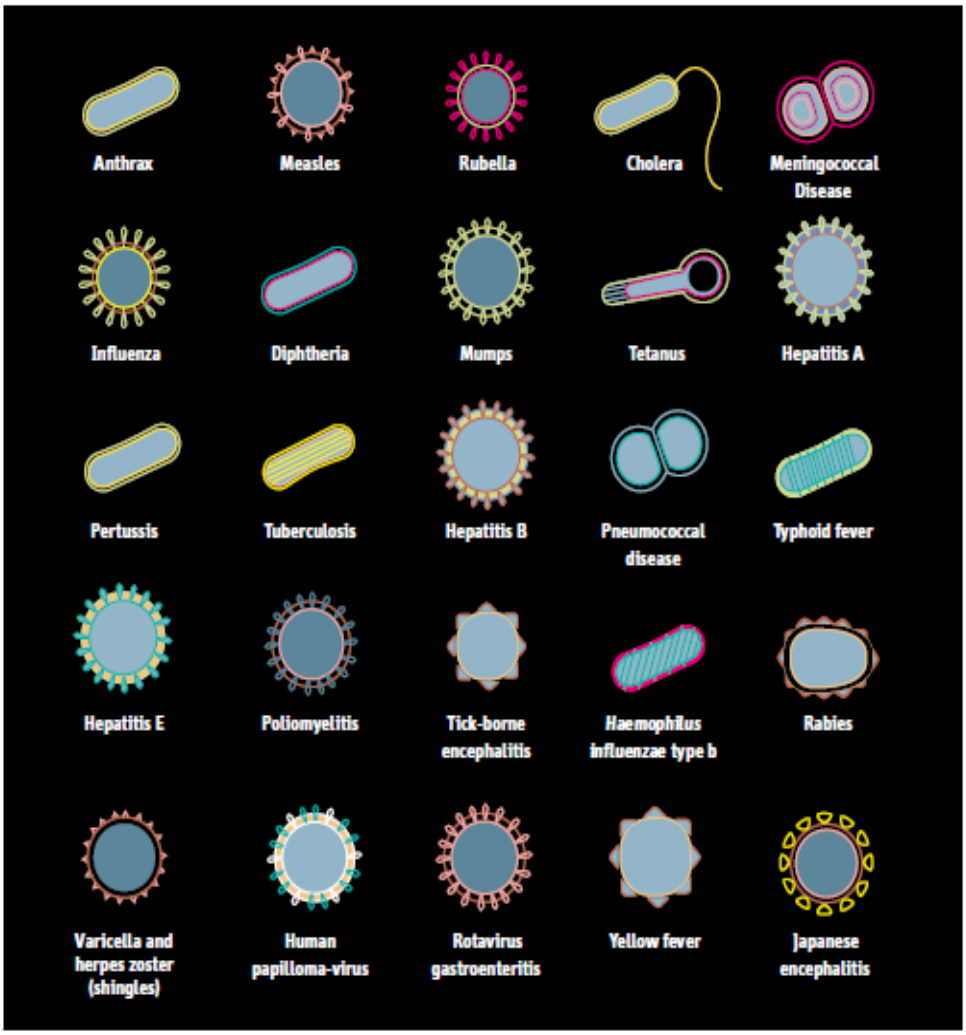
Annual Vaccine Preventable Diseases Report for Northern Ireland 2018

An analysis of data for the calendar year 2017



HSC Public Health Agency

Acknowledgements

The Public Health Agency Health Protection Directorate Vaccine Preventable Disease Surveillance Team would like to thank everyone across Northern Ireland who reports cases of vaccine-preventable diseases. This information enables us to assess the burden of disease across the region and evaluate the impact of our national vaccination programmes. This includes GPs, hospital clinicians, paediatricians, staff in Health and Social Care Trust laboratories, the Regional Virology Laboratory and the Public Health England National Reference Centres, and PHA communications team.

The front cover image, taken from the WHO *Global Vaccine Action Plan 2011-2020*, represents all bacteria and viruses for which a vaccine is available, highlighting what a valuable and growing resource vaccines are across the world to protect against infectious diseases[1]. Not all of these vaccines are routinely used in Northern Ireland as vaccine recommendations are based on the local epidemiology of vaccine preventable diseases.

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Cover image used with permission from WHO *Global Vaccine Action Plan 2011-2020*[1] -
http://apps.who.int/iris/handle/10665/78141
http://www.who.int/immunization/global_vaccine_action_plan/GVAP_doc_2011_2020/en/
ISBN 9789241504980 - Table 1 on page 17

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Summary

Invasive Meningococcal Disease

- 36 clinically suspected notifications, with 21 (58%) laboratory confirmed cases; an increase of 9% and 5% respectively since 2016 (33 notifications; 20 confirmed cases)
- Median age of cases 13 years (1 month to 89 years), with age-specific incidence highest in children 4 years of age and under (11.2 per 100,000 population)
- Of the 21 laboratory confirmed cases, 62% (13) serotype B, 19% (4) serotype C, 14% (3) serotype Y and 5% (1) serotype W135
- 2 cases of serotype B were part of one cluster in a secondary educational setting

Invasive Pneumococcal Disease

- 172 laboratory confirmed cases; an increase of 19% since 2016 (144)
- Cases over 45 years of age accounted for 76% of cases, with the majority of these over 65 years
- Of the 90 laboratory confirmed cases with typing, 80 (89%) were due to strains not included in the pneumococcal vaccine

Invasive Haemophilus Influenzae Disease

- 31 laboratory confirmed cases which has more than doubled since since 2016 (15)

- Cases over 65 years of age accounted for 45% of cases followed by 15-44 years, under 1 year , 45-64 years, 1-4 years and 5-14 years
- Of the 17 laboratory confirmed cases with typing results, there was one case of HiB in an infant and 12 (71%) due to non-typeable strains

Pertussis

- 72 laboratory confirmed cases; a decrease of 35% since 2016 (110)
- The majority were in those over 25 years of age

Measles, Mumps, Rubella

- 45 notifications of suspected measles, 6 laboratory confirmed cases
- Six confirmed and one epidemiologically linked case associated with one chain of transmission from an imported case
- 191 laboratory confirmed cases of mumps, a decrease from 222 in 2016, with the majority of cases in 15-24 years (63%; 120/191)
- 6 notifications of clinically suspected rubella, with no laboratory confirmations

Introduction

Vaccine programmes have been a huge success in reducing the burden of Vaccine-Preventable Diseases (VPDs) globally. According to the *WHO Global Vaccine Action Plan 2011-2020*, "Overwhelming evidence demonstrates the benefits of immunisation as one of the most successful and cost-effective health interventions known". Their vision for the Decade of Vaccines (2011–2020) is of a world in which all individuals and communities enjoy lives free from vaccine preventable diseases.

This Annual Surveillance report 2018 provides an overview of the epidemiology of VPDs in Northern Ireland for the calendar year 2017. This is the first year that the VPD Surveillance Team has reported the epidemiology in a separate report as previously it was included the Annual Vaccine Report[2]. In order to facilitate timeliness, epidemiological information will now be published separately every year during spring for the previous calendar year.

