

Pneumococcal disease and the vaccines

PHA Immunisation Team
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Acknowledgements to UKHSA for use of their data slides



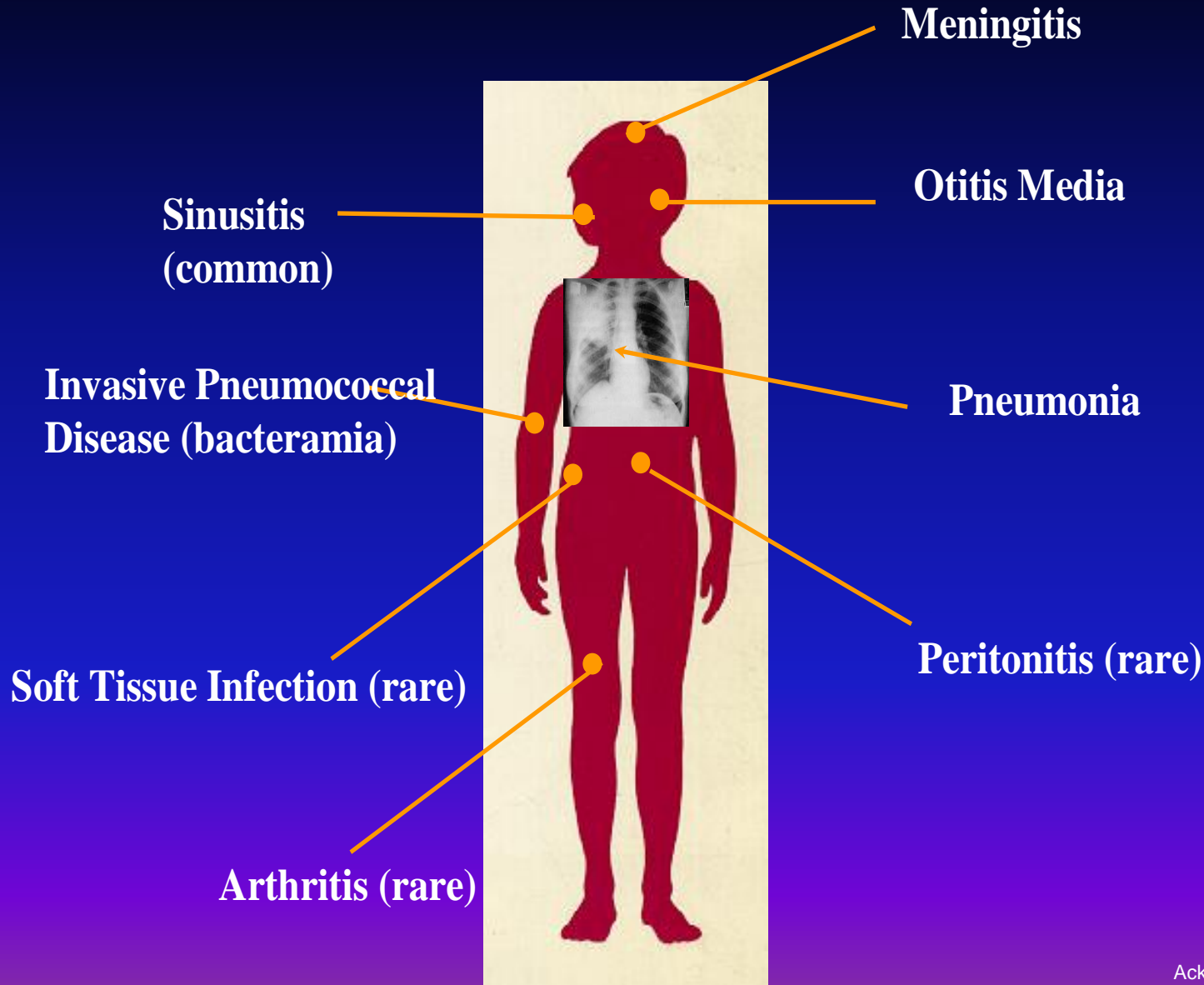
Learning outcomes

- describe pneumococcal disease and epidemiology in Northern Ireland (NI)
- be familiar with available pneumococcal vaccines
- understand the indications for immunisation, the current vaccine schedules, special considerations and contraindications

