed a full course of the vaccine in 2017, up from 73.8% in 2016 (refer to Table 6). Coverage for males ranged from 64.0% in

Tasmania to 84.8% in the Northern Territory. HPV vaccine coverage in males increased between 2016 and 2017 in all jurisdictions except Western Australia, with the largest increase seen in the Australian Capital Territory (7.2 percentage points).

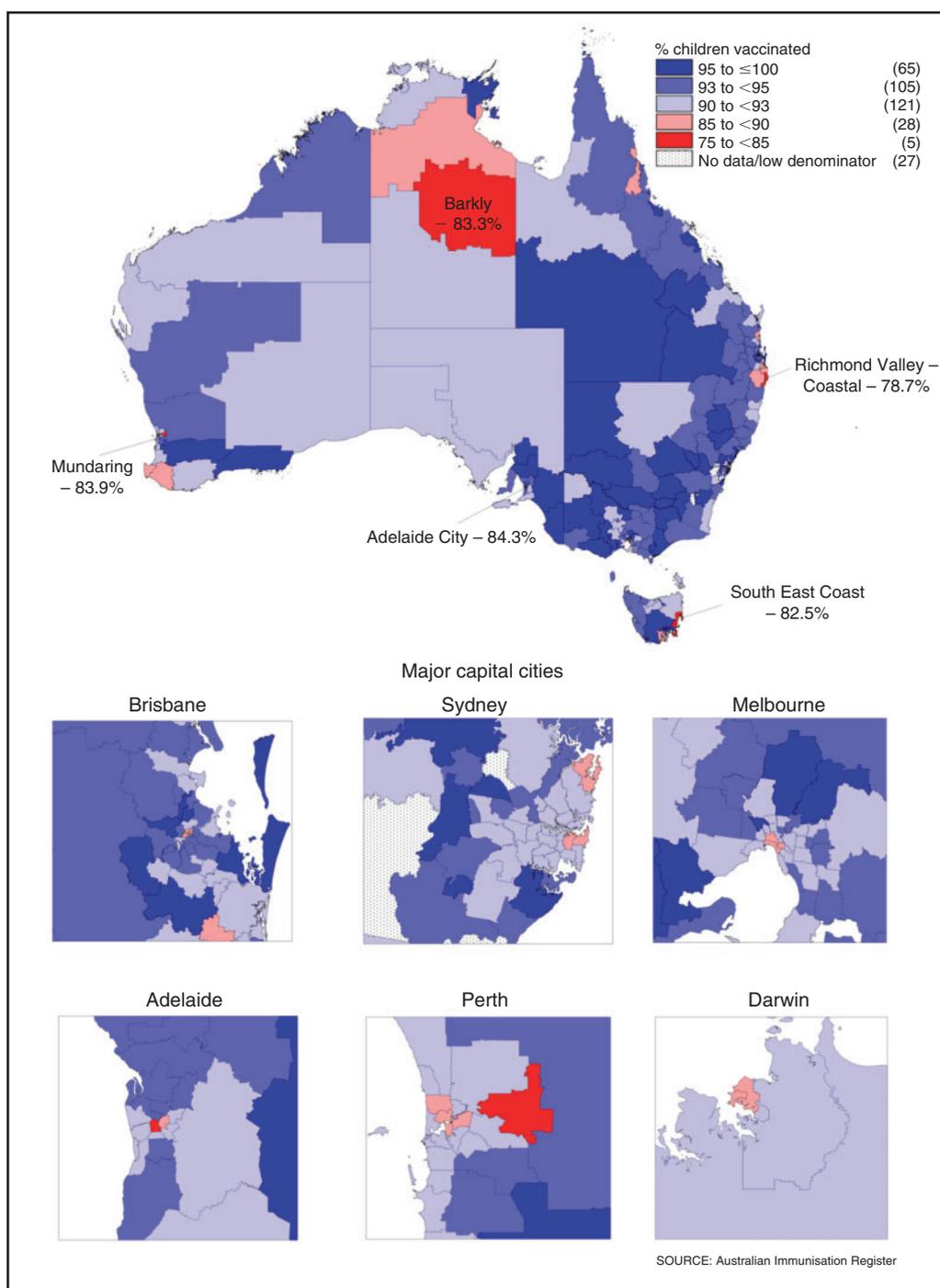


Figure 18. Measles-mumps-rubella (MMR) coverage at 24 months of age (2 doses) by Statistical Area 3, Australia and major capital cities, 2017.