Epidemiological information is presented for

- Invasive Meningococcus
- Invasive Pneumococcus
- Invasive Haemophilus Influenzae
- Pertussis (whooping cough)
- Measles
- Mumps
- Rubella
- Diphtheria, Tetanus and Poliomyelitis

Surveillance of VPDs is used to inform public health actions for individual cases, identify outbreaks, assess the burden of disease in Northern Ireland and contribute to national and European monitoring of disease burden and vaccine effectiveness.

Epidemiological information on other VPDs, including tuberculosis, genital warts, influenza, hepatitis B and rotavirus, can be found in PHA disease specific surveillance reports[3,4,5,6].

Data Sources

The VPD Surveillance Team collects and collates epidemiological data on VPDs throughout the year to analyse local trends of frequency, incidence rates, age distribution and serotype characterisation. Data is collected from the following sources:

Notification of Infectious Diseases (NOIDs):

Registered medical practitioners have a statutory duty to notify the PHA Health Protection Duty Room of clinically suspected cases of certain infectious diseases[7].

Laboratory reports from Health and Social Care Trusts (HSCT):

HSCT Laboratories performing a primary diagnostic role voluntarily report confirmed cases of infectious disease to the surveillance team through electronic software (CoSurv®). HSCT Laboratories report microbiological culture results and occasionally serological results. Urgent reports are sent by telephone or email to the duty room.

Laboratory reports from Regional Virology Laboratory (RVL):

The Regional Virology Laboratory voluntarily reports confirmed cases of viral infectious diseases and Polymerase Chain Reaction (PCR) testing of all infectious diseases through CoSurv®. Local HSCT laboratories voluntarily submit specimens for PCR testing if clinically indicated. Urgent reports are sent by telephone or email to the duty room.

Laboratory reports from National Reference Laboratories:

HSCT Laboratories and RVL voluntarily submit positive isolates to Public Health England (PHE) National Reference Laboratories. The surveillance team collates PHE laboratory reports on serotype characterisation and other specialist testing.

The Meningococcal Reference Unit in Manchester is the national reference laboratory for meningococcal disease. The Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU) provides for respiratory, systemic and vaccine-preventable bacteria and serodiagnostic testing for diphtheria, tetanus and bordetella pertussis immunity. The Immunisation and Diagnostic Unit (IDU) provides for rash associated viral and neurological infections, including measles, mumps and rubella.

Enhanced surveillance systems have been in place for:

- meningococcus since 1999 and
- pneumococcus in under 5 years of age since 2006.

This allows monitoring of vaccine effectiveness following introduction of each respective new vaccine programme. Additional variables are collected, including, for example, clinical diagnosis, vaccination status and severity indicators.

Incidence rates were calculated with 2016 mid-population estimates obtained from Northern Ireland Statistics and Research Agency (NISRA). www.nisra.gov.uk/publications/2016-mid-year-population-estimates-northern-ireland

Meningococcal disease

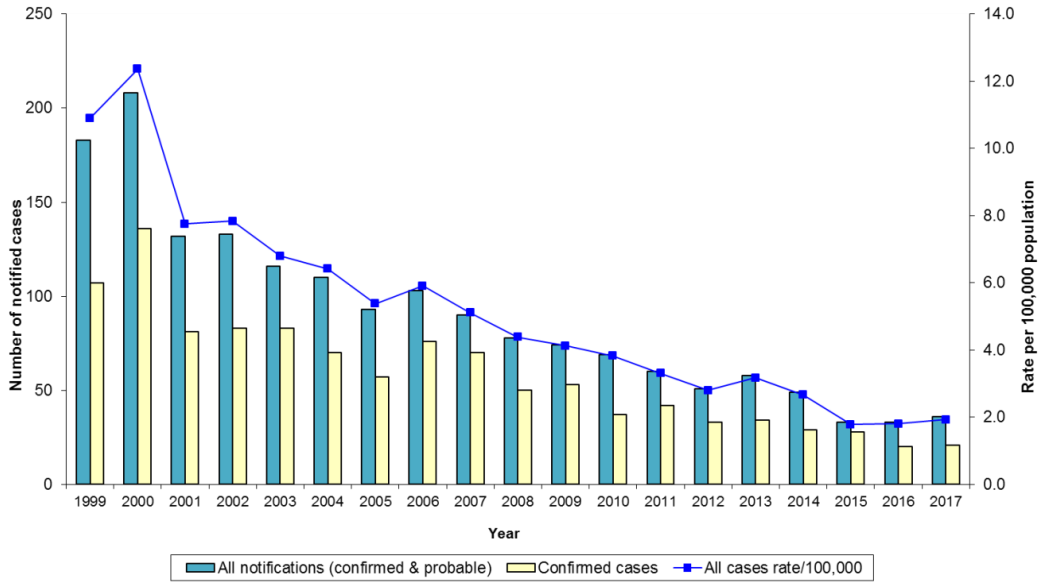
Meningococcal disease is caused by the bacterium *Neisseria meningitidis* (meningococcus) and is a normal inhabitant of the human nasopharynx. It is transmitted from person to person by aerosol, droplet and direct spread. Up to 10% of adults are colonised at any time and develop no signs or symptoms of disease. There are five main meningococcal serotypes, A, B, C, W, and Y that can cause disease in humans. Meningococcus can cause invasive disease, including meningitis, septicaemia and pneumonia. Young children and teenagers are at highest risk of meningococcal disease. Meningococcal serotype vaccination programmes have changed the incidence of disease over time.

Epidemiological situation

There were 36 notifications of clinically suspected invasive meningococcal disease; notification rate of 1.9 per 100,000 population. Twenty one (58%) were laboratory confirmed cases, crude incidence rate 1.1 per 100,000 population observed, of which two were part of an educational setting cluster.

The annual number of notifications and laboratory confirmed cases has fallen over time. From 1999 to 2017, the notification rate has fallen by 82% from 10.9 per 100,000 population in 1999 (Figure 1).

