Science for Communities
He Pūtaiao, He Tāngata

INVASIVE PNEUMOCOCCAL DISEASE BIANNUAL REPORT: January 2023 to December 2023

Prepared as part of a Ministry of Health contract for scientific services

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- Staff in the ESR Antibiotic Reference Laboratory for antimicrobial susceptibility data.

DISCLAIMER

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KEY FINDINGS

This report describes the epidemiology of Invasive pneumococcal disease (IPD) in New Zealand in 2023. The analyses are based on IPD notifications in the EpiSurv database, as well as information from the national immunisation register and ESR's national antibiotic reference laboratory.

- In 2023, there were 757 cases of IPD notified (14.5 cases per 100,000).
- The incidence of IPD has been increasing steadily since 2020, and in 2023 the IPD incidence rate was the highest observed in the past 10 years.
- Incidence of IPD among children <2 years decreased in 2023 compared to 2022 (from 50.3 per 35.6 per 100,000). The rate remains high compared to rates in 2015-2020.
- Those aged <5 and ≥65 years continue to experience the highest rates of IPD.
- Māori and Pacific populations continue to experience substantially higher rates of IPD than those of European/Other/MELAA and Asian ethnicities.
- Serotype 19A remains the most common serotype, followed by serotype 8 and then serotype 3. Serotypes 3 and 19A are included in the PCV13 vaccine and cases due to these serotypes declined among children <2 years in 2023, following the re-introduction of PCV13 to the childhood schedule in late 2022. IPD cases due to serotypes included in PCV7 and PCV10 accounted for 3.1% of typed cases in 2023.
- Potentially vaccine-preventable serotypes were responsible for the majority of IPD cases in children aged 6 weeks to 5 years (where typing was undertaken). Serotypes included in PCV13 continue to cause disease among unvaccinated children as well as children who received PCV10 as part of their routine immunisations. One quarter of cases in children aged 6 weeks to 5 years were due to serotypes not included in any pneumococcal conjugate vaccine in production in 2023.

The epidemiology of IPD in New Zealand in 2023 demonstrates the early impact of the re-introduction of PCV13 to the childhood immunisation schedule in the first 12 months since this change. Incidence of IPD caused by serotype 19A more than halved among children <2 years, despite only some of this cohort being eligible for PCV13. Further reductions in incidence are anticipated as more children receive PCV13 as part of their routine immunisations.

Given the recent changes to the vaccine programme, the phenomenon of serotype replacement and the availability and development of new vaccines, it is important to continually monitor trends in IPD epidemiology to inform vaccine decisions in the future. One area that requires particular attention is the monitoring of the incidence of serotype 8 and other serotypes not covered by current vaccines. It is also important to monitor trends in age and ethnic groups where there are clear disparities.

In addition to the changes in the PCV immunisation programme over time, there has been a recent decline in childhood immunisation coverage in New Zealand and increasing disparities in immunisation coverage. To further reduce the incidence of IPD in New Zealand and the inequities in incidence, it is important that immunisation coverage is increased with a focus on improving equitable coverage.

It is also important to note that not all IPD is vaccine-preventable and prevention efforts should extend to addressing systemic and healthcare access issues that may contribute to the spread of *S. pneumoniae* infection.

INTRODUCTION

Invasive pneumococcal disease (IPD) refers to disease due to *Streptococcus pneumoniae* (*S. pneumoniae*) entering a sterile site, such as blood, pleural fluid, or cerebrospinal fluid. IPD represents the most severe end of the disease spectrum caused by this bacterium. The most common clinical presentations in IPD are bacteraemic pneumonia, non-localised bacteraemia (bacteraemia without focus), and meningitis. Older adults generally have bacteraemic pneumonia, while young children may have any of the three clinical presentations, with meningitis being the most severe.

S. pneumoniae can also cause non-invasive infections such acute otitis media (predominantly in children) and sinusitis (predominantly older children and adults). Non-invasive *S. pneumoniae* infections are not notifiable and are not discussed in this report.

IPD is largely a vaccine preventable disease with vaccines available that provide protection against different serotypes of the bacterium. A pneumococcal vaccine has been part of the New Zealand childhood immunisation schedule since 2008. The history of the pneumococcal vaccine programme in New Zealand is summarised in Table 1 [1].

Table 1. Pneumococcal conjugate vaccine history in New Zealand

Date	Vaccination schedule change
2006	PCV7 and 23PPV introduced for high-risk individuals.
2008	PCV7 introduced to the Schedule at ages 6 weeks, 3 months, 5 months and 15 months.
2011	PCV10 replaced PCV7 on the Schedule. PCV13 replaced PCV7 for high-risk children.
2014	PCV13 replaced PCV10 on the Schedule.
2015	PCV13 became available for patients of any age with certain high-risk conditions.
2017	PCV10 replaced PCV13 on the Schedule. PCV13 and 23PPV continues for high-risk individuals
2020	PCV10 recommended as a 2-dose primary schedule plus booster dose given at 6 weeks, 5 months and 12 months. PCV13 remained at 3-dose schedule plus booster for high-risk infants (i.e. given at ages 6 weeks, 3, 5 and 12 months)
2022	PCV13 replaced PCV10 in a 2-dose primary schedule plus booster dose on 1 December. PCV13 remained at 3-dose schedule plus booster for high-risk infants (i.e. given at ages 6 weeks, 3, 5 and 12 months)

PCV13 is the currently funded vaccine on the childhood immunisation schedule. Two doses of PCV13 are given as the primary course, at 6 weeks and 5 months, with a booster at age 12 months. Children who started their immunisation course with PCV10 prior to December 2022 can complete it with PCV13. PCV13 is not funded for those who have previously been fully vaccinated with PCV10. In addition, PCV13 and 23 PPV are available for vaccination and re-vaccination for people of any age with eligible conditions that affect the immune system [1].

This report provides an overview of the epidemiology of IPD for 2023. It also presents trends from 2014. This report is produced biannually and along with a monthly online dashboard, it replaces the *quarterly and annual reports* that were previously produced.

METHODS

The case data presented in this report are based on the information recorded on EpiSurv, the national notifiable disease surveillance system, as of 3 March 2024. Any updates made to EpiSurv data by public health service staff after this date will not be reflected in this report. Episurv data are supplemented with serotype and antimicrobial susceptibility data from the ESR national laboratory-based surveillance of invasive *S. pneumoniae* isolates. The immunisation status of cases that were eligible for PCV vaccination was extracted from the National Immunisation Register (NIR).

IPD CASE DEFINITION

IPD has been a notifiable disease since 2008. A confirmed case is one that has a clinically compatible illness that is laboratory confirmed. Most cases present with either meningitis, pneumonia, or septicaemia. Laboratory confirmation requires at least one of the following [2]:

- isolation of *S. pneumoniae* from blood, cerebrospinal fluid (CSF) or another normally sterile site (eg. joint fluid, pleural fluid)
- detection of *S. pneumoniae* nucleic acid from blood, CSF or another normally sterile site
- a positive *S. pneumoniae* antigen test on CSF or pleural fluid.

Pleural fluid was added in 2016 as a sterile site. [2] As a result, this addition may have slightly increased the total number of IPD cases identified after that date relative to previous years.

CALCULATION OF POPULATION RATES

All rates presented in this report are crude rates.

The 2017–2022 mid-year population estimates published by Statistics New Zealand were used to calculate the incidence rates for total population.

All rates are presented as the number of cases per 100,000 population. Rates have not been reported where there were fewer than five cases in any category as this produces unstable rates.

ETHNICITY

Prioritised ethnicity is used in this report. Ethnicity is prioritised in the following order: Māori, Pacific peoples, Asian, and European/Other/Middle Eastern/Latin American/African (MELAA) ethnicity. For more detail on classification refer to the Ministry of Health ethnicity data protocols [3].

The incidence rates for ethnic groups were calculated by applying the usually resident 2018 census population ethnic proportions to the 2017–2022 mid-year population estimates.

SOCIO-ECONOMIC DEPRIVATION

The New Zealand index of deprivation 2018 (NZDep2018) is used to measure socioeconomic deprivation. NZDep2018 is derived from a weighted combination of nine variables from the 2018 census, each reflecting a different aspect of material and socioeconomic deprivation [4]. The deprivation score is calculated for each geographical mesh block in New Zealand.

This report presents NZDep2018 by quintiles, where 1 represents the least socioeconomically deprived areas and 5 the most socioeconomically deprived areas.

The denominator data used to determine disease rates for NZDep2018 categories is based on the proportion of people in each NZDep2018 category from the usually resident 2018 census population.

TRENDS

Trend data are presented for 12-month periods from 1 January to 31 December each year.

INVASIVE PNEUMOCOCCAL DISEASE IN NEW ZEALAND

There were 757 cases of IPD notified in New Zealand in 2023 (14.5 cases per 100,000) (Table 2 and Figure 1).

