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# Invasive Pneumococcal Disease Surveillance, 1 July to 30 September 2019

Kate Pennington and the Enhanced Invasive Pneumococcal Disease Surveillance Working Group, for the Communicable Diseases Network Australia

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Quarterly report

# Invasive Pneumococcal Disease Surveillance, 1 July to 30 September 2019[i]

Kate Pennington and the Enhanced Invasive Pneumococcal Disease Surveillance Working Group, for the Communicable Diseases Network Australia

## Summary

The number of notified cases of invasive pneumococcal disease (IPD) in the third quarter of 2019 was higher than in the previous quarter, but lower than in the third quarter of 2018. Following the July 2011 replacement of the 7-valent pneumococcal conjugate vaccine (7vPCV) in the childhood immunisation program with the 13-valent pneumococcal conjugate vaccine (13vPCV), there was an initial relatively rapid decline in disease due to the additional six serotypes covered by the 13vPCV across all age groups, however more recently this decline is no longer evident. Over this period the number of cases due to the eleven serotypes additionally covered by the 23-valent pneumococcal polysaccharide vaccine (23vPPV), and also those serotypes not covered by any available vaccine, has been increasing steadily across all age groups.

## Key points

IPD exhibits seasonal variations with incidence increasing over the winter months in temperate countries. In the third quarter of 2019, there were 753 cases of IPD reported to the National Notifiable Disease Surveillance System (NNDSS). Compared to the previous quarter (n = 596), this represented a 26% increase in the number of cases, however compared to the same quarter in 2018 (n = 812) there were 7% fewer cases (Table 1, Figure 1). In the third quarter of 2019, the most common pneumococcal serotype causing IPD continued to be serotype 3 (16%; 118/753), followed by 22F (10%; 75/753) and 19F (6%; 50/753) (Table 2).

Among non-Indigenous Australians this quarter, cases continued to be highest among older adult age groups, especially those aged 55 years and older, and among children aged less than 5 years (Table **3**). Among Indigenous Australians, notifications were highest among children aged less than 5 years and adults aged 40–44 years. The proportion of cases reported as Indigenous Australians this quarter (13%; 99/753) equalled the proportion reported in the previous quarter (13%; 76/596) and was similar to the proportion in the third quarter of 2018 (12%; 101/812) (Table 1).

Children aged less than 5 years comprised 14% (102/753) of all cases reported in this quarter, which was lower than the proportion reported in the second quarter of 2019 (17%; 101/596) and equal to the proportion reported in the third quarter of 2018 (14%; 115/812). Serotype information was available for 71 (70%) of the cases aged less than 5 years this quarter. Around two-fifths of these cases (41%; 29/71) had a serotype included in the 13vPCV, which was a lower proportion than in the previous quarter (55%; 42/76) and in the third quarter of 2018 (49%; 40/82) (Figure 2). The most frequently reported serotypes among cases aged less than 5 years this quarter were serotypes 3 (30%; 21/71) and 23B (10%; 7/71). Only serotype 3 is included in the 13vPCV. Of the 29 cases aged

i Based on data extracted from the National Notifiable Diseases Surveillance System (NNDSS) on 7 November 2019. Due to the dynamic nature of the NNDSS, data on this extract is subject to retrospective revision and may vary from data reported in published NNDSS reports and reports of notification data by states and territories.

less than 5 years with 13vPCV serotype disease, 5 cases were fully vaccinated and considered to be 13vPCV failures. These 13vPCV failures were due to serotypes 3 (n = 4) and 19F (n = 1) (Table 4).

Among Indigenous Australians aged 50 years and over, there were 32 cases of IPD reported this quarter. The number of IPD cases reported in this population group this quarter was slightly lower than in the previous quarter (n = 35) and the third quarter of 2018 (n = 36). Of those cases with a reported serotype (n = 30), 23 (72%) were due to a serotype included in the 23vPPV (Figure 3). The proportion of cases with a reported serotype that were due to a serotype included in the 23vPPV was higher than in the previous quarter (68%; 21/31), but similar to the third quarter of 2018 (75%; 26/35). Amongst this population group this quarter, the most frequently reported serotypes were serotypes 22F (n = 5), 8 (n = 4) and 10A (n = 4), all of which are included in the 23vPPV.

