

INVASIVE PNEUMOCOCCAL DISEASE IN NEW ZEALAND, 2022

Background

Since 17 October 2008, invasive pneumococcal disease (IPD) has been notifiable to the local Medical Officer of Health under the Health Act 1956. The pneumococcal conjugate vaccine (PCV) was added to the New Zealand childhood immunisation schedule on 1 June 2008. The vaccine used on the schedule has changed a number of times: • Prevenar® (PCV7) was used from June 2008 to June 2011, • Synflorix® (PCV10) was used from July 2011 to June 2014, • Prevenar13® (PCV13) was used from July 2014 to June 2017, • Synflorix® (PCV10) had been used since July 2017 to 30 November 2022. Prevenar13® (PCV13) was re-introduced from 1 December 2022. The current PCV childhood immunisation schedule is a 2 plus 1 regime and includes doses at 6 weeks, 5 months, and 12 months of age. This regime has been in place since July 2020, when it changed from a 3 plus 1 schedule with the 3-month dose of PCV removed from the schedule.

PCV10 includes the seven serotypes in PCV7 (4, 6B, 9V, 14, 18C, 19F and 23F) as well as serotypes 1, 5 and 7F. PCV13 includes the 10 serotypes in PCV10 as well as serotypes 3, 6A and 19A. In addition, PCV13 and the 23-valent pneumococcal polysaccharide vaccine (23PPV, Pneumovax 23) were recommended for individuals with medical conditions that increase the risk of IPD. PCV13 is now recommended for all PCV-unvaccinated children. 23PPV includes the 13 serotypes of PCV13 as well as serotypes 2, 8, 9N, 10A, 11A, 12F, 15B, 17F, 20, 22F and 33F.

The data presented in this report (except for immunisation status) is based on the information recorded on EpiSurv, the national notifiable disease surveillance system, as of 6 January 2023. Any updates made to EpiSurv data by public health unit staff after this date will not be reflected in this report. The immunisation status of cases that were eligible for PCV vaccination was extracted from the National Immunisation Register (NIR).

The incidence of cases is assessed against a threshold for cases due to the three additional serotypes covered by PCV13 (3, 6A and 19A) as well as for 19A serotype cases, at the end of each quarter for the previous 12-month period. A 12-month period is used due to the small number of cases. If the incidence for a particular 12-month period exceeds the threshold, further assessment will be undertaken to evaluate the role of PCV-10 vaccine re-introduction after PCV-13.

Note: a threshold breach does not confirm that the change in vaccine type is the explanation, but it indicates the need to investigate further. Further investigation will examine serotype

information (vaccine and non-vaccine serotypes), case-specific factors, such as immunisation status, and the presence of underlying health conditions or risk factors which may have predisposed the case to disease.

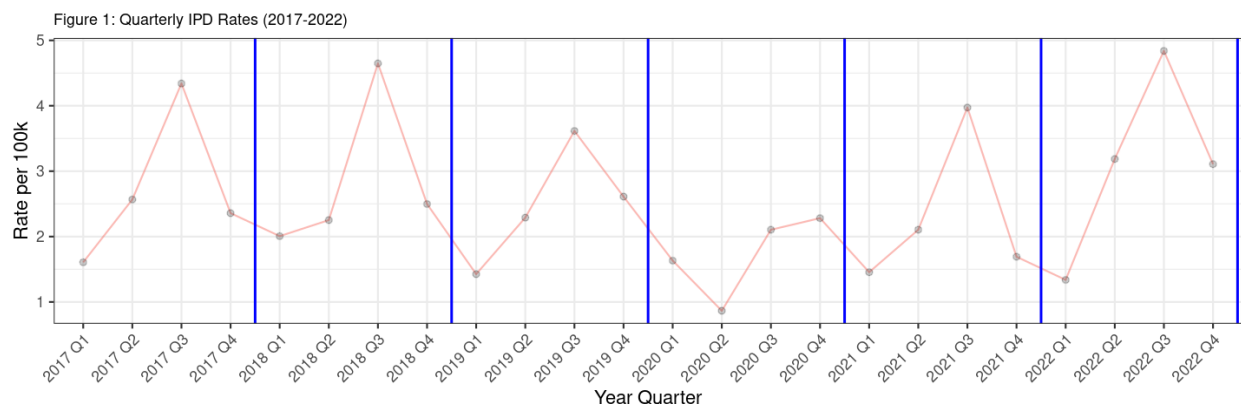
These quarterly and threshold reports are part of an enhanced surveillance programme to monitor the impact of PCV vaccination, including the changes in vaccine valency, on the epidemiology of IPD in New Zealand.