Figure 1. Number of notified and confirmed cases of IMD and overall rates per 100,000 population, 1999-2017, Northern Ireland



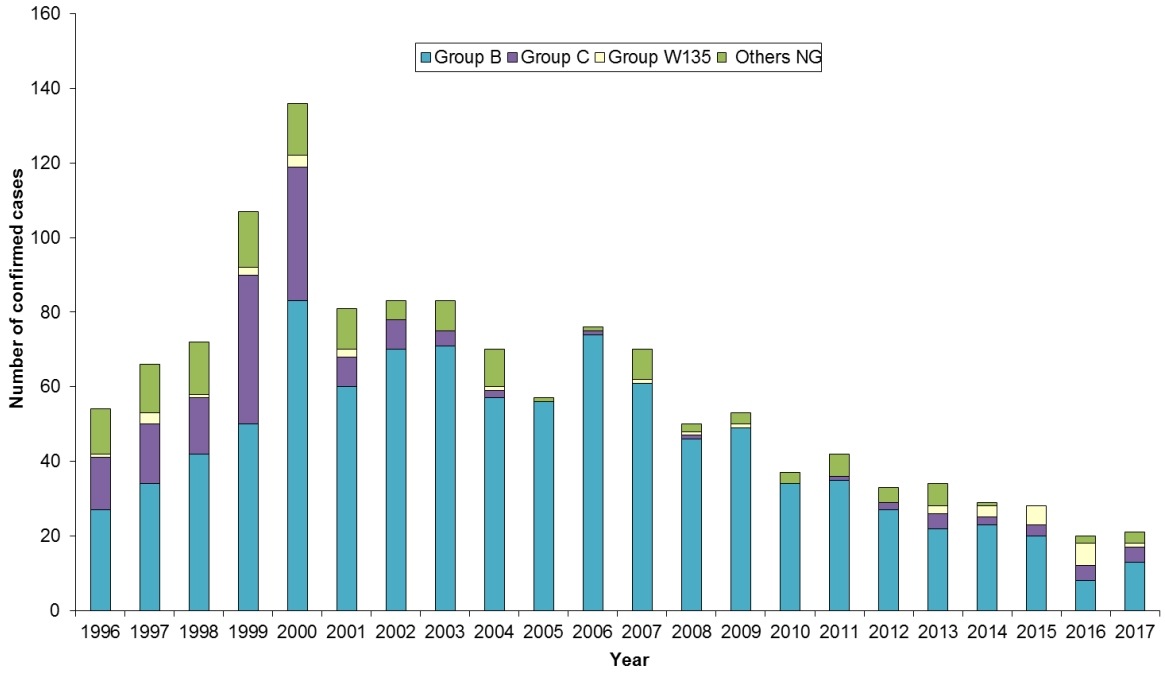
Source: Enhanced Surveillance of Meningococcal Disease (ESMD) in Northern Ireland

Serotypes

Serogroup B remains the most common serotype as with previous years, accounting for 62% (13) of confirmed cases. In addition, 4 cases were serogroup C, 3 serogroup Y and 1 serogroup W135 (Figure 2).

A non-significant reduction in the proportion of serotype B cases has occurred between 2014 (79%), before introduction of the meningococcal B vaccine, and 2017 (62%) (p=0.05). This is consistent with the pattern seen across the United Kingdom.

Figure 2. Laboratory confirmed cases of IMD by serogroup, 1996-2017, Northern Ireland

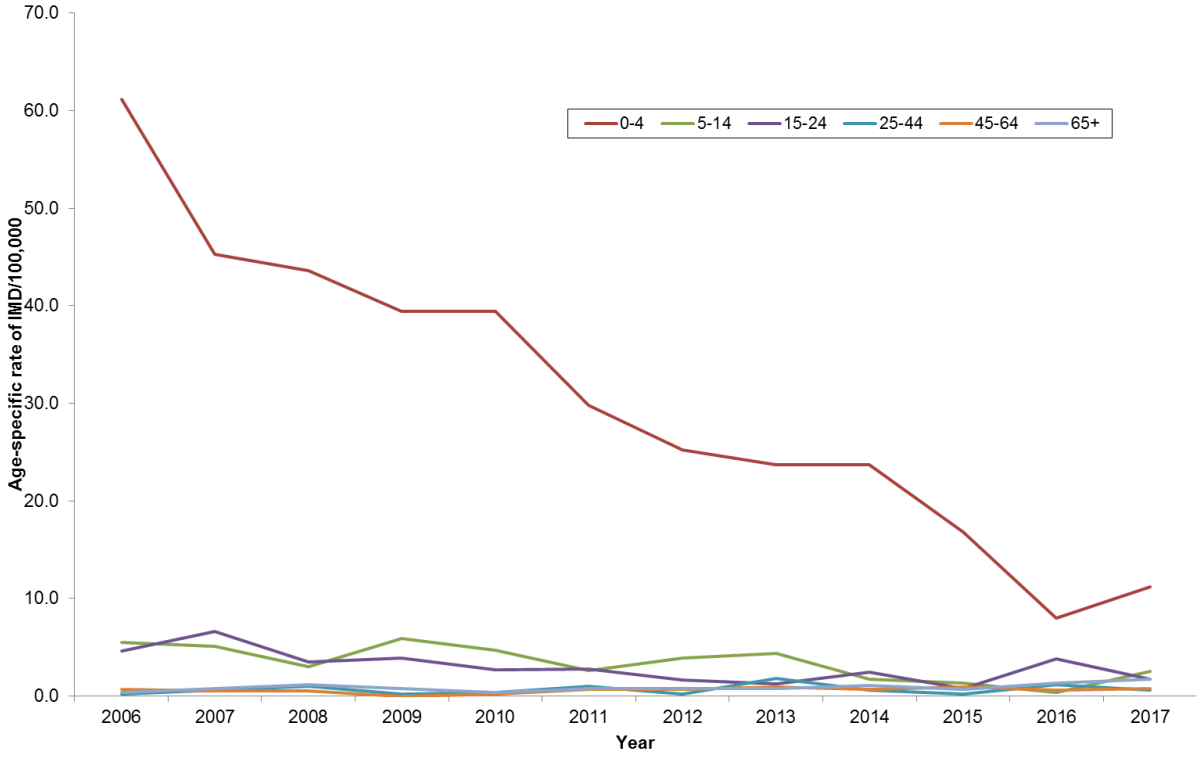


Source: Enhanced Surveillance of Meningococcal Disease (ESMD) in Northern Ireland

Age

The median age of confirmed cases was 13 years (range under 1 month to 89 years). Consistent with previous years, age-specific incidence was highest in infants and young children 4 years of age and under (11.2 per 100,000). Incidence rates have fallen in all age groups over time, with those 0-4 years over 5 times lower in 2017 compared to 2006 (61.2/100,000) (Figure 3).

Figure 3. Age-specific incidence rates of IMD, 2006-2017, Northern Ireland



Source: Enhanced Surveillance of Meningococcal Disease (ESMD) in Northern Ireland

Enhanced surveillance

Average length of hospitalisation for confirmed cases was 20 days (range 1-88 days). There were three deaths where meningococcal disease may have been a contributory factor, two were serotype Y and one serotype B. The case fatality rate of confirmed cases was 8% (3/21), compared to 12% in 2016.

Cluster

Two confirmed cases of meningococcal B disease, both 11 years of age, with dates of onset 7 days apart that attended the same secondary school. Microbiological findings from the National Reference Centre through whole genome sequencing characterised both isolates as indistinguishable. Fifty-six close contacts were identified, offered chemoprophylaxis and two doses of menigococcal B vaccine.

