

Invasive Pneumococcal Disease Quarterly Report July–September 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) has been used since July 2017. 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 PCV10 was 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) are recommended for individuals with medical conditions that increase the risk of IPD. 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 at 1 October 2022. 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.

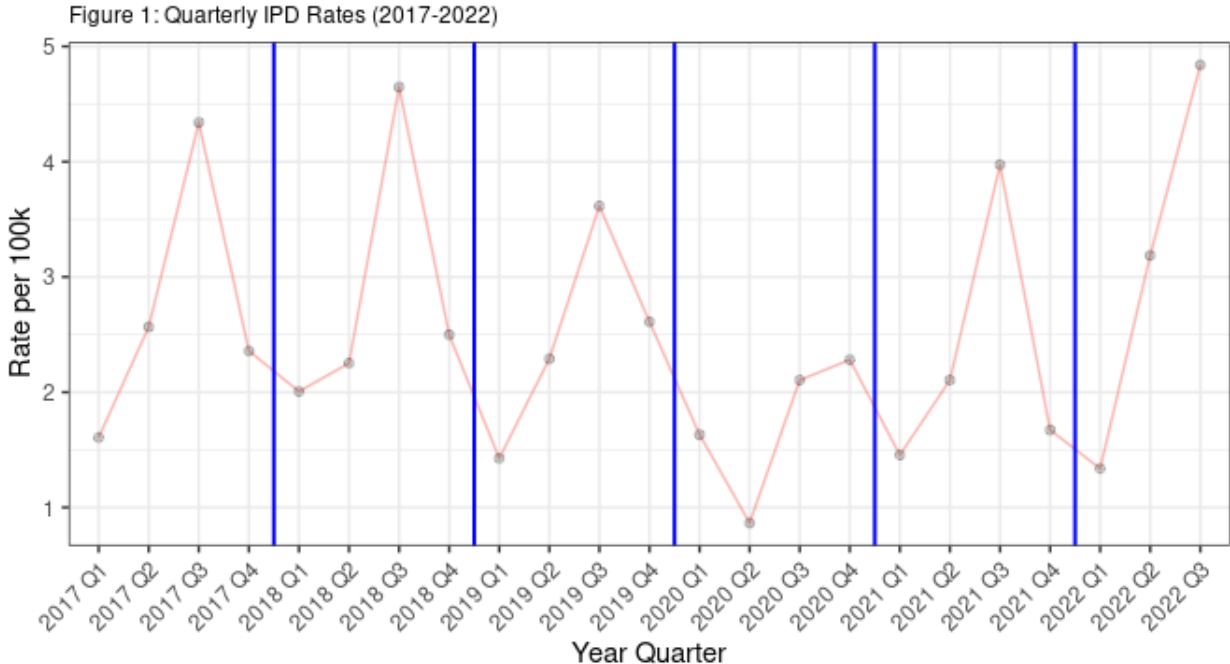
Note: a threshold breach does not confirm that the change in vaccine type is the explanation, but it indicates the need to investigate further. Further investigation will look into serotype information (vaccine and non-vaccine serotype), case-specific factors, such as immunisation status, and the presence 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.

Quarterly rates of IPD

There were 246 IPD cases notified between July and September 2022 (Q3 2022). This is the highest number of cases reported in Q3 of any year since IPD became notifiable (n=254 cases in Q3 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 September 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 September 2020 (Q3 2020), the rate of 19A was per 100,000 and remained steady until the rate increased to 7.5 for the 12 months ending in December 2020 (Q4 2020) (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 September 2022 (Q3 2022), the rate of 19A cases reached a record high to date, with 23.3 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 24.9 in the 12 months ending in June 2022 and remains there through September 2022. These increases are largely explained by the increase in 19A (since early 2020, 19A has represented more than 90% of cases of the combined serotypes).