Streptococcus pneumoniae

- Pneumococcal disease is the term used to describe infections caused by the bacterium *Streptococcus pneumoniae* (also known as pneumococcus or *S. pneumoniae*)
- *S. pneumoniae* is an encapsulated Gram positive bacteria
- *S. pneumoniae* causes invasive and non-invasive pneumococcal disease. Strains without a capsule rarely cause disease
- 100 different serotypes (lack of cross-reactivity)
- Carriage is common (in the nose and throat)
- Transmission is via aerosols, droplets or direct contact with respiratory secretions of someone carrying the organism
- Incubation period for pneumococcal disease is not clearly defined but may be as short as 1 – 3 days

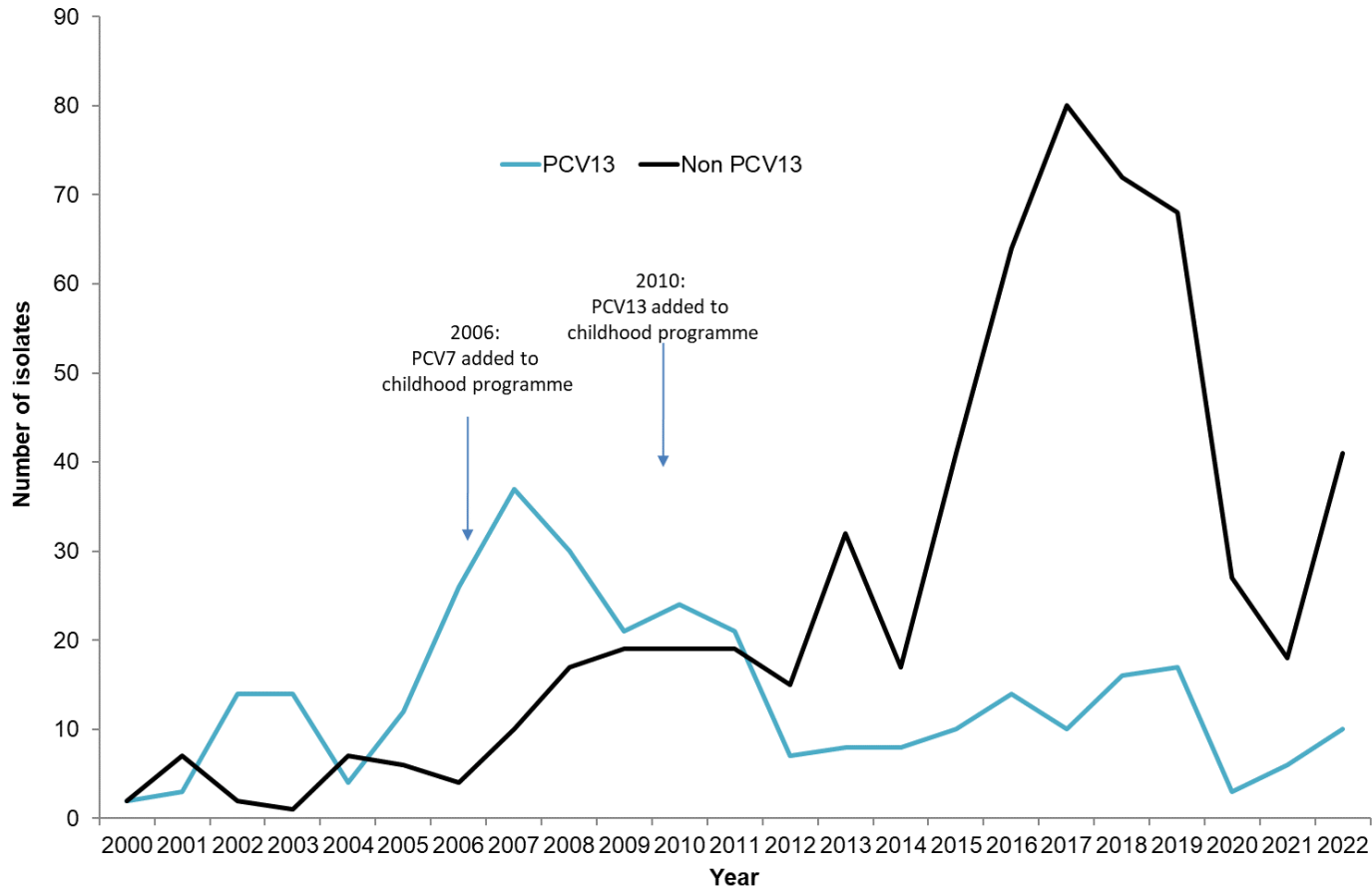
Spectrum of pneumococcal infection



Epidemiology

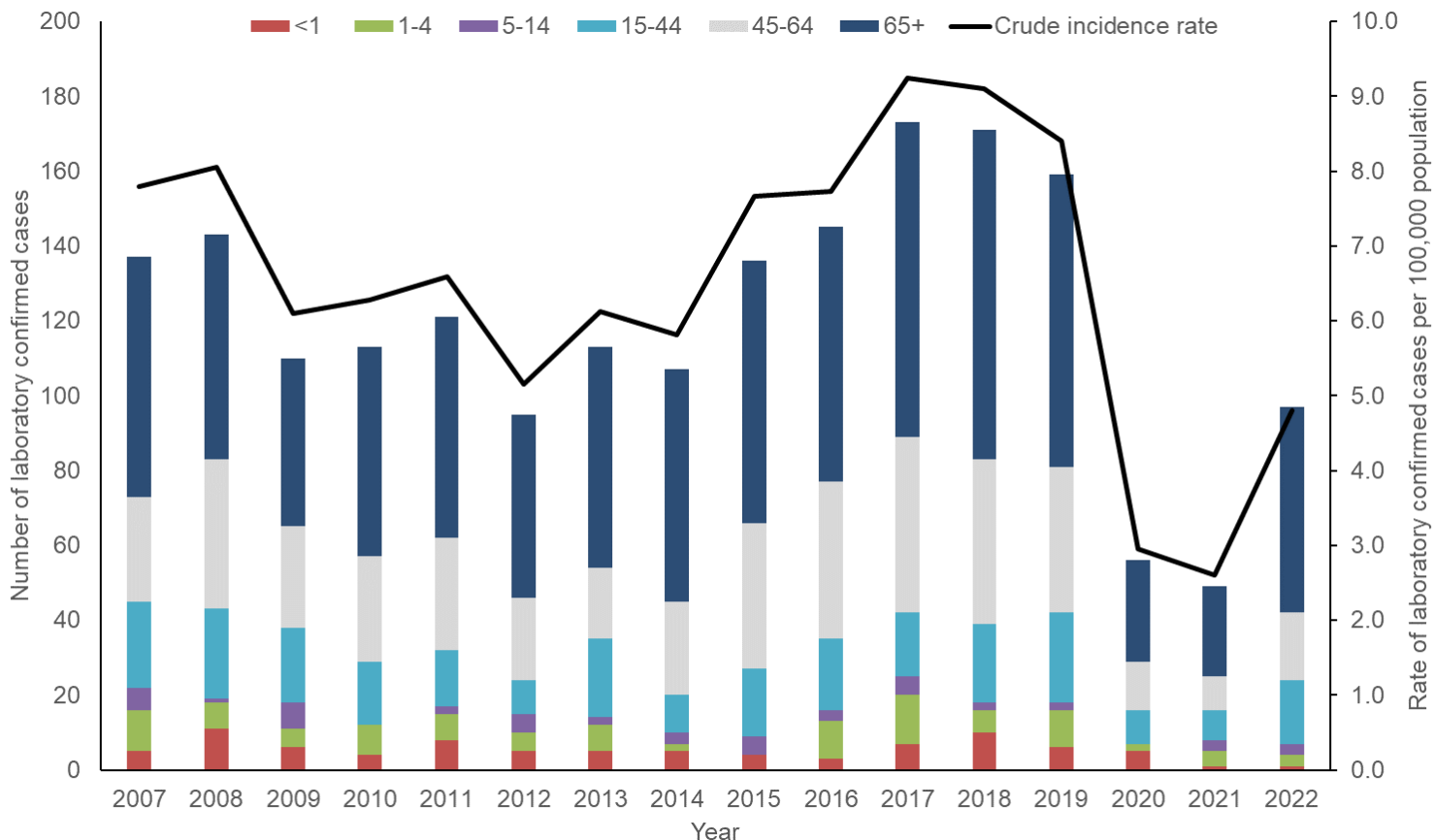
- Invasive pneumococcal disease (IPD) is a major cause of morbidity and mortality.
- As with other respiratory infections, there is a seasonal variation in pneumococcal disease, with peak levels in the winter months
- IPD particularly affects the very young, the elderly, and those with impaired immunity and other underlying medical conditions.
- Recurrent infections may occur in association with skull defects, cerebrospinal fluid (CSF) leaks, cochlear implants or fractures of the skull.
- Other risk groups include the those with an absent or non-functioning spleen, those with immunosuppression and certain underlying medical conditions (please find further information regarding risk groups in Table [25.2 Green book chapter 25 - Pneumococcal \(publishing.service.gov.uk\)](#))

