



SUMMARY

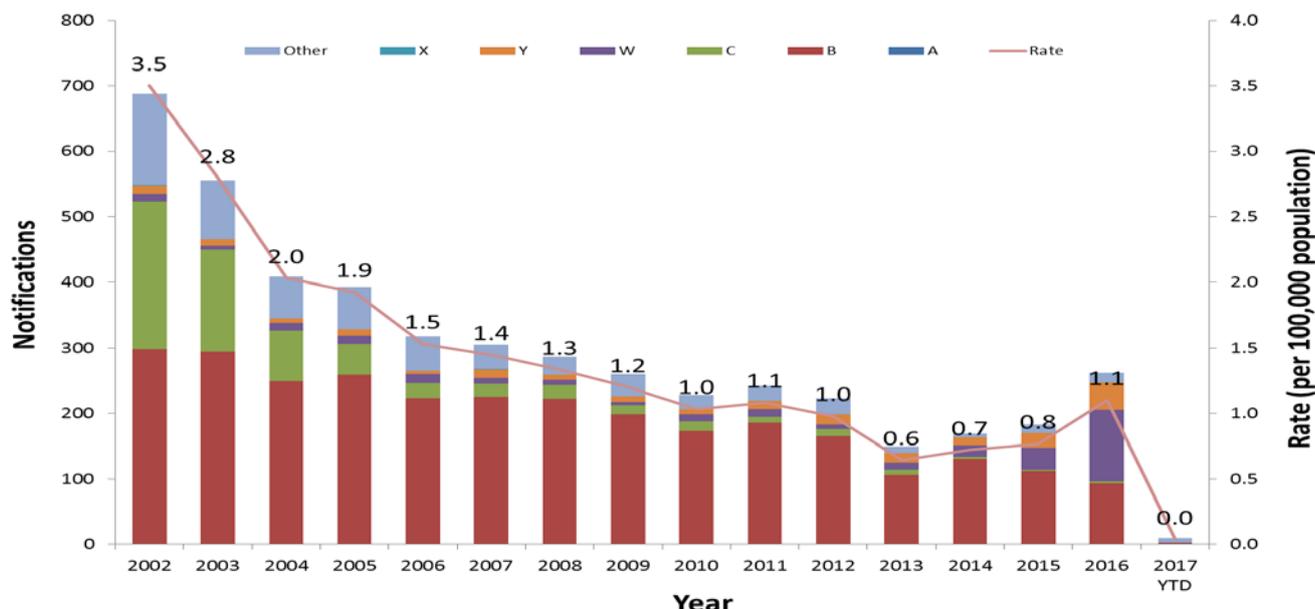
- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2015 serogroup W (MenW) has emerged as a significant cause of IMD with notifications increasing nearly five-fold between 2014 and 2016.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was meningococcal B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia.
- In 2016, MenW increases were not uniform across Australia but the serogroup accounted for an increasing burden of IMD across all jurisdictions, except the Northern Territory.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. Notifications in 2016 followed a similar trend with reported cases peaking in August and October. A total of 9 cases of IMD have been reported in January 2017 year to date (YTD).
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent ST11 clonal complex, associated with a higher risk of invasive disease and a higher case fatality rate.

ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the meningococcal C (MenC) vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013 (Figure 1). However, from 2014 the overall rate of IMD has increased. In 2016, there were a total of 262 IMD cases compared to 149 IMD cases in 2013 (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. In 2016, MenB accounted for 35% of IMD cases (n=93) notified to the NNDSS.
 - MenC, the target of a national immunisation since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline).
 - Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (110).
 - Annual notifications of serogroup Y (MenY) have ranged from 5 to 41 since 2002, with an increasing trend since 2011. In 2016, there were 41 notifications on MenY compared to 22 and 12 in 2015 and 2014 respectively.
 - Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There were no notifications of either MenA or MenX in 2016.

Figure 1. Notifications of IMD by serogroup and rates, Australia, 2002 to 2017 YTD*

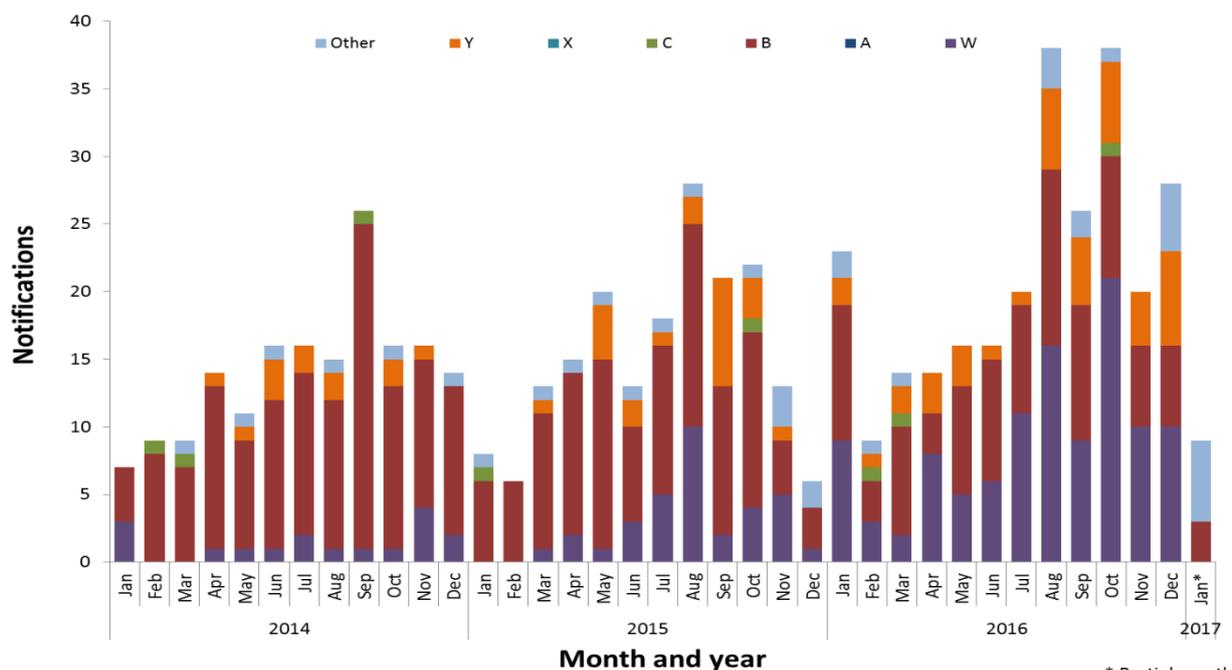


Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 9 January 2017.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 38 cases in both August and October. Notifications decreased in November 2016 (20 cases) and December (28 cases).
 - The shift in serogroup predominance has become increasingly evident since April 2016, with one-third or more of IMD notifications each month caused by MenW (Figure 2).
 - A total of 9 cases of IMD have been reported in January 2017 YTD. Of these, 3 cases are MenB and 6 cases are serogroup typing pending or unknown.