Figure 2: Quarterly IPD incidence rate per 100,000 children less than 2 years of age for the previous 12 months ending 30 September 2022

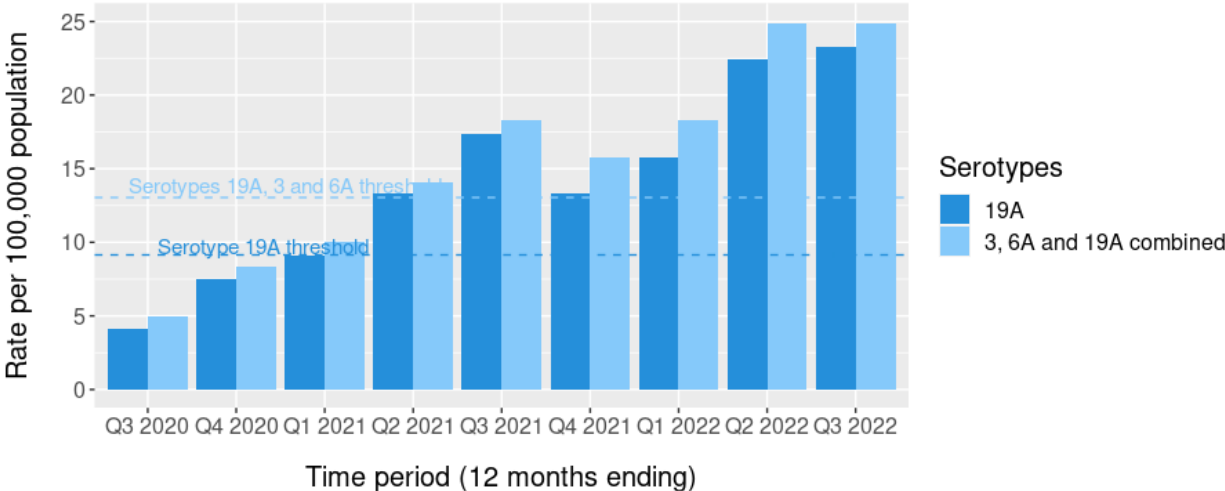


Table 1: Threshold table of quarterly IPD incidence rate per 100,000 children less than 2 years of age

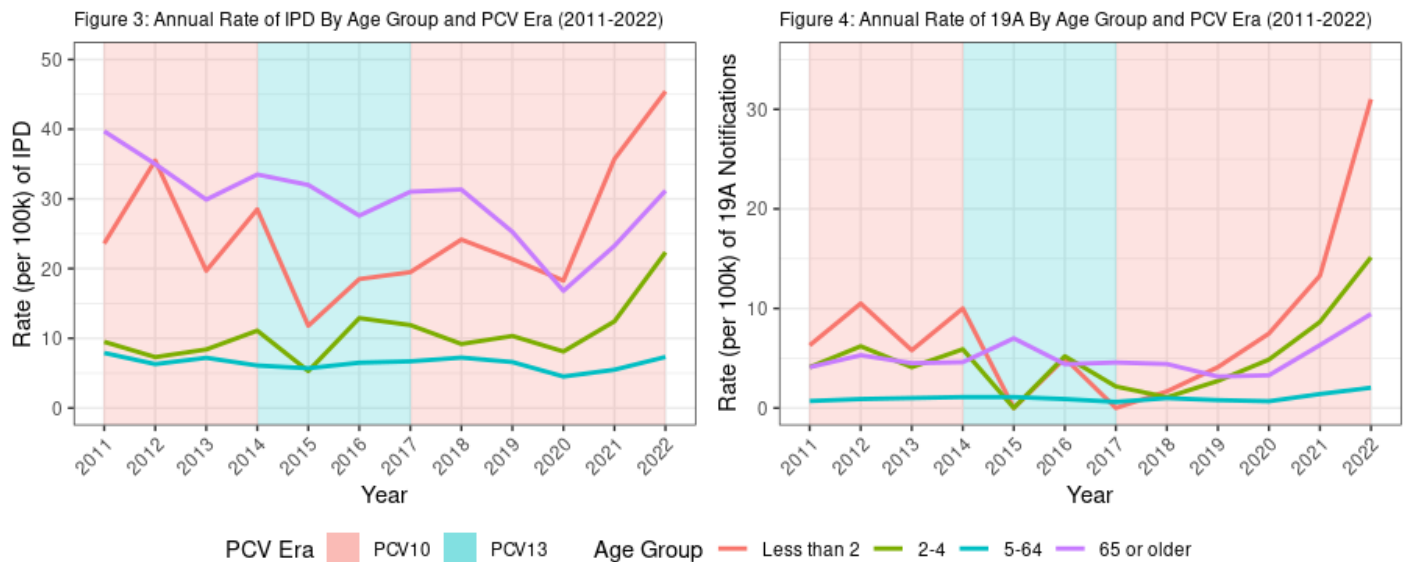
Serotypes	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022
3, 6A and 19A combined	5	8.3	10	14.1	18.3	15.8	18.3	24.9	24.9
19A	4.1	7.5	9.1	13.3	17.4	13.3	15.8	22.4	23.3

