

Communicable Diseases Branch

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NSW VACCINE PREVENTABLE  
DISEASE ANNUAL REPORT

2015



Health  
Communicable  
Diseases

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# Contents

Contents .....	3
Glossary .....	4
Summary .....	5
2015 vaccine preventable disease trends.....	5
Introduction.....	6
Diphtheria .....	7
<i>Haemophilus influenzae</i> type b.....	8
Invasive meningococcal disease.....	9
Invasive pneumococcal disease .....	11
Measles .....	14
Mumps.....	15
Pertussis.....	16
Rubella .....	18
Tetanus .....	19
References .....	20
Appendix 1.....	21
Methods.....	21
Appendix 2.....	22

# Glossary

LHD	local health district	NS	Northern Sydney LHD
CC	Central Coast LHD	PHU	Public health unit
FW	Far West LHD	SES	South Eastern Sydney LHD
HNE	Hunter New England LHD	SNSW	Southern NSW LHD
IS	Illawarra Shoalhaven LHD	SWS	South Western Sydney LHD
M	Murrumbidgee LHD	SYD	Sydney LHD
MNC	Mid North Coast LHD	WNSW	Western NSW LHD
NBM	Nepean Blue Mountains LHD	WS	Western Sydney LHD
NIP	National Immunisation Program	NSW	New South Wales
NNSW	Northern NSW LHD	VPD	Vaccine preventable diseases

# Summary

This annual report aims to describe the epidemiology of selected vaccine preventable diseases in New South Wales, Australia for the year 2015. Publishing regular epidemiological updates enables the identification of trends both nationally and internationally, informing ongoing disease surveillance and control efforts.

Conditions included in the report are: diphtheria, invasive *Haemophilus influenzae* type b disease, measles, mumps, invasive meningococcal disease, pertussis, invasive pneumococcal disease, rubella and tetanus.

Most vaccine preventable diseases in NSW remain well controlled with a low and stable level of notifications occurring each year. However control of pertussis remains a persistent challenge.

## 2015 vaccine preventable disease trends

- An outbreak of pertussis occurred in 2015, with notifications increasing to a peak of 2097 cases in November.
- Measles notifications decreased in 2015 with the few importations rapidly contained. The predominant genotype in 2015 was D8, a change from 2014 where B3 was predominant.
- Meningococcal disease notifications increased in 2015, and will be monitored into 2016 to detect if this reflects a sporadic increase or a trend of increasing notifications.
- Mumps, rubella, tetanus, diphtheria, and *Haemophilus influenzae* type b disease remain well controlled in NSW.

# Introduction

Under the New South Wales (NSW) Public Health Act 2010, certain conditions are required to be notified to public health authorities in NSW. Notification of conditions allows for a coordinated public health response to minimise the risk to the community and to limit onward spread of the disease. Furthermore, disease surveillance allows for epidemiological analysis of notification data, facilitating the identification of patterns and trends which can inform public health policy. Monitoring of vaccine preventable disease allows an assessment of the effectiveness of vaccine programs and can inform subsequent public health action.

This report is part of a yearly series examining NSW epidemiology. Description of the NSW health system and Australian vaccination schedule has been published previously (1). In NSW there are 15 local health districts (LHD) with 12 public health units (PHU). Public health management is conducted at a local level and coordinated centrally by the Communicable Disease Branch, Health Protection NSW.

Australia's National Immunisation Program (NIP) is funded by the Australian Government and administered by states and territories (2) who are also responsible for public health follow up of notifiable conditions (3). Immunisation campaigns can also be initiated and funded at a state level, in response to local conditions. In 2015, NSW launched and funded a maternal pertussis vaccination program in response to increasing notifications first observed in 2014 and new evidence on the effectiveness of vaccination during pregnancy in protecting infants during the early months of life (4).

Conditions included in the report are: diphtheria, invasive *Haemophilus influenzae* type b disease, measles, mumps, invasive meningococcal disease, pertussis, invasive pneumococcal disease, rubella and tetanus.

Some other vaccine preventable conditions are also notifiable in NSW including cholera, typhoid, hepatitis A and rotavirus; Q fever; hepatitis B; and influenza infections. Reports on these conditions can be found in the OzFoodNet, Zoonoses, Sexually Transmitted Infections and Influenza Reports. Polio is also notifiable, however, Australia was officially declared polio free on October 29, 2000, with not a single locally acquired case reported since 1972. Chicken pox and shingles are vaccine preventable, but not notifiable in NSW, however emergency department presentations of these conditions are reported (<http://www.health.nsw.gov.au/Infectious/Pages/data.aspx>)

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Methods are presented in [appendix 1](#), rates by year [appendix 2](#)

# Diphtheria

Diphtheria is a contagious and potentially life-threatening bacterial infection caused by toxin-producing strains of *Corynebacterium diphtheriae*. Diphtheria was a common cause of death in children up until the 1940s but now has almost disappeared in Australia as a result of immunisation, with fewer than four cases notified nationally each year since 1991.

Diphtheria occurs when toxigenic *Corynebacterium diphtheriae* infect the back of the throat. The toxin formed by the diphtheria bacteria can cause inflammation of heart muscle and nerves that can be fatal, with death occurring in 5-10% of cases.

*Corynebacterium diphtheriae* bacteria can also cause skin infections resulting in a poorly healing ulcer. Not all strains of *Corynebacterium diphtheriae* produce the toxin, and public health units receive notifications of skin infections caused by non-toxigenic *Corynebacterium diphtheriae* from time to time. Skin infections caused by toxin-producing strains are potentially serious in unvaccinated people because of the effects of the toxin on the heart and nervous system. Cutaneous diphtheria is more common in the tropics than in areas where the climate is more temperate.

Diphtheria vaccine is provided as part of the NIP and in 2015 was provided as a part of a combination vaccine at 6 weeks, 4 and 6 months of age, with booster doses at 4 and 12 years of age. The vaccine protects against the toxin produced by the bacterium, so vaccinated people can have infection with *Corynebacterium diphtheriae* but are unlikely to suffer the effects of the toxin.

## Summary 2015

- Case count: 0

# Haemophilus influenzae type b

*Haemophilus influenzae* type b disease (Hib) is caused by infection with *Haemophilus influenzae* type b bacteria. Humans are the only known reservoir, and the organism can be carried asymptotically in the naso- and oro-pharynx. Hib is predominantly transmitted from asymptomatic carriers by direct contact with respiratory droplets or discharges from the nose and throat. It can also rarely be transmitted from infected persons. Hib does not survive in the environment on inanimate surfaces.

