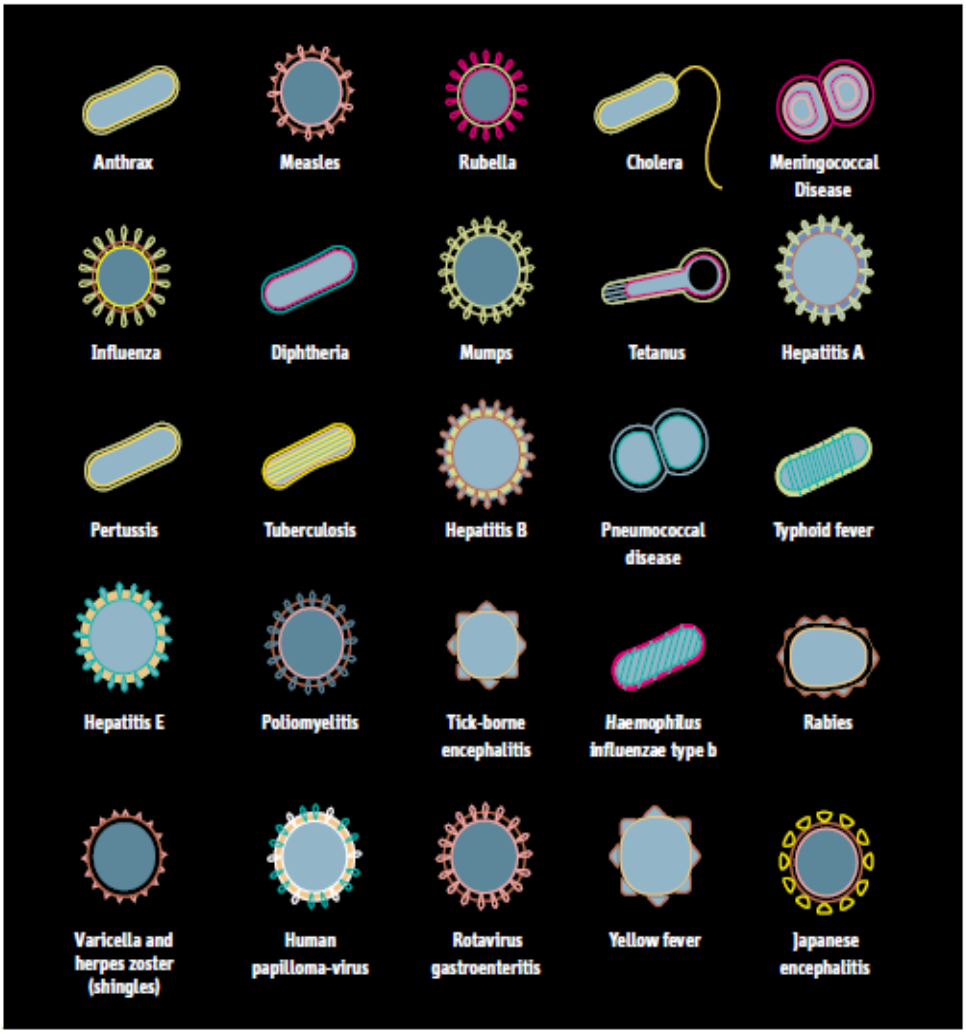
Annual Immunisation and Vaccine Preventable Diseases Report for Northern Ireland

2016-17



HSC Public Health Agency

Acknowledgements

The Public Health Agency immunisation team would like to thank everyone who works so hard across Northern Ireland to ensure that the population is protected against vaccine preventable diseases by maintaining high vaccine coverage. This includes health visitors, school health teams, GPs, practice nurses, treatment room nurses, midwives, Genitourinary Medicine (GUM) staff, Trust occupational health staff, Northern Ireland Child Health teams and PHA communications team.

We are grateful to all those who contributed to the uptake data in this report including Northern Ireland Child Health System teams, school health teams and surveillance colleagues Joy Murphy, Ruth Campbell, Cathriona Kearns and Monica Sloan.

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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- For the year 2016-17 uptake of three doses of DTaP/IPV/Hib vaccine by 12 months of age was 97.0% in Northern Ireland, which is a slight decrease from the previous year, but still above the 95% target level
- Uptake of one dose of MMR vaccine by 2 years of age was 94.9%. This is a decrease from last year and just below the 95% target level
- Uptake of two doses of MMR by 5 years of age was 92.8% and has been generally increasing since 2013, but is still below the 95% target level
- By the end of school year 10, 89.6% of girls had completed a course of HPV vaccine, a slight decrease from 90.7% in 2015-16
- By the end of school year 12 in 2017, 94.1% of young people had received two doses of MMR vaccine, 85.7% had received a booster of Td/IPV vaccine and 86.5% had received the new meningococcal ACWY vaccine
- For the year 2016-17, 46% of 70 year olds received the shingles vaccine and 45.4% of 78 year olds. This is a further decrease of 6.2% from the previous year, but eligible people continue to be immunised in subsequent years
- In October 2016, a three dose HPV vaccine programme for men who have sex with men (MSM) under 46 years of age commenced across GUM clinics. Provisional data for the first year shows that 65.2% of MSM up to 46 years of age have had at least one dose of the HPV vaccine, 35.7% at least two doses and 11.2% have completed the course

- In September 2017 a new combined vaccine containing protection against hepatitis B was added to the primary immunisation schedule for babies at 2, 3 and 4 months of age

Vaccine Preventable Diseases for 2016

- Thirty-three cases of meningococcal disease were notified to PHA, with 20 cases (61%) laboratory confirmed
- 40% of laboratory confirmed cases were caused by serogroup B, followed by 30% serogroup W135, 20% serogroup C and 10% serogroup Y
- The proportion of serogroup B cases have halved between 2014 and 2016 since introduction of the Men B vaccine
- There were 144 cases of invasive pneumococcal disease, with 76% occurring in those over 45 years of age, and the majority of these over 65 years. The majority of cases were due to serogroups not included in the vaccines
- There were 15 cases of invasive haemophilus influenza disease but no cases of Haemophilus Influenzae B (Hib)
- Pertussis cases increased to 110 cases from 99 cases in 2015, but this is still fewer than in 2012 (314). The majority are in those over 25 years of age
- There was one confirmed case of measles, unvaccinated and associated with an outbreak at a mass gathering event in England
- Mumps cases increased to 222 cases from 200 cases in 2015, which is still a decrease from 2013. The majority of cases are adolescents and young adults, of which over 90% received two doses of MMR vaccination

Priorities for Improvement

- PHA will continue to work with GP, health visitor and Child Health Information System colleagues to gain a greater understanding of the variation of pre-school immunisation uptake across Northern Ireland and work together to improve coverage, particularly where this is currently below 95%
- PHA will work with Child Health Information System to investigate in more detail the MMR coverage of children in Northern Ireland and work towards a coverage of 95% receiving two MMR vaccines for all children
- PHA will work with school health and communications colleagues to improve the uptake of HPV vaccine for 2017-18
- PHA will work with GP colleagues to gain a greater understanding of the decline in shingles uptake and work to improve the uptake for 2017-18
- PHA will work with the Northern Ireland Maternity Administrative System (NIMATS) to introduce data extraction on vaccination uptake for vaccinations given in pregnancy
- PHA is carrying out a qualitative study with individuals from the Roma community to better understand the knowledge, attitudes and barriers to vaccinations

Introduction

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.”[1] 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.

Immunisation policy for Northern Ireland is set by the Department of Health, on advice from the independent Joint Committee for Vaccines and Immunisation (JCVI). This committee regularly reviews the epidemiology of vaccine preventable diseases (VPDs) in the UK and makes recommendations on the introduction of new programmes in response to changes in disease incidence and the likely cost-effectiveness of vaccination programmes. The UK has a very comprehensive vaccine programme, free at the point of delivery for those eligible by virtue of age or risk group status.

Northern Ireland has implemented all JCVI recommendations and has some of the highest immunisation uptakes worldwide. This has undoubtedly contributed to a reduction in the burden of communicable diseases in Northern Ireland.

Though vaccine coverage is high overall, health inequalities mean that some groups of people and some areas in Northern Ireland are less likely than others to be vaccinated. The PHA immunisation team is committed to working towards the WHO vision where individuals and communities enjoy lives free from VPDs by maintaining and improving uptake rates of all immunisations.

The 2016-17 Northern Ireland Vaccination Report includes information on the vaccine coverage in each of the programmes and information on the epidemiology of VPDs. Data in each section is provided at different time points in the year depending on the programme:

- Immunisation coverage information is presented for the financial year April 2016 - March 2017 for childhood immunisations up to the age of 5, in line with national COVER statistic reporting

- Data for immunisations provided in schools and the shingles vaccine is presented from September 2016 - August 2017 in line with the delivery of those programmes. Information on influenza immunisations has been published elsewhere, in the Surveillance of Influenza in Northern Ireland 2016-17 report[2]
- This year, epidemiological information on vaccine preventable diseases is presented for the calendar year 2016.

The Routine Childhood Immunisation Schedule in Northern Ireland from October 2017

When to immunise	Diseases vaccine protects against	How it is given
2 months old	Diphtheria, tetanus, pertussis (whooping cough), polio, Hib and hepatitis B	One injection
	Pneumococcal infection	One injection
	Rotavirus	Orally
	Meningococcal B infection	One injection
3 months old	Diphtheria, tetanus, pertussis, polio, Hib and Hepatitis B	One injection
	Rotavirus	Orally
4 months old	Diphtheria, tetanus, pertussis, polio, Hib and hepatitis B	One injection
	Pneumococcal infection	One injection
	Meningococcal B infection	One injection
Just after the first birthday	Measles, mumps and rubella	One injection
	Pneumococcal infection	One injection
	Hib and meningococcal C infection	One injection
	Meningococcal B infection	One injection
Every year from 2 years old up to P7	Influenza	Nasal spray or injection
3 years and 4 months old	Diphtheria, tetanus, pertussis and polio	One injection
	Measles, mumps and rubella	One injection
Girls 12 to 13 years old	Cervical cancer caused by human papillomavirus types 16 and 18 and genital warts caused by types 6 and 11	Two or three injections over six months
14 to 18 years old	Tetanus, diphtheria and polio	One injection
	Meningococcal ACWY	One injection

Targeted Childhood Immunisations

When to immunise	Diseases vaccine protects against	Vaccine given
At birth, 1 month old and 12 months old	Hepatitis B	Hepatitis B vaccine
At birth	Tuberculosis	BCG
Six months up to two years	Influenza	Inactivated flu vaccine
11 to less than 18 years	Influenza	Flu nasal spray or inactivated flu vaccine

(For children assessed as being at risk of these conditions)

Routine Immunisation Schedule for Adults

When to immunise	Diseases vaccine protects against	Vaccine given
Age 65 years	Pneumococcal Disease	PPV-23
Annually from age 65 years	Influenza	Inactivated flu vaccine
Age 70 years	Shingles	Zostavax ®

Targeted Adult Immunisations

Who to immunise	Diseases vaccine protects against	Vaccine given
Risk groups described in annual CMO letter	Influenza	Inactivated flu vaccine
Risk groups described in Green Book	Pneumococcal Disease	PPV-23
Pregnant women from 16th gestational week	Pertussis (Whooping Cough) in newborn	Boostrix-IPV ®

Men who have sex with men, aged ≤45 years who attend GUM clinics	Anal, throat and penile cancer caused by human papillomavirus types 16 and 18 and genital warts caused by types 6 and 11	Gardasil ®
All adults born since 1970 with no history of two doses of MMR vaccine	Measles, mumps and rubella	MMR vaccine
Catch-up cohorts published annually	Shingles	Zostavax ®

Uptake and Coverage in Childhood Immunisation Programmes

Immunisations up to 12 months of age

In 2016-17, the immunisation schedule for all babies was a course of primary immunisations at the ages of 2, 3, and 4 months to protect against diphtheria, tetanus, polio, pertussis, *Haemophilus influenza* type B (DTaP/IPV/Hib), pneumococcal disease (PCV), rotavirus, and meningococcal group B. The rotavirus vaccine schedule must be completed by 24 weeks of age, whereas all the other immunisations can be given later if a child has missed them at the scheduled time. This explains why the rotavirus vaccine uptake is slightly lower than the other vaccines given under 12 months of age. The uptake of primary immunisations in Northern Ireland is consistently equal to or higher than other areas of the UK. However, there is variation of uptake by local commissioning group (LCG) area, with uptake 1-2% lower in Belfast than other areas (Table 1).