Laboratory confirmed cases of IPD by PCV/non-PCV serogroup, 2000-2022, Northern Ireland



Source: NILIS

Laboratory confirmed cases of Invasive Streptococcus Pneumoniae by age group, 2007-2022, Northern Ireland



Source: NILIS

Pneumococcal vaccines

Two types of pneumococcal vaccine:

- ❖ Pneumococcal Conjugate Vaccine (PCV)
- ❖ Pneumococcal Polysaccharide Vaccine (PPV)

Four vaccines licensed for use in UK currently:

- PCV13 (Prevenar 13), PCV15 (Vaxneuvance) and PCV20 (Prevenar 20):
 - Conjugated vaccine (antigens are cross-linked to a protein antigen) to improve antibody response in children from 2 months of age
 - The number in the name corresponds to the number of serotypes covered by the vaccine
 - Direct protection and indirect (herd) protection achieved through the prevention of pneumococcal carriage in the vaccinated child's nasopharynx.
 - **PCV15 (Vaxneuvance) is currently not included in the UK national immunisation programme.**
- PPV (Pneumovax 23):
 - PPV23 contains purified capsular polysaccharide from 23 common capsular types of pneumococcus
 - Antibodies to capsular polysaccharides produced by the third week following immunisation
 - Antibody response to PPV in children < 2 years is poor

UNIVERSAL CHILDHOOD PROGRAMME

PNEUMOCOCCAL CONJUGATE VACCINE (PCV / PREVENAR 13)



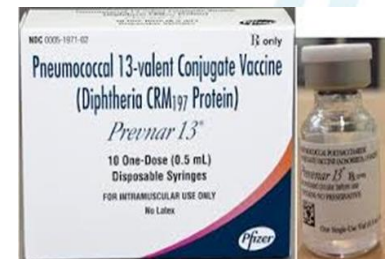
Objectives of pneumococcal childhood programme

To protect all of those for whom infection is likely to be more common/serious:

- Infants as part of routine childhood immunisation schedule
- Children in clinical risk groups

Pneumococcal conjugate vaccine (PCV13)

- **Brand name:** Prevenar 13
- Pneumococcal conjugate vaccine (PCV13) contains polysaccharide from 13 common capsular types 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F. These are conjugated to protein (CRM197)
- Inactivated vaccine
- **Administration:** The vaccine should be given by intramuscular injection. The preferred sites are the anterolateral aspect of the thigh (vastus lateralis muscle) in infants (1 year and under) or the deltoid muscle of the upper arm in children and adults.
- Reduces carriage and therefore induces herd immunity



PCV dose and schedule

- A single dose of PCV is 0.5ml

Routine immunisation for infants under two years of age:

- a priming dose PCV13 at 16 weeks of age
- a booster dose of PCV13 at one year of age

- Doses of any PCV given before 12 weeks of age should be discounted.
- The PCV dose at 16 weeks of age should then be given at the same time as the other vaccines recommended at that age.
- Unimmunised or partially immunised children aged one year and up to two years of age require one dose
- Routine immunisation with PCV is not offered after the 2nd birthday unless child is at increased risk of pneumococcal disease

Infants from eight weeks of age up to first birthday

DTaP/IPV/Hib/HepB⁵ + MenB⁶ + rotavirus⁷

Four week gap

DTaP/IPV/Hib/HepB + MenB⁶ + rotavirus⁷

Four week gap

DTaP/IPV/Hib/HepB + PCV13⁸

* A child who has already received 1 or more doses of primary diphtheria, tetanus, inactivated polio, pertussis and Hib should complete the 3 dose course with DTaP/IPV/Hib/HepB. Where a child is only missing any doses of HepB, these can be given as monovalent HepB at 4 week intervals