Among non-Indigenous[ii] Australians aged 65 years and over there were 264 cases of IPD reported this quarter. The number of notified cases of IPD in this population group was 26% higher than in the previous quarter (n = 209) and 15% lower than the number reported in the third quarter of 2018 (n = 310). Of those cases with a reported serotype (n = 244), 64% (155/244) were due to a serotype included in the 23vPPV (Figure 4). This was similar to the proportions in the previous quarter (61%; 123/201) and in the third quarter of 2018 (63%; 187/295). For this quarter, serotype 3 (n = 44) was the most common serotype reported for this population group, followed by serotypes 22F (n = 28) and 19F (n = 19). All of these serotypes are included in the 23vPPV.

During this quarter there were 48 deaths attributed to a variety of IPD serotypes. Thirty-three (69%) of the cases had a serotype covered by currently available pneumococcal vaccines, 10 (21%) were due to a non-vaccine serotype; there was one case each reported with a non typable isolate, a not viable isolare or no isolate referred; two cases were reported as being untyped. Four of the reported deaths this quarter were among Indigenous Australians. The median age of those cases reported to have died this quarter was 72 years (range 12 to 96 years).

## Notes

The data in this report are provisional and subject to change as laboratory results and additional case information become available. More detailed data analysis of IPD in Australia and surveillance methodology are described in the IPD annual report series published in *Communicable Diseases Intelligence*.

In Australia, pneumococcal vaccination is recommended as part of routine immunisation for children, individuals with specific underlying conditions associated with increased risk of IPD, and older Australians. More information on the National Immunisation Program and pneumococcal vaccination recommendations can be found on the Australian Government Department of Health Immunisation website (https://www.health.gov.au/health-topics/immunisation).

In this report, a 'vaccine failure' is reported when a child aged less than 5 years is diagnosed with IPD due to a serotype found in the 13vPCV and they have received 3 primary scheduled doses of 13vPCV at least 2 weeks prior to disease onset with at least 28 days between doses of vaccine.

There are currently two pneumococcal vaccines available in Australia via the National Immunisation Program, each targeting multiple serotypes (13vPCV and 23vPPV). Note, in this report serotype analysis is generally grouped according to vaccine composition, both historic and current (Table 5).

Follow-up of all notified cases of IPD is undertaken in all states and territories except New

ii Non-Indigenous Australians includes cases reported with an Indigenous status of non-Indigenous, not stated, blank or unknown.

South Wales and Victoria who conduct targeted follow-up of notified cases aged under 5 years, and 50 years or over for enhanced data. Follow-up of notified cases of IPD in Queensland is undertaken in all areas except Metro South and Gold Coast Public Health Units who conduct targeted follow-up of notified cases for those aged under 5 years only. However, in these areas where targeted case follow-up is undertaken, some enhanced data may also be available outside these targeted age groups.

## Acknowledgements

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Enhanced Invasive Pneumococcal Disease Surveillance Working Group contributors to this report include (in alphabetical order): Frank Beard (NCIRS), Heather Cook (NT and secretariat), Lucinda Franklin (Vic.), Carolien Giele (WA), Robin Gilmour (NSW), Michelle Harlock (Tas.), Ben Howden (Microbiological Diagnostic Unit, University of Melbourne), Sanjay Jayasinghe (NCIRS), Vicki Krause (NT and chair), Shahin Oftadeh (Centre for Infectious Diseases and Microbiology Laboratory Services, NSW Health Pathology), Sue Reid (ACT), Vitali Sintchenko (Centre for Infectious Diseases and Microbiology – Public Health, Westmead Hospital), Helen Smith (Queensland Health Forensic and Scientific Services), Janet Strachan (Vic.), Hannah Vogt (SA), Angela Wakefield (Qld).