HPV vaccine coverage in 2017 was highest for the first dose and lower for the second and third doses in both males and females and across all age groups. In females, coverage of the first dose was highest (89.0%) in the 14- to 15-year-old age group (refer to Figure 23a). Coverage decreased by age, with only 58.0% of females aged 20–26 years fully vaccinated compared to 80.0% of females aged 14–15 years. In males, coverage for the first dose in the 14- to 15-year-old age group was 86.0%, up three percentage points from 2016, and coverage in the 16- to 17-year-old

age group was 79.0%, up 5 percentage points from that in 2016 (refer to Figure 23b).

Analysis of trends in HPV vaccine course completion show lower rates for Indigenous compared to non-Indigenous people for both females and males and across all birth cohorts (refer to Table 7). In 2017, 79% of 15-year-old Indigenous girls who received the first dose of HPV vaccine had completed the course compared to 91% of non-Indigenous girls. The disparity was 1% higher among males

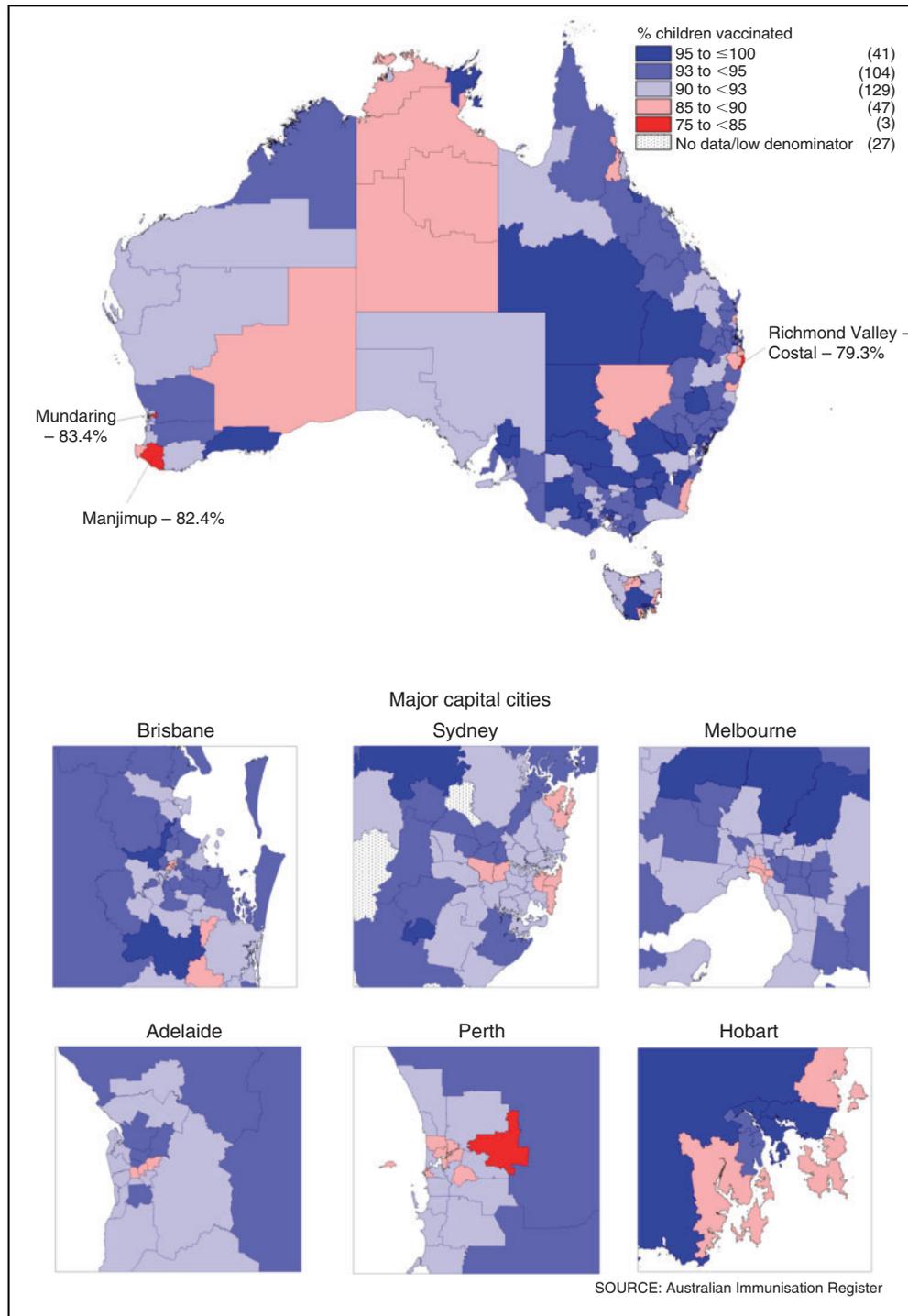


Figure 19. Diphtheria-tetanus-acellular pertussis (DTPa) coverage at 24 months of age (4 doses) by Statistical Area 3, Australia and major capital cities, 2017.