Infection can lead to serious illness including meningitis and epiglottitis (inflammation of the throat). Since Hib vaccines were included in the routine childhood immunisation schedule in 1993, there has been a reduction of more than 95% in notified cases of Hib. In 2015, four doses of Hib vaccine were recommended in NSW for all infants at 6 weeks, 4, 6 and 12 months of age and provided as part of free routine immunisation in combination vaccines due at those ages.

## Summary 2015

- Case count: 5
- Reported deaths: 0
- Notification rate 0.07 per 100,000

- Sporadic

Age distribution:

- Two infants
- Three adults, 1 aged 40-44 years, 2 aged over 65 years

Overall trend:

- Rare in NSW
- Remains at a stable rate

Vaccination status of cases

- Three cases (adults) were not vaccinated
- Two infants were vaccinated for age

Seasonality:

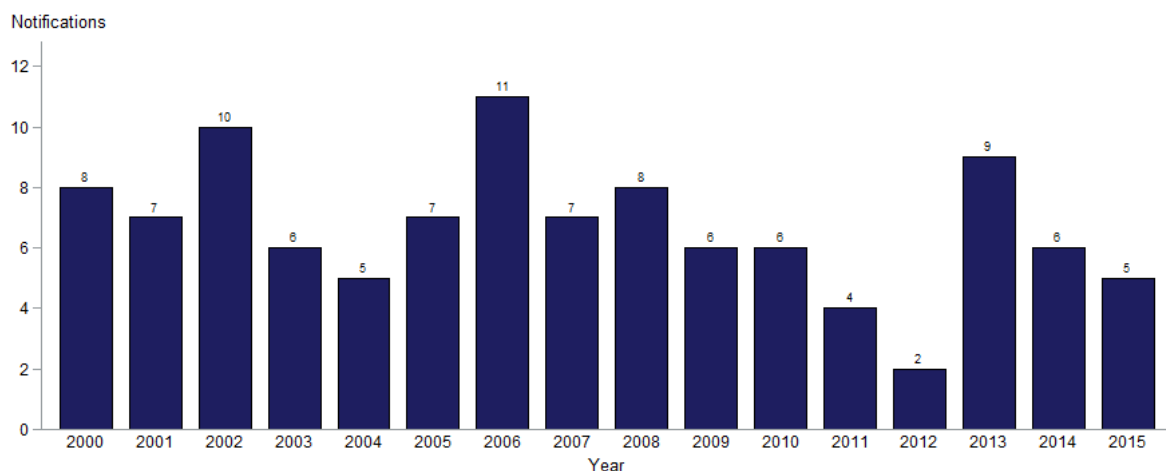


Figure 1. Notifications of Hib 2000 to 2015.



# Invasive meningococcal disease

Invasive meningococcal disease (IMD) is caused by infection with one of several serogroups of *Neisseria meningitidis* bacteria. The bacteria are spread through direct contact of mucous membranes with the organism, such as exposure to respiratory droplets from the nose and throat of a person carrying the organism. Close contact may result in the bacteria colonising the throat of the exposed person but in most people this does not cause any disease. In only a very small proportion of people the bacteria may invade from the throat to other parts of the body, causing IMD.

IMD typically involves meningitis (infection of the lining of the brain), septicaemia (infection of the blood) or both. Up to 10 per cent of IMD infections are fatal even with appropriate antibiotic treatment, and survivors may be left with long-term complications.

There are several serogroups of *Neisseria meningitidis* which can cause invasive disease. The common serogroups in Australia are B, C, W and Y.

Notifications of meningococcal disease increased in 2015 with 44 cases reported compared to 36 in 2014. This was partially due to an increase in meningococcal serogroup W notifications – a pattern which has also been observed in the rest of Australia (5, 6). Meningococcal notifications have been decreasing in NSW following the introduction of a serogroup C vaccine in 2003 which is provided free of charge at 12 months of age. This reduction has been observed in both serogroup B and C, despite the NIP only including vaccination against serogroup C.

This is the first increase in annual IMD notifications since 2009. In 2015 serogroup B remained the most common type, comprising 23 of the 44 notifications. The other cases where serogroup was available were caused by serogroup W (8), Y (7) and C (2).

## Summary 2015

- Case count: 44
- Reported deaths: 3
  - Serogroups W (2) and Y (1)
- Notification rate 0.58 per 100,000

