

Review of evidence to inform the New Zealand National Immunisation Programme, 2026: Pneumococcal - infants

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Ora

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Contents

Acknowledgements	iii
Abbreviations	iii
Executive Summary	i
Purpose of the review	i
Overview	i
Vaccine Safety	ii
Immunogenicity	ii
Vaccine effectiveness.....	ii
Implications for children at high risk of invasive pneumococcal disease.	ii
Equity Considerations	iii
Summary	iii
Key recommendations	iii
Summary of the findings of this review of evidence	i
Outstanding questions	i
Introduction	i
Background	1
Pneumococcal vaccines	2
Epidemiology.....	3
Review of recent literature.....	10
Safety	10
Immunogenicity	11
Efficacy and effectiveness	15
International immunisation schedules.....	18
Decision-making by country.....	19
Summary of evidence	21
Table 7: Burden of disease, programme effectiveness and serotype prevalence.....	21
Table 8: Vaccine safety	26
Table 9: Immunogenicity	29
Table 10: Vaccine efficacy and effectiveness.....	34
Methodology for literature searches	37
Concepts	37
Search details.....	37
References.....	39

List of Tables and Figures

Table 1. Comparison of the pneumococcal serotypes contained within high valency vaccines used in children.....	2
Table 2: Number and rate (per 100,000 population) of invasive pneumococcal disease cases notified in 2025, by age and ethnicity (source PHF Science, provisional data)	6
Table 3 Invasive pneumococcal cases, by serotype and age, 2025 (Source PHF Science, provisional data).....	7

Table 4: Cases of IPD with serotypes that would be covered by PCV20 in children aged under 1 year, and vaccination status (source PHF Science, provisional data for 2025)	8
Table 5: Cases of IPD with serotypes that would be covered by PCV20 (shaded) in children aged 1 to 4 years, by vaccination status (source PHF Science, provisional data for 2025)	9
Table 5: Median observed and predicted vaccine effectiveness by serotype, in the US (Ryman, 2024, open access)	16
Table 6: A summary of some of the international immunisation schedules for pneumococcal vaccinations in children aged under 5 years ^a (as of March 2026)	18
Table 7: Burden of disease, programme effectiveness and serotype prevalence	21
Table 8: Vaccine safety	26
Table 9: Immunogenicity	29
Table 10: Vaccine efficacy and effectiveness	34
 Figure 1: Number of invasive pneumococcal disease cases by month and year in New Zealand (Source PHF Science, to 28 February 2026)	3
Figure 2: Invasive pneumococcal serotypes, 2014 - 2024 (ESR, IPD annual report 2024, open access)	4
Figure 3: Serotype 19A invasive pneumococcal disease by age group, rate per 100,000, 2014-2024 (ESR, IPD annual report 2024, open access)	5
Figure 4: Rate of invasive pneumococcal disease, by age and ethnicity, 2025 (source PHF Science, provisional data)	6
Figure 5: Modelling of the relative risk of colonisation with six additional shared serotypes for PCV15 and PCV20 versus PCV13 (excluding PCV7 serotypes). (Displayed as mean [points] ± 95% CI [error bars]; RR >1 represents higher risk of colonisation). (Wong, 2025, open access)	14

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Abbreviations

ACIP	Advisory Committee on Immunization Practices
AE	adverse events
AEFI	adverse events following immunisation
aHR	adjusted hazard ratio
aOR	adjusted odds ratio
ATSI	Aboriginal Torres Strait Islanders – indigenous people of Australia
95% CI	confidence interval
DTaP	Combined diphtheria, tetanus, acellular pertussis vaccine
DTaP-IPV-HepB/Hib	Combined diphtheria-tetanus-pertussis, inactivated poliovirus, hepatitis B and <i>Haemophilus influenzae</i> type B vaccine
ESR	Institute for Environmental and Scientific Research
GMT / GMC	Geometric mean titre / concentration
GMR	Geometric mean titre ratio
Hib	<i>Haemophilus influenzae</i> type b
IgG	immunoglobulin G
IPD	Invasive pneumococcal disease
IRR	Incidence risk ratio
MELAA	Middle Eastern, Latin American and African ethnicity
MMR	measles mumps and rubella vaccine
NIP	National Immunisation Programme
NZ	Aotearoa New Zealand
OM	otitis media
OPA	opsonophagocytic activity
PCV7, 10, 13 or 20	Pneumococcal conjugate vaccine 7-valent, 10-valent, 13-valent or 20-valent
23PPV	Pneumococcal polysaccharide vaccine 23-valent
PHF Science	New Zealand Institute of Public Health and Forensic Science
RCT	Randomised controlled trial
RV	rotavirus vaccine
SAE	severe adverse events
spHUS	<i>Streptococcus pneumoniae</i> -associated haemolytic uremic syndrome
UK	United Kingdom
US	United States of America
VV	varicella vaccine
WHO	World Health Organization

Executive Summary

Purpose of the review

This review aims to assess recent evidence on the 20-valent pneumococcal conjugate vaccine (PCV20, Prevenar 20®) in the context of childhood immunisations in Aotearoa New Zealand and current epidemiology of invasive pneumococcal disease (IPD). It draws on literature published between January 2019 and March 2026 and examines epidemiology, clinical data on vaccine safety and immunogenicity, and international experience. This information will support the National Immunisation Programme and updates to the Immunisation Handbook. The review is not a formal systematic review but provides a comprehensive synthesis of available evidence to inform policy and clinical practice. It was commissioned as part of a contract for services between the Immunisation Advisory Centre at the University of Auckland and Health New Zealand | Te Whatu Ora.

Overview

In New Zealand, the incidence of invasive pneumococcal disease (IPD) typically peaks during the winter in association with peaks in respiratory virus infections (July–August), with the highest burden among young children under 5 years and among older adults increasing with aged from 50 years. Higher incidence rates are observed for Māori and Pacific people than for other ethnicities. Introduction of pneumococcal conjugate vaccines (PCVs) to the National Immunisation Schedule in 2008 substantially reduced pneumococcal hospitalisations and improved outcomes for young children in high-risk communities. Subsequent programme changes have included shifts from PCV7 to PCV10 and PCV13, and a reduction in the primary series from a three-dose plus booster dose primary series (3+1) to a two-dose plus booster (2+1) schedule given at age 6 weeks, 5 months and 12 months.

PCV20 expands serotype coverage beyond PCV13 by including seven additional serotypes (8, 10A, 11A, 12F, 15B, 22F and 33F) that can potentially cause IPD. In 2025, serotypes 8 and 22F were among the most prevalent causes of IPD and together accounted for nearly half of the IPD cases in the 5–64-year age group. Infants also experienced disease from these additional serotypes, including serotype 8 and 15B, despite receiving PCV13.

New Zealand's recent challenges with a surge in serotype 19A IPD illustrate the consequences of insufficient vaccine serotype coverage. After a change in vaccine from PCV13 to PCV10 in 2017, the incidence of serotype 19A IPD rose sharply in infants and toddlers, and those of Māori ethnicity were affected disproportionately. Incidence rose from 0.0 cases in 2017 to 7.3 per 100,000 in 2020. In 2020, the schedule was reduced to a 2+1 schedule, and in 2022, NZ saw the highest total IPD incidence since 2011 – 25% higher than pre-COVID-19 rates. This resurgence occurred despite stringent COVID-19 control restrictions and was not seen in Australia with similarly stringent restrictions. Reintroduction of PCV13 in 2023 rapidly reduced 19A disease in infants, but in 2025, children aged 1–4 years who had received only PCV10 continued to account for all the 19A IPD cases in children aged under 5 years.

PCV20 offers the potential to address both the historical vulnerability to serotype 19A and the growing burden of non-PCV13 serotypes. PCV20 is not yet approved for use in New Zealand.

Since this vaccine has only been approved for use globally since 2023, the majority of the evidence below comes from phase 3 clinical trials. For regulatory approval, immunogenicity and immunobridging (in comparison with licenced PCVs) were used as proxies for efficacy.

Vaccine Safety

Across clinical trials, PCV20 demonstrated a safety profile comparable to PCV13 with similar rates of local and systemic reactions. No new safety signals were identified. Adverse events were predominantly mild or moderate in intensity and transient, consistent with other pneumococcal conjugate vaccines.

Immunogenicity

In clinical trials, PCV20 met non-inferiority criteria for most PCV13 serotypes, including 19A, and generated strong immune responses to all seven additional serotypes. However, mean antibody levels for some PCV13 serotypes, particularly 19A and 3, were modestly lower than those induced by PCV13. The data highlight declines in immunogenicity as vaccine valency increases: this phenomenon has been described by WHO as immunogenicity creep. Reduced immunogenicity for some serotypes raises concerns about the potential impact on nasopharyngeal carriage and herd protection, and in turn the risk of serotype replacement.

The key considerations are:

- Direct protection against disease is expected to be strong across all 20 serotypes.
- Carriage reduction may be less robust than with PCV13, which could influence indirect protection.
- Breakthrough disease will need to be monitored, particularly for vaccine serotypes with lower mean antibody responses.

PCV20 did not adversely affect immune responses to other co-administered infant vaccinations.

Vaccine effectiveness

Real-world data is emerging but very limited around the effectiveness of PCV20 when used in the infant schedule. Unpublished surveillance data in the US has indicated good effectiveness against the additional seven serotypes in PCV20 following two doses (80-99%) but as for PCV13, effectiveness is low against serotype 3.

Implications for children at high risk of invasive pneumococcal disease.

Using a higher valency vaccine, PCV20 would simplify and strengthen protection across all children. Because PCV20 covers most serotypes included in 23-valent pneumococcal polysaccharide vaccine (23PPV) it could eliminate the need for 23PPV. PCV20 is more immunogenic than 23PPV especially in young children, and for children at medically high risk of IPD it could help to improve both uptake and protection from a younger age. With reduced immunogenicity for some serotypes, it is expected that children with immunocompromise will continue to require a three-dose primary course (as a 3+1 schedule). Further data is needed to assess duration of protection and the frequency and requirement for booster doses.

Equity Considerations

Māori and Pacific infants experience IPD rates 6–8 times higher than European/Other infants. Broader serotype coverage is likely to provide greater absolute benefit in these populations, particularly given the higher burden of both PCV13-covered and emerging serotypes. Previous additions to the PCV valency have led to reductions in the disparity in the rates of IPD.

Summary

Benefits:

- PCV20 aligns more closely with New Zealand's current serotype distribution than PCV13 and has the potential to reduce the rates of IPD disease directly, particularly in communities with higher rates of disease
- All young children will have a protection against a greater number of serotypes
- It simplifies the schedule for children at increased risk of IPD who historically have often missed out on extended pneumococcal vaccinations that include 23PPV.

Limitations:

- Immunogenicity decreases as vaccine valency increases although the clinical implications of this are uncertain.
- To date, it is unclear whether a 2+1 PCV20 schedule will be sufficiently effective against PCV13 serotypes compared with a 2+1 PCV13 schedule or 3+1 PCV20 schedule.
- The review highlights the need for ongoing close surveillance of pneumococcal disease, to monitor for breakthrough disease or persistent carriage of PCV20 serotypes.

Key recommendations

- PCV20 will provide coverage against more of the predominant pneumococcal serotypes.
- Close surveillance and rapid responsiveness are required to identify if serotype replacement or predominance changes occurs.
- Implementation of a catch-up programme for all children aged under 5 years, including those previously vaccinated with PCV10 or PCV13, is recommended for direct protection, to reduce the carriage reservoir and to provide indirect protection to other age groups, including immunocompromised children, at risk from PCV20-serotype IPD.
- Monitor real-world effectiveness and safety data from national and international sources.
- The introduction of PCV20 should be accompanied by an ability to make timely adjustments to the schedule, if indicated by surveillance.
- Remove 23PPV from the schedule once PCV20 is introduced

Summary of the findings of this review of evidence

Findings	PCV13 (Current schedule)	PCV20 (Proposed option)	Implications for NZ
Serotype coverage	13 serotypes (incl. 19A)	20 serotypes (adds 8, 10A, 11A, 12F, 15B, 22F, 33F)	Better alignment with current NZ epidemiology
Protection against emerging serotypes	No coverage for 8, 22F, 33F, 15B	Direct coverage	Expected reduction in rising serotype 8 and 22F disease
19A protection	Strong, proven; rapid decline after 2023 reinstatement	Slightly lower immunogenicity – unlikely to be clinically significant	Continued monitoring required
Safety	Excellent	Comparable to PCV13	No new concerns
Immunogenicity	High across serotypes	Slightly reduced for some PCV13 serotypes	Potential impact on herd immunity and carriage
Efficacy /effectiveness	Limited effectiveness against serotype 3	Limited data – likely to be similar to PCV13	Initially relying on international evidence.
Carriage reduction	Well established	Uncertain; may be less robust than PCV13	Enhanced surveillance needed
Schedule	2+1	2+1	Flexibility to change to 3+1 if required
Children at high-risk of IPD	PCV13 (3+1) + 23PPV	Could replace 23PPV; maintain 3+1 schedule Unknown duration of protection	Simplifies schedule
Equity impact	Good	Potentially greater	Broader serotype coverage has been shown to reduce incidence in Māori and Pacific infants
Overall fit for NZ	Strong for 19A control	Strong for emerging serotypes; broader protection	Likely to reduce total IPD burden

Outstanding questions

Since PCV20 is new to the market, there are several broad questions about its effectiveness. This is particularly important for New Zealand with its high level of pneumococcal transmission in children under 5 years, including serotype 19A. Although IPD is rare in New Zealand, it is rarer in countries with well-established pneumococcal vaccine programmes that have consistently used PCV13.

- Will PCV20 reduce the incidence of IPD in young children in New Zealand?
- Is PCV20 sufficiently immunogenic against the PCV13-serotypes, particularly 19A, when given as a 2+1 schedule in the New Zealand context?
- Will replacing 23PPV with PCV20 provide sufficiently broad protection for children who are at medically high risk of IPD beyond the age of 2 years?
- Could PCV20 provide indirect protection by reducing serotypes circulating both within peer groups and older adults?
- What is the risk of serotype replacement if immunogenicity is suboptimal, unable to prevent nasopharyngeal carriage and allows transmission?

One additional question that arose while writing this, which was not investigated as part of this review, was whether universal influenza vaccination of children in the UK has also helped to reduce the incidence of IPD. The UK has very low levels of IPD and has been able to reduce the schedule to 1+1 due to the rarity of IPD. Children in the UK are routinely funded influenza vaccine from age 2 years and provided vaccination as part of school-based programmes until age 17 years. Some states in Australia also fund influenza vaccination for children aged under 5 years, including the introduction of live attenuated influenza vaccine in 2026 for children aged 2 years and over alongside PCV20 for all children aged under 5 years. Young children are a known reservoirs of pneumococci and influenza virus. Could it be an approach used in New Zealand given the high burden of IPD and influenza hospitalisation of young children?

Review of evidence to inform the New Zealand National Immunisation Programme, 2026: Pneumococcal - infants

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Introduction

This review aims to assess the evidence from recent literature about the 20-valent pneumococcal conjugate (PCV20) in the context of the infant immunisation schedule and epidemiology of invasive pneumococcal disease (IPD) in Aotearoa New Zealand (NZ). This is not a systematic review, as the evidence is not formally assessed for biases, and it does not include cost-benefit analyses. The purpose of this review is to support the National Immunisation Programme (NIP) and future updates of the Immunisation Handbook. The opinions expressed are those of the author with guidance from the peer reviewer. Decisions about the NIP will be made by the official policy makers.

This review considers key questions around what advantages there are for using PCV20. Could this improve the outcomes for all young children, including those who are medically at increased risk of IPD, and reduce pneumococcal disease incidence in Māori and Pacific infants?