Table 1. Completed primary immunisations by 12 months of age, 2016-17, Northern Ireland and UK

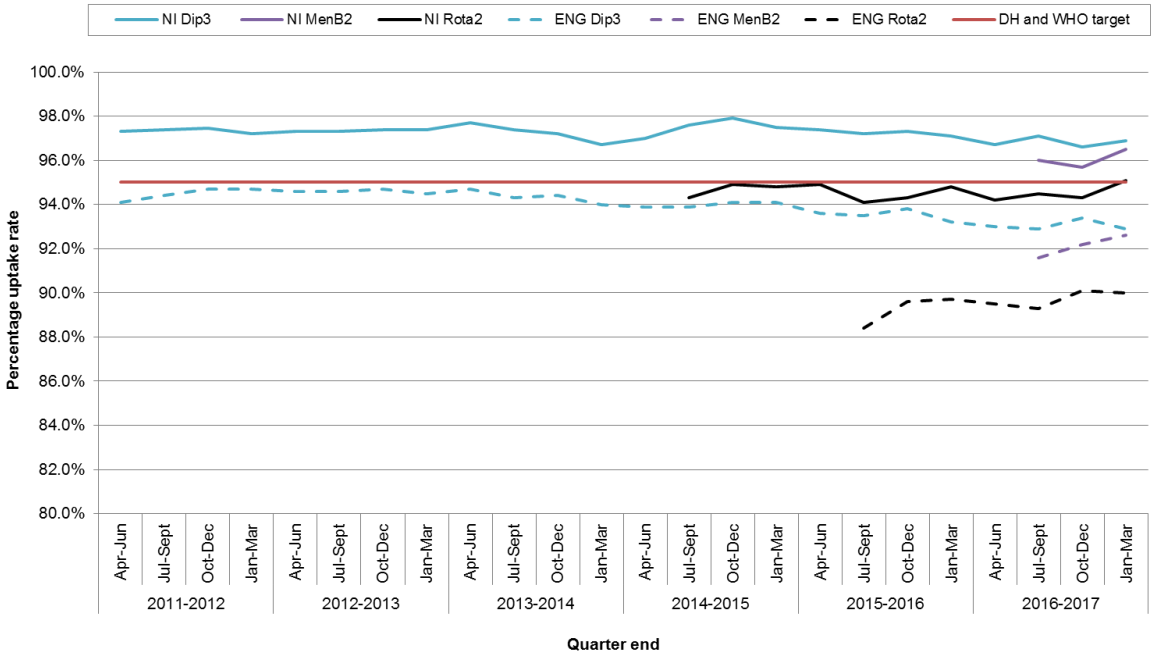
Area	% vaccinated at 12 months		
	DTaP / IPV / Hib3	PCV2	Rota2
Belfast	94.8%	94.8%	93.2%
South Eastern	97.1%	97.1%	94.6%
Northern	97.8%	97.7%	95.1%
Southern	97.6%	97.5%	94.8%
Western	97.5%	97.6%	94.1%
NI Total	**97.0%**	**97.0%**	**94.4%**
England	93.4%	93.5%	89.6%
Scotland	96.8%	96.8%	93.1%
Wales	96.3%	96.2%	94.1%

Source: Quarterly COVER returns (Northern Ireland Child Health System and PHE)

Only three quarters of data are so far available for the uptake of two doses of the new meningococcal group B vaccine by the age of one, however, uptake is around 96%. This is very similar to the uptake of other vaccines given at this age and shows

that parents have welcomed this addition to the immunisation programme. Full year's data will be reported in next year's report.

Figure 1. Diphtheria, Meningococcal B and Rotavirus vaccination uptake rates at 12 months of age, April 2011 – March 2017, Northern Ireland and England



Source: Quarterly COVER returns (Northern Ireland Child Health System and PHE)

Immunisations up to 24 months of age

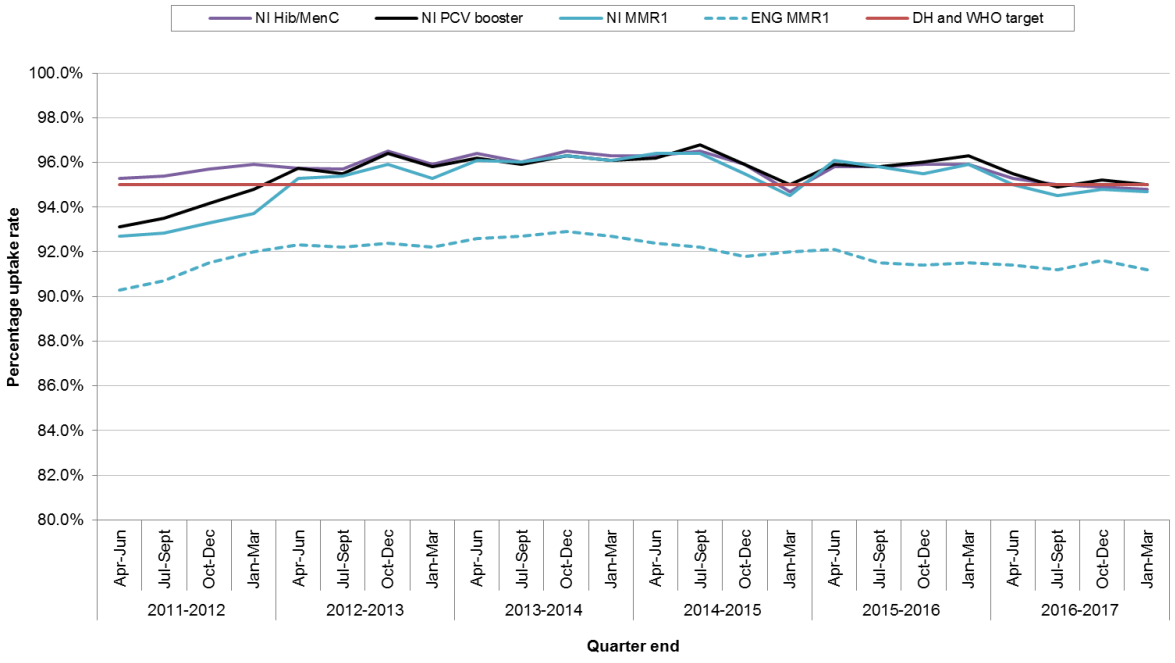
Infants are offered immunisations just after their first birthday to protect against measles, mumps and rubella (MMR), pneumococcal disease (PCV), meningococcal group C and *haemophilus influenza type B* (Hib/MenC). Uptake of these immunisations is measured at their second birthday. Uptake rates of all immunisations at 24 months for 2016-17 (Table 2) are above the 95% target, with the exception of a slight dip for MMR1 to 94.9% and they are higher than the uptake across the other parts of the UK. Again, uptake of vaccines at 24 months is lower in Belfast LCG area than the other LCG areas and falls below 95% for all immunisations given just after the first birthday. Since 2012-13 uptake of MMR has closely mirrored that of all the other immunisations given just after the first birthday showing that parents are now choosing for their children to receive all the vaccines offered at this visit.

Table 2. Completed primary immunisations by 24 months of age, 2016-17, Northern Ireland and UK

Area	% vaccinated at 24 months			
	DTaP / IPV / Hib3	PCV Booster	Hib/MenC	MMR1
Belfast	96.1%	91.1%	90.7%	91.1%
South Eastern	98.0%	95.5%	95.5%	95.0%
Northern	98.3%	96.1%	96.0%	95.7%
Southern	98.3%	95.8%	95.9%	96.2%
Western	98.5%	96.5%	96.4%	95.9%
NI Total	**97.9%**	**95.1%**	**95.0%**	**94.9%**
England	95.1%	91.5%	91.5%	91.6%
Scotland	97.7%	94.9%	95.0%	94.9%
Wales	97.0%	95.4%	94.5%	95.1%

Source: Quarterly COVER returns (Northern Ireland Child Health System and PHE)

Figure 2. Haemophilus Influenzae type B and Meningococcal group C, Pneumococcal and MMR1 vaccination uptake rates at 24 months of age, April 2011 – March 2017, Northern Ireland and England



Source: Quarterly COVER returns (Northern Ireland Child Health System and PHE)

Immunisations up to five years of age

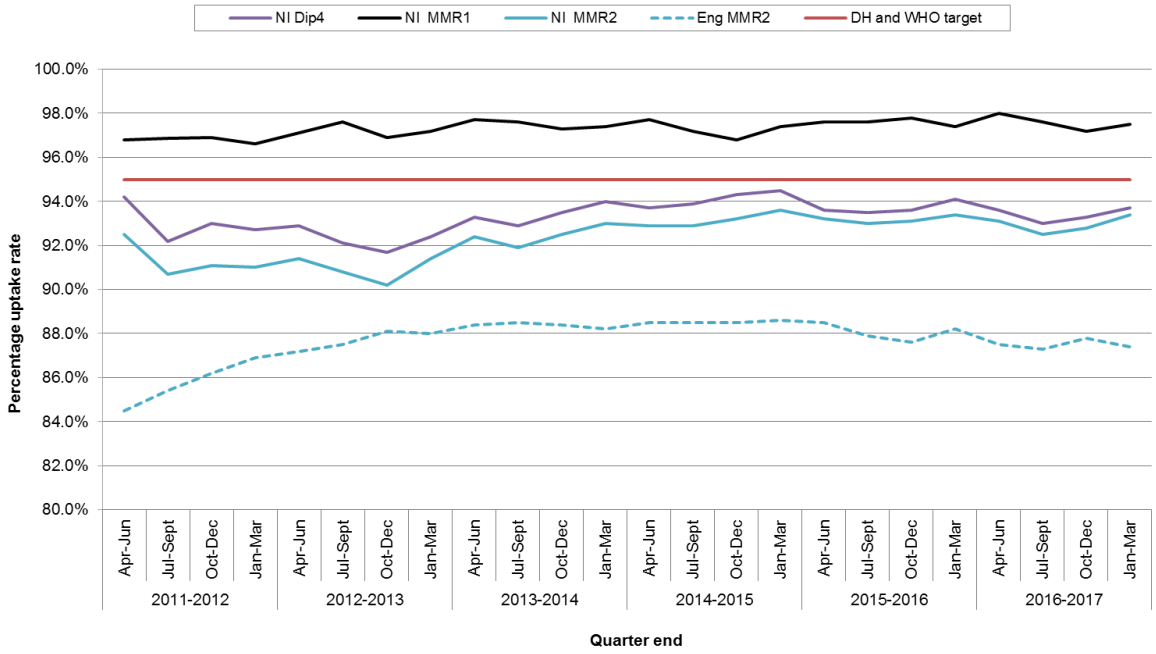
Children are offered “pre-school booster” immunisations from the age of 3 years and 4 months, providing a fourth dose booster of protection against diphtheria, tetanus, polio and pertussis (DTaP/IPV) and a second dose of MMR vaccine. Uptake of these vaccines is measured at their fifth birthday. Uptake of booster immunisations for MMR and DTaP/IPV measured at 5 years show that this is below 95% for 2016-17. As was the case at 12 months and 24 months, uptake in the Belfast area is lower than the other LCG areas. Uptake of MMR2 is below the 95% target needed to ensure that the spread of measles outbreaks can be contained through herd immunity, making improving MMR2 uptake an important goal.