in 2017 (77% completion for Indigenous boys compared to 90% for non-Indigenous boys) (refer to Table 7).

Among those who did complete the HPV vaccine course, the time taken to complete was consistently longer for Indigenous compared to non-Indigenous people across all birth cohorts (data not shown). For those aged 15 years in 2017

there was an average of 8.8 months between the first dose and the third dose for both Indigenous girls and boys, compared to 7.5 months for non-Indigenous girls and boys. As many as 12.6 per cent of Indigenous girls and 14.2% of Indigenous boys took over 12 months to complete, compared to 3.8% of non-Indigenous girls and 4.2% of non-Indigenous boys (data not shown).

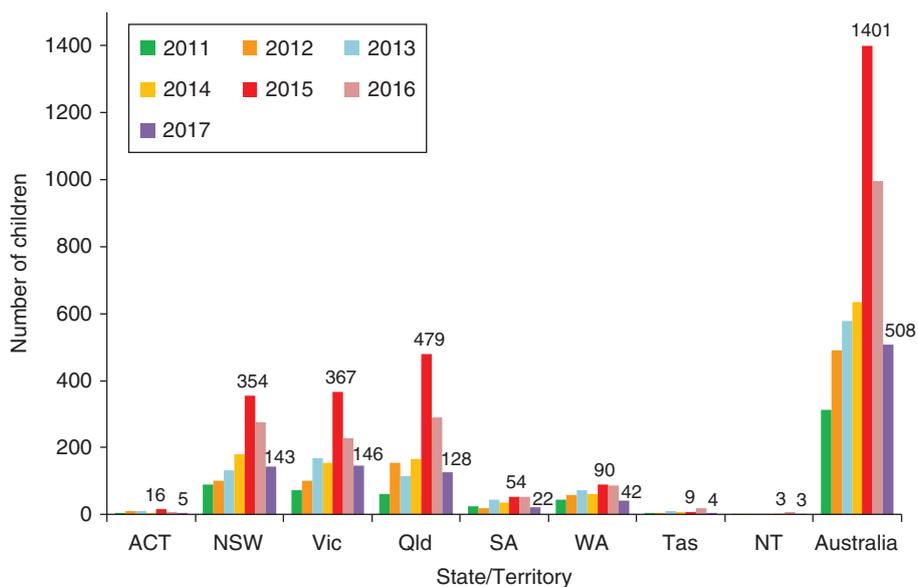


Figure 20. Trends in the number of children aged 6 months to 10 years with at least one new vaccination exemption due to a medical contraindication entered into the Australian Immunisation Register, by state/territory, Australia, 2011-2017.

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

Source: Australian Immunisation Register, data as at 31 March 2018.