** Children require 2 doses of MenB (at least 4 weeks apart) and 1 dose of PCV13 in first year of life

† First dose of rotavirus vaccine to be given only if child is more than 6 weeks and under 15 weeks. Second dose to be given only if child is less than 24 weeks old

‡ Children who are aged 16 weeks or over when starting their primary schedule can be given their single infant priming dose of PCV13 with their first set of primary immunisations. If a child has received PCV10 vaccine abroad, they should be offered 1 dose of PCV13 (at least 4 weeks after PCV10 was given and once they are 16 weeks of age). A dose of PCV13, PCV14, PCV15 or PCV20 given abroad from 12 weeks of age counts as a valid dose

Subsequent vaccination

As per UK schedule ensuring a minimum 4 week interval between the MenB and PCV13 priming and booster doses

General principles

- unless there is a documented or reliable verbal vaccine history, individuals should be assumed to be unimmunised and a full course of immunisations planned
- individuals coming to UK part way through their immunisation schedule should be transferred onto the UK schedule and immunised as appropriate for age
- if a course of vaccines has been started but not completed, resume the course – no need to repeat doses or restart course
- plan catch-up immunisation schedule with minimum number of visits and within a minimum possible timescale – aim to protect individual in shortest time possible

Children from first up to second birthday

DTaP/IPV/Hib/HepB⁵ + PCV13⁸ + MenB⁶ + MMRV⁹

Four week gap

DTaP/IPV/Hib/HepB⁵ + MenB⁶

Four week gap

DTaP/IPV/Hib/HepB⁵

* Children born from 01/08/17 who received primary vaccines without HepB should be opportunistically offered a 3 dose course of monovalent HepB vaccine. If they are in a high-risk group or are exposed to hepatitis B, they should be proactively offered a hepatitis B vaccine course

** All children require a dose of Hib over the age of 1 year. If they have received all 3 primary doses of hexavalent vaccine in their first year of life but no dose of a Hib-containing vaccine over 1 year of age, and were born:

- on or before 30/06/24, they should be offered the combined Hib/MenC vaccine now (or hexavalent if Hib/MenC vaccine not available) ensuring a minimum 4 week interval between this and the primary DTaP/IPV/Hib/HepB doses given in their first year of life
- on or after 01/07/24, they should be offered the hexavalent vaccine at 18 months (or now if older than 18 months)

††† If they have received at least one of their primary doses of hexavalent vaccine over 1 year of age, the Hib/MenC or additional hexavalent dose offered at 18 months is not needed

†††† All children require a dose of PCV over the age of 1 year. If a child has received PCV10 vaccine abroad, they should be offered 1 dose of PCV13 (at least 4 weeks after PCV10 was given). PCV14, PCV15 or PCV20 given abroad over 1 year of age counts as a valid dose

††††† All children require a dose of MenB over the age of 1 year. However, children who received less than 2 doses of MenB in their first year of life should receive 2 doses of MenB in their second year of life (given 4 weeks apart)

†††††† See MMR and MMRV box below regarding timing of 2nd dose

Subsequent vaccination

- all children require a dose of Hib over 1 year (see ** above)
- DTaP/IPV vaccine should be offered from 3 years 4 months (and at least one year after last dose of DTaP/IPV/Hib/HepB vaccine)
- MMRV vaccine should be offered as described below

MMRV and MMRV vaccine – from first birthday onwards:

- dose of measles, mumps, rubella or varicella-containing vaccine given prior to 12 months of age should not be counted
- 2 doses of MMR or MMRV (as appropriate for age/DOB) should be given irrespective of history of measles, mumps, rubella or varicella infection
- a minimum of 4 weeks should be left between doses
- 2nd dose of MMRV should not be given <18 months of age except where protection against measles or varicella is urgently needed

- where an individual is born before 01/08/17 and rubella is not included in their MMRV now. Subsequent doses possible to the age they are now old (second dose) or offer second dose if born on or after 01/08/17 (see table 2 in MMRV schedule)

Clinical risk groups

Infants from birth to two years of age in a clinical risk group:

