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WEBINAR

# PERTUSSIS UPDATE

Presenter: Dr Andrew Baird
Moderator: Dr Andrew Minton, PhD

13 SEPTEMBER 2023 | 6–7 PM AEST

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# Dr Andrew Baird

Andrew is a General Practitioner in Elwood, Melbourne and a tutor in Professional Practice for medical students at University of Melbourne.

He is an IC member as well as being a member of the Scientific Advisory Committee.

He has a background in rural general practice and his interests are in general practice and medical education.

# Learning Objectives

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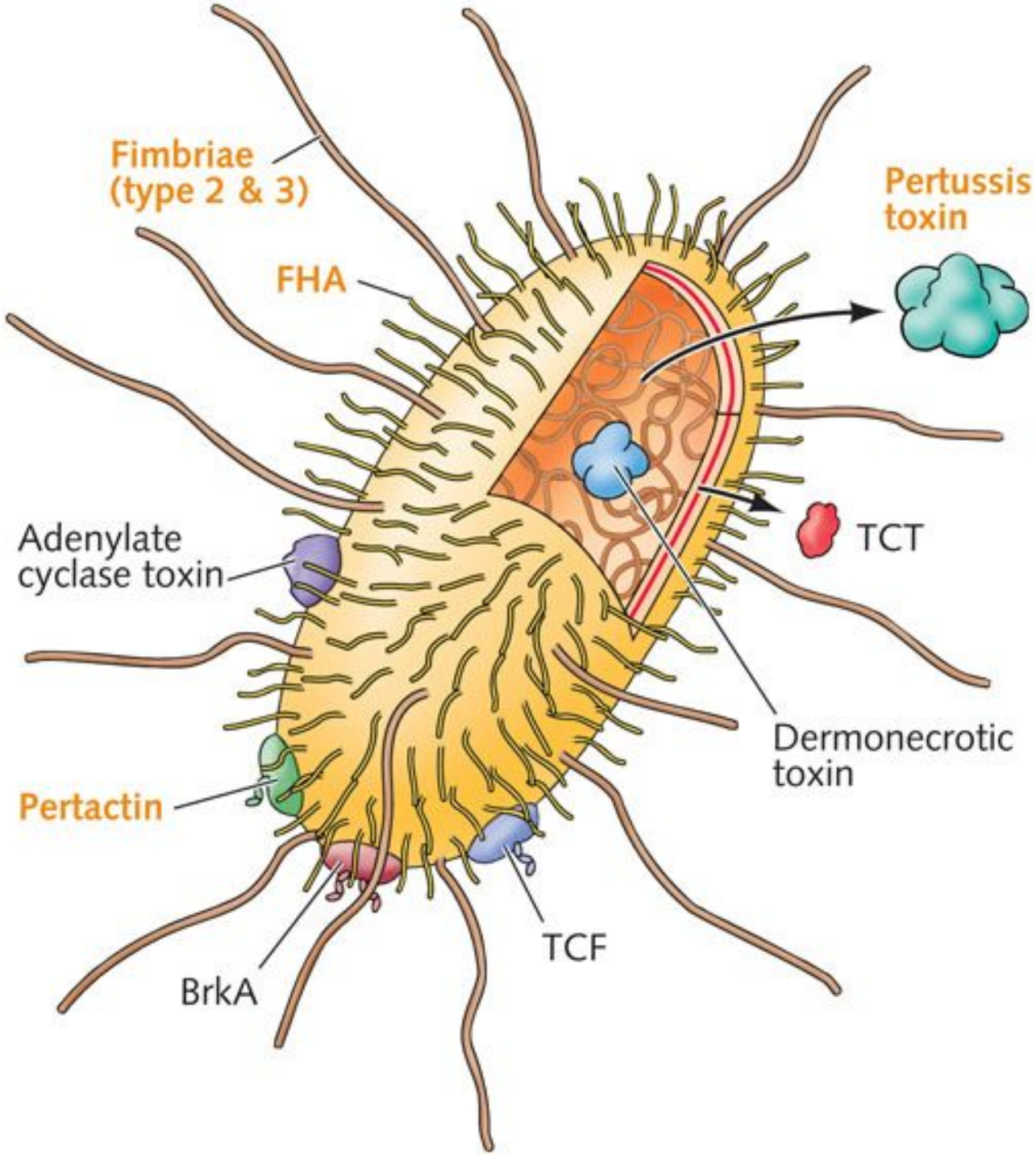
1. Review pertussis epidemiology
2. Outline vaccines' effectiveness and coverage rates in targeted age groups, and indications
3. Review pertussis recommendations for vaccination as described in the National Immunisation Program Schedule
4. Consider the benefits of pertussis vaccination in the older population and the role of primary care in improving the vaccination rate

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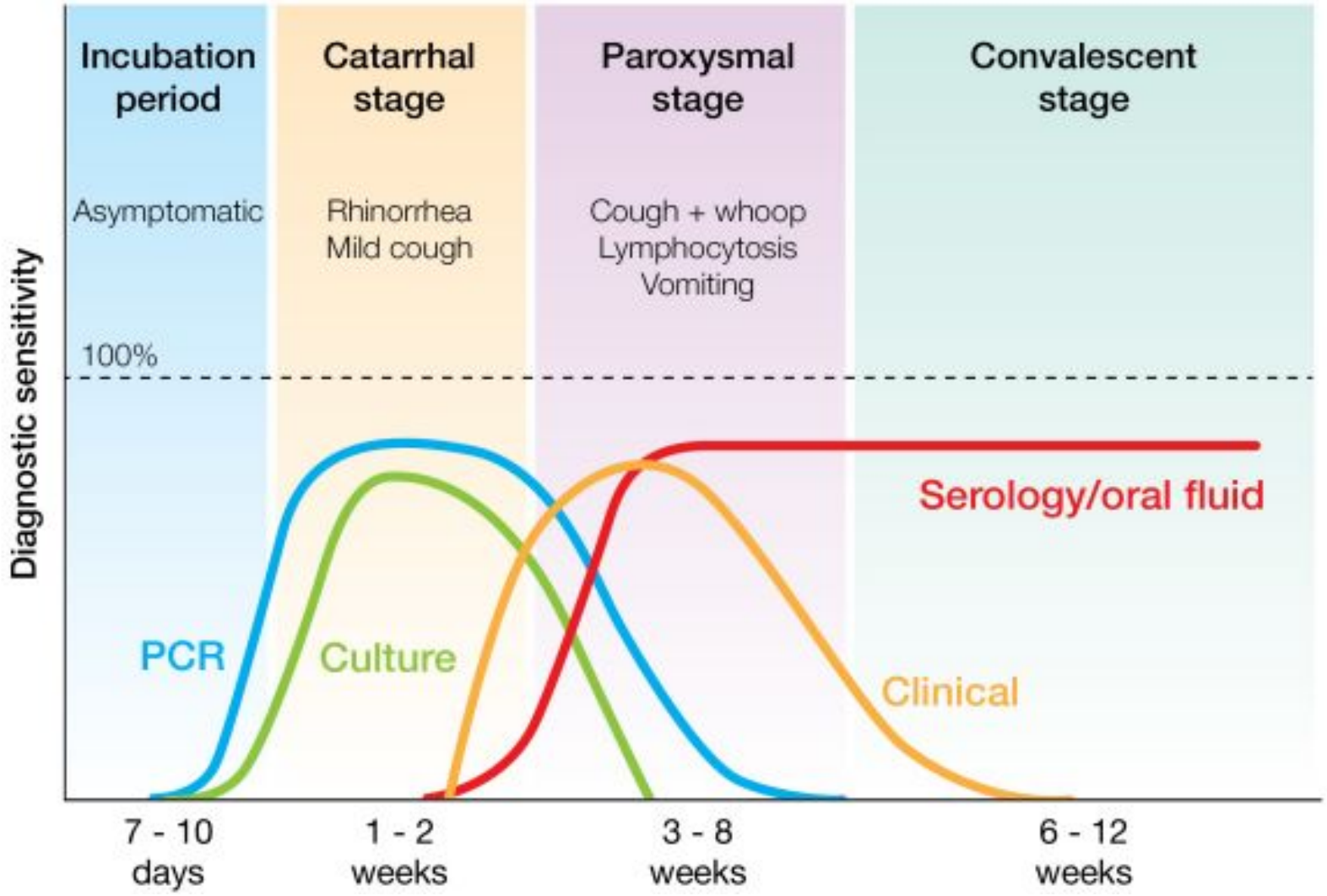
# Clinical course of pertussis




Fry et al., Journal of Medical Microbiology 2021;70:001442
DOI 10.1099/jmm.0.001442

# Communicable disease

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- Incubation period is 6-20 days, usually 14 days.
- School and childcare exclusion is 21 days after cough onset, or after 5 days of antibiotics.
- Unimmunised contacts <7 in same room as case – exclude for 14 days from last exposure, or after 5 days of antibiotics.
- Highly communicable in the catarrhal pre-cough stage.
- Not communicable from 3 weeks after cough onset, or after 5 days of antibiotics.

# Antibiotic treatment

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- Eliminates Bordetella pertussis (B. pertussis) from nasopharynx.
- Minimises transmission to susceptible contacts.
- Recommended if diagnosis <3 weeks after cough onset.
- Avoid contact with others until after 5 days of antibiotic Rx.
- Prophylaxis?  infants, >36/40, risk to infants … get advice.
- Azithromycin, once daily, 5 days.
- Clarithromycin, twice daily, 7 days.
- Co-trimoxazole, twice daily, 7 days.