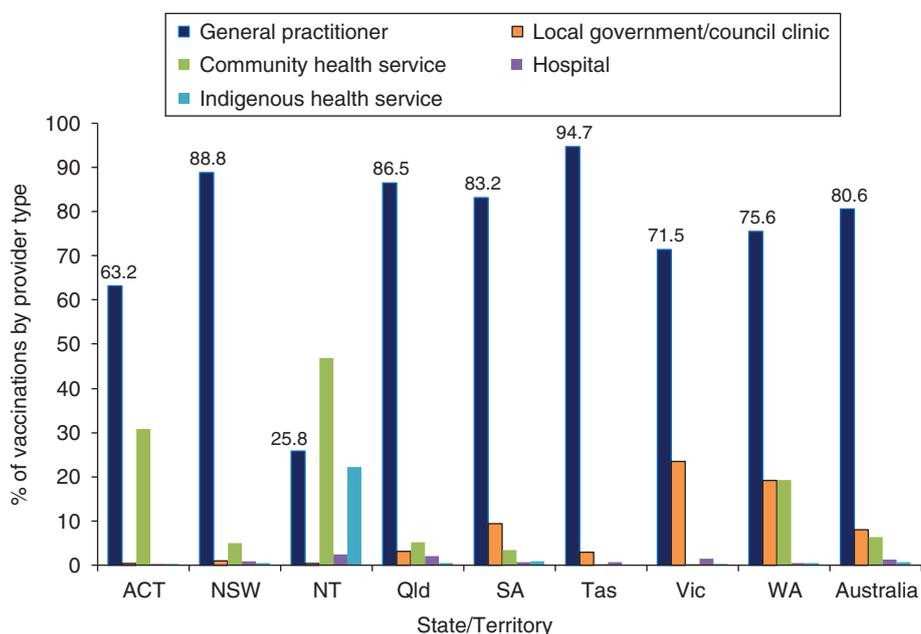


Figure 21. Proportion of vaccinations given to children aged <7 years by provider type and state or territory, Australia, 2017.

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

Source: Australian Immunisation Register, data as at 31 March 2018.

Discussion

Vaccination coverage in young children

'Fully immunised' coverage at the 12-month age assessment milestone has progressively increased since 2014,

after a decade of being largely stable at around 90%, and reached its highest ever recorded level of 94.3% in June 2017. 'Fully immunised' coverage at the 24-month age assessment milestone was also largely stable at around

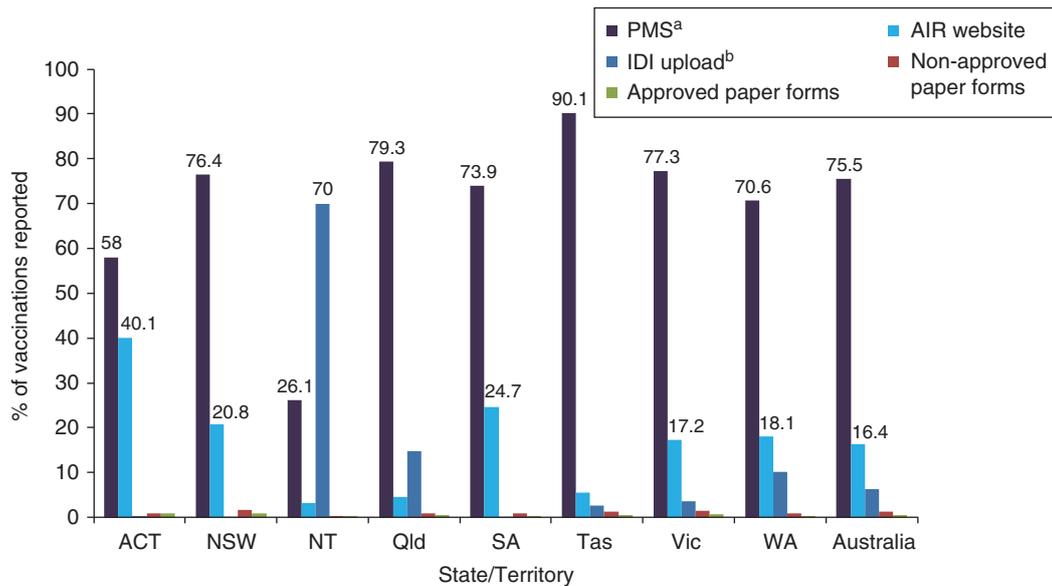


Figure 22. Proportion of vaccinations given to children aged <7 years by type of reporting mechanism and state or territory, Australia, 2017.

^aPractice management software.

^bIDI = internet data interchange (approved immunisation providers/organisations can send vaccination encounter details in bulk to the AIR using the IDI upload facility).