PCV-13 was re-introduced on 1 December 2022 for newly vaccine eligible children. We will continue to closely monitor and analyse the impact of the reintroduction of PCV13 on the changes in the incidence of IPD trends and distribution of serotypes in children in comparison with periods in which PCV10 alone (July 2017 – 30 November 2022) was used. However, considering the residual influence of many cohorts vaccinated with PCV10, it will take time for any changes to be observed. As such, beginning in 2023, the threshold analyses will be superseded by a 12-month rolling rate of 19A for children under 2 years of age as part of routine IPD surveillance.

Quarterly rates of IPD

There were 158 IPD cases notified between October and December 2022 (Q4 2022). This is the highest number of cases reported in Q4 of any year since IPD became notifiable (n=161 cases in Q4 2009) (Figure 1).

Figure 1: Quarterly IPD rates (2017-2022)



Threshold analyses (IPD cases in children less than 2 years of age, 12 months ending December 2022)

The threshold for 19A has been established at 9.1 cases per 100,000 children less than 2 years of age. The rates we report are based on cumulative cases over a four-quarter time-period. For the 12 months ending in December 2020 (Q4 2020), the rate of 19A was 7.5 cases per 100,000 (Figure 2 and Table 1). In the 12 months ending in June 2021 (Q2 2021), the rate for 19A cases exceeded the threshold for the first time, with a rate of 13.3 cases per 100,000. In the 12 months ending in September 2021 (Q3 2021), the rate of 19A cases continued to increase, reaching 17.4 cases per 100,000.

In the 12 months ending in December 2022 (Q4 2022), the rate of 19A cases reached a record high to date, with 29.9 cases per 100,000.

The rate for the combined serotypes of interest (3, 6A, and 19A) has steadily increased in the previous four threshold analyses, and exceeded the threshold, with a rate of 18.3 per 100,000 in the 12 months ending in September 2021. The rate for the combined serotypes of interest has reached a record high of 33.2 in the 12 months ending in December 2022. These increases are largely explained by the increase in 19A.

Figure 2: Quarterly IPD incidence rate per 100,000 children less than 2 years of age for the previous 12 months ending 31 December 2022

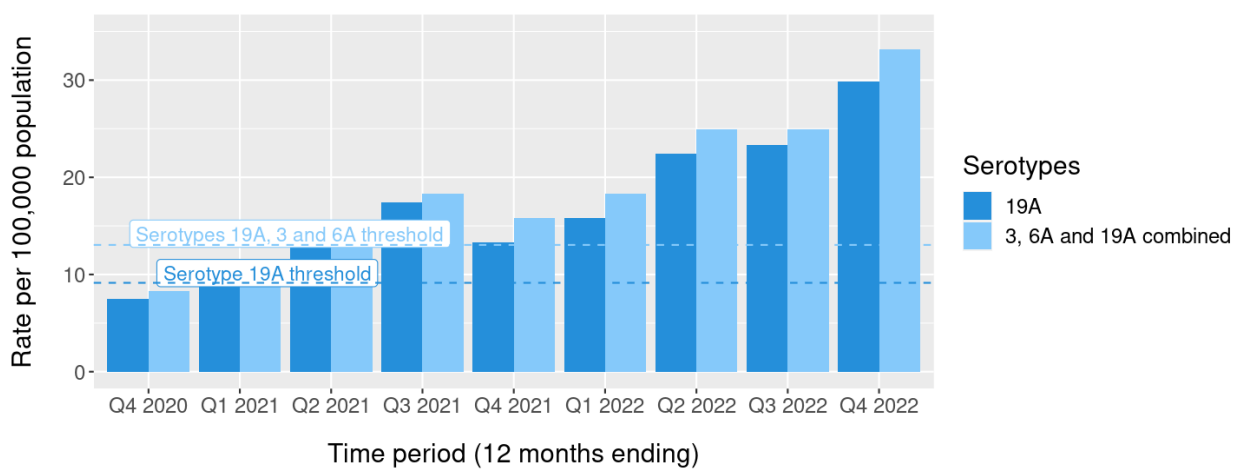


Table 1: Threshold table of quarterly IPD incidence rate per 100,000 children less than 2 years of age

