

Invasive Pneumococcal Disease Quarterly Report October–December 2021

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, and has since undergone a number of changes: • 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.

PCV10 includes the seven serotypes in PCV7 (4, 6B, 9V, 14, 18C, 19F and 23F) as well as serotypes 1, 5 and 7F, and some cross-reactivity to serotype 19A. PCV13 includes the 10 serotypes in PCV10 as well as serotypes 3, 6A and 19A. The recommended schedule is now three doses, given at 6 weeks, 5 months and 12 months of age. 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 January 2022. Any changes made to EpiSurv data by public health unit staff after this date will not be reflected in this report. Immunisation status of cases that were eligible for PCV vaccination was extracted from the National Immunisation Register (NIR).

Reporting of cases compared to a threshold is completed 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 vaccination type is the explanation, but it indicates the need to investigate further. Further investigation will look into case-specific factors, such as immunisation status, the presence of underlying health conditions or risk factors which may have predisposed the case to disease, and contextual factors, such as the incidence of other vaccine and non-vaccine serotypes.

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.

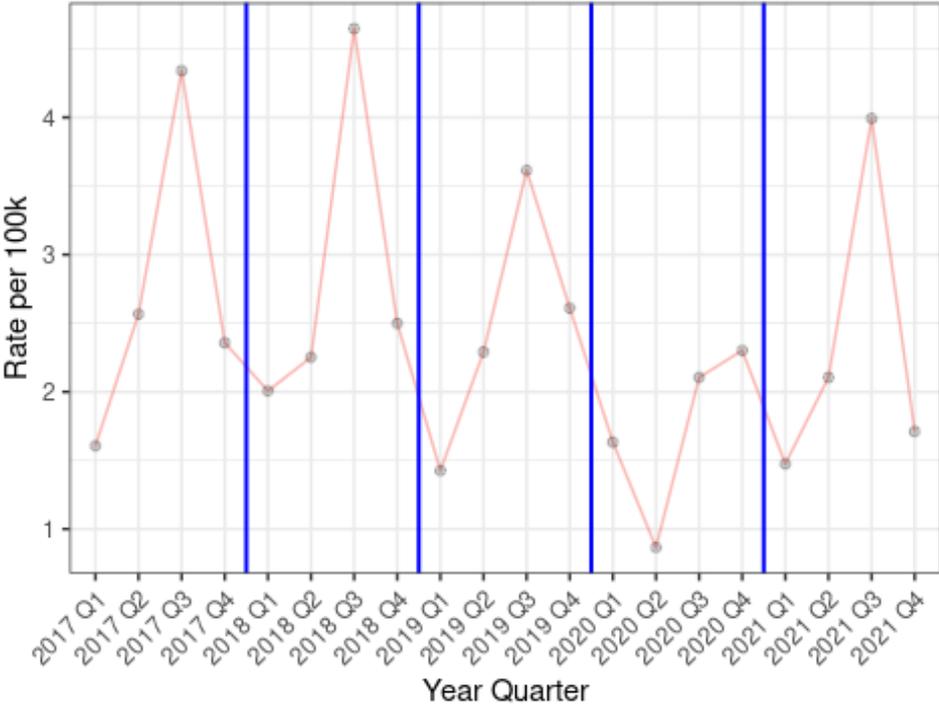
Quarterly Rates of IPD

There were 203 IPD cases notified in the July-September 2021 quarter (Q3 2021), compared with 107 IPD cases notified in Q4 2020 and 180 in Q3 2019.

During the October-December 2021 quarter (Q4 2021), there were 87 IPD cases notified, compared with 117 in Q4 2020 and 130 in Q4 2019. IPD diagnoses follow a seasonal pattern with a winter peak and summer trough (Figure 1).

Of note, the Auckland region was in lockdown through the entirety of Q4 2021 and the rest of New Zealand was under increased public health restrictions. As a result, the IPD cases in Q4 2021 are not directly comparable to previous quarters.