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

Source: Australian Immunisation Register, data as at 31 March 2018.

92–93% through until 2014, but then decreased to below 90% due to addition of several new vaccine doses to the assessment algorithm in July 2014. Coverage at this milestone reached 91.2% in the first half of 2017 but then decreased to 89.8% in the second half of the year, following the inclusion of the new 18-month DTPa booster dose in the assessment algorithm. 'Fully immunised' coverage at the 60-month age assessment milestone, which has increased steadily since 2009, reached its highest ever recorded level of 94.5% in December 2017. The increases in coverage documented at 12 and 60 months of age are likely to have been contributed to by a range of measures, including the federal government 'No Jab No Pay' policy (implemented from 1 January 2016) and 'No Jab No Play' policies implemented in some states. Although rotavirus vaccine coverage is still lower than that for other vaccines because of the strict upper age limits for vaccine administration, the coverage achieved has resulted in substantial herd immunity and decreases in rotavirus hospitalisations in Australia.^{31,32}

'Fully immunised' coverage at 12 and 60 months of age in Indigenous children has steadily increased since 2012, and reached the highest ever recorded levels of 93.2% and 96.9%, respectively, in December 2017. The gap in 'fully immunised' coverage between Indigenous and non-Indigenous children at 12 months of age has closed considerably from 6.7 percentage points in 2013 to 0.7 percentage points in December 2017. Coverage for Indigenous children at 60 months of age has been higher than

that in non-Indigenous children since 2012. However 'fully immunised' coverage at 24 months of age was 2.1% lower in Indigenous children compared to non-Indigenous children at the end of 2017, after having been similar from 2011 to 2013. This highlights a differential impact on coverage in Indigenous children after additional vaccine doses were incorporated into the assessment algorithm in 2014 and 2016, most likely related to timeliness issues.

The 'fully immunised' coverage figures presented in this report likely underestimate true coverage by an amount that is difficult to precisely quantify. This is because of under-reporting due to a range of factors, including incorrect data entry and failure of transfer of information from practice management software to the AIR, as documented in a recent report.³³

Recorded coverage in the influenza immunisation program for Indigenous children aged 6 months to <5 years (which commenced in 2015) was low in 2017 with overall national coverage of 15%, and only the Northern Territory (60.6%) achieving coverage above 20%. However, upward trends in coverage over time were seen for all jurisdictions. Influenza vaccine coverage in 2017 increased 13-fold in the Northern Territory and almost 7-fold in Queensland compared with the coverage in 2014. Influenza vaccine coverage data should be regarded as a minimum estimate because of the potential for under-reporting. The extent of under-reporting to the AIR for influenza vaccine is unclear, but may be more than that for 'universal' vaccines, given the

Table 4. Catch-up vaccination activity for adolescents aged 10–19 years of age^a not recorded as having received relevant doses before 1 January 2017 who received catch-up vaccines during 2017, by state or territory, Australia

	State or territory							Australia	
	ACT	NSW	NT	Qld	SA	Tas	Vic		WA
Number with no MMR2 record	5571	102428	4060	76230	21219	4599	71582	51452	337141
Number of MMR2 doses given	374	6279	272	4883	2190	518	5161	3066	22743
MMR2 catch-up activity (%)	6.7	6.1	6.7	6.4	10.3	11.3	7.2	6.0	6.8
Number with no DTPa/dTpa/dT3 record	4183	77541	3017	59972	15232	3008	56697	42466	262116
Number of dTpa/dT3 doses given	122	2819	92	1591	973	220	2648	968	9433
dTpa/dT3 catch-up activity (%)	2.9	3.6	3.1	2.7	6.4	7.3	4.7	2.3	3.6

^aCohort born 1 July 1997 – 30 June 2007, vaccinations given 1 January – 31 December 2017.
ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia
Source: Australian Immunisation Register, data as at 31 March 2018.

lack of incentive payments for notification to the AIR. Other factors contributing to the low coverage of influenza vaccine likely include parental and provider attitudes and concerns, along with other issues such as the seasonal nature of the program, the two doses required in the first year a child under 9 years of age receives influenza vaccine and the 'gap' in NIP funding for 5- to 14-year-old Indigenous children.³⁴