Figure 2. Notifications of IMD by month and year of diagnosis and serogroup, Australia, 2014 to 2017 YTD*



* Partial month

Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known. *Data extracted from the National Notifiable Diseases Surveillance System on 9 January 2017.

Geographical distribution

- MenW accounted for 42% (110 cases) of notifications of IMD reported in 2016. Across jurisdictions this ranged from 0% in Northern Territory to 80% in Tasmania (Table 1).
- MenW increases are not uniform across Australia but the serogroup is accounting for an increasing burden of IMD across all jurisdictions, except the Northern Territory (Table 2). Compared to 2015, the cases in 2016 were:
 - 3.4 times in New South Wales from 8 to 27 cases, respectively
 - 3.3 times in Queensland from 4 to 13 cases, respectively
 - 3.0 times in Western Australia from 4 to 12 cases, respectively
 - 2.8 times in Victoria from 17 to 48 cases, respectively, and
 - South Australia and Tasmania have also reported increases (from no cases to 5 cases in South Australia, and from 1 to 4 cases in Tasmania, respectively) and, in 2016, the Australian Capital Territory reported its first case of MenW since 2008.

Table 1. Notifications of IMD by serotype, Australia, 2016 by state and territory

State or territory	Notifications							Rate (per 100,000 population)	
	A	B	C	W	X	Y	Other		Total
ACT	0	1	0	1	0	0	0	2	0.51
NSW	0	27	2	27	0	16	6	78	1.02
NT	0	2	0	0	0	0	0	2	0.82
QLD	0	16	0	13	0	13	4	46	0.96
SA	0	23	0	5	0	0	0	28	1.65
TAS	0	0	0	4	0	1	0	5	0.97
VIC	0	18	1	48	0	9	4	80	1.35
WA	0	6	0	12	0	2	1	21	0.81
Australia	0	93	3	110	0	41	15	262	1.10

Table 2. Notifications and rate of MenW, Australia, 2013 to 2017 YTD by state and territory

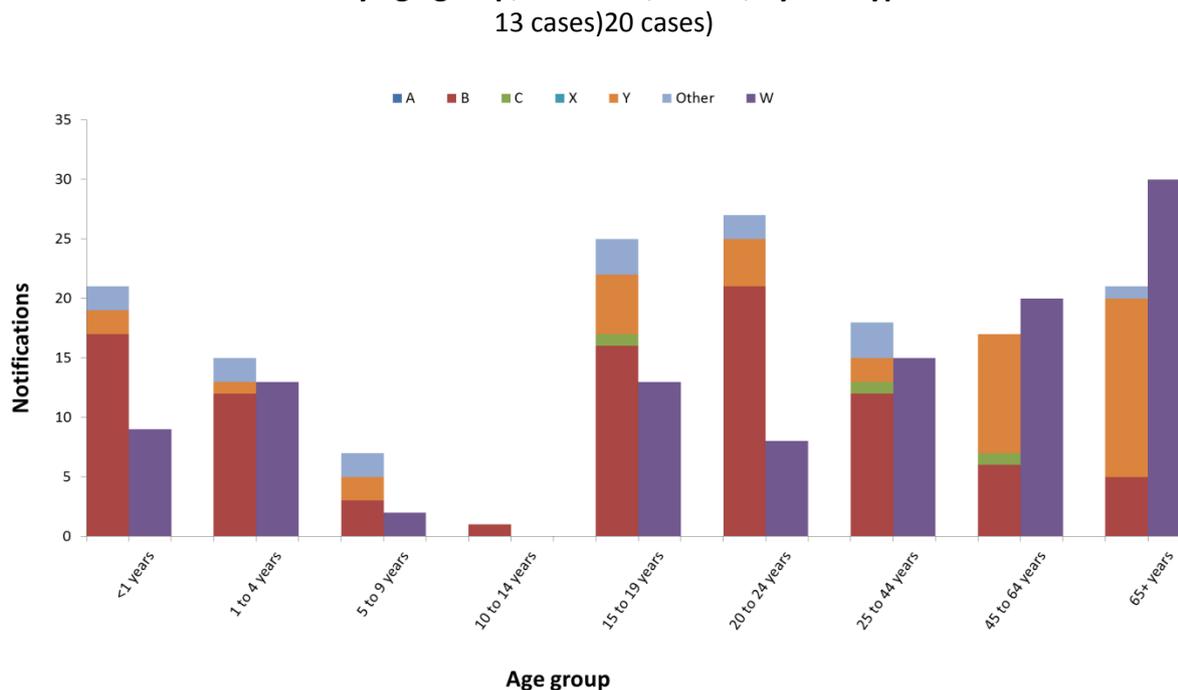
Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	AUS
	Notifications								
2013	0	5	0	3	1	0	1	1	11
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	27	0	13	5	4	48	12	110
2017 YTD	0	0	0	0	0	0	0	0	0
Rate (per 100,000 population)									
2013	-	0.07	-	0.06	0.06	-	0.02	0.04	0.05
2014	-	0.09	-	0.06	-	0.19	0.07	0.08	0.07
2015	-	0.10	-	0.08	-	0.19	0.29	0.15	0.14
2016	0.26	0.35	-	0.27	0.29	0.77	0.81	0.46	0.46
2017 YTD*	-	-	-	-	-	-	-	-	-

* annualised rate

Age distribution

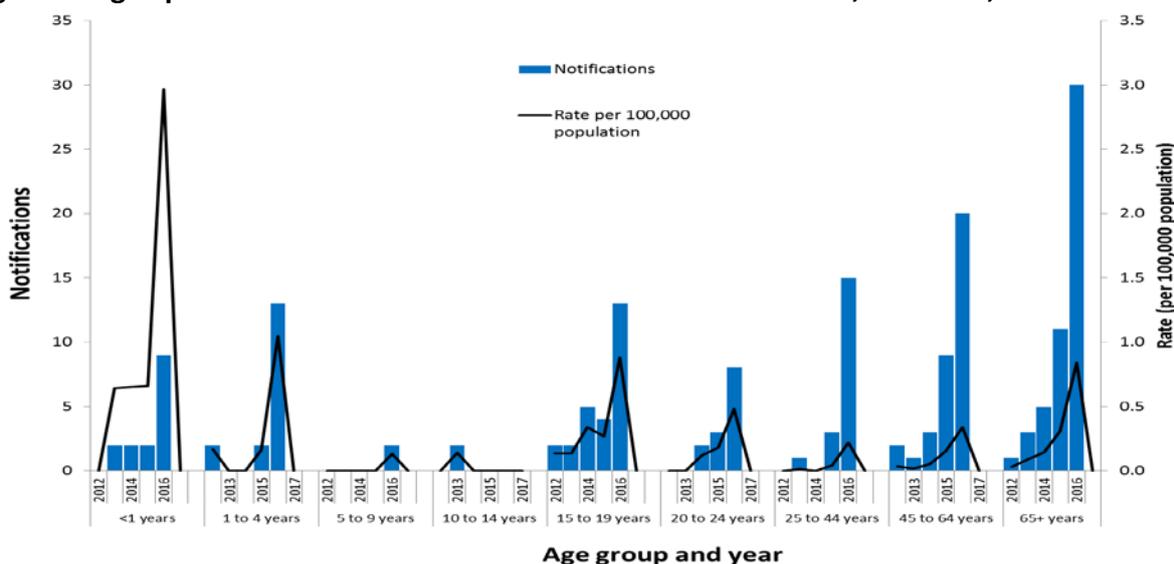
- In 2016, MenW was reported in all age groups, except in children aged 10 to 14 years.
- MenW accounts for 59% of IMD disease in adults aged 65 years and older.
- Age-specific rates of MenW, while remaining low, have increased in most age groups over the past 5 years (Figure 4).
- Notifications of MenW have remained low in children aged less than 5 years up until 2016, with no more than 2 cases reported annually in children aged less than 1 year and no more than 4 cases reported annually in children aged between 1 and 5 years since reporting began in 2002 (Figure 4). However in 2016, 9 cases of MenW were reported in children aged less than 1 year and 13 cases have been reported in children aged between 1 and 4 years.