### Overall trend:

- Uncommon in NSW

### Seasonality:

- Most notifications late winter/early spring

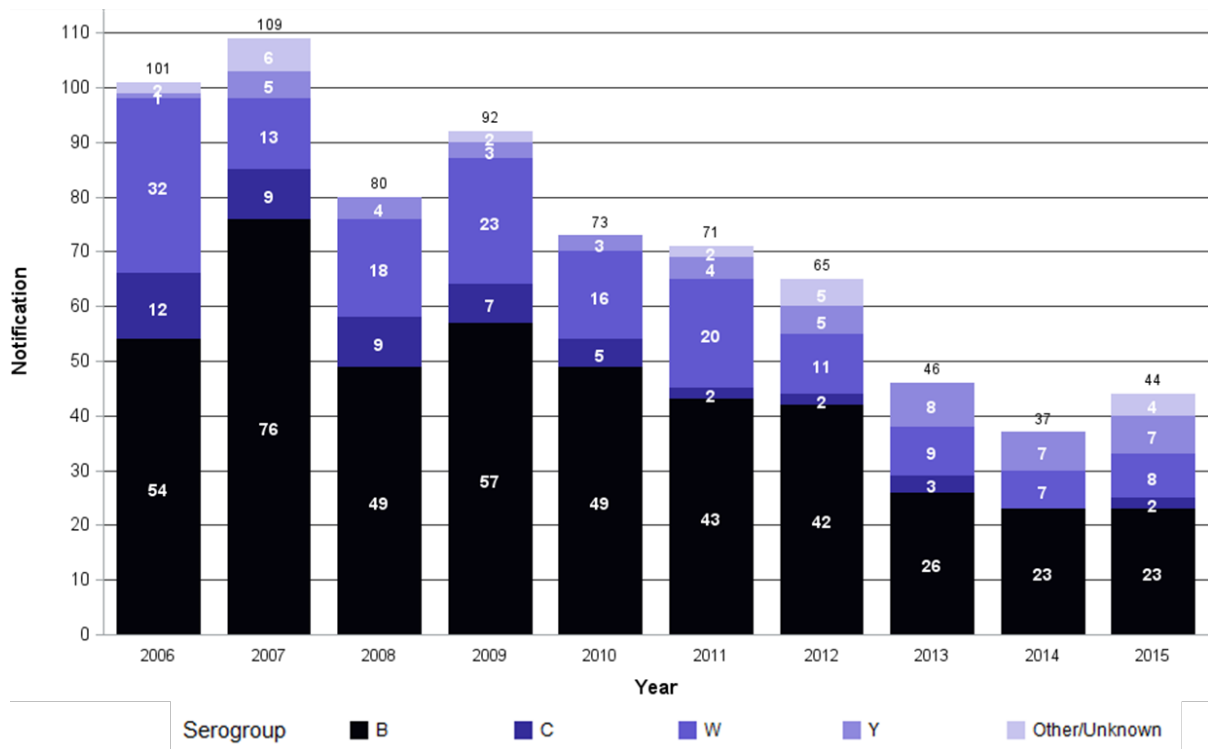
### Age Distribution

- Five cases in infants
- Ten cases 1-14 years
- 12 cases 15-24 years
- 17 cases 25 years and older

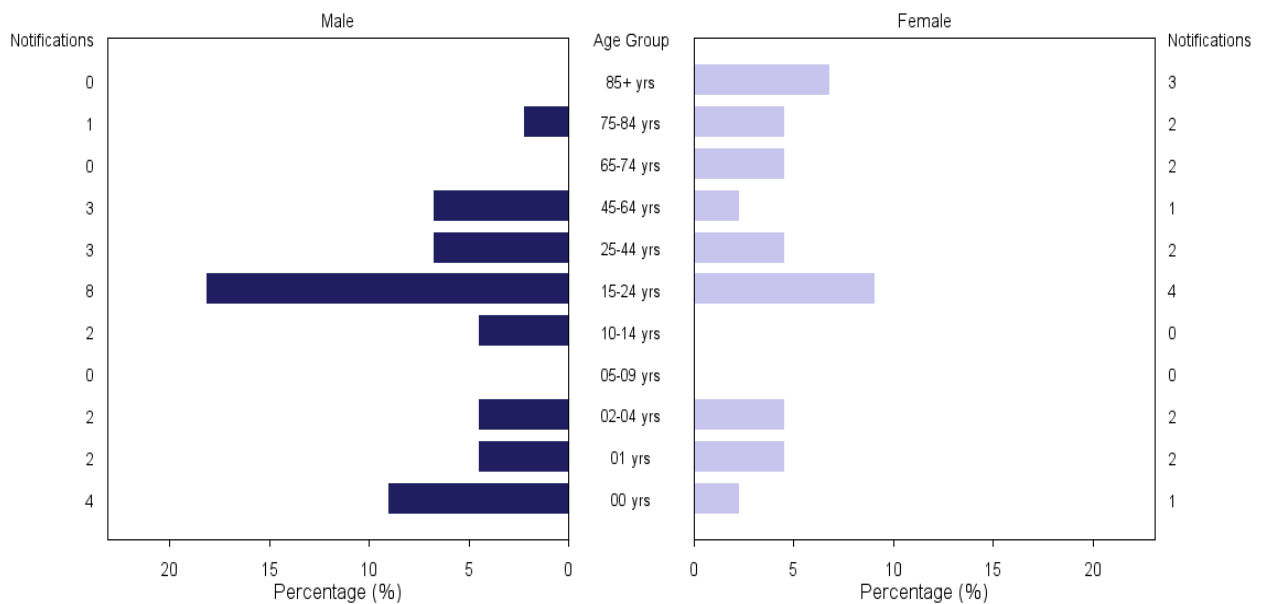
### Vaccination status of cases

- One vaccinated against infecting strain (serogroup C)
- 43 not vaccinated or not vaccinated against infecting strain

# Invasive meningococcal disease (continued)



**Figure 2.** Invasive meningococcal disease notifications by serogroup 2006 to 2015



**Figure 3.** Age and sex distribution for invasive meningococcal disease notifications in 2015.

# Invasive pneumococcal disease

Invasive pneumococcal disease (IPD) is caused by the bacterium *Streptococcus pneumoniae*. It can cause a variety of presentations including pneumonia, septicaemia (blood infection), otitis media and meningitis. Symptoms depend on the site of infection and the age of the person. People with pneumococcal pneumonia tend to experience shortness of breath, fever, lack of energy, loss of appetite, headache, chest pain and cough.

People most at risk of the infection include children under two years of age, older adults, Aboriginal people, people with lung disease, heart disease, cancer, kidney disease, or HIV infection, people whose spleen has been removed or is impaired, and people who smoke. In NSW enhanced surveillance is conducted for those aged less than 5 years and those aged 50 years or older at diagnosis.

There are over 90 serotypes of pneumococcal bacteria. Different pneumococcal serotypes vary in their propensity to cause disease. The current pneumococcal vaccine used for children under the NIP - Prevenar 13® - covers the 13 serotypes most commonly associated with invasive disease, and in 2015 was given in NSW at 6 weeks, 4 and 6 months of age. Adults with risk factors for IPD, Aboriginal people 50 years and over, and other adults 65 years of age and older are eligible for vaccination with Pneumovax 23®, a vaccine which covers 23 serotypes. Under the NIP people in these groups are eligible for one dose, with a second due 5 years later for Aboriginal people and those that have an underlying medical condition.

