**Supplemental online material**

**Supplemental Text 1**. Detailed methodology and search terms of the systematic search

**Supplemental Figure 1.** Focus on the patient

**Supplemental Table 1**. List of excluded high-income countries with reasons for exclusion

**Supplemental Table 2**. Invasive pneumococcal disease distribution across analyzed countries by era for children <5 years old

**Supplemental Table 3**. Invasive pneumococcal disease distribution across analyzed countries by era for adults ≥65 years old

**Supplemental online material**

**Supplemental Text 1. Detailed methodology and search terms of the systematic search**

A broad systematic search was performed aimed at identifying observational post-marketing studies that evaluated the impact of PCVs on any pneumococcal disease, nasopharyngeal carriage, antibiotic resistance and serotype distribution. Articles and abstracts, published between January 2001 and April 2017, were extracted from EMBASE, Scopus and Searchlight (a Med’meme-powered database specialized in grey literature). Detailed search terms and strategy by database are mentioned below. This resulted in 13254 references. After removal of duplicates, 8404 references remained. Titles and abstracts, and subsequently full texts were screened against inclusion and exclusion criteria. This resulted in 1297 remaining references.

Inclusion criteria were: (1) English-language; (2) studies analyzing PCV impact (e.g. incidence, effectiveness, case numbers) on any pneumococcal disease, nasopharyngeal carriage, antibiotic resistance and serotype distribution.

Exclusion criteria were: review articles, case reports, randomized control trials, efficacy data, papers not reporting vaccine data, specifically PCV7, PHiD-CV or PCV13 data, papers reporting data either pre-PCV or post-PCV introduction but not both, papers reporting other outcomes than the ones of interest.

For the purpose of the current analyses, we searched the resulting database of 1297 references for studies with IPD as an outcome by using the search terms: invasive pneumococcal disease, IPD, meningitis and bacteremia. This resulted in 933 references. Among these, we performed specific searches for the 29 high-income countries or regions that had a population of 1,000,000 or more, a PCV implemented in their infant immunization programs and well-described national, regional population-based or sentinel IPD surveillance system in place before PCV introduction. We further screened titles, abstracts and full texts of the remaining references against the following inclusion criteria: (1) IPD incidence or number of cases reported for at least 2 years before any PCV introduction and at least 3 years after higher-valent PCV introduction, and, where relevant, in the PCV7 period; (2) IPD incidence and/or case counts stratified by age (<5 years and/or ≥65 years); (3) IPD incidence and/or case counts segregated by pneumococcal serotype or grouped serotypes (VT and NVT).

**EMBASE search strategy**

|  |  |  |
| --- | --- | --- |
| #17  | **#11** OR **#12** AND [2001-2015]/py |  |
| #12  | **#6** AND **#7** AND **#9** |
| #11  | **#6** AND **#7** AND **#8** |
| #9  | **'bacterial strain'**/syn OR **'virus strain'** OR **'carriage'** OR **'bacterium colony'**/syn OR **'microbial colonization'**/syn OR **'bacterium carrier'**/syn OR **'bacterium carrier'** OR **carrier\*** OR **colonis\*** OR **coloniz\*** OR **serotyp\*** OR **strain\*** OR **'nasopharyngeal'** OR **'oropharyngeal'** OR **'nasopharynx'** OR **'oropharynx'** |
| #8  | **'community acquired infections'**/syn OR **'community acquired infections'** OR **'pneumococcal infection'**/syn OR (**pneumococc\*** AND **disease\***) OR (**pneumococc\*** AND **infecti\***) OR **'septicemia'**/syn OR **'septicaemia'** OR **'bacteremia'**/syn OR **'bacteraemia'** OR **'sinusitis'**/syn OR **'chronic obstructive lung disease'**/syn OR **'copd'** OR **'meningitis'**/syn OR **'invasive pneumococcal disease'**/syn OR **'invasive pneumococcal disease'** OR **'ipd'** OR **'empyema'**/syn OR **'acute otitis media'**/syn OR **aom** OR **'pneumonia'**/syn OR **'community acquired pneumonia'** OR **'cap'** OR **'infection'**/syn |
| #7  | **efficacy** OR **effectiveness** OR **impact** OR **'incidence'**/exp OR **'incidence'** OR **surveillance** OR **'surveillance postmarketing'**/exp OR **'surveillance postmarketing'** OR **'case control study'**/syn OR **'case control study'** OR **'case control'** OR **'case-control'** OR **observational** OR **'prevalence'**/exp OR **prevalence** OR **'epidemiology'**/syn OR **epidemiology** OR **'observational study'**/syn OR **'observational study'** OR **'disease surveillance'**/syn OR **'disease surveillance'** OR **'postmarketing surveillance'**/syn OR **'postmarketing surveillance'** OR **'drug efficacy'**/syn |
| #6  | **'pneumococcal conjugate'**:de,tn,cl,ab,ti OR **'pneumococcus conjugate'**:de,tn,cl,ab,ti OR **'conjugate pneumococcal'**:de,tn,cl,ab,ti OR **'conjugate pneumococcus'**:de,tn,cl,ab,ti OR **'pneumococcal polysaccharide conjugate'**:de,tn,cl,ab,ti OR **'pneumococcal conjugated'**:de,tn,cl,ab,ti OR **'pneumococcus conjugated'**:de,tn,cl,ab,ti OR **'conjugated pneumococcal'**:de,tn,cl,ab,ti OR **'conjugated pneumococcus'**:de,tn,cl,ab,ti OR **'pneumococcal polysaccharide conjugated'**:de,tn,cl,ab,ti OR **'pneumococcal conjugates'**:de,tn,cl,ab,ti OR **'pneumococcus conjugates'**:de,tn,cl,ab,ti OR **'conjugates pneumococcal'**:de,tn,cl,ab,ti OR **'conjugates pneumococcus'**:de,tn,cl,ab,ti OR **'pneumococcal polysaccharide conjugates'**:de,tn,cl,ab,ti OR **'7vcrm'**:de,tn,cl,ab,ti OR **'10vcrm'**:de,tn,cl,ab,ti OR **'13vcrm'**:de,tn,cl,ab,ti OR **'7vpnc'**:de,tn,cl,ab,ti OR **'10vpnc'**:de,tn,cl,ab,ti OR **'13vpnc'**:de,tn,cl,ab,ti OR **'pcv10'**:de,tn,cl,ab,ti OR **'7pcv'**:de,tn,cl,ab,ti OR **'10pcv'**:de,tn,cl,ab,ti OR **'13pcv'**:de,tn,cl,ab,ti OR **'pcv7'**:de,tn,cl,ab,ti OR **'pcv13'**:de,tn,cl,ab,ti OR **'pcv 10'**:de,tn,cl,ab,ti OR **'pcv 7'**:de,tn,cl,ab,ti OR **'pcv 13'**:de,tn,cl,ab,ti OR **'pcv-7'**:de,tn,cl,ab,ti OR **'pcv-10'**:de,tn,cl,ab,ti OR **'pcv-13'**:de,tn,cl,ab,ti OR **'pncrm7'**:de,tn,cl,ab,ti OR **'pncrm10'**:de,tn,cl,ab,ti OR **'pncrm13'**:de,tn,cl,ab,ti OR **'pncrm-7'**:de,tn,cl,ab,ti OR **'pncrm-10'**:de,tn,cl,ab,ti OR **'pncrm-13'**:de,tn,cl,ab,ti OR **'seven-valent'**:de,tn,cl,ab,ti OR **'ten-valent'**:de,tn,cl,ab,ti OR **'thirteen-valent'**:de,tn,cl,ab,ti OR **'10-valent'**:de,tn,cl,ab,ti OR **'13-valent'**:de,tn,cl,ab,ti OR **'7-valent'**:de,tn,cl,ab,ti OR **'7valent'**:de,tn,cl,ab,ti OR **'10valent'**:de,tn,cl,ab,ti OR **'13valent'**:de,tn,cl,ab,ti OR **'7 valent'**:de,tn,cl,ab,ti OR **'10 valent'**:de,tn,cl,ab,ti OR **'13 valent'**:de,tn,cl,ab,ti OR **'pcv7/13'**:de,tn,cl,ab,ti OR **'phid-cv'**:de,tn,cl,ab,ti OR **'phid10cv'**:de,tn,cl,ab,ti OR **'phidcv'**:de,tn,cl,ab,ti OR **'phidcv10'**:de,tn,cl,ab,ti OR **'phid-cv10'**:de,tn,cl,ab,ti OR **'heptavalent'**:de,tn,cl,ab,ti OR **'synflorix'**:de,tn,cl,ab,ti OR **'prevenar'**:de,tn,cl,ab,ti OR **'prevenar 13'**:de,tn,cl,ab,ti OR **'prevnar'**:de,tn,cl,ab,ti OR **'prevnar 13'**:de,tn,cl,ab,ti |