Table 2. IPD cases by age group (years) and ethnicity

Age group (years)	Māori	Pacific	Asian	European/Other/ MELAA	Unknown	Total
<2	19	7	3	12	2	43
2-4	14	5	11	8	3	41
5-64	117	71	39	152	3	382
≥65	44	31	13	199	4	297
Total	**194**	**114**	**66**	**371**	**12**	**757**

Figure 1 shows the incidence of IPD from 2014 to 2023 for the total population. The incidence of IPD has been increasing steadily since 2020 with the incidence in 2023 the highest it has been in the past 10 years.

Figure 1. Incidence of invasive pneumococcal disease in New Zealand, rate per 100,000, 2014 to 2023

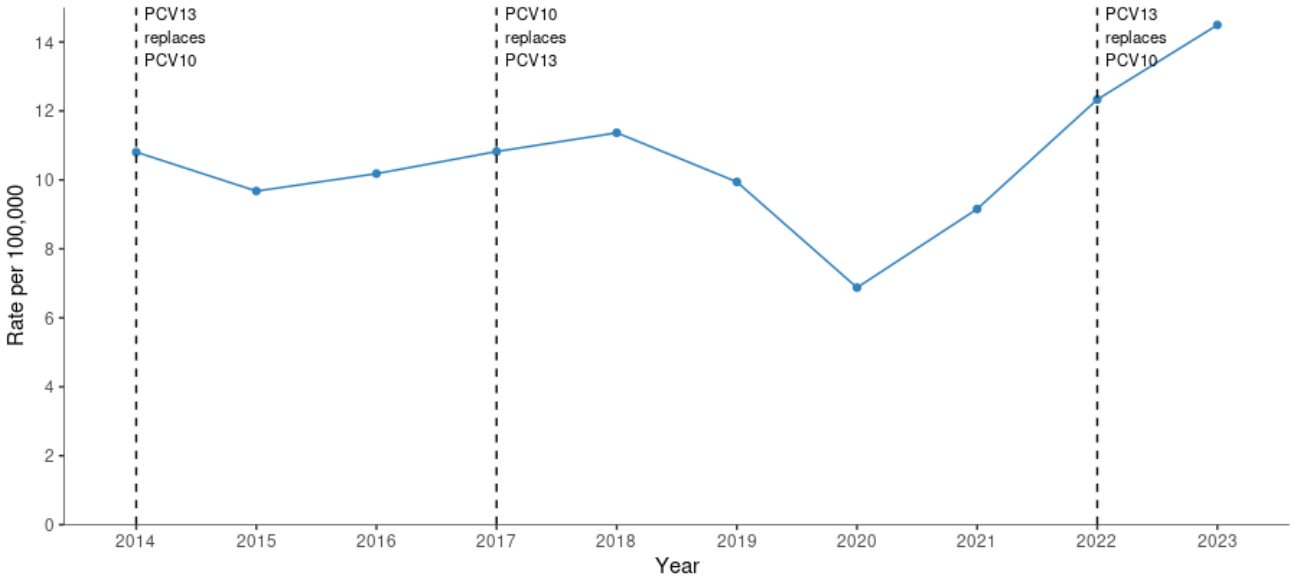


Figure 2 shows IPD trends over time by age group. Since 2020, there has been an increasing trend in the incidence of IPD in all age groups and the incidence has been highest for those aged <2 years. The incidence for those aged <2 years decreased from 50.3 per 100,000 in 2022 to 35.6 per 100,000 in 2023, but remains substantially higher than the incidence observed

during 2015-2020 (ranging from 11.5 to 23.0 per 100,000). In 2023, incidence of IPD also decreased among those aged 2 to 4 years and 15 to 29 years; in all other age groups incidence increased compared to 2022.

Prior to 2020, those aged ≥65 years had the highest incidence of IPD. In 2023, the incidence was second highest among those ≥65 years (33.7 per 100,000).

Since 2021, those aged 2 to 4 years have had the third highest incidence, in 2023, the incidence in this age group was 22.6 per 100,000.

Figure 2. Incidence of invasive pneumococcal by age group, rate per 100,000, 2014 to 2023

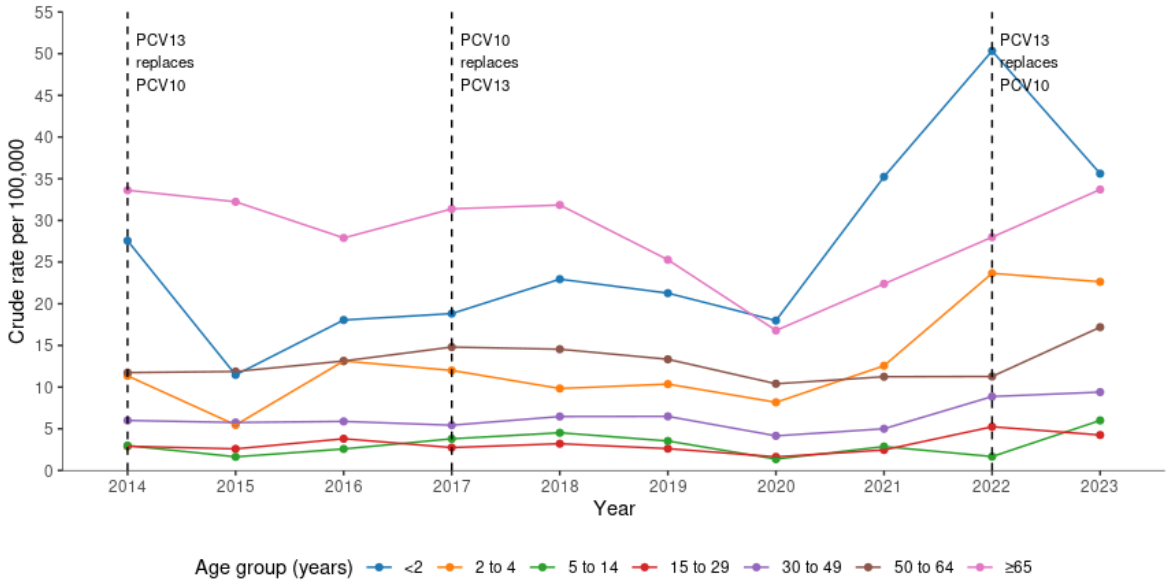


Figure 3 shows the cumulative number of IPD cases per year from 2018 to 2023. Total case numbers were higher in 2023 than in each of 2018-2022. Figure 4 shows that this was driven by increased case numbers among people >5 years old. Case numbers among those aged <2 years were lower in 2023 than 2022, and case numbers among those aged 2 to 4 years were similar in 2023 to 2022. In both those aged <2 and those aged 2-4 case numbers remained higher than those observed in 2018-2020 (Figure 4).

Figure 3. Cumulative number of invasive pneumococcal disease cases per year, 2018–2023