## Summary 2015

- Case count: 490
- Reported deaths: 42
- Notification rate 6.43 per 100,000

### Overall trend:

- Remains at a stable rate

### Seasonality:

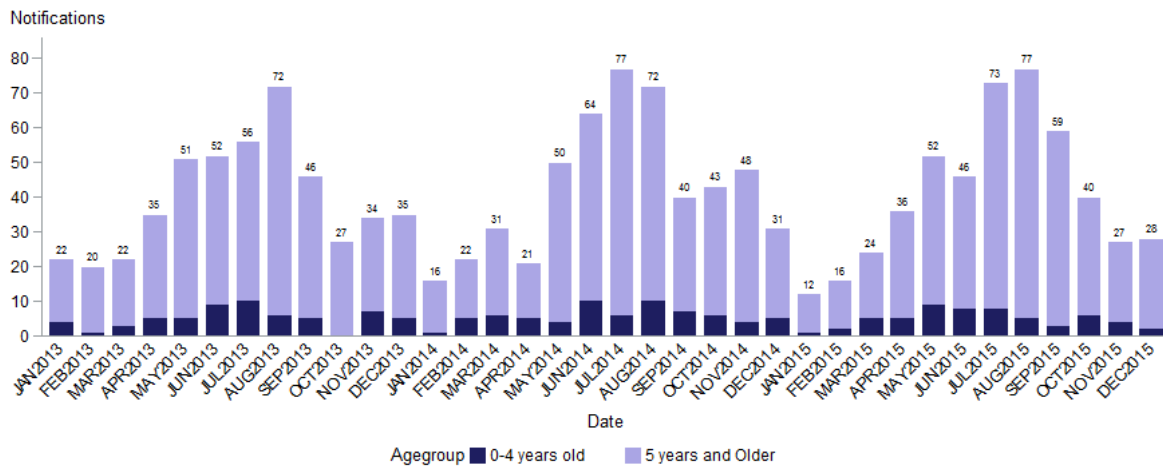
- Increase during winter flu season

### Age distribution:

- 12% of cases under 5 years of age
- 63% of cases 50 years or over

### Vaccination status of cases

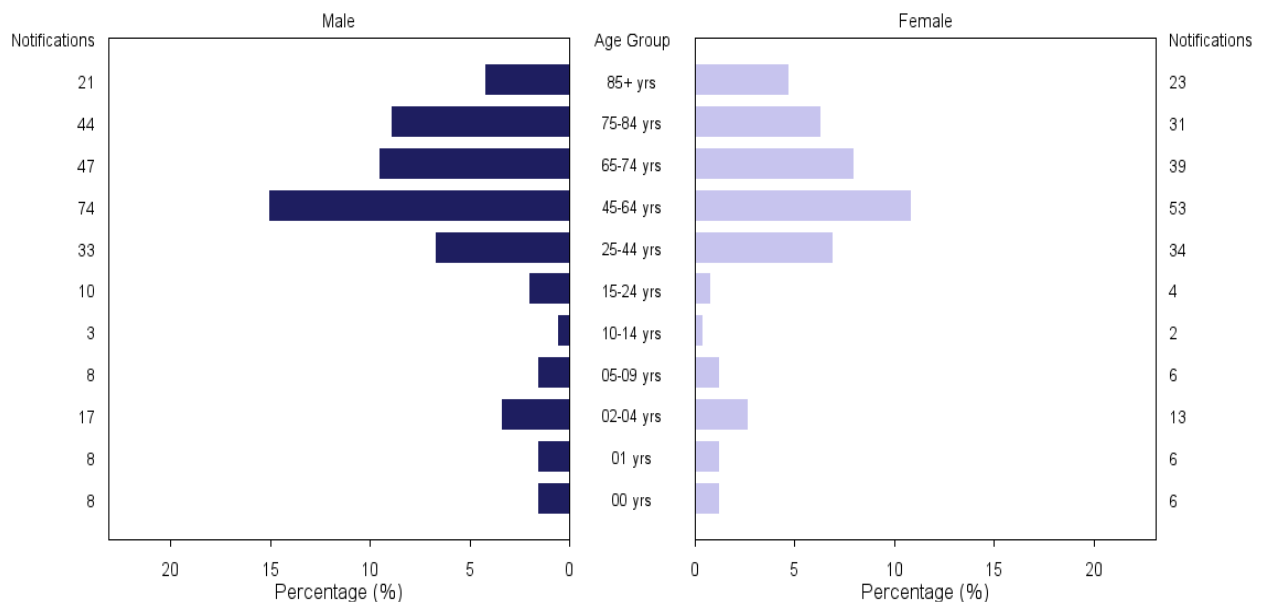
- 88% of cases under 5 years old were vaccinated, of these 48% were infected with a serotype not covered by the vaccine
- 32% of cases aged >50 years had received at least one dose of the 23 valent pneumococcal vaccine, of these 49% were infected with a serotype not included in the vaccine



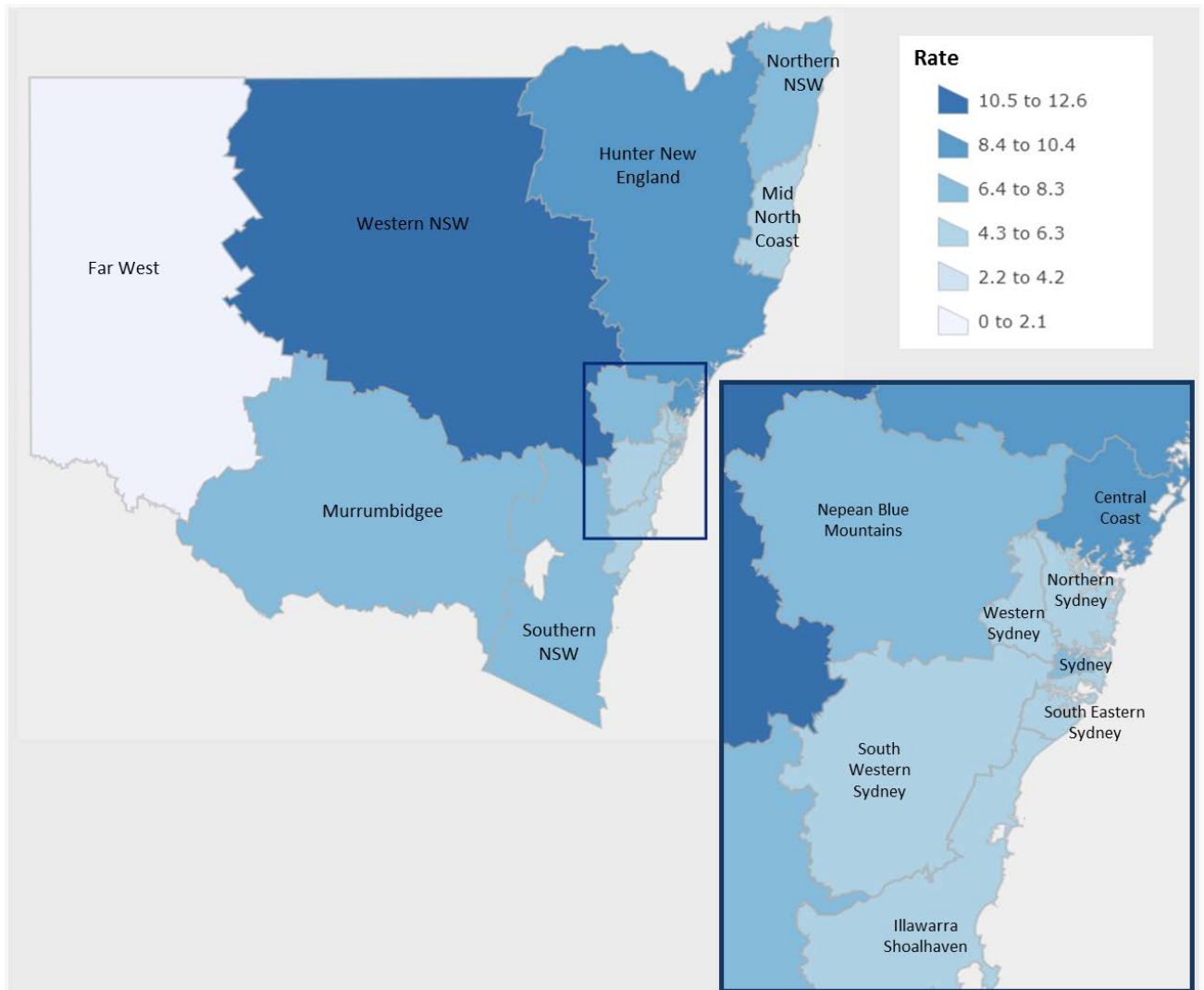
**Figure 4.** Monthly notifications of IPD by age group, 2013 to 2015.