Table 3. Completed primary immunisations and boosters by 5 years of age, 2016-17, Northern Ireland and UK

Area	% vaccinated at 5 years			
	DTaP/IPV/Hib3	MMR1	MMR2	DTaP/IPV booster
Belfast	96.4%	96.3%	88.3%	88.2%
South Eastern	98.2%	97.6%	93.2%	93.9%
Northern	98.3%	97.7%	94.4%	95.2%
Southern	97.6%	97.5%	93.3%	93.6%
Western	97.7%	98.2%	94.5%	95.1%
NI Total	**97.7%**	**97.4%**	**92.8%**	**93.3%**
England	95.6%	95.0%	87.6%	86.2%
Scotland	98.0%	96.9%	92.9%	93.4%
Wales	94.8%	96.7%	90.3%	92.5%

Source: Quarterly COVER returns (Northern Ireland Child Health System and PHE)

Figure 3. Diphtheria and MMR vaccination uptake rates at 5 years of age, April 2011 – March 2017, Northern Ireland and England,



Source: Quarterly COVER returns (Northern Ireland Child Health System and PHE)

Work to Improve Uptake of Pre-School Immunisations

In 2017, PHA worked with Health and Social Care Board and Child Health System (CHS) colleagues to produce data for each GP practice on their uptake of pre-school immunisations. This was sent to all practices along with a sheet explaining how practices can work with the CHS to ensure that all eligible children are called in a timely way for the immunisations that they are due.

PHA plan to contact some of the practices with lower uptake to see if any additional help can be provided to them to improve their systems. The uptake letter will now also be produced on an annual basis to assist all practices to review their uptake.

Teenage immunisations

Human Papilloma Virus (HPV)

In 2008, the Human Papilloma Virus (HPV) vaccine was introduced for girls aged 12-13 years old, with a catch-up campaign for girls up to 18 years old. The HPV vaccine offers protection against types 16 and 18 of the virus which together cause up to

70% of cervical cancers, as well as protection against types 6 and 11 of the virus which cause genital warts. The programme is delivered routinely in schools with vaccines given in year 9 and then opportunities provided in school to catch-up on missing doses in year 10.

The uptake of a completed course by the end of year 9 has fallen somewhat since a maximum in 2012, but due to further clinics being offered in year 10, nearly 90% of girls had completed the course by the end of year 10 in June 2017 (Table 4, Figure 4).

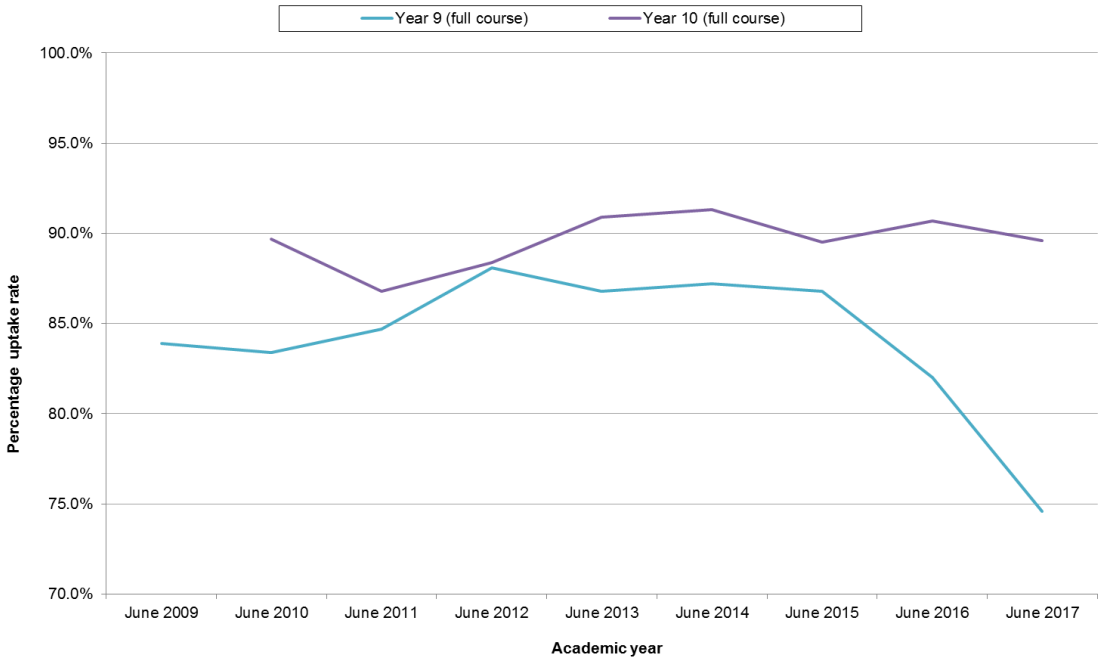
Disappointingly there was a continued decrease in uptake of the HPV vaccine in year 9 for the academic year 2016-17. PHA are investigating the reason for this decrease. These girls are offered the chance to be immunised in year 10 and PHA are working with communications colleagues and school health to improve the uptake for the 2017-18 campaign.

Table 4. HPV vaccination uptake rates, year 9 and 10 girls completing full course, 2009-17, Northern Ireland

	Year 9 (full course)	Year 10 (full course)
June 2009	83.9%	
June 2010	83.4%	89.7%
June 2011	84.7%	86.8%
June 2012	88.1%	88.4%
June 2013	86.8%	90.9%
June 2014	87.2%	91.3%
June 2015	86.8%	89.5%
June 2016	82.0%	90.7%
June 2017	74.6%	89.6%

Source: Northern Ireland Child Health System

Figure 4. HPV vaccination uptake rates, year 9 and 10 girls completing full course, 2009-17, Northern Ireland



Source: Northern Ireland Child Health System

Diphtheria, Tetanus and Polio booster

In year 11, school health teams offer a booster vaccine to all young people against diphtheria, tetanus and polio (Td/IPV), commonly known as the "school leaver booster". For most young people this will be the fifth and final dose that they require. At this visit, school health also offer MMR to any children who have not yet received two doses to ensure that they complete the recommended course. There is a further opportunity to receive the Td/IPV and MMR vaccines in year 12 for those who have not yet completed the course. Eighty-five percent of pupils received the school leaver booster by the end of year 12 (Table 5). Pupils who have not received this vaccine from school health can request it from their GP. The target for uptake of two doses of MMR is 95% as this is the level required to contain the spread of measles in the community. It is very encouraging to note that even though the level of two doses of MMR is below this level at five years of age, by the end of year 12 the population coverage for two doses of MMR has increased to 94.1%.

Table 5. Annual school leaver booster vaccine coverage, 2016-17, Northern Ireland

Area	Year 11 % vaccinated	Year 12 % vaccinated
Belfast	79.6%	85.1%
South Eastern	75.2%	83.1%
Northern	80.3%	86.8%
Southern	81.3%	89.0%
Western	72.9%	82.8%
NI Total	**78.4%**	**85.7%**

Source: Northern Ireland Child Health System

Table 6. Annual MMR2 vaccine coverage, 2016-17, Northern Ireland

Area	Year 12 % vaccinated
Belfast	93.0%
South Eastern	92.4%
Northern	95.1%
Southern	94.4%
Western	95.2%
NI Total	**94.1%**

Source: Northern Ireland Child Health System

Meningococcal ACWY vaccine

The meningococcal ACWY (Men ACWY) vaccine programme was introduced in the UK in August 2015 in response to an outbreak of meningococcal group W disease across the UK. Teenagers aged 14-18 years and university "freshers" were chosen as the target group for immunisation. For operational reasons the programme was introduced in a phased way. All young people with dates of birth between 02/07/96-01/07/99 were offered immunisations by their GP, and children in year 11 and 12 were offered immunisation by school health. All young people in the eligible age range but who have not yet been immunised can request this from their GP up to the age of 25 years.

The Men ACWY vaccine is now provided routinely to young people in schools in year 11 with the school leaver booster and MMR, with an opportunity to catch up in year 12. By the end of year 12 in 2016-17, 86.5% of young people were immunised with the Men ACWY vaccine, which is an increase of 12.4% from the previous year.

Table 7. Coverage of Men ACWY for year 11 and 12, September 2017, Northern Ireland

Area	Year 11 (DOB 02/07/01 - 01/07/02) % vaccinated	Year 12 (DOB 02/07/00 - 01/07/01) % vaccinated
Belfast	81.3%	85.5%
South Eastern	74.7%	83.6%
Northern	80.2%	86.8%
Southern	81.4%	89.1%
Western	74.8%	86.7%
NI Total	**79.0%**	**86.5%**

Source: Northern Ireland Child Health System and HSCB

Uptake and Coverage in Targeted Childhood Immunisation Programmes

Hepatitis B vaccine to babies born to hepatitis B positive mothers

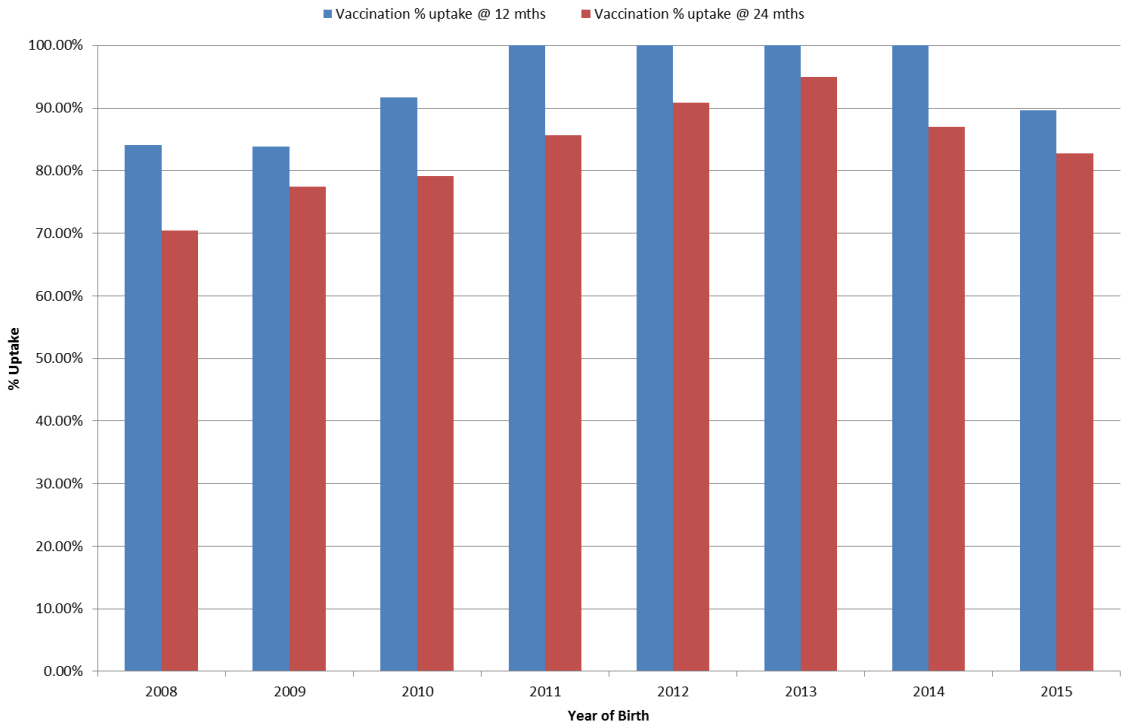
Hepatitis B is a virus that mainly affects the liver and is transmitted by blood and bodily fluids. From August 2017, hepatitis B vaccine has been added to the universal primary immunisation schedule at 2, 3 and 4 months of age.