Figure 3. Notifications of IMD by age group, Australia, 2016*, by serotype.



*Data extracted from the National Notifiable Diseases Surveillance System on 9 January 2017.

Figure 4. Age-specific notifications and rate of MenW notifications, Australia, 2012-2017 YTD*



*Data extracted from the National Notifiable Diseases Surveillance System on 9 January 2017.

Clinical presentation and severity

- Many MenW strains identified in Australia belong to the hypervirulent ST11 clonal complex. ST11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹ However non-specific presentation is not uncommon for IMD.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is nearly double the CFR of IMD due to all other serogroups (5%).
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the National Notifiable Diseases Surveillance System on 9 January 2017.
- Data extracted by diagnosis date.

REFERENCES

- ¹. Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine* 34 (13): 1515-1523.
- ². Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases* Dec 2010: 853-61



SUMMARY

- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2013 serogroup W (MenW) has emerged as a significant cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was meningococcal B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia.
- A total of 38 cases of IMD have been reported in 2017 year-to-date (YTD). Of these, 12 cases were due to MenB, 10 cases were due to MenW, 7 cases were due to serogroup Y (MenY), 2 cases were due to serogroup C (MenC) and the serogroup for the remaining 7 cases is pending or unknown.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory and the Northern Territory.
- In 2017 YTD, a total of 7 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 3 cases were due to MenB, 2 cases were due to MenW, and the serogroup for the remaining 2 cases is pending or unknown.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in December 2016 (n=27) and January 2017 (n=28) were also high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent ST11 clonal complex, associated with a higher risk of invasive disease and a higher case fatality rate.

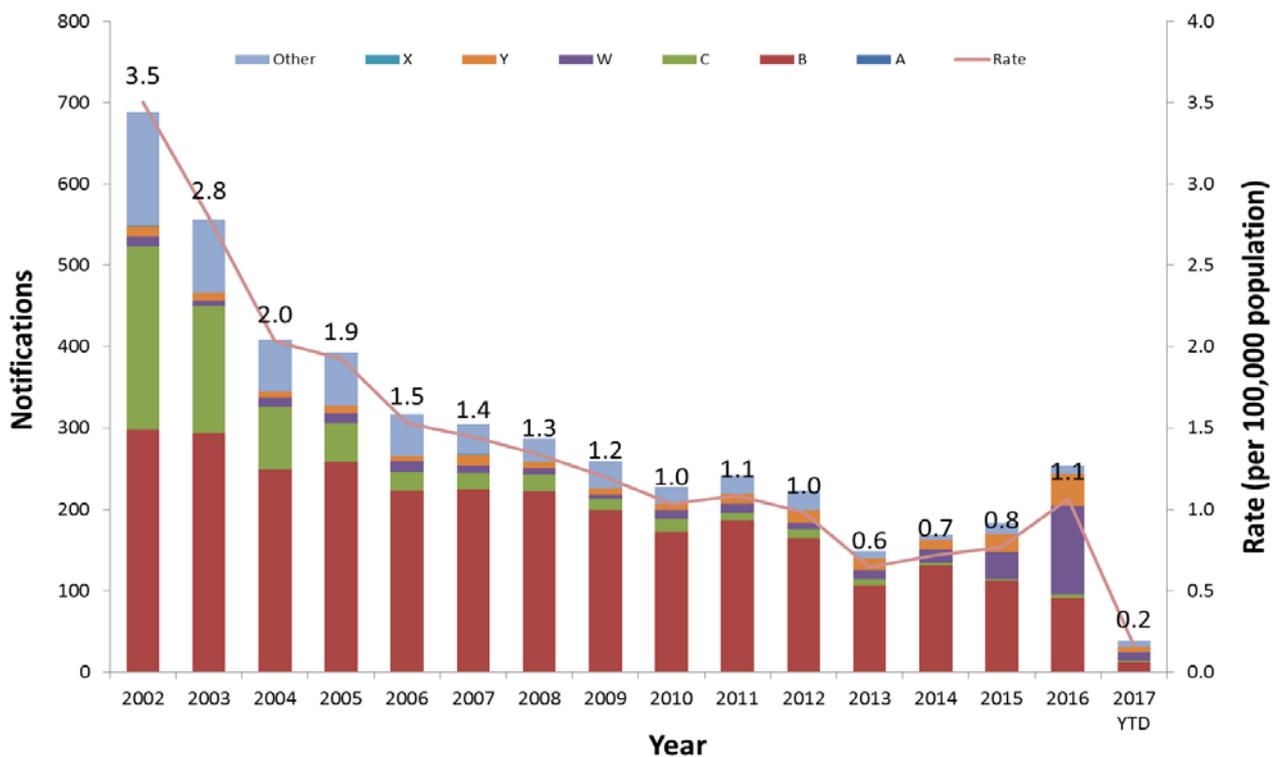
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD and 2016, there have been a total of 38 and 254 IMD cases respectively, compared to 149 IMD cases in 2013 (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 32% of IMD cases (n=12) notified to the National Notifiable Diseases Surveillance System (NNDSS) are MenB .

