

Vaccine-preventable diseases, NSW, 2010

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(BOX)

Abstract: Aims: To describe trends in case notification data for vaccine-preventable diseases in NSW for 2010. **Methods:** Risk factor and vaccination status data was collected from cases through public health unit follow-up. Data from the NSW Notifiable Diseases Database were analysed by: Local Health District of residence; age; vaccination status; and sub-organism where available. **Results:** Outbreaks of measles and pertussis were notified in 2010, associated with unimmunised groups (measles) or as a result of waning immunity (pertussis). **Conclusion:** With the exception of pertussis, most vaccine preventable disease notifications remain low in NSW. Ensuring high levels of vaccination for travellers will be important to prevent future outbreaks of vaccine preventable disease.

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The objectives of vaccine-preventable disease (VPD) surveillance are to: detect and investigate outbreaks of vaccine-preventable disease; identify close contacts of patients who may be at risk of infection; identify potential vaccine failures; and understand the epidemiology of vaccine-preventable disease (including the impact of immunisation), to inform the development of prevention strategies.

Notified cases of vaccine preventable disease were defined according to national criteria.¹ Under the NSW Public Health Act, since 1991²:

- medical practitioners have been required to notify patients diagnosed with measles and pertussis;

- laboratories have been required to notify patients diagnosed with measles, pertussis, rubella, *Haemophilus influenzae* type b invasive infection, meningococcal disease, mumps and rubella;
- hospital general managers have been required to notify patients diagnosed with measles, pertussis, *Haemophilus influenzae* type b invasive infection, and meningococcal disease;

to NSW Health (via public health units [PHUs]). Laboratories have been required to notify patients with invasive pneumococcal infections since 2002.

Notifications of *Haemophilus influenzae* type b invasive infection, measles, meningococcal disease, pertussis, pneumococcal disease (cases aged under 5 years and 50 years and over) and tetanus prompt public health follow-up according to NSW case definitions and response protocols.³ Notifications of mumps and rubella are not routinely followed-up by public health units in NSW.³ PHU staff enter data gathered on notified cases into the statewide Notifiable Diseases Database. This report describes trends in surveillance data for vaccine-preventable diseases in NSW.

Method

Notification data from the NSW Notifiable Diseases Database were reviewed for cases of vaccine-preventable diseases with a date of onset from 2006 to 2010. All rates were calculated using Australian Bureau of Statistics population estimates for the relevant year. Rates are presented as annual rates per 100 000 total population or population in age groups. Risk factor and vaccination status data was collected from notified cases through public health unit follow-up. In NSW, laboratories provide serotype data for measles, meningococcal and pneumococcal disease. Notified cases were analysed by place of usual residence according to geographical regions served by the relevant Local Health Districts' Public Health Unit.

Results

***Haemophilus influenzae* type b invasive infection**

Haemophilus influenzae type b (Hib) is a bacillus which may form part of the flora of the upper respiratory tract. The bacteria are spread through contact with droplets from the nose or throat of an infected person, usually in household-like settings. Infection can result in invasive disease including meningitis, epiglottitis, septic arthritis, cellulitis and pneumonia.⁴

Since 1993, vaccination against Hib has been available and is provided for infants at 2, 4, 6 and 12 months of age.⁵

Summary of notified cases

The number of notified cases of Hib has decreased significantly in NSW since the introduction of a vaccine. In 2010, six cases of Hib were notified. Two cases were aged less than one year, two cases were aged between 1 year and 6 years, and two cases were notified from adults aged 35 and 55 years. In 2010, 3 (50%) cases of Hib were male and no cases were notified in Aboriginal people.

Vaccination status

Of the four notified cases of children with Hib in 2010, one was unvaccinated and three cases were fully vaccinated for their age (an infant aged 7 months with 3 doses and 2 children aged three years with 4 doses).

Comment

Hib is now rarely seen in NSW children. Hib vaccination has successfully reduced the rate of disease incidence in unvaccinated populations.

Measles

Measles is an acute, highly infectious viral disease that can have serious complications. Prodromal symptoms of measles include fever, tiredness, cough, runny nose, sore red eyes and feeling unwell. A characteristic rash appears 3–7 days after the prodrome, beginning on the face and spreading down the body. The rash usually lasts 4–7 days.⁴

Summary of notified cases

In 2010, 26 cases of measles were notified in NSW, compared to 19 in 2009. The highest notification rates of measles were reported among young people aged 10–14 at onset of illness (10 cases, 2.2 per 100 000 population) and 15–19 years (7 cases, 1.5 per 100 000 population) (Figure 1).

In 2010, 18 (69%) cases were male and no cases were notified in Aboriginal people. Geographically, the highest notification rates were reported from Northern NSW Local Health District (LHD) (4.0 per 100 000 population) (Table 1).