Serotypes	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
3, 6A and 19A combined	8.3	10	14.1	18.3	15.8	18.3	24.9	24.9	33.2
19A	7.5	9.1	13.3	17.4	13.3	15.8	22.4	23.3	29.9

Annual Rates of IPD

The total number of IPD cases in 2022 through Q4 was the highest recorded since the first year IPD became notifiable in 2009 (634 and 697 cases in 2022 and 2009, respectively). The annual rates of IPD among those under 2 years old and 2-4 years old were the highest since IPD became notifiable in 2009. For those aged 65 years and over, the total number of IPD cases diagnosed in 2022 (n=236) was the highest since 2009 (n=241). Importantly, there is often a delayed indirect immunity of at least 2-3 years in this age group.

Annual Rates of Serotype 19A

The rate of serotype 19A for children under 2 years has steadily increased since 2017 (Figure 4). The 19A annual rates for 2022 for children under 2 years suggests a rapidly increasing rate since 2020, approximately 3 times higher than the highest rate observed since IPD became notifiable in (now estimated to be approximately 30 cases per 100,000). Similarly, the 19A annual rate for 2022 for children aged 2-4 years has also rapidly increased, now 3 times higher than the previous peak observed (now estimated to be about 14 cases per 100,000). For adults 65 years or older, the 19A annual rate is also the highest on record (now nearly 10 cases per 100,000).

Figure 3: Annual Rate of IPD by Age Group and PCV Era (2011-2022)

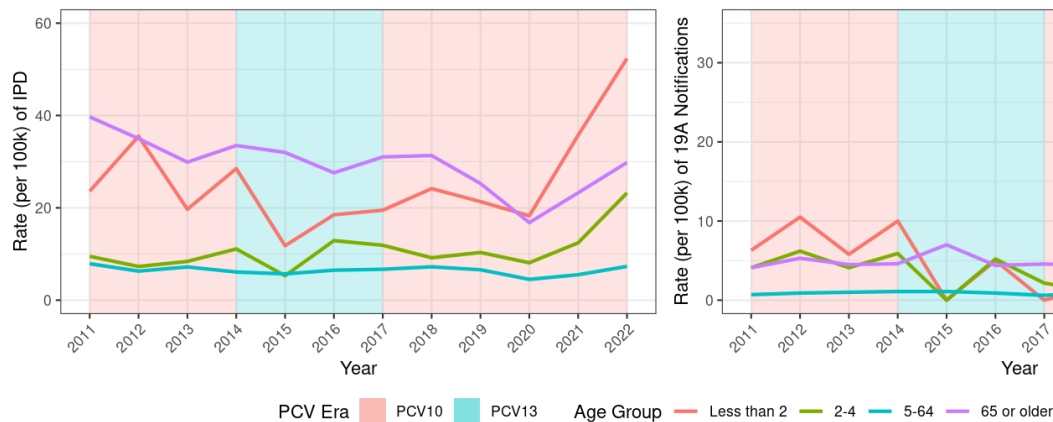
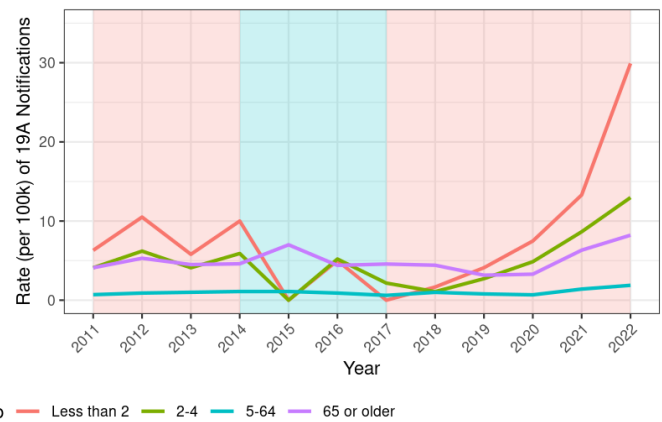