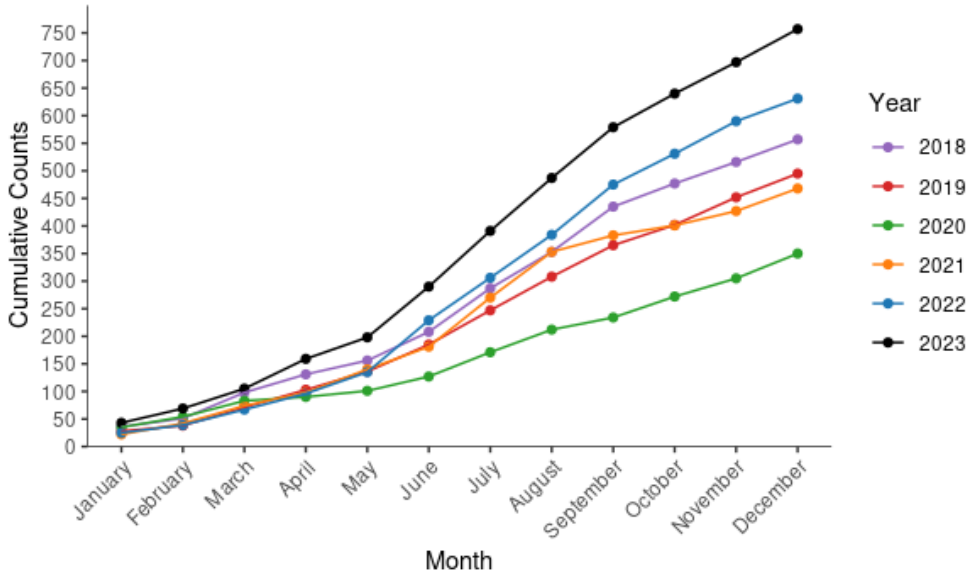
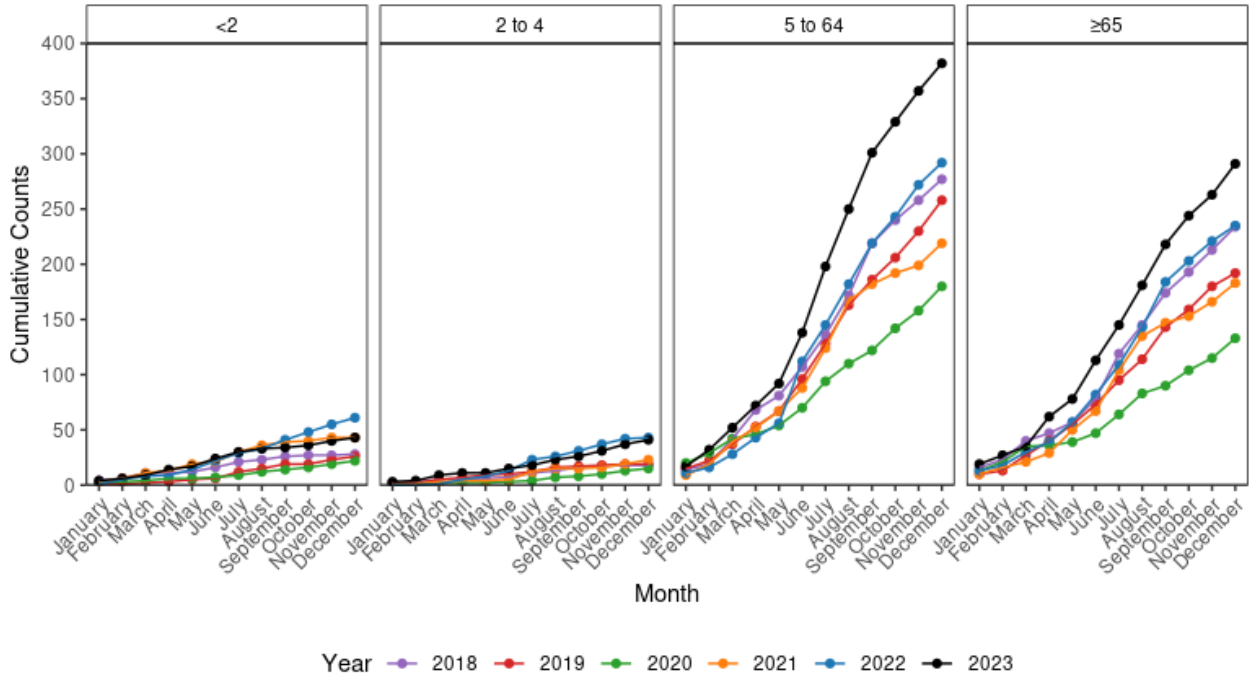
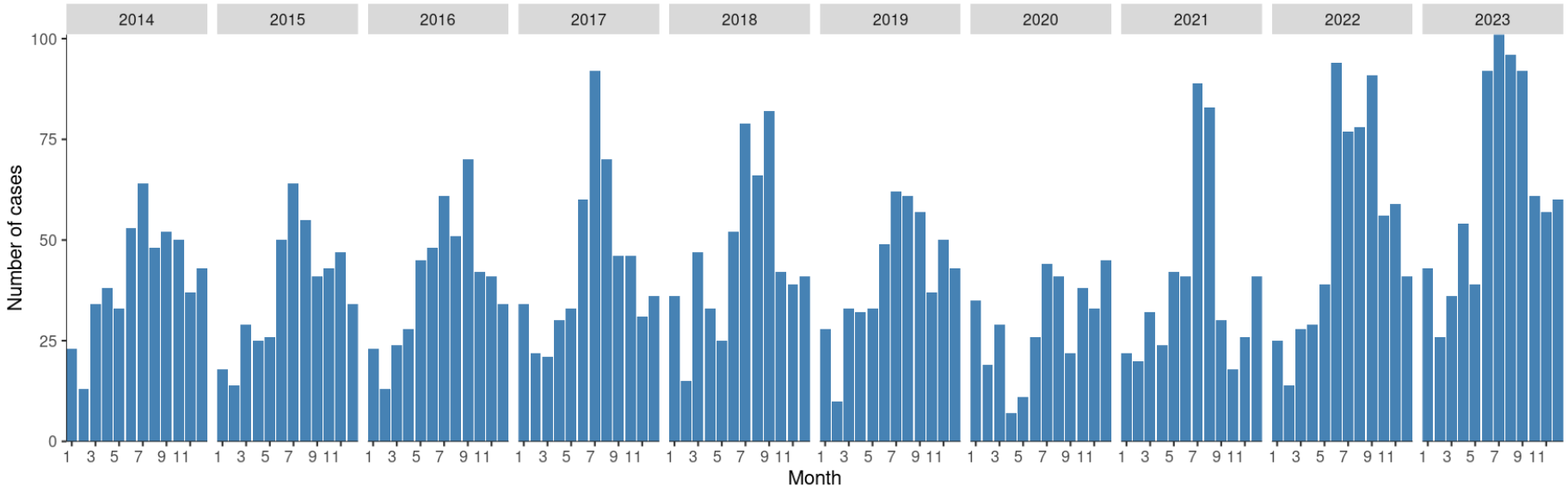


Figure 4. Cumulative number of invasive pneumococcal disease cases per year by age group, 2023



IPD follows a seasonal pattern with the highest numbers seen in the winter months each year (Figure 5).

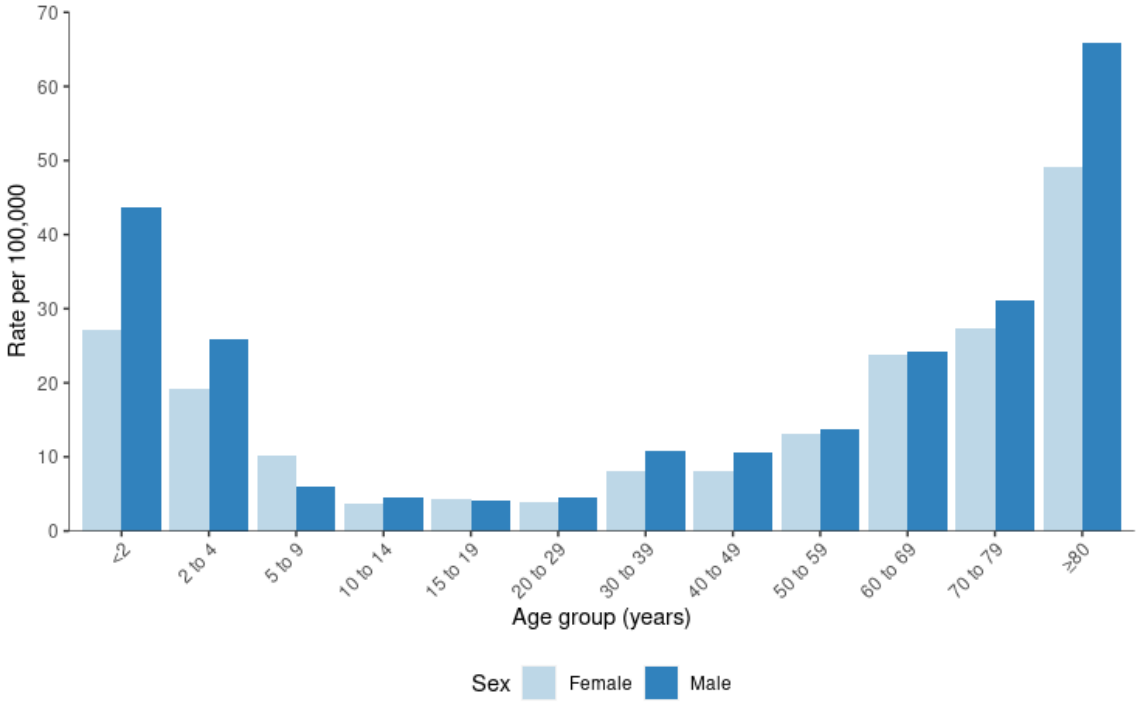
Figure 5. Number of cases of invasive pneumococcal disease by month and year, 2014–2023



INCIDENCE OF INVASIVE PNEUMOCOCCAL DISEASE BY AGE GROUP AND SEX

The incidence of IPD follows a U-shaped distribution by age (Figure 6). In 2023, adults ≥80 and infants <2 years had the highest incidence of IPD (56.2 per 100,000 and 35.6 per 100,000 respectively). Males aged ≥80 had the highest rate of IPD (65.8 per 100,000), followed by females aged ≥80 (49.1 per 100,000), then males aged <2 years (43.7 per 100,000) (Figure 6). This U-shaped distribution has also been seen in previous years.