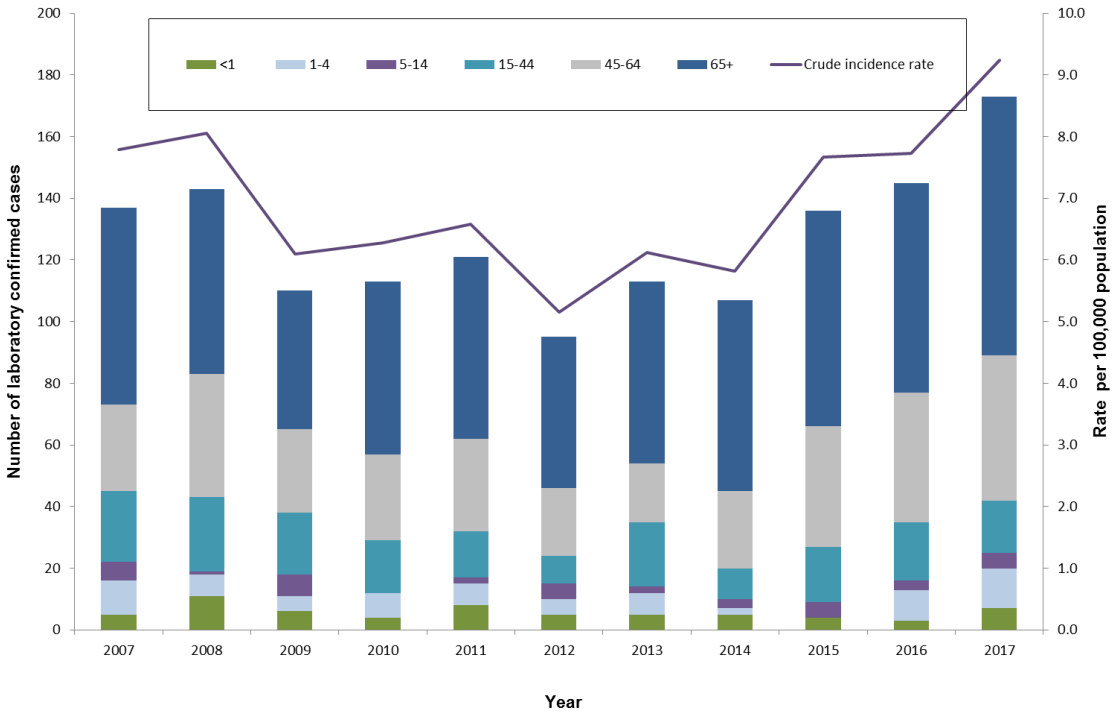
Pneumococcal disease

Pneumococcal disease is caused by the gram-positive bacterium *Streptococcus pneumoniae* (pneumococcus). It occurs throughout the world and is a major cause of morbidity and mortality globally. There are more than 90 different pneumococcal serotypes that can cause disease in humans. It is transmitted from person to person via droplet or aerosol spread. Humans are the only reservoir for infection and carriage of the bacteria in nasopharynx is a prerequisite for disease. Disease ranges from milder non-invasive infections, such as otitis media, sinusitis and bronchitis to severe Invasive Pneumococcal Disease (IPD) such as meningitis, septicaemia, pneumonia, empyema, arthritis and peritonitis. It particularly affects very young children, the elderly and people with impaired immunity. Pneumococcal vaccination programmes have reduced the incidence of disease from vaccine preventable strains. Recommendations for the pneumococcal vaccination have undergone a number of changes over the years.

Epidemiological situation

There were 172 laboratory confirmed cases of IPD; crude incidence rate 9.24 per 100,000 population. This is higher than the number of cases reported in 2016 (144) and consistent with an upward trend since 2012 (Figure 4).

Figure 4. Laboratory confirmed cases of Invasive Streptococcus Pneumoniae by age group, 2007-2017, Northern Ireland



Source: Regional CoSurv Laboratory System

Age

As with previous years, cases predominantly affect the older age groups: 83 cases were over 65 years of age (48.5%), 47 aged 45 to 65 years (27.0%), 17 aged 15 to 44 years (9.8%); 5 aged 5-14 years (3.0%) and 13 under 5 years (7.5%) of which 7 were under 1 years of age (4.0%) (Figure 4).

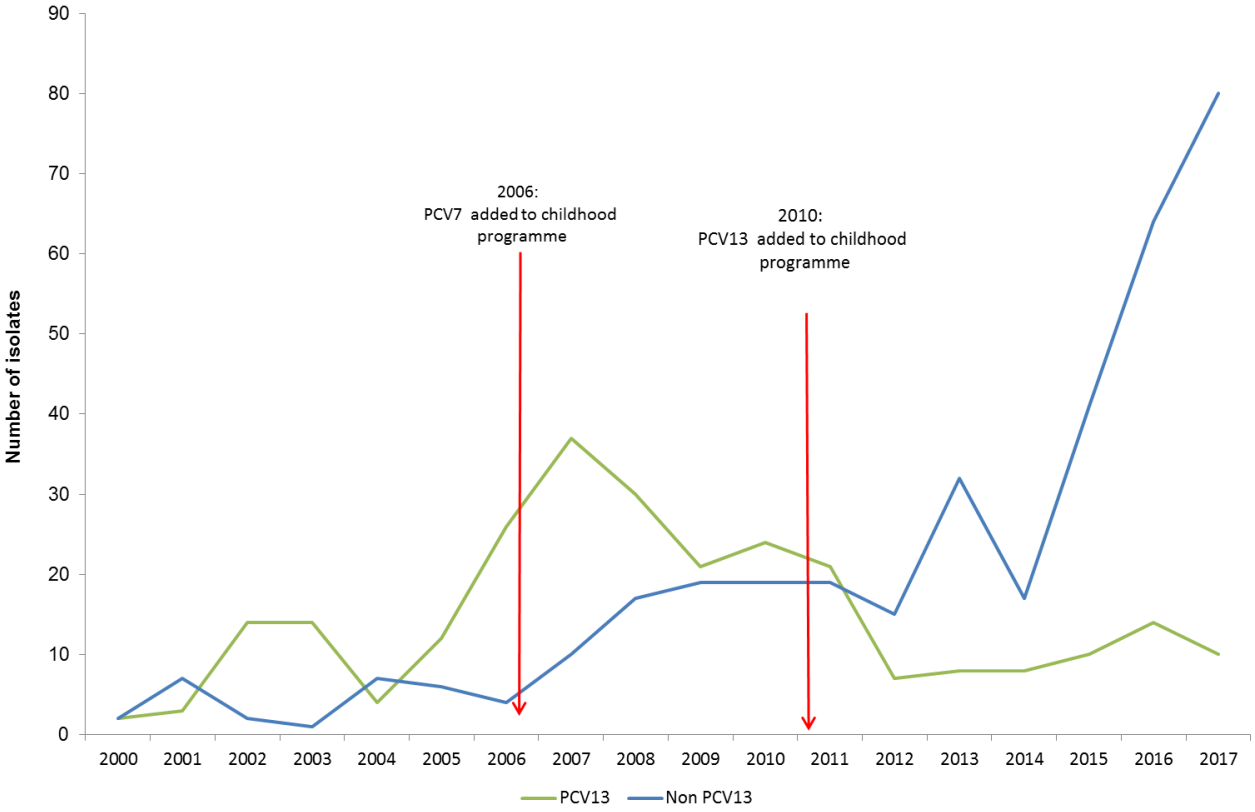
Serotypes

Typing information was available for 52% (90) of cases. Of these cases, the most common serotypes reported were 8, 19A and 3. Ten (11.1%) were caused by one of the vaccine-preventable strains contained in the pneumococcal vaccine offered in the routine childhood programme at 2 and 4 months of age (pneumococcal conjugate vaccine 13 (PCV13)), of which seven were over 65 years of age.