Background

The introduction of a pneumococcal conjugate vaccine (PCV) to the childhood National Immunisation Schedule (childhood Schedule) in 2008 led to significant reductions in hospitalisations with *Streptococcus pneumoniae* (pneumococcal) infections and associated disparities among young children in NZ. Pneumococcal immunisation commenced with a seven-valent vaccine (PCV7, Prevenar) in a three-dose primary plus booster dose schedule (3+1, given at ages 6 weeks, 3 months, 5 months and 15 months). An immediate decline in IPD was observed, predominantly of PCV7-specific serotypes. Between 2006 and 2015, the numbers of children aged under 6 years hospitalised with invasive pneumococcal disease decreased by 73% overall, by 79% for tamariki Māori and 67% for Pacific children; all-cause pneumonia incidence declined by 8% overall, by 12% in Māori and 21% in Pacific children; and otitis media (OM) declined by 25% overall and by 51% for tamariki Māori.¹

New Zealand has frequently changed the pneumococcal vaccines used on the childhood Schedule. Immunisation was expanded to 10 serotypes with PCV10 (Synflorix®) in 2011 and expanded further in 2014 with PCV13 (Prevenar 13®). In 2017, PCV10 replaced PCV13 and from 2020, PCV10 was given as a two-dose rather than three-dose primary course (ie 2+1, at ages 6 weeks, 5 months and 12 months). However, due to a significant increase in 19A prevalence, PCV13 urgently replaced PCV10 in late 2022 for children aged under 2 years.²

For children with immunocompromise or underlying medical factors that increase their risk for IPD, PCV13 continued to be offered in place of PCV10 and remains as a 3+1 schedule. Unfortunately, most eligible children were missed for this extended programme. With improved coverage, routinely using a higher valency vaccine such as PCV20 could help to provide broader protection for all children, including those with underlying medical conditions.

Pneumococcal vaccines

There are two types of pneumococcal vaccine.

- **Pneumococcal conjugate vaccines (PCV)** – contain pneumococcal polysaccharides conjugated to a carrier protein to improve immunogenicity in young children. Valency for use in children has increased from 7 to 20 serotypes.
 - PCV7 – Prevenar® (Pfizer) (superseded)
 - PCV10 – Synflorix® (GSK) (no longer available in NZ)
 - PCV13 – Prevenar® 13 (Pfizer)
 - PCV15 – Vaxneuvance® (MSD) (not approved for use in NZ)
 - PCV20 – Prevenar® 20 (Pfizer) (not approved for use in NZ)

Other higher valency pneumococcal vaccines are in development, initially for use in adults, (eg PCV21, PCV24 and PCV31). These will be reviewed in a separate Review of Evidence.

- **Pneumococcal polysaccharide vaccine (PPV)** – 23PPV; Pneumovax 23 (MSD)
 - contains only pneumococcal polysaccharides that do not induced a protective antibody response in children aged under 2 years. The immune response to this vaccine is T-cell independent resulting in poor memory B-cell responses and reduced long-term immunity compared to PCVs.

For the serotypes covered by each vaccine, see Table 1.

Table 1. Comparison of the pneumococcal serotypes contained within high valency vaccines used in children.

Serotype	1	3	4	5	6A	6B	7F	9V	14	18C	19A	19F	23F	22F	33F	8	10A	11A	12F	15B	2	9N	17F	20
Vaccine																								
PCV10	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓											
PCV13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											
PCV15	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓									
PCV20	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
23PPV	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

PCV20 (Prevenar 20®, also branded as Pevnar 20® in the US and formerly Apexxnar® in Europe) received its first paediatric approval for use in the US in April 2023 and has subsequently been granted regulatory approval in Europe (including the UK), Canada and Australia. It is indicated for active immunisation to prevent invasive disease caused by 20 *S. pneumoniae* serotypes in children aged 6 weeks to 17 years, and for the prevention of otitis media caused by seven *S. pneumoniae* serotypes (types 4, 6B, 9V, 14, 18C, 19F and 23F) in individuals aged 6 weeks to 5 years.

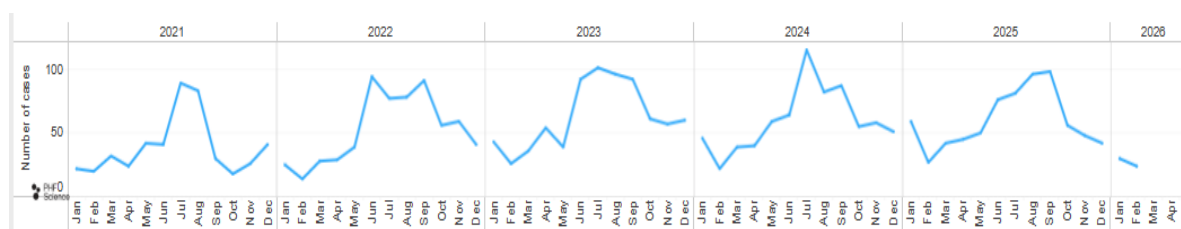
See **International immunisation schedules** for details of international recommendations.

Epidemiology

This section considers the incidence and burden of invasive pneumococcal disease (IPD) and pneumococcal infections in New Zealand over recent years. IPD is a notifiable disease, cases are reported to EpiSurv and analysed by PHF Science.

A seasonal pattern is common with peaks in IPD incidence coinciding with winter / early spring months, associated with increases in influenza and other respiratory viruses. See Figure 1.

Figure 1: Number of invasive pneumococcal disease cases by month and year in New Zealand (Source PHF Science, to 28 February 2026)



For the latest published data see the [Invasive Pneumococcal Disease dashboard](#) and for monthly and annual reports see [PHF Science Digital library](#).

Changes in epidemiology associated with vaccination schedules

As mentioned in the introduction, New Zealand has switched between PCV10 and PCV13 twice since 2011. The following examines the impact of these vaccine changes on pneumococcal disease epidemiology. See Table 7 for further details of the studies conducted in NZ and elsewhere on the burden of pneumococcal disease and immunisation programme effectiveness.

Vaccine effectiveness to 2019

Following the introduction of PCV vaccines in New Zealand, hospitalisation for IPD in children aged under 6 years declined by 73% overall (from 26.5 to 6.5 per 100,000 person-years) between 2006 and 2015.¹ For Māori and Pacific children and children living in socioeconomically deprived areas greater declines were observed for IPD, all-cause pneumonia and otitis media, and continued to decline with the use of higher valency vaccines. For example, IPD incidence in Māori children decreased by 79% vs 67% for all ethnicities between 2006 – 2013.¹

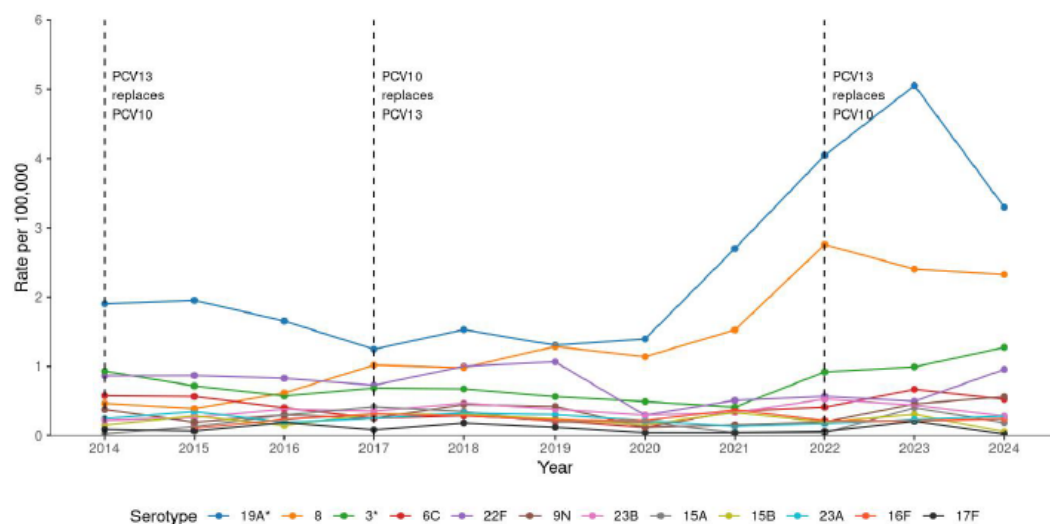
The effectiveness of the PCV programme in NZ against hospitalisation with otitis media or pneumonia was examined in a retrospective cohort study in children born between 2006 and 2016. The study investigated cases over three 12-month transition periods switching between PCV7, PCV10 and PCV13 vaccines.³ When switching from PCV7 (transition period 1, with 6 years of follow-up), cohorts vaccinated with PCV10 had a significantly lower risk of otitis media ($p = 0.011$) but no difference in risk for pneumonia hospitalisation. In transition period 2 (PCV10 to PCV13, 4.5 years follow-up), no differences were observed between PCV13 and PCV10 for otitis media or pneumonia. During transition period 3 (PCV13 to PCV10, 18-month follow-up), PCV10 was more effective than PCV13 against both otitis media and all-cause pneumonia, but circulating serotypes likely influenced the vaccine impact with increases in non-PCV and non-typeable serotypes. Overall, otitis media and pneumococcal pneumonia incidences decreased during the study period with higher valency

vaccines being equally more effective than PCV7. However, this study was conducted prior to 2020 when PCV10 was changed to a 2+1 schedule and there was a sharp increase in 19A serotype IPD.³

Increase in serotype 19A

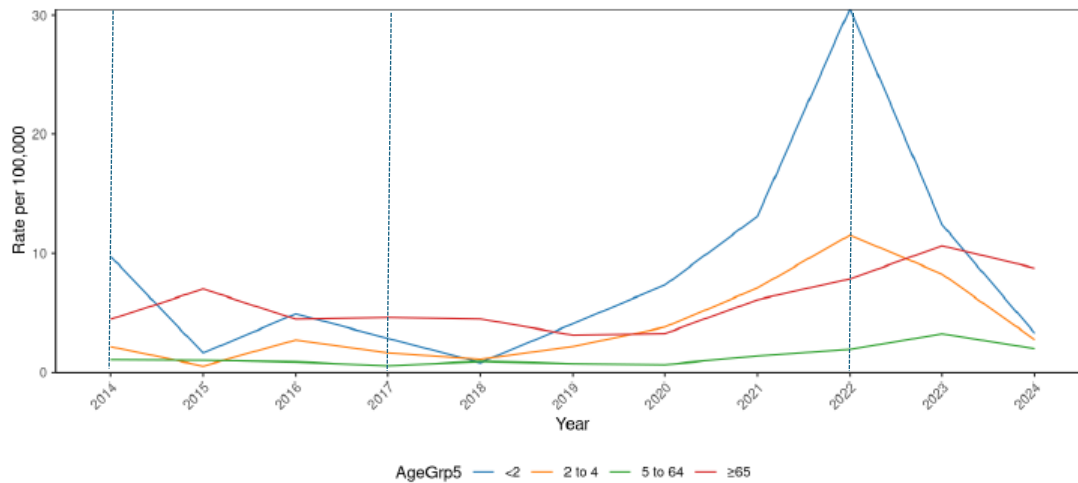
Following shifts in the childhood pneumococcal Schedule, firstly from a three-dose primary schedule with PCV13 to PCV10 in 2017, and then to a two-dose primary PCV10 schedule in 2020, New Zealand experienced a marked rise in IPD in infants aged under 2 years (as shown in Figure 2 and Figure 3).^{2, 4} With the change to PCV10, serotype 19A incidence had begun to increase from 0.0 in 2017 to 7.3 per 100,000 in 2020, accompanied by a 65% rise in penicillin resistance.² By 2022, the total IPD incidence reached its highest level since 2011 and exceeded 2019 pre-COVID rates by 25%. This contrasted with declines in cases in Australia and the US.⁵⁻⁷ The rise in 19A IPD in children was particularly unexpected in New Zealand, since we had some of the most stringent COVID-19 control restrictions and border closures. While the total IPD cases did not increase proportionally, the burden of disease fell disproportionately on children under 2 years, particularly for Māori and Pacific infants. During 2017–2022, there were 145 cases of 19A IPD in PCV-eligible children aged under 5 years, with only five unvaccinated cases and five cases vaccinated with PCV13.⁵

Figure 2: Invasive pneumococcal serotypes, 2014 - 2024 (ESR, IPD annual report 2024, open access)



*PCV13 serotypes

Figure 3: Serotype 19A invasive pneumococcal disease by age group, rate per 100,000, 2014-2024 (ESR, IPD annual report 2024, open access)



During 2021 – 2023, two children, who were aged under 5 years and fully vaccinated with PCV10, died as a result of 19A IPD. Thirteen (14%) out of 91 IPD cases in Auckland had severe sequelae.⁸ These sequelae included hypoxic brain injury, development delay, epilepsy, bronchiectasis and hearing loss.⁸

NZ had 21 cases of *S. pneumoniae*-associated haemolytic uremic syndrome (SpHUS) between 2020 – 2024, all due to serotype 19A. The incidence rate of SpHUS for children under 5 increased from 0.33 in 2019 to a peak of 3.96 per 100,000 in 2022. For comparison, there had only been 11 cumulative cases of SpHUS between 2011 – 2019 and six (55%) of these were caused by serotype 19A.^{5, 9} Across both time periods (2011 – 2024), 68% of cases were aged under 2 years, 45% were Māori, and 30 out of 31 of the 19A cases required renal dialysis within 3 days of HUS diagnosis.^{8, 9}

In 2023, PCV13 was reinstated for children aged under 2 years, leading to a more than 50% reduction in IPD incidence in children under 5 within two years. By 2024, PCV13-serotype IPD had declined significantly among children under 2 years (IRR 0.58; 95% CI 0.34–0.94), though no reduction was observed among the 2–4 years age group (IRR 0.82; 0.46–1.44).¹⁰ This age cohort was vaccinated with PCV10 but, despite being at risk for pneumococcal disease, were not offered catch-up vaccination for additional PCV13 serotype protection. The proportion of PCV13-serotype isolates fell to 30% in children under 2 but remained around 60% in the 2–4-year age group.¹⁰

Summary

Pneumococcal conjugate vaccines have been highly effective at reducing IPD overall. But unlike trends in countries that continually used PCV13, the predominance and severity of 19A pneumococcal disease in New Zealand highlighted the risks of inadequate serotype coverage. The rapid decline in 19A IPD following PCV13 reintroduction in the vaccinated cohort underscores the importance of continual monitoring and appropriate vaccine selection for sustained population protection.

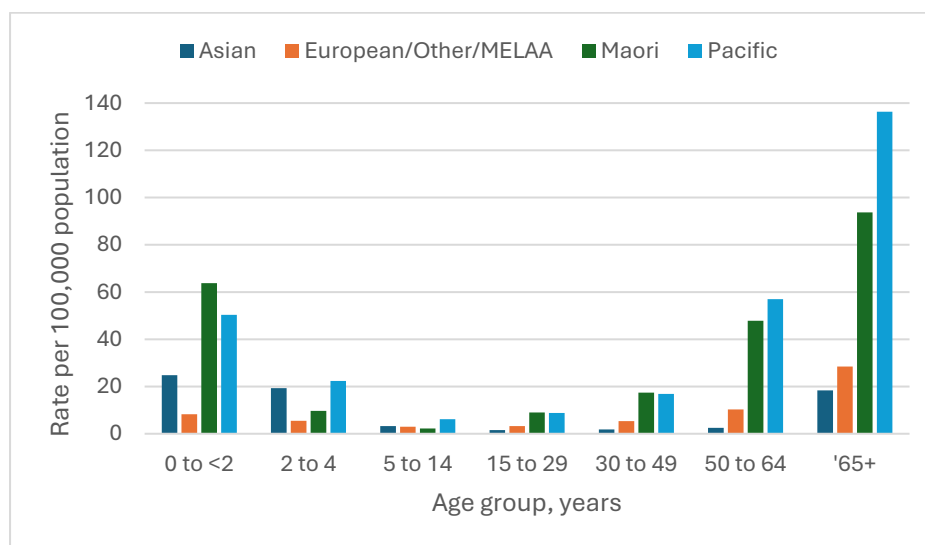
Invasive pneumococcal disease incidence in 2025

During 2025, there were 38 cases of IPD in children aged under 2 years. Although the bulk of the cases were in adults aged over 65 years (326 cases), the incidence rates were similar at 31.9 per 100,000 infants and 36.2 per 100,000 older adults (see Table 2). These data were supplied by PHF Science directly and are to be considered as provisional. An IPD report for 2025 was published in mid-2026, after this report was written (see [PHF Science Digital library](#) for finalised data).¹¹

Table 2: Number and rate (per 100,000 population) of invasive pneumococcal disease cases notified in 2025, by age and ethnicity (source PHF Science, provisional data)

Ethnicity	Age group														Total by ethnicity	
	<2 years		2–4 years		5–14 years		15-29 years		30–49 years		50–64 years		≥65 years			
	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate	No.	rate
Asian	6	24.8	7	19.3	4	3.2	3	1.5	7	1.8	3	2.5	14	18.4	44	4.5
European/ Other	4	8.3	4	5.5	9	3.0	16	3.2	41	5.4	67	10.3	207	28.5	348	11.4
Māori	22	63.8	5	9.7	4	2.2	21	9.0	39	17.4	62	47.8	65	93.7	218	23.6
Pacific People	6	50.3	4	22.4	4	6.1	9	8.8	17	16.9	29	57.0	38	136.4	107	28.4
Total by age	38	31.9	20	11.2	21	3.1	49	4.8	104	7.0	162	17.1	326	36.2	717	13.5

Figure 4: Rate of invasive pneumococcal disease, by age and ethnicity, 2025 (source PHF Science, provisional data)



People of Māori and Pacific ethnicity are disproportionately affected by IPD (see Figure 4), across all age groups. Rates of IPD are notably highest in the children under-2 years and rise markedly from the age of 50 years. The incidence of IPD in Māori and Pacific infants was 8- and 6-times higher, respectively, than for European/Other/MELAA infants.