A selective hepatitis B immunisation programme is also delivered to protect those thought to be at high risk of contracting the infection. One group offered the hepatitis B vaccine are babies born to hepatitis B positive mothers. This is because hepatitis B can pass from mother to baby during pregnancy, birth or early life and without intervention about 90% will develop chronic hepatitis B infection which can lead to liver cirrhosis and liver cancer.

All pregnant women in Northern Ireland are offered testing for hepatitis B as part of their antenatal care and if found to be hepatitis B positive, their babies are offered post exposure hepatitis B immunisation to prevent mother to child transmission at or around the time of birth. Babies born before August 2017 receive the vaccine at birth, 1, 2 and 12 months of age. Following introduction of hepatitis B to the childhood schedule (August 2017), babies born to mothers that are hepatitis B positive will also receive extra doses at birth, 1 and 12 months.

Numbers of babies born to hepatitis B positive women are small in Northern Ireland, with a mean of 36 (25-48) cases occurring annually. Figure 5 shows by calendar year of birth, the uptake of the first three doses by the baby's first birthday and for the first four doses by the baby's second birthday. Since 2011 all babies born to hepatitis B positive mothers have received three doses of vaccine by their first birthday and since 2012 over 90% have received four doses by their second birthday. Some of the lower uptake in the second year of life is attributed to families moving out of Northern Ireland.

Figure 5. Hepatitis B vaccine uptake at 12 and 24 months for babies born to hepatitis B positive mothers, 2008-15, Northern Ireland



Source: Northern Ireland Child Health System

Uptake and Coverage in Routine Adult Immunisation Programmes

Shingles vaccine

The shingles vaccine programme for older adults was introduced in September 2013 following recommendation by JCVI in 2010 and a Northern Ireland policy outlined in HSS(MD) 27/2013.[3,4]

The programme has been offered to people aged 70 years on 1 September each year, with catch-up cohorts planned so that all people who were aged in their 70s when the programme started on 1 September 2013 will be offered the vaccine over time (Table 8). Individuals who were previously eligible but did not take up the vaccine can still get vaccinated until they are aged 80 years on 1 September of the current catch-up programme year.

Table 8. Eligible cohorts for the Shingles vaccine (age on 1 September of each year)

Time Period	Routine Cohort	Catch-up Cohort	Still Eligible
1 Sept 2013-31 Aug 2014	70 years	79 years	NA
1 Sept 2014-31 Aug 2015	70 years	78 and 79 years	71 years
1 Sept 2015-31 Aug 2016	70 years	78 years	71, 72 and 79 years
1 Sept 2016-31 Aug 2017	70 years	78 years	71, 72, 73 and 79 years
1 Sept 2017-31 Aug 2017	70 years	78 years	71, 72, 73, 74, 79 years

Source: Apollo Information System

Uptake of the vaccine is estimated using the Apollo information system to count the number of vaccinated people and the eligible population recorded in primary care information systems. The reporting year for shingles is taken from 1 September to 31 October the following year.

Since the programme began shingles vaccine uptake has been between 50% and 57% in the two main cohorts, with a further 5% to 7% taking up the vaccine in the year after they became eligible (Table 9). Disappointingly, in 2016-17, uptake in the

eligible ages (70 and 78 years) were both slightly lower than the previous year, 46.0% and 45.4% respectively. This fall is consistent with elsewhere in the UK. Planning for the 2017-18 cycle is underway and PHA is looking at ways to improve the uptake.

Table 9. Estimated Shingles vaccine uptake, 2013-14 to 2016-17, Northern Ireland

Time period		Age on 1 September (years)			
	70	71	72	78	79
1 Sept 2013 - 31 Aug 2014	52.5%	NA	NA	NA	49.7%
1 Sept 2014 - 31 Aug 2015	56.8%	4.8%	NA	54.4%	54.4%
1 Sept 2015 - 31 Aug 2016	52.2%	5.6%	NA	50.3%	6.6%
1 Sep 2016 - 31 Aug 2017	46.0%	5.5%	3.1%	45.4%	6.0%

Source: Apollo Information System

Pneumococcal Polysaccharide Vaccine (PPV)

Two pneumococcal vaccinations are available the pneumococcal conjugate vaccine (PCV) and pneumococcal polysaccharide vaccine (PPV). The PPV vaccine provides protection for 23 strains of pneumococcal disease and is offered to all of those over 65 years of age and those under 65 years with clinical risk factors.

Uptake of the vaccine is estimated for those over 65 years and 75 years of age using the Apollo information system to count the number of vaccinated people and the eligible population recorded in primary care information systems. GP practices generally offer the vaccine at the same time as the influenza and shingles vaccine at the start of the flu season.

Information from General Practice information systems indicates that from 1 September 71.2% of 65 to 74 year-olds and 91.5% of those aged 75 years or greater have ever received PPV.

Uptake and Coverage in Targeted Adult Immunisation Programmes

Pertussis (whooping cough) vaccine in pregnant women

In October 2012 the pertussis vaccine in pregnancy programme commenced as an emergency response to a national outbreak and was offered between 28 and 32 weeks gestation. The vaccine programme has continued since then and since May 2016 is offered from 16 weeks of gestation until delivery.

Recording uptake of vaccines for a pregnant cohort is difficult because of the changing number of pregnant women. Prior to August 2017 there has been no source of data available to allow accurate uptake rate of pertussis vaccine in pregnancy to be calculated. Uptake was estimated by the number of *pertussis vaccine in pregnancy* administration fees claimed for by GPs and the number of live births in the same time period (Table 10). In 2016, 18,164 vaccines were claimed by GPs. This is higher than in previous years and likely to be because the vaccine was offered at an earlier stage in pregnancy thus enabling more women to receive it. In addition, claims do not represent when the vaccination was delivered. The annual estimate for 2016 (75.4%) is likely to be an overestimation.

Table 10. Number of Pertussis vaccine administrative claims and live births, 2013-16, Northern Ireland

Year	No. vaccines claimed by GP practices	Number of live births	Estimated uptake
2013	14,131	24,277 (2013)	58.2%
2014	14,025	24,394 (2014)	57.5%
2015	15,046	24,215 (2015)	62.1%
2016	18,164	24,076 (2016)	75.4%

Source: HSCB administrative claims by GP; Annual report of Registrar General

This year the PHA immunisation team is working with HSCB/PHA maternity service commissioners to introduce recording pertussis and influenza vaccine on to the Northern Ireland Maternity Administrative System (NIMATS). NIMATS is a regional electronic information system that records maternal and neonatal information at the

time of delivery. Next year accurate uptake of pertussis vaccination should be available for all pregnant women delivering after 24 weeks gestation.

HPV vaccine in MSM aged up to 46 years who attend GUM clinics

In 2008 the girls' HPV vaccine programme was introduced across the UK. Studies have shown that, in addition to directly protecting females, the vaccine induces herd protection, which provides protection to boys when there is high vaccine coverage in girls. However, while the girls' programme confers indirect protection to heterosexual males, MSM receive little benefit from it. Evidence suggests that 80-85% of anal cancers, 36% of oropharyngeal and 50% of penile cancer are linked to HPV infection. In November 2015, the JCVI advised a targeted HPV vaccination programme with a course of three doses for MSM aged up to and including 45 years who attend GUM clinics.[5]

In October 2016, the HPV vaccine programme for MSM was offered across Northern Ireland. Three doses are offered preferably within one year, but up to two years. Anonymised data is extracted from the GUM clinic Genito-Urinary Medical Clinic Activity Dataset (GUMCAD) to estimate the number of vaccines delivered and number of MSM up to 46 years attending a clinic.

For this year's annual report, provisional data has been presented for the first year of the programme from 1 October 2016 to 30 September 2017 (Table 11). The table shows that 65.2% of MSM up to 46 years of age have had at least one dose of the HPV vaccine. There are limitations to these figures. Not all clinics started offering the vaccine on 1 October. Uptake figures are dependent on accurate coding of vaccines by health professionals. The PHA is working with GUM clinics to validate the data.

Table 11. Uptake of HPV vaccine programme in MSM up to 46 years of age, 1 October 2016 - 30 September 2017, Northern Ireland

	Uptake of ≥ one dose	Uptake of ≥ two dose	Complete
2016/17*	65.2%	35.7%	11.2%

Source: GUMCAD

*provisional data

Epidemiology of Vaccine Preventable Diseases in Northern Ireland

This section of the report presents epidemiological data on vaccine preventable diseases (VPD) where there are regional vaccination programmes. VPD surveillance data is used to monitor the burden and impact of the disease and evaluate and test the effectiveness of the vaccine programmes.

This report includes information on VPDs highlighted below. Epidemiological information on the other diseases can be found in the disease specific surveillance reports.[2,6,7,8,9] This year data has been presented for the 2016 calendar year.