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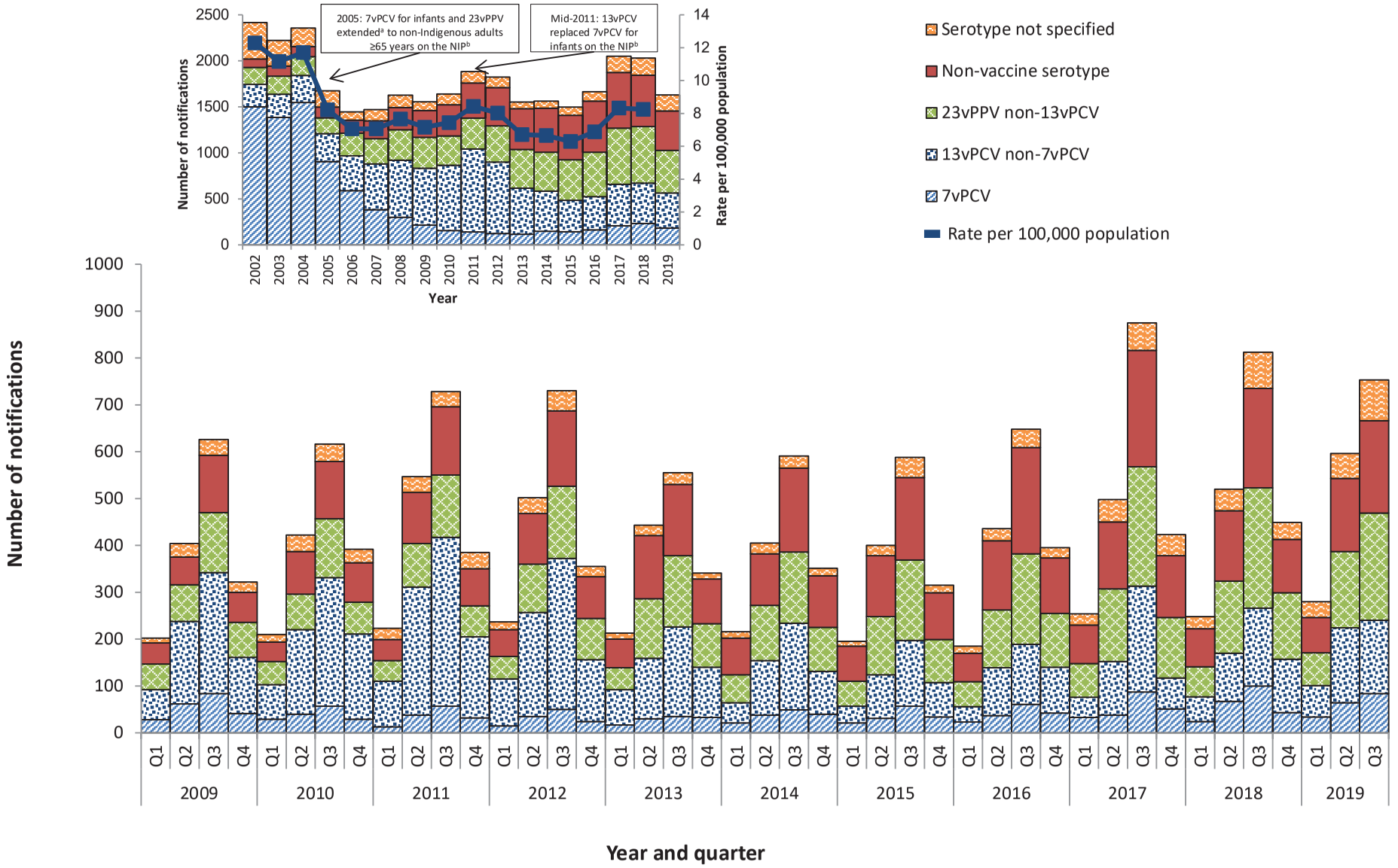
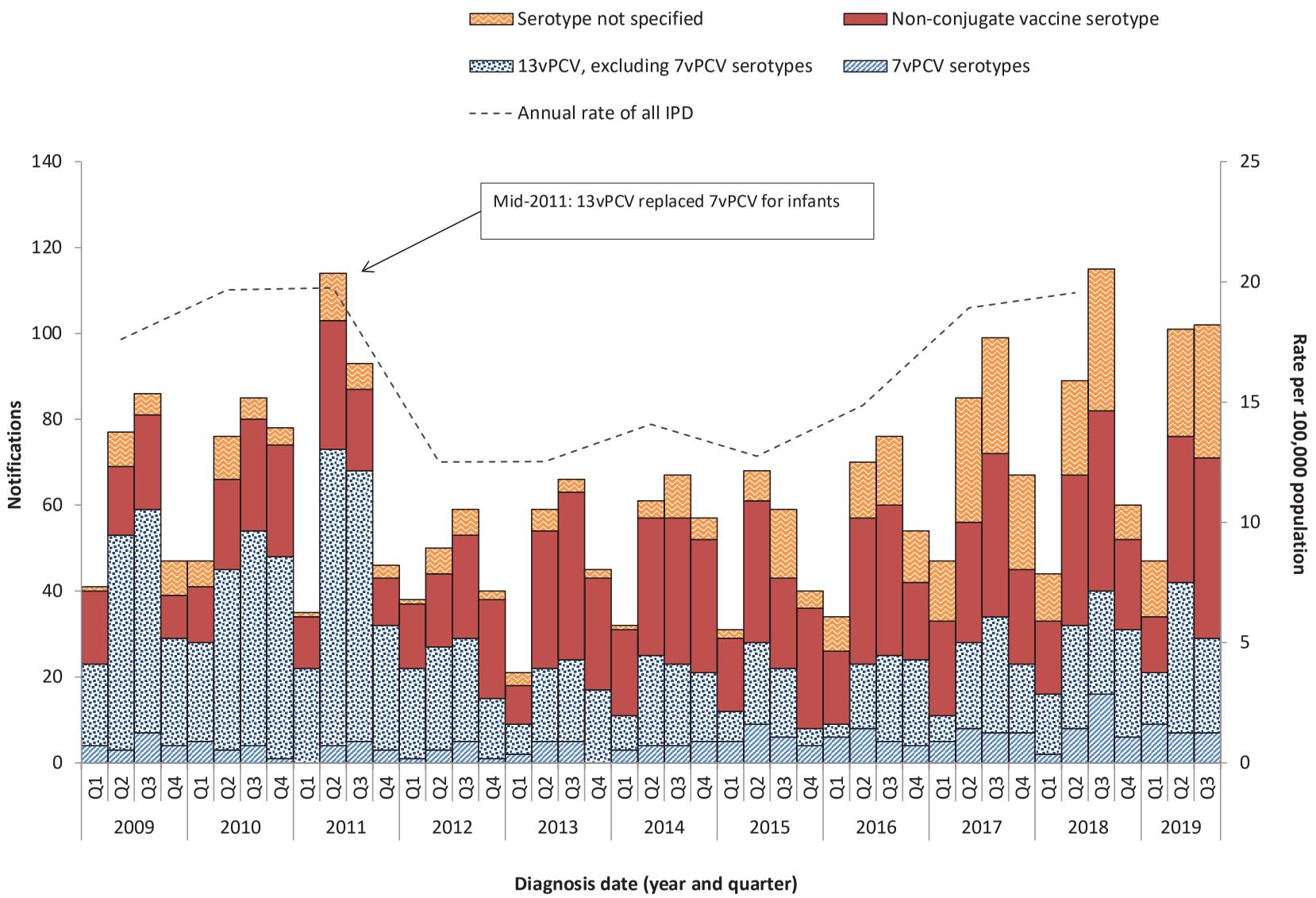
## Figure 1: Notifications of invasive pneumococcal disease, Australia, 1 January 2002 to 30 September 2019, by vaccine serotype group