Table 25.2 Clinical risk groups who should receive pneumococcal immunisation

Clinical risk group	Examples (decision based on clinical judgement)
Asplenia or dysfunction of the spleen	This also includes individuals with coeliac disease who are diagnosed with splenic dysfunction and all haemoglobinopathies including homozygous sickle cell disease
Chronic respiratory disease (chronic respiratory disease refers to chronic lower respiratory tract disease)	<p>This includes chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema; and such conditions as bronchiectasis, cystic fibrosis, interstitial lung fibrosis, pneumoconiosis and bronchopulmonary dysplasia (BPD). Individuals in whom respiratory function may be compromised due to neurological or neuromuscular disease (such as cerebral palsy).</p> <p>Asthma is not an indication, unless so severe as to require continuous or frequently repeated use of systemic steroids (as defined in Immunosuppression below).</p>

Clinical risk group	Examples (decision based on clinical judgement)
Chronic heart disease	This includes those requiring regular medication and/or follow-up for ischaemic heart disease, congenital heart disease, hypertension with cardiac complications, and chronic heart failure.
Chronic kidney disease	Nephrotic syndrome, chronic kidney disease at stages 4 and 5 and those on kidney dialysis or with kidney transplantation.
Chronic liver disease	This includes cirrhosis, biliary atresia and chronic hepatitis.
Diabetes	Diabetes mellitus requiring insulin or anti-diabetic medication. This does not include diabetes that is only diet controlled.
Immunosuppression	Due to disease or treatment, including patients undergoing chemotherapy leading to immunosuppression, bone marrow transplant, asplenia or splenic dysfunction, complement disorder, HIV infection at all stages, multiple myeloma or genetic disorders affecting the immune system (such as IRAK-4, NEMO). Individuals on or likely to be on systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day (any age), or for children under 20kg, a dose of 1mg or more per kg per day.
Individuals with cochlear implants	It is important that immunisation does not delay the cochlear implantation.
Individuals with cerebrospinal fluid leaks	This includes leakage of cerebrospinal fluid such as following trauma or major skull surgery (does not include CSF shunts).
Occupational risk	Please see page 10.

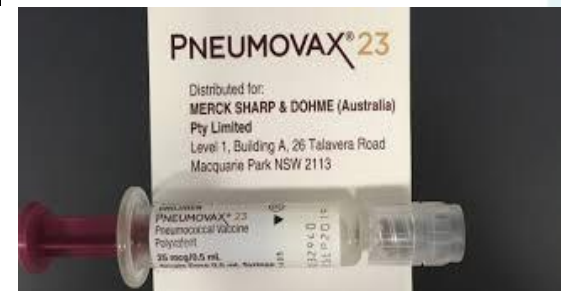
Objectives of pneumococcal adult programme

To protect all of those for whom infection is likely to be more common / serious:

- at-risk groups (may require PCV before PPV)
- routinely for all adults aged 65 years and older.

Pneumococcal polysaccharide vaccine (PPV23)

- Brand Name: Pneumovax 23
- Contains purified capsular polysaccharide from each of 23 capsular types of pneumococcus (PPV23) 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19F, 19A, 20, 22F, 23F, 33F
- Inactivated vaccine
- Administration: Intramuscular injection. Preferred site is the deltoid muscle of the upper arm.
- Subcutaneous if patient has a bleeding disorder.



Pneumococcal Conjugate Vaccine (PCV20)

- Brand Name: Prevenar 20
- Serotypes covered: 1, 3, 4, 5, 6A, 6B, 7F, 8, 9V, 10A, 11A, 12F, 14, 15B, 18C, 19A, 19F, 22F, 23F, 33F
- Inactivated vaccine
- Administration: Intramuscular injection. Preferred site is the deltoid muscle in the upper arm.
- Subcutaneous if patient has a bleeding disorder.

PPV23 and PCV20 dose and schedule

A single dose of PPV is 0.5ml.

Recommended for:

- all adults 65+ years
- individuals aged 2 years or over in clinical risk groups.

Antibody levels are likely to rapidly decline in individuals with no spleen, splenic dysfunction or chronic renal disease. Therefore revaccination recommended every 5 years.