Predominant serotypes

Table 3 shows the serotypes of isolates collected from IPD cases by age group.

Table 3 Invasive pneumococcal cases, by serotype and age, 2025 (Source PHF Science, provisional data)

Serotypes	<2y	2-4y	5-64y	≥ 65y
PCV7	1	0	7	8
PCV10	0	0	3	0
PCV13	7	8	82	81
19A	6	8	56	49
3	1	0	25	31
6A	0	0	1	1
PCV15	6	0	47	64
22F	3	0	40	51
33F	3	0	7	13
PCV20	6	3	125	62
8	4	1	112	41
10A	0	1	4	6
11A	1		4	10
12F			3	
15B	1	1	2	5
Non-PCV[#]	18	9	72	111
Total	38	20	336	326

Non-PCV included 1 non-typeable case and 31 cases for which serotypes were not available.

There were 31 cases for which isolates were not serotyped. The table shows that infants are generally well protected by PCV13 vaccine and most PCV13-specific serotypes occur in those aged over 5 years (163/175 PCV13-serotype cases), but cases of 19A still occurred in children aged under 5 years. For the additional serotypes in PCV20, serotype 8 and 22F are the most prevalent, particularly in those aged over 5 years (accounting for 45% of cases in the 5–64-year age group). As shown in Figure 2, cases of IPD associated with PCV20/PCV15 serotypes 8 and 22F were increasing in frequency in 2024.

Vaccination status of IPD cases with serotype 19A infection

Despite the change in Schedule vaccine in late 2022 to PCV13 for infants aged under 1 year, children aged 1 – 4 years remained disproportionately affected by serotype 19A in 2025. Of the 14 cases of 19A IPD in young children 12 were aged 1 – 4 years, some of which had only received PCV10 vaccinations, and some had PCV13. One of these cases were completely unvaccinated but two were under vaccinated for age any PCV vaccination. Breakthrough cases are expected until community carriage rates have declined.¹² Of the two infants aged under 1 year with 19A IPD, one was unvaccinated and the other had an unknown vaccination status. Infants aged under 6 weeks were not included in this data as they were too young to have received any PCV vaccination.

Vaccination status of IPD cases with PCV20 serotypes

Table 3, Table 4 and Table 5 show the distribution of IPD cases with PCV13-specific (also covered by PCV20) and additional PCV20-specific serotypes in children aged under 5 years. The data demonstrates that infants are at risk of IPD caused by the additional PCV20 serotypes (serotypes 8, 15B, 22F and 33F). For those aged 1-4 years, most had received three doses of either PCV13 and/or

PCV10; one case in this age group was completely unvaccinated. These data indicate that the introduction of PCV20 catch-up could benefit those aged under 5 years who had previously received PCV10 or PCV13 to ensure coverage of the additional seven serotypes.

Table 4: Cases of IPD with serotypes that would be covered by PCV20 in children aged under 1 year, and vaccination status (source PHF Science, provisional data for 2025)

No cases of PCV20 serotype 12F detected. There were two children aged under 1 years who had untyped IPD and who were unvaccinated. Cases aged under 6 weeks are not presented as they are not eligible for vaccination.

Age group	Serotype	n doses PCV10	n doses PCV13
<1	8	0	1
	8	0	1
	15B	0	2
	19A	unvaccinated	
	19A	unknown	
	22F	unvaccinated	
	21	0	2
	38	0	1
	38	unknown	
	23A	0	2
	23B	0	1
	23B	1	1
	6C	unknown	
	9N	0	1
	9N	unknown	

Table 5: Cases of IPD with serotypes that would be covered by PCV20 (shaded) in children aged 1 to 4 years, by vaccination status (source PHF Science, provisional data for 2025)

No cases of PCV20 serotype 12F detected.

Age group	Serotype	n doses PCV10	n doses PCV13
1 to 4	8	1	2
	38	0	3
	38	4	0
	10A	0	3
	11A	0	3
	15B	3	0
	15C	3	0
	16F	0	3
	19A	0	0
	19A	4	0
	19A	3	1
	19A	0	0
	19A	1	3
	19A	1	0
	19A	0	2
	19A	0	3
	19A	0	4
	19A	0	3
	19A	unvaccinated	
	22F	0	2
	22F	1	2
	33F	0	3
	33F	0	3
	33F	1	1
	6C	3	0
	7C	3	0
	untyped	3	0
	untyped	0	3
	untyped	0	3
	untyped	0	2
	untyped	3	0
	untyped	0	3
	untyped	0	3

Review of recent literature

The following is a review of the current literature (published since January 2019 to March 2026) about the use of 20-valent pneumococcal conjugate vaccine (PCV20, Prevenar 20, manufactured by Pfizer) in infants as part of their primary immunisation schedule. Since this vaccine has only recently received regulatory approvals, much of the evidence comes from Pfizer-sponsored randomised controlled clinical trials (RCT). This is not a systematic review and was not formally assessed for biases.

Safety

Currently, most of the published data on PCV20 safety is reactogenicity and adverse event following immunisation (AEFI) data from the pivotal phase 3 randomised controlled clinical trials (RCT). See Table 8 for details of studies around vaccine safety.

No data is available yet on real-world usage as this vaccine has only recently been introduced to childhood immunisation schedules in a few countries. Monitoring will be conducted through passive and active survey-based surveillance as part of the usual pharmacovigilance and vaccine adverse event reporting systems. For example, the AusVaxSafety survey in Australia will monitor the safety of PCV20 when given concurrently with other vaccines as part of the National Immunisation programme schedule (see <https://ausvaxsafety.org.au/vaccine-safety-data/national-immunisation-program-schedule-vaccines>).

The safety profile of PCV20 is not anticipated to differ from other PCVs and was shown to be consistent with that of PCV13 during clinical trials, across diverse populations in the US, Puerto Rico, Europe, Australia and Japan, with varying schedules and coadministration contexts.¹³⁻¹⁶

No new or unexpected safety concerns were observed. Across all the studies, local and systemic reactions were predominantly mild to moderate and transient. Median onset was 0 – 1 days and duration 1 – 5 days, and are as expected for paediatric vaccine reactions, including injection-site redness, irritability, drowsiness and fever.

Fever appears largely attributable to concomitant vaccines rather than PCV20 itself.¹⁶ As observed with PCV13, fever ($\geq 38^{\circ}\text{C}$) was reported more commonly when PCV20 doses 3 or 4 were administered concomitantly with influenza vaccine (16.8% - 24.4%) than without (11.0% - 13.9%).¹⁶ In this phase 3 study, dose 4 was also coadministered with MMR and varicella vaccines. No febrile seizure signal was shown with influenza vaccine, but one case occurred 14 days after dose 4 was given with MMR and varicella vaccine; and another case occurred in a child with COVID-19 infection.^{17, 18} Similar proportions of adverse events were observed between groups in a European/Australian RCT in which infants were concomitantly administered rotavirus vaccine alongside PCV20 and usual infant immunisations (with DTaP-IPV-HepB/Hib).¹⁶

Conclusion

The safety profile of PCV20 is consistent with that of PCV13, including when administered with other routine infant immunisations. Clinical trials did not observe any new or unexpected safety concerns, and local and systemic reactions were predominantly mild to moderate in intensity and transient.

Real-world surveillance data for the use of PCV20 in national immunisation programmes is commencing as implementation is rolled out.

Immunogenicity

The following provides highlights of immunogenicity data from clinical trials and comparisons made either head-to-head or indirectly with other PCVs. See Table 9 for details of each immunogenicity study.

Immunogenicity as proxy for efficacy

Regulatory approval of PCV20 (and other new pneumococcal vaccines) is based on immunogenicity and non-inferiority against a predecessor or comparator, because IPD is a rare disease which makes efficacy studies impractical. Much of the immunogenicity data for PCV20 considers 'non-inferiority' to the serotypes in common with the licensed PCV13 vaccine. No serotype-specific immunological correlates of protection have been established for pneumococcal conjugate vaccines.

WHO defines primary analysis endpoints of clinical trial data for non-inferiority between pneumococcal vaccines to be the percentage of subjects with IgG ≥ 0.35 $\mu\text{g/ml}$ and serotype-specific IgG geometric mean concentration ratios (GMR) between vaccine of interest and licenced comparator.¹⁹ If one or more serotype fails to meet both sets of criteria, the regulatory approval authority for each country (ie Medsafe in New Zealand) should take into consideration the disease burden associated with those serotypes. Based on efficacy and effectiveness from studies of the PCV7 vaccine, non-inferiority of the seven additional serotypes in the new vaccine (PCV20) is assumed by comparing the proportions of participants that reached IgG ≥ 0.35 $\mu\text{g/ml}$ for each new serotype against any serotype that achieves the lowest percentage of IgG ≥ 0.35 $\mu\text{g/ml}$ in the licensed comparator (PCV13) group. Functional antibody titres are assessed using opsonophagocytic activity (OPA) assays. This data is obtained from a subset of trial participants, but again, since no serotype-specific correlates of protection are defined, geometric mean titre ratios (GMR) are used to compare new and licensed vaccines.¹⁹

The measure of immunogenicity used to confirm non-inferiority does not necessarily indicated long term protection. A UK study using an indirect cohort method in infants found that serotype-specific correlates of protection may be higher or lower than 0.35 $\mu\text{g/ml}$, and that vaccine effectiveness may be lower than predicted by the clinical trial immunogenicity data.²⁰ It found that if the predicted correlate of protection for the all PCV13 serotypes in PCV13 (excluding serotype 3) had matched that of PCV7 (ie 0.35 $\mu\text{g/ml}$), then vaccine effectiveness of PCV13 would have been 97%. However, the aggregated effectiveness was shown to be lower at 82% (95% CI 68-89%) with a calculated correlate of protection of 0.81 (95% CI 0.70-1.10) $\mu\text{g/ml}$.²⁰

Caution, therefore, is required when predicting vaccine efficacy from immunogenicity data from clinical trials. Clinical trials can only demonstrate non-inferiority or equivalence between the vaccine formulations in a selected group of healthy participants.

Pivotal clinical trial findings

Across phase 3 RCT conducted in infants using 3+1 and 2+1 schedules (see Table 9), PCV20 elicited robust serotype-specific IgG and functional OPA responses, meeting non-inferiority criteria for the majority of the shared serotypes and demonstrated strong booster responses.^{14, 15, 17, 21, 22} Although some serotypes showed lower IgG responses relative to PCV13 (direct comparison) or PCV15 (by

indirect comparison) in certain analyses, functional antibody and post-booster responses support expected clinical protection across all 20 serotypes with both 2+1 or 3+1 immunisation schedules.

A systematic review and meta-analysis (Pacheco-Haro, 2025) of four studies involving 4,093 infants found that, for some outcomes, PCV20 induced a lower antibody response than PCV13 for the 13 shared serotypes (as measured by GMR and OPA GMTs).²³ However, the pooled difference in the proportion of participants who achieved the predefined IgG levels for each serotype was not significantly different. It was noted that it is unknown as to whether reduced serotype-specific antibody titres equate to reduced efficacy for those serotypes, or if clinical equivalence can be implied by antibody non-inferiority. For the additional seven PCV20 serotypes, responses were higher than the lowest comparator but not statistically greater for all of these serotypes.

As observed in immunobridging studies, an effect called ‘immunogenicity creep’ describes an incremental decrease in the immune response to shared serotypes with the inclusion of more serotypes to each PCV.²⁴

Findings from specific clinical trials include:

- PCV20 met non-inferiority criteria for IgG GMR for all 20 serotypes compared with PCV13 in a 3+1 schedule in the US/Puerto Rico.¹⁷ Functional memory responses were seen after the primary course with strong IgG boosting and OPA at one month after dose 4.
- In Japan, PCV20 met non-inferiority for 11/13 shared serotypes after dose 3, with small shortfalls for serotypes 6A and 6B. All participants achieved protective IgG levels for all serotypes after dose 4.¹⁴ Additionally, this study found no significant difference in immunogenicity between intramuscular or subcutaneous injections.
- In a 2+1 schedule in Europe and Australia, PCV20 statistically missed non-inferiority IgG criteria after dose 2 for PCV13-matched serotypes 6A, 6B, 9V and 23F and 6B after dose 3. However, functionality data (OPA response and boosting IgG) were robust for all matched serotypes.¹⁵

Concomitant vaccinations

PCV20 does not impair immune responses to routine infant or toddler vaccines in either a 2+1 or 3+1 schedule. Immune responses to coadministered vaccines were similar between the PCV20 and PCV13 groups in two RCTs.¹⁵⁻¹⁷ Non-inferiority criteria for prespecified antibody responses were met for DTaP-IPV-HepB/Hib antigens after three doses in both studies, and MMR and varicella after dose 4 in the 3+1 study.¹⁶

Summary

Although PCV20 elicits good primary and booster antibody responses, it does not statistically meet non-inferiority criteria against PCV13 for all shared serotypes. The responses to the additional seven serotypes are robust. It is unknown whether reduced antibody responses equate to reduced effectiveness in real-world settings. Immune responses to routine infant vaccines are comparable given concomitantly with PCV20 or PCV13.

Indirect comparisons

Using immunogenicity data from separate head-to-head Pfizer-sponsored clinical trials with PCV13, comparisons were made indirectly between PCV15 and PCV20 in both 3+1 and 2+1 schedules.^{21, 22} In a 3+1 schedule, PCV15 and PCV20 both generated strong antibody responses, but PCV15 showed

superior responses for serotype 3 and higher responses for serotypes 4, 9V, and 23F.²¹ In 2+1 schedules, PCV15 demonstrated stronger responses for several PCV13 serotypes, but PCV20 remained non-inferior overall and provides broader serotype coverage. PCV15 showed superiority for several serotypes. PCV15 was superior to PCV20 for most of the shared PCV13 serotypes: 1, 3, 4, 5, 6B, 9V and 23F for IgG response rates and 3, 4, 5, 6B, 9V, and 23F for IgG GMCs. Post-primary course, PCV15 met non-inferiority to PCV20 for all shared serotypes except 6A; post-booster dose, PCV15 remained superior for serotype 3. PCV20 did not meet superiority criteria for any serotype.^{21, 22}

Another indirect comparison compared PCV20 with PCV10 against PCV13-shared serotypes for 3+1 and 2+1 schedules.²⁵ Generally, PCV10 was less immunogenic than PCV13 for shared serotypes. When comparing PCV20 with PCV10, the IgG and OPA responses were similar for the 10 shared serotypes with variation by serotype. A secondary analysis indirectly comparing PCV20 and PCV15 found that the OPA GMRs were close to equivalent for most shared serotypes (but with wider confidence intervals than for IgG GMR comparisons). Immunogenicity of PCV20 and PCV10 in both schedules was generally comparable and suggested PCV20 would have similar effectiveness for 10 shared serotypes.²⁵

Another indirect comparative analysis found PCV15 and PCV20 to be less immunogenic than PCV13, but each produced broadly similar immune responses.²⁶ The analysis (published as a commentary) compared the functional OPA titre ratios between clinical trials at one month post toddler dose for 3+1 and 2+1 schedule for PCV13, PCV15 and PCV20. Response to all three vaccines compared poorly with PCV7 for the shared serotypes. PCV13 had a lower functional immunogenicity than PCV7 with an average OPA ratio = 0.77 (across three RCTs), except for serotype 19F. The mean OPA ratio between PCV15 and PCV13 was 0.75 (except serotype 14, OPA ratio 1.51) and between PCV20 and PCV13 was 0.72 for common serotypes.²⁶

Furthermore, the results of this analysis also suggested that for all three vaccines, a 2+1 schedule was less immunogenic than 3+1 schedule.²⁶ PCV20 appeared to be more immunogenic than PCV15 against serotype 19A, by indirect comparison. It was concluded that post-market studies would be needed to assess the effectiveness of these vaccines as compared to PCV13 in real-world settings.