[INSERT FIGURE 1 & TABLE 1 ABOUT HERE]

Vaccination status

Of the 26 cases, 18 (69%) cases were unvaccinated, four (15%) were vaccinated (three with one dose of vaccine recorded and one case with two doses of vaccine recorded) and four (15%) adult cases were unable to recall their vaccination status.

Outbreaks

Most cases of measles in NSW are notified from non-immune travellers who return with the infection from countries where measles is endemic or in non-immune people who are exposed to a known case.⁶ Of the 26 cases notified in 2010, six (23%) were associated with overseas travel. Three of the six overseas cases resulted in further transmission affecting 20 people. One case infected overseas was associated with transmission to two unvaccinated family members and one unvaccinated community contact. A second case infected overseas was associated with transmission to three unvaccinated family members and one airplane contact with uncertain vaccination history. A third overseas case, from Northern NSW LHD, was associated with transmission in a high school (eight cases), a prison (four cases) and the community (two cases).

Genotype

There are several different genotypes of the measles virus. In 2010, eight cases had measles genotype information identified. Of these, one were identified as H1 (associated with travel to Vietnam), one was D8 (associated with travel to Sri Lanka), one was D4 (associated with travel to Italy), and five were D9 (one associated with travel to China, and four from the Northern NSW LHD cluster initially associated with travel to Malaysia).

Comment

People at risk of contracting measles are those who have never had measles or who have never been vaccinated. A second dose of measles-mumps-rubella (MMR) was added to the National Immunisation Program in 1992.⁵ Non-immune travellers who return with the infection from countries where measles is endemic or non-immune people who are exposed to a known case make up the majority of notifications in NSW.

Meningococcal disease

Meningococcal disease is an acute bacterial disease that typically causes septic shock or meningitis (or a combination of these syndromes).⁴ Invasive meningococcal disease is caused by infection with meningococcus bacteria, of which there are several serogroups. A vaccine against serogroup C meningococcal disease was added to the National Immunisation Program in 2003 for children at 12 months of age and offered to all persons aged 1–19 years between 2003 and 2004.⁵ There is no vaccine licensed in Australia to protect against disease caused by other serogroups.

Summary of notified cases

In 2010, 74 cases of invasive meningococcal disease were notified in NSW (66 confirmed and 8 probable) compared to 92 cases notified in 2009. Five deaths were notified in 2010 (three serogroup B, one serogroup W135, and one with an unknown serogroup) compared to four deaths in 2009 (two serogroup B, one serogroup W135, and one with an unknown serogroup).

[INSERT FIGURE 2 ABOUT HERE]

The highest notification rates of meningococcal disease were among children aged less than 5 years of age at onset of illness (29 cases, 6.2 per 100 000 population) and young people aged 15–19 years (10 cases, 2.1 per 100 000 population). Of the notifications from children aged less than 5 years, the highest rates were reported from children aged 12-24 months (10 cases, 10.1 per 100 000 population) and infants aged less than 12 months (8 cases, 8.4 per 100 000 population) (Figure 2).

In 2010, 36 (49%) cases of meningococcal disease were male and seven cases were notified in Aboriginal people. Geographically, the highest notification rates were from Central Coast (3.2 per 100 000 population) and Illawarra Local Health Districts (2.1 per 100 000 population) (Table 1).

Vaccination status

Vaccination status was complete for 60 cases (81%). Of the cases with known vaccination status, 37 (62%) were vaccinated against serogroup C. Of the vaccinated cases, 29 (78%) were from serogroup B, 1 (3%) was from serogroup W 135 and 6 (16%) were unable to be typed. No vaccinated cases were due to serogroup C.

Serogroup

Of the 74 cases notified in NSW in 2010, serogroup information was recorded for 62 (84%). Of the cases with known serogroup information, 49 (79%) were caused by serogroup B (for which there is no vaccine), six (10%) were serogroup C, 4 (6%) were serogroup W135 and three (5%) were serogroup Y. Of the 12 (19%) cases with unknown serogroup information, the serogroup could not be typed for five cases and seven cases were clinical diagnoses.

Comment

The number of notified cases of invasive meningococcal disease has declined significantly since the National Meningococcal C Immunisation Program commenced in 2003. The greatest reduction in notified cases of meningococcal disease has been for serogroup C, from 44 (29%) cases with known serogroup in 2003 to 6 (10%) cases in 2010. Serogroup C meningococcal disease is now mainly reported from adults and unimmunised children. The number of cases of meningococcal disease associated with serogroup B has decreased over time. Due to reductions in group C disease, notifications of group B disease now account for a larger proportion of the meningococcal disease notifications in NSW. Non-vaccine serogroups (W135 and Y) have remained relatively stable over time.