Bacterial VPDs	**Viral VPDs**
Meningococcal Disease*	***Measles****
Invasive Pneumococcal Disease*	***Rubella****
Haemophilus Influenza*	***Mumps****
Pertussis*	***Polio****
Diphtheria*	Varicella
Tetanus*	HPV
Tuberculosis	Influenza
	Hepatitis B
	Rotavirus

*VPDs included in this report

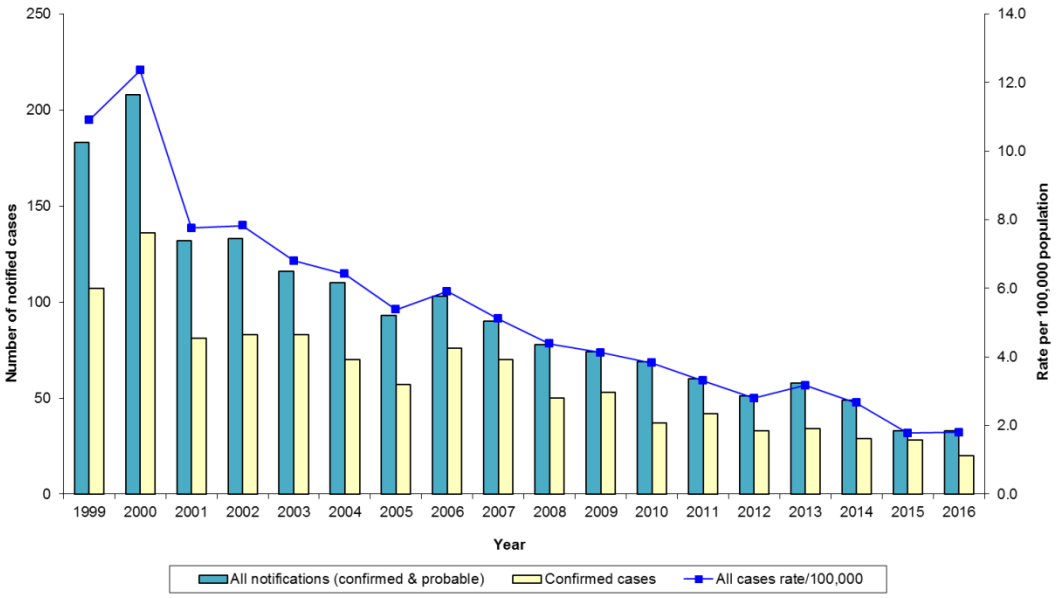
Meningococcal disease

Meningococcal disease is notifiable across the UK. The PHA Health Protection Duty Room is notified of all suspected cases. Enhanced Surveillance of Meningococcal Disease (ESMD) was first implemented in Northern Ireland in 1999 to monitor known and suspected cases of invasive meningococcal disease (IMD). ESMD is based on notifications from clinicians, laboratory confirmed reports from local laboratories and the Public Health England Meningococcal Reference Unit in Manchester.

In 2016, 33 cases of IMD were notified to the duty room, of which 20 (61%) were laboratory confirmed cases. The rate of notification of IMD in Northern Ireland is

1.8/100,000 population. From 1999 to 2016 this rate has fallen by 83% from 10.9/100,000 population (Figure 6).

Figure 6. Number of notified and confirmed cases of IMD and overall rates per 100,000 population, 1999-2016, Northern Ireland

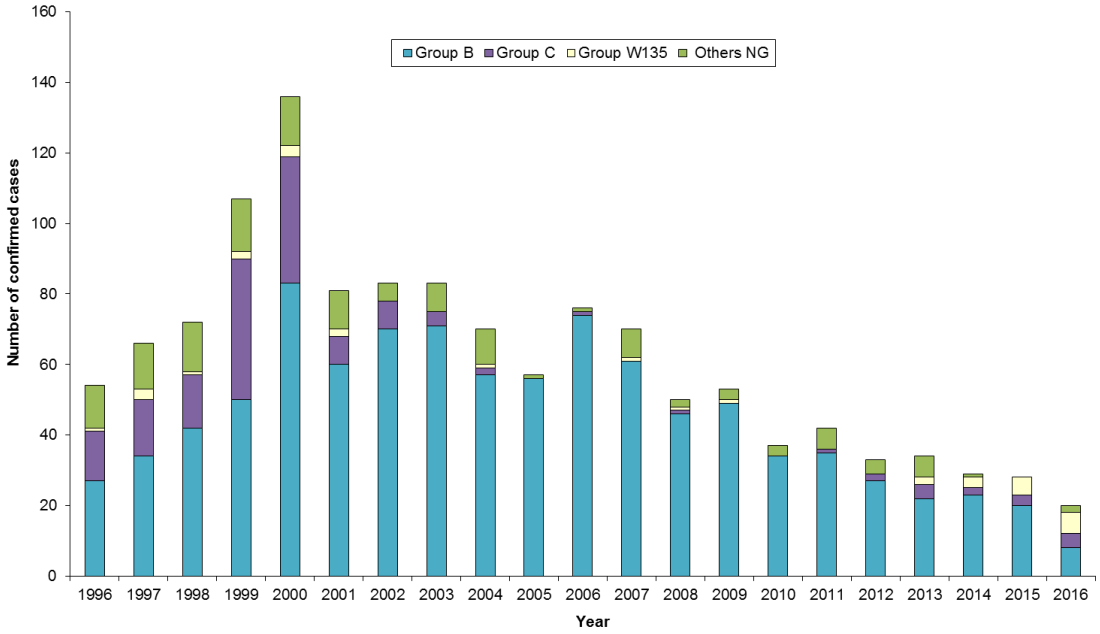


Source: Enhanced Surveillance of Meningococcal Disease (ESMD) in Northern Ireland

Laboratory confirmed cases were tested locally by Polymerase Chain Reaction (PCR) testing (45%; 9/20), culture of *N. meningitidis* (20%; 4/20) or PCR and culture (35%; 7/20).

In 2016, 40% (8/20) of confirmed cases were serogroup B, a further 6 serogroup W135, 4 serogroup C and 2 serogroup Y. Whilst serogroup B remains the most common serotype, the proportion of serotype B cases has halved from 79% in 2014, before the introduction of the meningococcal B vaccine programme in September 2015 (Figure 7). An increase in W135 cases has occurred across the UK over the past few years, including Northern Ireland, although the increase has been lower.

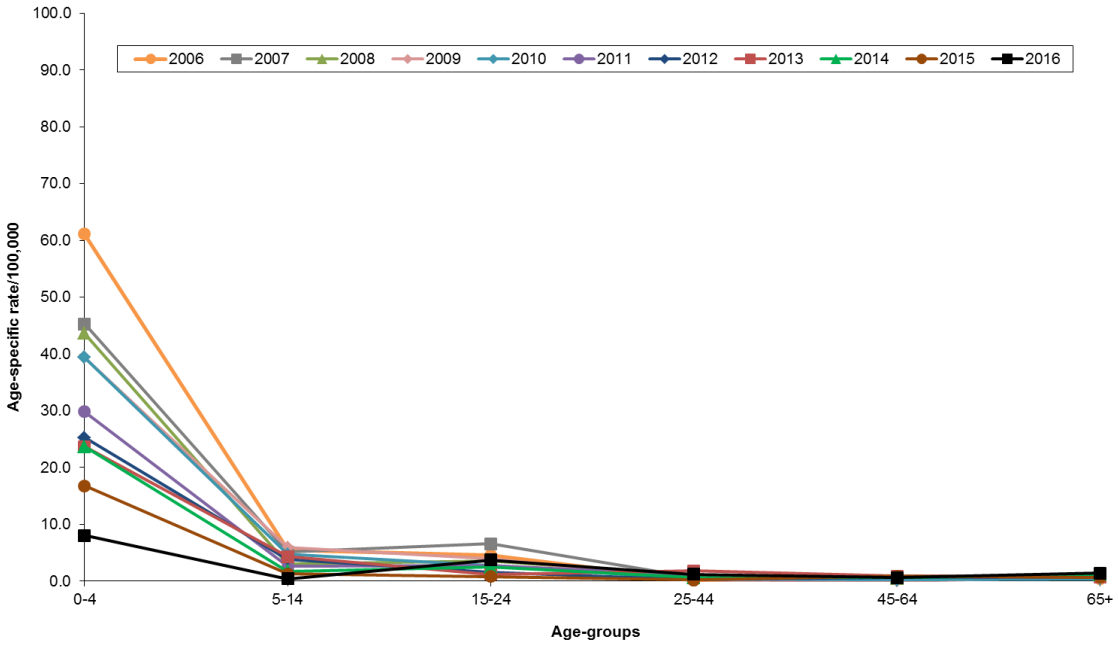
Figure 7. Laboratory confirmed cases of IMD by serogroup, 1996-2016, Northern Ireland



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

Consistent with previous years, age-specific incidence during 2016 was highest in infants and young children (Figure 8). Ages ranged from 2 months to 70 years with a median of 20 years. The rate of IMD has fallen in 2016 in those aged 0-4 years and is nearly 8 times lower when compared with the level in 2006.

Figure 8. Age-specific incidence rates of IMD, 2006-16, Northern Ireland



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

Of the 20 confirmed cases the average length of stay in hospital was 26 days (range 3-168 days). Four IMD associated deaths occurred in 2016, giving a case fatality ratio of 12% compared with 9% in 2015. One case was confirmed as serogroup C, one case serogroup Y, one case serogroup W135 and the other case was not laboratory confirmed.

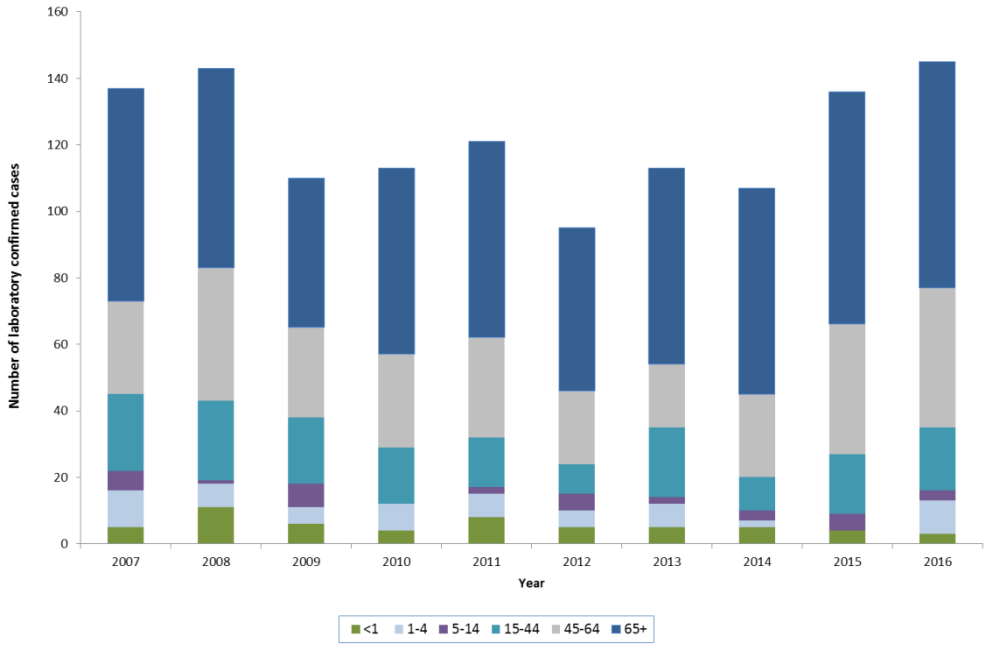
Pneumococcal disease

Invasive pneumococcal disease (IPD) is defined as pneumococcal infection of any usually sterile site. Clinical presentation includes meningitis, bacteraemia, empyema, arthritis and peritonitis. Surveillance is based on voluntary reports from clinicians, laboratory confirmed reports from local laboratories and serogroup characterisation by the Public Health England Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU).

During 2016, 144 confirmed cases of IPD were reported by local laboratories. The majority of cases were over 45 years of age (76.3%), with 47.2% of this group over 65 years of age. From 2000 reported IPD cases increased from 120 to a peak of 177

in 2003, before declining by 47% to 94 in 2012. Since 2012 there has been an upward trend again (Figure 9).