# Overview of pertussis across age groups

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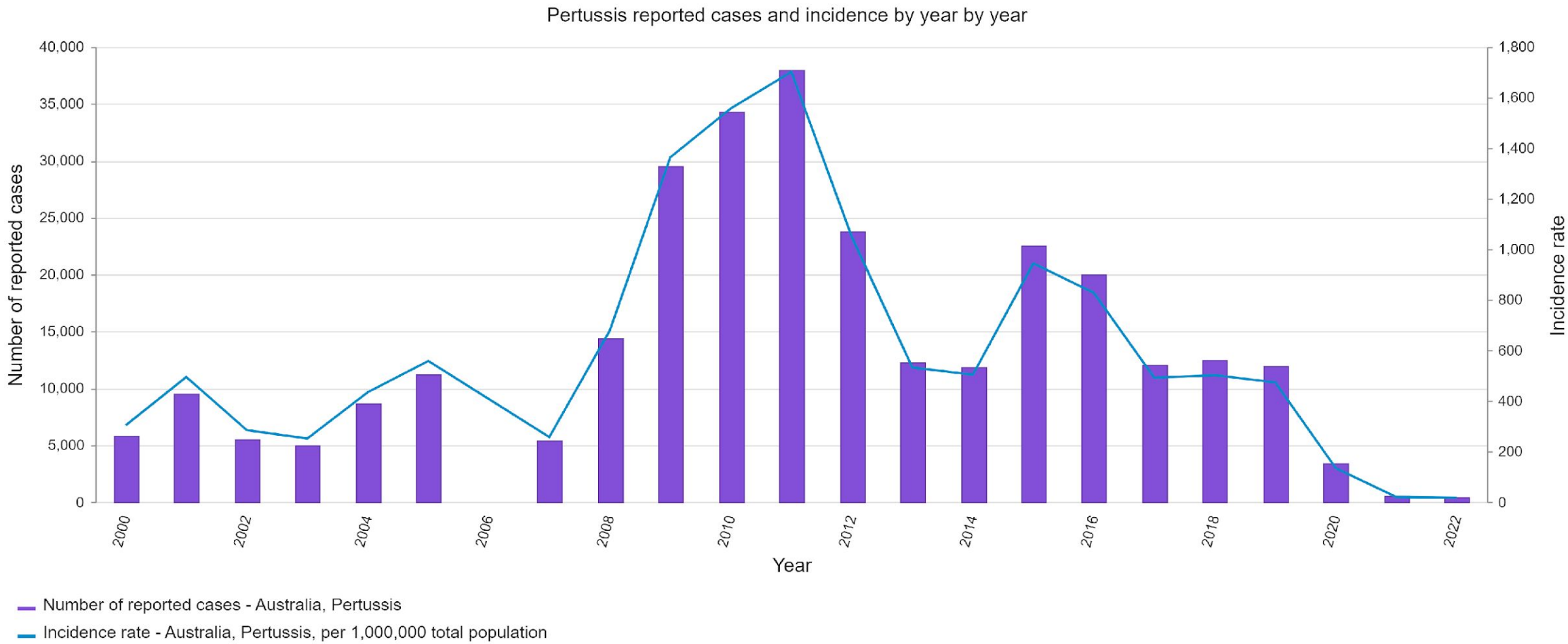
- Infants, children
- Adolescents
- Adults including pregnant women
- Older persons
- Vaccine immunity and natural immunity wane after 6-10 years
- There is a reservoir of B. Pertussis in the community

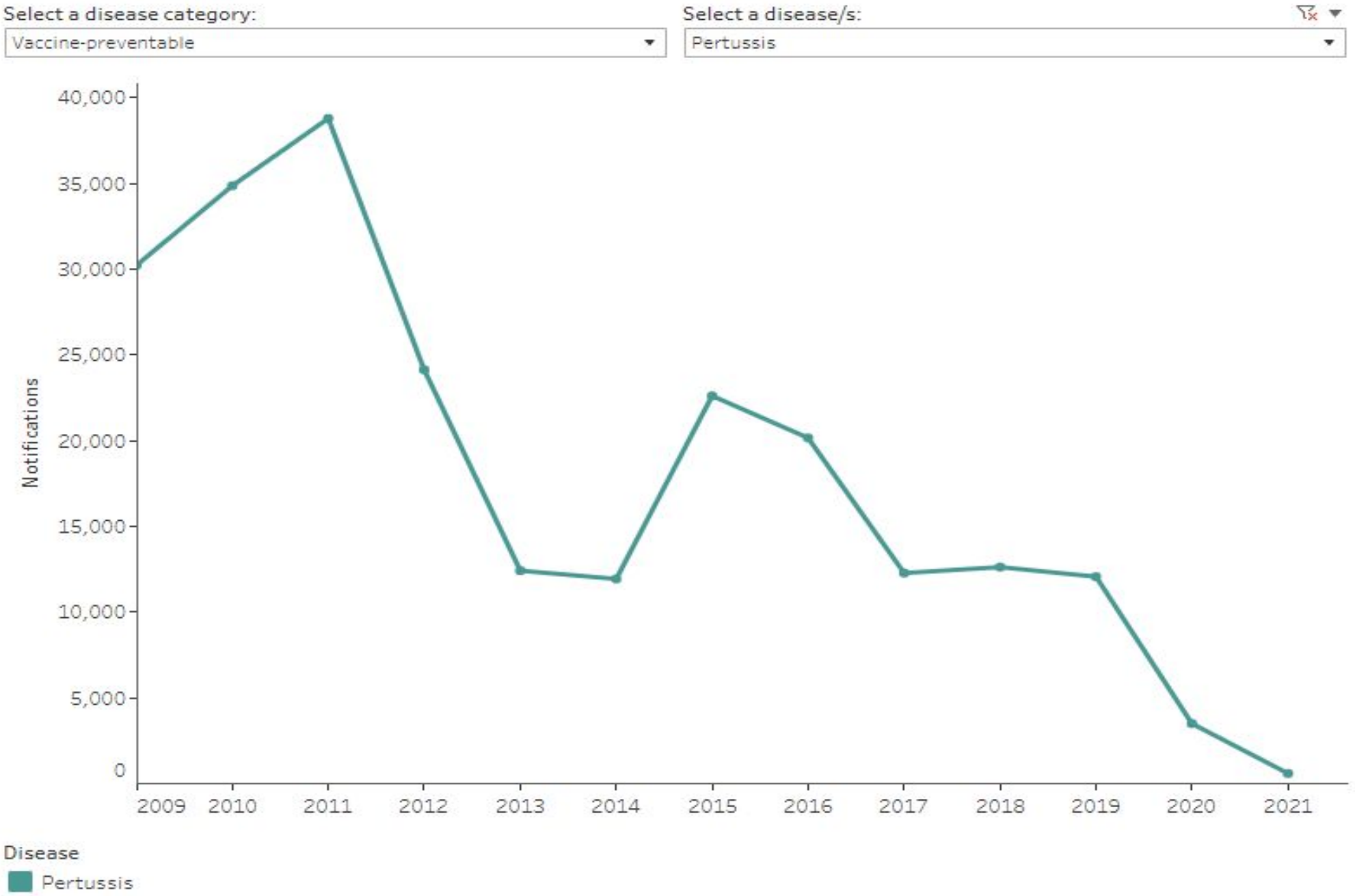
World Health Organization




Source: WHO Immunization Data portal

Date of export: 9/11/2023

# Figure 1: Cases of notifiable infectious diseases, Australia, 2009–2021

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# Pertussis in adolescents and young adults

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**Figure 2: Rate of notifications for pertussis (whooping cough) among young people aged 15–19 and 20–24, 2009–2020**


*Note:* All NNDSS data were extracted January 2021, see Technical notes.
*Chart:* AIHW.
*Source:* DoH 2020a.

Source: https://www.aihw.gov.au/reports/children-youth/infectious-diseases

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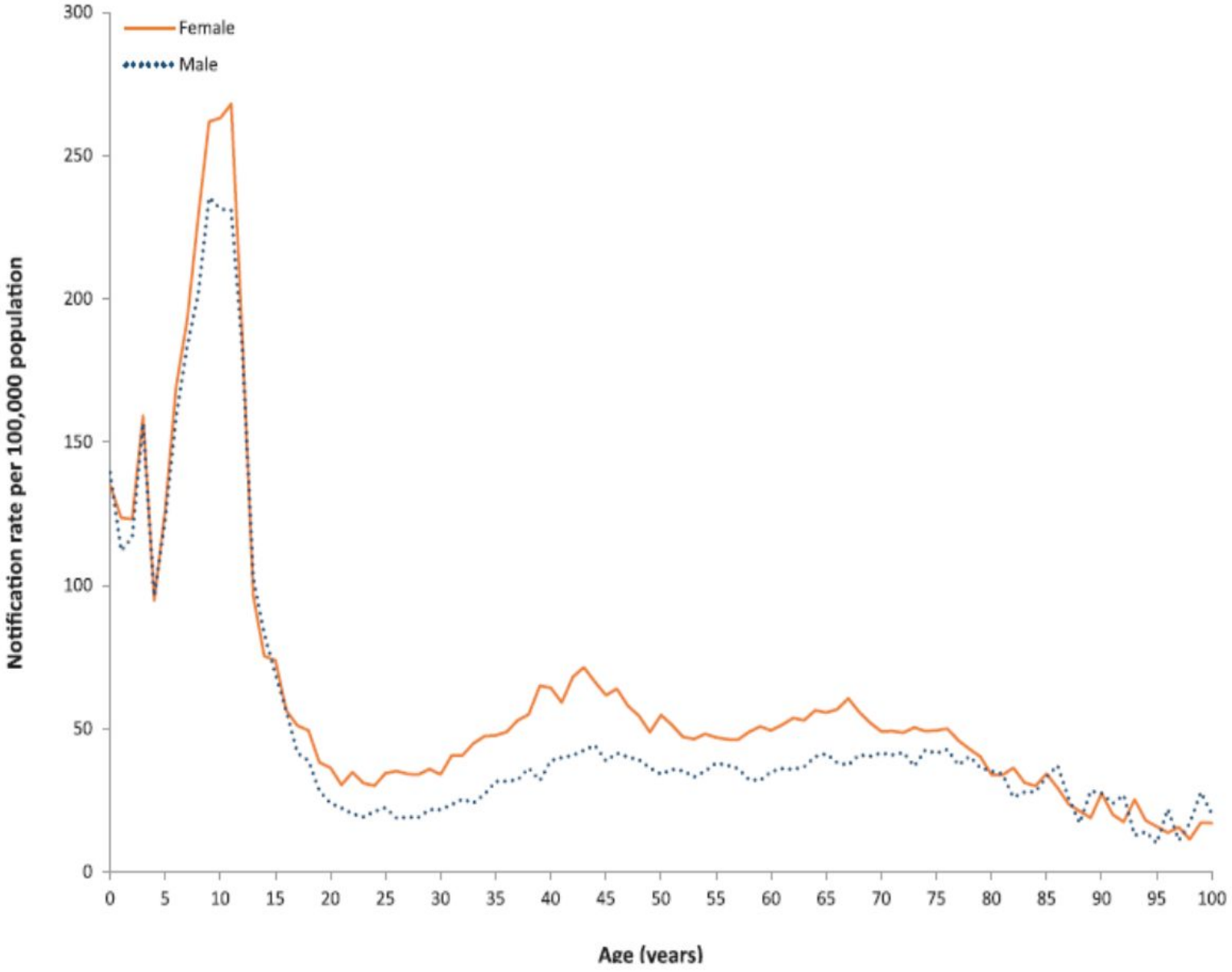
## Figure 2: Pertussis notification rates by age and sex, Australia, 2013–2018[a]




a Data source: NNDSS (notification data).

**Marshall K S, et al, Australian vaccine preventable disease epidemiological review series: Pertussis, 2013-2018, Commun Dis Intell (2018) 2022 Jan 27;46**

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- Annual national all-age incidence of pertussis notifications between 2013 and 2018 was **63.6 per 100,000** population, **40%** less than between 2006 and 2012.

- Between 2016 and 2018, infants aged < 2 months had the lowest notification rates of age groups < 5 years old, with the highest notification rates in pre-adolescents aged 9-11 years.

- Notification and hospitalisation rates in Indigenous children were 3-8 times as high as rates in non-Indigenous children across all age groups < 5 years old.