Figure 1: Quarterly IPD Rates (2017-2021)

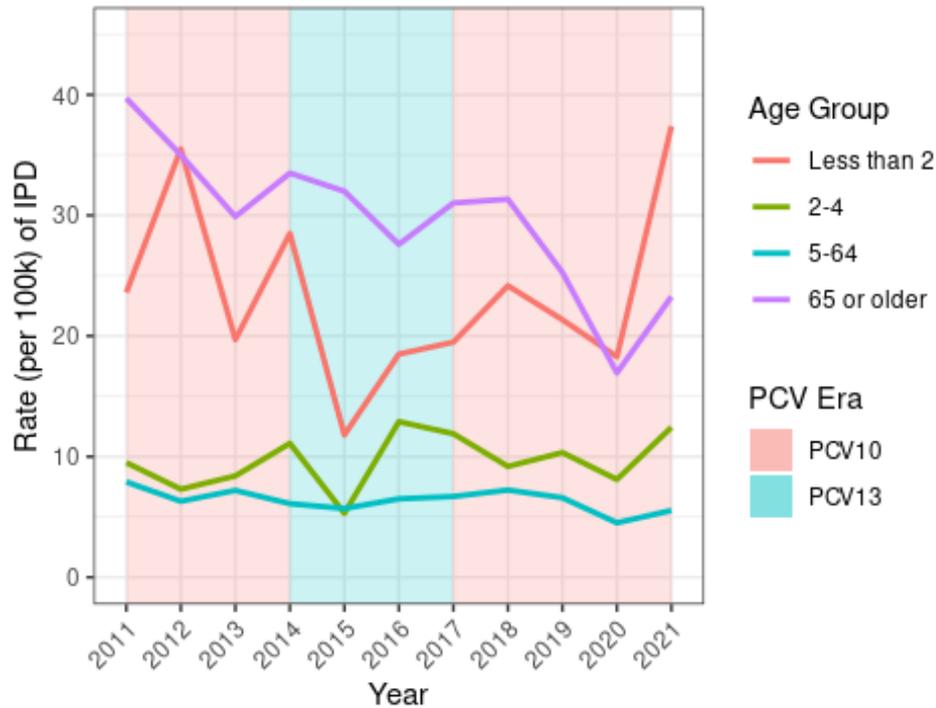


Annual Rates of IPD

Importantly, there were 29% fewer IPD cases in 2020 when compared to 2019, likely due to COVID-19 control measures and border closures. The total number of IPD cases in 2021 relative to 2019 were comparable through Q3 (365 and 385 annual cases through Q3 2019 and Q3 2021, respectively), though COVID-19 control measures were re-introduced in Q4 2021 and likely affected the number of IPD cases in late 2021. Throughout 2021, the rates of IPD have remained relatively stable for 5-64 year olds (Figure 2). The rate of IPD among those 2-4 years old and 65 or older through Q4 2021 is slightly higher than the rate at the

end of 2020. However, for children under 2 the rate of IPD through Q4 2021 is now the highest since 2012.

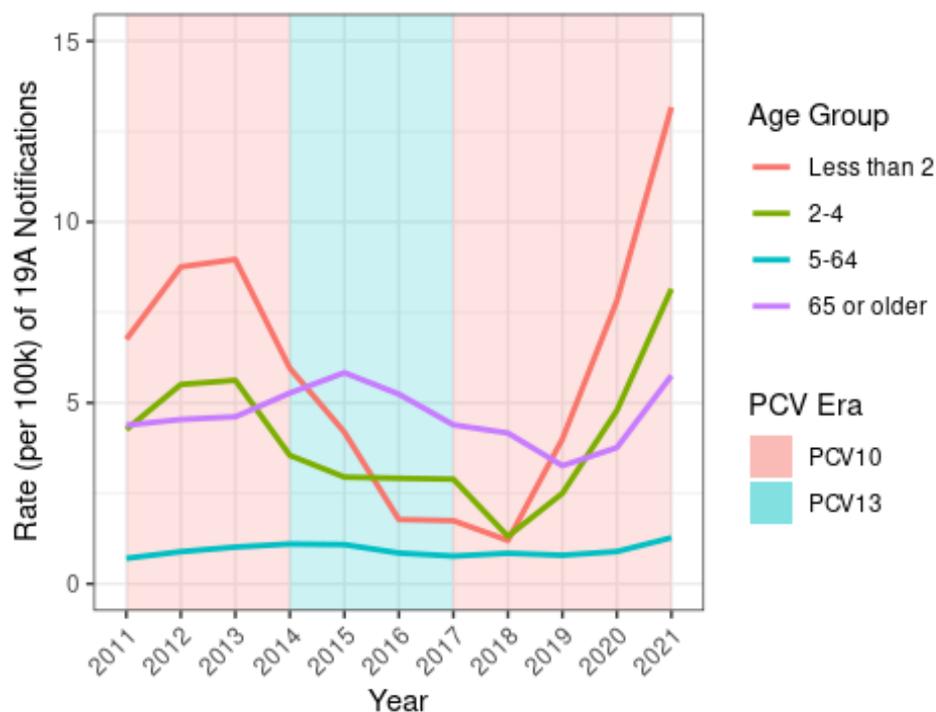
Figure 2: Annual rate of IPD by age group and PCV era (2011-2021)



Annual Rates of Serotype 19A

The rate of serotype 19A for children under 2 years has steadily increased since 2017 (Figure 3). The rate of 19A in 2021 among children under 2 years and for children 2-4 years old is now the highest since before PCV10 was first introduced in 2011. The rates of serotype 19A for 2021 among 65 or older is the highest since 2015.