Four hundred and ninety cases of IPD were notified in 2015, down from the 510 notified in 2014 (Table 1). Forty-two deaths were identified, two were in very young children, aged one month and five months (serotypes 35B and 13, both non-vaccine type). Of the remaining deaths, two were in people in the 40 to 45 year age group, five in the 50 to 64 year age group and 33 deaths in people aged 65 years or older.

Of the 365 cases that occurred in the age groups which are followed up by PHUs (0 to 4 year age group, and 50 years or over), 21 (6%) were notified in Aboriginal people, amongst whom case notification rates were higher than in non-Aboriginal people (30.3 and 11.4 per 100,000, respectively).



**Figure 5.** Age and sex distribution of IPD notifications in 2015.



**Figure 6.** Age and Sex Standardised rate of IPD notifications (per 100,000) by LHD in 2015.

Rates of disease by LHD varied from 4.9 cases per 100,000 population in Western Sydney LHD to 11.2 cases per 100,000 population in Western NSW LHD. There were no cases reported in Far West LHD (Figure 4).

The rate of disease in children under five years of age was 11.8 cases per 100,000 population, down from the previous year (13.9 cases per 100,000). Most of the notifications were in adults (Figure 5). Serotype 19F (N=10) and 19A (N=9) were the leading cause of all disease in children (32%) followed by serotype 3 (10%), all of which are included in the current 13-valent vaccine. In children under five years of age, 48% of disease was caused by non-vaccine serotypes and this proportion continues to increase. Vaccination data was available for 100% (58 cases) of notifications under the age of five years. Forty-seven (81%) cases were fully vaccinated and nine (16%) cases were either partially vaccinated or too young to have received their first dose. There were two cases (3%) whose parents chose not to vaccinate. There were seventeen (29%) cases of vaccine serotype disease in fully vaccinated children (i.e. vaccine failures). Serotype 19F accounted for most (47%) of the vaccine failures, with serotypes 19A (35%) and 3 (18%) responsible for the remainder of cases. The number of vaccine failures in children less than five years reported in 2015 continues the increasing trend in these notifications over recent years.

# Measles

The measles virus is highly infectious and it is readily transmitted from person to person via respiratory secretions in the air following coughing and sneezing. Symptoms of measles include fever, runny nose, sore red eyes and cough. This is followed three to four days later by a red blotchy rash spreading from the head and neck to the rest of the body.

Infection with the measles virus can be serious with common complications including middle ear infection and viral or bacterial bronchopneumonia (infection that includes the small airways deep in the lung). Acute encephalitis (inflammation of the brain) occurs rarely and subacute sclerosing panencephalitis, a chronic and severe type of brain inflammation, is a very rare fatal complication, occurring many years after infection in about one per 100,000 cases.

Measles containing vaccine is routinely offered to all children at 12 months (as measles-mumps-rubella) and 18 months of age (as measles-mumps-rubella-varicella) through the NIP.

## Summary 2015

- Case count: 9
- Reported deaths: 0
- Notification rate 0.12 per 100,000

## Seasonality:

- Sporadic

## Age distribution:

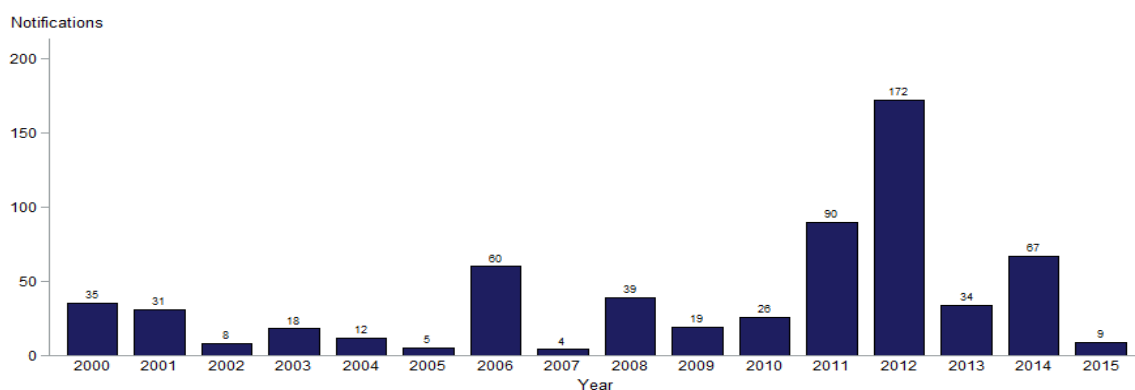
- Seven adults
- Two infants

## Overall trend:

- Rare in NSW (eliminated)
- Low numbers of sporadic cases – all imported from overseas
- Genotype: D8 (a change from 2014 where B3 was predominant)

## Vaccination status of cases

- Seven unvaccinated or unable to recall their vaccination status
- One partially vaccinated
- One fully vaccinated



**Figure 7.** Measles notifications 2000 to 2015

# Mumps

Mumps is an acute viral disease. Common symptoms include fever, loss of appetite, tiredness and headaches followed by swelling and tenderness of the salivary glands. Complications are rare but can be serious including encephalitis and meningitis, orchitis (infection of the testes), spontaneous abortion and hearing loss. The mumps virus is transmitted through contact with respiratory secretions; usually from respiratory droplets through the airborne route but also through direct contact with the saliva of an infected person.