Mumps

Mumps is an acute infectious disease caused by the mumps virus. Common symptoms of mumps include fever, loss of appetite, tiredness and headaches followed by swelling and tenderness of the salivary glands. Illness is usually more severe in people infected after puberty.⁴ In NSW, vaccination is provided using MMR vaccine at 12 months and 4 years of age.⁵

Summary of notified cases and comment

In 2010, 38 cases of mumps were notified in NSW compared to 40 in 2009. The highest notification rates of mumps were among young adults aged 25-29 years at onset of illness (10 cases, 2.0 per 100 000 population). In 2010, 13 (34%) cases were male. Geographically, the highest rates were notified from Sydney Local Health District (1.1 per 100 000 population) (Table 1).

In NSW, notified cases of mumps are not routinely followed-up by public health units. A significant increase in mumps notifications (largely from young adults in South East Sydney) was reported in 2007.⁷ No outbreaks or clusters were notified in 2010.

Pertussis

Pertussis (or whooping cough) is a disease caused by infection of the throat with the bacteria *Bordetella pertussis*. Pertussis can be very serious in small children. Older children and adults may have a less serious illness, with bouts of coughing that continue for many weeks regardless of treatment.⁴ Pertussis vaccination is combined with diphtheria and tetanus (DTPa) in a primary course at 2, 4 and 6 months of age and a booster at 4 years. A second booster dose is given between 15 and 17 years of age using the adult dTpa formulation.⁵

Summary of notified cases

In 2010, 9 287 cases of pertussis were notified in NSW compared with 12 448 in 2009. Following an epidemic period during 2008 and 2009⁸, notifications of pertussis declined and stabilised in the first half of 2010 (2 376 notified up to 30 June 2010) compared to the same period in 2009 when 8 777 cases were notified. Notifications of pertussis increased during the second half of 2010 (6 911 cases), peaking in November at 1 866 cases.

The highest pertussis notification rates were reported in children aged less than 5-9 years (2730 cases, 616.9 per 100 000 population) and 10-14 years (1614 cases, 356.5 per 100 000 population). Notifications of pertussis in children aged 0-4 years were significantly lower in 2010 (1394 cases, 298.8 rate per 1000,000 population) compared to 2009 (2821 cases, 621.6 rate per 100,000 population). Of the cases aged less than 5 years, the highest notification rates were in children aged 3 years (364 cases, 384.7 per 100 000 population) and infants aged less than 12 months (302 cases, 315.4 per 100 000 population) (Figure 3).

In 2010, 4026 (43%) cases were male. Of the 1394 cases aged 0-4 years (who are followed up by public health units), 49 (4%) were reported in Aboriginal people. Geographically, the highest notification rates were reported in Far West (260.3 per 100 000 population), Murrumbidgee (196.8 per 100 000 population), and North Sydney (195.5 per 100 000 population) Local Health Districts (Table 1).

[INSERT FIGURE 3 ABOUT HERE]

Vaccination status

In 2010, 302 cases were notified in infants aged less than 12 months of age. Of these, 204 (68%) were infants too young to be fully vaccinated. Of the 1092 cases of pertussis notified in children aged 1–4 years, 83(8%) had no immunisation recorded, 123 (10%) had less than 3 doses of vaccine recorded, and 884 (81%) had 3 or more doses recorded.

Comment

In 2010, the number of notifications of pertussis was significantly lower in children aged 0–4 years compared to the previous year. This was particularly striking for children aged 3 years at onset of illness (with a rate of 384.7 per 100,000 population in 2010 compared to 810.9 in 2009) and infants aged less than 12 months of age (315.4 per 100,000 population in 2010 compared to 677.2 per 100,000 population in 2009).

The reduction in notifications in these age groups may be in part to a statewide community awareness campaign to protect infants. The key messages were for infants to receive their first dose of vaccine at 6 weeks (from 8 weeks), that children receive their first booster dose of vaccine at 3 ½ years (from 4 years), and to promote free vaccination for new parents, grandparents and carers of infants.⁹

Pneumococcal disease (invasive)

Pneumococcal disease is caused by infection with the bacteria *Streptococcus pneumoniae* and is a frequent cause of serious bacterial infections.⁴ There are more than 90 serotypes that can cause disease. Vaccines for children aged less than 5 years (7-valent pneumococcal conjugate vaccine – 7vPCV) and adults older than 65 years (23-valent pneumococcal polysaccharide vaccine – 23vPPV) were introduced into the National Immunisation Program in 2005.⁵ In NSW, cases of all ages are notified, but only those aged less than five years or older than 50 years are routinely followed-up by public health units to gather vaccination and serotype data.