Summary

Immunogenicity of PCVs decreases as their valency increase when compared with PCV7, with some serotype exceptions. Reduced schedules (with two rather than three primary doses) also have decreased immunogenicity. Continuous assessment of the real-world effectiveness of PCV20 will be required.

Nasopharyngeal colonisation

As higher valency PCVs may induce weaker antibody responses than lower valency vaccines, it is necessary to understand how immunogenicity translates into *S. pneumoniae* nasopharyngeal colonisation (carriage). While high-valency PCVs provide sufficient protection against IPD, protection against transmission could be reduced for some of the less immunogenic vaccine serotypes and risk a change in epidemiology, as seen with serotype 19A in New Zealand.

A UK-based cross-sectional observation study compared pneumococcal serotype carriage from nasopharyngeal swabs with serotype-specific antibody concentrations.²⁷ Nasopharyngeal swabs were taken from 1,410 children aged 6–12 months and 13–48 months and a subgroup of 747 children were tested for pneumococcal antibodies. Samples taken in 2017–19 were compared with

988 historical samples taken during a previous study in 2014–2015. The study found overall that pneumococcal carriage remained stable between 2014 and 2019 ($p = 0.1$). Non-PCV13 serotypes represented over 95% of the isolates in fully vaccinated children, but PCV13 serotypes 3 and, to a lesser extent, 19A persisted. Around 20% of the children carried PCV20 additional serotypes and introduction of the vaccine could significantly change the composition of pneumococcal serotype carriage profile in UK children.²⁷ Although IgG GMC were higher for serotypes 3, 19A and non-vaccine type 10A ($p < 0.02$) at age 13–48 months, there were no significant differences between antibody titres ($\text{IgG} \geq 0.35 \mu\text{g/ml}$) for any serotype between 2014 and 2019.²⁷

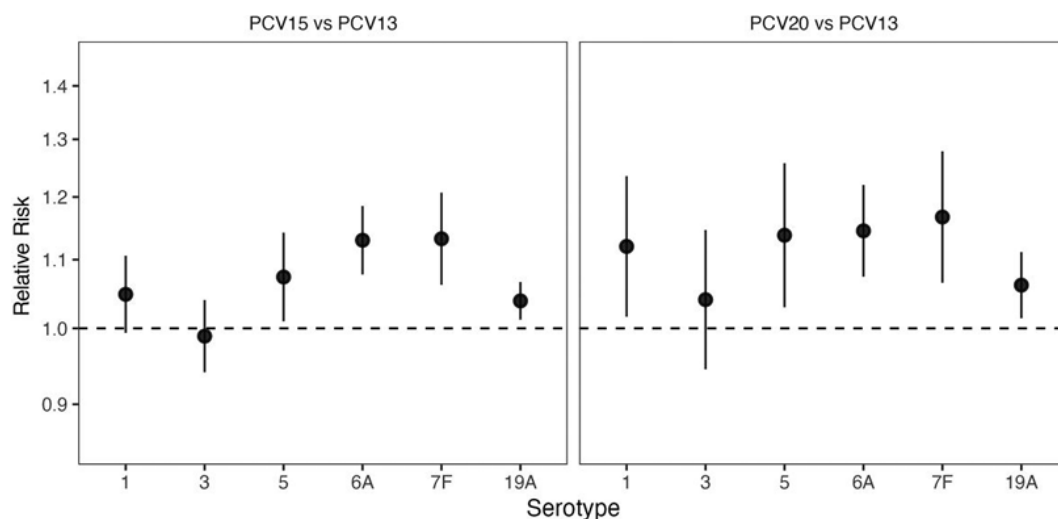
A hierarchical Bayesian model was used to predict protection against colonisation from serum IgG levels collated from longitudinal and immunogenicity data from head-to-head RCTs.²⁸ The mathematic model predicted that the risk of colonisation increased for serotypes 4 and 23F across comparisons; for serotypes 5, 6A, 6B, 7F, 19A, 19F when PCV15/PCV20 were compared with PCV13; and for serotypes 1, 9V, 18C in a comparison between PCV20 and PCV13. The impact on vaccine effectiveness against colonisation was estimated to reduce with increased valency.

For example, from an assumed VE of 60% for PCV7, the predicted vaccine effectiveness for each of the higher valency vaccines against serotype 23 were:

- PCV13 56%
- PCV15: 55%
- PCV20: 45%.

Based on this model, Figure 5 indicates the relative risk of colonisation for PCV15 and PCV20 isotypes shared with PCV13 (excluding shared PCV7 serotypes). It shows that while PCV20 is expected to protect well against disease, it highlights the need for ongoing serotype surveillance.

Figure 5: Modelling of the relative risk of colonisation with six additional shared serotypes for PCV15 and PCV20 versus PCV13 (excluding PCV7 serotypes). (Displayed as mean [points] $\pm$ 95% CI [error bars]; RR >1 represents higher risk of colonisation). (Wong, 2025, open access)



Conclusion

PCV20 induces broad and functional immune responses across all 20 serotypes in both 3+1 and 2+1 schedules, with strong booster responses and no evidence of interference with routine vaccines. While indirect comparisons show PCV15 may outperform PCV20 for a few PCV13-shared serotypes,

particularly serotype 3, PCV20 provides broader serotype coverage. Immunogenicity is reduced for 2+1 schedules, which may impact how well PCV20 performs in real-world settings in New Zealand.

Efficacy and effectiveness

Since regulatory approval of PCV20 internationally was based on immunogenicity data, currently at the time of writing, no data is published on efficacy nor real-world effectiveness in infants. PCV20 has not yet received approval for use in New Zealand. The following presents evidence likely to support effectiveness of PCV20. See Table 10 for the details of these studies.

PCV13 effectiveness

PCVs have demonstrated high effectiveness overall against IPD in children, particularly when a booster dose is used. A systematic review of 25 studies published between 2000 and 2024 evaluated a range of schedules using PCV13.²⁹ Although there was considerable heterogeneity between studies, a primary course (one to three doses) plus booster dose was 94.4% (87.3-97.6%) effective against IPD. For the primary course only, one-dose effectiveness was 66.8% (56.4-74.7%), two doses 78.8% (68.6-85.7%) and three doses 82.0% (73.1-88.0%). For serotype 3, pooled VE was -80.6% (-2598.0 to 87.9%) in comparison to serotype 19A with pooled VE of 83.3% (60.7-92.9%). Due to this wide variation in serotype protection, the authors concluded that surveillance is essential to assess the effectiveness of reduced schedules to provide lasting immunity and to reduce pneumococcal transmission.²⁹

Summary

PCV13 has demonstrated very good effectiveness against IPD in young children after one, two, three or four doses (with 95% CI ranging from 56.4% to 88.0%). A booster dose increases the effectiveness to 94.4% (87.3-97.6%), regardless of the number of primary doses given. However, effectiveness of individual serotypes can vary considerably, with no effectiveness against serotype 3 and good effectiveness against serotype 19A. As concluded previously, close surveillance of vaccine effectiveness and serotype prevalence is essential.

Predicted effectiveness of PCV15 and PCV20

Using modelling against the real-world effectiveness of PCV7 and PCV13 (non-PCV7 types) and placebo, the effectiveness of PCV15 (designated V114 in MSD clinical trials) and PCV20 was estimated based on serology post the primary dose in a MSD funded study.³⁰ The study created a reverse cumulative distribution curve and compared effectiveness with the serotype-specific protective IgG from US-based RCT immunogenicity data to predict vaccine effectiveness. See Table 5 for observed PCV7 and PCV13 vaccine effectiveness compared with the predicted vaccine effectiveness for PCV15 and PCV20 in the US.

Table 6: Median observed and predicted vaccine effectiveness by serotype, in the US (Ryman, 2024, open access)

Serotype	Observed effectiveness, median % (95% CI) ^A	Predicted effectiveness, median % (95% CI)	
		V114	PCV20
4	93% (65-99)	95% (42-100)	74% (32-93)
6B	94% (77-98)	87% (60-94)	83% (51-97)
9V	100% (88-100)	99% (84-100)	98% (65-100)
14	94% (81-98)	92% (79-97)	76% (52-92)
18C	97% (85-99)	95% (65-99)	89% (57-99)
19F	87% (65-95)	99% (91-100)	94% (63-100)
23F	98% (80-100)	99% (82-100)	90% (55-96)
1	87% (77-93)	82% (64-92)	69% (56-79)
3	80% (30-94)	99% (63-100)	60% (10-93)
5	87% (77-93)	83% (67-90)	82% (70-90)
6A	86% (76-92)	73% (56-85)	72% (60-82)
7F	97% (83-100)	97% (81-99)	91% (66-99)
19A	86% (71-94)	80% (54-91)	80% (63-90)

- V114 = PCV15
- ^A published sources^{31, 32}
- Due to a lack of cases, effectiveness estimates were not available for PCV13 serotypes 1, 5, and 6A so pooled estimate for “PCV13-non-PCV7 types” was used for serotypes 1 and 5 and the estimate for “PCV13 type” was used for 6A³²

This modelling predicted PCV15 to have comparable effectiveness to PCV7 and PCV13 (non-PCV7 serotypes), whereas PCV20 was predicted to have comparable effectiveness for 9/13 shared serotypes. PCV20 is likely to be effective against its additional 7 serotypes but due to the lower immunogenicity is less likely to be effective against serotype 3 than PCV15.

In another MSD-funded study, a mathematic model was used to predict the incidence breakthrough IPD in infants in France over 20 years with PCV15 and PCV20.³³ The results were based on serotype-specific VE predicted by Ryman et al³⁰ which were in turn based on clinical trial immunogenicity data. This modelling predicted that a 2+1 schedule of PCV15 was likely to lower the incidence of breakthrough IPD more than either a 2+1 or 3+1 schedule of PCV20. The model predicted that PCV20 (2+1) would increase PCV7 serotype-IPD by 350% (from 0.2 to 0.9 cases per 100,000) over 20 years compared with a predicted decrease of 55% for PCV15 (2+1) from 0.2 to 0.09 cases per 100,000; and predicted a 65% increase for PCV20 (3+1) to 0.33 cases per 100,000.³³ A decrease was predicted for other serotypes relative to baseline (IPD incidence in 2019). The study concluded that the benefits of coverage against additional serotypes need to be weighed against the impact of any reduction in serotype-specific immune responses in vulnerable populations. Breakthrough IPD associated with PCV13 serotypes will continue to contribute to the burden of IPD with lower vaccine effectiveness.³³

Based on US pneumococcal disease incidence and susceptibility, a dynamic model structure was used to predict potential benefits of replacing PCV13 with PCV20 on the paediatric vaccine schedule (Pfizer funded study).³⁴ Compared with continued use of PCV13 over a 10-year horizon, replacing PCV13 with PCV20 was predicted to reduce IPD by 44,249 cases, outpatient pneumonia by 1.02 million cases, hospitalised pneumonia by 248,700 cases and otitis media by 4.63 million cases. PCV20 was also predicted to have greater benefit than PCV15 (i.e. reduction in IPD by 31,361 cases and OM by 3.11 million). The study concluded that by offering broader protection against a range of serotypes, PCV20 can help to further decrease the burden of pneumococcal disease.³⁴

Similarly, based on an Australian population-based multicohort model (funded by Pfizer), PCV20 given as a 2+1 infant schedule was estimated to have an incremental benefit of 642,804 fewer pneumococcal disease cases and 8,308 fewer deaths than PCV13 over 10-years, through direct and indirect effects.³⁵

PCV20 effectiveness – preliminary data

Data from indirect cohort study, presented at the International Society of Pneumonia and Pneumococcal Disease meeting (ISPPD-2026), reported unadjusted vaccine effectiveness of PCV20 in US children.³⁶ In the cohort were 253 IPD cases aged under 59 months eligible for PCV15 or PCV20, between October 2023 to April 2026 across 24 US sites. Comparison was made between additional vaccine serotypes (non-PCV13) and non-vaccine serotypes (controls). Preliminary unadjusted vaccine effectiveness of at least two doses of PCV20 was 96% (80-99%) against the additional seven PCV20 serotypes and 78% (46-92%) against all PCV20 serotypes (excluding serotype 3).³⁶

Summary

Preliminary, unpublished, real-world effectiveness data indicate that PCV20 is protective against paediatric IPD caused by the vaccine-specific serotypes. With limited real-world effectiveness data, modelling has been used to predict benefits of using higher-valency PCV vaccines. Interpretation of these findings from Pharma company studies needs to be cautious since all these studies show bias towards each company's vaccine (PCV15 – MSD and PCV20 – Pfizer). Furthermore, the data inputs for these modelling studies are limited to the original clinical trial data with relatively small numbers of participants compared with real-world usage and historical data on vaccine effectiveness for PCV7 and PCV13 over the last 20 years. At best, these newer PCV vaccines will have comparable effectiveness against PCV7 and PCV13 serotypes, with the additional benefit of broader protection against more serotypes.

International immunisation schedules

Table 7: A summary of some of the international immunisation schedules for pneumococcal vaccinations in children aged under 5 years^a (as of March 2026).

Country	Routine schedule	Special groups	Available vaccines
New Zealand	6 weeks, 5 months, 12 months (2+1)	Three doses for catch-up if unvaccinated, to age 59 months only	PCV13
	6 weeks, 3 months, 5 months, 12 months (3+1)	Children under 5 years: - Immunocompromised - Born preterm (<28 weeks gestation) - Down syndrome - Diabetes - Pre/post transplant - Pre/post splenectomy, asplenia - Renal failure or nephrotic syndrome - cochlear implants, cerebrospinal leakage, intracranial shunts - chronic pulmonary disease (including asthma treated with high dose corticosteroids)	PCV13 and 23PPV (from age 2 years) Additional dose(s) available to special groups not previously vaccinated with PCV13 primary course and aged over 12 months – under 18 years
Australia	2 months (or 6 weeks), 4, 12 months	- Routine schedule for non-ATSI children - Catchup for children aged <5 years (non-indigenous or ATSI born before 1 March 2025)^b	PCV20
	2 months (or 6 weeks), 4, 6 and 12 months	Special groups with high-risk conditions and ATSI children (born after 1 March 2025)^b	
Canada	2, 4, 12 months (2+1 schedule) or 2, 4, 6, 12-15 (3+1 schedule)	Routine schedule varies by Province/Territory	PCV15 or PCV20
	2, 4, 6, 12-15 (3+1 schedule)	Infants with additional medical, social, behavioural or environmental IPD risk factors	PCV20 (or complete doses with PCV20 if partially vaccinated)
UK	16 weeks and 12 months (1+1 schedule)		PCV13
	1+1 plus booster age 2 years - from age 8 weeks then 4 weeks later, 2 years.	Age <1 year: - clinical risk excluding asplenia or severe immunocompromise – routine plus 23PPV - with asplenia or severe immunocompromise – 2 doses PCV >4 weeks, starting age 8 weeks	- PCV13 plus 23PPV (or PCV20 when available) at from age 2y - PCV20 (when available) instead of PCV13 at age 12 months
	1+1 plus booster - additional dose at diagnosis plus booster	Age ≥2 years: - clinical risk with/without asplenia - severe immunocompromise	- One dose 23PPV (or PCV20) - One dose PCV13 (or PCV20), plus booster 23PPV (or PCV20) >4 weeks after last PCV.
US	2, 4, 6, 12-15 months		PCV15 or PCV20
		Age ≥2 – 5 years - Risk conditions +/- immunocompromise Age 6 – 18 years - Risk conditions + immunocompromise - Risk conditions - immunocompromise	complete series for PCV20 and give 1 dose 23PPV or PCV20 if not had 23PPV. Additional 23PPV or PCV20 (if not previously received); if immunocompromised and received 23PPV give 1 dose 23PPV or PCV20 five years later

a. Other special groups offered pneumococcal vaccines over the age of 5 years are not included in this review of evidence.

b. Some states offered 23PPV to Aboriginal Torres Strait Islander (ATSI) children before 1 March 2025 following PCV13 or PCV15.