**Scopus search strategy**

( ( TITLE-ABS-KEY ( efficacy ) OR TITLE-ABS-KEY ( effectiveness ) OR TITLE-ABS-KEY ( impact ) OR TITLE-ABS-KEY ( incidence ) OR TITLE-ABS-KEY ( surveillance ) OR TITLE-ABS-KEY ( "surveillance postmarketing" ) OR TITLE-ABS-KEY ( "postmarketing surveillance" ) OR TITLE-ABS-KEY ( "case control study" ) OR TITLE-ABS-KEY ( "case control" ) OR TITLE-ABS-KEY ( "case-control" ) OR TITLE-ABS-KEY ( observational ) OR TITLE-ABS-KEY ( prevalence ) OR TITLE-ABS-KEY ( epidemiology ) OR TITLE-ABS-KEY ( "observational study" ) OR TITLE-ABS-KEY ( "disease surveillance" ) OR TITLE-ABS-KEY ( "drug efficacy" ) OR TITLE-ABS-KEY ( epidemiolog\* ) AND PUBYEAR > 2000 ) AND ( TITLE-ABS-KEY ( "pneumococcal infection" ) OR TITLE-ABS-KEY ( pneumococc\* AND disease\* ) OR TITLE-ABS-KEY ( pneumococc\* AND infecti\* ) OR TITLE-ABS-KEY ( septicemia ) OR TITLE-ABS-KEY ( septicaemia ) OR TITLE-ABS-KEY ( bacteremia ) OR TITLE-ABS-KEY ( bacteraemia ) OR TITLE-ABS-KEY ( sinusitis ) OR TITLE-ABS-KEY ( "chronic obstructive lung disease" ) OR TITLE-ABS-KEY ( copd ) OR TITLE-ABS-KEY ( meningitis ) OR TITLE-ABS-KEY ( "invasive pneumococcal disease" ) OR TITLE-ABS-KEY ( "invasive pneumococcal disease" ) OR TITLE-ABS-KEY ( ipd ) OR TITLE-ABS-KEY ( empyema ) OR TITLE-ABS-KEY ( "acute otitis media" ) OR TITLE-ABS-KEY ( aom ) OR TITLE-ABS-KEY ( pneumonia ) OR TITLE-ABS-KEY ( "community acquired pneumonia" ) OR TITLE-ABS-KEY ( cap ) OR TITLE-ABS-KEY ( infection ) OR TITLE-ABS-KEY ( "pneumococcal infections" ) OR TITLE-ABS-KEY ( pneumococc\* AND disease\* ) OR TITLE-ABS-KEY ( pneumococc\* AND infecti\* ) OR TITLE-ABS-KEY ( "chronic obstructive lung diseases" ) OR TITLE-ABS-KEY ( "invasive pneumococcal diseases" ) OR TITLE-ABS-KEY ( pneumoni\* ) OR TITLE-ABS-KEY ( "invasive pneumococcal diseases" ) OR TITLE-ABS-KEY ( infections ) AND PUBYEAR > 2000 ) AND ( TITLE-ABS-KEY ( "pneumococcal conjugate" ) OR TITLE-ABS-KEY ( "pneumococcus conjugate" ) OR TITLE-ABS-KEY ( "conjugate pneumococcal" ) OR TITLE-ABS-KEY ( "conjugate pneumococcus" ) OR TITLE-ABS-KEY ( "pneumococcal polysaccharide conjugate" ) OR TITLE-ABS-KEY ( "pneumococcal conjugated" ) OR TITLE-ABS-KEY ( "pneumococcus conjugated" ) OR TITLE-ABS-KEY ( "conjugated pneumococcal" ) OR TITLE-ABS-KEY ( "conjugated pneumococcus" ) OR TITLE-ABS-KEY ( "pneumococcal polysaccharide conjugated" ) OR TITLE-ABS-KEY ( "pneumococcal conjugates" ) OR TITLE-ABS-KEY ( "pneumococcus conjugates" ) OR TITLE-ABS-KEY ( "conjugates pneumococcal" ) OR TITLE-ABS-KEY ( "conjugates pneumococcus" ) OR TITLE-ABS-KEY ( "pneumococcal polysaccharide conjugates" ) OR TITLE-ABS-KEY ( 7vcrm ) OR TITLE-ABS-KEY ( 10vcrm ) OR TITLE-ABS-KEY ( 13vcrm ) OR TITLE-ABS-KEY ( 7vpnc ) OR TITLE-ABS-KEY ( 10vpnc ) OR TITLE-ABS-KEY ( 13vpnc ) OR TITLE-ABS-KEY ( pcv10 ) OR TITLE-ABS-KEY ( 7pcv ) OR TITLE-ABS-KEY ( 10pcv ) OR TITLE-ABS-KEY ( 13pcv ) OR TITLE-ABS-KEY ( pcv7 ) OR TITLE-ABS-KEY ( pcv13 ) OR TITLE-ABS-KEY ( "pcv 10" ) OR TITLE-ABS-KEY ( "pcv 7" ) OR TITLE-ABS-KEY ( "pcv 13" ) OR TITLE-ABS-KEY ( "pcv-7" ) OR TITLE-ABS-KEY ( "pcv-10" ) OR TITLE-ABS-KEY ( "pcv-13" ) OR TITLE-ABS-KEY ( pncrm7 ) OR TITLE-ABS-KEY ( pncrm10 ) OR TITLE-ABS-KEY ( pncrm13 ) OR TITLE-ABS-KEY ( "pncrm-7" ) OR TITLE-ABS-KEY ( "pncrm-10" ) OR TITLE-ABS-KEY ( "pncrm-13" ) OR TITLE-ABS-KEY ( "seven-valent" ) OR TITLE-ABS-KEY ( "ten-valent" ) OR TITLE-ABS-KEY ( "thirteen-valent" ) OR TITLE-ABS-KEY ( "10-valent" ) OR TITLE-ABS-KEY ( "13-valent" ) OR TITLE-ABS-KEY ( "7-valent" ) OR TITLE-ABS-KEY ( 7valent ) OR TITLE-ABS-KEY ( 10valent ) OR TITLE-ABS-KEY ( 13valent ) OR TITLE-ABS-KEY ( "7 valent" ) OR TITLE-ABS-KEY ( "10 valent" ) OR TITLE-ABS-KEY ( "13 valent" ) OR TITLE-ABS-KEY ( "pcv7/13" ) OR TITLE-ABS-KEY ( "phid-cv" ) OR TITLE-ABS-KEY ( phid10cv ) OR TITLE-ABS-KEY ( phidcv ) OR TITLE-ABS-KEY ( phidcv10 ) OR TITLE-ABS-KEY ( "phid-cv10" ) OR TITLE-ABS-KEY ( heptavalent ) OR TITLE-ABS-KEY ( synflorix ) OR TITLE-ABS-KEY ( prevenar ) OR TITLE-ABS-KEY ( "prevenar 13" ) OR TITLE-ABS-KEY ( prevnar ) OR TITLE-ABS-KEY ( "prevnar 13" ) AND PUBYEAR > 2000 ) ) OR ( ( TITLE-ABS-KEY ( carriage ) OR TITLE-ABS-KEY ( "bacterium colony" ) OR TITLE-ABS-KEY ( "microbial colonization" ) OR TITLE-ABS-KEY ( "bacterium carrier" ) OR TITLE-ABS-KEY ( "bacterium carrier" ) OR TITLE-ABS-KEY ( carrier\* ) OR TITLE-ABS-KEY ( colonis\* ) OR TITLE-ABS-KEY ( coloniz\* ) OR TITLE-ABS-KEY ( serotyp\* ) OR TITLE-ABS-KEY ( strain\* ) OR TITLE-ABS-KEY ( nasopharyngeal ) OR TITLE-ABS-KEY ( oropharyngeal ) OR TITLE-ABS-KEY ( nasopharynx ) OR TITLE-ABS-KEY ( oropharynx ) OR TITLE-ABS-KEY ( bacterium AND carri\* ) OR TITLE-ABS-KEY ( microb\* AND colon\* ) AND PUBYEAR > 2000 ) AND ( TITLE-ABS-KEY ( "pneumococcal conjugate" ) OR TITLE-ABS-KEY ( "pneumococcus conjugate" ) OR TITLE-ABS-KEY ( "conjugate pneumococcal" ) OR TITLE-ABS-KEY ( "conjugate pneumococcus" ) OR TITLE-ABS-KEY ( "pneumococcal polysaccharide conjugate" ) OR TITLE-ABS-KEY ( "pneumococcal conjugated" ) OR TITLE-ABS-KEY ( "pneumococcus 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pncrm13 ) OR TITLE-ABS-KEY ( "pncrm-7" ) OR TITLE-ABS-KEY ( "pncrm-10" ) OR TITLE-ABS-KEY ( "pncrm-13" ) OR TITLE-ABS-KEY ( "seven-valent" ) OR TITLE-ABS-KEY ( "ten-valent" ) OR TITLE-ABS-KEY ( "thirteen-valent" ) OR TITLE-ABS-KEY ( "10-valent" ) OR TITLE-ABS-KEY ( "13-valent" ) OR TITLE-ABS-KEY ( "7-valent" ) OR TITLE-ABS-KEY ( 7valent ) OR TITLE-ABS-KEY ( 10valent ) OR TITLE-ABS-KEY ( 13valent ) OR TITLE-ABS-KEY ( "7 valent" ) OR TITLE-ABS-KEY ( "10 valent" ) OR TITLE-ABS-KEY ( "13 valent" ) OR TITLE-ABS-KEY ( "pcv7/13" ) OR TITLE-ABS-KEY ( "phid-cv" ) OR TITLE-ABS-KEY ( phid10cv ) OR TITLE-ABS-KEY ( phidcv ) OR TITLE-ABS-KEY ( phidcv10 ) OR TITLE-ABS-KEY ( "phid-cv10" ) OR TITLE-ABS-KEY ( heptavalent ) OR TITLE-ABS-KEY ( synflorix ) OR TITLE-ABS-KEY ( prevenar ) OR TITLE-ABS-KEY ( "prevenar 13" ) OR TITLE-ABS-KEY ( prevnar ) OR TITLE-ABS-KEY ( "prevnar 13" ) AND PUBYEAR > 2000 ) AND ( TITLE-ABS-KEY ( efficacy ) OR TITLE-ABS-KEY ( effectiveness ) OR TITLE-ABS-KEY ( impact ) OR TITLE-ABS-KEY ( incidence ) OR TITLE-ABS-KEY ( surveillance ) OR TITLE-ABS-KEY ( "surveillance postmarketing" ) OR TITLE-ABS-KEY ( "postmarketing surveillance" ) OR TITLE-ABS-KEY ( "case control study" ) OR TITLE-ABS-KEY ( "case control" ) OR TITLE-ABS-KEY ( "case-control" ) OR TITLE-ABS-KEY ( observational ) OR TITLE-ABS-KEY ( prevalence ) OR TITLE-ABS-KEY ( epidemiology ) OR TITLE-ABS-KEY ( "observational study" ) OR TITLE-ABS-KEY ( "disease surveillance" ) OR TITLE-ABS-KEY ( "drug efficacy" ) OR TITLE-ABS-KEY ( epidemiolog\* ) AND PUBYEAR > 2000 ) )