Summary of notified cases

In 2010, 503 cases of invasive pneumococcal disease were notified compared to 478 in 2009. Forty-six deaths were identified in 2010 compared to 53 in 2009. Two deaths were notified in fully vaccinated children aged less than 2 years (disease caused by serotypes not included in the vaccine), five in people aged 5-49, and 39 in people aged older than 50 years.

The highest notification rates of invasive pneumococcal disease were notified in adults aged older than 85 years (45 cases, 32.6 per 100 000 population), 80-84 years (34 cases, 22.5 per 100 000 population) and children aged less than 5 years (98 cases, 21.1 per 100 000 population) (Figure 4). Of the cases aged less than 5 years, the highest notification rates were in children aged 12-23 months (35 cases, 38.0 per 100 000 population) and infants aged less than 12 months (26 cases, 27.2 per 100 000 population).

Fifty-six percent of cases were male. Of the 371 cases aged 0-4 years and older than 50 years (who are followed up by public health units), 13 (4%) were notified in Aboriginal people. Geographically, the highest notification rates were reported in the Western NSW (10.0 per 100 000 population), South Eastern Sydney (8.7 per 100 000 population), and Nepean Blue Mountains (8.3 per 100 000 population) Local Health Districts (Table 1).

[INSERT FIGURE 4 ABOUT HERE]

Serotype

Of the 503 cases of invasive pneumococcal disease notified in 2010, 400 (80%) had complete serotype information. For children aged less than 5 years with known serotype information, 92 (94%) were notified with serotypes not included in the 7-valent vaccine, two (2%) were notified with invasive disease caused by a serotype included in the 7-valent vaccine (19F and 23F), and 4 (4%) were unable to be typed. For people aged 5-49 years with known serotype information, 95 (81%) were notified with serotypes not included in the 7-valent vaccine, 17 (15%) were notified with invasive disease caused by a serotype included in the 7-valent vaccine, and 5 (4%) were unable to be typed. For adults aged older than 50 years, 70 (28%) cases were caused by a non-vaccine-related serotype.

Comment

Invasive pneumococcal disease has significantly decreased in children aged less than 5 years, with moderate reductions in adults aged older than 50 years, following the addition of pneumococcal vaccine onto the National Immunisation Program in 2005.¹⁰ In children, disease caused by serotypes included in the 7-valent vaccine are uncommon, however, disease caused by serotypes not included in the 7vPCV vaccine has continued to increase (particularly disease caused by serotype 19A).

Rubella

Rubella (or German measles) is an infectious viral disease. Although a mild infection in most people, infection in early pregnancy can cause serious birth defects or miscarriage. Rubella is spread from an infected person by droplets from the nose or mouth or by direct contact.⁴ Rubella is easily spread to people who have not been vaccinated or previously infected. Rubella vaccination is provided using MMR vaccine at 12 months and 4 years of age.⁵

Summary of notifications and comment

In 2010, 13 cases of rubella were notified in NSW compared to 7 in 2009. All cases were notified in adults aged between 20-50 years. Six (46%) cases were male. The highest notification rates were in Central Coast (0.6 per 100 000 population) (Table 1). Rubella cases are not routinely followed-up by public health units in NSW. Notifications have declined over time.

Tetanus

Tetanus is a disease caused by the bacteria *Clostridium tetani*. Toxin made by the bacteria, which grows at the site of an injury, attacks a person's nervous system. Although now rare due to immunisation, tetanus can be fatal. *C. tetani* bacteria are found in dust and animal faeces and infection may occur after minor injury (sometimes unnoticed punctures to the skin that are contaminated with soil, dust or manure) or after major injuries such as open fractures, dirty or deep penetrating wounds, and burns.⁴ Tetanus is not passed from one person to another. Vaccination against tetanus is given to children with diphtheria and pertussis (DTPa) in a primary course at 2, 4 and 6 months of age. A booster dose of DTPa is given at 4 years.⁵ A second booster dose has been included in the National Immunisation Program for those aged 15–17 years since 2004 using the adult dTpa formulation.

Summary of notifications and comment

In 2010, one case of tetanus was notified in NSW. The case was notified in an elderly gentleman who was unsure of previous vaccination history. The numbers of notified cases of tetanus have remained relatively stable over the past 5 years, ranging from one to two cases annually. In Australia, tetanus mostly occurs in older adults who are not adequately immunised.

Discussion

The numbers of notified cases of many vaccine-preventable diseases remains low in NSW, however, outbreaks do occur. High rates of pertussis infection have been notified in recent years, in part due to waning immunity and increased use of more sensitive tests. Outbreaks of measles have occurred as a result of non-vaccinated people travelling to countries where vaccine-preventable disease is more common. Maintaining high levels of vaccination coverage for overseas travellers will be important for future vaccine preventable disease control.