# Pertussis

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- Epidemics occur every 3 to 4 years
- Two-thirds of cases occur in Spring or Summer
- Pertussis incidence increased by 500% from 2005 to 2010

| STATES | (per 100,000) | Cases |
|---|---|---|
| ALABAMA | 0.95 | 48 |
| ALASKA | 0.27 | 2 |
| ARIZONA | 1.43 | 104 |
| ARKANSAS | 0.53 | 16 |
| CALIFORNIA | 0.21 | 84 |
| COLORADO | 4.34 | 252 |
| CONNECTICUT | 0.19 | 7 |
| DELAWARE | 0.10 | 1 |
| D.C. | 0.45 | 3 |
| FLORIDA | 0.27 | 59 |
| GEORGIA | 0.38 | 41 |
| HAWAII | 0.42 | 6 |
| IDAHO | 0.47 | 9 |
| ILLINOIS | 0.63 | 80 |
| INDIANA | 1.01 | 69 |
| IOWA | 0.72 | 23 |
| KANSAS | 0.31 | 9 |
| KENTUCKY | 0.78 | 35 |
| LOUISIANA | 0.06 | 3 |
| MAINE | 5.39 | 74 |
| MARYLAND | 0.23 | 14 |
| MASSACHUSETTS | 0.09 | 6 |
| MICHIGAN | 0.67 | 67 |
| MINNESOTA | 0.25 | 14 |
| MISSISSIPPI | 0.03 | 1 |
| MISSOURI | 0.36 | 22 |
| MONTANA | 0.18 | 2 |
| NEBRASKA | 1.48 | 29 |
| NEVADA | 4.61 | 145 |
| NEW HAMPSHIRE | 0.14 | 2 |
| NEW JERSEY | 0.00 | 0 |

https://ndc.services.cdc.gov/case-definitions/pertussis-2020/

## Reported Pertussis Cases

2021: **1,609***  2022: **2,388**

*Provisional 2021 Week 52 reported pertussis cases; final 2021 data were not available at the time of publication.

## Reported Pertussis Cases and Percent Hospitalization by Age Group

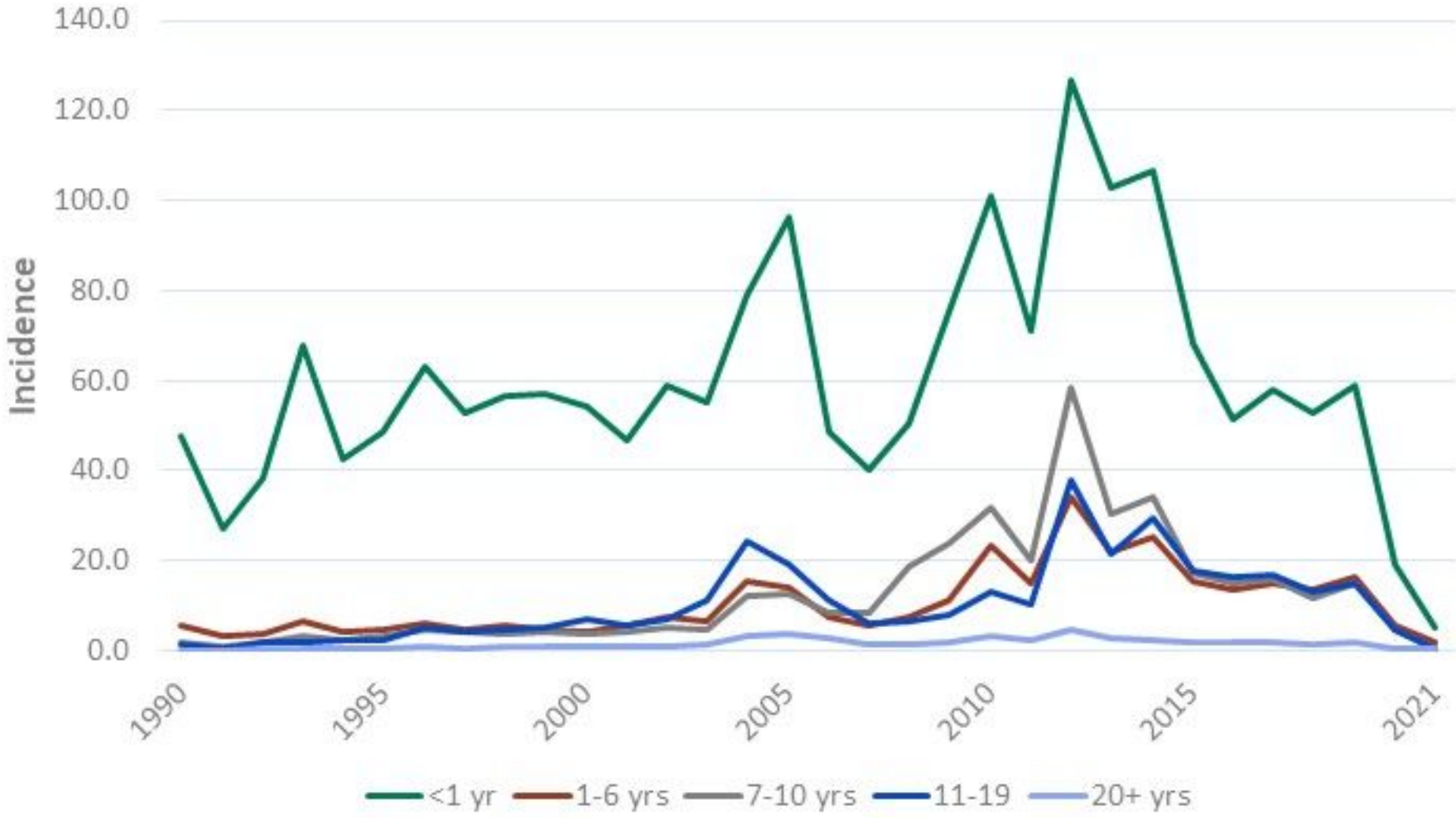
| Age | No. of Cases (% of total) | Age Inc /100,000 | % Hospitalized by age** |
|---|---|---|---|
| < 6 mos | 139 (5.8) | 7.8 | 17.1 |
| 6-11 mos | 130 (5.4) | 7.3 | 4.9 |
| 1-6 yrs | 622 (26.0) | 2.7 | 1.9 |
| 7-10 yrs | 176 (7.4) | 1.1 | 0.0 |
| 11-19 yrs | 231 (9.7) | 0.6 | 1.2 |
| 20+ yrs | 1,089 (45.6) | 0.4 | 11.2 |
| Unknown Age | 1 (0.0) | N/A | N/A |
| **Total** | **2,388 (100)** | **0.7*** | **6.9** |

## Reported Pertussis Deaths

| Age | Deaths* |
|---|---|
| Cases, aged < 1 yr | 1 |
| Cases, aged ≥ 1 yr | 2 |
| **Total** | **3†** |

*Deaths reported through NNDSS
Confirmation of deaths is ongoing and may result in changes to the final count for 2022.

# Reported National pertussis incidence by age: 1990-2021






URCE: CDC, National Notifiable Diseases Surveillance System

# Reported QLD pertussis incidence: YTD 2023

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| | Weekly totals (week commencing) | | | | Year to date (YTD) comparisons 1 Jan - 10 Sep 2023 | | |
|---|---|---|---|---|---|---|---|
| **Disease** | **Mon Sep 04 2023** | **Mon Aug 28 2023** | **Mon Aug 21 2023** | **Mon Aug 14 2023** | **YTD 2023** | **YTD mean: 2018-2022** | **Ratio YTD 2023: (YTD mean)** |
| Diphtheria | 0 | 1 | 0 | 0 | 6 | 8 | 0.8 |
| Influenza (lab confirmed) | 643 | 999 | 1266 | 1379 | 65636 | 23400 | 2.8 |
| Measles | 0 | 0 | 0 | 0 | 4 | 9 | 0.5 |
| Mumps | 1 | 0 | 0 | 0 | 23 | 98 | 0.2 |
| Pertussis | 13 | 12 | 12 | 10 | 151 | 537 | 0.3 |
| Poliomyelitis | 0 | 0 | 0 | 0 | 0 | 0 | * |
| Rotavirus | 27 | 27 | 27 | 33 | 837 | 637 | 1.3 |
| Rubella | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

# Reported NSW pertussis incidence by age: 2019 - 2023

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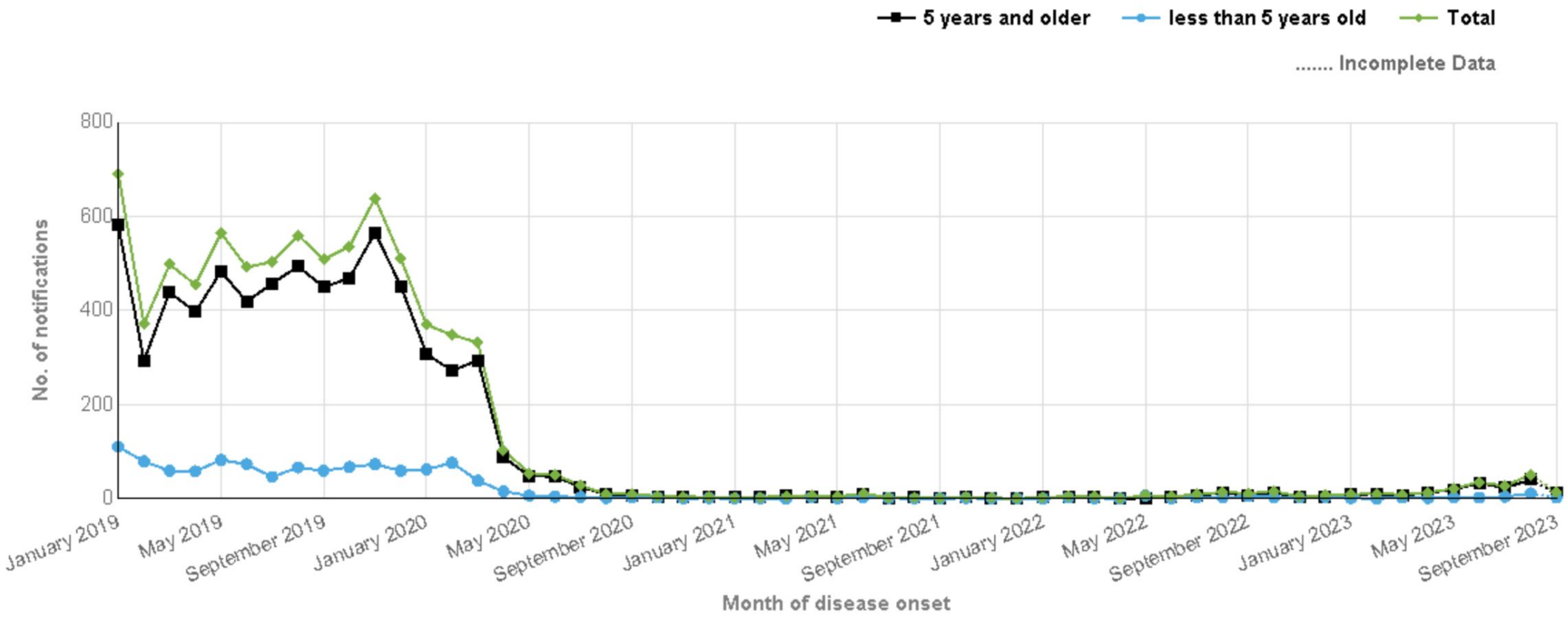