a In 1999, the 23vPPV was funded for all Indigenous Australians aged 50 years and over, as well as younger Indigenous Australian adults with risk factors.

b NIP - National Immunisation Program.

**Figure 2: Notifications and annual rates[a] of invasive pneumococcal disease in children aged less than 5 years, Australia, 1 January 2009 to 30 September 2019, by vaccine serotype group**




a Annual rates are shown on quarter 2, excluding 2019.

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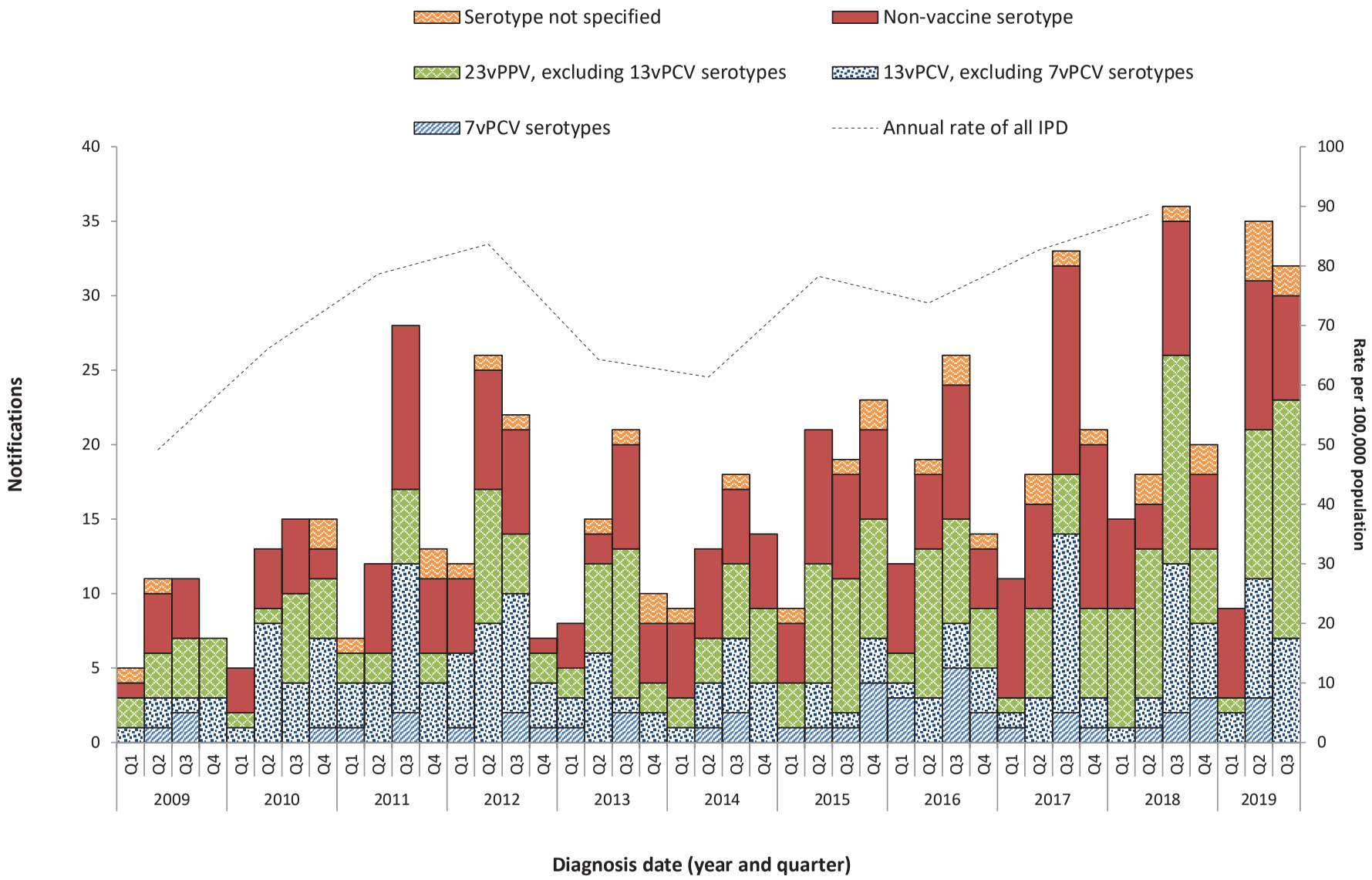
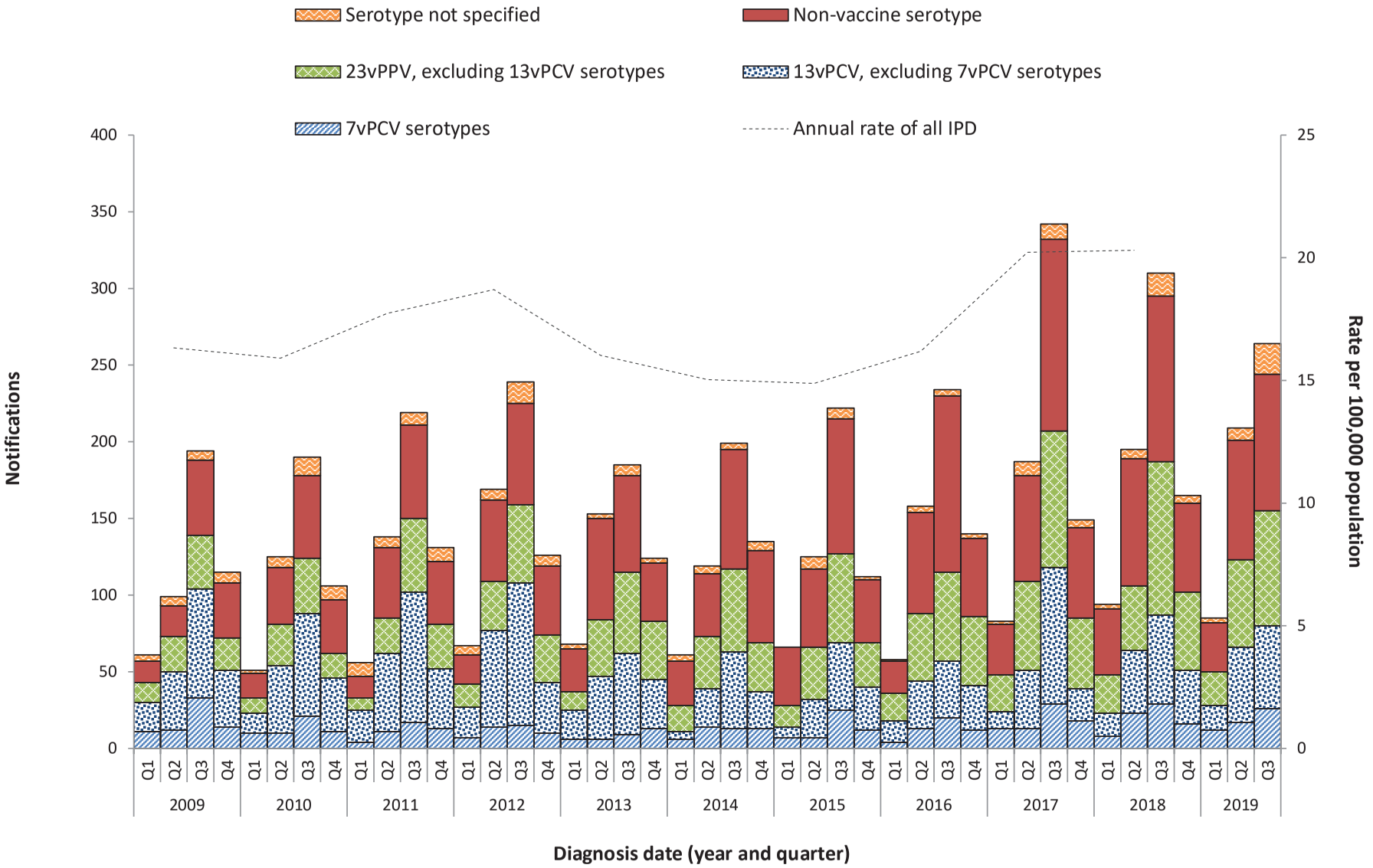
**Figure 3: Notifications and annual rates[a] of all invasive pneumococcal disease in Indigenous Australians aged 50 years or over, Australia, 1 January 2009 to 30 September 2019, by vaccine serotype group**