**Searchlight (Med’meme) search strategy**

Records were selected from the following source: Full text search using **Body & Title =** (((((PNEUMOCOCCAL  *OR* PNEUMOCOCCUS ) *AND* (CONJUGATE  *OR* CONJUGATES  *OR* CONJUGATED )) *OR* 7VCRM  *OR* 10VCRM  *OR* 13VCRM  *OR* 7VPNC  *OR* 10VPNC  *OR* 13VPNC  *OR* PCV10  *OR* 7PCV  *OR* 10PCV  *OR* 13PCV  *OR* PCV7  *OR* (PCV13  *OR* "PCV 13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "PCV 10"  *OR* "PCV 7"  *OR* ("PCV 13"  *OR* "PCV13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "PCV-7"  *OR* "PCV-10"  *OR* ("PCV-13"  *OR* "PCV 13"  *OR* "PCV13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* (PNCRM7  *OR* "7-valent pneumococcal conjugate vaccine"  *OR* "HEPTAVALENT PNEUMOCOCCAL CONJUGATE VACCINE"  *OR* "PNCRM 7"  *OR* "Pneumococcal 7-valent conjugate vaccine"  *OR* "Prevenar"  *OR* "Prevnar"  *OR* "Seven-valent pneumococcal PS-meningococcal OMPC conjugate vaccine" )  *OR* PNCRM10  *OR* (PNCRM13  *OR* "PCV 13"  *OR* "PCV13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "PNCRM-7"  *OR* "PNCRM-10"  *OR* ("PNCRM-13"  *OR* "PCV 13"  *OR* "PCV13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "SEVEN-VALENT"  *OR* "TEN-VALENT"  *OR* "THIRTEEN-VALENT"  *OR* "10-VALENT"  *OR* "13-VALENT"  *OR* "7-VALENT"  *OR* 7VALENT  *OR* 10VALENT  *OR* 13VALENT  *OR* "7 VALENT"  *OR* "10 VALENT"  *OR* "13 VALENT"  *OR* "PCV7/13"  *OR* "PHID-CV"  *OR* PHID10CV  *OR* PHIDCV  *OR* PHIDCV10  *OR* "PHID-CV10"  *OR* HEPTAVALENT  *OR* SYNFLORIX  *OR* (PREVENAR  *OR* "7-valent pneumococcal conjugate vaccine"  *OR* "HEPTAVALENT PNEUMOCOCCAL CONJUGATE VACCINE"  *OR* "PNCRM 7"  *OR* "PNCRM7"  *OR* "Pneumococcal 7-valent conjugate vaccine"  *OR* "Prevnar"  *OR* "Seven-valent pneumococcal PS-meningococcal OMPC conjugate vaccine" )  *OR* "PREVENAR 13"  *OR* (PREVNAR  *OR* "7-valent pneumococcal conjugate vaccine"  *OR* "HEPTAVALENT PNEUMOCOCCAL CONJUGATE VACCINE"  *OR* "PNCRM 7"  *OR* "PNCRM7"  *OR* "Pneumococcal 7-valent conjugate vaccine"  *OR* "Prevenar"  *OR* "Seven-valent pneumococcal PS-meningococcal OMPC conjugate vaccine" )  *OR* ("PREVNAR 13"  *OR* "Pneumococcal 13-valent conjugate vaccine" ) ) *AND* ((EFFICACY  *OR* "outcome"  *OR* "outcome measures" )  *OR* EFFECTIVENESS  *OR* IMPACT  *OR* (INCIDENCE  *OR* "demographics"  *OR* "epidemiologic"  *OR* "epidemiology"  *OR* "incidences"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* SURVEILLANCE  *OR* "SURVEILLANCE POSTMARKETING"  *OR* "POSTMARKETING SURVEILLANCE"  *OR* "SURVEILLANCE POST-MARKETING"  *OR* "POST-MARKETING SURVEILLANCE"  *OR* "CASE CONTROL STUDY"  *OR* "CASE CONTROL"  *OR* "CASE-CONTROL"  *OR* OBSERVATIONAL  *OR* (PREVALENCE  *OR* "prevalences" )  *OR* (EPIDEMIOLOGY  *OR* "demographics"  *OR* "epidemiologic"  *OR* "incidence"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* "OBSERVATIONAL STUDY"  *OR* "DISEASE SURVEILLANCE"  *OR* "DRUG EFFICACY"  *OR* (EPIDEMIOLOGY  *OR* "demographics"  *OR* "epidemiologic"  *OR* "incidence"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* (EPIDEMIOLOGIC  *OR* "demographics"  *OR* "epidemiology"  *OR* "incidence"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* EPIDEMIOLOGICAL ) *AND* (CARRIAGE  *OR* "BACTERIUM COLONY"  *OR* "MICROBIAL COLONIZATION"  *OR* "BACTERIUM CARRIER"  *OR* "BACTERIUM CARRIER"  *OR* CARRIER  *OR* CARRIERS  *OR* COLONISATION  *OR* COLONIZATION  *OR* COLONIZING  *OR* COLONISING  *OR* SEROTYPE  *OR* SEROTYPING  *OR* SEROTYPES  *OR* (STRAIN  *OR* "athletic"  *OR* "exercise"  *OR* "knee injury"  *OR* "massage therapy"  *OR* "sport"  *OR* "sports"  *OR* "Sports medicine"  *OR* "sprain" )  *OR* STRAINS  *OR* NASOPHARYNGEAL  *OR* OROPHARYNGEAL  *OR* NASOPHARYNX  *OR* OROPHARYNX  *OR* BACTERIUM )) *OR* ((((PNEUMOCOCCAL  *OR* PNEUMOCOCCUS ) *AND* (CONJUGATE  *OR* CONJUGATES  *OR* CONJUGATED )) *OR* 7VCRM  *OR* 10VCRM  *OR* 13VCRM  *OR* 7VPNC  *OR* 10VPNC  *OR* 13VPNC  *OR* PCV10  *OR* 7PCV  *OR* 10PCV  *OR* 13PCV  *OR* PCV7  *OR* (PCV13  *OR* "PCV 13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "PCV 10"  *OR* "PCV 7"  *OR* ("PCV 13"  *OR* "PCV13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "PCV-7"  *OR* "PCV-10"  *OR* ("PCV-13"  *OR* "PCV 13"  *OR* "PCV13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* (PNCRM7  *OR* "7-valent pneumococcal conjugate vaccine"  *OR* "HEPTAVALENT PNEUMOCOCCAL CONJUGATE VACCINE"  *OR* "PNCRM 7"  *OR* "Pneumococcal 7-valent conjugate vaccine"  *OR* "Prevenar"  *OR* "Prevnar"  *OR* "Seven-valent pneumococcal PS-meningococcal OMPC conjugate vaccine" )  *OR* PNCRM10  *OR* (PNCRM13  *OR* "PCV 13"  *OR* "PCV13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM-13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "PNCRM-7"  *OR* "PNCRM-10"  *OR* ("PNCRM-13"  *OR* "PCV 13"  *OR* "PCV13"  *OR* "PCV-13"  *OR* "PNCRM 13"  *OR* "PNCRM13"  *OR* "Pneumococcal Polysaccharide Conjugate Vaccine"  *OR* "Pneumococcal vaccine conjugate 13-valent" )  *OR* "SEVEN-VALENT"  *OR* "TEN-VALENT"  *OR* "THIRTEEN-VALENT"  *OR* "10-VALENT"  *OR* "13-VALENT"  *OR* "7-VALENT"  *OR* 7VALENT  *OR* 10VALENT  *OR* 13VALENT  *OR* "7 VALENT"  *OR* "10 VALENT"  *OR* "13 VALENT"  *OR* "PCV7/13"  *OR* "PHID-CV"  *OR* PHID10CV  *OR* PHIDCV  *OR* PHIDCV10  *OR* "PHID-CV10"  *OR* HEPTAVALENT  *OR* SYNFLORIX  *OR* (PREVENAR  *OR* "7-valent pneumococcal conjugate vaccine"  *OR* "HEPTAVALENT PNEUMOCOCCAL CONJUGATE VACCINE"  *OR* "PNCRM 7"  *OR* "PNCRM7"  *OR* "Pneumococcal 7-valent conjugate vaccine"  *OR* "Prevnar"  *OR* "Seven-valent pneumococcal PS-meningococcal OMPC conjugate vaccine" )  *OR* "PREVENAR 13"  *OR* (PREVNAR  *OR* "7-valent pneumococcal conjugate vaccine"  *OR* "HEPTAVALENT PNEUMOCOCCAL CONJUGATE VACCINE"  *OR* "PNCRM 7"  *OR* "PNCRM7"  *OR* "Pneumococcal 7-valent conjugate vaccine"  *OR* "Prevenar"  *OR* "Seven-valent pneumococcal PS-meningococcal OMPC conjugate vaccine" )  *OR* ("PREVNAR 13"  *OR* "Pneumococcal 13-valent conjugate vaccine" ) ) *AND* ("PNEUMOCOCCAL INFECTION"  *OR* (PNEUMOCOCCAL  *AND* DISEASE ) *OR* (PNEUMOCOCCAL  *AND* (INFECTION  *OR* "general infectious disease"  *OR* "infections"  *OR* "infectious"  *OR* "infectious disease"  *OR* "infectious diseass"  *OR* "mycoses"  *OR* "parasitic infections"  *OR* "systemic infection" ) ) *OR* (PNEUMOCOCCAL  *AND* DISEASES ) *OR* (PNEUMOCOCCAL  *AND* (INFECTIONS  *OR* "general infectious disease"  *OR* "Infection"  *OR* "infectious"  *OR* "infectious disease"  *OR* "infectious diseass"  *OR* "mycoses"  *OR* "parasitic infections"  *OR* "systemic infection" ) ) *OR* (PNEUMOCOCCUS  *AND* DISEASE ) *OR* (PNEUMOCOCCUS  *AND* (INFECTION  *OR* "general infectious disease"  *OR* "infections"  *OR* "infectious"  *OR* "infectious disease"  *OR* "infectious diseass"  *OR* "mycoses"  *OR* "parasitic infections"  *OR* "systemic infection" ) ) *OR* (PNEUMOCOCCAL  *AND* DISEASES ) *OR* (PNEUMOCOCCAL  *AND* (INFECTIONS  *OR* "general infectious disease"  *OR* "Infection"  *OR* "infectious"  *OR* "infectious disease"  *OR* "infectious diseass"  *OR* "mycoses"  *OR* "parasitic infections"  *OR* "systemic infection" ) ) *OR* (SEPTICEMIA  *OR* "hematosepsis"  *OR* "inflammatory response syndrome, systemic"  *OR* "intestinal sepsis"  *OR* "puerperal fever"  *OR* "puerperal sepsis"  *OR* "sapremia"  *OR* "Sepsis"  *OR* "sepsis lenta"  *OR* "septemia"  *OR* "septic"  *OR* "septic fever"  *OR* "septic intoxication"  *OR* "septic shock"  *OR* "septic syndrome"  *OR* "sirs"  *OR* "systemic inflammatory response syndrome" )  *OR* SEPTICAEMIA  *OR* BACTEREMIA  *OR* BACTERAEMIA  *OR* (SINUSITIS  *OR* "acute sinusitis"  *OR* "bronchiolitis"  *OR* "bronchitis"  *OR* "chronic sinusitis"  *OR* "lung infection"  *OR* "pharyngitis"  *OR* "pneumonia"  *OR* "pulmonary infections"  *OR* "respiratory infections"  *OR* "respiratory infectious disease"  *OR* "respiratory tract infection"  *OR* "Respiratory tract infections"  *OR* "rhinosinusitis"  *OR* "sinusitus" )  *OR* ("CHRONIC OBSTRUCTIVE LUNG DISEASE"  *OR* "chronic airflow obstruction"  *OR* "chronic airway obstruction, NEC in ICD9CM\_2006"  *OR* "chronic airway obstruction, not elsewhere classified"  *OR* "chronic obstructive airways disease"  *OR* "chronic obstructive airways disease NOS"  *OR* "chronic obstructive airways disease NOS (disorder)"  *OR* "chronic obstructive lung disease (disorder)"  *OR* "chronic obstructive lung disease [Ambiguous]"  *OR* "Chronic obstructive pulmonary disease"  *OR* "chronic obstructive pulmonary disease and allied conditions"  *OR* "chronic obstructive pulmonary disease finding"  *OR* "COLD (chronic obstructive lung disease)"  *OR* "COPD"  *OR* "COPD NOS"  *OR* "Dops"  *OR* "pulmonary disease, chronic obstructive" )  *OR* (COPD  *OR* "chronic airflow obstruction"  *OR* "chronic airway obstruction, NEC in ICD9CM\_2006"  *OR* "chronic airway obstruction, not elsewhere classified"  *OR* "chronic obstructive airways disease"  *OR* "chronic obstructive airways disease NOS"  *OR* "chronic obstructive airways disease NOS (disorder)"  *OR* "chronic obstructive lung disease"  *OR* "chronic obstructive lung disease (disorder)"  *OR* "chronic obstructive lung disease [Ambiguous]"  *OR* "Chronic obstructive pulmonary disease"  *OR* "chronic obstructive pulmonary disease and allied conditions"  *OR* "chronic