# Reported WA pertussis incidence by mth: 2018 - 2023

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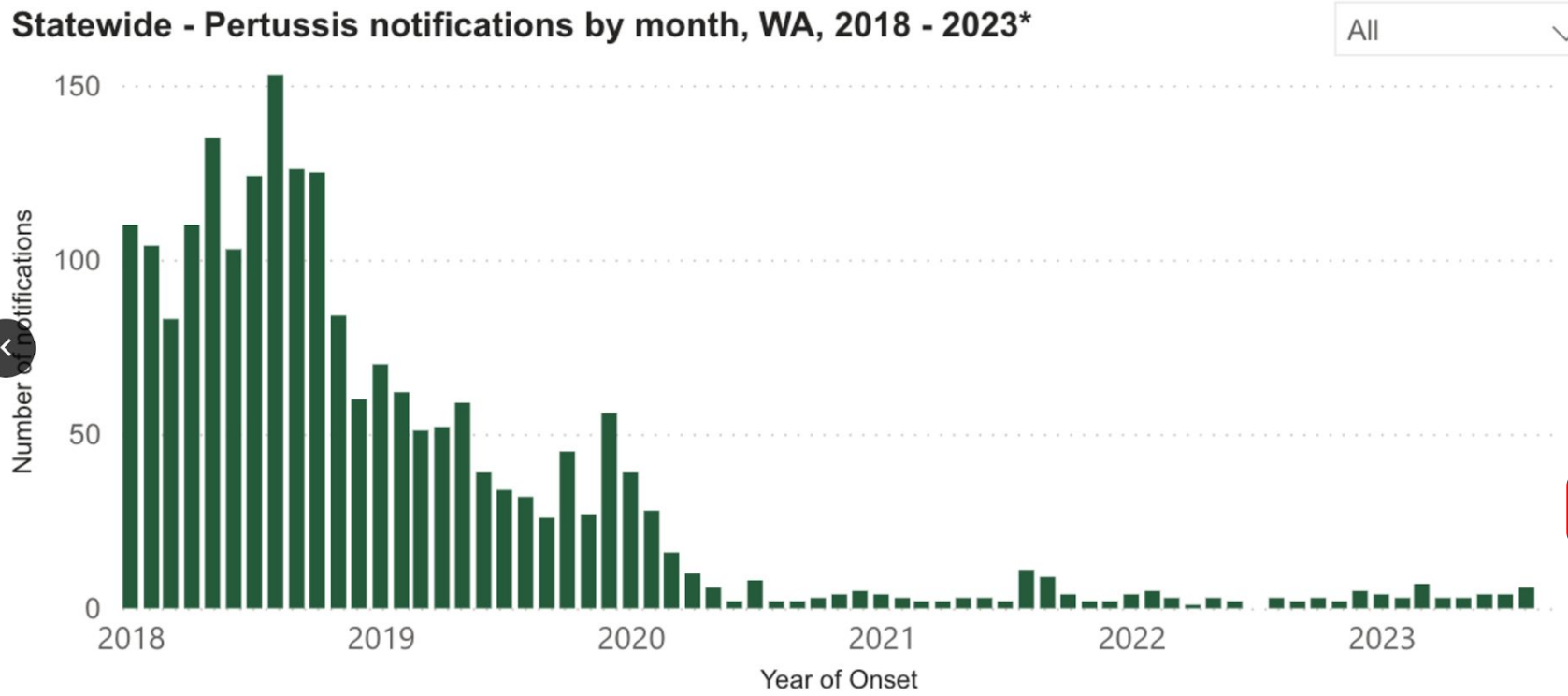


**Statewide - Pertussis notifications and rates by year, WA, 2018 - 2023***

| Year | Number | Rate |
|---|---|---|
| 2018 | 1,317 | 50.7 |
| 2019 | 553 | 21.2 |
| 2020 | 125 | 4.7 |
| 2021 | 47 | 1.8 |
| 2022 | 33 | 1.2 |
| 2023* | 34 | 1.7 |

# Reported VIC pertussis incidence: YTD 2023

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- No 2023 data available

# Vaccine effectiveness in children

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- Pertussis-containing vaccines protect against severe and typical pertussis.
- They provide substantially less protection against milder coughing illness.
- DTPa vaccines have vaccine efficacy of:
  - 71–78% for preventing milder symptoms of pertussis (≥7 days of paroxysmal cough and laboratory confirmation)
  - 84% for preventing typical disease (≥21 days of paroxysmal cough and laboratory confirmation)
- The 1st dose of the childhood schedule significantly reduces the incidence of severe pertussis disease in young infants. Protection increases further with the doses given at 4 and 6 months of age, as measured by hospitalisation rates and mortality.

# Vaccine effectiveness in adolescents and adults

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- Pertussis-containing vaccines with reduced antigen content (dTpa) are immunogenic, including in older people.

- A randomised trial in adults reported a point estimate of 92% efficacy against culture-positive or nucleic acid amplification test–positive disease within 2.5 years of vaccination with a  pertussis vaccine.

# Vaccine effectiveness in pregnant women

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- Vaccinating pregnant women with dTpa can reduce the risk of pertussis in them and their young infants. This is a result of transplacental transfer of high levels of pertussis antibodies from the mother to the foetus during pregnancy.

- In a landmark study, vaccination of mothers at least 7 days before delivery reduced pertussis disease by 91% in infants <3 months of age.

**However, it is not known:**

- what exact level of pertussis antibody the pregnant woman needs to have to provide this level of protection to her infant.

- how waning pertussis immunity in the mother affects this protection.

# National Immunisation Program Schedule

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| Age | Disease | Vaccine Brand |
|---|---|---|
| **2 months** | Diphtheria, tetanus, **pertussis (whooping cough)**, hepatitis B, polio, *Haemophilus influenzae* type b (Hib) | **Infanrix® hexa or Vaxelis®** |
| **4 months** | Diphtheria, tetanus, **pertussis (whooping cough)**, hepatitis B, polio, *Haemophilus influenzae* type b (Hib) | **Infanrix® hexa or Vaxelis®** |
| **6 months** | Diphtheria, tetanus, **pertussis (whooping cough)**, hepatitis B, polio, *Haemophilus influenzae* type b (Hib) | **Infanrix® hexa or Vaxelis®** |
| **18 months** | Diphtheria, tetanus, **pertussis (whooping cough)** | **Infanrix® or Tripacel** |
| **4 years** | Diphtheria, tetanus, **pertussis (whooping cough)**, polio | **Infanrix® IPV or Quadracel®** |
| **12–13 years** | Diphtheria, tetanus, **pertussis (whooping cough)** | **Boostrix® or Adacel®** |
| **Pregnant women** | **Pertussis (whooping cough)** | **Boostrix® or Adacel®** |

# Vaccine Recommendations

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## Infants and children

- Infants and children are recommended to receive pertussis-containing vaccine in a 5-dose schedule.
- 18-month booster was reintroduced in 2016.
- Infants and children aged <10 years who have missed a dose of pertussis-containing vaccine are recommended to catch up.

**Target is 95%**

# DTPa coverage at 12 months of age

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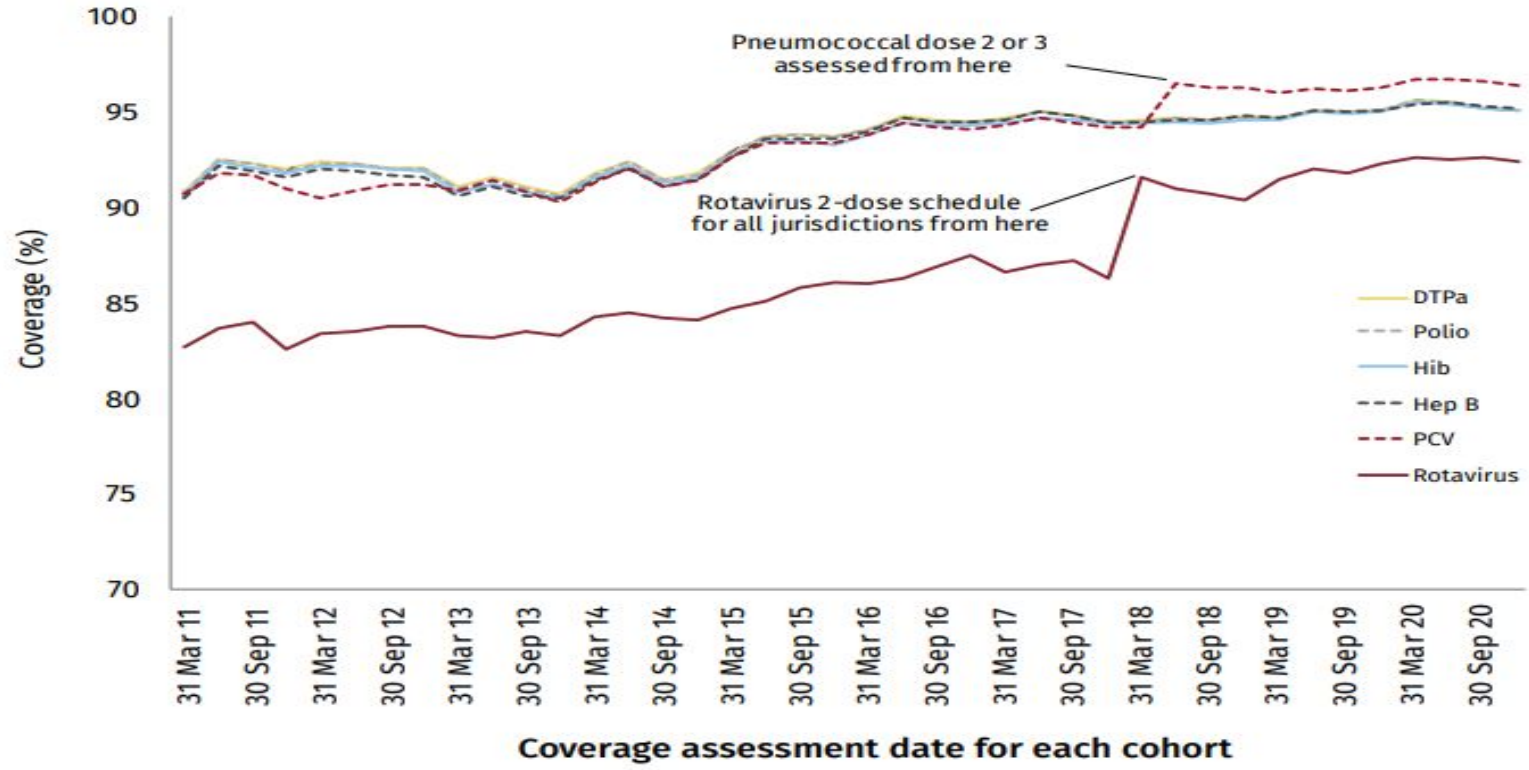
Figure A2. Trends in vaccination coverage estimates at 12 months of age, by vaccine/antigen* and quarter, Australia, 2011 to 2020




By 3-month birth cohorts born between 1 January 2010 and 31 December 2019. 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.
* Third dose of DTPa vaccine, polio vaccine and 13vPCV, second or third dose of Hib and rotavirus vaccines, and third dose of hepatitis B vaccine.
DTPa = diphtheria-tetanus-acellular pertussis
Hib = *Haemophilus influenzae* type b
Hep B = hepatitis B
13vPCV = 13-valent pneumococcal conjugate vaccine
Source: Australian Immunisation Register, data as at 31 March 2021.