Figure 9. Laboratory confirmed cases of Invasive Streptococcus Pneumoniae by age group, 2007-16, Northern Ireland



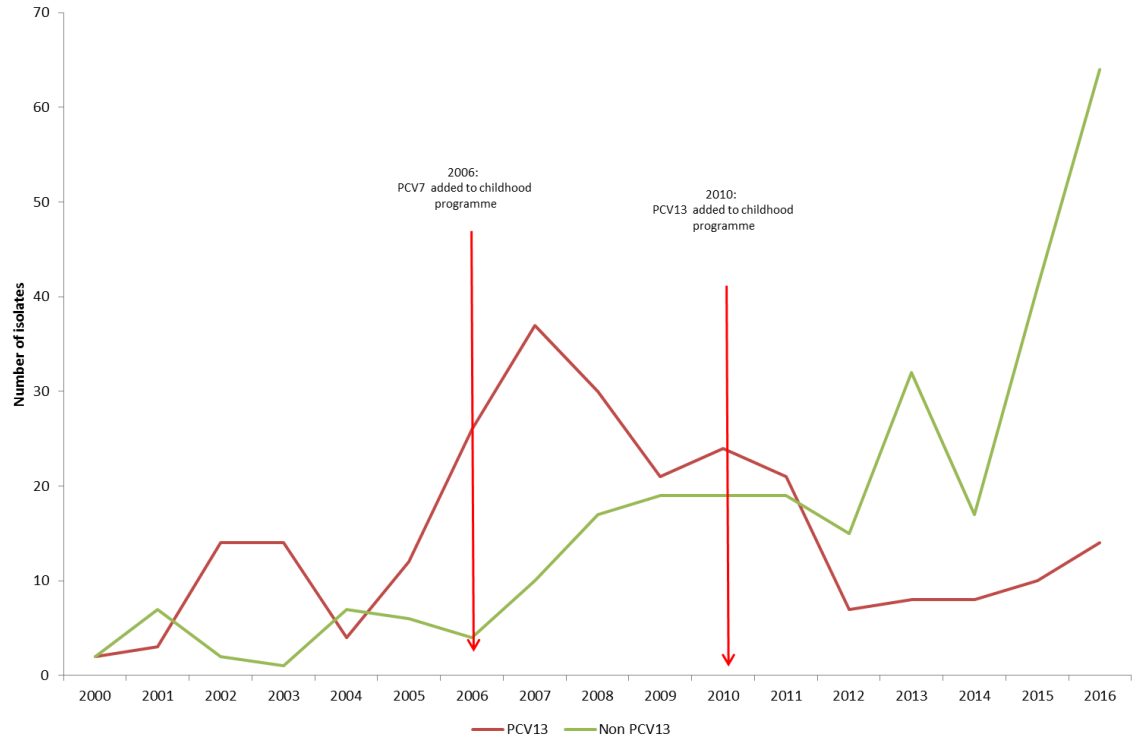
Source: Regional CoSurv Laboratory System

Pneumococcal isolates from cases under 5 years of age are referred to the reference unit for serogroup characterisation. Local laboratories may also voluntarily refer isolates from other cases. In 2016, 54% of isolates were sent to the reference laboratory and typed; 67% typed in those under 5 years of age, 50% in those 5-64 years and 56% in those over 65 years of age. This is in comparison to 2000 when only 3% of isolates were sent to the reference laboratory.

Recommendations for the pneumococcal vaccination have undergone a number of changes over the years. Since 2010, pneumococcal conjugate vaccine containing 13 serotypes (PCV13) has been offered as part of the childhood programme. Where serogroup characterisation is available, data has been broken down by the number of cases caused by PCV 13 serogroup and the number caused by non-PCV13 serogroup (Figure 10). In 2016, 82% (64/78) of IPD cases were caused by a non-PCV13 serogroup. Since 2000, the number of PCV13 serogroup cases increased to

a peak in 2007 before decreasing, with further reductions seen after 2010. In contrast the number of non-PCV13 cases has increased, particularly since 2012.

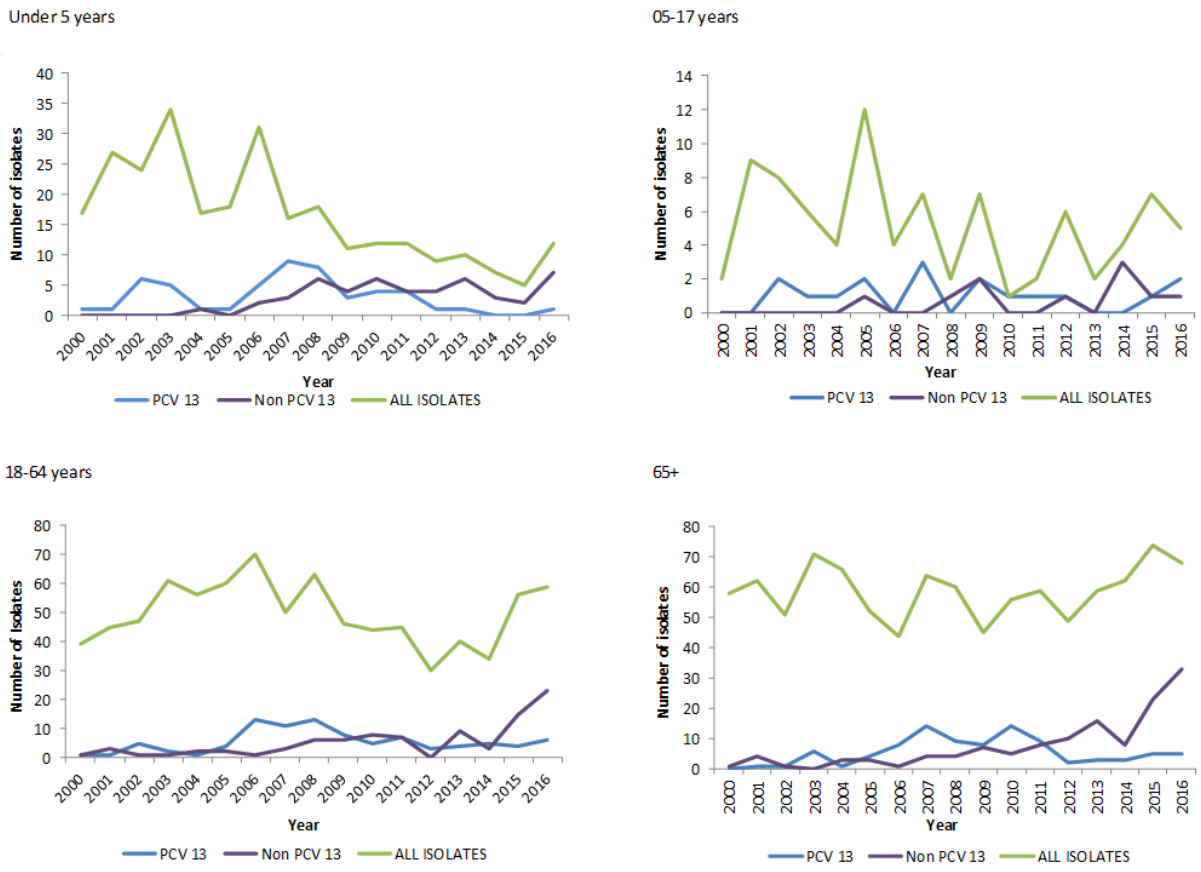
Figure 10. Laboratory confirmed cases of IPD by PCV/non-PCV serogroup, 2000-16, Northern Ireland



Source: CoSurv

The following four figures outline the same information according to age groups: under 5 years of age, 5-17 years; 18-64 year and over 65 years of age. IPD cases in those under 5 years of age have reduced dramatically, with PCV13 cases accounting for very little IPD disease. IPD cases in the other three age groups also fell to some degree. However, since 2013, there is an indication that cases are increasing, as a result of non-PCV serogroup type. This is consistent across the UK and national surveillance systems are monitoring it carefully.

Figure 11. Laboratory confirmed cases of IPD by PCV/non-PCV serogroup, by age group, 2000-16, Northern Ireland



Source: CoSurv

Haemophilus Influenzae

Haemophilus Influenzae can cause serious invasive disease. Before the introduction of vaccination, type b (Hib) was the prevalent strain. Hib meningitis was one of the most common causes of meningitis in those under 5 years of age. The disease was rare in children under three months of age, rising during the first year, before declining steadily to four years of age after which infection was uncommon.

Surveillance of haemophilus influenza is based on reports from clinicians, laboratory confirmed reports from local laboratories and serogroup characterisation by the Public Health England Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU). Enhanced surveillance is carried out for invasive haemophilus disease on those under 10 years and all haemophilus influenzae b infections.

During 2016, there were 15 confirmed cases of invasive haemophilus influenza disease. Since 2007 there has been no discernible trend with the mean number of cases 15 (10-24) (Table 12). Serotype information was available for just under half of cases (47%; 7/15). During the 10 year period, the majority cases with serogroup information available were caused by non-capsulated serotype (34%). Since 2015, there have been no cases of invasive Hib disease (Table 12).

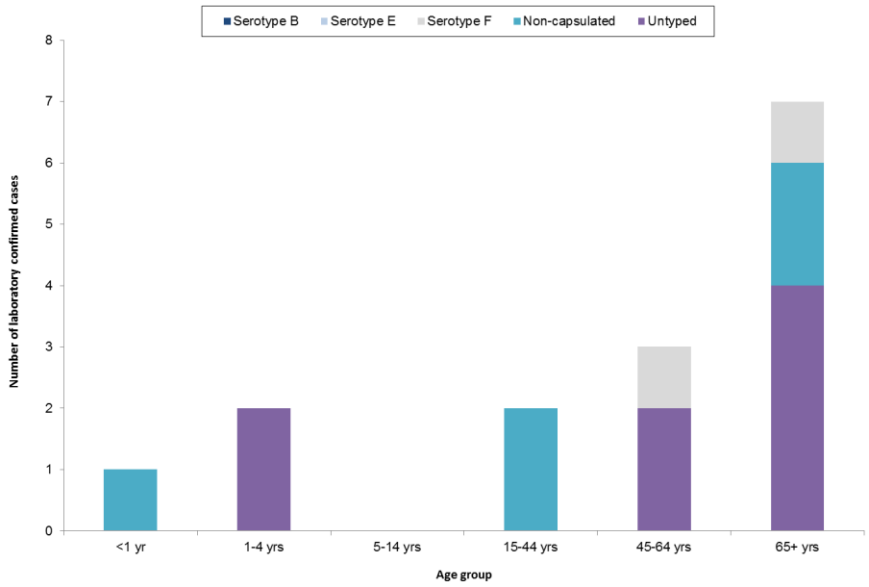
Table 12. Invasive Haemophilus Influenzae cases by serotype, 2007-16, Northern Ireland

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**
Total	**8**	**3**	**5**	**52**	**83**	**151**

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

In 2016, the largest proportion of invasive Haemophilus Influenzae cases occurred in those over 65 years of age (47%; 7/15) (Figure 12).