Figure 3: Annual rate of 19A by age group and PCV era (2011-2021)



Threshold Analyses (12 Months Ending December 2021)

The threshold for 19A has been established at 9.1 cases per 100,000 children < 2 years of age. The rates we report are based on cumulative cases over a 4-quarter time-period. For the 12 months ending in December 2019 (Q4 2019), the rate of 19A was 4.1 and remained steady until the rate increased to 7.4 for the 12 months ending in December 2020 (Q4 2020) (Figure 4 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 13.1 cases per 100,000.

And in the 12 months ending in September 2021 (Q3 2021) the rate of 19A cases continued to increase, reaching 15.5 cases per 100,000.

In the 12 months ending in December 2021 (Q4 2021) the rate of 19A cases decreased to 13.1 cases per 100,000, though it is still substantially above the threshold. Importantly, the Auckland Region was in lockdown for Q4 2021 and these public health measures likely impacted the IPD risk, as well.

The rate for the combined serotypes of interest (3, 6A, and 19A) also steadily increased in the previous four threshold analyses, and also exceeded the threshold, with a rate of 17.2 per 100,000 in the 12 months ending in September 2021, though these increases are largely explained by the increase in 19A (19A represents more than 90% of cases of the combined serotypes over the last 12 months). The rate for the combined serotypes of interest decreased in the 12 months ending in December 2021 to 15.54 cases per 100,000,

though still exceeding the threshold. An investigation into the increase in cases due to serotype 19A is ongoing.

Figure 4: Quarterly IPD incidence rate per 100,000 in less than 2-year old for previous 12 months ending 31 December 2021

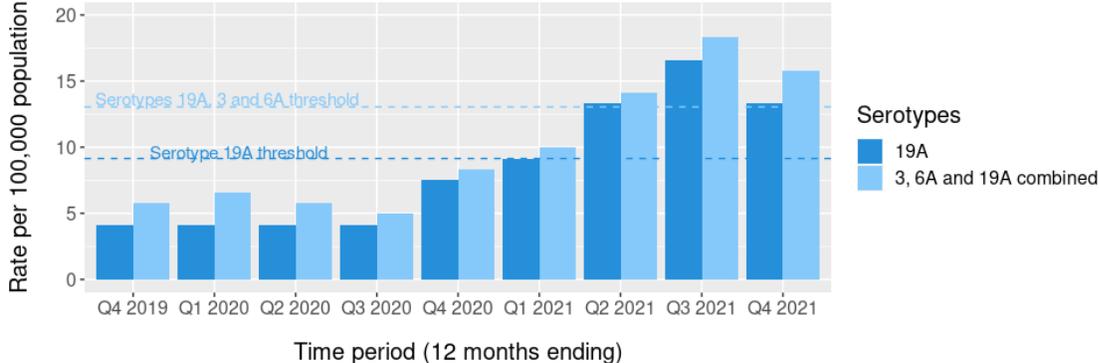


Table 1: Threshold Table of Quarterly IPD Incidence Rate per 100,000

Serotypes	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021
3, 6A and 19A combined	5.8	6.6	5.8	5	8.3	10	14.1	18.3	15.8
19A	4.1	4.1	4.1	4.1	7.5	9.1	13.3	16.6	13.3

Vaccine Preventable Incident Cases

The number of cases with PCV10 preventable serotypes has steadily increased in 2021 (Table 2). The number of IPD incident cases (n=125) in 2021 is higher than 2019 and 2020 at year’s end. The proportion of all IPD cases that are 19A has steadily increased since 2017. In 2020, 21.1% of all IPD cases (with known serotypes) were 19A. In 2021, 31.8% of IPD cases are 19A.

The proportion of all vaccine preventable cases that are 19A has also increased since 2017. In 2017, 44.8% of all vaccine preventable cases (PCV10 serotypes) were 19A. In 2021, the proportion has nearly doubled to 84.8% of all vaccine preventable cases.