Figure 4: Annual Rate of 19A by Age Group and PCV Era (2011-2022)



Vaccine preventable incident cases

Among children under 5 years of age, the number of IPD cases that are PCV10-vaccine preventable has remained low since 2017. However, the proportion of PCV13-vaccine preventable cases that are 19A has increased since 2017.

The number of cases with PCV13 preventable serotypes among children under 5 years of age has steadily increased since 2018 (Table 2). In 2017, 36.4% of all vaccine preventable cases (PCV13-specific serotypes) were 19A. In 2022, the proportion reached 91% of all vaccine preventable cases (PCV13-specific serotypes). Since 2019, 89% of all PCV13-vaccine preventable cases in children under 5 years have been serotype 19A (120/135).

The proportion of cases due to a PCV13 serotype that are 19A among all ages has also steadily increased since 2017. In 2019, 49.2% of all cases due to a PCV13 serotype were 19A, this increased to 75% in 2021 and 2022.

Table 2: Distribution of vaccine preventable serotypes (2017-2022)

Year	No. IPD cases	No. IPD cases with known serotypes*	No. with Vaccine Preventable Serotypes (PCV10)	No. with PCV13 Serotypes	No. 19A Cases (% of PCV13 cases)	No. IPD cases in Children Under 5 Years of Age**	No. with Vaccine Preventable Serotypes (PCV10) for Children Under 5 Years of Age	No. with PCV13 Serotypes for Children Under 5 Years of Age	No. 19A Cases (% of cases with PCV13 serotypes in children under 5 years of age)
2017	521	482	74	169	60(35.5%)	45	3	11	4(36.4%)
2018	557	523	52	163	75(46.0%)	46	1	7	4(57.1%)
2019	495	461	38	132	65(49.2%)	45	1	13	10(76.9%)
2020	350	335	18	114	71(62.3%)	37	0	20	18(90.0%)
2021	469	453	25	184	138(75.0%)	66	1	36	32(88.9%)
2022	634	574	23	267	200(74.9%)	106	1	66	60(90.9%)

*Not all cases reported in 2022 have serotype results available at this time

**Includes cases with unknown serotype.

Deaths

Based on the information in EpiSurv, the total number of people who have died with a diagnosis of IPD at the time of death in 2022 to date is 41. The number of deaths with serotype 19A is 11. Importantly, the main causes of death are not yet final for most cases.

Immunisation status

Of all PCV eligible children born after 1 January 2008, 114 children were diagnosed with IPD in 2022 through Q4. Of these 114 children, 99 had NIR data available and 15 had no NIR data and were assumed to be unvaccinated. Of the 99 children where NIR data is available, 55.6% (n=55) were serotype 19A, 5.1% (n=5) was serotype 3, 39.4% (n=39) were non-PCV serotypes or the serotype is still unknown (Table 3).

There was one IPD case that was serotype 9V which is covered by PCV7. This child was unvaccinated. There were eight IPD cases that was serotype 3 which is covered by PCV13. One child received one dose of PCV10, two received three doses of PCV10, one was fully vaccinated with PCV10, one received 1 PCV10 dose and 3 PCV13 doses, and three were unvaccinated.

The other observed vaccine preventable serotype was 19A (also covered by PCV13). None of the 63 cases with 19A serotype who were eligible for vaccination had been vaccinated with PCV13 alone. Eight were unvaccinated, one received 3 PCV7 doses and 1 PCV10 dose, one received 2 PCV10 doses and 1 PCV13 dose, and 1 received 4 doses of PCV7. The remainder had been vaccinated with PCV10 alone (21 had 1-2 doses, 11 had 3 doses, 20 had 4 doses). It is unknown whether these children were eligible to receive PCV13 due to having a high-risk condition.