Sources:

- Immunisation Handbook 2026 (see <https://www.healthnz.govt.nz/health-professionals/guidance-standards/topic/immunisation/immunisation-handbook-2026-version-2>)
- <https://immunisationhandbook.health.gov.au/contents/vaccine-preventable-diseases/pneumococcal-disease>
- <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-16-pneumococcal-vaccine.html>
- <https://www.gov.uk/government/publications/pneumococcal-the-green-book-chapter-25>
- <https://www.cdc.gov/acip-recs/hcp/vaccine-specific/pneumococcal.html>
- <https://www.cdc.gov/pneumococcal/hcp/vaccine-recommendations/risk-indications.html>

Decision-making by country

World Health Organization

The following are highlights concerning higher valency vaccines from the WHO position paper on pneumococcal conjugate vaccines in infants and children aged <5 years, September 2025²⁴

- The choice of schedules should be based on local epidemiological and programmatic factors.
- Countries considering switching to recently licensed higher valency PCV product (e.g., PCV14, PCV15, PCV20) to broaden serotype coverage.
- By extending valency, countries must consider trade-offs that may exist:
 - potential higher price
 - potential partial loss of some direct or indirect protection against serotypes included in PCV10 and PCV13 due to reduced immunogenicity leading to higher disease and/or higher acquisition of carriage
 - potential need for an increased number of doses used to compensate for the loss in immunogenicity (e.g. moving from a 2p+1 to a 3p+1 schedule).
- Serotype-specific surveillance is recommended to monitor direct and indirect impact on pneumococcal disease burden.²⁴

Australia

PCV13 had been used in the Australian childhood immunisation programme since 2011. As of 1 September 2025, PCV20 replaced PCV13 and 23PPV on the national immunisation programme and childhood schedules (ie for all children aged under 18 years). Australia identified that the additional non-PCV13 serotypes, which were causing IPD, were covered by PCV20 and any of remaining 23PPV serotypes were associated minimally with disease in children, so found no additional benefit for using 23PPV over PCV20 in children.³⁷

PCV20 schedule:

- Non-indigenous children – no change to 2+1 schedule, given ages 2, 4 and 12 months (some states commence schedule at age 6 weeks).
- Children with risk conditions aged <12 months – no change to 3+1 schedule given at 2, 4, 6 and 12 months.
- Indigenous Aboriginal and Torres Strait Island children – changed from 2+1 to 3+1 schedule, if born after 1 March 2025 (2+1 if born before 1 March 2025).

- Children who started the recommended schedule with PCV13 or PCV15 are recommended to complete the schedule with PCV20.
- Children who have completed their PCV schedule with PCV13 or PCV15 do not require any supplemental doses of PCV20.

United States

In April 2023, the FDA expanded the use of PCV20 to include children aged 6 weeks to 17 years and recommended the following uses of PCV20:³⁸

- PCV15 or PCV20 for routine vaccination of children aged 2-23 months
- Catchup for healthy children aged under 5 years with incomplete vaccinations using PCV13, PCV15 or PCV20 – recommended PCV15 or PCV20:
 - healthy aged 24-29 months – give 1 dose ≥ 8 weeks after previous dose
 - children aged 24-71 months with certain underlying medical conditions with incomplete schedule of <3 doses by aged 24 months – 2 doses given 8 weeks apart
 - children aged 24-71 months with certain underlying medical conditions who completed 3 doses before aged 12 months – 1 dose given ≥ 8 weeks after previous PCV dose.
- For children aged 6–18 years with any risk condition who have not received any dose of PCV13, PCV15 or PCV20, a single dose of PCV15 or PCV20 is recommended ≥ 8 weeks after the most recent dose of pneumococcal vaccination.
- For children aged 6–18 years with a risk condition who have received PCV13 only at or after age 6 years, either a dose of PCV20 or ≥ 1 dose of PPSV23 is recommended at least 8 weeks after the last PCV13 dose.

United Kingdom

<https://www.gov.uk/government/publications/pneumococcal-vaccination-guidance-for-health-professionals/changes-to-the-infant-pneumococcal-conjugate-vaccine-schedule-information-for-healthcare-practitioners>

Through PCV13, the UK achieved high levels of pneumococcal herd immunity for all age groups and IPD is rare in infants due to indirect protection. Since 2020, the routine schedule reduced from 2+1 to 1+1 given at ages 12 weeks and 12 months (on or after 1st birthday). It was subsequently changed to ages 16 weeks and 12 months from July 2025. There are no current plans to replace PCV13 with PCV20 for the infant programme. PCV20, when available, will be used as a booster instead of 23PPV in adults over 65 years and as part of the 'at-risk' programme for individuals aged over 2 years. PCV20 will also replace PCV13 as the booster dose given at age 12 months for children aged under 2 years with asplenia, splenic dysfunction, complement disorder or severe immunocompromise.

Summary of evidence

Table 8: Burden of disease, programme effectiveness and serotype prevalence

Outcomes	Ref	Participants	Results	Findings
New Zealand				
Reduced inequity	1	Retrospective cohort study, NZ children aged <6 years 2006-2015 • PCV7 introduced 2008 • PCV10 in 2011 • PCV13 in 2014	Children hospitalised between 2006-2015: • with IPD = 640 cases; declined by 73% overall, 79% Māori and 67% Pacific • all-cause pneumonia = 26,589 cases; declined by 8%, 12% Māori and 21% Pacific • otitis media = 44,545 hospitalised cases; declined by 25% overall, 51% Māori. Highest rates of cases but also highest decline rates were Māori and Pacific and SES deprived	PCV programme was associated with significant reductions in disparities for hospitalisation of young children for IPD, pneumonia and otitis media.
19A notifications	2	ESR EpiSurv data 2017-2020, compared with NIR vaccination data. Vaccine preventable pneumococcal serotypes = PCV10 types plus 19A	• shift from PCV13 to PCV10 resulted in increased in 19A cases. ○ total rates decreased in 2020 ○ For >65s plateaued during PCV13 and decreased again in 2nd PCV10 era – delayed indirect effects of PCV13 ○ For children <2 years – decreased during PCV13 but increased in 2017 with reintroduction of PCV10 ○ 2-4y and 5-64y remained stable, slight increase in 2017 for 2-4 y/o ○ 19A increased sharply in <2s with reintroduction of PCV10. • Relative proportion of 19A in IPD cases increased significantly across all age groups in both PCV10 eras (p<0.01) and significantly decreased during PCV13 era (p<0.01) ○ 18 cases <5 y in 2020 – all 19A , 3 unvaccinated, 12 fully immunised for age, 3 under-vaccinated for age. • Penicillin resistance increased in 19A isolates by 65% (similar to Europe at 67%).	Steady increase in 19A cases from 2017 -2020 in young children. Rate increased from 0 to 7.3 per 100,000 during this period while total IPD cases have not increased proportionally. NZ needs to reconsider returning to PCV13 as recommended by WHO.

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Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
Otitis media and pneumonia	3	Retrospective cohort study in NZ, over 3 PCV periods in children born between 2006 - 2016. Examining 12-month periods when both vaccines were administered to the study population in same birth cohort. Followed up until age 6 years. 4.5 years or 18 months. Otitis media (OM) hospitalisation and elective surgery; hospitalisation with pneumonia	- Transition period 1 = PCV7 to PCV10 (with 6 years follow-up) [PCV13 for high-risk groups instead of PCV10] 3425 OM first hospitalisations, out of 53299 individuals; pneumonia 1763 first hospitalisation, 92 bacterial pneumonia out of 53,635 children - PCV10 significantly lower risk of OM than PCV7 (aHR 0.89; 0.72-0.97; p = 0.0106) - No difference in all-cause pneumonia (PCV10 vs PCV7) - Transition period 2 = PCV10 to PCV13 (4.5 years follow-up) 3205 OM / 51723; 1828 all-cause pneumonia and 63 bacterial pneumonia / 51659 - No differences PCV13 vs PCV10 in OM or pneumonias - Transition period 3 = PCV13 to PCV10 (18 months follow-up) 972 OM / 53015; 801 ac-pneumonia and 0 bacterial / 52,971 - PCV10 more effective than PCV13 against OM (p=0.003) and all-cause pneumonia (p=0.034) Circulating serotypes likely to influence vaccine impact – non-PCV and non-typeable serotypes increased. IPD had decreased during study period but this was before 19A started increasing.	Data demonstrate effectiveness of PCV programme against OM and pneumonia in children. Equivalence was seen between vaccines. But after 2020, 19A increased considerably.
Serotype replacement	5	Compared IPD incidence rate ratio 2022 vs 2022 with other countries	NZ incidence rate highest in 2022 since 2011 and significantly higher IRR than US (p<0.01). - Australia: IR in 2022 was 10% lower than 2019 (pre-covid) - IRR 1.69 (1.57-1.82), p = 0.41 - US: 30% lower in 2022 than 2019 - IRR 1.15 (1.12-1.18); p < 0.01 - NZ: 2022 IR was 25% higher than 2019 and highest since 2011 - IRR 1.80 (95% CI 1.58-2.05) - NZ IPD 2017 vs 2022 (PCV10 2+1 era) – IRR 1.12, 1.00-1.26 - biggest increases in children under 2 (IRR 2.63, 1.65-4.33) and 2-4 yo (IRR 1.95, 1.18-3.32) - Māori – 1.34 (1.08-1.66), no significant changes NZE/Other or Asian - Males – 1.18 (1.01 – 1.39) 19A breakthrough cases 145 PCV-eligible case of IPD 19A between 2017-2022, 5 unvaccinated, 5 PCV13 vaccinated. 2021 – 75 PCV-eligible IPD cases – 52% would have been covered by PCV13, 92% were 19A, 2 PCV-13 breakthrough cases. 2022 – 99 cases, 61% PCV13-preventable, 92% 19A, no PCV13-breakthrough. - Unique to NZ - a recent analysis identified at least 19 IPD patients under 5 years of age with <i>S pneumoniae</i>-associated haemolytic uremic syndrome (spHUS) during 2020–22 in NZ (all with 19A), while only 9 cumulative cases were identified in the previous 20 years. Three-quarters were aged under 2 years and almost 60% Māori.	Surge in 19A IPD underscores inadequate serotype coverage and impact on disease burden. The epidemiology at the time of PCV change and different immunogenicity could provide an environment for serotype change.

continued over page

Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
Severe 19A in children	8	IPD in children <5 between 2021 – 2023, in Auckland.	93 IPD cases (annual incidence 18-20 cases per 100,000 pop per year) - Incidence of IPD in young children approaching that of the pre-PCV era. - Of those with identified serotype 46/68 (68%) were 19A - Pacific > NMNP (IRR 2.3, 1.4-3.7); Māori vs NMNP (IRR 1.4 0.74-2.4, not significant) - Outcomes: - SpHUS and empyema only in 19A cases. - two children died both with 19A; 13/91 survivors (14%) had serious sequelae. - Both children who died were fully vaccinated with PCV10 (one had underlying risk factors) - Median duration of hospital stay was 13 nights (IQR 5-25) 30 (32%) to ICU; 58 (62%) underwent 130 surgical procedures. 19A associated with all pleural drainage procedures. - Sequelae – hypoxic brain injury or development delay, epilepsy, bronchiectasis, hearing loss. All HUS cases required renal dialysis, anti-hypertensive meds. - Pneumococcal serotypes 49 isolates would be covered by PCV13 not PCV10, 5 by PCV20 but not PCV15. 12 not covered by any PCV. 46 episodes were 19A; 3 each serotypes 3, 15A, 23B. 33/34 episodes of PCV13-serotypes were 19A and children who received ≥2 doses of PCV10 - No children diagnosed with clinically significant immunodeficiency.	Very high incidence of IPD in children <5 years in Auckland during 2021-2023. Largely attributed to 19A including in children fully vaccinated with PCV10.
Haemolytic uraemic syndrome	9	Cases of SpHUS notified between 2011-2024 at Starship, national referral centre to ICU or nephrology care or NZPSU. (conference poster)	38 cases (2011-2024) = 26/38 between Dec 2020 - Dec 2024, aged <5.5 years. - Age <2 year = 26/38 (68%) - Age 2-6y = 12 (32%) 17 (45%) Māori, 7 (18%) Pacific, 14 (37%) NMNP - Incidence: 2019 = 0.33/100,000; 2022 peak 3.96/100,000 - Complication in 11% of all IPD cases in 2022 aged <5 years. Serotype 19A 2011-2019 - 6/11 (55%) 2020-2024 – 21/21 (100%) Immunisation status 19/26 ≥2 doses PCV10 or PCV13 5 cases had ≥2 doses PCV13, 4/5 serotype 19A, all required ICU and 4/5 required dialysis	Concerning increase in serotype 19A-related IPD, most marked in children aged <5 years. Very high rates of SpHUS associated with 19A with severe outcomes. Multi-factorial reasons – use of PCV10, poor immunisation rates in disadvantaged populations, changes in respiratory virus seasonality after COVID-19 restrictions of population.

continued over page

Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings	
switch PCV10 – PCV13	10	Population-based surveillance cohort study. IPD notifications 2009-2024 merged with StatNZ census data. 1. Quantify impact of PCV13 reintroduction (IPD incidence rate ratio 2024 vs 2022; PCV13-type IRR) 2. Predictive model of IPD cases that could have been prevented by PCV13 instead of PCV10 in <2 and 2-4 y	2019 – PCV13-specific incidence rate began to increase: <2y: 6.6 / 100K; 2-4y: 2.7/100K) 2022 – peak <2y: 34.6 and 2-4y 14.8 / 100K 2017-2022 <2y:PCV13-types increased from 35% to 65% (of which 77% 19A); 2-4y – 40% to 80% (65% 19A) Secondary analysis estimated 32 fewer cases of PCV13-specific IPD in under 2s in 2023-2024 than if PCV10 had continued.	2024 : PCV13-types decreased to 30% but remained about 60% in 2–4-year-olds - age <5 years 2024 vs 2022 - all IPD IRR 0.48 (0.34-0.67) - PCV13-type IPD overall IRR 0.67 (0.46-0.97)l <2 IRR 0.58 (0.34-0.94) but not significant for 2-4 y IRR 0.82 (0.46-1.44) - Ethnicity 2022-2024, all IPD - Asian IRR 0.33 (0.12-0.92) - Pacific – only group without decrease IRR 0.77 (0.38-1.55)	The incidence rate of IPD in children aged under 5 years has decreased by more than 50% in the 2 years following change from PCV10 to PCV13 on the Schedule. A significant drop in PCV13-type IPD was observed in under 2-year-olds compared with the expected number of cases if PCV10 had continued to be used. A more attenuated drop was also seen in 2–4-year-olds not eligible for PCV13.
Other countries					
Comparison Australian / NZ	6	Collated IPD notification 2017-2021 in Australia and NZ	- Crude IPD incidence per 100,000: Australia 4.3-8.4 vs NZ 6.9-11.4 - Age-adjusted rates: highest rates in Australia Indigenous ranged 27.3-35.3 then Māori/Pacific 19.7-30.4 - Ethnicity adjusted rates for children <2y: Australia 23.3 (19.5-27.1) vs NZ 30.2 (21.1-39.4); p<0.001 - Serotype 19A: Australia remained at 5% ; NZ increased from 11.5% to 29.5% (largest increase in <2 and 2-4y/o).	Despite high rates in Indigenous Australians, overall IPD rate increased in NZ particularly among young children and in 19A cases. Data support change to PCV13 from Dec 2022 in NZ.	
Australian epi	7	Multicentre prospective audit of IPD from 5 paediatric hospitals in Australia of 5.5 years 2016-2021	377 IPD episodes in 375 children: 338 (90% received ≥3 PCV doses; 42 (11%) had IPD risk factors. - Serotypes available 230 (61%): 140 (61%) PCV-13-types; predominantly 3, 19A and 19F. Children with risk factors were more likely to have non-vaccine serotypes. - Complicated pneumonia was the most common presentation.	Non-vaccine serotypes accounted for the majority of bacteraemia and meningitis episodes. High rates of ceftriaxone-resistant non-vaccine type 23B in meningitis cases.	