Coverage for established programs of vaccines targeted specifically at Indigenous children, that is, hepatitis A vaccine and a booster dose of pneumococcal polysaccharide vaccine has increased in recent years but still remains suboptimal. Both these vaccines are included on the NIP for Indigenous children in the Northern Territory, Queensland, South Australia and Western Australia. Coverage for the second dose of hepatitis A vaccine in these jurisdictions combined has increased from around 30% in 2007 to 74.7% at the end of 2017, the highest figure on record, with coverage greater than 65% in each jurisdiction. The targeted national hepatitis A immunisation program has been shown to have had a significant impact with relatively modest vaccine coverage, and with evidence suggestive of substantial herd protection effects.³⁵ Coverage of the pneumococcal booster dose in Indigenous children has also increased, reaching 74.7% for the four jurisdictions combined in 2017, with coverage greater than 63% in each. The extent of under-reporting to the AIR for hepatitis A vaccine and the pneumococcal booster dose is unclear, but may be more than that for 'universal' vaccines, given the lack of incentive payments for notification to the AIR. However, lower coverage for vaccines targeted specifically at Indigenous people has been a relatively consistent finding for both children³⁶ and adults.³⁷ Lack of provider and parent knowledge about the recommendations and suboptimal identification of Indigenous children by immunisation providers are likely to be important contributing factors.

Although most children eventually complete the scheduled vaccination series, many still do not do so in a timely manner. On-time vaccination (within 30 days of the recommended age) for the first, second and third doses of DTPa vaccines, and the first dose of MMR vaccine increased in 2017 for both Indigenous and non-Indigenous children, compared to that in 2016, and also increased for the second dose of MMR vaccine for Indigenous children. The disparity in on-time vaccination of the first, second and third doses of DTPa vaccine between Indigenous and non-Indigenous children in Australia has decreased by 2.4–5.8 percentage points from 2008 to 2017. However, timeliness of vaccination remains an ongoing problem for Indigenous children in Australia, particularly given the higher rates of many diseases at a younger age.³⁸ As younger children are often more vulnerable to severe disease, immunisation at the earliest appropriate age should be a public health goal for countries such as Australia where high levels of vaccine coverage at milestone ages have been achieved.

Table 5. Catch-up vaccination activity for adolescents aged 10–19 years of age^a not recorded as having received relevant doses before 1 January 2017 who received catch-up vaccines during 2017, by Indigenous status, Australia

	Indigenous status		Total
	Indigenous	Non-Indigenous	
Number with no MMR2 record	7986	329155	337141
Number of MMR2 doses given	1620	21123	22473
MMR2 catch-up activity (%)	20.3	6.4	6.8
Number with no DTPa/dTpa/dT3 record	3497	258619	262116
Number of dTpa/dT3 doses given	280	9153	9433
dTpa/dT3 catch-up activity (%)	8.0	3.5	3.6

^aCohort born 1 July 1997 – 30 June 2007, vaccinations given 1 January – 31 December 2017.

Source: Australian Immunisation Register, data as at 31 March 2018.

Table 6. Coverage (%) for 3 doses of human papillomavirus (HPV) vaccine for girls aged 15 years in 2012–2017, and boys aged 15 years in 2014–2017, by state/territory, Australia

	State/territory								Australia
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
Girls									
2012	73.0	71.6	86.6	69.9	71.4	66.0	74.5	70.6	71.9
2013	71.4	69.3	86.4	72.1	73.4	65.9	75.2	72.7	72.1
2014	70.1	71.2	85.6	75.2	74.9	70.8	77.7	78.7	74.8
2015	78.3	81.4	91.2	76.6	75.1	71.0	79.2	76.5	78.7
2016	79.9	82.4	92.2	77.6	75.8	71.6	79.1	80.0	79.7
2017	80.1	82.9	92.5	79.1	78.7	74.6	79.7	76.9	80.2
Boys									
2014	64.6	57.6	64.8	62.4	64.3	58.2	67.8	63.1	62.4
2015	69.3	64.8	72.5	68.7	69.6	61.9	71.9	64.8	67.8
2016	71.4	74.5	82.2	70.8	72.6	63.8	74.5	78.1	73.8
2017	78.6	78.1	84.8	73.7	74.4	64.0	76.3	75.3	75.9

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

Population is Estimated Resident Population (ERP) provided by the Australian Bureau of Statistics (ABS).³⁰

Source: National HPV Vaccination Program Register, data as of 4 July 2018.