Figure 12. Laboratory confirmed cases of Invasive Haemophilus Influenza, by serotype and age group, 2016, Northern Ireland



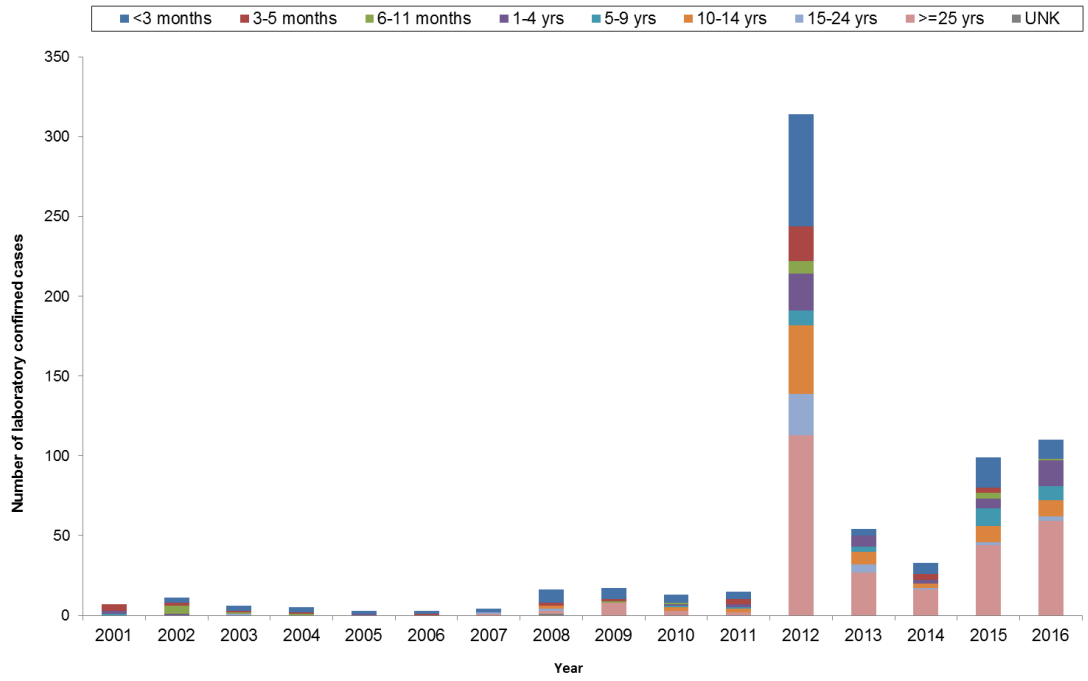
Source: CoSurv

Pertussis (whooping cough)

Pertussis (whooping cough) is a notifiable disease across the UK, with notifications in Northern Ireland sent to the PHA acute response duty room. Local laboratories also report confirmed cases of pertussis to the PHA.

In 2016, there were 110 laboratory confirmed cases of pertussis in Northern Ireland. The greatest number of cases were in those aged over 25 years (54%; 59/110). 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) with this calendar year the highest number seen since 2012 (Figure 13).

Figure 13. Laboratory confirmed cases of Pertussis by age group, 2001-16, Northern Ireland



Source: Regional CoSurv/ Pertussis Enhanced Surveillance System

In response to the national outbreak in 2012, the programme to vaccinate pregnant women was introduced with the aim of protecting babies too young to be vaccinated themselves. Due to the success of the programme and because of the continuing higher incidence of whooping cough it has been continued on the advice of JCVI.

In 2016, there were 12 cases of whooping cough in babies aged under 3 months old, of which six (50%) were born to mothers who had received the whooping cough vaccine in pregnancy. Due to the small numbers it is not possible to determine whether there is an association with the proportion vaccinated (Table 13).

Table 13. Annual Pertussis cases in babies under 3 months of age according to whether mother was vaccinated in pregnancy, 2013-16, Northern Ireland

Year	Number of cases <3 months of age	Number of mothers vaccinated	Number of mothers not vaccinated
2013	**4***	1 (33.3%)	2 (66.7%)
2014	**7**	1 (14.3%)	6 (85.7%)
2015	**19***	5 (27.8%)	13 (72.2%)
2016	**12**	6 (50.0%)	6 (50.0%)

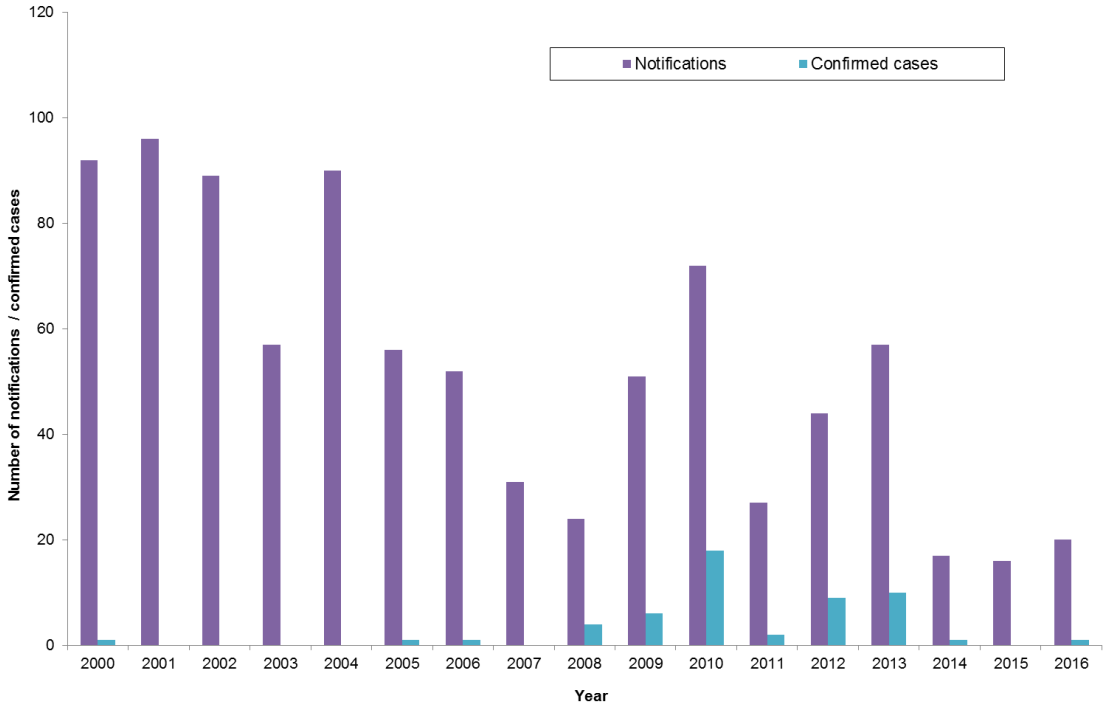
Source: Pertussis Enhanced Surveillance System (Note: *vaccination status of mother unknown in one case)

Measles

Measles surveillance is obtained from data from notifications to the PHA acute response duty room and local laboratories. Characterisation of isolates from confirmed cases is done by the Virus Reference Department, Public Health England.

In 2016, there were 20 notifications of measles to the duty room and one confirmed case. Notifications in Northern Ireland are low and have reduced since 2000 (Figure 14). The number of confirmed cases is even lower. The one case in 2016 was in an unvaccinated adult associated with an outbreak at a mass gathering event in England. All confirmed cases in recent years have been unvaccinated imported cases.

Figure 14. Notifications and laboratory confirmed cases of Measles, 2000-16, Northern Ireland



Source: Measles Enhanced Surveillance System and HPZone

Mumps

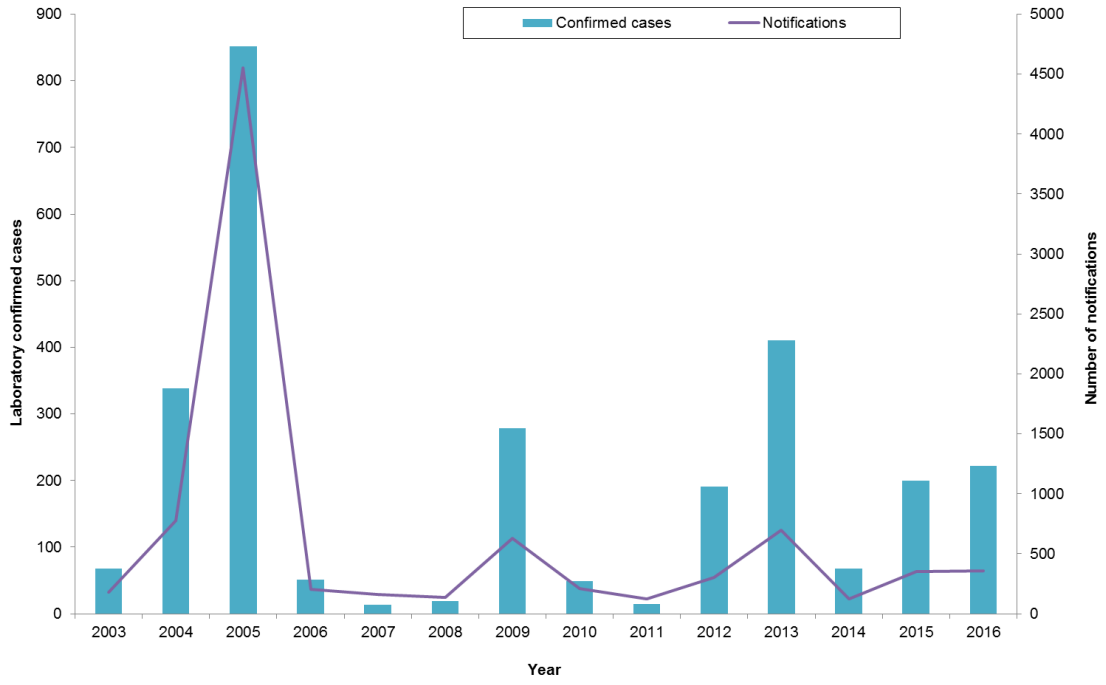
Mumps surveillance is obtained from data from notifications to the PHA acute response duty room and local laboratories.

In 2016, there were 222 laboratory confirmed cases of mumps. This is an increase compared to 2015 (200), but fewer than the number reported in 2013 (410).

Following the introduction of the MMR vaccine in 1988, the incidence of mumps substantially decreased. Since 2004 there has been a persistent increase across the UK with the number of laboratory confirmed cases peaking in 2005 (Figure 15).

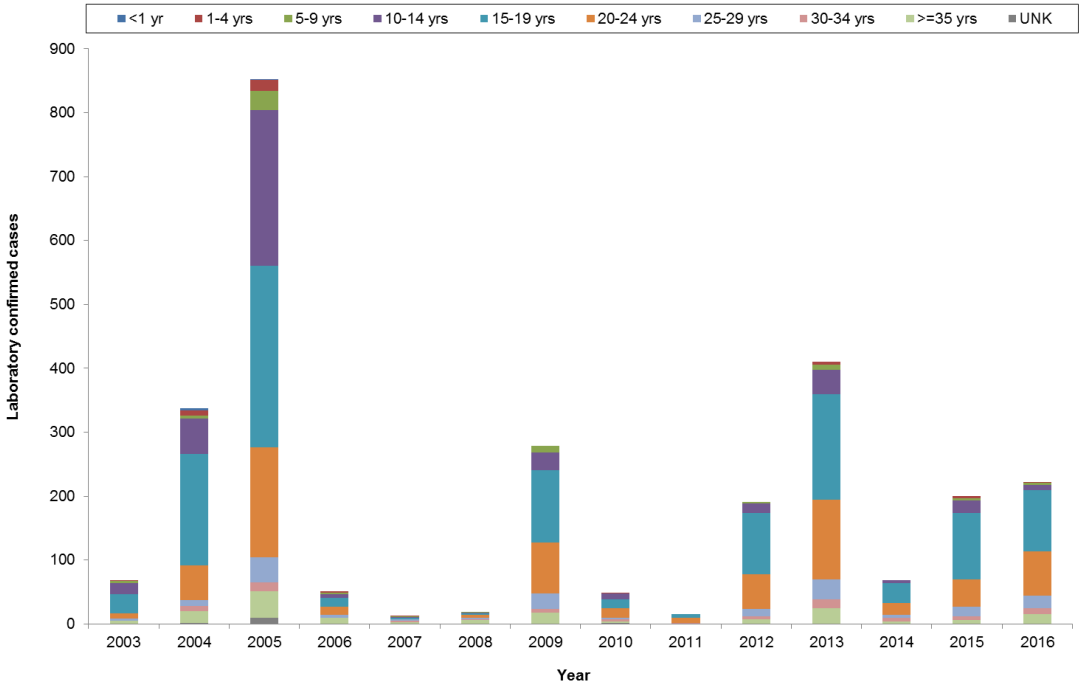
The majority of cases (74%; 165/222) were 15-24 years of age and of those, 94% had received two doses of MMR vaccine. In the past four years the majority of mumps cases have been adolescents and young adults (Figure 16). The observed increase in cases may represent waning immunity within the fully and/or partially vaccinated population.