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Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
Factors associated with carriage	39	Global SRMA, 82 articles, published pre July 2021 Heterogeneity prevented quantification methods.	Factors associated with pneumococcal carriage in all country income settings: • Young age • Living with young children (likely associated with increased viral transmission) • Symptoms of RTI – vaccines and other PH measures to reduce viral respiratory pathogens prevent pneumococcal disease • Childcare attendance • Ethnicity • Poverty / proxies for poverty • Exposure to cooking and tobacco smoke (greater in low-income countries) • Co-colonisation with other bacteria (<i>M. catarrhalis</i>, <i>H. influenzae</i>, <i>S. aureus</i>) • Breastfeeding and antibiotic use were protective.	Knowledge gap regarding Pneumococcal carriage risk factors.
PCV13 schedules and breakthrough infection	12	Breakthrough 2+1 or 3+0 vs 3+1 PCV13 or PCV7-serotype IPD children <5 • Primary series 2+0 or 3+0 before booster <12 or 12-35 months • Booster series 2+1 or 3+1 as 12-23 and 24-59 months • No vaccination history for all children with breakthrough IPD	• Highest rates of PCV13-serotype infection were in infants aged <12 month who received 2-dose primary (7.79 vs 0.6 for 3-dose). • 12 months, similar if had 2 or 3 primary doses (1.31 vs 2.34) • Comparing early vs later PCV13 introduction <12: ○ Early 2 vs 3 dose primary 18.8 vs 1.4 = rate difference 16.6 additional / 100,000 per year ○ Later – 3.6 vs 0.2 = RD 3.4	Three doses were better in first year of life than two doses but there was a reduction in differences between the schedules over time. Differences between schedules may diminish as vaccine serotypes reduced in circulation.
Breakthrough and vaccine failure	40	Narrative review	Cases of vaccine failure were mostly caused by more virulent serotypes or those more resistant to antibiotics – eg 3 and 19A. Incomplete vaccinations reduce serotype-specific vaccine effectiveness (3, 6A and 19A) and presence of comorbid conditions are important factors associated with breakthrough disease and vaccine failure.	

Abbreviations: aHR – adjusted hazard ratio; ESR – Institute of Environmental and Scientific Research ICU – intensive care unit; IR – incidence rate; IRR – incidence rate ratio; NMNP – non-Māori non-Pacific; NZPSU – New Zealand Paediatric Surveillance Unit; PCV – pneumococcal conjugate vaccine; RD – rate difference; RTI – respiratory tract infection; SES – socioeconomic status; SRMA – systematic review and meta-analysis.

Table 9: Vaccine safety

Outcomes	Ref	Participants	Results	Findings
PCV20				
4 doses in infants (3+1)	13	Phase 3 multi-country RCT. Healthy infants randomised 2:1 PCV20 (n=1000) and PCV13 (n=504) given at ages 2, 4, 6, 12-15 months	Frequency of local and systemic reactions were similar between groups, most mild to moderate. Median onset 0-1 days after vaccination, duration 1-2 days. After doses 1 – 4 - Local reaction – injections site pain: PCV20 24.7% - 40.5% vs PCV13 26.8% to 42% - Systemic - irritability: PCV20 54.8% - 68.2% vs PCV13 54.7% - 68.5% - drowsiness: PCV20 35% - 65% vs PCV13 36% to 62% - fever: PCV20 9% - 18% vs PCV13 10% - 17% - No SAE - Majority of participants received routine childhood vaccines concomitantly: 85.9% +dose 1, 85.7% +dose 2, 50.8% +dose 3 and 62.0% +dose 4.	Safety profile of PCV20 was similar to PCV13. No new safety concerns.
Clinical trial data – first approval review	18	Review of clinical trial data	Most common solicited adverse reactions (pooled from 3 trials): - Infants: irritability (>60%), injection-site pain (>30%), redness (>10%) and swelling (>10%), drowsiness (>30%), decreased appetite (>20%), fever (>10%) - Children aged >2: injection-site pain (>50%); fatigue (>20%), muscle pain (>20%), headache (age >5 y, >10%) - Similar rates between PCV13 and PCV20, vaccines given with other schedule vaccines. - SAE – age < 2 years, febrile seizure 14 days after dose 4, given with MMR/VV. Another febrile seizure after dose 4 classified as non-serious and associated with COVID-19 infection. - No SAE in older age groups.	

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Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
Phase 3, Japan 3+1 schedule, IM vs SC	14	double-blind RCT in Japan PCV20 SC (n=226), PCV20 IM (n=218) vs PCV13 SC (224) dose 1 age 2-6 m, dose 2 and 3 at 4–8-week intervals, dose 4 at 12- 15 months. Given with age- appropriate vaccines. Median age at dose 1 = 2.3 (2.0- 4.9 months) and at dose 4 = 12.4 (12.0-15.2) months	Local reactions • mild to moderate, injection site redness most common • lower proportion of swelling and redness in IM group • no difference between PCV13 or PCV20 given SC. • Onset – day 1 (vaccination) or 2, median duration 1-5 days Systemic reactions • Similar across groups, mostly mild-moderate • Irritability, drowsiness after doses 1-3 • fever ($\geq 37.5^{\circ}\text{C}$) after dose 4 (38.2 – 42.7%) ○ Fever $\geq 40^{\circ}\text{C}$ in one child after dose 4 of PCV20 SC. (non-serious AE) – given concomitant vaccines. ○ Rates of fever in doses 1-3 = 0% - 1.8%, after dose 4 = 4.5% - 8% • No SAE considered vaccine related	Subcutaneous PCV20 had a similar safety profile to SC PCV13. Local reactions rates were lower when PCV20 was given IM.
Phase 3, healthy infants and toddlers (2+1)	15	RCT, double-blind 1,204 healthy infants aged 42-112 days at enrolment in Europe and Australia (NCT04546425) Randomised 1:1 PCV20 or PCV13; doses day 0, 8 weeks later, age 11-12 months. (2+1 schedule) coadministered with Infanrix- Hexa each dose and dose 3 with MMR and VV (unless outside of local guidelines). Rotavirus and influenza given in accordance with local guidelines. (for concomitant findings, see ¹⁶)	Local and systemic reactions were mild to moderate and occurred at similar frequency between groups. Median onset 1-2 days with 1-3 day duration. Most frequent: • local – injection-site pain and redness • systemic – irritability and drowsiness • fever ($\leq 3.6\%$ over 38.9°C, 2 (0.3%) in PCV20 had fever $>49.9^{\circ}\text{C}$) ○ dose 1 PCV20 8.9% PCV13 8.5% ○ dose 2 PCV20 14.9% PCV13 14.0% ○ dose 3 PCV20 24.3% PCV13 23.7% AE – consistent with age of population; SAE of seizure-like events reported in 2 participants, not considered vaccine related.	No unexpected safety concerns and solicited events were mild to moderate and transient. Fever after toddler dose in both vaccine groups were likely attributable to concomitant vaccines. Similar proportions adverse events between groups.
Phase 3, healthy infants and toddlers (3+1)	17	Phase 3 RCT, 4-doses series given aged 2, 4, 6, 12-15m (n=1997) in US/Puerto Rico (NCT04382326) conducted 2020-2022. Randomised 1:1 PCV20 (n=1001) or PCV13 (n=990). Administered DTaP-IPV-HepB and Hib with doses 1-3 and MMR and varicella with dose 4. Rotavirus and influenza given at any time.	Local and systemic reactions were mainly mild to moderate and comparable frequency between PCV20 and PCV13. Median onset day 0-2 duration 1-3 days. Most frequent: • injection-site pain: PCV20 – 35.7-49.1%; PCV13 - 35.8-45.3% • irritability: PCV20 – 61.0-71.6%; PCV13 – 61.1% - 71.7% • drowsiness: PCV20 - 39.5%–67.2%; PCV13 39.5%–66.0% Febrile seizure occurred in 2 children: • one 14 days after dose 4 given with MMR and varicella vaccine, possibly related to concomitant vaccination • another occurred 7 days post dose 4, child diagnosed with COVID-19.	Safety profile of PCV20 is like that of PCV13. No safety concerns with concomitant administration with other routine infant immunisations.

Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
continued over page				
Concomitant vaccinations (2 and 3+1 schedules)	16	Two RCT, healthy infants vs PCV13 - study 1:¹⁷ 4-doses series (n=1997; US/Puerto Rico) given aged 2, 4, 6, 12-15m - Study 2:¹⁵ 3-dose (n=1207, Europe/Australia) given approximate ages 2, 4, 11-12m concomitant vaccines included: DTaP-IPV-HepB and Hib or DTaP-IPV-HepB/Hib; MMR, VV with dose 4. (plus RV and influenza at any time)	PCV20 had similar tolerability and safety profile to PCV13 (as previously observed) No SAE in study 1; Study 2 – SAE of inflammation 7 days after dose 1, considered to be vaccine related (either PCV20 or DTaP-IPV-HepB/Hib) Post-hoc subgroup analysis (influenza vaccine study 1 or rotavirus study 2): - Influenza vaccine dose 3 or 4: - similar % with systemic events in PCV13 or PCV20 groups +/- influenza vaccination - Fever $\geq 38^{\circ}\text{C}$ 16.8% - 24.3% when given influenza with dose 3 or 4 vs 11% - 13.9% without influenza vaccine - No signal for febrile seizures among participants who received influenza vaccine with either PCV13 or PCV20. - Rotavirus vaccine: - Similar % systemic AE +/- RV between groups - Fever $\geq 38^{\circ}\text{C}$ 8.1-16.9% after dose 1 or 2 with RV; 8.4% - 13.2% without RV. - A higher frequency of AE in PCV20 group with RV driven by AE unrelated to vaccine (infections like upper respiratory tract infection) likely incidental.	PCV20 has a similar safety profile to PCV13 when given with routine infant vaccinations, and generally similar when given with influenza and rotavirus vaccines.

Abbreviations: DTaP-IPV-HepB/Hib – combined diphtheria, tetanus, pertussis, inactivated poliovirus, hepatitis B and *H. influenzae* type b vaccine; IM – intramuscular; MMR – measles mumps rubella vaccine; PCV – pneumococcal conjugate vaccine; RCT – randomised controlled trial; RV – rotavirus vaccine; SAE – serious adverse event; SC – subcutaneous; SRMA – systematic review and meta-analysis; VV – varicella vaccine;

Table 10: Immunogenicity

Outcomes	Ref	Participants	Results	Findings
PCV20				
Systematic review and meta-analysis	23	Lit search to September 2024 in infants aged <2 years, subgroup according to schedule (2+1 – one study, or 3+1 – 3 studies) - Pooled GMR PCV20/PCV13 serospecific Ab (GMR) - Pooled difference in % achieving predefined IgG levels for each serotype (DP) - Pooled GMT serotype specific OPA (OPA)	- Four studies (4093 infants) between 2021-2024 comparing PCV13 and PCV20. - PCV20 – lower immune responses for 13 shared serotypes (GMR and OPA) - DP – not significantly different - Immune responses were higher for additional PCV20 serotypes, but not statistically significant for all serotypes.	Some outcomes indicated PCV20 elicits lower immune responses for the 13 shared serotypes than PCV13 (except for the proportion achieving a defined IgG level). It provides protection against the 7 additional serotypes. It is unclear whether reduced serotype-specific antibody titres equate to reduced efficacy for those serotypes as there are no defined thresholds for each serotype. Conversely, non-inferiority does not imply clinical equivalence.
Phase 3, healthy infants and toddlers, 2+1 schedule	15	RCT, double-blind 1,204 healthy infants aged 42-112 days at enrolment in Europe and Australia (NCT04546425) Randomised 1:1 PCV20 or PCV13; doses day 0, 8 weeks later, age 11-12 months. coadministered with Infanrix-Hexa each dose and dose 3 with MMR and VV (unless outside of local guidelines). Rotavirus and influenza given in accordance with local guidelines.	1 month after dose 3 IgG GMC (non-inferiority criterion lower 2-sided 95% CI >0.5): 19/20 serotypes met non-inferiority (except 6B; GMR 0.57 (0.48-0.67)) 1 month after dose 2: 16/20 met IgG non-inferiority - Serotypes 10A and 12F – didn't achieve NI for primary objective of percentage of recipients with predefined IgG concentrations after dose 2 compared with the lowest result for PCV13-matched serotypes in PCV13 group. - Responses were highest for PCV20-only serotypes than PCV13-types. - OPA s seen for all seven additional PCV20 serotypes and were similar for shared serotypes between groups. - OPA titre boosting response seen 1 month after dose 2 and dose 3, including those who missed NI criteria after dose 2 (6A, 6B, 9V, 23F) and additional serotypes 10A and 12F.	PCV20 induced robust immune responses to all 20 serotypes. Although it statistically missed non-inferiority IgG criteria compared with PCV13 after dose 2 for matched serotypes 6A, 6B, 9V and 23F and 6B after dose 3. However, other supportive functionality data (OPA response and boosting IgG) were robust for all matched serotypes.
Phase 3, Japan 3+1 schedule, IM vs SC	14	Double-blind RCT in Japan PCV20 SC (n=226), PCV20 IM (n=218) vs PCV13 SC (224) Dose 1 age 2-6 m, dose 2 and 3 at 4–8-week intervals, dose 4 at 12-15 months. Given with age-appropriate vaccines. Median age at dose 1 = 2.3 (2.0-4.9 months) and at dose 4 = 12.4 (12.0-15.2) months	After dose 3, PCV20 SC was non-inferior (lower 2-sided 95% CI difference PCV20 – PCV13 -10%) for 11/13 matched serotypes (not 6A -8.1% [-14 to -4%] and 6B -8.6 [-14.0 to -3.7]) Additional serotypes – non-inferior to lowest percentage in PCV13 SC group. In PCV20 SC group – 90% and 87.8% achieved predefined IgG concentrations for 6A and 6B after dose 3 and 100% after dose 4. Across all vaccine groups, the predefined IgG against shared serotypes were met for similar % of recipients after dose 4. Functional Ab responses (OPA GMT and GMFR) were generally similar across all vaccine groups. As above – significantly higher for additional PCV20 types.	PCV20 elicited robust serotype specific antibody (IgG and OPA) response in healthy Japanese infants by SC or IM route. Although PCV20 missed non-inferiority criteria for IgG against 6A, 6B, 10A and 12F after dose 3, the functionality OPA and booster responses indicated that protection is expected to be clinically effective for all 20 serotypes.