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 2 MenC cases have been notified to the NNDSS, one of which was acquired overseas.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (109). As of 17 February 2017, 10 cases of MenW have been notified to the NNDSS.
- Annual notifications of serogroup Y (MenY) have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014 respectively. So far in 2017, 7 MenY cases have been notified in Australia.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD*, by serogroup

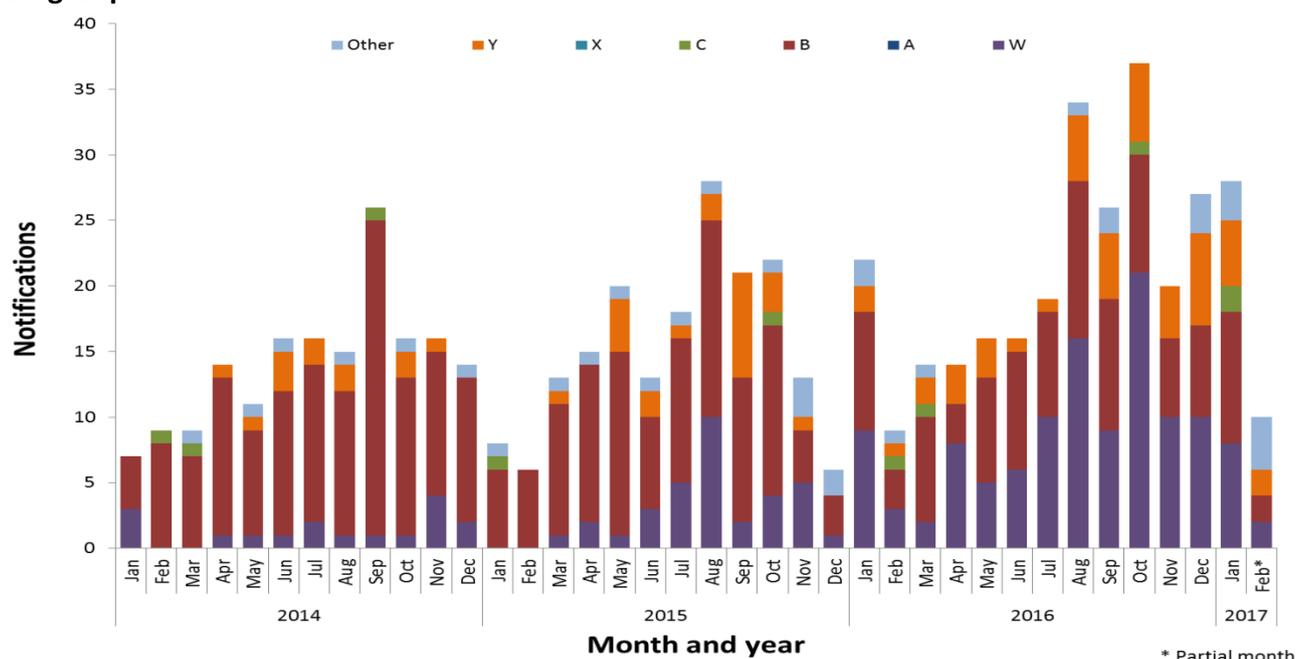


Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 17 February 2017.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in December 2016 (n=27) and January 2017 (n=28) were high when compared to the same months in previous years (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD*, by month and year of diagnosis and serogroup



Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 17 February 2017.

Geographical distribution

- MenW accounted for 26% (10 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in both the Australian Capital Territory (ACT) and the Northern Territory (NT) to 100% in Tasmania (Table 1).
- MenW increases are not uniform across Australia but the serogroup is accounting for an increasing burden of IMD across all jurisdictions, except the ACT and NT. The highest rate of notifications in 2017 YTD has been reported in Tasmania with 0.39 cases per 100,000 population (Table 2).

Table 1. Notifications of IMD, Australia, 2017 YTD by state and territory and serogroup

State or territory	Notifications							Total	Rate (per 100,000 population)
	A	B	C	W	X	Y	Other*		
ACT	0	0	0	0	0	0	0	0	0.00
NSW	0	3	2	2	0	2	1	10	0.13
NT	0	0	0	0	0	0	0	0	0.00
QLD	0	6	0	1	0	3	4	14	0.29
SA	0	1	0	1	0	1	0	3	0.18
TAS	0	0	0	2	0	0	0	2	0.39
VIC	0	2	0	2	0	1	1	6	0.10
WA	0	0	0	2	0	0	1	3	0.12
Australia	0	12	2	10	0	7	7	38	0.16

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Table 2. Notifications and rates of MenW, Australia, 2013 to 2017 YTD, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	AUS
Notifications									
2013	0	5	0	3	1	0	1	1	11
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	26	0	13	5	4	48	12	109
2017 YTD	0	2	0	1	1	2	2	2	10
Rate (per 100,000 population)									
2013	-	0.07	-	0.06	0.06	-	0.02	0.04	0.05
2014	-	0.09	-	0.06	-	0.19	0.07	0.08	0.07
2015	-	0.10	-	0.08	-	0.19	0.29	0.15	0.14
2016	0.26	0.34	-	0.27	0.29	0.77	0.81	0.46	0.46
2017 YTD*	-	0.03	-	0.02	0.06	0.39	0.03	0.08	0.04

*Not annualised rates.

Indigenous status

- In 2017 YTD, a total of 7 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 3 cases were due to MenB, 2 cases were due to MenW, and the serogroup for the remaining 2 cases is pending or unknown (Table 3).

Table 3. Notifications of IMD, Australia, 2017 YTD by Indigenous status and serogroup

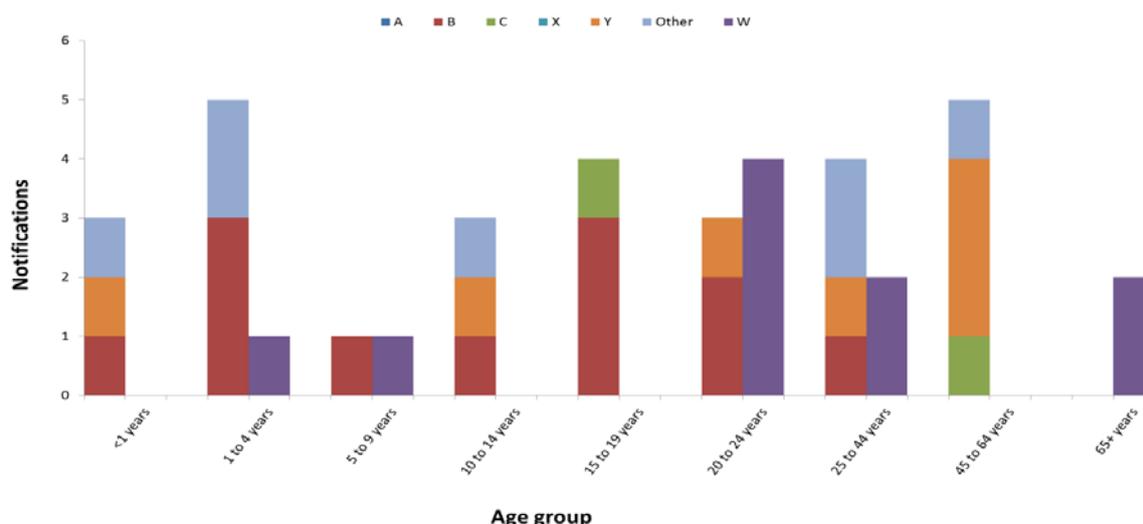
IMD serogroup	Indigenous	Non-indigenous	Total
A	0	0	0
B	3	9	12
C	0	2	2
W	2	8	10
Y	0	7	7
Other*	2	5	7
Total	7	31	38