Among children under 5 years of, the number of IPD cases that are vaccine preventable has increased steadily since 2018. In 2021, the number of vaccine preventable cases among children under 5 (n=31) is more than 2019 and 2020 combined (n=29). Further, since 2018, more than 95% of all vaccine preventable cases in children under 5 have been 19A (58/61).

Table 2: Distribution of Vaccine Preventable Serotypes (2017-2021)

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	No. 19A Cases (% of all vaccine preventable cases in children under 5 years of age)
2017	521	482	74	169	60(35.5%)	34	3	11	4(36.4%)
2018	557	523	52	163	75(46%)	39	1	7	4(57.1%)
2019	495	461	38	132	65(49.2%)	38	1	13	10(76.9%)
2020	351	336	18	115	71(61.7%)	36	0	20	18(90%)
2021	472	428	24	175	132(75.4%)	59	1	35	31(88.6%)

Immunisation Status

Of all PCV eligible children born after January 1, 2008, 84 children were diagnosed with IPD in 2021, of whom 77 had NIR data available and 7 were assumed to be unvaccinated. Of these 77 children, 44.2% (n=34) were serotype 19A, 2.6% (n=2) were serotype 3, and 51.9% (n=40) were non-PCV serotypes or unknown (Table 3). There were 2 IPD cases that were serotype 3, which is covered by PCV13. One child had 2 doses of PCV10, one had 4 doses of PCV10. Of vaccine preventable serotypes (PCV10 serotypes), 34/35 (97.1%) cases were serotype 19A. Of these 34, 1 had 4 doses of PCV7, 8 had 2 doses of PCV10, 4 had 3 doses of PCV10, and 15 had 4 doses of PCV10. Additionally, 2 had 4 doses of PCV13. An additional 4 children who were diagnosed with 19A were given a combination of PCVs. All 4 children received both PCV10 and PCV13.

Table 3: Immunisation status of the 2021 IPD cases (n=77) who were age-eligible for PCV and have an NIR record

Vaccine Type (doses)	PCV7 Serotypes							PCV10 Serotypes			PCV13 Serotypes			Non-PCV Serotypes or Unknown	Number of People
	4 n=0	6B n=0	9V n=0	14 n=0	18C n=0	19F n=1	23F n=0	1 n=0	5 n=0	7F n=0	19A n=34	3 n=2	6A n=0		
PCV7															
1														0	0
2														0	0
3														0	0
4											1			1	2
PCV10															
1														4	4
2											8	1		9	18
3											4			2	6
4											15	1		12	28
PCV13															
1														0	0
2														0	0
3														2	2
4											2			2	4
Multiple PCVs															
PCV7/PCV10						1 ^a								0	1
PCV7/PCV13														0	0
PCV10/PCV13											4 ^b			7 ^c	11
PCV7/ PCV10/PCV13														1 ^d	1
	0	0	0	0	0	1	0	0	0	0	34	2	0	40	77

Note: blank cells represent 0 observations.

^a3 PCV7 doses/1 PCV10 dose.

^b2 cases received 3 PCV10 doses/1 PCV13 dose; 1 case received 1 PCV10 dose/1 PCV13 dose; 1 case received 1 PCV10 dose/3 PCV13 doses

^c 3 cases received 3 PCV10 doses/1 PCV13 dose; 3 cases received 2 PCV10 doses/2 PCV13 doses; 1 case received 1 PCV10 dose/3 PCV13 doses

^d1 case received 3 PCV7 doses/1 PCV10 dose/1 PCV13 dose

Deaths

The total number of IPD deaths in 2021 was the highest since 2018 ($n=35$). Additionally, the number of deaths with serotype 19A was the highest in our recorded data ($n=12$). Among children under 5, in 2021 there were 7 deaths, the highest in our recorded data. Of the 7 deaths in children under 5, $n=2$ were 19A.

Table 4: Number of IPD Deaths and number of deaths with 19A (2017-2021)

Year	No. Total Deaths	No. Deaths from Disease	No. Deaths Unknown or Missing Primary Cause	No. Total Deaths with 19A	No. Deaths Among <5 (No. with 19A)
2017	44	27	12	4	2 (0)
2018	40	25	13	1	2 (0)
2019	31	12	14	2	2 (0)
2020	24	11	10	4	2 (1) ¹
2021	35	15	15	12	7 (2) ²

1. This case received 4 doses of PCV13

2. One case received 2 doses of PCV10 (on schedule) and one case received 3 doses of PCV10.