Source: https://www.ncirs.org.au/sites/default/files/2022-07/NCIRS%20Annual%20Immunisation%20Coverage%20Report%202020.pd

# DTPa coverage at 24 months of age

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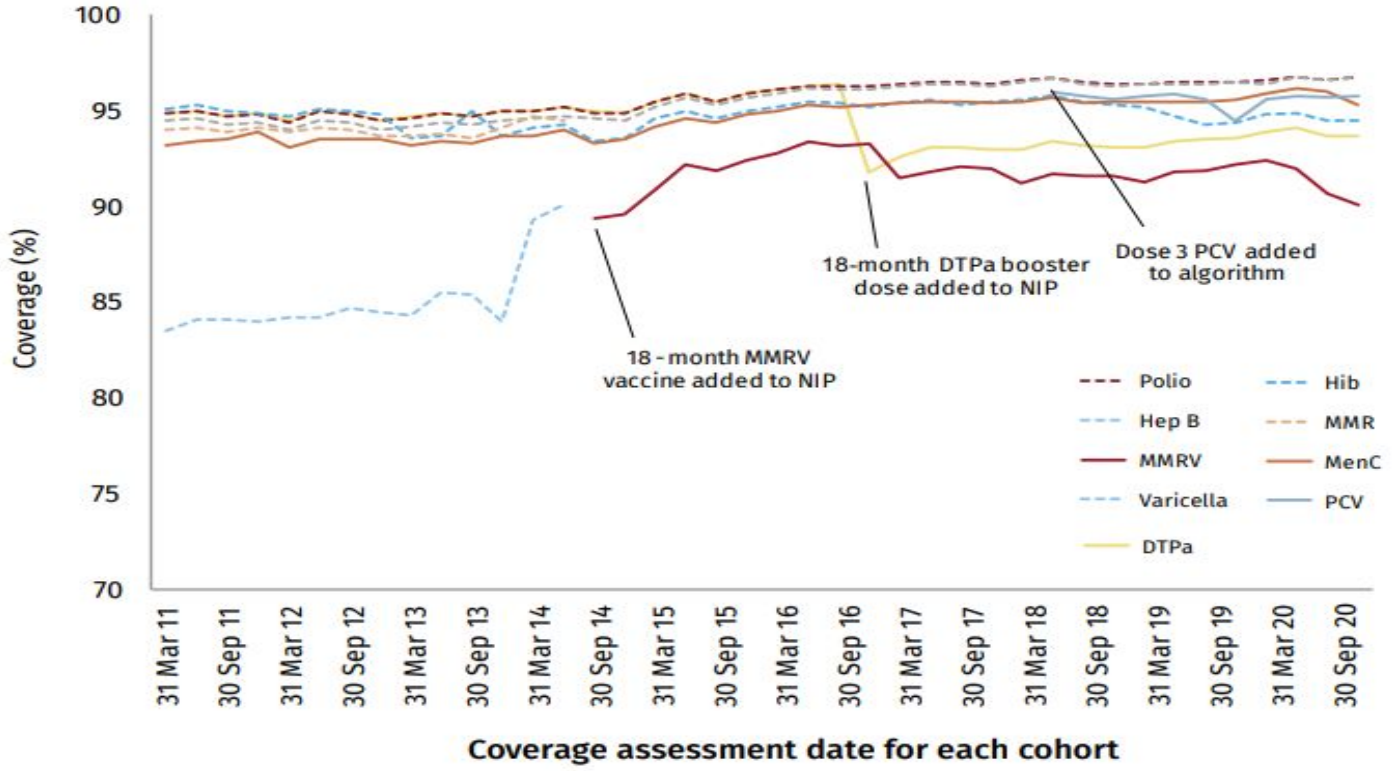
Figure A3. Trends in vaccination coverage estimates at 24 months of age by vaccine/antigen* and quarter, Australia, 2011 to 2020




By 3-month birth cohorts born between 1 January 2009 and 31 December 2018. Coverage assessment date was 24 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.
* Fourth dose of DTPa (from October 2016), third dose of polio, third or fourth dose of Hib, third dose of hepatitis B, a dose of varicella, second dose of MMR (from September 2014), and first dose of MenC (MenACWY from July 2018)
DTPa = diphtheria-tetanus-acellular pertussis
Hib = *Haemophilus influenzae* type b
Hep B = hepatitis B
MMR = measles-mumps-rubella
MenC = meningococcal C-containing
MMRV = measles-mumps-rubella-varicella
13vPCV = 13-valent pneumococcal conjugate vaccine

Source: Australian Immunisation Register, data as at 31 March 2021.

Source: https://www.ncirs.org.au/sites/default/files/2022-07/NCIRS%20Annual%20Immunisation%20Coverage%20Report%202020.pd

# DTPa coverage at 60 months of age

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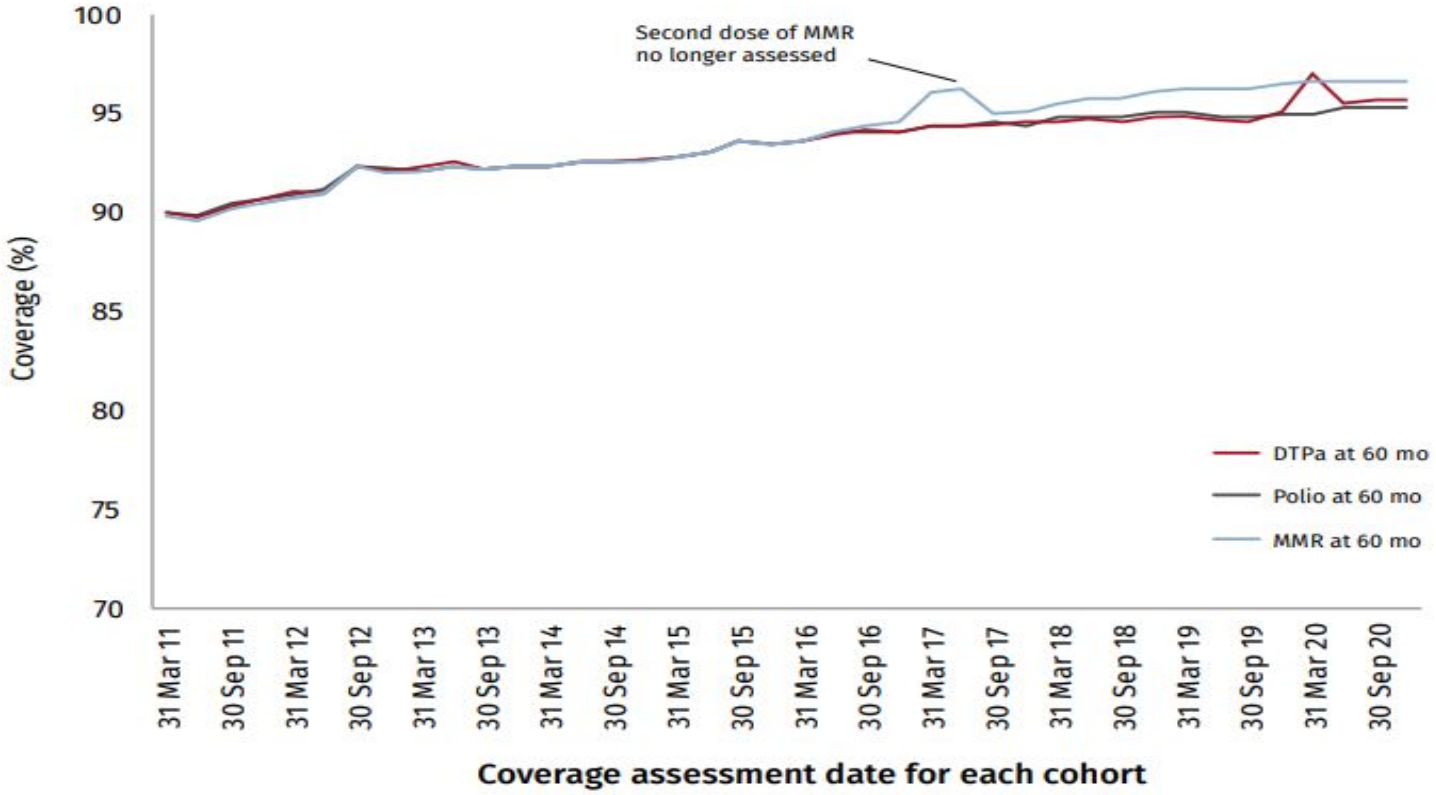
Figure A4. Trends in vaccination coverage estimates at 60 months of age by vaccine/antigen* and quarter, Australia, 2011 to 2020




By 3-month birth cohorts born between 1 January 2006 and 31 December 2015. Coverage assessment date was 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.
* Fourth or fifth dose of DTPa and fourth dose of polio, second dose of MMR (up until June 2017)
DTPa = diphtheria-tetanus-acellular pertussis
MMR = measles-mumps-rubella
Source: Australian Immunisation Register, data as at 31 March 2021.

Source: https://www.ncirs.org.au/sites/default/files/2022-07/NCIRS%20Annual%20Immunisation%20Coverage%20Report%202020.pd

# Vaccine Recommendations

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## Adolescents

- Optimal age for a booster dose of pertussis-containing vaccine for adolescents is 11–13 years.