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Age distribution

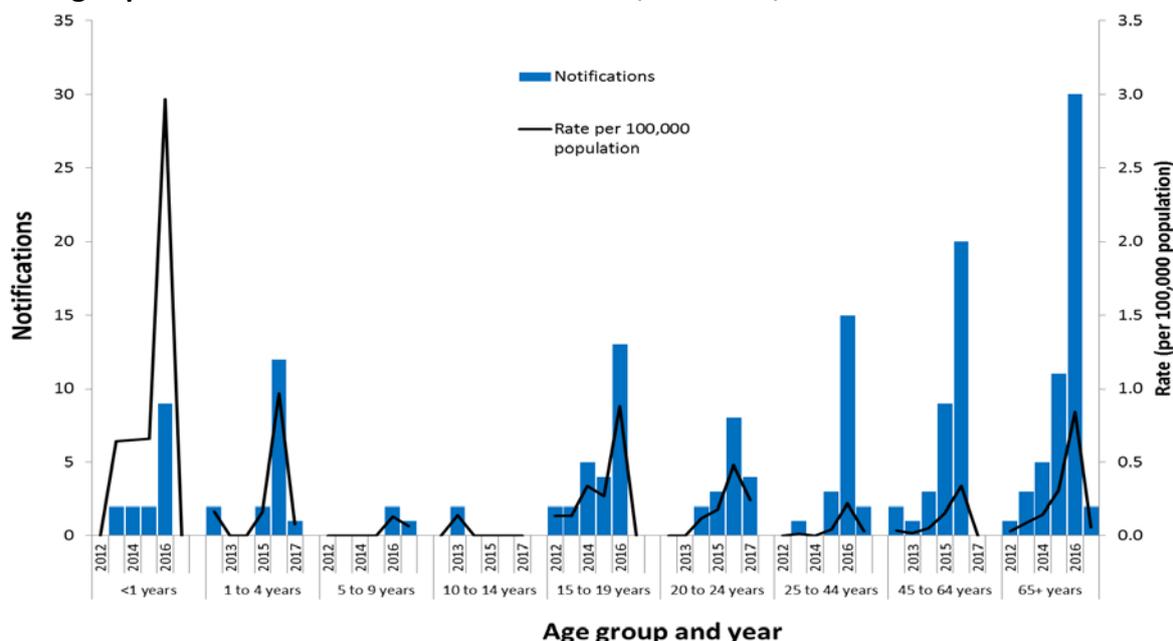
- So far in 2017, MenW has been reported in age groups, 1-4 years (1 case), 5-9 years (1 case), 20-24 years (4 cases), 25-44 years (2 cases) and 65 and over (2 cases) (Figure 3).
- MenW accounts for all cases of IMD in adults aged 65 years and older (2 cases).
- Age-specific rates of MenW, while remaining low, increased in most age groups from 2012 to 2016. Taking into account that 2017 data are partially complete, rates for the 20 to 24 year age group in 2017 YTD (0.2 per 100,000 population) are high when compared with rates in 2016 (0.5 per 100,000) and in 2015 (0.2 per 100,000) for the same age group (Figure 4).
- Prior to 2016, notifications of MenW remained low in children aged less than 5 years, with no more than 2 cases reported annually in children aged less than 1 year and no more than 4 cases reported annually in children aged between 1 and 5 years since reporting began in 2002 (Figure 4). However in 2016, 9 cases of MenW were reported in children aged less than 1 year and 12 cases were reported in children aged between 1 and 4 years. In 2017 YTD, 1 case of MenW has been reported in the 1-4 year age group.

Figure 3. Notifications of IMD, Australia, 2017 YTD*, by age group and serogroup



*Data extracted from the National Notifiable Diseases Surveillance System on 17 February 2017.

Figure 4. Age-specific notifications and rate of MenW, Australia, 2012 to 2017 YTD*



*Data extracted from the National Notifiable Diseases Surveillance System on 17 February 2017.

*Not annualised rates.

Clinical presentation and severity

- Many MenW strains identified in Australia belong to the hypervirulent ST11 clonal complex. ST11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹ However non-specific presentation is not uncommon for IMD.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is nearly double the CFR of IMD due to all other serogroups (5%). No deaths have occurred due to MenW in 2017 YTD.
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the National Notifiable Diseases Surveillance System on 17 February 2017.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date.

REFERENCES

- ¹. Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523*.
- ². Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*



SUMMARY

- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a significant cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 110 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 82 cases of IMD have been reported to the NNDSS. Of these, 27 cases were due to MenB, 26 cases were due to MenW, 18 cases were due to serogroup Y (MenY), 3 cases were due to serogroup C (MenC) and the serogroup for the remaining 8 cases is pending or unknown.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 10 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 5 cases were due to MenB, 4 cases were due to MenW, and 1 case was due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications reported between December 2016 and March 2017 were also high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent sequence type (ST) 11, which is part of the ST 11 clonal complex (CC 11). ST 11 is associated with a higher risk of invasive disease and a higher case fatality rate.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since from 2011. A total of 18 cases of MenY have been reported in 2017 YTD, accounting for 22% of notifications.