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Outcomes	Ref	Participants	Results	Findings
3+1 phase 3	17	phase 3 RCT, 4-doses series given aged 2, 4, 6, 12-15m (n=1997) in US/Puerto Rico (NCT04382326) conducted 2020-2022. Randomised 1:1 PCV20 (n=1001) or PCV13 (n=990). Administered DTaP-IPV-HepB and Hib with doses 1-3 and MMR and varicella with dose 4. Rotavirus and influenza given at any time.	Noninferiority (NI) – GMR after dose 3 and 4 (lower 2-sided 95% CI > 0.5) DP = % participants with predefined IgG concentrations for shared PCV13 types or for 7 additional serotypes vs lowest serotype response PCV13 group (lower 2-sided 95% CI difference in % > -10%). - All 20 serotypes met NI GMR criteria - After dose 3: 8/13 matched (missed by small margins 1, 4, 9V and 23F) and 6/7 serotypes met DP criteria (except 12F, excluding serotype 3). - At 1 month after dose 4, strong boosting IgG response was seen for all serotypes. - PCV20 elicited OPA response to all 20 serotypes after dose 3 and dose 4. - Functional memory response were seen by PCV20 after primary course (OPA boost)	A four-dose series of PCV20 induced immune responses expected to protect against 20 serotypes.
Concomitant vaccinations (2+1 and 3+1 schedules)	16	Two RCT, healthy infants vs PCV13 - study 1¹⁷: 4-doses series (n=1997; US/Puerto Rico) given aged 2, 4, 6, 12-15m - Study 2¹⁵: 3-dose (n=1207, Europe/Australia) given approx ages 2, 4, 11-12m Concomitant infant vaccinations.	Non-inferiority met for prespecified antibody levels: - Study 1 - DTaP-IPV-HepB and Hib at 1 month after 3rd primary dose - Study 2 - DTaP-IPV-HepB/Hib after toddler dose - Both studies - GMT for MMR ad VV vaccines 1 month after 4th dose	Immune responses to routine vaccines given with PCV20 were similar to those when given with PCV13 concomitantly.
comparison with other PCVs				
PCV15 vs PCV20, 3+1 schedule	21	Indirect comparison of two phase 3 RCT 3+1 schedule PCV15 (n=858) and PCV20 (n=1001, compared with PCV13, n= 856 and 987)	Primary endpoints – IgG response rate differences (RRD) 1 month post dose 3 and IgG GMR post doses 3 and 4. - PCV15 was non-inferior to PCV20 for all endpoints (RDD margin > -10%, GMR > 0.5) for all PCV13 serotypes and superior for serotype 3 (vs PCV20 indirect and PCV13 direct comparison) - Compared with PCV20, immunogenicity of PCV15 was lowest for 6A but remained above NI margins. Response rates and antibodies were higher for PCV15 against serotypes 4, 9V and 23F.	PCV15 was non-inferior to PCV20 for all PCV13 serotypes when antibody responses were examined by indirect comparison.

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Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
PCV15 vs PCV20, 2+1 schedule	22	Indirect comparison of 2 ph3 RCT 2+1 schedule, PCV15 (n=858) and PCV20 (n=1001, compared with PCV13, n=856 and 987)	Methodology as above. - Post-primary series – lower bounds of IgG GMR PCV15 met non-inferiority of PCV20 for shared serotypes except 6A. - PCV15 met superiority margin (>1.2) for serotypes 3 and 6B (no superiority met by PCV20 vs PCV13). - PCV15 was superior to PCV20 for most of the PCV13 serotypes: 1,3,4,5,6B, 9V, 23F for IgG response rates and 3, 4, 5, 6B, 9V, and 23F for IgG GMCs - Post-toddler dose – PCV15 met superiority for serotype 3 vs PCV13; PCV20 didn't not meet superiority for any serotype. - PCV15 was similarly non-inferior to PCV20 for shared PCV13-serotypes, superior for type 3 (IgG RR and GMC) and 6B and 23F (IgG GMC)	By indirect comparison, PCV15 in 2+1 schedule elicited non-inferior immune responses compared with PCV20 for all shared serotypes and superiority for several serotypes, including serotype 3.
Indirect comparison of 3+1 and 2+1 schedule with PCV10	25	Indirect comparison of RCT data PCV20 and PCV10 that compared these vaccines individually head-to-head with PCV13 in 3+1 and 2+1 schedules (Pfizer study) Secondary analysis – PCV20 indirectly compared with PCV15	Indirectly compared GMR for shared serotypes PCV20 vs PCV10, with PCV13 as common comparator - Meta-analysis PCV10 vs PCV13 – less immunogenic for most of shared serotypes. - Relative immunogenicity of PCV20 vs PCV10 varied by serotypes. - IgG responses to 10 shared serotypes were similar for both 3+1 and 2+1 schedules, post primary and post booster. - Direct OPA GMR favoured PCV13 over PCV10 for shared serotypes. - For PCV10 vs PCV20, indirect comparison OPA GMR – were close to equivalence for 10 shared serotypes, although varied by individual serotypes. - PCV20 vs PCV15: OPA GMRs clustered around the line of equivalence for most serotypes (with wider 95% CI than for IgG GMR comparison)	Immunogenicity of PCV20 and PCV10 in both schedules were generally comparable and suggest PCV20 would have similar effectiveness for 10 shared serotypes.
NP carriage and antibody levels	27	UK cross-sectional observation study. Swabs taken from 1,410 children aged 6-12 (June 2017 – Aug 2019; received 2 doses PCV13) and 13-48 months (June 2017-2020; received 3 doses PCV13); blood samples from subgroup of 747 children (2017-2020). Reanalysis of 988 stored swabs from 2014-2015.	No significant change in carriage between 2014-2015 to 2017-2019 (P=0.1) Carriage lower in 6-12m group than 13-48 months (p=0.01) Most frequently isolated serotypes: 15B/C, 23B, 21, 10A, 11A IgG GMC were significantly higher for those aged 13-48 months in 2017-2019 compared with 2014-2015 for PCV13-types ST5 and 19A and non-vaccine types 10A and 20. (P<0.02) but no significant difference in IgG titre $\geq 0.35\mu\text{g/ml}$ for any serotype.	Overall carriage remained stable (around 50%) of children aged 13-48 months between 2014/15 and 2017/19. Non-PCV13 accounted for >95% of isolates in PCV13-vaccinated children. Serotypes 3 and 19A persist. 20% of children carry additional serotypes in PCV20.

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Outcomes	Ref	Participants	Results	Findings
Serum antibody vs colonisation	28	Using hierarchical Bayesian model to predict risk of colonisation based on serum IgG using longitudinal data and head-to-head RCT immunogenicity data.	As higher valency PCV may trigger weaker immune response, need to understand how immunogenicity translates into colonisation. - Estimated higher-valency vaccines to have reduced effectiveness against colonisation for some serotypes: - Across comparisons – serotypes 4 and 23F - Serotype 4 when comparing PCV20 vs PCV13 and PCV13 vs PCV7 - Serotypes 5, 6A, 6B, 7F, 19A, 19F – PCV15 and PCV20 with PCV13 - Serotypes 1, 9V, 18C – PCV20 vs PCV13 The risk of colonisation with the use of higher-valency PCV compared with lower valency in 3 head-to-head comparisons: - serotype 14 risk 7-8% higher than PCV7: - VE against colonisation 57% PCV13, 54% PCV15 and PCV20 (based on VE 60% for PCV7) - Serotype 23 – risk was 4-26% higher than PCV7: - VE against colonisation 56% PCV13, 55% PCV15, 45% PCV20 - Compared with PCV13, PCV15 and PCV20 had increase risk of colonisation for serotypes 5, 6A, 7F and 19A. - For serotype 19A and 5 – risk 4-5% and 7-14% higher with PCV20 than PCV13 (high uncertainty for serotype 5 than 19A)	While higher-valency PCVs might have sufficient protection against disease, protection against transmission might be reduced for some serotypes. Future localised monitoring is required to assess the potential impact.

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Outcomes	Ref	Participants	Results	Findings
Comparison of immunogenicity PCV15, PCV20 and PCV13 in toddlers.	26	Functional OPA titre ratios were compared in same and different RCTS at one month post toddler dose.	3+1 schedule - PCV13/PCV7 (3 RCTs) – OPA titres were lower for 6/7 shared serotypes (except 19F) (average OPA ratio = 0.77) - PCV15/PCV13 (1 RCT) – average OPA ratios <1, mean = 0.75 (except serotype 14) - PCV20/PCV13 (1 RCT) – average OPA ratio = 0.72 for common serotypes - PCV15/PCV20 (indirect) – OPA ratio = 1.04 (except ST14, ratio 1.82) - PCV15/PCV7 (indirect) – mean OPA ratio = 0.63 - PCV20/PCV7 (indirect) – mean OPA ratio = 0.54 2+1 schedule (no data to compare with PCV7) - PCV15 and PCV20 induced lower OPA titres than PCV13 for the majority of the shared serotypes (2 RCT) - PCV15/PCV13 - mean OPA ratio = 0.75 - PCV20/PCV13 - mean OPA ratios = 0.76 - PCV12/PCV20 – mean OPA ratio = 1.02 - Note for serotype 19A: PCV20/PCV13 ratio = 1.07, PCV15/PCV13 = 0.70 and indirect comparison PCV15/PCV20 = 0.66 Comparison of 3+1 and 2+1 schedules. - PCV13 (2 RCT Merck) – average OPA ratio = 1.39 and 1.35 (2 RCT Pfizer) - PCV15 (2 RCT Merck) – av OPA ratios = 1.35 - PCV20 (2RCT Pfizer) – av OPA ratio = 1.31 - reduced immunogenicity for 2+1 schedule following toddler dose.	PCV15 and PCV20 are less immunogenic than PCV13, but produced broadly similar immune responses though compared poorly with PCV7. Results also point to reduced immunogenicity with a 2+1 schedule compared with a 3+1 schedule for all three vaccines. PCV20 appeared to be more immunogenic against serotype 19A than PCV15. Post-marketing studies will be needed to assess their effectiveness compared with PCV13 in real life.

Abbreviations: Ab – antibody; DP – difference in percentage; DTaP-IPV-HepB/Hib – combined diphtheria, tetanus, pertussis, inactivated poliovirus, hepatitis B and *H. influenzae* type b vaccine; OPA – opsonophagocytic activity; GMFR – geometric mean titre fold rise; GMR – geometric mean titre ratio; GMT – geometric mean titre; IgG – immunoglobulin G; MMR – measles mumps rubella vaccine; RCT – randomised controlled trial; RDD – response rate difference; VV – varicella vaccine

Table 11: Vaccine efficacy and effectiveness

Outcomes	Ref	Participants	Results	Findings
PCV10, PCV13				
Schedules, PCV13	29	SRMA, 25 studies from 2000 – 2024, IPD in children aged <18. (excluding PCV10), incl 3+1, 2+1, 3+0 and 1+1 schedules.	Pooled VE against IPD • prime-boost (1-3 + 1) = 94.4% (87.3-97.6%); heterogeneity $I^2 = 78\%$ • primary only = 1 primary 66.8% (56.4-74.7%); 2 primary 78.8% (68.6-85.7%); 3 primary 82.0% (73.1-88.0%) • From 3 studies, VE for 3 primary doses in high-risk children was estimated 86.9% (36.4-97.3%) vs 86.1% (63.2-94.8%) for low-risk children. Serotype-specific analyses revealed notable differences • Pooled VE serotype 3 - 80.6% (-2598.0 to 87.9%) • Serotype 19A – 83.3% (60.7-92.9) excluding 1 study.	PCVs have high overall effectiveness against IPD in children. Booster doses are essential to maximise protection. Surveillance is essential to assess the effectiveness of reduced schedules to provide lasting immunity and to reduced pneumococcal transmission.
PCV20 - modelling				
Predicted effectiveness PCV15 and PCV20, 3+1 schedule	30	Estimated VE by serotype with PCV15 (V114) and PCV20 serology post-primary dose. Using modelling against PCV7 and PCV13 (non-PCV7 types) real-world VE values and placebo to create a reverse cumulative distribution curve and compared with serotype-specific protective IgG concentration from immunogenicity data from US-based clinical trials to predict VE. (MSD funded study)	• VE for shared PCV7 serotypes in PCV13 were unavailable due to a lack of PCV7-serotype IPD in the US.	PCV15 is predicted to have comparable effectiveness to that of PCV7 and PCV13 (non-PCV7 serotypes). PCV20 is predicted to have comparable effectiveness for 9 of the 13 shared serotypes. PCV20 may be effective against its additional 7 serotypes, it is less immunogenic and likely less effective than PCV15 against serotype 3.

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Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
PCV15 and PCV20 breakthrough infections, France	33	Mathematical model (MSD study), incidence of breakthrough IPD across 3 subtype classes: - PCV7 (ST 4, 6B, 9V, 18C, 19F and 23F) - PCV13-nonPCV7 excluding ST3 (1, 5, 6A, 7F and 19A) - ST3 only, Compared with IPD ages 0-12m in France in 2019 All PCVs were assumed to provide waning protection for av. 10 years. These results were driven by serotype-specific VE predicted by Ryman et al³⁰ which were in turn based on clinical trial immunogenicity data.	- Model was calibrated against data PCV7 and PCV13. - PCV15 as 2+1 schedule – predicted to reduced incidence - PCV7 serotypes from 0.2 to 0.09 cases per 100,000 over 20 years (-55%) - PCV13-non-PCV7-nonST3 – 0.77 to 0.55 (-29%) - ST3 – significant decrease then maintained 0.05 per 100,000 (-89%) over 20 years. - PCV20 2+1 or 3+1 - PCV7 serotypes: 2+1 = 0.9 cases per 100,000 over 20 years (+350%); 3+1 = 0.33 (+65%) - PCV13-non-PCV7-nonST3: 2+1 = initial increase slow decrease to baseline; 3+1 initial increase after 5 years then slow decrease to 20 years. - ST3 – 2+1 slight increase; 3+1 decrease.	Routine use of PCV15 as a 2+1 regimen was predicted to lower breakthrough IPD more than PCV20 as 2+1 or 3+1. PCV20 2+1 regimen was predicted to increase incidence of PCV13-type, vs baseline (2019) while 3+1 regimen was associated with an increase in PCV7-types and decrease in other serotypes relative to baseline. Conclusion – benefits of additional serotypes coverage should be weighed against impact of any reduced serotype-specific immune responses in vulnerable populations. With lower effectiveness, breakthrough disease associated with PCV13 serotypes that continue to contribute to burden of IPD.
Dynamic model, US	34	Dynamic model structure used to estimate IPD incidence in the US – susceptible-infected-susceptible model based on carriage and risk of pneumococcal disease. Calibrated against historical IPD incidence by age group over 20 years.	- Compared with continued use of PCV13 over a 10-year horizon, replacing with PCV20 for paediatric vaccination was expected to reduce IPD cases by 44,249 cases, outpatient pneumonia by 1.02 million, hospitalised pneumonia by 248,700 and otitis media by 4.63 million. - PCV20 vs PCV15 = reduced IPD by 31,361 cases, outpatient pneumonia 718,363, hospitalised pneumonia 170,941 and OM 3.11 million.	By offering broader protection against a range of serotypes, PCV20 can help to decrease the burden of pneumococcal disease.
Health impact of PCV20, Australia	35	Population-based multi-cohort model with 10-year horizon, Australia. Direct and indirect effects.(based on a 2+1 schedule). Data based on PCV13 real-world effectiveness, PCV7 efficacy and PCV13 impact data. (Pfizer funded)	- Estimated PCV20 – incremental benefit 642,804 fewer pneumococcal disease cases and 8308 fewer deaths than PCV13 over 10 years. - PCV15 – 290,943 cases and 3730 deaths fewer than PCV13	Assuming current serotype distributions were proportional to IPD, PCV20 as a 2+1 schedule was the dominant strategy over lower valency PCV13 and PCV15

Review of Evidence, 2026: Pneumococcal - infants

Outcomes	Ref	Participants	Results	Findings
Real-world effectiveness	36	US IPD surveillance 24 sites, Oct 2023-Nov 2025 (ISPPD poster, May 2026)	253 IPD cases in children <59 months: median age 2 years among PCV15/nonPCV13 and PCV20/nonPCV13 and 1 year among NVT cases - Non-vaccine types = 148 cases; PCV15/nonPCV13 = 13, PCV20/nonPCV13 = 26, PCV13 type cases 75 Unadjusted vaccine effectiveness: ≥1 dose of PCV20 (against PCV20/non-PCV13) VE 96.2 % (81-99%) ≥2 doses of PCV20 (against PCV20/non-PCV13) VE 96.2% (80-99) ≥2 doses PCV20 (against all PCV20 serotypes) = 63% (17-84); ≥3 doses 66% (13-87) ≥2 doses PCV20 (against all PCV20 serotypes except ST3) = 78% (46-92); ≥3 doses 83% (50-95%)	Preliminary data VE estimates suggest PCV20 provides protection against paediatric IPD due to covered serotypes. Vaccination with at least 2 doses of PCV20 is 96% effective at preventing IPD due to 7 additional serotypes and 78% effective against all PCV20 serotypes (excluding serotype 3).