Notification data for vaccine preventable disease are subject to several limitations and are likely to underestimate the true incidence of disease. Firstly, some infections can be mild, so people may not present for medical attention. Secondly, for those who do present to health care providers, notification relies on a diagnoses being made and in the absence of a doctor notifying the case, appropriate laboratory tests being ordered. Thirdly, positive diagnoses may not be notified by the doctor, laboratory or hospital to public health units as required under the Public Health Act for a variety of reasons. Nonetheless, assuming these biases are relatively stable over time, vaccine preventable disease notification data do provide a useful indication of the trends in disease incidence in NSW.

Conclusion

With the exception of pertussis, most vaccine-preventable diseases are currently notified in low numbers in NSW. This is largely the result of reaching and maintaining high vaccination coverage levels. Notification and disease estimates from surveillance systems can be affected by changes in disease awareness, laboratory diagnostic tests and testing protocols, case definitions, and reporting practices over time. However, ongoing surveillance for vaccine-preventable disease is important to identify changes to disease incidence and to inform appropriate public health action.

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References

1. Australian Government, Department of Health and Ageing. Australian national notifiable diseases case definitions. Available at:
<http://www.health.gov.au/internet/main/publishing.nsf/content/cdna-casedefinitions.htm>.
(Cited June 2011).
2. NSW Government. *Public Health Act 1991*. Available at
http://www.austlii.edu.au/au/legis/nsw/consol_act/pha1991126/.
3. Communicable Disease Branch, NSW Department of Health. Disease Control Guidelines. Available at:
<http://www.health.nsw.gov.au/publichealth/Infectious/controlguide.asp> (Cited June 2011)
4. Heymann DL, editor. *Control of Communicable Diseases Manual*. 19th ed. Washington: American Public Health Association; 2008.
5. National Health and Medical Research Council. *The Australian Immunisation Handbook*. 9th ed. Canberra: Australian Government Department of Health and Ageing; 2008.
6. Brotherton J. EpiReview: Measles in NSW, 1991–2000. *N S W Public Health Bull* 2001; 12(7): 200–4.
7. Ferson MJ, Konecny P. Recent increases in mumps incidence in Australia: the “forgotten” age group in the 1998 Australian Measles Control Campaign. *Med J Aust* 2009; 190(5): 283–4.
8. Spokes PJ, Quinn HE, McAnulty JM. Review of the 2008–2009 pertussis epidemic in NSW: notifications and hospitalisations. *N S W Public Health Bull* 2010; 21(7–8): 167–73.
9. Whooping Cough information campaign, NSW Department of Health. Available at:
<http://www.health.nsw.gov.au/PublicHealth/Infectious/whoopingcough/index.asp> (Cited June 2011).
10. Gilmour R. EpiReview: Invasive pneumococcal disease, NSW, 2002. *N S W Public Health Bull* 2005; 16(1–2): 26–30.