Since introduction of the pneumococcal vaccine into the routine childhood programme, the number of cases from PCV13 serotypes has declined, with further reductions observed 2010. In contrast the number of cases from non-PCV13 strains

has increased, particularly since 2012 (Figure 5). This is consistent across the UK and national surveillance systems are monitoring it carefully.

Figure 5. Laboratory confirmed cases of IPD by PCV/non-PCV serogroup, 2000-2017, Northern Ireland



Source: Regional CoSurv Laboratory System

Enhanced Surveillance in children under 5 years

Twenty confirmed cases (11.6%) were in children under 5 years of age. This is higher than the number of cases reported in 2016 (5) but lower than the number of annual cases before 2005. Where serotyping information was available (13), all but one case were non PCV 13 strains.

All were eligible for PCV13 vaccine; 50% (10) had received three doses of PCV13 and 80% (16) were appropriately vaccinated for their age. Where information was available (10/19), 5 presented with septicaemia, two with meningitis and three with pneumonia and septicaemia. There was one death. Nine of the cases had no clinical risk factors for invasive pneumococcal disease.

Haemophilus Influenzae

Haemophilus influenzae (Hi) is a gram-negative bacterium carried asymptomatically in the nasopharynx. There are two major categorises: encapsulated and non-encapsulated. Encapsulated strains are classified by their capsular antigens where there are six recognised serotypes: a, b, c, d, e, f. The non-encapsulated are non-typeable (NTHi) because of the absence of a capsule. Acquisition most commonly results from asymptomatic carriers. Individuals may transfer the organism to close contacts though airborne or droplet spread by coughing and sneezing.

Before the introduction of the vaccination, the most prevalent strain was HiB. Disease caused by HiB can cause severe life-threatening disease in healthy individuals and is a major global cause of childhood meningitis, pneumonia, epiglottitis, septicaemia, cellulitis, osteomyelitis and septic arthritis. NTHi strains rarely cause disease outside the respiratory tract, ranging from non-invasive diseases such as otitis media, conjunctivitis, sinusitis, to pneumonia with systemic upset.

Epidemiological situation

There were 31 laboratory confirmed cases of invasive Hi disease; crude incidence rate 1.7 per 100,000 population. This is twice the number of confirmed cases in 2016 (15). Between 2007 and 2016, there has been no discernible trend with the annual number of cases a mean of 15 (10-24) (Table 1).

Age

The largest proportion of cases occurred in those over 65 years of age (14; 45%) followed by 15-44 years (5; 16%), 45-64 years (4; 13%), under 1 year (5; 16%), 1-4 years (2; 6%) and 5-14 years (1; 3%).

Serotypes

Typing information was available for 55% (17) of cases. Of these, the majority (70.6%) were NTHi, as well as one case of HiB, three HiF and one HiE (Table 1).

HiB infections have remained constantly low highlighting the success of the Hib vaccine. The increased reporting of non-b and NTHi strains over the years may be partly explained by better case ascertainment.

Table 1. Invasive Haemophilus Influenzae cases by serotype, 2007-2017, Northern Ireland

Year	Serotype B	Serotype E	Serotype F	Non-capsulated	Untyped	Total
2007	2	0	0	1	12	**15**
2008	0	1	1	3	8	**13**
2009	1	1	0	7	3	**12**
2010	3	1	0	5	10	**19**
2011	1	0	0	8	15	**24**
2012	0	0	1	7	4	**12**
2013	0	0	1	6	3	**10**
2014	1	0	0	4	8	**13**
2015	0	0	0	6	12	**18**
2016	0	0	2	5	8	**15**
2017	1	1	3	12	14	**31**
Total	**9**	**4**	**8**	**64**	**97**	**182**

Source: Regional CoSurv Laboratory System

*Untyped means that the isolate was not sent to the Reference Lab

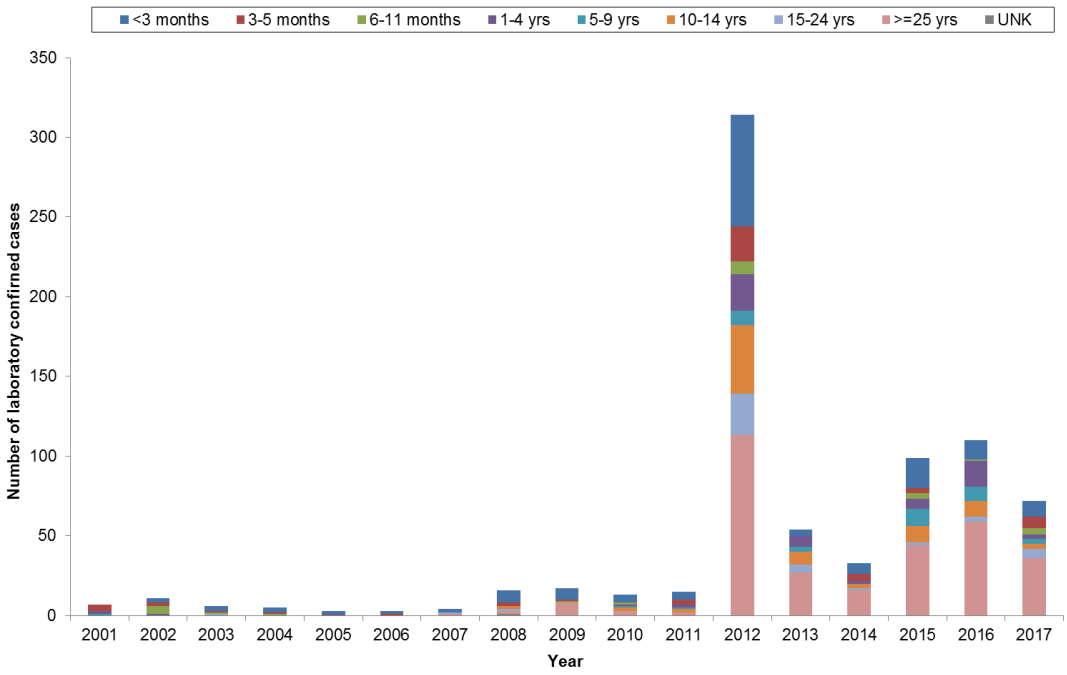
Pertussis (whooping cough)

Pertussis (whooping cough) is caused by the *Bordetella pertussis* bacterium. It is an acute respiratory disease that can cause serious and life-threatening complications, including pneumonia, apnoea and seizures. Severe complications and deaths occur mostly in infants under 6 months of age. Adolescents and adults usually suffer a milder disease with a cough that may persist for many weeks.