# Adolescent coverage rates 2019 and 2020

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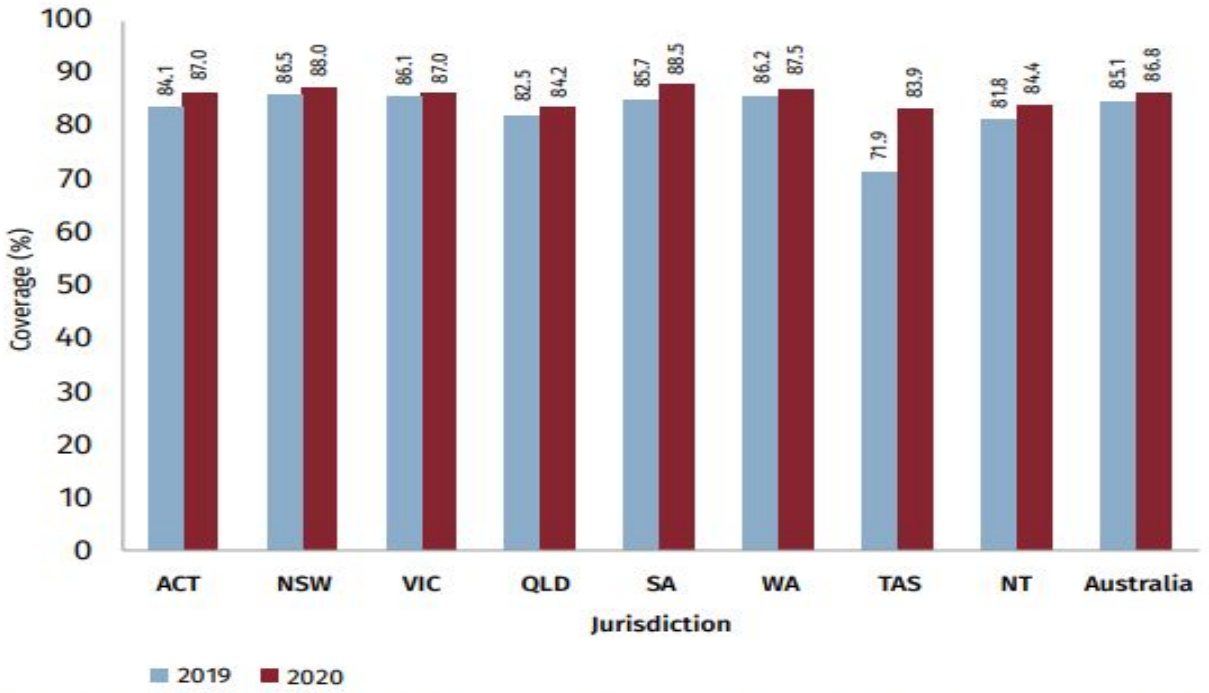
## Diphtheria-tetanus-acellular pertussis (dTpa) booster vaccine coverage

Figure 15 shows coverage, by 15 years of age, of the adolescent booster dose of dTpa vaccine in 2019 and 2020, by jurisdiction. Nationally, dTpa coverage was 1.7 percentage higher in 2020 than 2019 (86.8% versus 85.1%). Coverage in all jurisdictions was higher in 2020 than 2019, with the largest increase in Tasmania (from 71.9% to 83.9%). Coverage in 2020 ranged from 84.2% in Queensland to 88.5% in South Australia.

**Figure 15. Coverage (%) of the adolescent booster dose of diphtheria-tetanus-acellular pertussis (dTpa) vaccine by 15 years of age,* by jurisdiction, Australia, 2019 and 2020**




* dTpa vaccinations received before 15th birthday in cohort born 1 January – 31 December 2004 for 2019 coverage estimates and cohort born 1 January – 31 December 2005 for 2020 coverage estimates

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; QLD = Queensland; SA = South Australia; TAS = Tasmania; VIC = Victoria; WA = Western Australia

dTpa = diphtheria, tetanus, pertussis (acellular) – adolescent/adult formulation

**Source: Australian Immunisation Register, data as at 31 March 2020 (for 2019 data) and as at 31 March 2021 (for 2020 data).**

Source: https://www.ncirs.org.au/sites/default/files/2022-07/NCIRS%20Annual%20Immunisation%20Coverage%20Report%202020.pdf

# Vaccine Recommendations

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## Adults

- Adults who want to reduce their likelihood of becoming ill with pertussis are recommended to receive pertussis-containing vaccine.
- Adults who need a tetanus-containing vaccine are recommended to receive dTpa vaccine rather than dT vaccine.

# Vaccine Recommendations

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## Older Persons

- Adults aged ≥65 years are recommended to receive pertussis-containing vaccine if their last dose was more than 10 years ago.

# Vaccine Recommendations

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## Women who are pregnant or breastfeeding

- Pregnant women are recommended to receive a single dose of pertussis-containing vaccine in each pregnancy.
- Women who recently gave birth and did not receive pertussis-containing vaccine during pregnancy are recommended to receive the vaccine as soon as possible.
- Jurisdictional from 2015, NIP from 2018.

# Vaccine Recommendations

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## Adult household contacts and carers of infants

- Adult household contacts and carers of infants aged <6 months are recommended to receive pertussis-containing vaccine at least 2 weeks before they have close contact with the infant.

# Vaccine Recommendations

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## Healthcare workers

- Healthcare workers are recommended to receive pertussis-containing vaccine every 10 years.

## Early childhood educators and carers

- Early childhood educators and carers are recommended to receive pertussis-containing vaccine every 10 years.

# Adolescent Pertussis Vaccination

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- Vaccination is recommended for all adolescents aged 12–13 years
- Offered in Year 7 or 8, depending on state or territory
- Can be offered in General Practice (free NIP vaccine)
- Includes refugees and humanitarian entrants
- Receipt of family assistance payments such as Family Tax Benefit (Part A) require adolescents to be vaccinated as per the NIP

# Adolescent Pertussis Vaccination

- Students may miss school immunisation visits.
- All providers have the responsibility to ensure absent students receive a catch-up vaccine.
- Be opportunistic.
- Check the AIR at each encounter.

# World Health Organisation

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## Global Vaccine Action Plan 2011-2020

- The vision of the Decade of Vaccines (2011–2020) is a world in which all individuals and communities enjoy lives free from vaccine-preventable diseases.
- The benefits of immunisation are equitably extended to all people.
- Strong immunisation systems are an integral part of a well-functioning health system.
- The goal of vaccination is not only to prevent  disease but to influence the trajectory of intrinsic  capacity.

# Healthy Ageing …

The process of developing and maintaining well-being in older age

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# Adult Pertussis Vaccination

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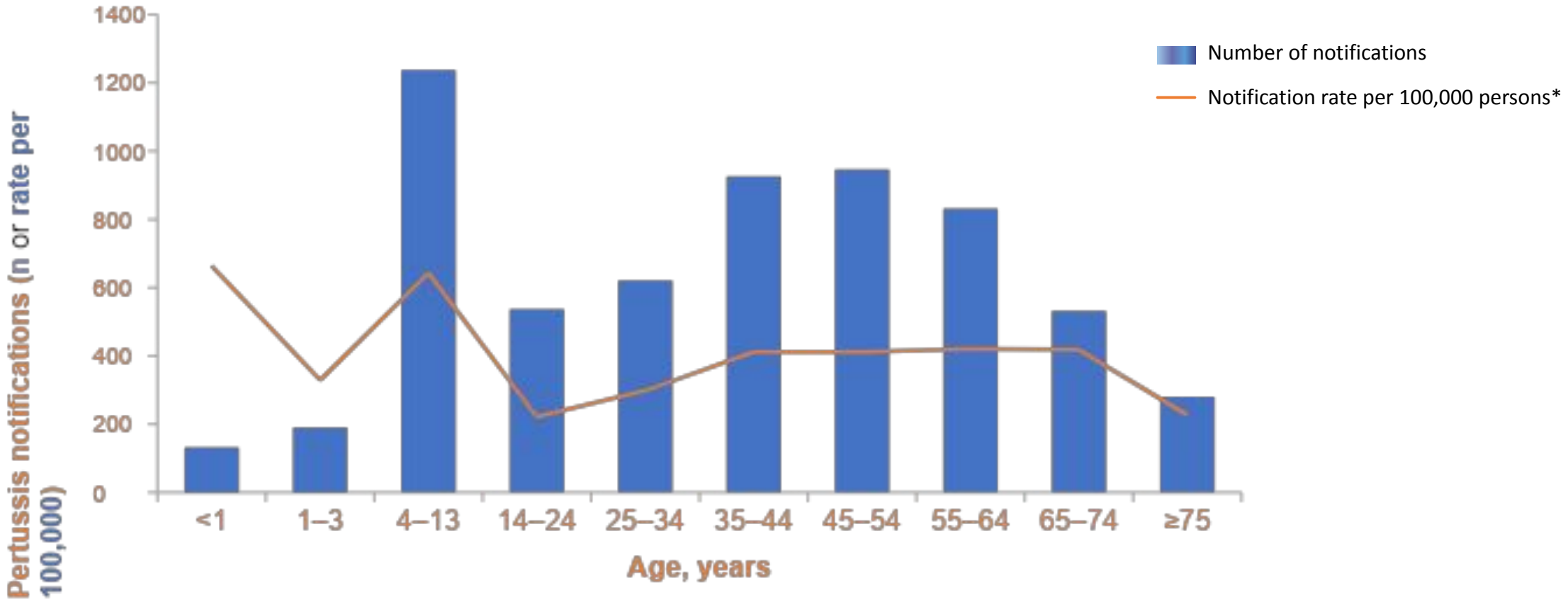
## Why vaccinate adults?

- Pertussis is not just a childhood disease

## Reservoir and waning immunity

- Immunosenescence (age-related deterioration of immune system)
- Co-morbidities

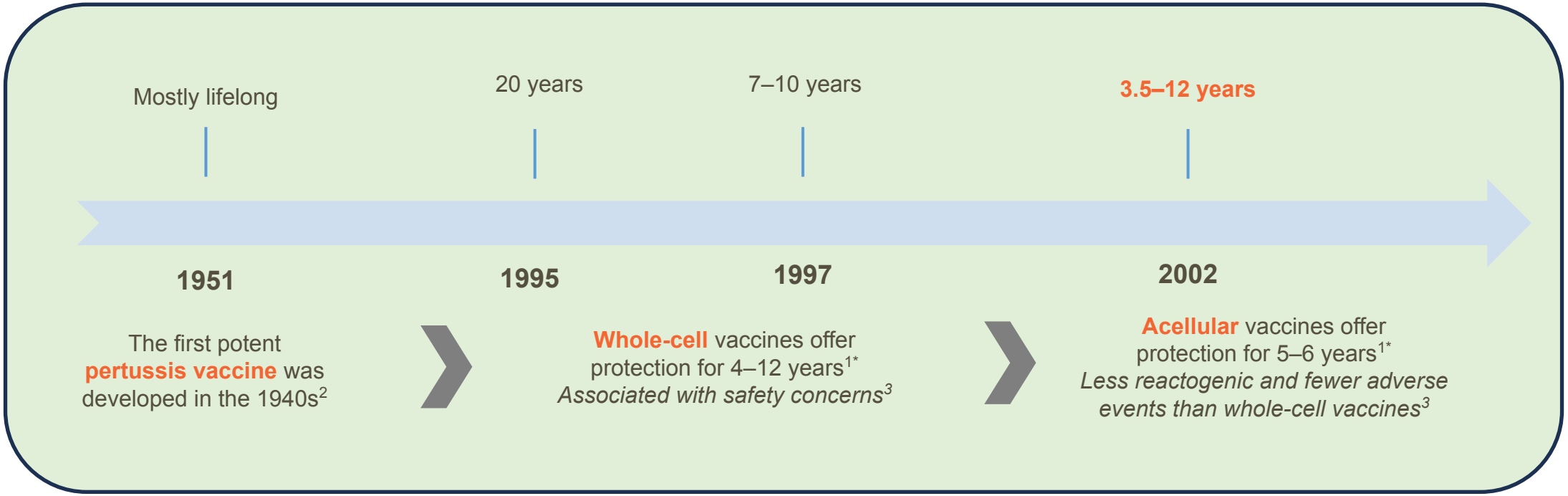
# Pertussis is not just a childhood disease