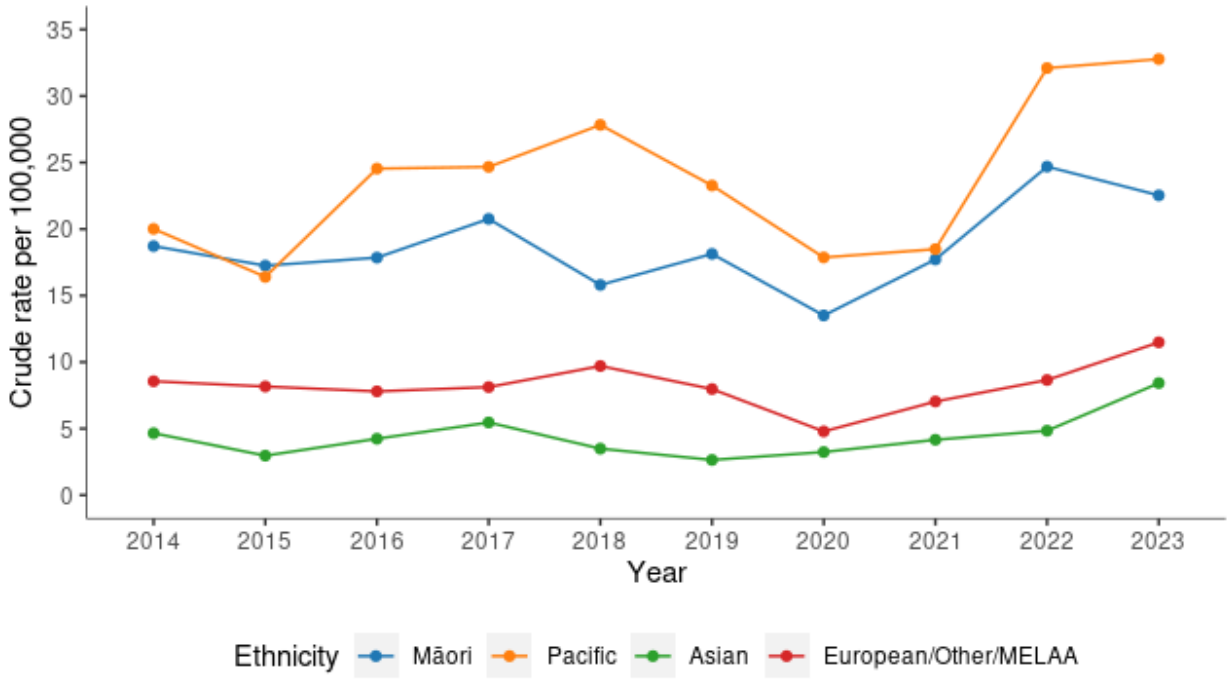
Figure 6. Incidence of invasive pneumococcal disease by age group and sex, rate per 100,000, 2023



INVASIVE PNEUMOCOCCAL DISEASE BY ETHNIC GROUP

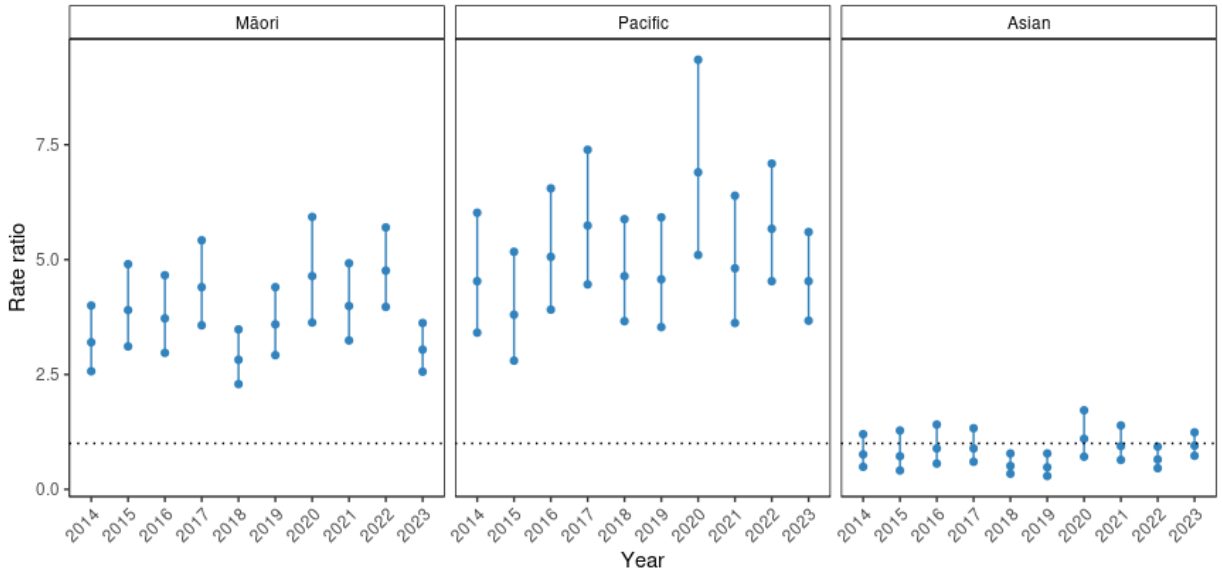
Pacific peoples consistently experience the highest crude rates of IPD, followed by Māori (Figure 7). Between 2022 and 2023, rates increased for European/Other/MELAA, remained stable for Pacific peoples, and decreased slightly for Māori (Figure 7).

Figure 7. Incidence of invasive pneumococcal disease by prioritised ethnicity, rate per 100,000, 2014 to 2023



In 2023, Māori and Pacific people had 3.0 and 4.5 times, respectively, the incidence rate of IPD compared to European/Other/MELAA after adjusting for age (Figure 8).

Figure 8. Invasive pneumococcal disease - rate ratios and 95% confidence intervals by ethnicity and year, adjusted by age (reference group European/Other/MELAA)[i]

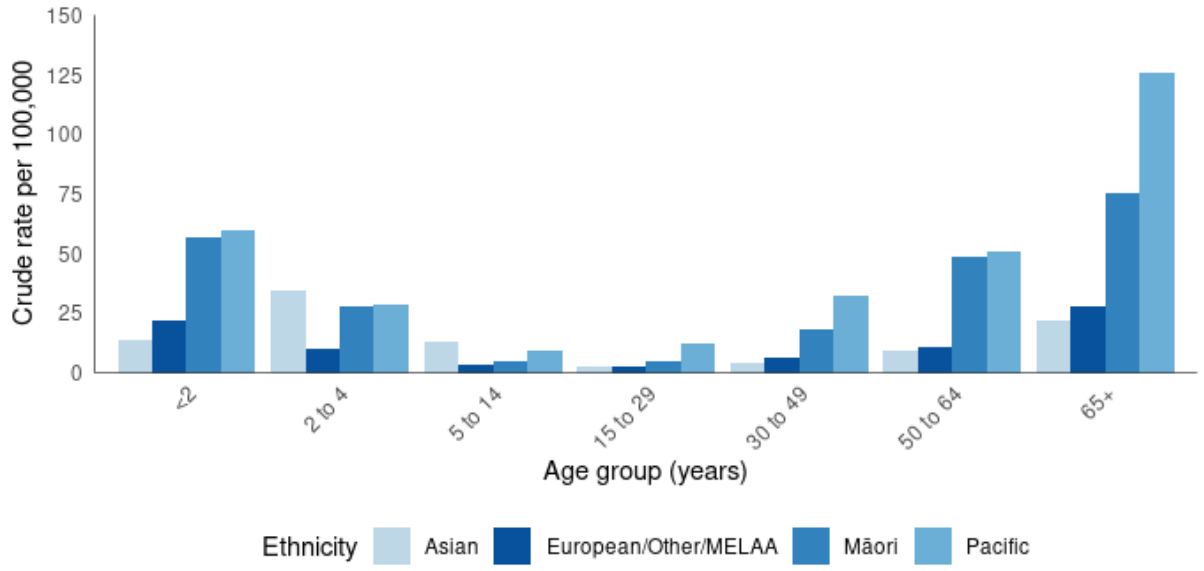


[i] The age-standardised rates are direct-standardised to the age distribution of the total New Zealand population.

Māori and Pacific people experience higher rates of IPD across most age groups (Figure 9). In 2023, Pacific adults aged ≥65 years, followed by Māori adults aged ≥65 years, had the highest rate of IPD, followed by Pacific and Māori children aged <2 years. For those aged ≥65 years, Māori (75.0 per 100,000) and Pacific people (126.1 per 100,000) have 2.7 and 4.6 times, respectively the incidence of IPD among European/Other/MELAA (27.6 per 100,000). For those aged 30-49, Māori (18.5 per 100,000) and Pacific peoples (32.5 per 100,000) had 3.0 and 5.2 times, respectively, the rate of IPD among European/Other/MELAA (6.2 per 100,000). For those aged 50 to 64, Māori (48.8 per 100,000) and Pacific peoples (50.8 per 100,000) had 4.6 and 4.8 times, respectively, the rate of IPD among European/Other/MELAA (10.7 per 100,000).

Among children aged <2 years, Māori and Pacific had 2.5 and 2.7 times, respectively, the incidence seen in European/Other/MELAA children.