obstructive pulmonary disease finding"  *OR* "COLD (chronic obstructive lung disease)"  *OR* "COPD NOS"  *OR* "Dops"  *OR* "pulmonary disease, chronic obstructive" )  *OR* (MENINGITIS  *OR* "meningitas"  *OR* "pachymeningitis" )  *OR* "INVASIVE PNEUMOCOCCAL DISEASE"  *OR* IPD  *OR* (EMPYEMA  *OR* "abscess of pleural cavity (disorder)"  *OR* "abscess of thorax (disorder)"  *OR* "Empyema (& pleural)"  *OR* "Empyema (disorder)"  *OR* "Empyema (morphologic abnormality)"  *OR* "Empyema NOS"  *OR* "Empyema NOS (& pleural)"  *OR* "Empyema of pleura (disorder)"  *OR* "Empyema of pleura without fistula (disorder)"  *OR* "Empyema with fistula"  *OR* "Empyema with fistula (& pleural)"  *OR* "Empyema with fistula (disorder)"  *OR* "Empyema with fistula NOS (& pleural)"  *OR* "Empyema with no fistula"  *OR* "Empyema with no fistula NOS"  *OR* "Empyema with pleural fistula (disorder)"  *OR* "Empyema with pleural fistula NOS (disorder)"  *OR* "Empyema with thoracic fistula NOS (disorder)"  *OR* "Empyema without mention of fistula"  *OR* "Empyema, chest"  *OR* "lung empyema NOS (disorder)"  *OR* "Pleural empyema"  *OR* "Pleural empyema (disorder)"  *OR* "Pleural empyema NOS (disorder)"  *OR* "Pleural empyema with fistula (disorder)"  *OR* "pleural empyema with no fistula"  *OR* "Pleural empyema with no fistula (disorder)"  *OR* "pulmonary Empyema"  *OR* "Purulent pleurisy (disorder)"  *OR* "pyothorax"  *OR* "Thorax abscess NOS (disorder)" )  *OR* ("ACUTE OTITIS MEDIA"  *OR* "aom"  *OR* "otis media"  *OR* "Otitis media"  *OR* "Otitis media, acute" )  *OR* (AOM  *OR* "acute otitis media"  *OR* "otis media"  *OR* "Otitis media"  *OR* "Otitis media, acute" )  *OR* (PNEUMONIA  *OR* "acute pneumonia"  *OR* "bronchiolitis"  *OR* "bronchitis"  *OR* "inflammation of the lungs"  *OR* "lung infection"  *OR* "lung inflammation"  *OR* "pharyngitis"  *OR* "pneumonitis"  *OR* "pulmonary infections"  *OR* "pulmonary inflammation"  *OR* "respiratory infections"  *OR* "respiratory infectious disease"  *OR* "respiratory tract infection"  *OR* "Respiratory tract infections"  *OR* "sinusitis" )  *OR* "COMMUNITY ACQUIRED PNEUMONIA"  *OR* (CAP  *OR* "communicable pneumopathies"  *OR* "community acquired pneumonias"  *OR* "community-acquired pneumonia"  *OR* "community-acquired pneumopathies"  *OR* "Pneumonia, community-acquired" )  *OR* (INFECTION  *OR* "general infectious disease"  *OR* "infections"  *OR* "infectious"  *OR* "infectious disease"  *OR* "infectious diseass"  *OR* "mycoses"  *OR* "parasitic infections"  *OR* "systemic infection" )  *OR* "PNEUMOCOCCAL INFECTIONS"  *OR* "CHRONIC OBSTRUCTIVE LUNG DISEASES"  *OR* "INVASIVE PNEUMOCOCCAL DISEASES"  *OR* (PNEUMONIA  *OR* "acute pneumonia"  *OR* "bronchiolitis"  *OR* "bronchitis"  *OR* "inflammation of the lungs"  *OR* "lung infection"  *OR* "lung inflammation"  *OR* "pharyngitis"  *OR* "pneumonitis"  *OR* "pulmonary infections"  *OR* "pulmonary inflammation"  *OR* "respiratory infections"  *OR* "respiratory infectious disease"  *OR* "respiratory tract infection"  *OR* "Respiratory tract infections"  *OR* "sinusitis" )  *OR* (PNEUMONITIS  *OR* "acute pneumonia"  *OR* "inflammation of the lungs"  *OR* "lung inflammation"  *OR* "Pneumonia"  *OR* "pulmonary inflammation" )  *OR* PNEUMONIAE  *OR* "INVASIVE PNEUMOCOCCAL DISEASES"  *OR* (INFECTIONS  *OR* "general infectious disease"  *OR* "Infection"  *OR* "infectious"  *OR* "infectious disease"  *OR* "infectious diseass"  *OR* "mycoses"  *OR* "parasitic infections"  *OR* "systemic infection" ) ) *AND* ((EFFICACY  *OR* "outcome"  *OR* "outcome measures" )  *OR* EFFECTIVENESS  *OR* IMPACT  *OR* (INCIDENCE  *OR* "demographics"  *OR* "epidemiologic"  *OR* "epidemiology"  *OR* "incidences"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* SURVEILLANCE  *OR* "SURVEILLANCE POSTMARKETING"  *OR* "POSTMARKETING SURVEILLANCE"  *OR* "SURVEILLANCE POST-MARKETING"  *OR* "POST-MARKETING SURVEILLANCE"  *OR* "CASE CONTROL STUDY"  *OR* "CASE CONTROL"  *OR* "CASE-CONTROL"  *OR* OBSERVATIONAL  *OR* (PREVALENCE  *OR* "prevalences" )  *OR* (EPIDEMIOLOGY  *OR* "demographics"  *OR* "epidemiologic"  *OR* "incidence"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* "OBSERVATIONAL STUDY"  *OR* "DISEASE SURVEILLANCE"  *OR* "DRUG EFFICACY"  *OR* (EPIDEMIOLOGY  *OR* "demographics"  *OR* "epidemiologic"  *OR* "incidence"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* (EPIDEMIOLOGIC  *OR* "demographics"  *OR* "epidemiology"  *OR* "incidence"  *OR* "Pharmacomanagement"  *OR* "population"  *OR* "prevention" )  *OR* EPIDEMIOLOGICAL )))  *AND* **Release Date >=** 31/12/2000  *AND* **Source =** Presentation