Epidemiological situation

There were 72 laboratory confirmed cases of pertussis. This is a 35% decrease from 2016 (110). Prior to 2012, the mean annual number of cases was 9 (3-17). In 2012, cases peaked to 314, consistent with the rest of the UK and when a national outbreak was declared. Since 2012 the mean number of cases has remained higher than the pre-outbreak baseline at 74 (33-110) (Figure 6).

Figure 6. Laboratory confirmed cases of Pertussis by age group, 2001-2017, Northern Ireland



Source: Regional CoSurv Laboratory System/ Pertussis Enhanced Surveillance System

Age

The greatest number of cases was in those aged over 25 years (50%; 36/72), followed by <6 months of age (32%; 23/72), followed by the 1-4 years, 5-9 years and 10-14 years all had 3 cases (4%). Of those under three months, 60% were born to mothers who had not received the pertussis vaccine during pregnancy.

Measles

Measles disease is caused by a morbillivirus of the paramyxovirus family. It can affect people of all ages but infants less than one year are at increased risk of complications and death. It typically causes fever, malaise, conjunctivitis, cough, coryza and Koplik spots followed by a widespread maculopapular rash. Complications occur in around 1 in 15 notified cases and include otitis media, pneumonia, convulsions, encephalitis and death. A rare complication of measles is subacute sclerosing panencephalitis (SSPE), a fatal degenerative neurological disorder. The case fatality ratio is approximately one death per 5,000 cases, highest in children under one year.

The measles virus is transmitted from person to person by respiratory droplet. It is very infectious, with one case having the potential to infect another 12-18 individuals in susceptible populations. Measles cases are infectious in the four to five days before rash onset and the four days after.

Throughout 2017, European Union (EU) Member States reported 14,451 cases of measles with outbreaks in Romania (5,560 cases), Italy (5,004 cases), Greece (967 cases) and Germany (929 cases). A number of outbreaks also occurred in England at the end of the year[8].

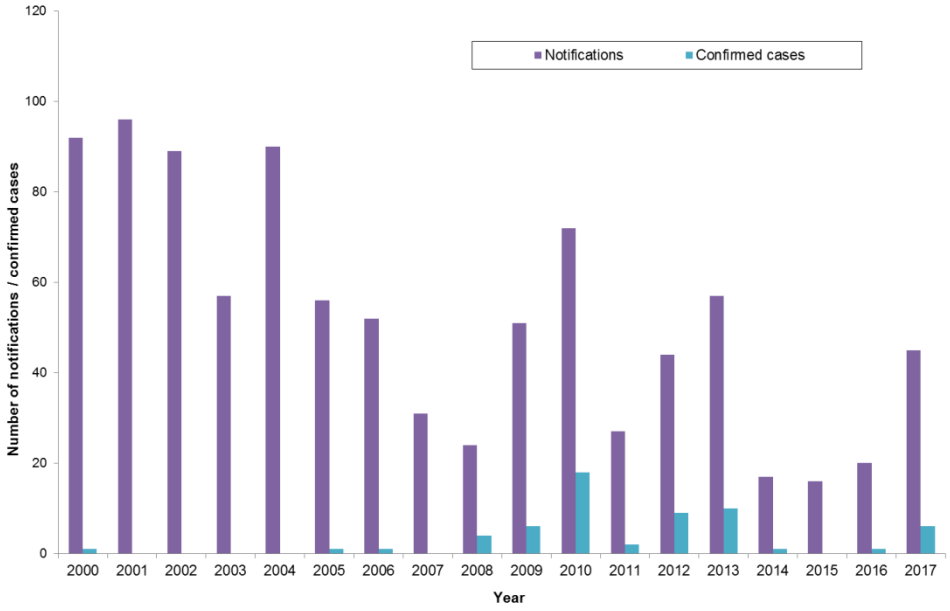
Epidemiological situation

There were 45 notifications of clinically suspected measles, of which six were laboratory confirmed, one epidemiologically linked to a confirmed case and 38 discarded as measles.

Five of the confirmed cases and one probable case were epidemiologically linked in time, person and place to an imported case from Romania, where there is an ongoing outbreak. One confirmed case met the World Health Organisation (WHO) definition of an imported case; associated with travel to Malaysia where there was a known outbreak at the time.

Both notifications and confirmed cases increased compared to 2016 (due to the outbreak); however overall there has been a downward trend since 2000 (Figure 7).

Figure 7. Notifications and laboratory confirmed cases of Measles, 2000-2017, Northern Ireland



Source: Measles Enhanced Surveillance System and HPZone

Age

Confirmed and probable cases were seen in adults and children. The median age of cases was 13 years, ranging from 9 months to 33 years. The age distribution of measles cases has been variable for the past four years but the majority of cases are in unvaccinated children and young adults.

Serotype

Isolates from five cases were identified as genotype B3. Phylogenetic analysis showed that the cases were identical to each other and to the strain associated with the outbreak in Romania. The isolate from one case was identified as genotype D9, which was associated with an outbreak in Malaysia.

Outbreak

Five confirmed and one epidemiologically linked case was identified between June and July. The median age of cases was 13 years; three were female. They originated from United Kingdom, Romania and Zimbabwe. All were unvaccinated. An outbreak control team investigated and managed the outbreak.