Figure 9. Incidence of invasive pneumococcal rates by ethnicity, rate per 100,000, 2023



INVASIVE PNEUMOCOCCAL DISEASE BY REGION

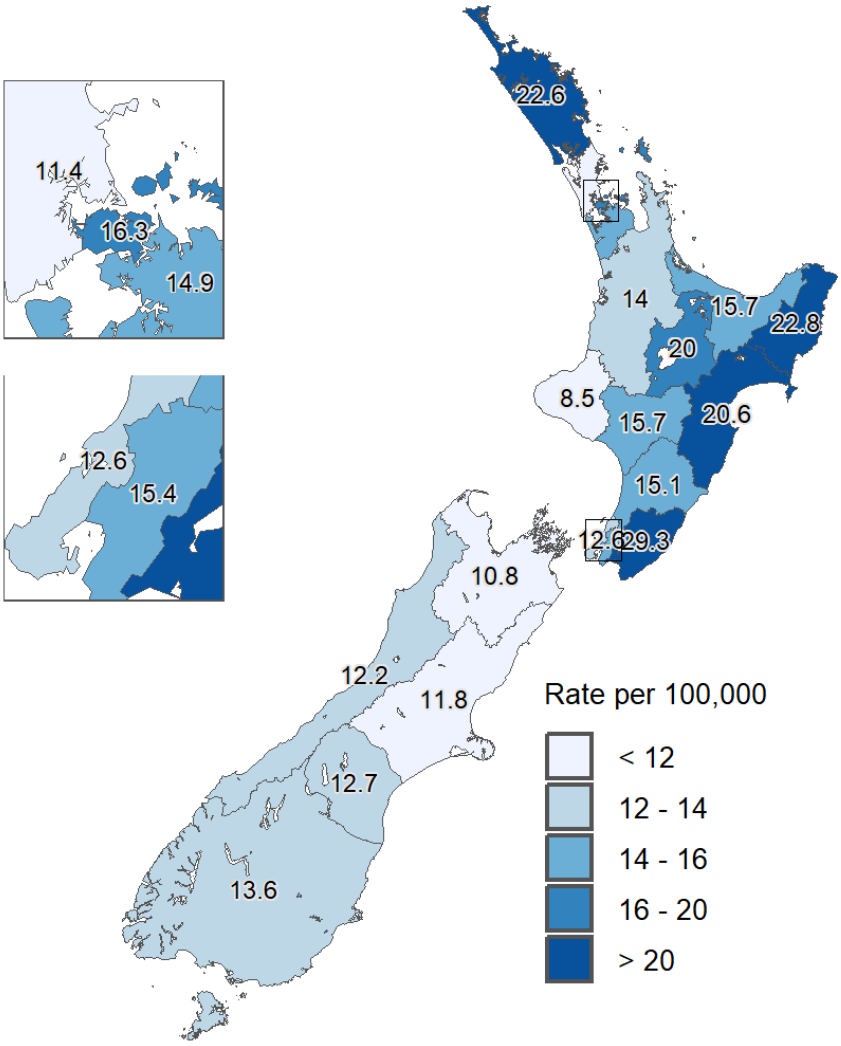
Te Manawa Taki had the highest overall IPD incidence in 2023, followed by Central North Island, then Northern (Table 3). Te Waipounamu had the lowest rate in 2023.

Table 3. Invasive pneumococcal disease by region, numbers, and rate per 100,000, 2023

Area	<2		2–4		5–64		≥65		Total	
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
Northern	22	46.5	21	29.6	158	10.1	92	32.9	293	14.9
Te Manawa Taki	7	26.9	5	12.8	79	10.1	64	33.5	155	14.9
Central North Island	8	35.6	10	30.5	85	11.1	56	33.2	159	16.1
Te Waipounamu	6	23.6	5	13.1	60	35.2	79	35.2	150	12.2
Total	**43**	**35.6**	**41**	**22.6**	**382**	**9.4**	**291**	**33.7**	**757**	**14.5**

Figure 10 provides further detail on the incidence of IPD in 2023 across New Zealand by district. The districts with the highest incidence of IPD in 2023 were Wairarapa (29.3 per 100,000), Tairāwhiti (22.8 per 100,000), Northland (22.6 per 100,000), and Lakes (20.0 per 100,000).

Figure 10. Geographic distribution of invasive pneumococcal disease cases, rates per 100,000, 2023

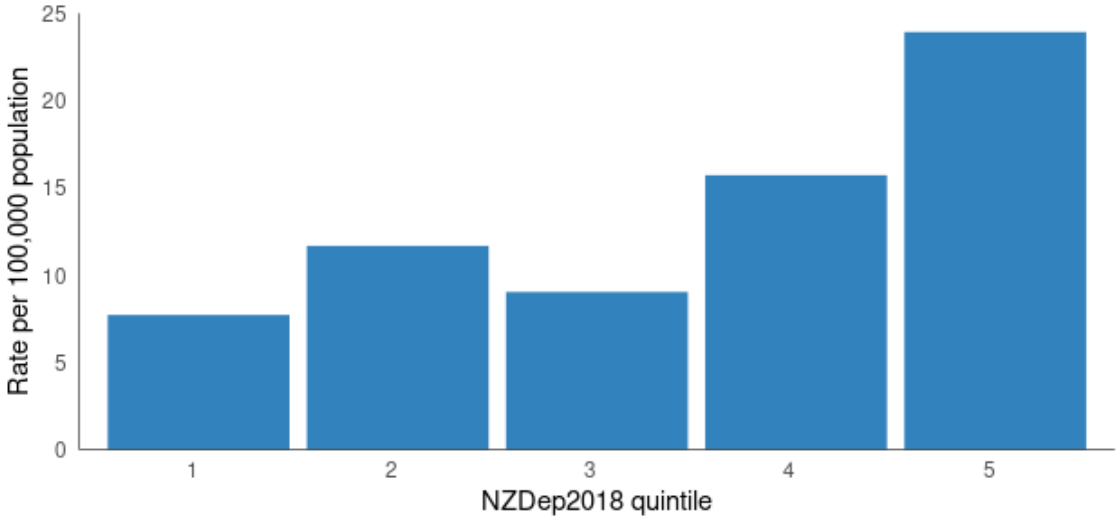


INVASIVE PNEUMOCOCCAL DISEASE BY DEPRIVATION

The NZDep 2018 quintile could be assigned for 718 of 757 cases (94.8%) in 2023.

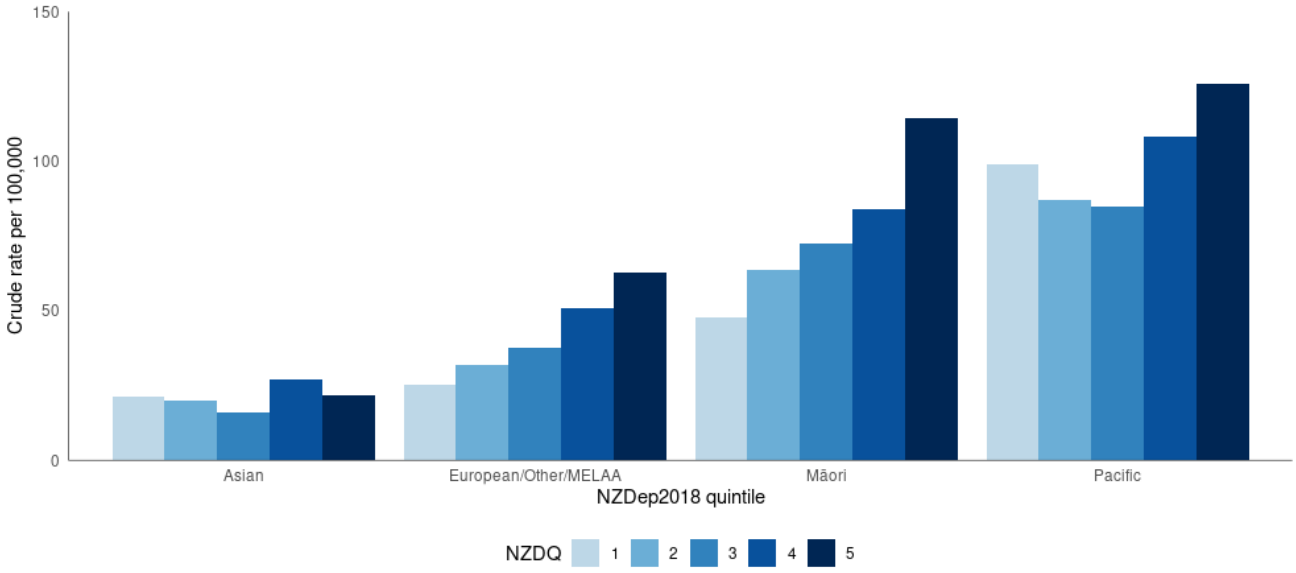
The total population rate for 2023 shows an increasing trend in IPD incidence with increasing deprivation (7.6 per 100,000 among quintile 1; 23.8 per 100,000 among quintile 5). 58.4% of cases (419/718) were in the most deprived quintiles 4 and 5 (Figure 11).

Figure 11. Incidence of invasive pneumococcal disease cases by NZDep2018 quintile, rate per 100,000, 2023



Considering both ethnicity and NZDep2018 quintile, Pacific peoples residing in an area of the highest deprivation (quintile 5) had the highest rate of IPD (125.9 per 100,000), followed by Māori residing in an area of the highest deprivation (114.6 per 100,000) (Figure 12). Crude incidence rates are higher at all levels of deprivation for Pacific peoples compared to European/Other/MELAA and Asian ethnic groups.