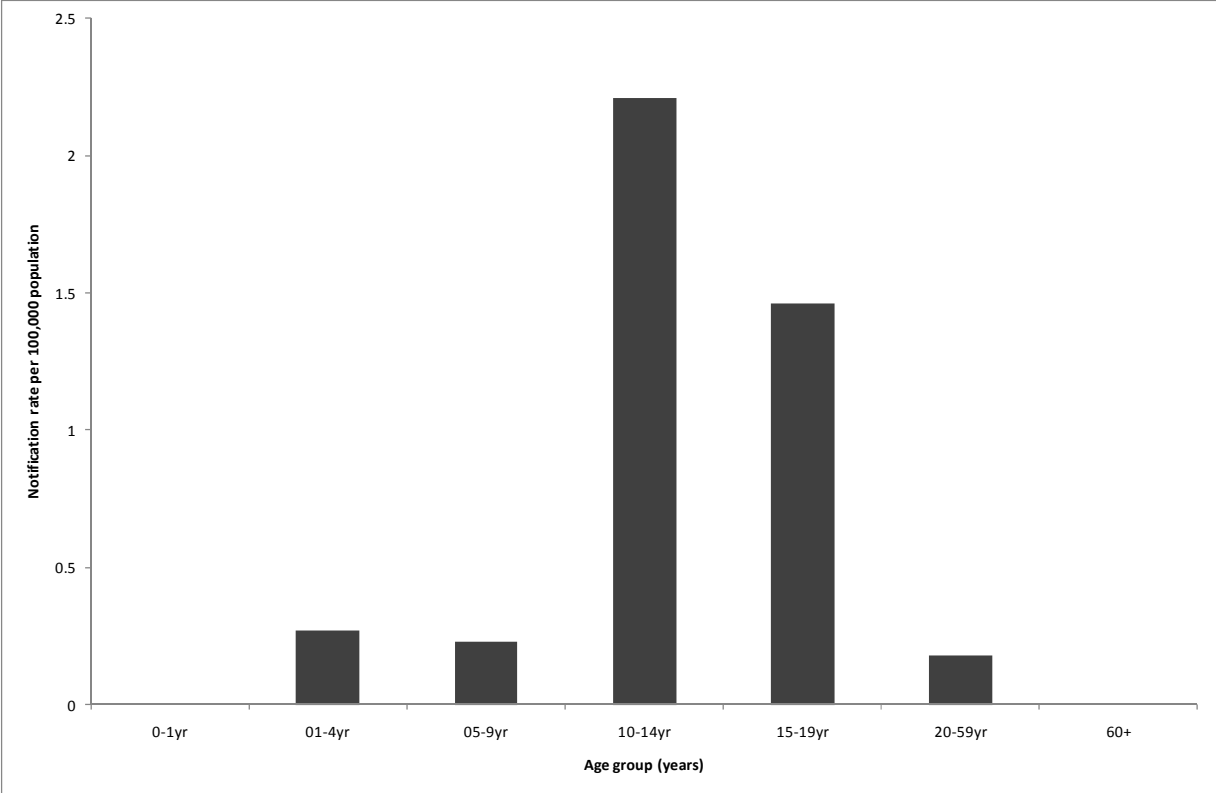


Figure 1. Annual notification rate of measles disease by age group, NSW, 2010.

Source: NSW Notifiable Diseases Database.

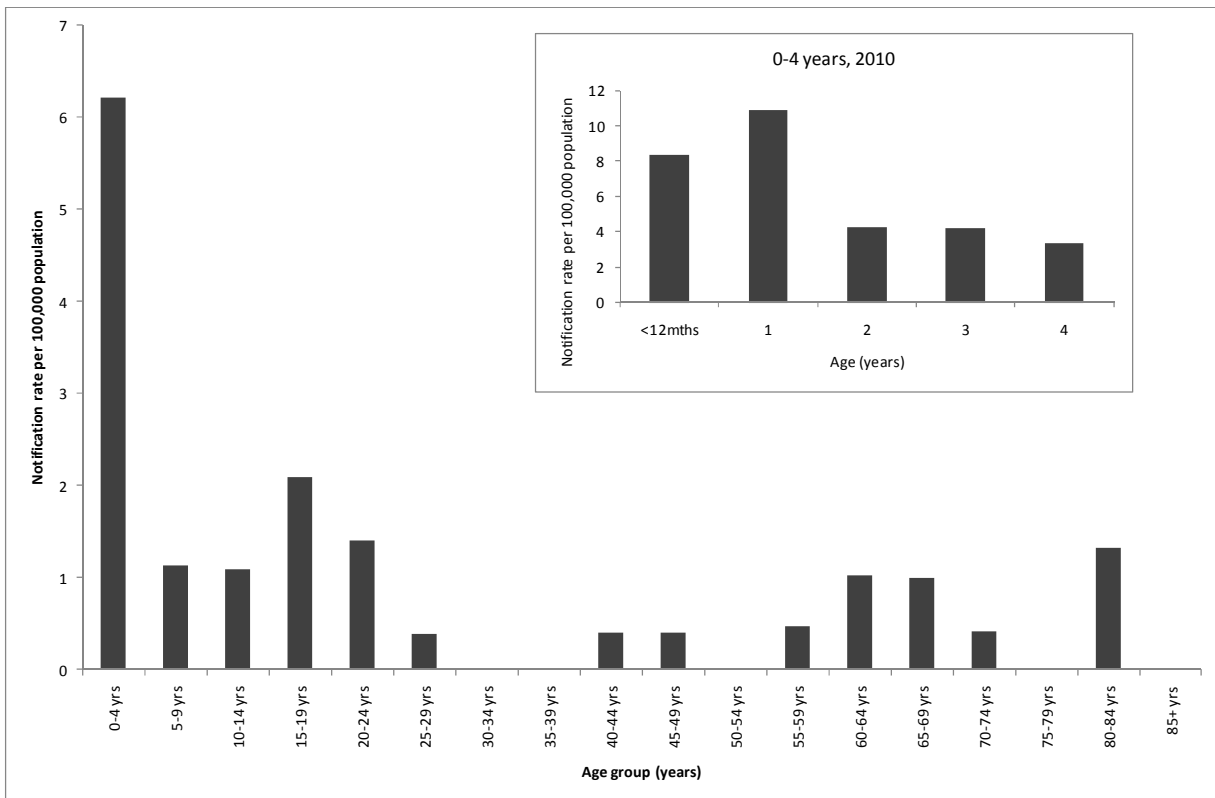


Figure 2. Annual notification rate of invasive meningococcal disease by 5 year age groups, NSW, 2010. Annual notification rate in children aged less than 5 years for 2010 for each year of age, presented inset.