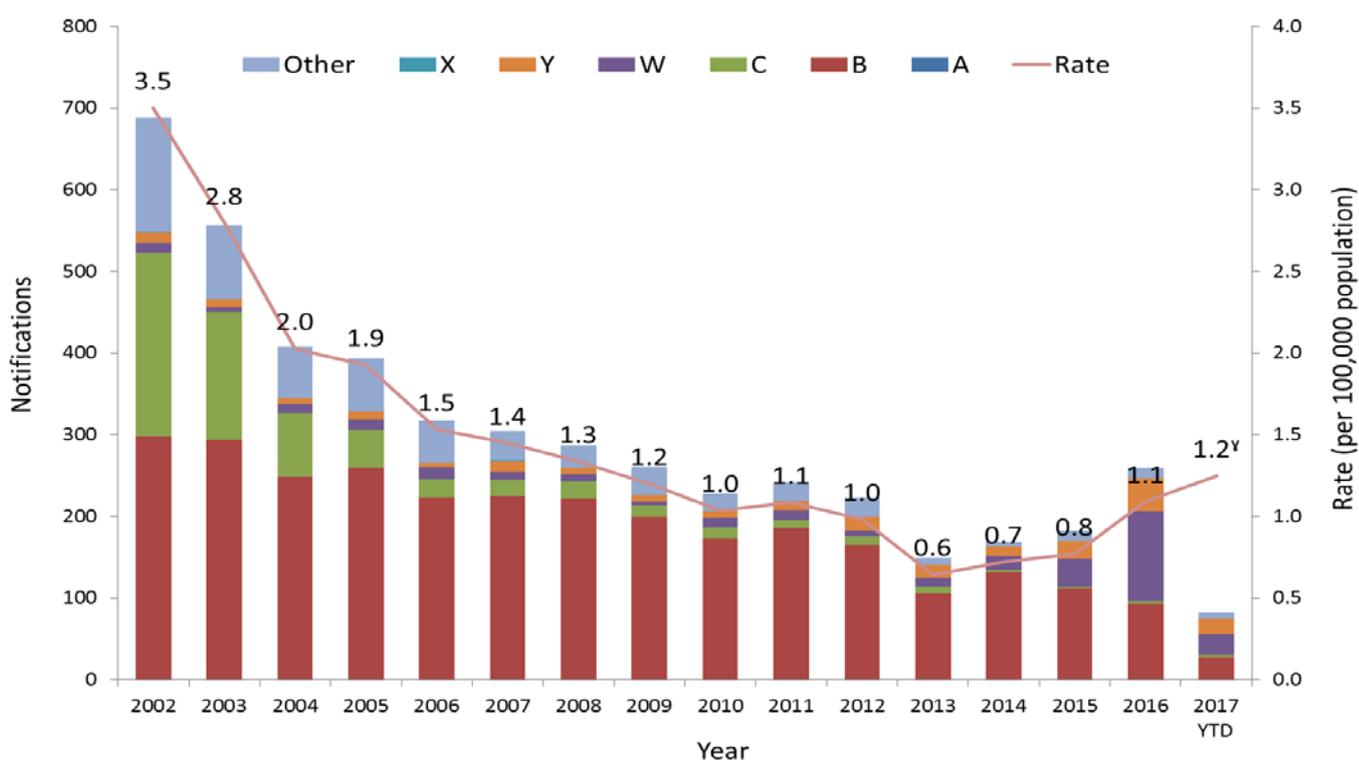
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD, there have been a total of 82 cases of IMD (0.3 per 100,000 (annualised rate 1.2 per 100,000)) compared to 254 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 33% of IMD cases (n=27) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 3 MenC cases have been notified to the NNDSS, one of which was acquired overseas.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (110). In 2017 YTD, 26 cases of MenW have been notified to the NNDSS. So far in 2017, 32% of IMD cases (n=26) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 41 since 2002, with an increasing trend since 2011. In 2016, there were 41 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 18 MenY cases have been notified to the NNDSS, accounting for 22% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD*, by serogroup



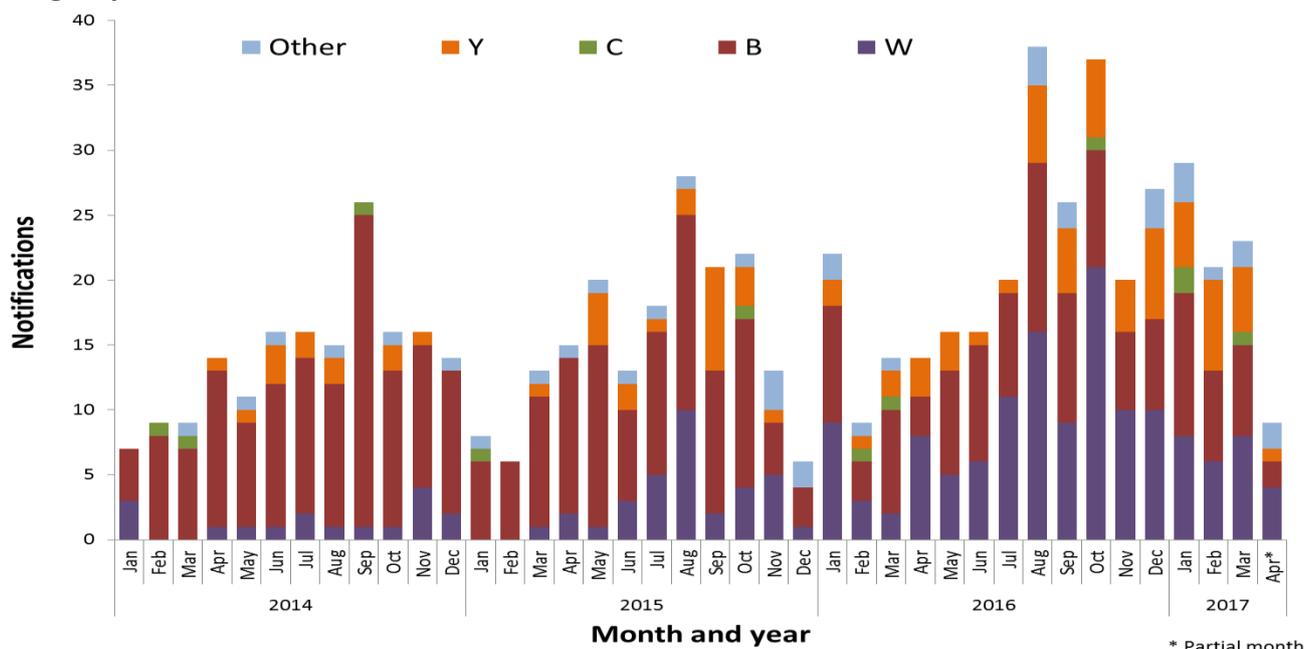
Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 13 April 2017.

^y The rate for 2017 YTD has been annualised.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in December 2016 (n=27), January 2017 (n=29), February 2017 (n=21) and March 2017 (n=23) were also high when compared to the same months in previous years.

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD*, by month and year of diagnosis and serogroup



Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 13 April 2017.

Geographical distribution

- MenW accounted for 32% (26 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in both the Australian Capital Territory (ACT) to 80% in Tasmania (Table 1).

Table 1. Notifications and rates of IMD, Australia, 2017 YTD by state and territory and serogroup

State or territory	Notifications								Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	Other*	Total		
ACT	0	0	0	0	0	0	0	0	-	-
NSW	0	9	2	2	0	2	3	18	0.2	0.9
NT	0	0	0	1	0	1	0	2	0.8	3.0
QLD	0	8	0	3	0	9	3	23	0.5	1.7
SA	0	2	0	2	0	2	0	6	0.4	1.3
TAS	0	0	0	4	0	0	1	5	1.0	3.5
VIC	0	5	0	10	0	4	0	19	0.3	1.2
WA	0	3	1	4	0	0	1	9	0.3	1.3
Australia	0	27	3	26	0	18	8	82	0.3	1.2

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- The highest rate of IMD due to MenW in 2017 YTD has been reported in Tasmania with an annualised rate of 2.8 cases per 100,000 population (Table 2).

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	27	0	13	5	4	48	12	110
2017 YTD	0	2	1	3	2	4	10	4	26
Rate (per 100,000 population)									
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.3	0.4	-	0.3	0.3	0.8	0.8	0.5	0.5
2017 YTD rate	-	0.0	0.4	0.1	0.1	0.8	0.2	0.2	0.1
2017 annualised rate	-	0.1	1.5	0.2	0.4	2.8	0.6	0.6	0.4

Indigenous status

- Between 2014 and 2017 YTD, a total of 73 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (Table 3). The majority (68%) of IMD cases reported in Aboriginal and Torres Strait Islander peoples were due to MenB. However, an increase in MenW notifications has also been observed.