Figure 12. IPD rates by ethnicity and NZDep2018 (quintiles), 2019–2023



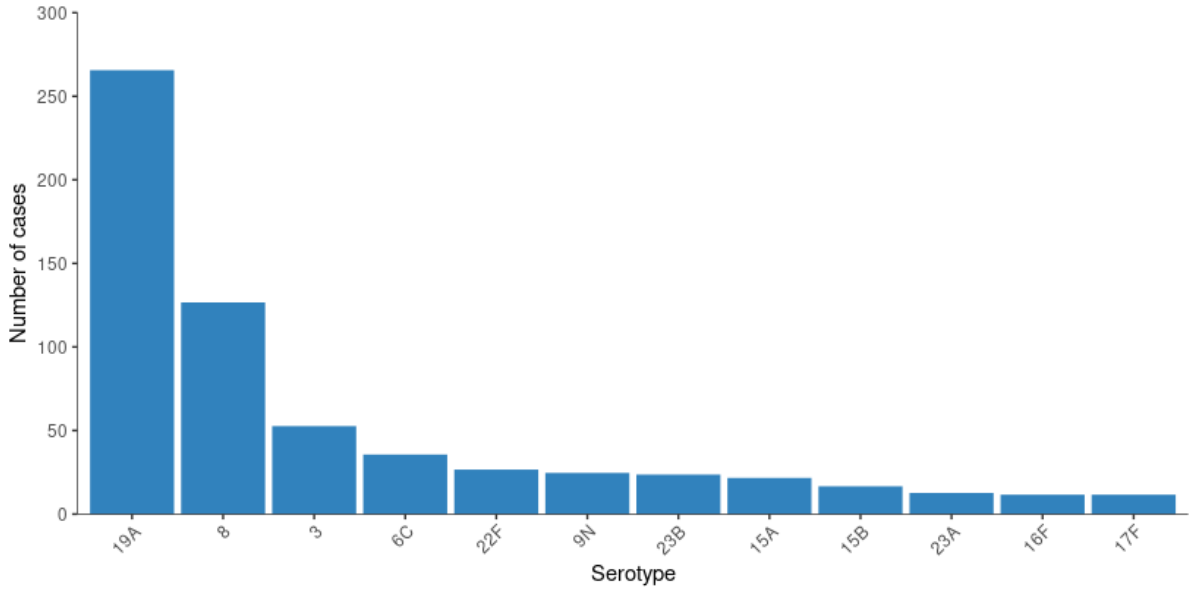
INVASIVE PNEUMOCOCCAL DISEASE BY SEROTYPE

There are over 90 serotypes of *S. pneumoniae* that cause disease.

Figure 13 shows the most common serotypes causing IPD in New Zealand in 2023. Serotype 19A was the most common serotype (37.6% of all cases where a serotype was identified), followed by serotype 8 (17.9%) and serotype 3 (7.4%). Serotypes 19A and 3 are included in PCV13; serotype 8 is included in PCV20 (not available in New Zealand in 2023).

The proportion of IPD cases due to serotypes included in PCV10 have declined over the past decade. In 2023, 3.1% of cases where a serotype was identified (22/705) were caused by serotypes contained in PCV10 (of which 68.1% (15/22) were caused by serotypes contained in PCV7). These cases all occurred in people aged 5 years and older.

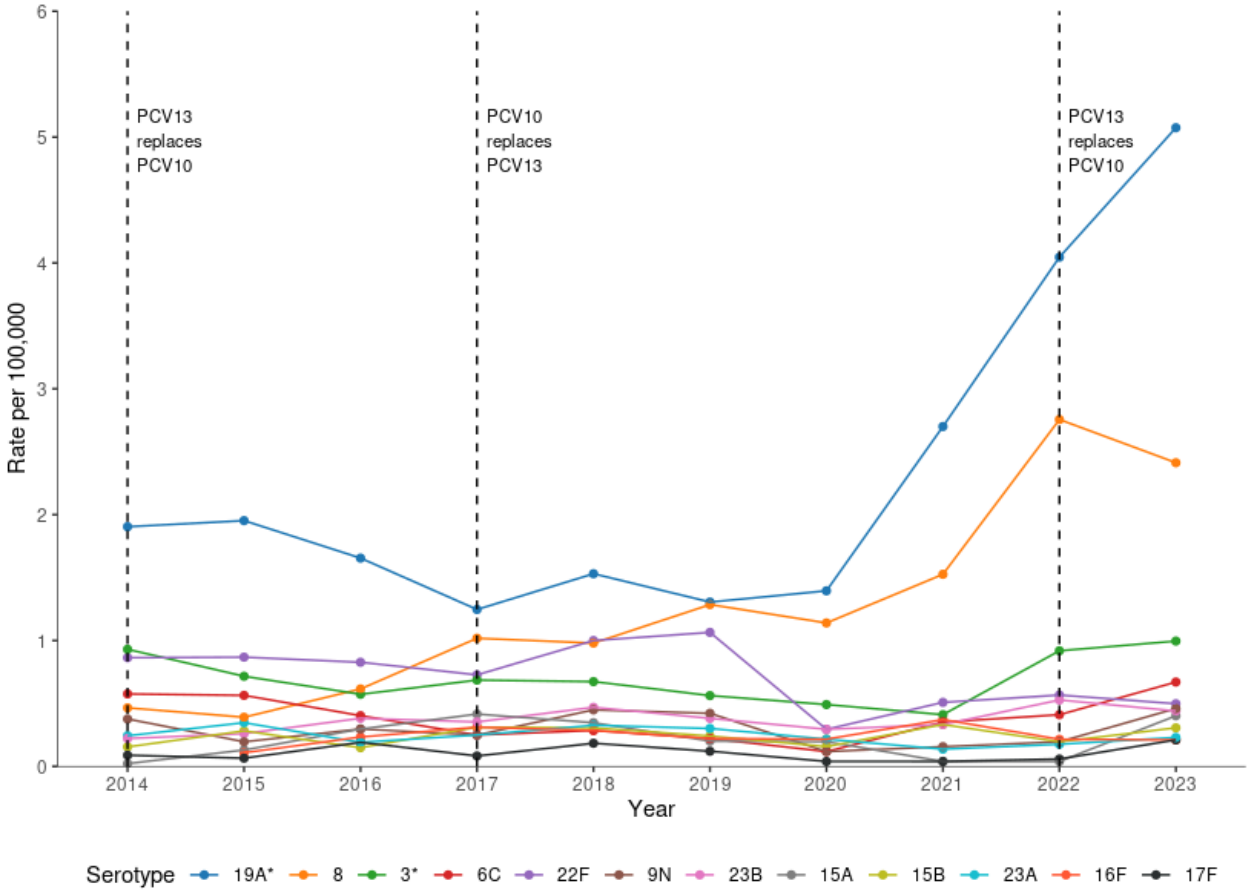
Figure 13. Invasive pneumococcal serotypes, 2023[1]



[1] Only serotypes where there were more than 10 IPD cases are shown.

Figure 14 shows the trend in the incidence of IPD serotypes in New Zealand from 2014 to 2023. Serotype 19A has been the dominant serotype since 2014. The incidence of serotype 19A was relatively stable until 2020 when there was a sharp increase. Serotype 8 has been the second most common serotype seen in New Zealand since 2019, incidence of disease caused by this serotype increased from 2020-2022 before decreasing in 2023.

Figure 14. Invasive pneumococcal serotypes, 2014 to 2023



*PCV13 serotypes

Serotype trends by age

In 2023, serotype 19A was the predominant serotype in all age groups (Figure 15). Among children <2 years, incidence of disease caused by 19A decreased sharply from the high seen in 2022 (from 30.5 to 12.4 per 100,000). Incidence of 19A also decreased among children aged 2 to 4 years compared to 2022 (from 11.6 to 8.3 per 100,000). Among those aged 5 to 64 years and ≥65 years incidence of 19A continued to increase in 2023.

Serotype 8 was the second most common serotype for all age groups except children aged 2 to 4 years. Incidence of disease caused by this serotype is much lower than that caused by 19A; the incidence of 19A was 3.0, 1.6 and 2.9 time that of 8 in the <2 years, 5 to 64 years and ≥65 years age groups respectively.

Further information on the serotypes causing disease among vaccine-eligible children <5 years old is available in, Table 4 below.