**Supplemental Figure 1. Focus on the patient**

****

**Supplemental Table 1. List of excluded high-income countries with reasons for exclusion**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Country | Type of IPD surveillance,Reporting approach | PCV introduction in NIPa | Infant vaccination schedulea | Vaccination coverage | Number of references obtained and screened | Reason for exclusion |
| Austria [[1](#_ENREF_1)] | Nationwide surveillance of all pediatric wards since 2001 | PCV7: 2001bPHiD-CV: Apr 2009PCV13: Dec 2009 | PCV7: 3+1PHiD-CV, PCV13: 2+1 | 2012: >90% | 9 | PCV was first introduced only for at-risk population. Years of universal vaccination not sufficient in the published reports. |
| Belgium [[2](#_ENREF_2)] | National reference center and pediatrician’s surveillance network Pedisurv  | PCV7: 2007PCV13: Jul 2011 | 2+1(catch-up in <2y for PCV7) | 2012: 89%–97% | 23 | Available data were either not presented in the age groups of interest or did not describe pre- and post-PCV period.  |
| Chile [[3-5](#_ENREF_3)] | Mandatory reporting to national reference laboratory; part of SIREVA | PHiD-CV: Jan 2011 | 3+1 in 2011, 2+1 since 2012 | 2012–2014: 82%–92%  | 7 | Not possible to derive VT, NVT IPD for age group <5y and ≥65y from the references. |
| Czech Republic [[6](#_ENREF_6), [7](#_ENREF_7)] | Active population-based surveillance; part of SpIDnet; national reference laboratory for pneumococcal infections and EPIDA  | PCV7: 2005cPHiD-CV: 2009 PCV13: Jan 2010 | 3+1 | 2012–2013: 69% | 7 |  No pre-PCV data publicly available. |
| Germany [[8](#_ENREF_8), [9](#_ENREF_9)] | National Reference Centre for Streptococci; Active hospital-based and passive laboratory-based surveillance; voluntary notification | PCV7: Jul 2006PHiD-CV: Apr 2009PCV13: Dec 2009 | PCV7: 3+1PHiD-CV, PCV13: 2+1 | >85% (since 2007) | 41 | Increased surveillance since 2007 in children and adults. After vaccine introduction, it was calculated that the number of cases reported increased from 40%–50% to 50%–60% in children. Published data reported only number of cases and proportions, and incidences were not possible to be calculated.  |
| Greece [[10](#_ENREF_10), [11](#_ENREF_11)] | Voluntary nationwide surveillance | PCV7: Jan 2006PHiD-CV: May 2009PCV13: Jun 2010d | 3+1 | 2012–2016: 86% | 44 | Data segregated per most frequent serotypes but not all data disclosed. No incidences available. |
| Hungary [[12-14](#_ENREF_12)] | No IPD data collection except for pneumococcal meningitis | PCV7: Apr 2009PCV13: Sep 2010e | 2+1 | 2015: nearly 100% | 0f | Surveillance captures only pneumococcal meningitis. |
| Ireland [[7](#_ENREF_7)] | Active population-based surveillance since 2012; part of SpIDnet  | PCV7: Sep 2008 PCV13: Dec 2010 | 2+1 | 2013: 93% | 18 | Surveillance report data segregated by age for overall IPD but not for VT or NVT IPD. Definition of IPD changed from July 2015: only confirmed IPD cases are reported, possible cases are no longer notified.  |
| Italy [[11](#_ENREF_11), [15](#_ENREF_15), [16](#_ENREF_16)] | National Surveillance of Invasive Bacterial Diseases; regional level; voluntary reporting | PCV7: 2005gPCV13: May 2010 | 2+1(PCV13 catch-up in <2y who received PCV7) | 2013: 75%–94%, varying by region | 34 | Published data in children and adults do not allow calculating incidences and number of cases. No pre-PCV period data are reported. Surveillance system was in place since 1998 for bacterial meningitis and extended to IPD since 2007. |
| Japan [[17](#_ENREF_17)] | Nationwide active surveillance | PCV7: Nov 2010hPCV13: Nov 2013 | 3+1 | 2014: >89% | 17 | PCV13 only included in November 2013, higher-valent PCV period too short for our analyses (<3y). |
| Korea Rep. [[18-20](#_ENREF_18)] | Korean Network for Study on Infectious diseases: prospective surveillance in several hospitals | PCV7: Nov 2003 (optional)PHiD-CV, PCV13:May 2014 | 3+1 | 57%–71%, varying by region | 5 | Higher-valent PCV introduced in national immunization program in 2014. Higher-valent PCV period too short for our analyses (<3y). |
| Latvia [[14](#_ENREF_14), [21](#_ENREF_21)] | State monitoring and surveillance system for infectious diseases  | PCV7: Jan 2010PHiD-CV: 2012 | PCV7: 3+1PHiD-CV: 2+1 | 2010: 51%(regardless of age) | 0 | No available data. |
| Lithuania [[14](#_ENREF_14)] | Passive surveillance system for IPD | PHiD-CV: Oct 2014 | 2+1 | Not reported | 0 | PCV introduced in 2014. Higher-valent PCV period too short for our analyses (<3y). |
| Singapore [[22](#_ENREF_22), [23](#_ENREF_23)] | Mandatory reporting since 2010 | PCV7: Oct 2009PCV13: Dec 2011 | 2+1 | 2012: 68% | 3 | Surveillance report available but data reported only for overall IPD and not reported per grouped serotypes VT/NVT in the age groups studied. |
| Slovak Republic [[12](#_ENREF_12), [14](#_ENREF_14)] | Epidemiological Information System; National Reference Center for Pneumococcal Diseases | PCV7: 2009PCV13: 2010PHiD-CV: 2011 | 2+1 | No data available | 1 | No pre-PCV data publicly available, published data do not allow to calculate incidences per age group and serotype. |
| Sweden [[7](#_ENREF_7)] | The National Surveillance System for Communicable Diseases; part of SpIDnet surveillance | PCV7: 2009 or 2007–2008 in some countiesPHiD-CV, PCV13: 2010 | 2+1 | 2013: 98% | 37 | Incidences for <5y cannot be calculated from the available data. Not enough granularity of data, absolute number of cases not disclosed. |
| Switzerland [[24](#_ENREF_24), [25](#_ENREF_25)] | Mandatory notification to the Federal Office of Public Health | PCV7: Nov 2005PCV13: 2011 | 2+1 | 2012: 83%  | 7 | Surveillance report provides number of IPD cases. Incidence not segregated by age or grouped serotypes. |
| Uruguay [[26-28](#_ENREF_26)] | Passive laboratory-based surveillance (voluntary); part of SIREVA | PCV7: Mar 2008PCV13: Mar 2010 | 2+1 | 2013–2017: ≥93% | 22 | SIREVA is a laboratory-based surveillance of IPD in Latin American countries. Reporting is not mandatory, therefore limited proportion of cases are captured throughlaboratory-based surveillance. In children <5y in Latin-America, SIREVA would capture <10% of the anticipated number of cases (based on published incidence rates), for all countries except for Chile, for which the percentage is higher than 35%.  |