Table 3. Notifications of IMD, Australia, 2014-2017 YTD by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	13	80	-	93
	2017 YTD	5	22	-	27
C	2014	-	3	-	3
	2015	-	2	-	2
	2016	-	3	-	3
	2017 YTD	-	3	-	3
W	2014	-	17	-	17
	2015	3	30	1	34
	2016	10	100	-	110
	2017	4	20	2	26
Y	2014	-	12	-	12
	2015	-	22	-	22
	2016	2	38	1	41
	2017 YTD	1	17	-	18
Other*	2014	1	5	-	6
	2015	2	11	-	13
	2016	-	12	-	12
	2017 YTD	-	8	-	8
TOTAL		73	611	9	693

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 10 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 5.5 per 100,000 population), compared to 69 cases reported in non-Indigenous populations (annualised rate = 1.0 per 100,000). Of the 10 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 5 cases were due to MenB, 4 cases were due to MenW, and 1 case was due to MenY (Table 4).

Table 4. Notifications and rates of IMD, Australia, 2017 YTD by Indigenous status and serogroup

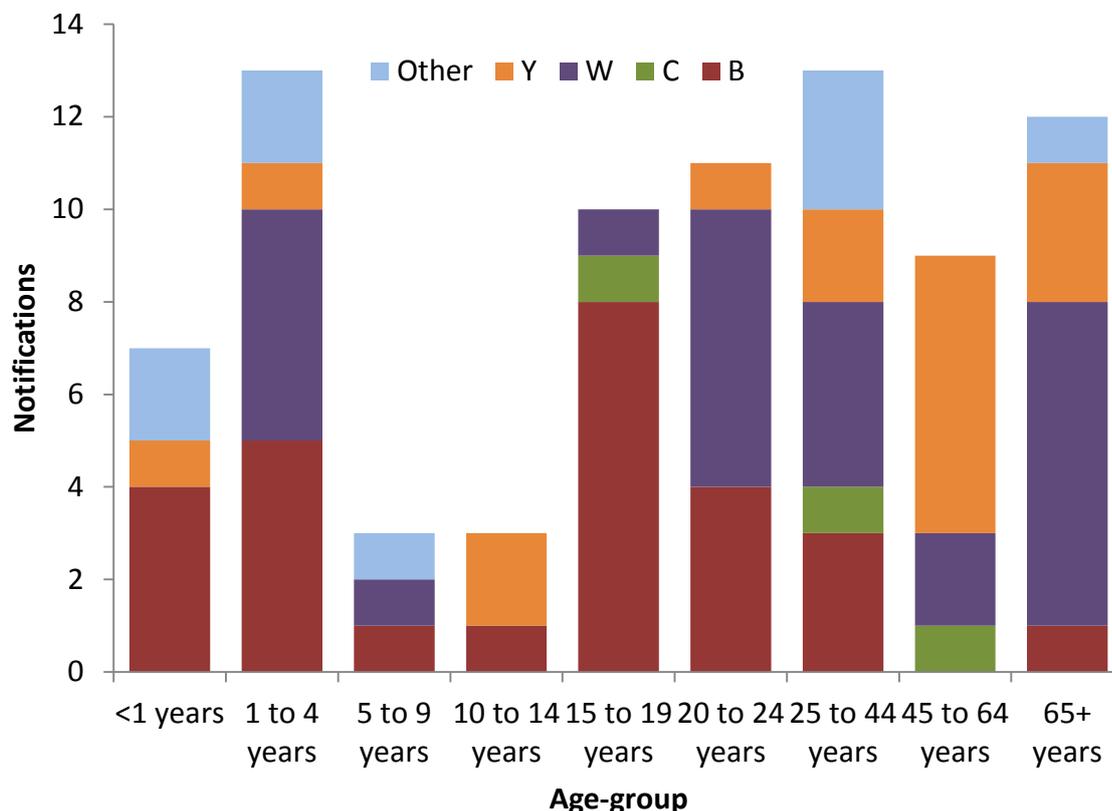
IMD serogroup	Indigenous			Non-Indigenous		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	5	0.8	2.7	22	0.1	0.3
C	0	-	-	3	<0.1	<0.1
W	4	0.6	2.2	20	0.1	0.3
Y	1	0.2	0.5	15	0.1	0.2
Other*	0	-	-	9	<0.1	0.1
Total	10	1.5	5.5	69	0.3	1.0

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Age distribution

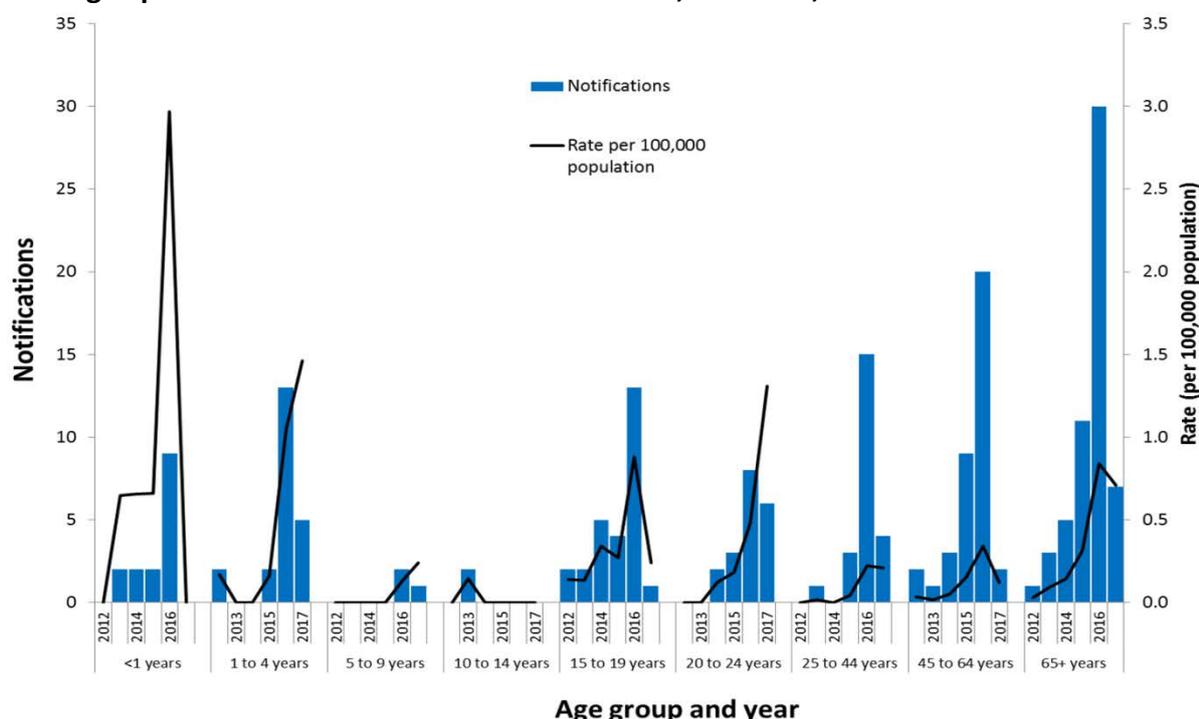
- So far in 2017, MenW has been reported in age groups, 1-4 years (5 cases), 5-9 years (1 case), 15-19 years (1 case), 20-24 years (6 cases), 25-44 years (4 cases), 45-64 (2 cases) and 65 and over (7 cases) (Figure 3).
- MenW accounts for 58% of cases of IMD in adults aged 65 years and older (7 cases).
- Age-specific rates of MenW, while remaining low, have increase in most age groups since 2012. Taking into account that 2017 data are partially complete, annualised rates for the 20 to 24 year age group in 2017 YTD (1.31 per 100,000 population) are high when compared with rates in 2016 (0.5 per 100,000) and in 2015 (0.2 per 100,000) for the same age group (Figure 4).
- In addition, prior to 2016, notifications of MenW remained low in children aged less than 5 years, with no more than 2 cases reported annually in children aged less than 1 year and no more than 4 cases reported annually in children aged between 1 and 5 years since reporting began in 2002 (Figure 4). However, in 2017 YTD , 5 cases of MenW have been reported in children aged between 1 and 4 years. Taking into account that 2017 data are partially complete, annualised rates for the 1 to 4 year age group in 2017 YTD (1.5 per 100,000 population) are high when compared with rates in 2016 (1.1 per 100,000) and in 2015 (0.2 per 100,000) for the same age group (Figure 4).