Figure 15. Common serotypes by age group, rate per 100,000, 2023

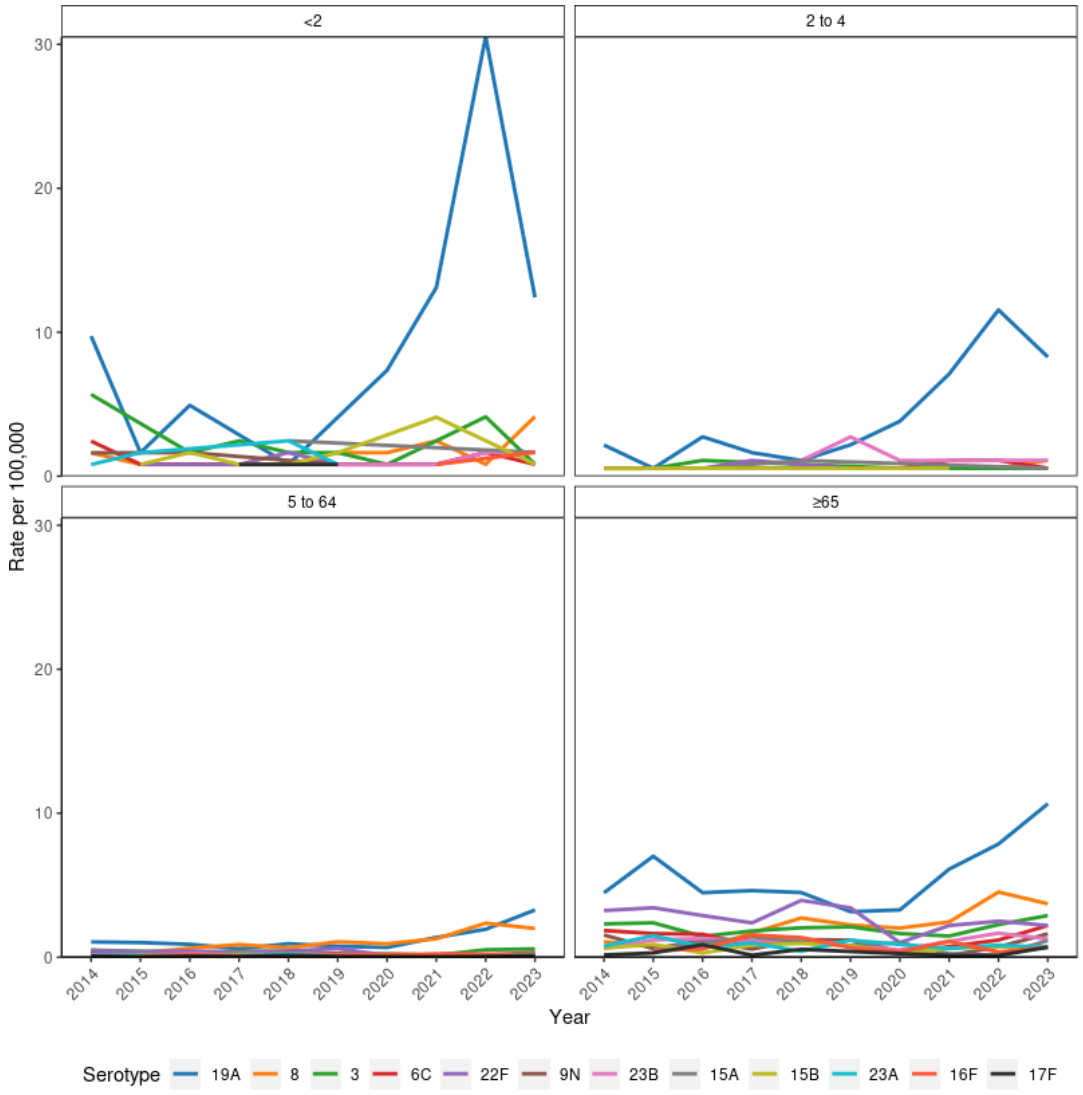


Table 4 shows the number of 19A cases by age group and year as well as the proportions of total typed cases for each age group that were 19A. From 2019 to 2022, the absolute number and proportion of 19A cases increased across most age groups. Between 2022 and 2023, the number and proportion of 19A cases decreased for <1, 1 and 2-4 years but continued to increase for 5-64 and ≥65 years.

Table 4. Serotype 19A cases and proportions of total typed cases by age group (years) and year

Age group (years)	2019	2020	2021	2022	2023
	n (%)	n (%)	n (%)	n (%)	n (%)
<1	4 (25%)	6 (60%)	10 (38%)	19 (73%)	8 (38%)
1	1 (14%)	3 (25%)	6 (43%)	18 (67%)	7 (58%)
2-4	5 (33%)	9 (64%)	16 (76%)	25 (74%)	18 (60%)
5-64	31 (13%)	27 (16%)	56 (27%)	79 (28%)	140 (39%)
≥65	24 (13%)	26 (20%)	50 (28%)	66 (29%)	92 (33%)

HOSPITALISATIONS AND DEATHS

Hospitalisation status was recorded for 748 / 757 (98.8%) cases in 2023. Among cases with hospitalisation status recorded, almost all were hospitalised (723 (96.7%)).

A clinical presentation was recorded for all cases in 2023 (Table 5). Pneumonia was the most common presentation across all age groups, followed by bacteraemia without focus. A presentation with meningitis was more common in children < 1 years compared to other age groups.

Table 5. Invasive pneumococcal disease, clinical presentation by age group, 2023[1]

Age group (years)	Meningitis		Empyema		Pneumonia		Bacteraemia		Other		Total
	n	%	n	%	n	%	n	%	n	%	n
<1	9	37.5	1	4.2	9	37.5	4	16.7	1	4.2	24
1	2	10.5	5	26.3	8	42.1	2	10.5	2	10.5	19
2–4	2	4.9	11	26.8	17	41.5	11	26.8	0	0.0	41
<5	13	15.5	17	20.2	34	40.5	17	20.2	3	3.6	84
5–64	28	7.3	10	2.6	275	72.0	54	14.1	14	3.7	382
≥65	9	3.1	9	3.1	220	75.6	40	13.7	13	4.6	291
Total	**50**	**6.6**	**36**	**4.8**	**529**	**69.9**	**111**	**14.7**	**30**	**4.0**	**757**

[1] N: number of cases with 'yes' recorded for the clinical presentation. Any cases for which *S. pneumoniae* was identified in CSF were considered to be cases of pneumococcal meningitis. If more than one clinical presentation has been recorded, clinical presentations have been prioritised as: meningitis, empyema, pneumonia, bacteraemia, other. %: percentage of cases within the age group with the clinical presentation. 'Other' includes septic arthritis. At least one clinical presentation was recorded for 757 (100%) of cases notified in 2023.

Based on the information in EpiSurv, there were 25 deaths due to IPD in 2023. Nearly half (12/25, 44%) of deaths occurred in those aged <65 years. The mortality data available in EpiSurv is provisional; these numbers may change when cause-of-death data are finalised.

IMMUNISATION STATUS

A pneumococcal vaccine was introduced to the childhood schedule in 2008 and there have been numerous changes to the schedule since this time (described in Table 1, above). Most recently, PCV13 replaced PCV10 on the childhood immunisation schedule in December 2022. This report covers the first 12 months since this change.

In 2023, there were 81 IPD cases in children aged 6 weeks to <5 years. Table 6 summarises the vaccination status and serotype causing disease for these cases. There were also three cases of IPD in children <6 weeks of age and thus not yet eligible for PCV13. National Immunisation Registry (NIR) data was available for 69 children who had at least one dose of vaccine more than 14 days prior to onset of IPD. The 12 vaccine-eligible cases who did not have NIR data available were assumed to be unvaccinated.

A serotype was identified in 61 of the 81 cases; 35 (57.4%) of these cases were due to serotypes covered by PCV13 (33 cases of 19A, 2 cases of 3); two (3.3%) due to serotypes included in PCV15 (both 33F); and eight (13.1%) due to serotypes included in PCV20 (six cases of 8, one each of 10A and 15B). There were 16 cases (26.2%) due to serotypes not included in any pneumococcal conjugate vaccine in production in 2023.

Most PCV13-serotype cases occurred in unvaccinated children (10 cases) or children who had only received PCV10 (19 cases). The remaining six cases occurred in children who had received one or two doses of PCV13 (including three who had received a mix of PCV10 and PCV13). There were no breakthrough infection cases in children <5 years with three or more PCV doses.

Table 6. Number of cases under 5 years by vaccination type, and serotype, 2023

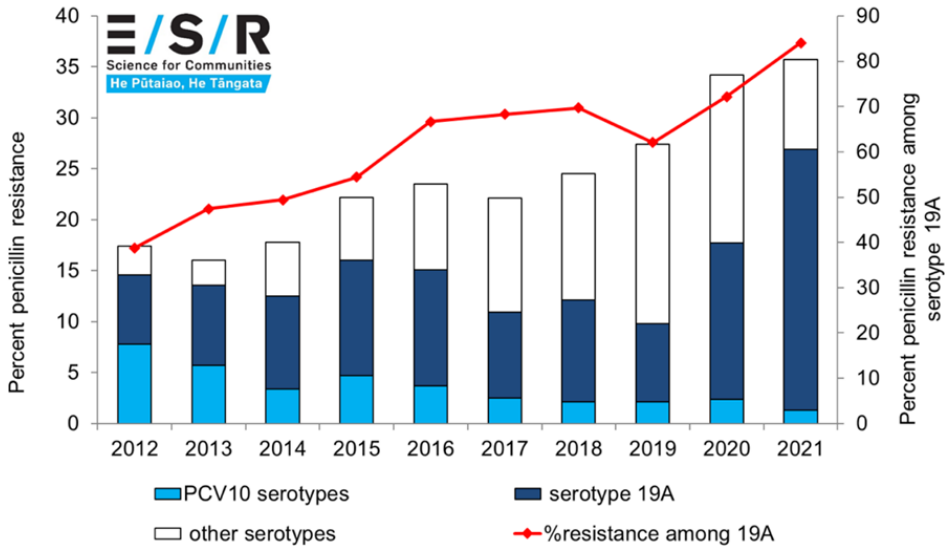
Vaccine serotype / Vaccine received/dose	PCV7[a]	PCV10[b]	PCV13			PCV15		PCV20					Non-PCV[c]	Un-known[d]	Total cases
			19A	3	6A	22F	33F	8	10A	11A	12F	15B			
Unvaccinated			9	1									1	1	12
PCV10															
1			1					1	1					1	4
2			2									1		2	5
3+			15	1				2					8	12	38
PCV13															
1			1				1	1							3
2			2											1	3
3+															
Mixed PCV															
PCV10/13			3				1	2					7	3	16
Total	**0**	**0**	**33**	**2**	**0**	**0**	**2**	**6**	**1**	**0**	**0**	**1**	**16**	**20**	**81**

Note: blank cells represent 0 observations. Children diagnosed before they were PCV eligible (6 weeks) are not included.
[a]PCV7 serotypes: 4, 6B, 9V, 14, 18C, 19F, 23F
[b]Additional PCV10 serotypes: 1, 5, 7F
[c]A serotype not covered by any PCV in production in 2023
[d]Serotype is not known either because the isolate was not typed or the typing did not yield a result.