Table 3: Immunisation status of all PCV eligible IPD cases born after 1 January 2008 (n=114)

Vaccine received and number of doses	PCV7 Serotypes							PCV10 Serotypes			PCV13 Serotypes			Non-PCV Serotypes or UNK	Total cases by vaccine and by number of doses
	4	6B	9V	14	18C	19F	23F	1	5	7F	19A	3	6A		
PCV7															
1														1	1
2															
3															
4+											1			2	3
PCV10															
1											2	1		5	8
2											19			7	26
3											11	2		8	21
4+											20	1		11	32
PCV13															
1														1	1
2														2	2
3														1	1
4+														1	1
PCV10/PCV13											1 ¹	1 ²			2
PCV7/PCV10											1 ³				1
Unvaccinated			1								8	3		3	15
Total			1								63	8		42	114

1. 2 PCV10 doses/1 PCV13 dose; 2. 1 PCV10 dose/3 PCV13 doses; 3. 3 PCV7 doses/1 PCV10 dose.

Note: blank cells represent 0 observations.

The year-to-date totals for all serotypes by year are shown in Table 4. In 2022, the total number of IPD cases reported year-to-date through December (n=634) is the most reported year-to-date since IPD became notifiable (2009 n=697).

Of the PCV13 serotypes reported since 2019, serotype 19A is the most reported vaccine serotype and has been steadily increasing in incidence (3-fold higher since 2019). Serotype 3 has also increased since 2019 (57% higher since 2019), though not as rapidly as 19A. In 2021, 138 19A cases were reported, and in 2022, 200 19A cases were reported. It is important to note that serotype data are often delayed, therefore, the most recent IPD isolates will likely have a much higher proportion of missing serotype information.

Table 4: Year-to-date cumulative totals by year and serotype

	2019	2020	2021	2022
Serotypes	December Year-To-Date Cumulative Totals			
PCV10	38	18	25	23
1	2	1		
4	8	3	3	2
5				
6B	4	1	1	3
7F	9	6	7	10
9V	1			1
14	3	1	2	
18C			2	1
19F	9	5	10	6
23F	2	1		
PCV13 only	94	96	159	244
3	28	25	21	44
6A	1			
19A	65	71	138	200
Other	329	221	266	299
Unknown	34	15	18	68
Total	495	350	468	634

The year-to-date 19A totals for age groups by year are shown in Table 5. There is an increase in the incidence of cases in the younger age groups over time – in the year to date for 2022 – approximately 30% of cases are under five years (around 18% under 2 years) compared to 2019 when about 15% of cases were under five years and there were only 5 cases under 2 years).

Table 5: Year-to-date 19A cumulative totals by year and age group

	2019	2020	2021	2022
Age group (years)	December Year-To-Date Cumulative Totals (percent of total)			
<2	5 (7.7)	9 (12.7)	16 (11.6)	36 (18.0)
2-4	5 (7.7)	9 (12.7)	16 (11.6)	24 (12.0)
5 or older	55 (84.6)	53 (74.6)	106 (76.8)	140 (70.0)
Total 19A	65	71	138	200

The year-to-date 19A totals for prioritised ethnicity groups by year are shown in Table 6. In 2021, 72 of the 138 19A cases reported were European/Other (52.2%), 35 were Māori (25.4%), 20 were Pacific Peoples (14.5%), and 11 were Asian (8.0%). In 2022, 97 of the 200 19A cases reported through December were European or Other (48.5%), 48 were Māori (24.0%), 32 were Pacific Peoples (16.0%), and 18 were Asian (9.0%); the ethnicity of 5 is still unknown (2.5%).

Although the number of 19A cases have increased across all ethnic groups, Māori and Pacific peoples are overrepresented in the number of cases - with 40% of cases in these ethnic groups in 2022.