a information from View-hub [[29](#_ENREF_29)] and indicated references. b became available, but recommended in the pediatric national immunization program (NIP) since 2003. c became available, but pneumococcal conjugate vaccines (PCV) introduced in the NIP since 2010. d PCV13 most commonly used since Jul 2010. e in use, but introduced in pediatric NIP since Jul 2014. f Hungary was excluded from the analysis due to the absence of an IPD surveillance system (other than for pneumococcal meningitis), therefore no literature search was performed. g PCV was included in the NIP in 2012, but several regions had already implemented PCVs in regional vaccination programs, starting from 2005. h vaccination encouraged for <5y by the government, included in NIP since Apr 2013. PCV7/13, 7/13-valent PCV; y, years of age; PHiD-CV, pneumococcal non-typeable *Haemophilus influenzae* protein D conjugate vaccine; IPD, invasive pneumococcal disease; VT IPD, IPD caused by serotypes included in any of the three PCVs, i.e. serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F; NVT IPD, IPD caused by any other serotype; SIREVA, Sistema Regional de Vacunas; SpiDnet, *Streptococcus pneumoniae* Invasive Disease network.

**Supplemental Table 2. Invasive pneumococcal disease distribution across analyzed countries by PCV era for children <5 years old**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Country (region) | Overall IPD | VT IPD | NVT IPD | 19A IPD | 3 IPD | 6A IPD |
| **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** |
| Pre-PCV era | Australia | 54.7 | 697.0 | 46.6 | 594.5 | 3.7 | 47.0 | 2.3 | 29.9 | 0.5 | 6.3 | NA | NA |
| Canada (Quebec) | 68.8 | 264.0 | 63.7 | 239.0 | 5.1 | 19.0 | 2.8 | 5.7 | 0.7 | 1.3 | NA | NA |
| Denmark | 26.7 | 88.4 | 24.2 | 80.1 | 2.5 | 8.3 | NA | NA | NA | NA | NA | NA |
| Finland | 38.2 | 110.2 | 35.8 | 103.2 | 2.4 | 7.0 | 3.6 | 10.2 | 0.3 | 1.0 | NA | NA |
| France | 17.1 | 473.0 | 15.4 | 427.4 | 1.6 | 45.6 | 1.2 | 33.0 | 0.5 | 14.0 | NA | NA |
| Israel | 50.6 | 365.3 | 45.3 | 327.0 | 5.3 | 38.3 | 5.1 | 36.8 | 0.3 | 2.2 | NA | NA |
| New Zealand | 53.4 | 154.5 | 49.7 | 144.0 | 3.1 | 9.0 | 3.6 | 10.5 | 0.3 | 1.0 | NA | NA |
| The Netherlands | 19.9 | 198.5 | 18.3 | 183.0 | 1.6 | 15.5 | 1.4 | 13.5 | 0.3 | 2.5 | NA | NA |
| UK (England and Wales) | 31.7 | 1070.0 | 28.8 | 972.8 | 2.9 | 97.2 | 1.3 | 45.0 | 0.5 | 17.0 | NA | NA |
| US | 94.7 | 1171.0 | 87.4 | 1082.1 | 7.2 | 88.9 | NA | NA | NA | NA | NA | NA |
| PCV7 era | Australia | 18.7 | 268.5 | 11.7 | 168.5 | 5.9 | 85.5 | 8.4 | 118.9 | 0.6 | 8.0 | NA | NA |
| Canada (Quebec) | 30.8 | 121.0 | 18.4 | 72.0 | 12.4 | 49.0 | 11.1 | 23.0 | 1.6 | 3.5 | NA | NA |
| Denmark | 16.2 | 53.0 | 12.4 | 40.5 | 3.8 | 12.5 | NA | NA | NA | NA | NA | NA |
| Finland | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| France | 16.2 | 316.0 | 11.7 | 352.2 | 4.4 | 132.8 | 3.8 | 113.0 | 0.3 | 0.0 | NA | NA |
| Israel | 33.0 | 261.0 | 24.9 | 197.0 | 8.1 | 64.0 | 5.0 | 39.5 | 0.8 | 6.3 | NA | NA |
| New Zealand | 17.9 | 56.5 | 13.0 | 41.0 | 4.1 | 13.0 | 3.7 | 11.5 | 0.6 | 2.0 | NA | NA |
| The Netherlands | 9.6 | 88.0 | 5.5 | 51.0 | 4.0 | 37.0 | 1.8 | 17.0 | 0.3 | 2.5 | NA | NA |
| UK (England and Wales) | 13.6 | 461.0 | 9.2 | 311.0 | 4.4 | 150.0 | 2.5 | 85.0 | 0.8 | 26.0 | NA | NA |
| US | 21.4 | 474.0 | 13.4 | 296.5 | 8.0 | 177.5 | NA | NA | NA | NA | NA | NA |
| HV-PCV era | Australia | 13.5 | 206.0 | 4.6 | 70.0 | 7.1 | 108.0 | 2.0 | 29.9 | 1.2 | 18.0 | 0.0 | 0.5 |
| Canada (Quebec) | 15.5 | 69.0 | 2.5 | 11.5 | 12.9 | 58.0 | 1.4 | 3.5 | 0.7 | 2.0 | 0.0 | 0.0 |
| Denmark | 8.4 | 25.5 | 0.8 | 2.5 | 7.6 | 23.0 | NA | NA | NA | NA | NA | NA |
| Finland | 8.4 | 25.0 | 6.2 | 18.5 | 2.2 | 6.5 | 3.5 | 10.5 | 1.0 | 3.0 | 0.2 | 0.5 |
| France | 7.6 | 227.0 | 1.5 | 45.5 | 6.1 | 181.0 | 0.3 | 8.0 | 0.1 | 4.0 | 0.0 | 0.0 |
| Israel | 18.8 | 155.0 | 6.0 | 49.0 | 12.8 | 106.0 | 1.6 | 13.2 | 0.9 | 7.4 | 0.3 | 2.5 |
| New Zealand | 13.8 | 42.5 | 7.1 | 22.0 | 5.5 | 17.0 | 3.4 | 10.5 | 1.8 | 5.5 | 0.6 | 2.0 |
| The Netherlands | 6.9 | 61.0 | 3.4 | 30.0 | 3.5 | 31.0 | 1.0 | 9.0 | 0.5 | 4.0 | 0.0 | 0.0 |
| UK (England and Wales) | 7.3 | 247.0 | 1.1 | 37.0 | 6.2 | 210.0 | 0.2 | 7.0 | 0.2 | 8.0 | 0.0 | 0.0 |
| US | 9.5 | 199.5 | 2.0 | 42.0 | 7.5 | 158.0 | NA | NA | NA | NA | NA | NA |