Mumps is a vaccine preventable disease, and notifiable in NSW. Vaccination against mumps is with the measles-mumps-rubella (MMR) and measles-mumps-rubella-varicella (MMRV) vaccine, given as part of the NIP and scheduled at 12 and 18 months of age respectively.

## Summary 2015

- Case count: 63
- Reported deaths: 0
- Notification rate 0.83 per 100,000

## Age distribution:

- 45 cases aged 15 years and over
- 18 cases under the age of 15

## Vaccination status of cases

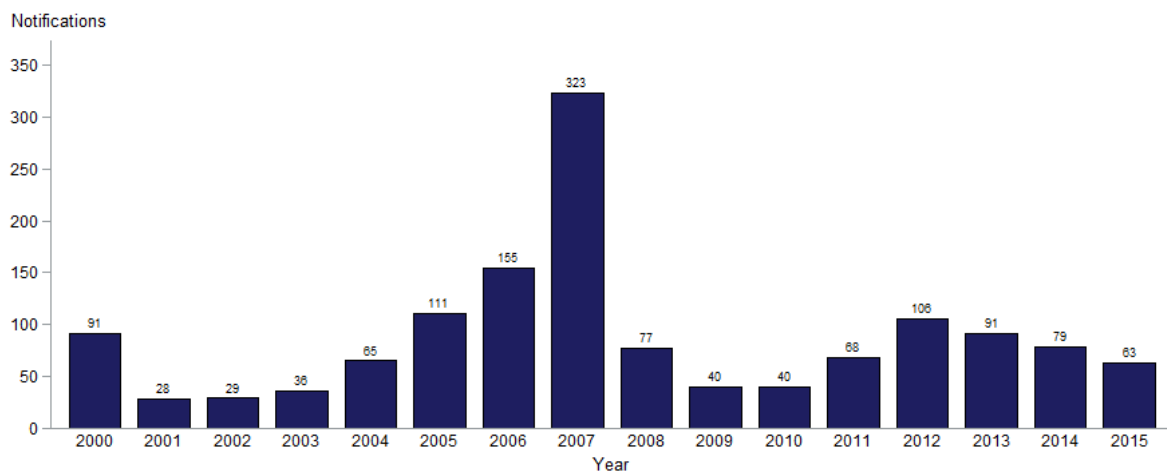
- 7 confirmed to be vaccinated fully for age

## Overall trend:

- Uncommon in NSW

## Seasonality:

- Sporadic



**Figure 8.** Mumps notifications 2000 to 2015

# Pertussis

Pertussis, also known as ‘whooping cough’, is a highly contagious bacterial infection affecting the respiratory system caused by the bacterium *Bordetella pertussis*. It affects individuals of all ages, but is more severe (and can be fatal) in small babies, particularly those too young to be vaccinated or those who are unvaccinated. Elderly people are also at increased risk of developing complications from pertussis.

Pertussis notifications in NSW saw a consistent increase throughout 2015, peaking in November with 2,097 cases. Although pertussis is a vaccine preventable disease, epidemics can occur every 3 or 4 years despite high vaccination rates due to incomplete protection from the vaccine and waning immunity from both infection and vaccination. Waning immunity refers to a person’s progressive loss of protective antibodies against a disease over time, requiring administration of another dose of vaccine (booster). In 2015 under the NIP Schedule vaccination against pertussis was with a combination vaccine given at 6 weeks, 4 and 6 months, 4 years of age, and in the first year of high school.

## Summary 2015

- Case count: 12,246
- Reported deaths: 0
- Notification rate 161 per 100,000

## Overall trend:

- Common in NSW
- Periodic epidemics every three to four years

## Seasonality:

- Highest notifications from late winter to early summer

## Age distribution:

- 4,570 cases 15 years old and over
- 7,676 cases under 15 years old
- Adult numbers may be underreported compared to children because adults are not routinely followed up by PHUs to allow case confirmation.

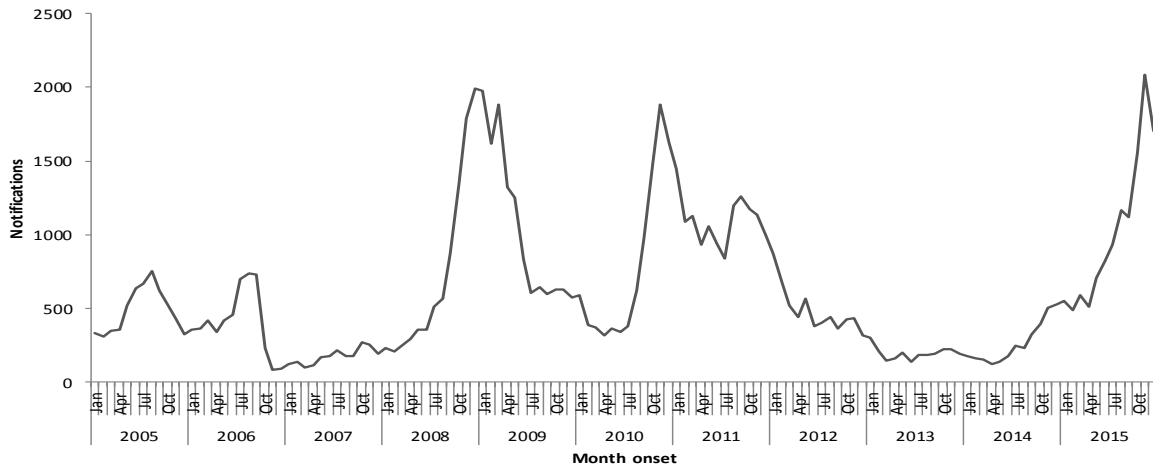
## Vaccination status of cases

- In the 0 to 4 age group – for which routine follow up occurs – 90 % were recorded as having received a vaccine for this condition. Of those, 95% were fully vaccinated for age