Clinical risk groups

Children aged 2 years and over and adults:

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Immunosuppression	Due to disease or treatment, including patients undergoing chemotherapy leading to immunosuppression, bone marrow transplant, asplenia or splenic dysfunction, complement disorder, HIV infection at all stages, multiple myeloma or genetic disorders affecting the immune system (such as IRAK-4, NEMO). Individuals on or likely to be on systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day (any age), or for children under 20kg, a dose of 1mg or more per kg per day.
Individuals with cochlear implants	It is important that immunisation does not delay the cochlear implantation.
Individuals with cerebrospinal fluid leaks	This includes leakage of cerebrospinal fluid such as following trauma or major skull surgery (does not include CSF shunts).
Occupational risk	Please see page 10.

Changes to UK national immunisation programme: PPV23 and PCV20

Please note:

Following a procurement exercise carried out by UKHSA, PCV20 will replace PPV23 for adults 65 years and over and the at-risk programme in late 2025/early 2026.

PPV23 will no longer be used in the UK national immunisation programme.

Contraindications

There are very few individuals who cannot receive pneumococcal vaccines.

Pneumococcal vaccines should **not** be administered to those who have had:

- a confirmed anaphylaxis to a previous dose of a pneumococcal vaccine

OR

- a confirmed anaphylactic reaction to any component or residue from the manufacturing process.

Minor illnesses without fever or systemic upset are not valid reasons to postpone immunisation.

Side effects (adverse reactions)

Common side effects of PCV and PPV:

- redness
- tenderness and/or swelling at injection site
- irritability
- slightly raised temperature
- loss of appetite
- drowsiness/increased sleep.

Reporting suspected adverse reactions

Suspected adverse reactions or suspected side effects should be reported to the Medicines and Healthcare Products Regulatory Agency (MHRA) [Yellow Card | Making medicines and medical devices safer \(mhra.gov.uk\)](https://www.mhra.gov.uk/yellowcard) or the Yellow Card app.

Anyone (patients and health care workers) can make a Yellow Card report, even if they are uncertain as to whether a vaccine caused the condition.



Further resources

- [The Green book of immunisation: chapter 25 - pneumococcal \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/424222/green-book-immunisation-chapter-25-pneumococcal.pdf)
- [Immunisation - elearning for healthcare \(e-lfh.org.uk\)](https://www.e-lfh.org.uk/)
- [Immunisation/vaccine preventable diseases | HSC Public Health Agency \(hscni.net\)](https://www.hscni.net/immunisation/vaccine-preventable-diseases)
- [Publications](#)
- [Pneumococcal disease | Vaccine Knowledge Project](#)

Splenectomy in adults and children | HSC Public Health Agency
 Factsheet for health professionals

Individuals who are splenectomised have an increased risk of infection. Splenectomy requires special management to reduce the risk of infection. This factsheet provides information on the general population.

There is a specific group of people known as the 'asplenic group' who are at a higher risk of infection. This group includes people who have had a splenectomy, people who have a functional asplenic state (where the spleen does not work properly), and people who have a splenic disorder (where the spleen is not fully developed).

Healthcare professionals should be aware of the prevention of pneumococcal infection.

Recommendations for vaccination:

Child under 5 years of age	13-valent pneumococcal conjugate vaccine (PCV13)
Child 5-16 years	13-valent pneumococcal conjugate vaccine (PCV13)
Child over 16 years of age and adults	23-valent pneumococcal polysaccharide vaccine (PPV23)

Recommendations for antibiotic prophylaxis:

Child 1 month-5 years	13-valent pneumococcal conjugate vaccine (PCV13)
Child 5-16 years	13-valent pneumococcal conjugate vaccine (PCV13)
Child 17-18 years	23-valent pneumococcal polysaccharide vaccine (PPV23)

Recommendations for antibiotic prophylaxis in adults:

Child 1 month-5 years	13-valent pneumococcal conjugate vaccine (PCV13)
Child 5-16 years	13-valent pneumococcal conjugate vaccine (PCV13)
Child over 16 years of age and adults	23-valent pneumococcal polysaccharide vaccine (PPV23)

www.hscni.net/healthprofessionals

Pneumococcal vaccine
 – helping to protect against pneumonia, meningitis and other serious illnesses



Vaccination against pneumococcal disease for people aged over 65 or with certain health conditions

HSC Public Health Agency