Table 6: Year-to-date 19A cumulative totals by year and ethnicity

	2019	2020	2021	2022
Ethnicity	December Year-To-Date Cumulative Totals			
European or Other	37 (56.9)	33 (46.5)	72 (52.2)	97 (48.5)
Māori	16 (24.6)	17 (23.9)	35 (25.4)	48 (24.0)
Pacific Peoples	8 (12.3)	16 (22.5)	20 (14.5)	32 (16.0)
Asian	3 (4.6)	5 (7.0)	11 (8.0)	18 (9.0)
Unknown	1 (1.5)			5 (2.5)
Total 19A	65	71	138	200

The year-to-date cumulative totals for all serotypes by year and district are shown in Table 7. The Northern North Island has consistently had the highest number of IPD cases (n=247 in 2022). The number of children under 5 years diagnosed with IPD in the Northern North Island (n=47) has increased by nearly 90% since 2021 (n=25) and is a record number reported since IPD became notifiable.

Table 7: Total IPD cases by age group (all ages and <5) by district and region (2019-22)

Districts	2019		2020		2021		2022	
	<5	All ages	<5	All ages	<5	All ages	<5	All ages
Te Tai Tokerau (Northland)	1	26		24	3	44	4	43
Waitematā	3	48	3	29	8	56	16	63
Te Toka Tumai Auckland	10	41	4	22	3	24	8	51
Counties Manukau	8	67	3	56	11	46	19	90
Northern North Island	22	182	10	131	25	170	47	247
Waikato	7	44	6	44	7	46	13	61
Lakes		19	3	14	2	12	3	23
Hauora a Toi Bay of Plenty	2	36	4	22	2	34	3	51
Tairāwhiti		4		6	1	15		5
Taranaki	2	21	1	11	2	13	3	11
Te Manawa Taki	11	124	14	97	14	120	22	151
Te Matau a Māui Hawke's Bay	2	28	2	16	5	29	7	42
Whanganui		14		3	1	11	1	14
Te Pae Hauora o Ruahine o Tararua MidCentral	1	17		11	1	15		16
Capital, Coast, and Hutt Valley	5	41	2	26	6	41	9	52
Wairarapa		7		7	1	7	1	10
Central North Island	8	107	4	63	14	103	18	134
Nelson Marlborough	1	10		2	3	12	4	13
Te Tai o Poutini West Coast		4		1		3		
Waitaha Canterbury	1	34	7	31	4	29	8	45

South Canterbury		6		7		3		6
Southern	2	28	1	18	7	28	6	38
Te Waipounamu	4	82	8	59	14	75	18	102
Total	45	495	36	350	67	468	105	634

The year-to-date cumulative 19A cases by year and district are shown in Table 8. Most 19A cases have been diagnosed in the Northern North Island. The number of 19A cases has increased by 21-100% in all regions in 2022 as compared to 2021. The number of 19A cases in children under 5 years has increased by 67% in the Northern Region, and 2- to - 3-fold higher in the Te Manawa Taki and Central Region, and 50% higher in Te Waipounamu (though numbers are small), compared to 2021.

Table 8: 19A cases by age group (all ages and <5) by district and region (2019-22)

Districts	2019		2020		2021		2022	
	<5	All ages	<5	All ages	<5	All ages	<5	All ages
Te Tai Tokerau (Northland)		8		5	1	13	2	7
Waitematā	2	7	1	4	5	20	9	27
Te Toka Tumai Auckland	1	6		4	1	7	6	20
Counties Manukau	2	4	3	12	8	17	8	24
Northern North Island	5	25	4	25	15	57	25	78
Waikato	2	5	2	8	3	16	10	20
Lakes		3	2	3	1	3	1	3
Hauora a Toi Bay of Plenty	1	3	4	8	1	7		12
Tairāwhiti		2		1		5		1
Taranaki		1				2	3	4
Te Manawa Taki	3	14	8	20	5	33	14	40
Te Matau a Māui Hawke's Bay	1	3	2	3	1	6	3	8

Whanganui		1				5		3
Te Pae Hauora o Ruahine o Taranua MidCentral		2		1	1	5		4
Capital, Coast, and Hutt Valley	1	8	1	9	1	9	5	24
Wairarapa		2		2	1	4	1	5
Central North Island	2	16	3	15	4	29	9	44
Nelson Marlborough						3	2	3
Te Tai o Poutini West Coast		1						
Waitaha Canterbury		3	3	10	3	6	5	18
South Canterbury		1		1				2
Southern		5			5	10	5	15
Te Waipounamu	0	10	3	11	8	19	12	38
Total	10	65	18	71	32	138	60	200