Annual Rates of IPD

The total number of IPD cases in 2022 through Q3 was the highest recorded since the first year IPD became notifiable in 2009 (476 and 536 cases (Q3 2022 includes) and Q3 2009, respectively). The annualized rate of IPD among those under 2 years old and 2-4 years old was the highest since IPD became notifiable in 2009. For those aged 65 years and over, the annualized rate is the highest since 2018. 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 annualized 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 31 cases per 100,000). Similarly, the 19A annualized 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 15 cases per 100,000). For adults 65 or older, the 19A annualized rate is also the highest on record (now nearly 10 cases per 100,000).



Note: 2022 rates are annualised.

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 2021, the proportion reached 89% of all vaccine preventable cases (PCV13-specific serotypes). Through Q3 2022, 49 of 51 (96.1%) PCV13-serotype cases in children under 5 years have been 19A. Since 2019, 90% of all PCV13-vaccine preventable cases in children under 5 years have been serotype 19A (109/120).

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 75.0% in 2021. In 2022 through Q3, 77.2% of cases due to a PCV13 serotype are 19A.

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	468	452	25	184	138(75.0%)	66	1	36	32(88.9%)
2022***	476	448	19	215	166(77.2%)	72	1	51	49(96.1%)

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

Includes cases with unknown serotype. * January to September 2022.

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 32. The number of deaths with serotype 19A is $n=8$. 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, 78 children were diagnosed with IPD in 2022 through Q3. Of these 78 children, 68 had NIR data available and 10 had no NIR data and were assumed to be unvaccinated. Of these 78 children, 66.7% ($n=52$) were serotype 19A, 2.6% ($n=2$) was serotype 3, 1.3% ($n=1$) was 9V, and 29.5% ($n=23$) 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 two IPD cases that was serotype 3 which is covered by PCV13. One child received 3 doses of PCV10 and one child received 1 PCV10 dose and 3 PCV13 doses.

The other observed vaccine preventable serotype was 19A (also covered by PCV13). None of 52 cases with 19A serotype who were eligible for vaccination, had been vaccinated with PCV13 alone. 7 were unvaccinated, 1 received 3 PCV7 doses and 1 PCV10 dose, and 1 received 4 doses of PCV7. The remainder had been vaccinated with PCV 10 alone (19 had 1-2 doses, 7 had 3 doses, 17 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 (2022 through quarter 3) (n=78)

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			1	2
PCV10															
1											2			1	3
2											17			5	22
3											7	1		5	13
4											17			6	23
PCV13															
1														1	1
2														1	1
3															
4															
PCV10/PCV13												1 ¹			1
PCV7/PCV10											1 ²				1
Unvaccinated			1								7			2	10
Total			1								52	2		23	78

1. 1 PCV10 dose/3 PCV13 doses; 2. 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 September (n=476) is the most reported year-to-date since IPD became notifiable (2009 n=536).

Of the PCV13 serotypes reported since 2019, serotype 19A is the most commonly reported vaccine serotype and has been steadily increasing in incidence (nearly 4-fold higher since 2019). Serotype 3 has also increased since 2019 (20% higher since 2019), though not as rapidly as 19A. In 2021, n=116 19A cases were reported through September, and in 2022, n=166 19A cases were reported through September. 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	September Year-To-Date Cumulative Totals			
PCV10	30	13	22	19
1	1	1		
4	5	2	2	1
5				
6B	3		1	3
7F	8	4	7	8
9V	1			1
14	2	1	2	
18C			2	1
19F	8	4	8	5
23F	2	1		
PCV13 only	68	61	132	196
3	25	19	16	30
6A				
19A	43	42	116	166
Other	241	154	214	226
Unknown	26	6	17	35
Total	365	234	385	476

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 percent of cases are under five years (around 17 percent under 2 years) compared to 2019 when about 19 percent of cases were under five years and there were only 3 cases under 2 years).