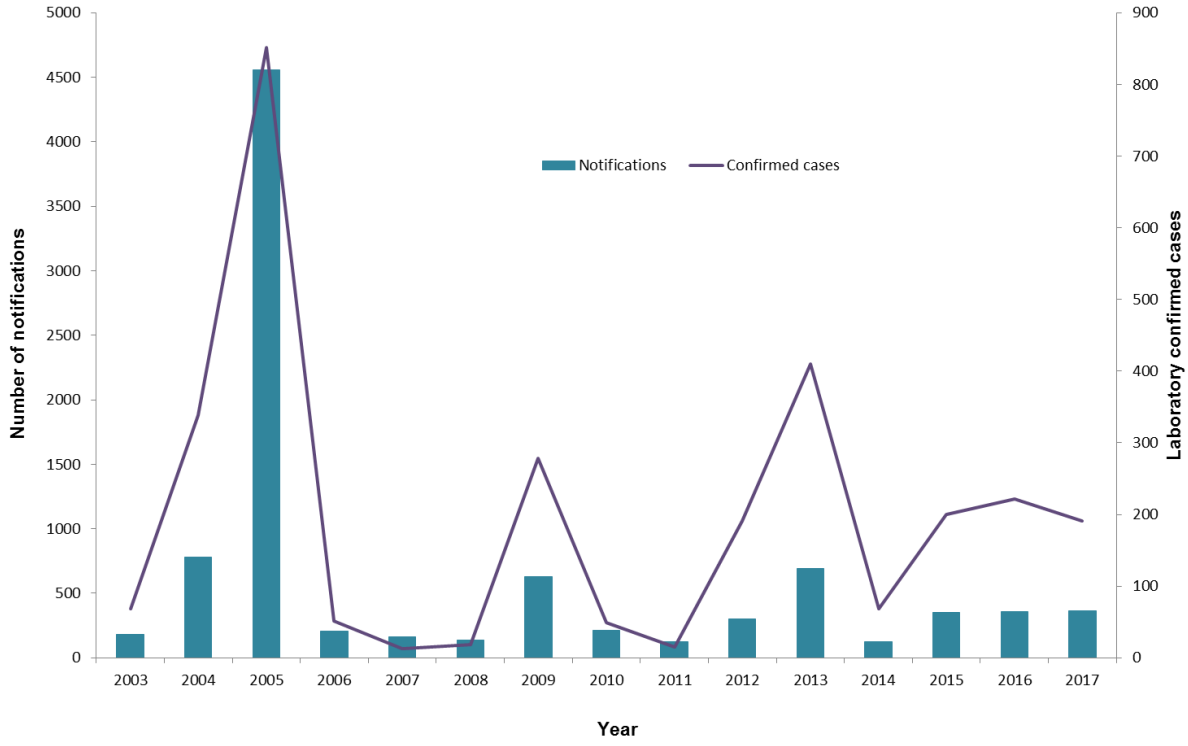
Mumps

Mumps disease is caused by the mumps virus. The disease is characterised by parotitis, fever, headache and lymphadenopathy. Infection can lead to serious complications, including aseptic meningitis, encephalitis, orchitis, pancreatitis, oophoritis and permanent deafness. Neurological involvement can also occur. Orchitis is the most common complication of mumps in adult males. Person to person transmission occurs by respiratory droplets with cases infectious from around 6-7 days before the onset of parotitis until 9 days after. However, infected individuals with no apparent clinical symptoms can also transmit the virus.

Epidemiological situation in 2017

There were 191 laboratory confirmed cases of mumps, which is a 14% decrease compared to 2016 (222). Since 2004, there has been a persistent increase in annual cases, regionally and across the UK, with the number cases peaking at 850 in 2005 (Figure 8).

Figure 8. Notifications and laboratory confirmed cases of Mumps, 2003-2017, Northern Ireland

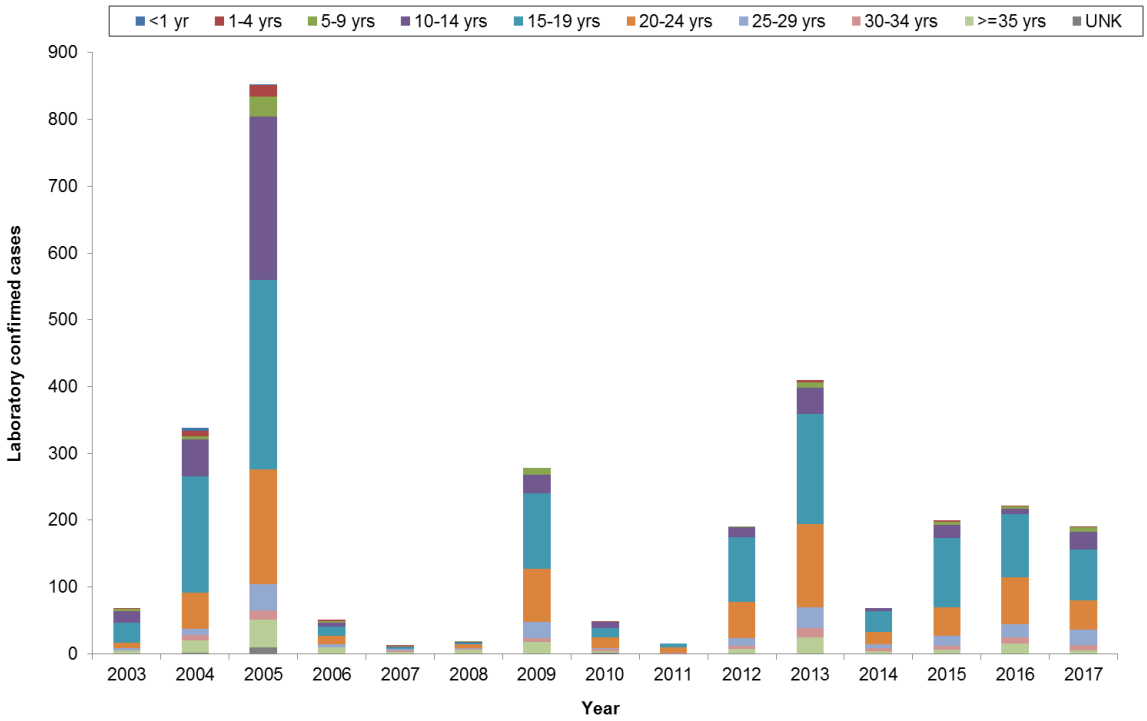


Source: Mumps Enhanced Surveillance System and HPZone
NB: Two different scales used

Age

The majority of cases were 15-24 years (63%; 120/191) (Figure 9). The majority of cases (92%) had received two doses of MMR vaccine. This and the observed increase in cases may represent waning immunity within the fully and/or partially vaccinated population.

Figure 9. Laboratory confirmed cases of Mumps, by age group, 2003-2017, Northern Ireland



Source: Mumps Enhanced Surveillance System and HPZone
Note: salivary antibody testing for mumps ceased in May 2010

Rubella (German Measles)