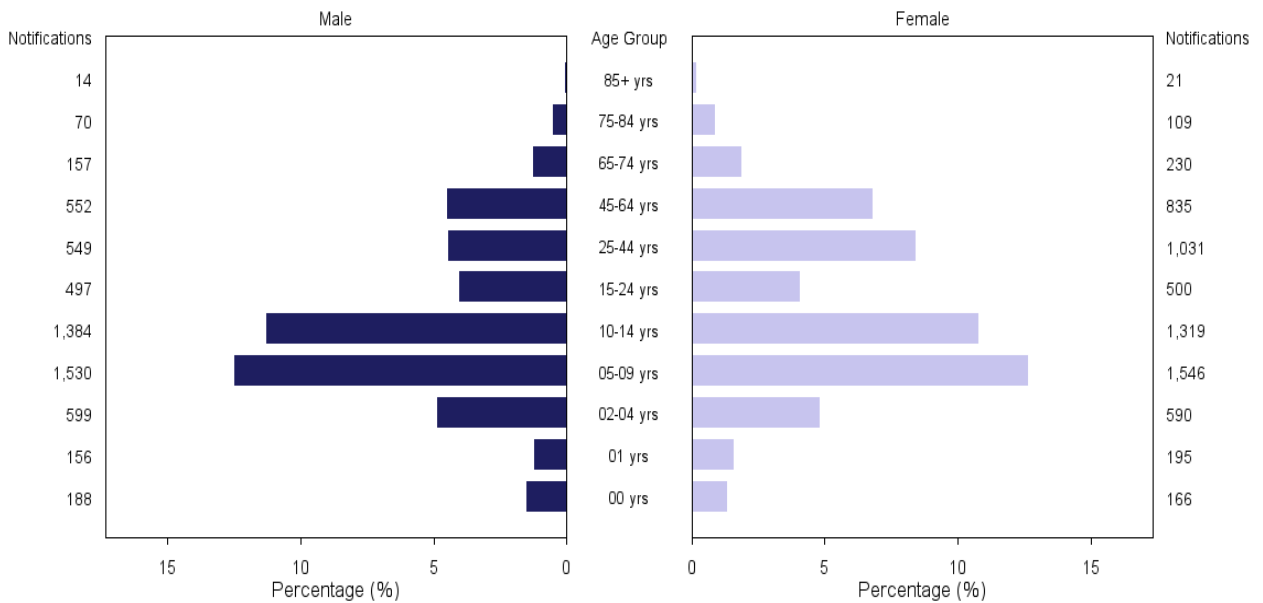
To protect infants too young to be vaccinated, the NSW Antenatal Pertussis Vaccination Program commenced on 1 April 2015, offering free diphtheria, tetanus and pertussis (dTpa – Boostrix®) vaccine to all pregnant women in the third trimester of pregnancy, preferably at 28 weeks gestation. As there is placental transfer of maternal pertussis antibody to the fetus, infants acquire immunity that protects them during the period before they are old enough to be vaccinated at six weeks of age.



# Pertussis (continued)



**Figure 9.** Pertussis notifications 2005 to 2015 by month of onset.



**Figure 10.** Age and sex distribution of pertussis notifications 2015.

# Rubella

Rubella is a viral infection causing mild symptoms including fever and a transient rash. Rubella infection of the mother during pregnancy can result in the fetus also becoming infected, causing congenital rubella syndrome. Abnormalities occur in up to 90% of infants born to women who had rubella during the first trimester of pregnancy. Abnormalities include intellectual disabilities, cataracts, deafness, heart abnormalities, intrauterine growth retardation, and inflammatory lesions of the brain, liver, lungs, and bone marrow.

Vaccination against rubella is with the measles-mumps-rubella (MMR) and measles-mumps-rubella-varicella (MMRV) vaccine, given as part of the National Immunisation Program and scheduled at 12 and 18 months of age respectively.

## Summary 2015

- Case count: 7
- Reported deaths: 0
- Notification rate 0.09 per 100,000

## Age distribution:

- Seven cases in adults
  - 2 cases in females of child bearing age

## Vaccination status of cases

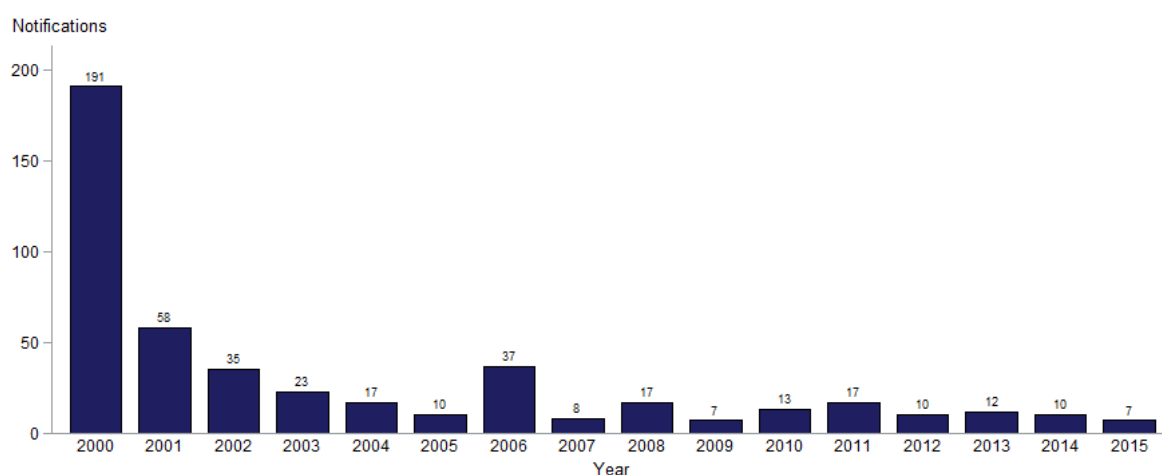
- Three vaccinated
- Three unvaccinated or unable to recall their vaccination status
- One not recorded

## Overall trend:

- Rare in NSW

## Seasonality:

- Sporadic



**Figure 11.** Rubella notifications 2000 to 2015

# Tetanus

Tetanus is caused by the bacterium *Clostridium tetani*, an organism which is commonly found in soil, dust and animal faeces. Disease occurs when the organism enters the body through a break in the skin (such as a puncture wound). When the bacterium grows it produces a neurotoxin which causes involuntary muscle contraction; the disease can be life threatening. Tetanus is not transmitted between people.