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

	2019	2020	2021	2022
Age group (years)	September Year-To-Date Cumulative Totals (percent of total)			
<2	3 (7.0)	4 (9.5)	16 (13.8)	28 (16.9)
2-4	5 (11.6)	4 (9.5)	12 (10.3)	21 (12.7)
5 or older	35 (81.4)	34 (81.0)	88 (75.9)	117 (70.5)
Total 19A	43	42	116	166

The year-to-date 19A totals for prioritised ethnicity groups by year are shown in Table 6. In 2021, 58 of the 116 19A cases reported through September were European/Other (49.9%), 29 were Māori (25.0%), 19 were Pacific Peoples (16.4%), and 10 were Asian (8.6%). In 2022, 80 of the 166 19A cases reported through September were European/Other (48.2%), 38 were Māori (22.9%), 29 were Pacific Peoples (17.5%), and 13 were Asian (7.8%); the ethnicity of 6 is still unknown (3.6%).

Although the number of 19A cases have increased across all ethnic groups, Māori/Pacific peoples are overrepresented in the number of cases - with approximately 40 percent 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	September Year-To-Date Cumulative Totals			
European/Other	27 (62.8)	23 (54.8)	58 (49.9)	80 (48.2)
Māori	9 (20.9)	10 (23.8)	29 (25.0)	38 (22.9)
Pacific Peoples	3 (7.0)	8 (19.0)	19 (16.4)	29 (17.5)
Asian	3 (7.0)	1 (2.4)	10 (8.6)	13 (7.8)
Unknown	1 (2.3)			6 (3.6)
Total 19A	43	42	116	166

The year-to-date cumulative totals for all serotypes by year and district are shown in Table 7. The Northern Region has consistently had the highest number of IPD cases through September (n=181 in 2022). The number of children under 5 years diagnosed with IPD in the Northern Region (n=31) has increased by 50% since 2021 (n=22) and is a record number reported through September since IPD became notifiable.

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

District	2019		2020		2021		2022	
	<5	All ages	<5	All ages	<5	All ages	<5	All ages
Northland	1	18		18	2	34	3	33
Waitemata	3	39		18	8	50	10	49
Auckland	9	31	3	17	3	23	7	39
Counties Manukau	5	45	1	39	9	42	11	60
Northern region	18	133	4	92	22	149	31	181
Waikato	7	33	5	33	6	37	7	40
Lakes		10	1	11	1	10	3	17
Bay of Plenty	2	31	2	14	2	27	1	37
Tairāwhiti		1		2	1	14		4
Taranaki	1	11	1	8	2	10	2	11
Midland region	10	86	9	68	12	98	13	109
Hawke's Bay	1	20	1	13	4	23	5	35
Whanganui		10		3		9	1	11
MidCentral	1	13		6	1	9		12
Hutt Valley	1	11	1	6	2	15		20
Capital & Coast	2	19		7	4	18	5	21
Wairarapa		5		4		4	1	7
Nelson Marlborough	1	9			3	9	3	9
Central region	6	87	2	39	14	87	15	115
West Coast		4		1		3		
Canterbury		29	5	18	3	24	7	36
South Canterbury		5		5		3		5
Southern	2	21	1	11	5	21	6	30
Southern region	2	59	6	35	8	51	13	71
Total	36	365	21	234	56	385	72	476

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 Region. The number of 19A cases has increased by 30-115% in all regions except the Midland Region in 2022 as compared to 2021. The number of 19A cases in children under 5 years has increased by 50% in the Northern Region, and 2- to 3-fold higher in the Midland and Central regions (though numbers are small), compared to 2021.

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

District	2019		2020		2021		2022	
	<5	All ages	<5	All ages	<5	All ages	<5	All ages
Northland		4		5	1	11	2	6
Waitemata	2	7		1	5	18	6	21
Auckland		3		3	1	7	5	17
Counties Manukau	2	3	1	8	7	14	8	21
Northern region	4	17	1	17	14	50	21	65
Waikato	2	4	1	4	3	16	7	15
Lakes		2	1	2	1	3	1	3
Bay of Plenty	1	3	2	5		4		9
Tairāwhiti		1		1		5		
Taranaki						1	2	3
Midland region	3	10	4	12	4	29	10	30
Hawke's Bay	1	1	1	2	1	5	3	8
Whanganui		1				5		3
MidCentral		1			1	3		3
Hutt Valley		1		2	1	2		8
Capital & Coast		3				4	3	12
Wairarapa		1		2		2	1	4
Nelson Marlborough						2	2	3
Central region	1	8	1	6	3	23	9	41
West Coast		1						
Canterbury		2	2	6	3	6	4	16
South Canterbury		1		1				2
Southern		4			4	8	5	12
Southern region	0	8	2	7	7	14	9	30
Total	8	43	8	42	28	116	49	166