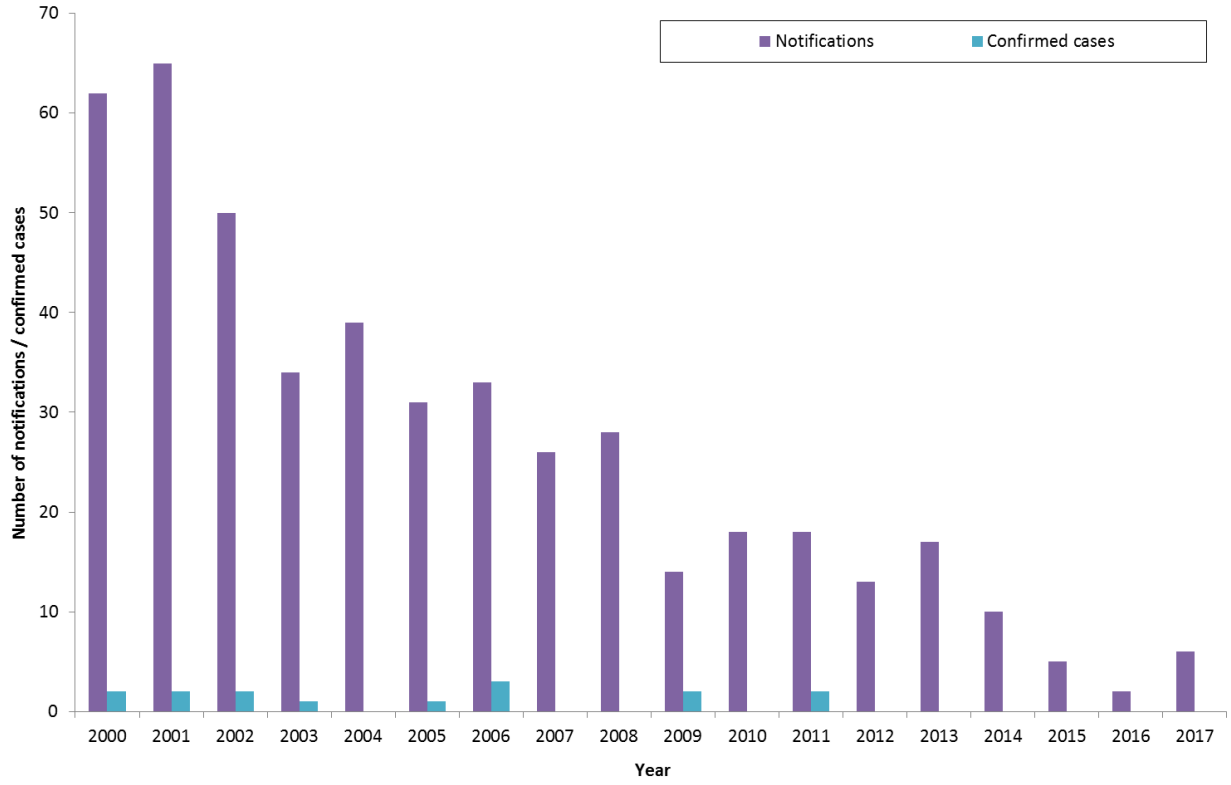
Rubella is an acute infection caused by rubella virus. It is generally a mild illness, but can have devastating affects if acquired by women in the first 16 weeks of pregnancy, leading to congenital rubella syndrome in the unborn baby. The infection may begin with a prodromal illness. Occipital and post-auricular lymphadenopathy may also occur before onset of an erythematous rash. Complications include thrombocytopenia, arthritis and arthralgia in adults, especially women, and encephalitis.

The disease is spread by droplet transmission from person to person. Cases are considered infectious from one week before the start of symptoms and are most infectious in one to five days after the onset of the rash.

Epidemiological situation

There were five clinically suspected notifications of rubella but no laboratory confirmed cases. Since 2012, there have been no laboratory confirmed cases of rubella and the number of notifications has been declining over time (Figure 10).

Figure 10. Notifications and laboratory confirmed cases of Rubella, 2000-2017, Northern Ireland



Source: Rubella Enhanced Surveillance System and HPZone

Diphtheria

Diphtheria is an infection caused by diphtheria toxin produced by gram-positive toxigenic bacterium *Corynebacterium diptheriae*. It occurs throughout the world and is a major cause of morbidity and mortality globally. Incidence has fallen dramatically since introduction of diphtheria vaccine into the childhood programme. However, it continues to cause high mortality in some parts of the world associated with outbreaks. It is an acute disease that affects the upper respiratory tract and occasionally the skin. The infection is transmitted from person to person via droplet or aerosol spread with humans the only reservoir for infection.

Epidemiological situation

One clinically suspected notification of diphtheria associated with travel but excluded after laboratory testing. Following the introduction of vaccine into the routine childhood programme, the incidence of disease has fallen dramatically with no cases in Northern Ireland in recent times.

Tetanus

Tetanus is a rare disease caused by a neurotoxin produced during infection with *Clostridium tetani*. The disease is characterised by rigidity and spasm of muscles, with the jaw usually affected (lockjaw) before becoming more generalised. The case-fatality ratio can range from 10%-90% with it being higher in the young and elderly.

C. tetani are common environmental bacteria and can form spores which are highly resistant to heat and freezing. They are present in soil and manure and commonly enter the body through a wound, burn, puncture or scratch. Tetanus cannot be transmitted from person to person.

Epidemiological situation

No clinically suspected notifications or laboratory confirmed cases reported. Since introduction of vaccination, the incidence of disease has fallen dramatically with no cases in Northern Ireland in recent times.

Poliomyelitis (Polio)

Poliomyelitis is an acute illness caused by the poliovirus. There are three serotypes of the virus: 1, 2, 3. Transmission occurs through contact with the faeces or pharyngeal secretions of infected individuals who can excrete virus for up to 6 weeks in faeces and two weeks in saliva. The virus infects and replicates in the gastrointestinal tract before spreading through the body to susceptible tissues or rarely the central nervous system. The majority of infections cause no clinical symptoms but there is a range of symptoms, from fever to aseptic meningitis or paralysis. Gastrointestinal symptoms, malaise, stiffness of the neck and back and headache can also occur, with or without paralysis.

Epidemiological situation

Since introduction of vaccine, the incidence of disease has fallen dramatically with no cases in Northern Ireland in recent times.

Conclusions

The burden of disease from vaccine-preventable diseases overall is low in Northern Ireland, which is undoubtedly due to the success of national vaccination programmes that continue to experience high levels of uptake across the region.

However, the small outbreak of measles that occurred this year, along with outbreaks elsewhere in the UK and wider Europe show that the risk of imported measles remains. This serves as a reminder of the importance of maintaining high vaccine uptake, and focusing efforts to ensure uptake is increased in the harder to reach groups of the population.

This annual report highlights the importance of surveillance systems that are sensitive enough to show the changing epidemiology of vaccine-preventable diseases that occurs when vaccine programmes are introduced or changed. For example, whilst the introduction of pneumococcal conjugate vaccines into the routine childhood schedule has reduced the all age incidence of invasive pneumococcal disase (IPD) from strains contained within the vaccine, an increase in IPD from nonvaccine strains has increased (known as 'serotype replacement'), particularly in older age groups. This highlights the importance of our surveillance systems being able to provide useful information on circulating serotypes of VPDs through collaboration between PHA, HSC Trust Laboratories and the National Reference Centres.

Priorities for 2018

1. The PHA Immunisation Team is conducting qualitative research to better understand the views and barriers to vaccinations within the Roma community
2. The PHA immunisation plans to conduct an audit of laboratory testing for vaccine-preventable diseases across the region

Sources of further information

The most useful resource for health professionals is the on-line version of The Green Book, which contains the most up-to-date information on immunisation.

Name	Link
Immunisation against Infectious Diseases ("The Green Book")	https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book
Public Health Agency Immunisation page	http://pha.site/immunisationvaccine-preventable-diseases
Public Health England Immunisation page	https://www.gov.uk/government/collections/immunisation
Chief Medical Officer (CMO) letters (Northern Ireland)	https://www.health-ni.gov.uk/publications/letters-and-urgent-communications-2017
Country Specific Vaccine schedules	http://apps.who.int/immunization_monitoring/globalsummary/schedules
Vaccination of individuals with uncertain or incomplete immunisation status	https://www.gov.uk/government/publications/vaccination-of-individuals-with-uncertain-or-incomplete-immunisation-status
Public Health Agency Publications	http://www.publichealth.hscni.net/publications

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