In 2017, parental vaccination objection could not be estimated as objection on non-medical grounds is no longer a valid exemption. The number of children aged 6 months to 10 years of age with new medical exemptions recorded on AIR, which had increased sharply in 2015 and then decreased in 2016, following introduction of stricter eligibility criteria,³⁹ decreased further in all jurisdictions in 2017.

Vaccination coverage in adolescents

Of 337,141 adolescents in Australia aged 10–19 years recorded as not having received their second dose of MMR vaccine (MMR2) before 1 January 2017, 22,743 (6.8%) received a catch-up dose of MMR2 during 2017. Some of these doses are likely to have been administered as a result

of the Australian government's 'No Jab No Pay' policy, introduced on 1 January 2016, which introduced annual immunisation requirements for eligibility for federal government family assistance payments through to 19 years of age, and removed non-medical exemptions.

Coverage for HPV vaccine, as derived from the National HPV Vaccination Program Register, continues to increase, reflecting a successful school-based program and the success of the gender-neutral approach to HPV vaccination.^{10,40,41} Three-dose national coverage by age 15 years in 2017 reached over 80% for girls and 76% for boys, representing incremental improvements in coverage for both genders and closing of the gap between them over time. Ongoing declines in vaccine-type HPV infection rates and

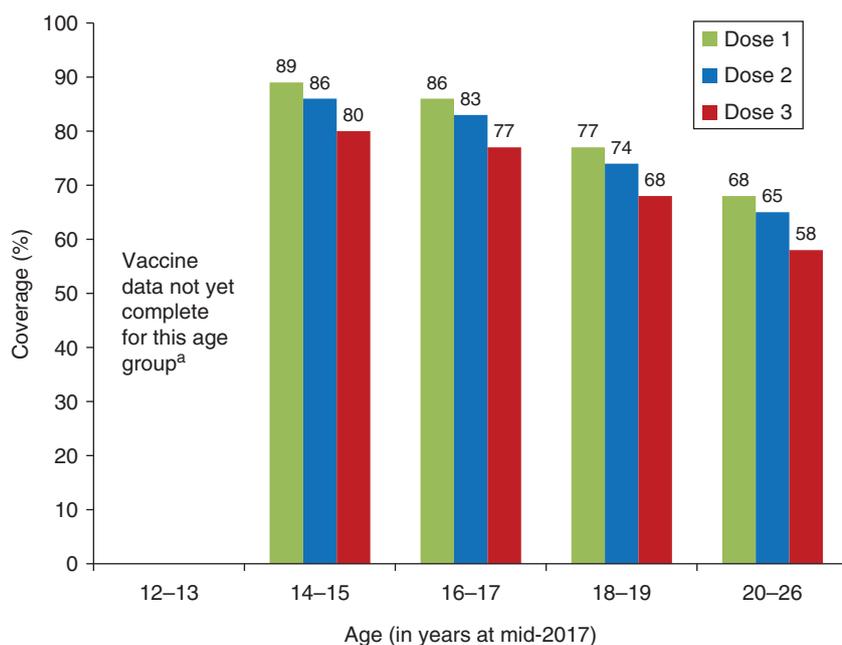


Figure 23a. HPV vaccination coverage by dose number for females by age group as of mid-2017, Australia, 2017.

^aIn some states those aged 12-13 years in 2017 are not eligible for vaccination until 2018.

Population is Estimated Resident Population (ERP) provided by the Australian Bureau of Statistics (ABS) (as at 30 June 2017).³⁰

Source: National HPV Vaccination Program Register, data as at 4 July 2018.