Source: NSW Notifiable Diseases Database.

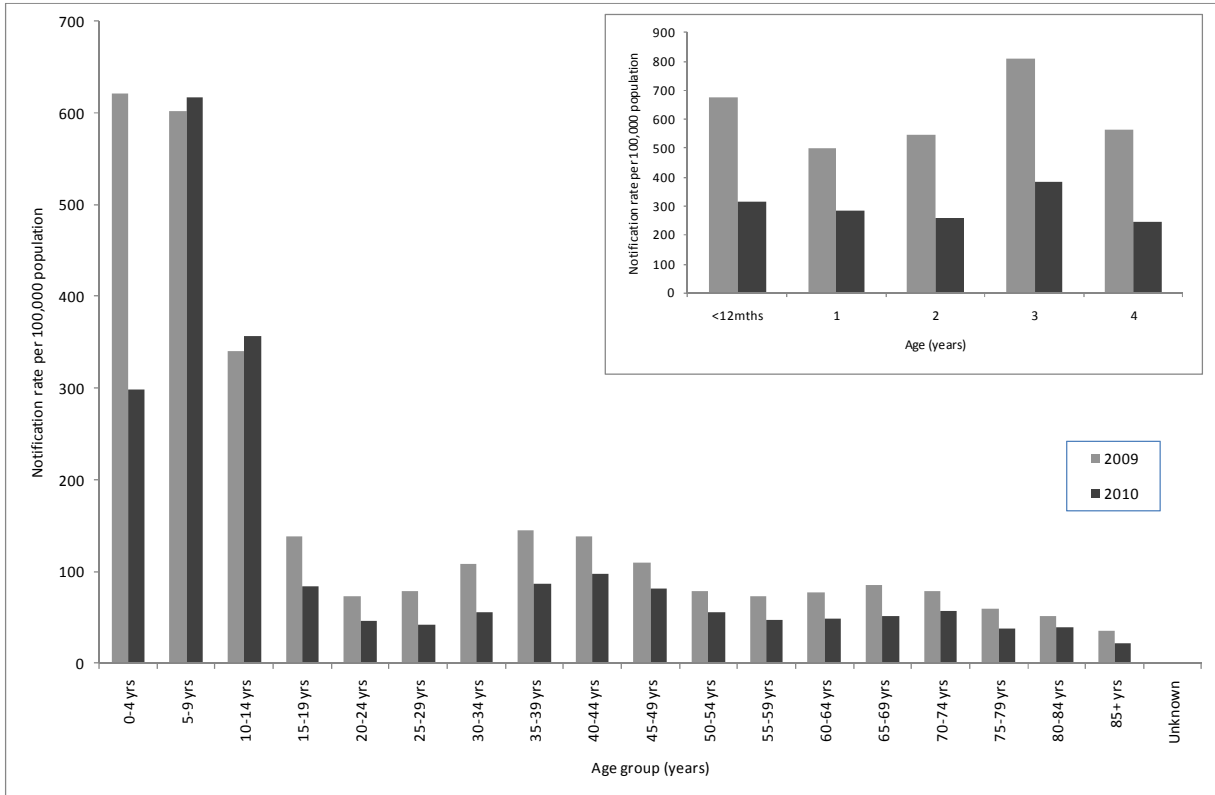


Figure 3. Annual notification rate of pertussis by 5 year age groups, NSW, 2009 and 2010. Annual notification rate in children aged less than 5 years for 2009 and 2010 for each year of age, presented inset.

Source: NSW Notifiable Diseases Database.