Figure 15. Notifications and laboratory confirmed cases of Mumps, 2003-16, Northern Ireland



Source: Mumps Enhanced Surveillance System and HPZone

Figure 16. Laboratory confirmed cases of Mumps, by age group, 2003-16, Northern Ireland



Source: Mumps Enhanced Surveillance System and HPZone

Note: salivary antibody testing for mumps ceased in May 2010

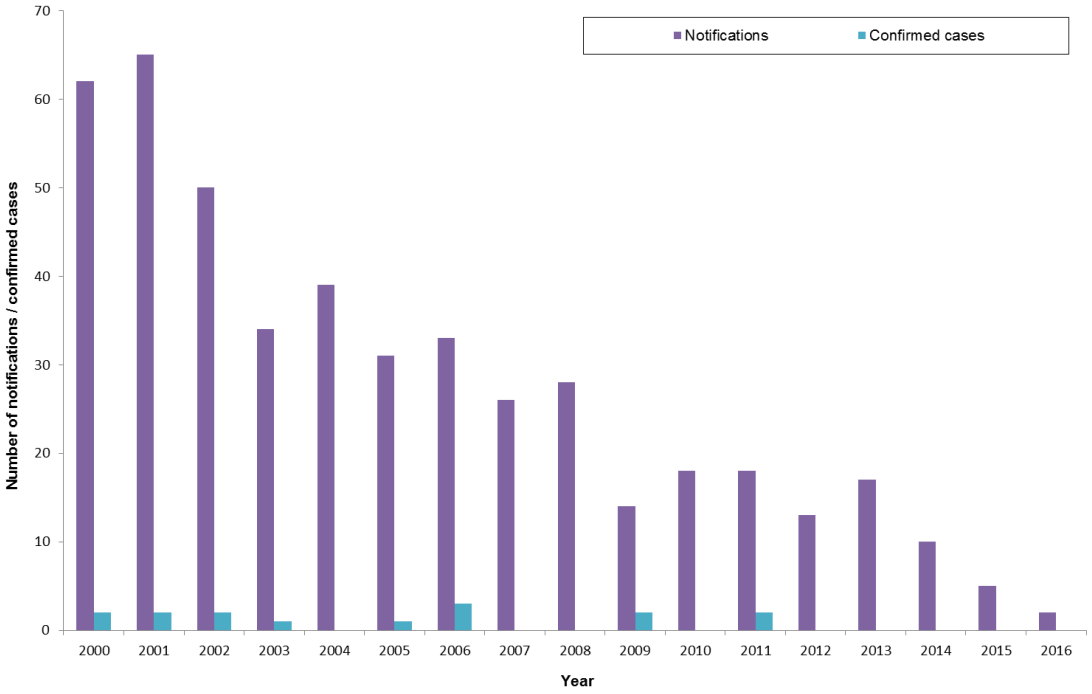
Rubella (German Measles)

Rubella is an acute viral infection that is generally a mild illness, but if acquired by women in early pregnancy (in the first 16 weeks) can have devastating effects on the unborn child, leading to congenital rubella syndrome.

Rubella surveillance is obtained from data from notifications to the PHA acute response duty room and local laboratories. Information on characterisation of confirmed cases is provided by the Virus Reference Department, PHE.

Since 2012, there have been no laboratory confirmed cases of rubella and a reducing number of notifications to the PHA. Since introduction of the MMR vaccine in 1988 cases of rubella have fallen dramatically (Figure 17).

Figure 17. Notifications and laboratory confirmed cases of Rubella, 2000-16, Northern Ireland



Source: Rubella Enhanced Surveillance System and HPZone

Diphtheria, Tetanus, Polio

Following the introduction of vaccine into the universal childhood programme, the incidence of these three infections has fallen dramatically. There have been no cases in Northern Ireland in recent times.

Conclusions

The year 2016-17 has again been a successful one for the childhood and adult immunisation programmes.

Uptake of immunisations for children under 5 years of age continues to be amongst the highest in the UK although work continues to ensure that this high level is maintained. In general, the uptake of immunisations for school aged children is very good, with uptake of 2 MMRs by year 12 nearly at the 95% level. There was a dip in the uptake of HPV vaccine for girls in year 9 in 2016-17, and this will be closely monitored by PHA.

The HPV vaccine programme for MSM has been successfully rolled out across Northern Ireland and initial figures indicate good uptake. Disappointingly there has been a gradual decline of shingles uptake overtime that is consistent with the rest of the UK. This year, PHA will look at this in more detail to try to determine ways to improve uptake. New improvements to the data collection across programmes will also enable more accurate uptake reporting for subsequent years.

This year, we reported on pneumococcal and haemophilus influenza diseases. There has been an increase of non-vaccine type pneumococcal disease, particularly in older age groups. Again, there has been an increase in pertussis and mumps and a decrease in confirmed meningococcal disease cases.

Recommendations

- PHA will continue to work with GP, health visitor and Child Health System colleagues to gain a greater understanding of the variation of pre-school immunisation uptake across Northern Ireland and work together to improve coverage, particularly where this is currently below 95%
- PHA will work with Child Health System to investigate in more detail the MMR coverage of children in Northern Ireland and work towards a coverage of 95% receiving two MMR vaccines for all children
- PHA will work with school health and communications colleagues to improve the uptake of HPV vaccine for 2017-18
- PHA will work with GP colleagues to gain a greater understanding of the decline in shingles uptake and work to improve the uptake for 2017-18
- PHA will work with the Northern Ireland Maternity Administrative System (NIMATS) to introduce data extraction on vaccination uptake for vaccinations given in pregnancy
- PHA will monitor the incidence of pertussis, particularly in infants under 3 months of age and continue to promote vaccination to pregnant women
- PHA is carrying out a qualitative study with individuals from the Roma community to better understand the knowledge, attitudes and barriers to vaccinations

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

Glossary of Terms

Antigen: A substance that when introduced into the body stimulates the production of an antibody.

Apollo: Software used to extract data from primary care systems

BCG: (Bacillus Calmette-Guerin) is a vaccine primarily used to provide protection against Tuberculosis (TB)

Booster Vaccine: This is an additional dose of vaccine given following an earlier dose / course of vaccines which is referred to as primary vaccines. The purpose of a booster dose is to increase / "boost" immunity.

Vaccine Cohort: Group of people who are eligible for a vaccine programme based on age or other risk factors for developing a vaccine preventable disease.

COVER: (Cover of Vaccination Evaluated Early) is a quarterly data collection used to evaluate childhood immunisation coverage across the UK.

Diphtheria: is an infectious disease caused by the bacterium *Corynebacterium diphtheriae.* It primarily infects the throat and upper airways.

DTaP/IPV/Hib Vaccine: This vaccine offers protection against diphtheria, tetanus, pertussis, polio and *haemophilus influenza type b.* It is commonly referred to as the "five in one".

DTaP/IPV/Hib/Hep B: This vaccine offers protection against diphtheria, tetanus, pertussis, polio, *haemophilus influenza type b* and hepatitis B. It is commonly referred to as the "six in one" or "hexa" vaccine.

Epidemiology: The study of the distribution and determinants of health-related states / events (including disease) and the application of this study to the control of diseases / other health problems.

Hepatitis B: is a viral infection that attacks the liver and can cause chronic disease.

Hepatitis B positive: is a term used to describe someone who has hepatitis B infection and the diagnosis is based on the detection of hepatitis B surface antigen from a blood sample.

Hib: Haemophilus influenza type b is the second most common cause of bacterial pneumonia.

HPV Vaccine: is a vaccine that offers protection against certain types of Human Papilloma Virus.

Human Papilloma Virus (HPV): is a viral infection that is mainly transmitted via sexual contact. HPV-related disease includes genital warts, cervical and ano-genital cancers.

Immunisation: is a process whereby a person is made immune / resistant to an infectious disease, typically by administration of a vaccine.

Inactivated Vaccine: is a vaccine that is made from microorganisms (bacteria, viruses, other) that have been killed through physical / chemical processes. These killed organisms cannot cause disease.

Incidence: is the number of individual who develop a specific disease / experience a health-related event during a particular time period.

IMD: (Invasive meningococcal disease) is caused by bacteria known as *Neisseria meningitidis*.

LCG: Local commissioning groups

Measles: is a vaccine preventable disease. Measles is a serious respiratory disease that causes a rash and fever and can cause significant morbidity and mortality.

Men ACWY Vaccine: Inactivated vaccine that offers protection against invasive meningococcal disease caused by *Neisseria meningitidis* groups A, C, W & Y.

Meningococcal Group B Vaccine: Inactivated vaccine that offers protection against invasive meningococcal disease caused by *Neisseria meningitidis* group B.

Meningococcal Group C Vaccine: Inactivated vaccine that offers protection against invasive meningococcal disease caused by *Neisseria meningitidis* group C.

MMR Vaccine: Combined vaccine used to offer protection against measles, mumps and rubella. MMR is a live vaccine i.e. contains attenuated / weakened organisms.

MSM: Men who have sex with men.

Pertussis: is a highly contagious disease of the respiratory tract caused by *Bordetella pertussis*. The disease caused by this bacterium is commonly referred to as “whooping cough”.

PCR: (polymerase chain reaction) is a method used to analyse a short sequence of DNA/RNA.

PHE: (Public Health England) is an executive agency of the Department of Health in England.

Pneumococcal Disease: is caused by a bacterium known as *Streptococcus pneumoniae*. Pneumococcal disease can range from upper respiratory tract infections to pneumonia, septicaemia and meningitis.

Polio: is a highly infectious disease caused by a virus. It invades the nervous system and can cause total paralysis in hours.

Rotavirus: is a virus that can cause severe diarrhoea and vomiting, especially in babies and young children.

Rubella: (German Measles) is a viral disease that causes a fever and a rash. It can cause defects in pregnant women who develop the infection.

Serogroup: A group of bacteria containing a common antigen / a group of viral species that are antigenically closely related.

Shingles: is caused by *varicella zoster virus* (VZV), the same virus that causes chickenpox.

Tetanus: is an infection caused by a bacteria called *Clostridium tetani*. The bacteria produce a toxin that causes painful muscle contractions.

Tuberculosis: (TB) is caused by the bacterium *Mycobacteria tuberculosis*. It usually causes infection of the lungs but can cause infection in other parts of the body too. If not treated properly TB can be fatal.

WHO (World Health Organisation): is a specialised agency of the United Nations that was established to prevent international spread of diseases.

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