a Annual rates are shown on quarter 2, excluding 2019.

**Figure 4: Notifications and annual rates[a] of all invasive pneumococcal disease in non-indigenous Australians[b] aged 65 years or over, Australia, 1 January 2009 to 30 September 2019, by vaccine serotype group**




a Annual rates are shown on quarter 2, excluding 2019.
b Non-Indigenous Australians includes cases reported with as non-Indigenous, not stated, blank or unknown.

**Table 1: Notified cases of invasive pneumococcal disease, Australia, 1 July to 30 September 2019, by Indigenous status, serotype completeness and state or territory**

| Indigenous status | ACT | NSW | NT | Qld | SA | Tas | Vic | WA | Total 3rd qtr 2019 | Total 2nd qtr 2019 | Total 3rd qtr 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Indigenous | 1 | 24 | 10 | 21 | 11 | 0 | 5 | 27 | 99 | 76 | 101 |
| Non-Indigenous | 13 | 190 | 3 | 106 | 53 | 17 | 118 | 64 | 564 | 469 | 651 |
| Not stated / Unknown | 0 | 45 | 0 | 0 | 1 | 0 | 44 | 0 | 90 | 51 | 60 |
| **Total** | **14** | **259** | **13** | **127** | **65** | **17** | **167** | **91** | **753** | **596** | **812** |
| Indigenous status completeness[a] (%) | 100 | 83 | 100 | 100 | 98 | 100 | 74 | 100 | 88 | 91 | 93 |
| Indigenous status completeness in targeted groups[a,b] (%) | 100 | 86 | 100 | 100 | 98 | 100 | 95 | 100 | 94 | 95 | 99 |
| Serotype completeness[c] (%) | 100 | 90 | 100 | 94 | 65 | 100 | 95 | 81 | 89 | 92 | 94 |

a Indigenous status completeness is defined as the reporting of a known Indigenous status, excluding the reporting of not stated or unknown Indigenous status.
b Targeted groups for follow-up by almost all jurisdictions and public health units are cases aged less than 5 years and 50 years and over.
c Serotype completeness is the proportion of all cases of invasive pneumococcal disease that were reported with a serotype or reported as non-typable. Incomplete serotype data can occur in cases when (i) no isolate was available as diagnosis was by polymerase chain reaction and no molecular typing was attempted or was not possible due to insufficient genetic material; (ii) the isolate was not referred to the reference laboratory or was not viable; (iii) typing was pending at the time of reporting, or no serotype was reported by the notifying jurisdiction to the National Notifiable Diseases Surveillance System.

Table 2: Distribution of serotypes causing invasive pneumococcal disease in notified cases, Australia, 1 July to 30 September 2019, by age group

| | Age groups | | | |
|---|---|---|---|---|
| **Vaccine type and serotype** | **Under 5** | **5–64** | **65+** | **Serotype total[a]** |
| **7vPCV** | | | | |
| 4 | 0 | 9 | 1 | 10 |
| 14 | 1 | 8 | 4 | 13 |
| 19F | 6 | 25 | 19 | 50 |
| 18C | 0 | 6 | 0 | 6 |
| **13vPCV non-7vPCV** | | | | |
| 3 | 21 | 52 | 45 | 118 |
| 19A | 1 | 14 | 10 | 25 |
| 7F | 0 | 12 | 1 | 13 |
| **23vPPV non-13vPCV** | | | | |
| 8 | 1 | 17 | 4 | 22 |
| 10A | 3 | 11 | 2 | 16 |
| 11A | 2 | 4 | 11 | 17 |
| 12F | 0 | 12 | 1 | 13 |
| 9N | 3 | 29 | 14 | 46 |
| 22F | 3 | 41 | 31 | 75 |
| 15B | 3 | 4 | 4 | 11 |
| 17F | 0 | 3 | 3 | 6 |
| 33F | 2 | 9 | 9 | 20 |
| **Non-vaccine type** | | | | |
| 15A | 0 | 3 | 15 | 18 |
| 31 | 1 | 3 | 1 | 5 |

| Vaccine type and serotype | Age groups | | | Serotype total[a] |
|---|---|---|---|---|
| | Under 5 | 5–64 | 65+ | |
| 38 | 1 | 1 | 5 | 7 |
| 23B | 7 | 16 | 6 | 29 |
| 6C | 0 | 9 | 19 | 28 |
| 23A | 2 | 7 | 15 | 24 |
| 35B | 2 | 4 | 7 | 13 |
| 15C | 2 | 4 | 3 | 9 |
| 16F | 4 | 13 | 9 | 26 |
| 18A | 1 | 3 | 0 | 4 |
| 35F | 2 | 4 | 3 | 9 |
| 24F | 1 | 2 | 4 | 7 |
| 7C | 0 | 3 | 2 | 5 |
| Other | | | | |
| Other serotypes[a] | 2 | 13 | 6 | 21 |
| Unknown[b] | 31 | 36 | 20 | 87 |
| **Total** | **102** | **377** | **274** | **753** |

a Serotypes that only occur in less than 5 cases per quarter are grouped as 'Other' and include 'non-typable' isolates this quarter.
b 'Serotype unknown' includes those serotypes reported as 'no isolate', 'not referred', 'not viable', 'typing pending' and 'untyped'.