# Pertussis vaccination does not confer lifelong immunity

*Waning immunity plays a role in disease transmission*

Our understanding of the duration of **naturally induced protection** has evolved since the 1950s[1]




- 1. Wendelboe AM *et al*. *Pediatr Infect Dis J* 2005:24;S58–S61; 2. Shapiro-Shapin CG. *Emerg Infect Dis* 2010;16:1273–1278; 3. Centers for Disease Control and Prevention. *MMWR Recomm Rep* 1997;46:1–25

# Immunosenescence

- Increase in exhausted memory T cells
- Decrease in naïve T cells
- Decrease CD8 cell population
- CD8/CD4 ratio <1
- Decreased telomerase
- Telomere shortening

- … Decreased response to all vaccines

# Immunosenescence

So, as we age;

- Substantial impact of immunosenescence and frailty on impact of disease and ongoing disability.
- For influenza, pneumonia, pertussis and shingles, vaccines exist but are not perfect and differential access and differential uptake seen across countries
- In Australia;
  - 80% of elderly regularly get influenza vaccine
  - About 60% get shingles vaccine
  - About 40% get pneumococcal vaccine
  - **Unknown coverage for pertussis**

# The burden of pertussis in adults is underestimated

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Pertussis in adults is often **missed**, **misdiagnosed** or **unreported**

### Misconceptions

- Pertussis is still perceived by some as a childhood disease[1]

### Atypical symptoms

- +/- stages
- +/- whoop
- +/- vomiting

### Late diagnosis

- Detection of pathogen difficult

### Surveillance

- Monitoring and statutory notification – varies worldwide


- 1. Tan T *et al. Pediatr Infect Dis J* 2005;24:S10–S18; 2. World Health Organization (WHO). *Wkly Epidemiol Rec* 2010;85:385–400; 3. Centers for Disease Control and Prevention (CDC). In: *The Pink Book: Epidemiology and Prevention of Vaccine-Preventable Diseases*, Hamborsky J *et al* (Eds). 13th edn. Washington, DC: Public Health Foundation, 2015. pp. 261–278; 4. Hong JY. *Korean J Pediatr* 2010;53:629–633; 5. Riffelmann M *et al. Dtsch Arztebl Int.* 2008;105:623–628

# Diagnostic Challenges

**NAAT / PCR:**

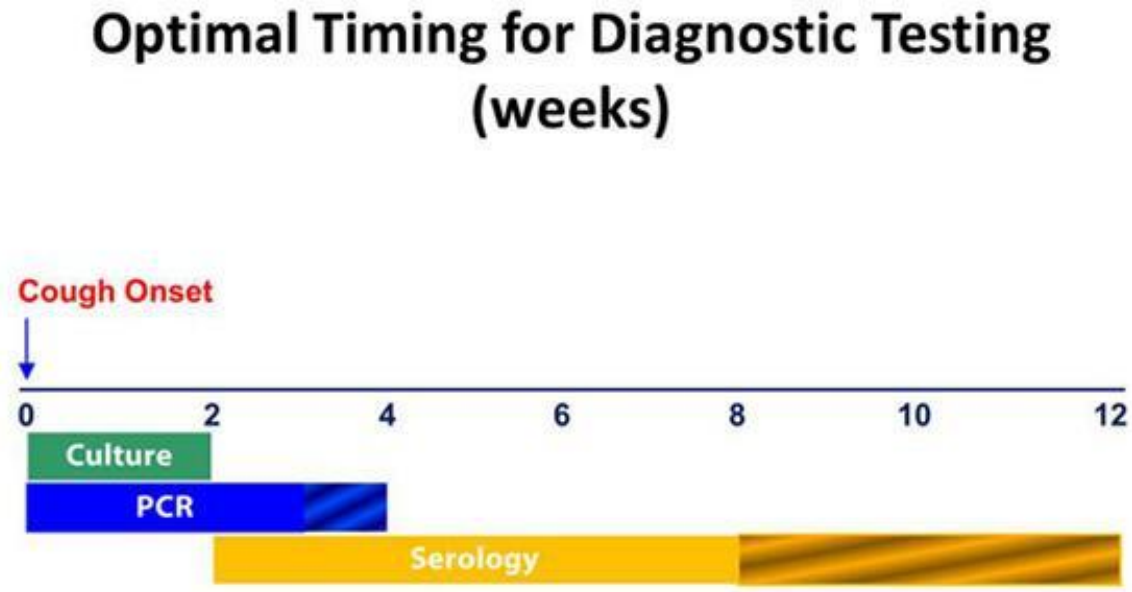
- Greatest sensitivity in first three weeks of illness
- Poor sensitivity after 5 days of antibiotics

**Culture – nasopharyngeal swab:**

- Gold standard, good specificity in first 2 weeks after cough-onset.
- From 2 weeks post cough-onset, high rate of false Negatives

**Serology:** (IgA)

- Best 2-8 weeks post cough-onset.
- Can be used up to 12 weeks post cough-onset



# *Hodder S et al* Antibody Responses to *Bordetella pertussis* Antigens and Clinical Correlations in Elderly Community Residents *Clin Infect Dis*, 2000 Vol 31, (1) 7–14

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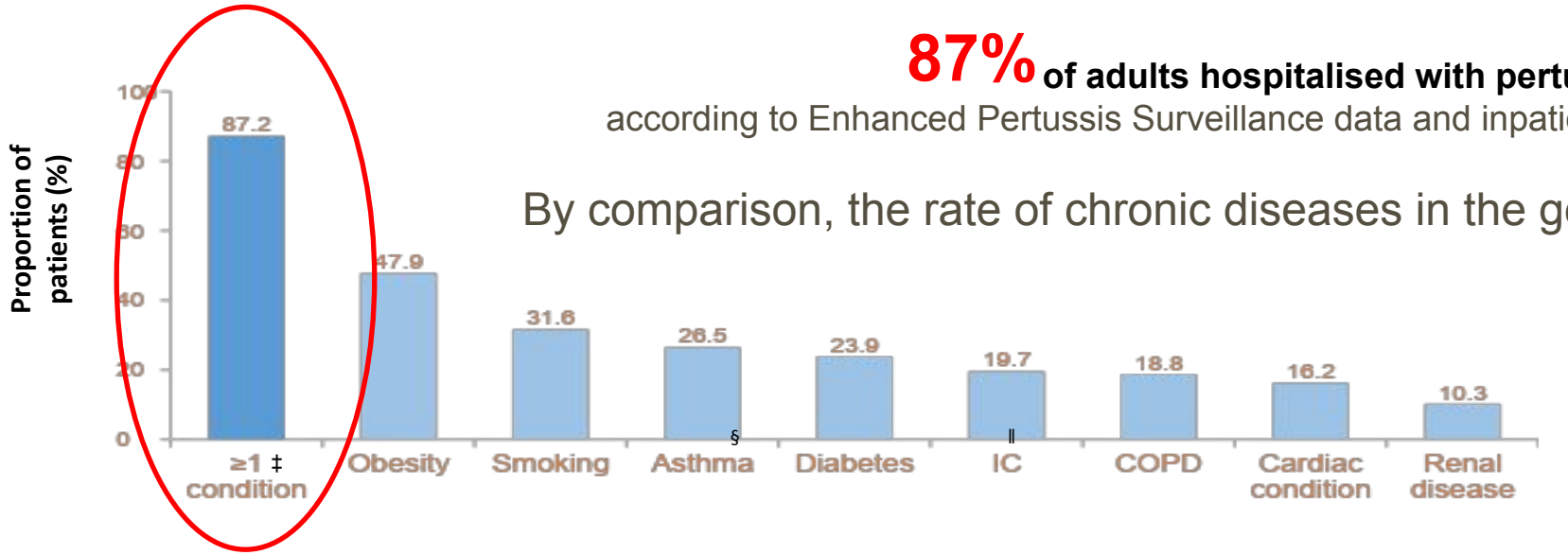
- A serological study to determine the frequency of Bordetella pertussis infection in 100 adults aged ≥65 years carried out over a 3-year period.
- The rates were 3.3 (definite B. pertussis infection) and 8.0 (probable B. pertussis infection) per 100 person-years.
- 50% with definite B. pertussis infection were symptomatic.
- Symptomatic pertussis occurs in elderly individuals, therefore, consider pertussis vaccination for the elderly.

# A US study suggested that adults with underlying conditions were at increased risk of severe pertussis




**87% of adults hospitalised with pertussis had underlying conditions[1]**

according to Enhanced Pertussis Surveillance data and inpatient medical records from seven US states,* 2011–2015 (N=117)

By comparison, the rate of chronic diseases in the general US adult population

**All reported pertussis deaths¶ in adults from 1990–2004 in the USA occurred in patients with underlying medical conditions[3]**

- Figure independently created for GSK from the original data
  *Colorado, Connecticut, Georgia, Minnesota, New Mexico, New York and Oregon; †Range of conditions included in chronic diseases[2] was not defined, and may not be fully consistent with those included for underlying conditions;[1] ‡Includes other conditions not shown; §Asthma or reactive airway disease; ‖Immunocompromising condition or immunosuppressive medication use; ¶5 deaths
  COPD, chronic obstructive pulmonary disease, IC, immunocompromising condition

1. Mbayei SA et al. Clin Infect Dis 2018;doi:10.1093/cid/ciy889; 2. Centers for Disease Control and Prevention (CDC), 2018. About chronic diseases. https://www.cdc.gov/chronicdisease/about/index.htm (accessed January 2019); 3. Kretsinger K et al. MMWR Recomm Rep 2006;55:1–37f

# Immunocompromised adults may be at increased risk of severe complications of pertussis

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**20%** **of adults hospitalised with pertussis had a potentially immunocompromising condition or immunosuppressive medication use**[1]

according to Enhanced Pertussis Surveillance data and inpatient medical records from seven US states,* 2011–2015 (N=117)

The estimated rate of immunosuppression in the general US adult population was lower, at 3%†[2]

≥21 yrs

**In four case reports, immunocompromised patients had pertussis with severe/fatal complications:**

- Age 62 years, Spain[3]
- Immunosuppressive therapy following renal transplantation
- Paroxysmal cough, apnoea, hypoxia, laryngeal spasms
- Required ICU treatment