Infection may occur after minor injury to the skin that is contaminated with soil, dust or manure or after major injuries and burns. Symptoms of the disease usually develop 3 to 21 days after exposure but the onset can sometimes be delayed for several months. Toxin produced by the bacteria attack the central nervous system causing muscle rigidity with painful spasms, including the characteristic muscle spasms of the jaw (“lock jaw”).

In 2015, tetanus vaccine was given in combination vaccines at 6 weeks, 4 and 6 months of age, with boosting doses at 4 years, and 12 years of age. Adults who haven't had a booster in the last ten years should also get a dose.

## Summary 2015

- Case count: 1
- Reported deaths: 0
- Notification rate 0.01 per 100,000

## Seasonality:

- Sporadic

## Age distribution:

- Female aged >75 yrs

## Vaccination status of cases

- The case was not vaccinated

## Overall trend:

- Rare in NSW
- Remains at a stable rate

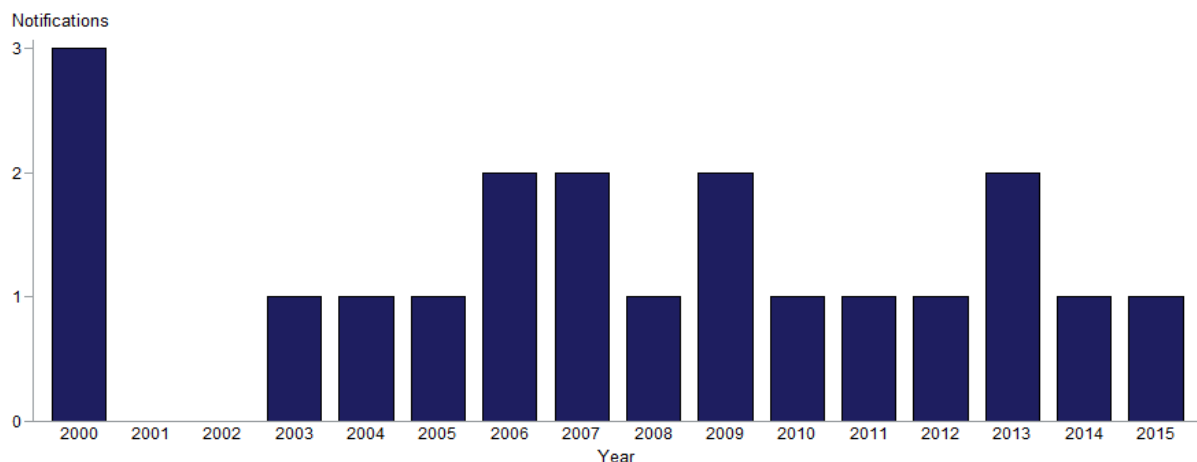


Figure 12. Tetanus notification 2000 to 2015.

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# Appendix 1

## Methods

Disease notifications for: diphtheria, invasive *Haemophilus influenzae* serotype b disease, measles, mumps, invasive meningococcal disease, pertussis, invasive pneumococcal disease, rubella and tetanus were included if they had a recorded onset in 2015 and met the national case definition (3).

Crude notification rates per 100,000 population were calculated for year of notification (1991 to 2015) age group and LHD. Population estimates used were from Health Stats NSW (7).

Notifications were analysed by age, sex, vaccination status and geographic residence where information was available.

Notifications are counted as NSW cases where the address of residence:

- is in NSW or
- is overseas, and the diagnosis was made in NSW

## Appendix 2

Notification and rate per 100,000 population by year onset for selected conditions

Year of onset	Haemophilus influenzae type b		Measles		Meningococcal Disease		Mumps		Pertussis		Pneumococcal Disease (Invasive)		Rubella		Tetanus	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
2015	5	0.07	9	0.12	44	0.58	63	0.83	12243	160.7	490	6.43	7	0.09	1	0.01
2014	6	0.08	67	0.89	37	0.49	79	1.05	3134	41.71	515	6.85	10	0.13	1	0.01
2013	9	0.12	34	0.46	46	0.62	91	1.23	2341	31.61	472	6.37	12	0.16	2	0.03
2012	2	0.03	170	2.33	65	0.89	106	1.45	5841	79.94	581	7.95	10	0.14	1	0.01
2011	4	0.06	90	1.25	71	0.98	68	0.94	13195	182.8	530	7.34	17	0.24	1	0.01
2010	6	0.08	25	0.35	73	1.02	40	0.56	9339	130.7	497	6.96	13	0.18	1	0.01
2009	6	0.09	19	0.27	92	1.3	40	0.57	12419	176.1	476	6.75	7	0.1	2	0.03
2008	8	0.12	39	0.56	80	1.15	77	1.11	7527	108.4	546	7.86	17	0.24	1	0.01
2007	7	0.1	4	0.06	109	1.59	323	4.73	1612	23.59	519	7.59	8	0.12	2	0.03
2006	11	0.16	60	0.89	101	1.5	155	2.3	3677	54.53	562	8.33	37	0.55	2	0.03
2005	7	0.1	5	0.07	137	2.05	111	1.66	5757	86.01	642	9.59	10	0.15	1	0.01
2004	5	0.08	11	0.17	146	2.2	65	0.98	3563	53.57	903	13.58	17	0.26	1	0.02
2003	6	0.09	17	0.26	197	2.98	36	0.54	2769	41.82	801	12.1	23	0.35	1	0.02
2002	10	0.15	7	0.11	211	3.21	29	0.44	2014	30.6	881	13.39	35	0.53	0	0
2001	7	0.11	23	0.35	232	3.55	28	0.43	4436	67.93	444	6.8	58	0.89	0	0
2000	8	0.12	35	0.54	248	3.82	91	1.4	3694	56.95	.*	.	191	2.94	3	0.05

\*IPD was made notifiable in 2001