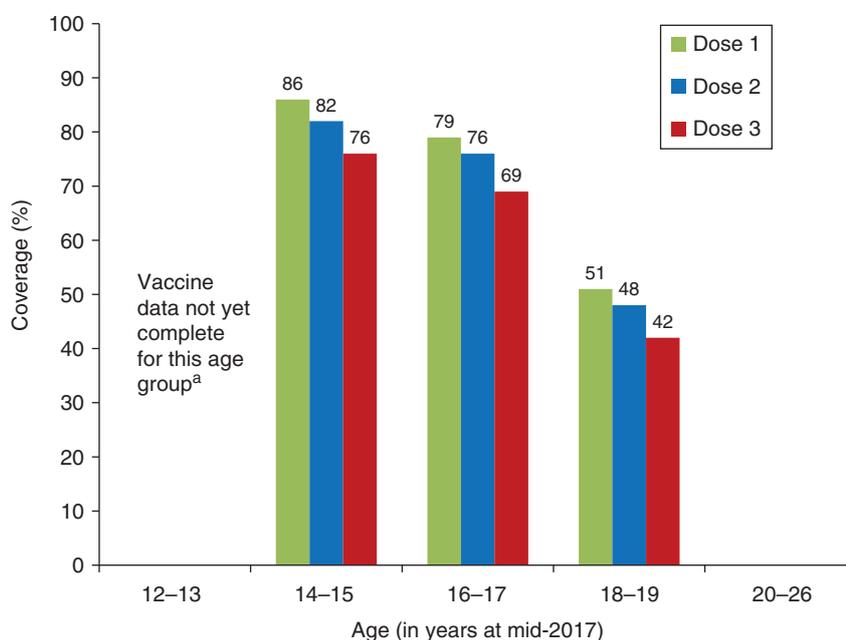


Figure 23b. HPV vaccination coverage by dose number for males by age group as of mid-2017, Australia, 2017.

^aIn some states those aged 12-13 years in 2017 are not eligible for vaccination until 2018.

Population is Estimated Resident Population (ERP) provided by the Australian Bureau of Statistics (ABS) (as at 30 June 2016).³⁰

Source: National HPV Vaccination Program Register, data as of 4 July 2018.

Table 7. HPV vaccination completion status (%) among those who commenced the course by birth year, Indigenous status, sex and number of doses received, Australia, 2007-2017

Birth year	Equates to 15 years old in	% of those who commenced course who received 1 dose only		% of those who commenced course who received 2 doses only		% of those who commenced course who received all 3 doses	
		Indigenous	Non-Indigenous	Indigenous	Non-Indigenous	Indigenous	Non-Indigenous
Females							
1992	2007	13	6	17	9	71	85
1993	2008	12	5	14	9	74	85
1994	2009	10	5	15	8	75	87
1995	2010	9	4	14	8	77	88
1996	2011	10	4	16	9	74	86
1997	2012	11	5	14	9	75	87
1998	2013	10	5	15	8	74	88
1999	2014	9	4	14	7	78	90
2000	2015	8	3	12	6	80	91
2001	2016	9	3	12	6	80	91
2002	2017	8	3	12	6	79	91
Males							
1997	2012	20	9	22	14	58	77
1998	2013	12	5	20	11	68	85
1999	2014	12	4	18	11	70	85
2000	2015	10	3	14	7	76	89
2001	2016	10	3	12	7	77	90
2002	2017	10	3	13	7	77	90

Source: National HPV Vaccination Program Register, data as of 4 July 2018.

incidence of high-grade cervical lesions in young women have been documented, building on the rapid and substantial decreases seen initially.⁴²⁻⁴⁴ Australia is well placed to respond to the recent WHO call for countries to work towards the elimination of cervical cancer as a public health problem,⁴⁵ especially given that modelling studies of the population impact of HPV vaccination programs suggest that sustained vaccination coverage of over 80% will be sufficient for elimination of targeted HPV types.⁴⁶ With the transition from 2018 to a two-dose HPV vaccine schedule for those aged 14 years or younger at first dose, it will be important to monitor coverage, particularly in Indigenous adolescents, given the lower completion rate and longer time to completion documented for the first time at a national level in this report. Indigenous women have twice the incidence of cervical cancer and four times the mortality rate from cervical cancer, compared to other Australian women,⁴⁴ and vaccination represents a significant opportunity to close this gap.

Conclusion

Data presented in this report reflect continuing successful delivery of the NIP in Australia, while identifying some areas for further improvement, particularly timeliness of vaccination for Indigenous children and coverage of vaccines specifically targeted to Indigenous children. A separate

report is planned to present adult AIR coverage and doses administered data and assess completeness of reporting.

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