- Age 63 years, Norway[4]
- Multiple myeloma
- *B. pertussis* bacteraemia
- Hospitalised with bronchopneumonia

- Age 31 years, USA[5]
- Wegener's granulomatosis + immunosuppressive medications
- *B. pertussis* bacteraemia
- Severe respiratory acidosis
- Died in hospital

- Age 82 years, USA[6]
- Multiple myeloma + immunosuppressive Medications
- *B. pertussis* bacteraemia
- Laboured breathing requiring mechanical ventilation
- Died in hospital

- *Colorado, Connecticut, Georgia, Minnesota, New Mexico, New York and Oregon; †Self-reported immunosuppression due to medications or medical conditions in US adults aged ≥18 years, 2013. ICU, intensive care unit


- 1. Mbayei SA *et al. Clin Infect Dis* 2018;doi:10.1093/cid/ciy889; 2. Harpaz R *et al. JAMA* 2016;316:2547–2548; 3. Garbiras M *et al. Transplant Infect Dis* 2016;18:280–283; 4. Trøseid M *et al. J Infect* 2006;52:e11–e13; 5. Janda WM *et al. J Clin Microbiol* 1994;32:2851–2853; 6. Centers for Disease Control and Prevention (CDC) *MMWR Morb Mortal Wkly Rep* 2004;53:131–132

# High BMI and medication/supplement use may increase the risk of pertussis

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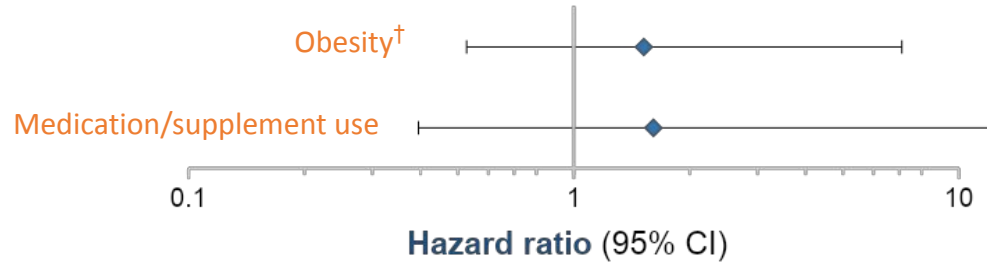
**48%** **of adults hospitalised with pertussis were obese**[1]

according to Enhanced Pertussis Surveillance data and inpatient medical records from seven US states,* 2011–2015 (N=117)

The rate of obesity† in the general US adult population‡ was lower, at 38%[2]

**Obesity or medication/supplement increased the risk of pertussis by more than 50%**

in a population-based prospective cohort study, NSW, Australia (N=263,094; notifications=205)[3]




≥21 yrs

≥45 yrs

- Figure independently created for GSK from the original data
*Colorado, Connecticut, Georgia, Minnesota, New Mexico, New York and Oregon; †Body mass index ≥30 kg/m$^2$; ‡Adults aged ≥20 years during 2013–2014; §Includes prescribed and over-the-counter formulations CI, confidence interval; NSW, New South Wales


- 1. Mbayei SA *et al. Clin Infect Dis* 2018;doi:10.1093/cid/ciy889; 2. National Center for Health Statistics, 2017. Report 2017-1232: Health, United States, 2016; https://www.ncbi.nlm.nih.gov/books/NBK453378/ (accessed January 2019); 3. Liu BC *et al. Clin Infect Dis* 2012;55:1450–1456

Scwharz KL et al

**Effectiveness of pertussis vaccination and duration of immunity**
CMAJ. 2016 Nov 1; 188(16): E399–E406. doi: 10.1503/cmaj.160193

Adjusted vaccine effectiveness:

- 80% (95% confidence interval [CI] 71% to 86%) at 15–364 days,
- 84% (95% CI 77% to 89%) at 1–3 years,
- 62% (95% CI 42% to 75%) at 4–7 years and
- 41% (95% CI 0% to 66%) at 8 or more years since last vaccination.

- Waning immunity with the acellular vaccine, with an adjusted OR for pertussis infection of 1.27 (95% CI 1.20 to 1.34) per year since last vaccination.

- Acellular, versus whole-cell, vaccine priming was associated with an increased odds of pertussis (adjusted OR 2.15, 95% CI 1.30 to 3.57).

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**So:**

- minimal protective antibodies
- lots of disease, much of it unrecognised
- mortality exists
- vaccine needed

But neither vaccine nor disease are protective for over a decade (if that) so need recurrent vaccination

# Strategies to increase vaccination rates in older people

**MICHAEL WOODWARD** AM, MB BS, MD, FRACP
**JOHN C.B. LITT** MB BS, DRACOG, MSc(Epid), FRACGP, FAFPHM, PhD
**PAUL VAN BUYNDER** MB BS, MPH, FAFPHM

**TABLE 2. COMMON MISCONCEPTIONS ABOUT PERTUSSIS VACCINATION AND SUGGESTED GP RESPONSES**

| Misconception | Suggested GP response* |
|---|---|
| I wasn't aware that I need pertussis vaccination | • Older people have the highest rates of pertussis<br>• Pertussis can be severe in older people, leading to a three-month-long cough and complications such as cracked ribs, hospitalisation and even death |
| I was vaccinated against pertussis as a child, I don't need another vaccination | • Pertussis vaccine provides good protection, but this protection starts to decrease after about three years<br>• Older people are not protected by childhood pertussis vaccination and need a booster dose |
| Pertussis vaccination won't stop me getting whooping cough | • Although pertussis vaccination does not protect for life, it is very effective for at least three to possibly 10 years |
| I was diagnosed with pertussis 10 years ago, I don't need the vaccine | • Immunity from natural pertussis infection lasts up to 20 years in some people but for as little as four years in others, so a booster should be considered |
| I am concerned about the adverse effects of pertussis vaccination | • Adult pertussis vaccines contain less antigen than the childhood vaccines so cause fewer adverse reactions<br>• Local reactions and mild fever or an unwell feeling may occur but severe adverse effects are rare |

* Healthcare providers remain the most trusted advisors and influencers of vaccination decisions. A recommendation from the practice nurse or GP frequently counters myths and misperceptions about both the disease and the vaccine to protect against the disease.

**5. TIPS FOR GPS TALKING WITH OLDER PATIENTS ABOUT PERTUSSIS VACCINATION**

***What is the risk of getting pertussis?***
The risk of getting pertussis is high. Protection provided by childhood vaccination wanes within a decade of the final dose, and protection after infection lasts only four to 20 years. Most older people are thus not immune to pertussis; they are at greater risk of disease than younger age groups.

***How serious is pertussis?***
Older adults usually develop an annoying and chronic cough that can last up to three months. One in five people who have a cough for more than two weeks are likely to have pertussis. Some older people with pertussis require hospitalisation and a small number die of the disease.

***How effective is pertussis vaccine?***
The vaccine has good effectiveness (about 84%).

***How long does protection last?***
Pertussis vaccine protects for three to possibly 10 years.

***What are possible adverse effects of the vaccine and how common are they?***
Adult pertussis vaccines contain lower amounts of antigens than paediatric vaccines. Possible side effects include local site reactions and mild systemic effects, which are self-limiting. Severe adverse effects are rare.

***What is the risk of an allergic reaction?***
The risk of an allergic reaction is very low, quoted as less than one in a million doses.

***What is the risk of getting pertussis from the vaccine?***
The pertussis vaccine consists of *Bordetella pertussis* antigens, not live organisms. It cannot cause pertussis.

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# Importance and challenges of vaccination in older people

**PAUL VAN BUYNDER** MB BS, MPH, FAFPHM
**MICHAEL WOODWARD** AM, MB BS, MD, FRACP

# YOU.

Family members
Grandparents
Communities
Governments…

GPs
Paediatricians
Geriatricians
Physicians

Nurses,
MCHNs, Midwives,
Aboriginal Health
Practitioners

Pharmacists

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# Summary

## Pertussis in high-risk populations

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- Pertussis occurs in **all age groups**[1]
- Pertussis is **under-reported**, with cases in adults frequently missed or misdiagnosed[2]

- Adults with underlying conditions can be at increased risk from pertussis:[3–7]

| | Asthma | COPD | Obesity | IC* | Age ≥50 | Smoking |
|---|---|---|---|---|---|---|
| **Risk of pertussis** | ! | ! | ! | | | |
| **Worse pertussis** symptoms or **hospitalisation**† | ! | ! | ! | ! | ! | ! |

- For those with pre-existing asthma or COPD, pertussis can **worsen symptoms** of the underlying condition and significantly **increase healthcare costs**[4,8,9]

Adults with underlying conditions are at higher risk for serious problems with pertussis
Booster vaccination with dTpa vaccine may help these populations to stay healthy[10]

- *Potentially immunocompromising condition or immunosuppressive medication use; †Pertussis-related hospitalisation, COPD, chronic obstructive pulmonary disease; IC, immunocompromised; Tdap, tetanus, diphtheria, acellular pertussis vaccine


- 1. Clarke MF et al. Epidemiol Infect 2013;141:463–471; 2. Tan T et al. Pediatr Infect Dis J 2005;24:S10–S18; 3. Mbayei SA et al. Clin Infect Dis 2018;doi:10.1093/cid/ciy889; 4. Buck PO et al. Epidemiol Infect 2017;145:2109–2121; 5. Liu BC et al. Clin Infect Dis 2012;55:1450–1456; 6. De Serres G et al. J Infect Dis 2000;182:174–179; 7. Karki S et al. Vaccine 2015;33:5647–5653; 8. Bonhoeffer J et al. Infection 2005;33:13–17; 9. Harju TH et al. Thorax 2006;61:579–584; 10. CDC, 2016. Vaccination of adults with lung disease including asthma. https://www.cdc.gov/vaccines/adults/rec-vac/health-conditions/lung-disease.html (accessed January 2019)

# References

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1. https://ranzcog.edu.au/news/updated-advice-on-pertussis-immunisation-in-pregna
2. Van Buynder PG, Van Buynder JL, Menton L, Thompson G, Sun J. Antigen specific vaccine hesitancy in pregnancy. Vaccine 2019; 37(21):2814-2820.
3. Ridda I, Yin K, King C, MacIntyre CR, McIntyre P. The importance of pertussis in older adults: A growing case for reviewing vaccination strategy in the elderly. Vaccine,2012; 30 (48) 6745-6752
4. Chiappini, E., Stival, A., Galli, L. *et al.* Pertussis re-emergence in the post-vaccination era. *BMC Infect Dis* **13,** 151 (2013). https://doi.org/10.1186/1471-2334-13-151

- **Question time**

- Thanks again to Dr Andrew Baird and the audience for their engagement

- **Evaluation Form** should be in your inbox. We look forward to hearing your feedback for continuous improvement.

- Next and last webinar for 2023

  Shingles update on 15 November, presented by A/Prof John Litt AM.

- Primary Care Infectious Disease meeting on 7 October: www.immunisationcoalition.org.au (Events)