PCV, pneumococcal conjugate vaccine; PCV7, 7-valent PCV; HV-PCV, higher-valent PCV (PHiD-CV, PCV13); overall IPD, invasive pneumococcal disease caused by any pneumococcal serotype; VT IPD, IPD caused by serotypes included in any of the three PCVs, i.e. serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F; NVT IPD, IPD caused by any other serotype; 3, 6A, 19A IPD, IPD caused by serotypes 3, 6A and 19A, respectively (Note: for New Zealand 6A IPD refers to IPD caused by serotypes 6A or 6C); --, not applicable (Finland did not introduce PCV7); NA, not available. Note: Cases indicate average number of cases over the respective analysis periods.

**Supplemental Table 3. Invasive pneumococcal disease distribution across analyzed countries by PCV era for adults ≥65 years old**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Country (region)** | **Overall IPD** | **VT IPD** | **NVT IPD** | **19A IPD** | **3 IPD** | **6A IPD** |
| **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** | **incidence** | **cases** |
| **Pre-PCV era** | Denmark | 64.9 | 522.9 | 45.5 | 367.0 | 19.4 | 155.9 | NA | NA | NA | NA | NA | NA |
| Finland | 31.3 | 270.8 | 23.8 | 205.4 | 7.6 | 65.4 | 1.2 | 10.6 | 2.2 | 19.2 | NA | NA |
| France | 27.7 | 2000.0 | 21.5 | 1552.0 | 6.2 | 448.0 | 2.8 | 202.2 | 2.5 | 181.0 | NA | NA |
| New Zealand | 34.2 | 177.5 | 27.9 | 145.0 | 6.3 | 32.5 | 1.5 | 8.0 | 2.4 | 12.5 | NA | NA |
| Norway | 75.3 | 509.0 | 60.1 | 406.0 | 15.3 | 103.0 | NA | NA | NA | NA | NA | NA |
| The Netherlands | 63.8 | 368.5 | 48.4 | 279.0 | 15.5 | 89.0 | 2.4 | 14.0 | 3.7 | 21.0 | NA | NA |
| UK (England and Wales) | 34.8 | 3125.0 | 25.3 | 2273.0 | 9.5 | 852.0 | 1.2 | 111.0 | 2.5 | 224.0 | NA | NA |
| US | 61.0 | 1251.5 | 45.0 | 923.5 | 16.0 | 328.0 | NA | NA | NA | NA | NA | NA |
| **PCV7 era** | Denmark | 58.5 | 519.7 | 32.4 | 287.8 | 26.1 | 231.9 | NA | NA | NA | NA | NA | NA |
| Finland | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| France | 31.1 | 2529.0 | 19.1 | 1553.0 | 12.0 | 976.0 | 4.5 | 366.0 | 3.4 | 276.0 | NA | NA |
| New Zealand | 39.8 | 227.0 | 22.2 | 133.0 | 13.1 | 76.0 | 4.0 | 23.0 | 2.1 | 12.0 | NA | NA |
| Norway | 58.3 | 416.0 | 32.6 | 232.5 | 25.7 | 183.5 | NA | NA | NA | NA | NA | NA |
| The Netherlands | 49.4 | 316.5 | 27.4 | 175.0 | 22.0 | 141.5 | 4.7 | 30.0 | 3.6 | 22.5 | NA | NA |
| UK (England and Wales) | 27.6 | 2468.0 | 14.9 | 1334.0 | 12.7 | 1134.0 | 3.1 | 279.0 | 2.9 | 256.0 | NA | NA |
| US | 39.6 | 1327.5 | 17.5 | 587.5 | 22.1 | 740.0 | NA | NA | NA | NA | NA | NA |
| **HV-PCV era** | Denmark | 44.6 | 463.0 | 11.1 | 114.7 | 33.5 | 348.3 | NA | NA | NA | NA | NA | NA |
| Finland | 35.3 | 391.0 | 20.0 | 221.5 | 15.3 | 169.5 | 4.5 | 50.5 | 6.3 | 70.0 | 1.4 | 15.0 |
| France | 20.0 | 1700.0 | 7.3 | 622.0 | 12.7 | 1078.0 | 2.2 | 187.0 | 2.4 | 204.0 | 0.1 | 9.0 |
| New Zealand | 31.7 | 202.5 | 16.0 | 104.0 | 13.9 | 89.5 | 4.6 | 29.0 | 2.0 | 13.0 | 2.0 | 12.5 |
| Norway | 38.1 | 313.5 | 9.3 | 76.0 | 28.9 | 237.5 | NA | NA | NA | NA | NA | NA |
| The Netherlands | 50.5 | 374.5 | 19.1 | 141.5 | 31.4 | 233.0 | 5.5 | 40.5 | 3.3 | 24.5 | 0.1 | 1.0 |
| UK (England and Wales) | 20.6 | 1841.0 | 4.3 | 380.0 | 16.3 | 1461.0 | 1.1 | 97.0 | 1.6 | 143.0 | 0.1 | 5.0 |
| US | 27.8 | 1127.5 | 6.0 | 243.5 | 21.8 | 884.0 | NA | NA | NA | NA | NA | NA |

PCV, pneumococcal conjugate vaccine; PCV7, 7-valent PCV; HV-PCV, higher-valent PCV (PHiD-CV, PCV13); overall IPD, invasive pneumococcal disease caused by any pneumococcal serotype; VT IPD, IPD caused by serotypes included in any of the three PCVs, i.e. serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F; NVT IPD, IPD caused by any other serotype; 3, 6A, 19A IPD, IPD caused by serotypes 3, 6A and 19A, respectively (Note: for New Zealand 6A IPD refers to IPD caused by serotypes 6A or 6C); --, not applicable (Finland did not introduce PCV7); NA, not available. Note: Cases indicate average number of cases over the respective analysis periods.

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