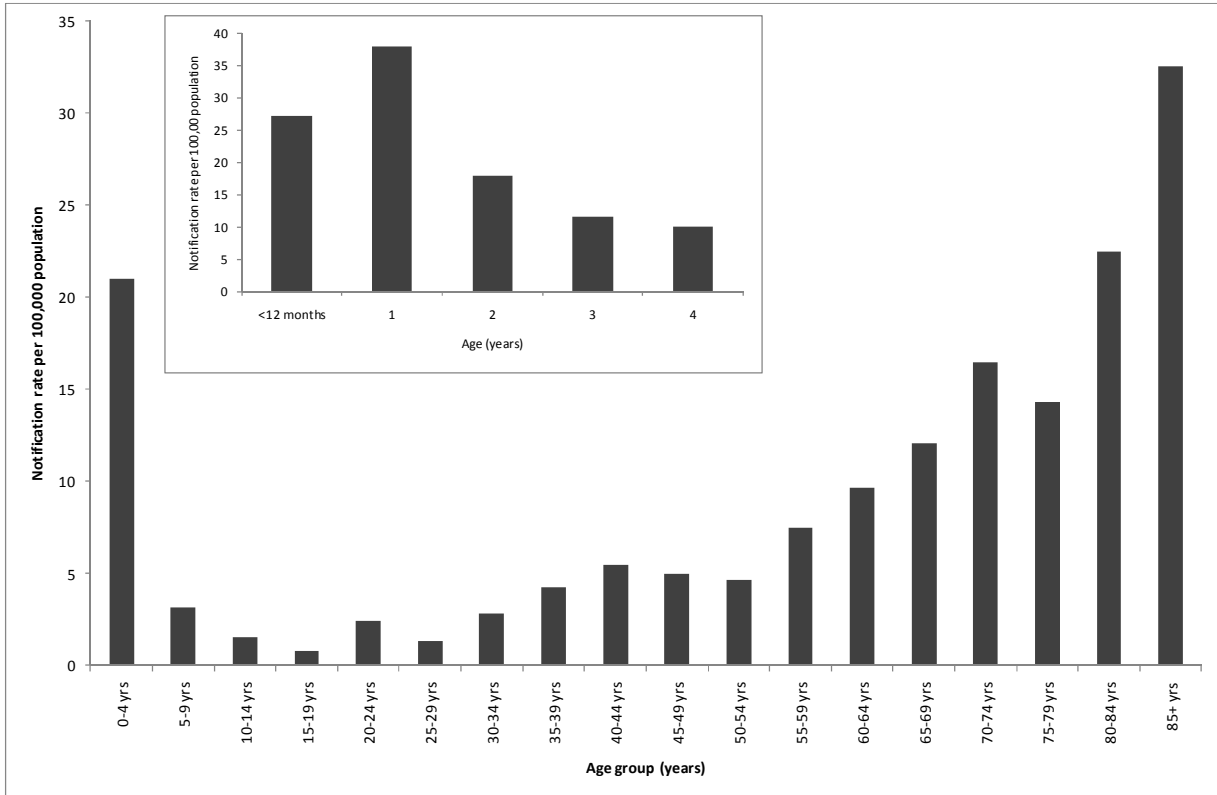


Figure 4. Annual notification rate of invasive pneumococcal disease by 5 year age groups, NSW, 2010. Annual notification rate in children aged less than 5 years for 2010 for each year of age, presented inset.

Source: NSW Notifiable Diseases Database.

Local Health District	H. influenzae b infection		Measles		Meningococcal disease (invasive)		Mumps		Pertussis		Pneumococcal disease (invasive)		Rubella	
	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate
Central Coast	0	0	3	1.0	10	3.2	2	0.6	192	60.6	20	6.3	2	0.6
Far West	0	0	0	0	0	0	0	0	114	260.3	3	6.8	0	0
Hunter New England	1	0.1	0	0	14	1.8	3	0.4	773	98.1	64	8	2	0.3
Illawarra	1	0.3	0	0	8	2.1	3	0.8	539	139.6	27	7	0	0
Justice Health*	-	na	4	na	-	na	-	na	-	na	1	na	-	na
Mid North Coast	1	0.3	0	0	5	1.7	0	0	148	49.4	7	2.3	0	0
Murrumbidgee	0	0	1	0.4	1	0.4	1	0.4	535	196.8	14	5.2	0	0
Nepean Blue Mountains	1	0.3	1	0.3	5	1.5	1	0.3	442	136.2	27	8.3	0	0
Northern NSW	0	0	12	4	1	0.3	0	0	216	72.7	23	7.7	1	0.3
Northern Sydney	0	0	4	0.5	1	0.1	5	0.6	1628	195.5	63	7.6	2	0.2
South Eastern Sydney	0	0	1	0.1	5	0.6	6	0.7	1187	139.7	74	8.7	3	0.4
South Western Sydney	1	0.1	0	0	9	1	8	0.9	912	105.1	56	6.1	1	0.1
Southern NSW	0	0	0	0	1	0.5	0	0	501	229	17	7.8	0	0
Sydney	0	0	0	0	3	0.5	6	1.1	677	122.1	35	6.3	2	0.4
Western NSW	1	0.4	0	0	5	1.8	0	0	407	145.5	28	10	0	0
Western Sydney	0	0	0	0	6	0.7	3	0.4	1009	122.6	44	5.2	0	0

* Rates for justice health are not able to be calculated

Table 1. Number and rate per 100,000 of notifications of vaccine-preventable diseases by Local health District, NSW, 2010