ANTIMICROBIAL RESISTANCE

Penicillin resistance in invasive pneumococci has increased over the last decade. This increase has largely been driven by an increase in the prevalence of serotype 19A isolates. Penicillin resistance has increased from 38.8% 2012 to 84.1% of 19A isolates in 2021 (Figure 16).

Figure 16. Penicillin-resistance amongst pneumococci from invasive disease cases, 2012–2021



Note: The bar chart and scale on the left-hand vertical axis show the percentage of pneumococcal isolates from invasive disease that were penicillin resistant (meningitis breakpoints). Each bar is split to indicate the proportion of the penicillin-resistant isolates that were PCV7 serotypes, the proportion that were serotype 19A and the proportion that were other serotypes. The line graph and scale on the right-hand vertical axis show the percentage of serotype 19A isolates that were penicillin resistant.

DISCUSSION

This report describes the epidemiology of IPD in New Zealand in 2023.

The incidence of IPD in the total population has been increasing since 2020 and in 2023 (14.5 cases per 100,000, 757 cases) is the highest it has been in the past 10 years. This increase in incidence is attributable to increasing rates of IPD in those ≥5 years; incidence rates in children aged <2 and 2-4 years decreased for the first time since 2020. While serotype 19A remains the predominant serotype in all age groups in 2023, fewer serotype 19A cases were reported in children aged <2 and 2-4 years. The reduction in incidence in young children and the decrease in reported serotype 19A cases is an early indication that the re-introduction of PCV13 is causing a reduction in IPD incidence through direct protection of vaccinated children. The impact of the changes to New Zealand's vaccination program is discussed further below.

IPD incidence follows a U-shaped distribution by age, with those aged <2 years and ≥65 years having the highest rates in 2023 (35.6 and 33.7 per 100,000 respectively). These incidence rates have converged when compared to 2022, where the incidence in children <2 years was substantially higher.

There are persistent and stark inequities in IPD incidence by ethnicity and socioeconomic deprivation. Māori and Pacific peoples experience the highest incidence of IPD overall and within most age groups. Overall age-adjusted incidence rates for Māori and Pacific people were 3.0 and 4.5 times, respectively, the incidence rate among European/Other/MELAA. This is higher than the incidence rate ratios reported in 2009 when PCV was first introduced to the childhood schedule [5]. In 2023, Māori and Pacific children <2 years had 2.5 and 2.7 times, respectively, the incidence seen in European/Other/MELAA children. This disparity has increased compared with the previous report (where Māori and Pacific children <2 years had 1.8 and 2.4 times, respectively, the incidence seen in European/Other/MELAA children) and may reflect inequitable access to vaccination for Māori and Pacific children.

The IPD incidence rate increases with socioeconomic deprivation. In 2023, the incidence rates among those living in areas of the highest deprivation were three-fold higher than those living in areas with the lowest deprivation. Inequities by ethnicity and deprivation compound, with the highest incidence rates seen among Māori and Pacific peoples living in areas of highest deprivation.

IMPACT OF NATIONAL IMMUNISATION PROGRAMME ON IPD INCIDENCE IN NEW ZEALAND

Monitoring the epidemiology of IPD in New Zealand provides insight into the effectiveness of the PCV immunisation programme and provides information to inform future decisions about the immunisation programme.

The epidemiology of IPD in New Zealand since PCV was included in the childhood immunisation schedule shows that the vaccine provides direct protection against the serotypes it covers, and, over time, provides indirect protection to others in the community by reducing carriage among vaccinated children.

The proportion of cases caused by serotypes included in PCV7 and PCV10 have declined over time and in 2023, across all age groups, only 3.1% of cases (22/705) where a serotype was identified were caused by serotypes contained in these vaccines.

Increasing IPD incidence in 2020-2021, driven by increases in serotype 19A, informed a decision to re-introduce PCV13 into the immunisation schedule in December 2022. This report covers the first 12-month period in which PCV13 was the scheduled vaccine. The cohort of children <2 years old in this report includes children who were eligible for PCV10, PCV13 and a combination of both vaccines. The re-introduction of PCV13 is having a direct impact on incidence of disease caused by 19A; cases due to 19A more than halved among those aged <2 years (from 37 in 2022 to 15 in 2023). Despite this, overall IPD incidence and the incidence of cases with serotype 19A remain higher in this age group than any year 2014-2020. Further decreases are anticipated as more children receive PCV13 as part of their routine vaccinations.

Cases of 19A among children aged 2 to 4 years also decreased in 2023, though to a lesser extent (from 25 in 2022 to 18 in 2023) This age cohort were not eligible for PCV13; indirect protection through reduced carriage of 19A among vaccinated infants may have contributed to this decrease.

Not all IPD is vaccine-preventable; around one quarter of cases among children <5 years in 2023 were due to serotypes not covered by any conjugate vaccine currently in global production. This highlights the importance of addressing underlying determinants of health and access to health services.

IPD incidence in those aged ≥65 years increased further in 2023, largely due to increases in serotype 19A. As with previous PCV vaccine introductions, the change in vaccine in the childhood immunisation schedule to PCV13 will over time have an indirect impact on the incidence in older age groups. Experience from other countries suggests it takes 3 to 4 years to achieve a 50% decrease in incidence of disease caused by PCV13 serotypes in unvaccinated older age groups through indirect protection[6].

In New Zealand, adults ≥65 years are recommended to receive one pneumococcal vaccine, although the vaccine is not funded for this age group. To reduce the incidence of disease, consideration could be made to making funded PCV13 available for older people as has been done in Australia. Aboriginal and Torres Strait Islander adults aged ≥50 and other adults aged ≥70 are eligible for funded pneumococcal vaccine in Australia [7]. The epidemiology of IPD in New Zealand supports a lower age eligibility for Māori and Pacific peoples for funded vaccine given the younger age at which incidence increases among these populations compared to the European/Other population.

Serotype replacement is a phenomenon associated with IPD. The history of IPD in New Zealand and overseas shows that serotype replacement occurs following the introduction of vaccine [8]. In New Zealand, there have been notable increases in the proportion of IPD cases caused by non-vaccine serotypes after PCV10 was re-introduced in 2017, in particular 19A [6]. Across all ages, serotype 8 was the second most common serotype identified in 2023, though uncommonly observed in children <2 years (*n*=5). The incidence of disease caused by serotype 8 increased in New Zealand between 2014 and 2022 though decreased into 2023. Serotype 8 is not covered by the vaccines currently available in New Zealand but is included in PCV20 which is now available overseas. Among children <5 years, 11 of 63 cases (17.5%) where a serotype was known were due to serotypes included in PCV20. It will be important to continue monitoring serotypes causing disease to enable evidence-based decisions around immunisation programme in the future.

Penicillin resistance in invasive pneumococci has increased over the last decade. This increase has largely been driven by an increase in the prevalence of serotype 19A isolates (which are more likely than other serotypes to be penicillin resistant) and increasing penicillin resistance among these isolates. The re-introduction of PCV13 is expected to reduce carriage and incidence of disease caused by serotype 19A, thereby also reducing prevalence of penicillin resistance.

CONCLUSION

The epidemiology of IPD in New Zealand in 2023 demonstrates early impact of the re-introduction of PCV13 to the childhood immunisation schedule in the first 12 months since this change. Incidence of IPD caused by serotype 19A more than halved among children <2 years, despite only some of this cohort being eligible for PCV13. Further reductions in incidence are anticipated as more children receive PCV13 as part of their routine immunisations.

Given the recent changes to the vaccine programme, the phenomenon of serotype replacement and the availability and development of new vaccines, it is important to continually monitor trends in IPD epidemiology to inform vaccine decisions in the future. One area that requires particular attention include monitoring incidence of serotype 8 and other serotypes not covered by current vaccines. It is also important to monitor trends in age and ethnic groups where there are clear disparities.

In addition to the changes in the PCV immunisation programme, there has been a recent decline in childhood immunisation coverage in New Zealand and increasing disparities in immunisation coverage. To further reduce the incidence of IPD in New Zealand and the inequities in incidence, it is important that immunisation coverage is increased with a focus on improving equity.

It is also important to note that not all IPD is vaccine-preventable and prevention efforts should extend to addressing determinants of health such as housing and equitable access and quality of health services for underserviced populations.

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