**Table 3: Notified cases of invasive pneumococcal disease, Australia, 1 July to 30 September 2019, by Indigenous status and age group**

| Age group | Indigenous status | | | Total |
|---|---|---|---|---|
| | Indigenous | Non-Indigenous | Not reported[a] | |
| 00–04 | 16 | 81 | 5 | 102 |
| 05–09 | 3 | 20 | 5 | 28 |
| 10–14 | 3 | 6 | 4 | 13 |
| 15–19 | 6 | 3 | 4 | 13 |
| 20–24 | 6 | 5 | 1 | 12 |
| 25–29 | 3 | 6 | 5 | 14 |
| 30–34 | 5 | 5 | 9 | 19 |
| 35–39 | 6 | 13 | 10 | 29 |
| 40–44 | 13 | 15 | 4 | 32 |
| 45–49 | 6 | 18 | 12 | 36 |
| 50–54 | 9 | 34 | 1 | 44 |
| 55–59 | 9 | 53 | 4 | 66 |
| 60–64 | 4 | 61 | 6 | 71 |
| 65–69 | 5 | 52 | 5 | 62 |
| 70–74 | 4 | 39 | 4 | 47 |
| 75–79 | 1 | 46 | 3 | 50 |
| 80–84 | 0 | 42 | 4 | 46 |
| 85+ | 0 | 65 | 4 | 69 |
| **Total** | **99** | **564** | **90** | **753** |

a Not reported is defined as not stated, blank or unknown Indigenous status.

**Table 4: Characteristics of 13vPCV failures in children aged less than 5 years, Australia, 1 July to 30 September 2019**

| Age | Indigenous status | Serotype | Clinical category | Risk factor(s) |
|---|---|---|---|---|
| 2 years | Non-Indigenous | 3 | Pneumonia | No risk factor identified |
| 3 years | Non-Indigenous | 3 | Pneumonia | Childcare attendee |
| 3 years | Non-Indigenous | 3 | No data provided | – |
| 4 years | Non-Indigenous | 3 | Pneumonia (pleural empyema) | No risk factor identified |
| 4 years | Non-Indigenous | 19F | Pneumonia | Childcare attendee |

**Table 5: *Streptococcus pneumoniae* serotypes targeted by pneumococcal vaccines**

| Serotypes | 7-valent pneumococcal conjugate vaccine (7vPCV) | 10-valent pneumococcal conjugate vaccine (10vPCV) | 13-valent pneumococcal conjugate vaccine (13vPCV) | 23-valent pneumococcal polysaccharide vaccine (23vPPV) |
|---|---|---|---|---|
| 1 | | ✓ | ✓ | ✓ |
| 2 | | | | ✓ |
| 3 | | | ✓ | ✓ |
| 4 | ✓ | ✓ | ✓ | ✓ |
| 5 | | ✓ | ✓ | ✓ |
| 6A | | | ✓ | |
| 6B | ✓ | ✓ | ✓ | ✓ |
| 7F | | ✓ | ✓ | ✓ |
| 8 | | | | ✓ |
| 9N | | | | ✓ |
| 9V | ✓ | ✓ | ✓ | ✓ |
| 10A | | | | ✓ |
| 11A | | | | ✓ |
| 12F | | | | ✓ |
| 14 | ✓ | ✓ | ✓ | ✓ |
| 15B | | | | ✓ |
| 17F | | | | ✓ |
| 18C | ✓ | ✓ | ✓ | ✓ |

| Serotypes | 7-valent pneumococcal conjugate vaccine (7vPCV) | 10-valent pneumococcal conjugate vaccine (10vPCV) | 13-valent pneumococcal conjugate vaccine (13vPCV) | 23-valent pneumococcal polysaccharide vaccine (23vPPV) |
|---|---|---|---|---|
| 19A | | | ✓ | ✓ |
| 19F | ✓ | ✓ | ✓ | ✓ |
| 20 | | | | ✓ |
| 22F | | | | ✓ |
| 23F | ✓ | ✓ | ✓ | ✓ |
| 33F | | | | ✓ |