Abbreviations: aHR – adjusted hazard ratio; fu – follow up; IPD – invasive pneumococcal disease; NVT – non-vaccine type; OM – otitis media; SRMA – systematic review and meta-analysis; ST – serotype; VE – vaccine effectiveness/efficacy

Methodology for literature searches

Published literature in online medical databases, with additional references added as review progressed using PubMed and Google Scholar. The majority of searches were conducted between 12 January 2026 – March 2026. Grey literature, conference proceedings and reports were also included. Total library 166 references (includes some references related to special groups and adults, for a future review of evidence, and PCV15 and PCV21).

Concepts

Pneumococcal disease	Vaccine	Infant	immunisation	PCV20	PCV	Immunogenicity	Safety
IPD	vaccin*	child	immuni?ation	20-valent	polysaccharide	antibody response	adverse events
Pneumococc?	safety	toddler	immunity		valent	OPA	
Streptococcus pneumoniae	efficacy		primary dose*		conjugate*	IgG	
bacteraemia	immunogenicity		booster				
meningitis	effectiveness						

Search details

2019 – 2026 (first search conducted 12 Jan 2026)

Medline OVID

# ▲ Searches	Results
1 Pneumococcal Vaccines/	9697
2 limit 1 to (english language and humans and yr="2019 -Current")	2466
3 Immunization Schedule/ or Immunization Programs/ or Immunization/	77345
4 2 and 3	352
5 Vaccination/ or Vaccines, Conjugate/ or Pneumococcal Vaccines/ or PCV20.mp.	127557
6 3 and 5	15975
7 limit 6 to (english language and humans and yr="2019 -Current")	4135
8 PCV20.mp.	300
9 7 and 8	32
10 4 and 8	32

#10 – selected all, deleted 5 (as related to cost-effectiveness) = 27

11 Child/	2057506
12 4 and 11	123
13 limit 4 to yr="2021 -Current"	201
14 20-valent.m_titl.	77

#14 selected 53 (excluded majority of cost-effectiveness studies)

#4 + #11 + #13 = 82, selected 21, deleted 5 duplicates (some adult articles included for a future review) Total = 89 refs

Scopus

- TITLE-ABS-KEY (pneumococcal 20 valent conjugate vaccine) AND PUBYEAR > 2020 = 384
- (TITLE-ABS-KEY (pneumococcal 20 valent conjugate vaccine) AND TITLE-ABS-KEY (children) OR TITLE-ABS-KEY (infants) AND NOT TITLE-ABS-KEY (adults)) AND PUBYEAR > 2019 AND PUBYEAR < 2027 = 122
- (TITLE-ABS-KEY (pneumococcal 20 valent conjugate vaccine) AND TITLE-ABS-KEY (children) OR TITLE-ABS-KEY (infants) AND NOT TITLE-ABS-KEY (adults) AND NOT TITLE-ABS-KEY ("cost effectiveness")) AND PUBYEAR > 2019 AND PUBYEAR < 2027 = 11
 - Selected 33 (removed duplicates)
- (TITLE-ABS-KEY (pneumococcal 20 valent conjugate vaccine) AND TITLE-ABS-KEY (children) AND TITLE-ABS-KEY ("immunization schedule")) AND PUBYEAR > 2019 AND PUBYEAR < 2027 = 22
 - selected 3 (removed 2 duplicates)
- (TITLE-ABS-KEY (pneumococcal 20 valent conjugate vaccine) AND TITLE-ABS-KEY (children) OR TITLE-ABS-KEY (infants) AND TITLE-ABS-KEY (immunogenicity)) AND PUBYEAR > 2019 AND PUBYEAR < 2027 = 50
 - selected 31
- (TITLE-ABS-KEY (pneumococcal 20 valent conjugate vaccine) AND TITLE-ABS-KEY (children) OR TITLE-ABS-KEY (infants) AND TITLE-ABS-KEY (safety)) AND PUBYEAR > 2019 AND PUBYEAR < 2027 = 38
 - selected 17, remainder 2 (after removing duplicates)

Removed 31 duplicates

References

1. Petousis-Harris H, Howe AS, Paynter J, et al. Pneumococcal conjugate vaccines turning the tide on inequity: A retrospective cohort study of New Zealand children born 2006-2015. *Clin Infect Dis*. 2019;68(5):818–26. doi: 10.1093/cid/ciy570
2. Anglemeyer A, McNeill A, DuBray K, et al. Invasive pneumococcal disease: Concerning trends in serotype 19A notifications in New Zealand. *Clin Infect Dis*. 2022;74(10):1859–61. doi: 10.1093/cid/ciab766
3. Paynter J, Howe AS, Best E, et al. A retrospective cohort study investigating the comparative effectiveness of pneumococcal vaccines against hospitalisation with otitis media and pneumonia in New Zealand. *Vaccine*. 2023;41(28):4121–8. doi: 10.1016/j.vaccine.2023.05.040
4. Institute for Environmental and Scientific Research. Invasive pneumococcal disease annual report 2024. Porirua, New Zealand; 2025 May 2025 <https://www.phfscience.nz/digital-library/invasive-pneumococcal-disease-annual-report-2024/>
5. Anglemeyer A, Ren X, Gilkison C, et al. The impact of pneumococcal serotype replacement on the effectiveness of a national immunization program: a population-based active surveillance cohort study in New Zealand. *Lancet Reg Health West Pac*. 2024;46:101082. doi: 10.1016/j.lanwpc.2024.101082
6. Hagedoorn NN, Anglemeyer A, Gilkison C, et al. Comparison of the epidemiology of invasive pneumococcal disease between Australia and New Zealand in 2017-2021: an observational study based on surveillance data. *Lancet Reg Health West Pac*. 2023;36:100764. doi: 10.1016/j.lanwpc.2023.100764
7. Phuong LK, Cheung A, Templeton T, et al. Epidemiology of childhood invasive pneumococcal disease in Australia: a prospective cohort study. *Arch Dis Child*. 2024;110(1):52–8. doi: 10.1136/archdischild-2024-327497
8. Burton C, Webb R, Anglemeyer A, et al. Severe Invasive Pneumococcal Disease Caused by Serotype 19A in Children Under Five Years in Tamaki Makaurau Auckland, Aotearoa New Zealand. *Pediatr Infect Dis J*. 2025;44(1):90–6. doi: 10.1097/INF.0000000000004528
9. Humphrey A, Prestidge C, Wong W, et al. Pneumococcal haemolytic uraemic syndrome in New Zealand associated with rising invasive pneumococcal disease driven by serotype 19A. *ASID Annual Scientific Meeting 2025*; 3 April 2025; Canberra, Australia: Australian Society for Infectious Diseases; 2025. Available from: <https://www.asidasm.com/2025-program>
10. Anglemeyer A, Srinivas A, McNeill A, et al. Large Reductions in Invasive Pneumococcal Disease and Related Morbidities Among Children in New Zealand After Change from PCV10 to PCV13. *J Infect Dis*. 2025. doi: 10.1093/infdis/jiaf587
11. PHF Science. Invasive pneumococcal disease annual report 2025. Porirua: New Zealand Institute for Public Health and Forensic Science 2026 30 July 2026. Report No.: FW26018 <https://www.phfscience.nz/digital-library/invasive-pneumococcal-disease-annual-report-2025/>
12. Adebajo TA, Pondo T, Yankey D, et al. Pneumococcal Conjugate Vaccine Breakthrough Infections: 2001–2016. *Pediatrics*. 2020;145(3). doi: 10.1542/peds.2019-0836
13. Hajdu G, Hughes T, Ouedraogo GL, et al. Safety of a 4-Dose 20-Valent Pneumococcal Conjugate Vaccine Series in Infants: A Randomized Trial. *Pediatrics*. 2024;154(5). doi: 10.1542/peds.2023-065218
14. Ishihara Y, Fukazawa M, Enomoto S, et al. A phase 3 randomized study to evaluate safety and immunogenicity of 20-valent pneumococcal conjugate vaccine in healthy Japanese infants. *Int J Infect Dis*. 2024;141:106942. doi: 10.1016/j.ijid.2024.01.009
15. Korbal P, Wysocki J, Jackowska T, et al. Phase 3 Safety and Immunogenicity Study of a Three-dose Series of Twenty-valent Pneumococcal Conjugate Vaccine in Healthy Infants and Toddlers. *Pediatr Infect Dis J*. 2024;43(6):587–95. doi: 10.1097/INF.0000000000004300
16. Senders S, Korbal P, Kline M, et al. Immunogenicity and safety of concomitant vaccines given with 20-valent pneumococcal conjugate vaccine in healthy infants. *Vaccine*. 2025;68:127916. doi: 10.1016/j.vaccine.2025.127916
17. Senders S, Klein NP, Tamimi N, et al. A Phase Three Study of the Safety and Immunogenicity of a Four-dose Series of 20-Valent Pneumococcal Conjugate Vaccine in Healthy Infants. *Pediatr Infect Dis J*. 2024;43(6):596–603. doi: 10.1097/INF.0000000000004334
18. Shirley M. 20-Valent Pneumococcal Conjugate Vaccine: Pediatric First Approval. *Paediatric Drugs*. 2023;25(5):613–9. doi:

19. World Health Organization. Recommendations to assure the quality, safety and efficacy of pneumococcal conjugate vaccines, Annex 3, TRS No 977. 2013 19 October 2013
<https://www.who.int/publications/m/item/pneumococcal-conjugate-vaccines-annex3-trs-977>
20. Andrews NJ, Waight PA, Burbidge P, et al. Serotype-specific effectiveness and correlates of protection for the 13-valent pneumococcal conjugate vaccine: a postlicensure indirect cohort study. *Lancet Infect Dis*. 2014;14(9):839–46. doi: 10.1016/S1473-3099(14)70822-9
21. Mt-Isa S, Chumbley JR, Crawford EL, et al. An indirect treatment comparison (ITC) and matching-adjusted indirect comparison (MAIC) between a 15-valent (V114) and a 20-valent (PCV20) pneumococcal conjugate vaccine among healthy infants. *Expert Rev Vaccines*. 2023;22(1):906–17. doi: 10.1080/14760584.2023.2270039
22. Mt-Isa S, Chumbley JR, Kelly MS, et al. Indirect comparison of the immunogenicity of 15-valent and 20-valent pneumococcal conjugate vaccines in children using a 2+1 schedule. *Expert Rev Vaccines*. 2025;24(1):946–57. doi: 10.1080/14760584.2025.2569037
23. Pacheco-Haro MD, de Arenas-Arroyo SN, Diaz-Goni V, et al. Immunogenicity of a 20-Valent Pneumococcal Conjugate Vaccine Versus a 13-Valent Vaccine in Infants: A Systematic Review and Meta-Analysis. *Vaccines (Basel)*. 2025;13(11):12. doi: 10.3390/vaccines13111156
24. World Health Organization. WHO position paper: Pneumococcal conjugate vaccines in infants and children aged <5 years - September 2025. *Weekly Epidemiological Record [Internet]*. 2025;39(100):411–37. Epub 26 September Available from:
<https://www.who.int/publications/i/item/who-wer10039-411-437>
25. Dunne EM, Struwig VA, Lowe W, et al. Indirect Comparison of PCV20 Immunogenicity with PCV10 in Pediatric 3 + 1 and 2 + 1 Schedules. *Infect Dis Ther*. 2025;14(5):1103–17. doi: 10.1007/s40121-025-01151-0
26. De Wals P. PCV13, PCV15 or PCV20: Which vaccine is best for children in terms of immunogenicity? *Can Commun Dis Rep*. 2024;50(1-2):35–9. doi: 10.14745/ccdr.v50i12a04
27. Tiley KS, Ratcliffe H, Voysey M, et al. Nasopharyngeal Carriage of *Pneumococcus* in Children in England up to 10 Years After 13-Valent Pneumococcal Conjugate Vaccine Introduction: Persistence of Serotypes 3 and 19A and Emergence of 7C. *The Journal of infectious diseases*. 2022;227(5):610–21. doi: 10.1093/infdis/jiac376
28. Wong A, Warren JL, Fitch L, et al. Estimating the Serotype-Specific Association Between the Concentration of Vaccine-Induced Serum Antibodies and Protection Against Pneumococcal Colonization. *J Infect Dis*. 2025;232(1):e27–e34. doi: 10.1093/infdis/jiaf106
29. Chang C-Y, Nasreen S, Sadarangani M, et al. Effectiveness of vaccine dosing schedules for pneumococcal invasive disease in children: A systematic review and meta-analysis. *Vaccine: X*. 2025;27. doi: 10.1016/j.jvax.2025.100734
30. Ryman J, Sachs JR, Yee KL, et al. Predicted serotype-specific effectiveness of pneumococcal conjugate vaccines V114 and PCV20 against invasive pneumococcal disease in children. *Expert Rev Vaccines*. 2024;23(1):60–8. doi: 10.1080/14760584.2023.2292773
31. Whitney CG, Pilishvili T, Farley MM, et al. Effectiveness of seven-valent pneumococcal conjugate vaccine against invasive pneumococcal disease: a matched case-control study. *Lancet*. 2006;368(9546):1495–502. doi: 10.1016/S0140-6736(06)69637-2
32. Moore MR, Link-Gelles R, Schaffner W, et al. Effectiveness of 13-valent pneumococcal conjugate vaccine for prevention of invasive pneumococcal disease in children in the USA: a matched case-control study. *Lancet Respir Med*. 2016;4(5):399–406. doi: 10.1016/S2213-2600(16)00052-7
33. Bakker KM, Oidtman RJ, Bannietts N, et al. PCV13-Serotype Breakthrough Pneumococcal Disease in Infants Receiving High-Valency Conjugate Vaccines: Population-Level Modeling in France. *Infectious Diseases and Therapy*. 2025;14(4):753–64. doi: 10.1007/s40121-025-01123-4
34. Wilson M, Althouse BM, Lucas A, et al. A comparative analysis of pediatric pneumococcal vaccination strategies: a dynamic model of PCV20 vs. PCV15 and PCV13. *Vaccine*. 2026;77:128350. doi: 10.1016/j.vaccine.2026.128350
35. Struwig VA, Ta A, Thorat AV, et al. Evaluating the implementation of the 20-valent pneumococcal conjugate vaccine for paediatric immunization in Australia. *Vaccine*. 2026;69:127996. doi: 10.1016/j.vaccine.2026.127996
36. Mugel S, Gierke R, Arvay M, et al., editors. Evaluation of vaccine effectiveness of 15- an 20-valent pneumococcal conjugate vaccines against invasive pneumococcal disease among U. S. children using an indirect cohort method. 14th Meeting of the International Society of Pneumonia and Pneumonoccal diseases (ISPPD); 2026 17–21 May 2026; Copenhagen, Denmark.

37. Jayasinghe S, editor Pneumococcal disease in children: impact on recent changes to the NIP. 27th Annual Scientific Meeting; 2023 15–16 February; Melbourne: Immunisation Coalition.
38. Farrar JL, Gierke R, Andrejko KL, et al. Use of 20-Valent pneumococcal conjugate vaccine among U.S. children: Updated recommendations of the Advisory Committee on Immunization Practices - United States, 2023. Weekly Report: Morbidity and Mortality Weekly Report (MMWR) [Internet]. 2023;72(39). Available from: <https://stacks.cdc.gov/view/cdc/133252>
39. Neal EFG, Chan J, Nguyen CD, et al. Factors associated with pneumococcal nasopharyngeal carriage: A systematic review. PLOS Global Public Health. 2022;2(4):e0000327. doi: 10.1371/journal.pgph.0000327
40. Feemster K, Weaver J, Buchwald U, et al. Pneumococcal Vaccine Breakthrough and Failure in Infants and Children: A Narrative Review. Vaccines (Basel). 2023;11(12). doi: 10.3390/vaccines11121750