Figure 3. Notifications of IMD, Australia, 2017 YTD*, by age group and serogroup



*Data extracted from the National Notifiable Diseases Surveillance System on 13 April 2017.

Figure 4. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD*



^y2017 rates are annualised.

*Data extracted from the National Notifiable Diseases Surveillance System on 13 April 2017.

Clinical presentation and severity

- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the ST 11 clonal complex (CC 11). This was verified by the enhanced data collected in January 2017 for 237 of the 259 IMD cases reported in 2016. Of the 110 cases of MenW reported in 2016, 69 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were strain ST 11 (35 of 69 isolates).

- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹ However, non-specific presentation is not uncommon for IMD.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is nearly double the CFR of IMD due to all other serogroups (5%). No deaths have occurred due to MenW in 2017 YTD.
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 13 April 2017.
- Line-listed de-identified enhanced data on 237 IMD cases from 1 January 2016 to 16 January 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date.

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- ¹. Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523*.
- ². Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*



SUMMARY

- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a significant cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 110 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 99 cases of IMD have been reported to the NNDSS. Of these, 36 cases were due to MenB, 29 cases were due to MenW, 20 cases were due to serogroup Y (MenY), 3 cases were due to serogroup C (MenC) and the serogroup for the remaining 11 cases is pending or unknown.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 13 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 7 cases were due to MenB, 5 cases were due to MenW, and 1 case was due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications reported between December 2016 and April 2017 were also high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent sequence type (ST) 11, which is part of the ST 11 clonal complex (CC 11). ST 11 is associated with a higher risk of invasive disease and a higher case fatality rate. Two deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since from 2011. A total of 20 cases of MenY have been reported in 2017 YTD, accounting for 20% of notifications.

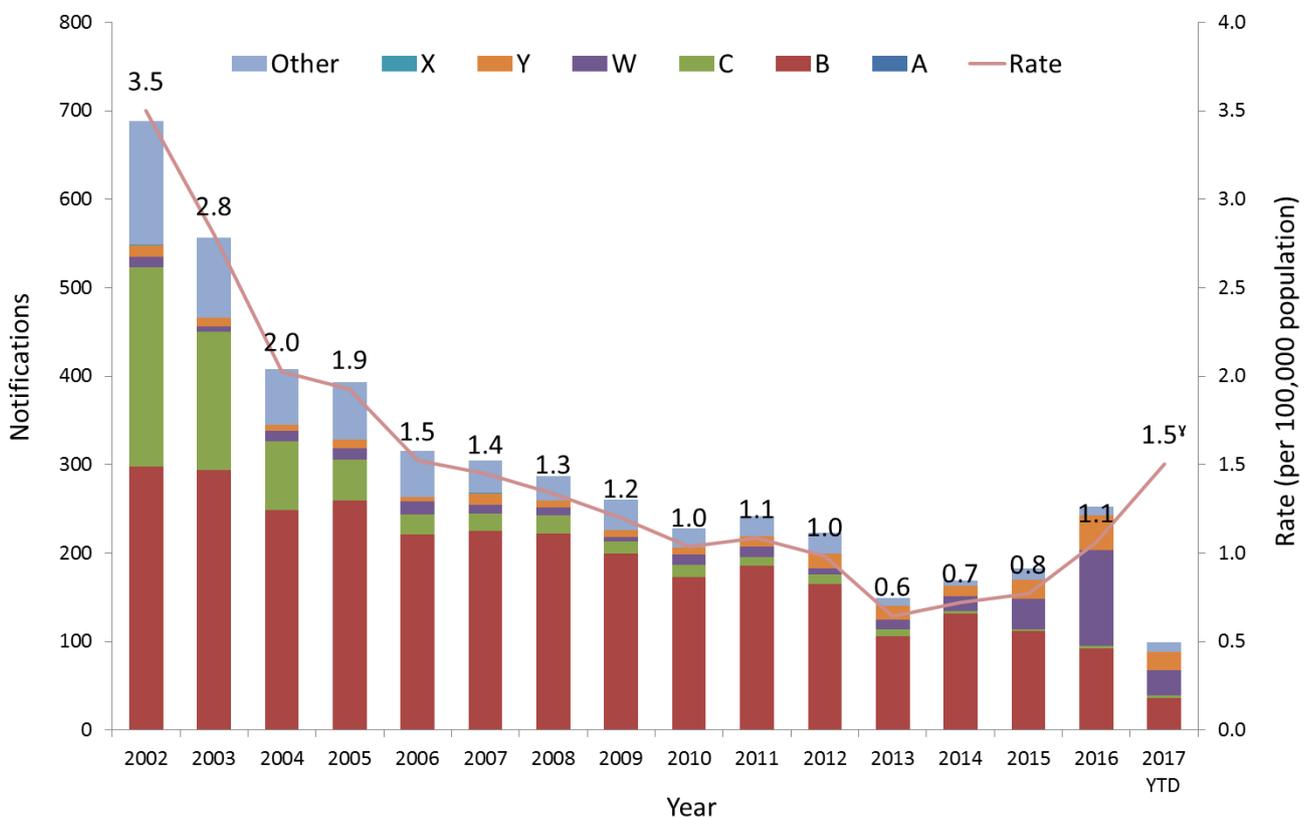
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD, there have been a total of 99 cases of IMD (0.4 per 100,000 (annualised rate 1.5 per 100,000)) compared to 252 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 36% of IMD cases (n=36) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 3 MenC cases have been notified to the NNDSS, one of which was acquired overseas.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (108). In 2017 YTD, 29% of IMD cases (n=29) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 20 MenY cases have been notified to the NNDSS, accounting for 20% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD*, by serogroup



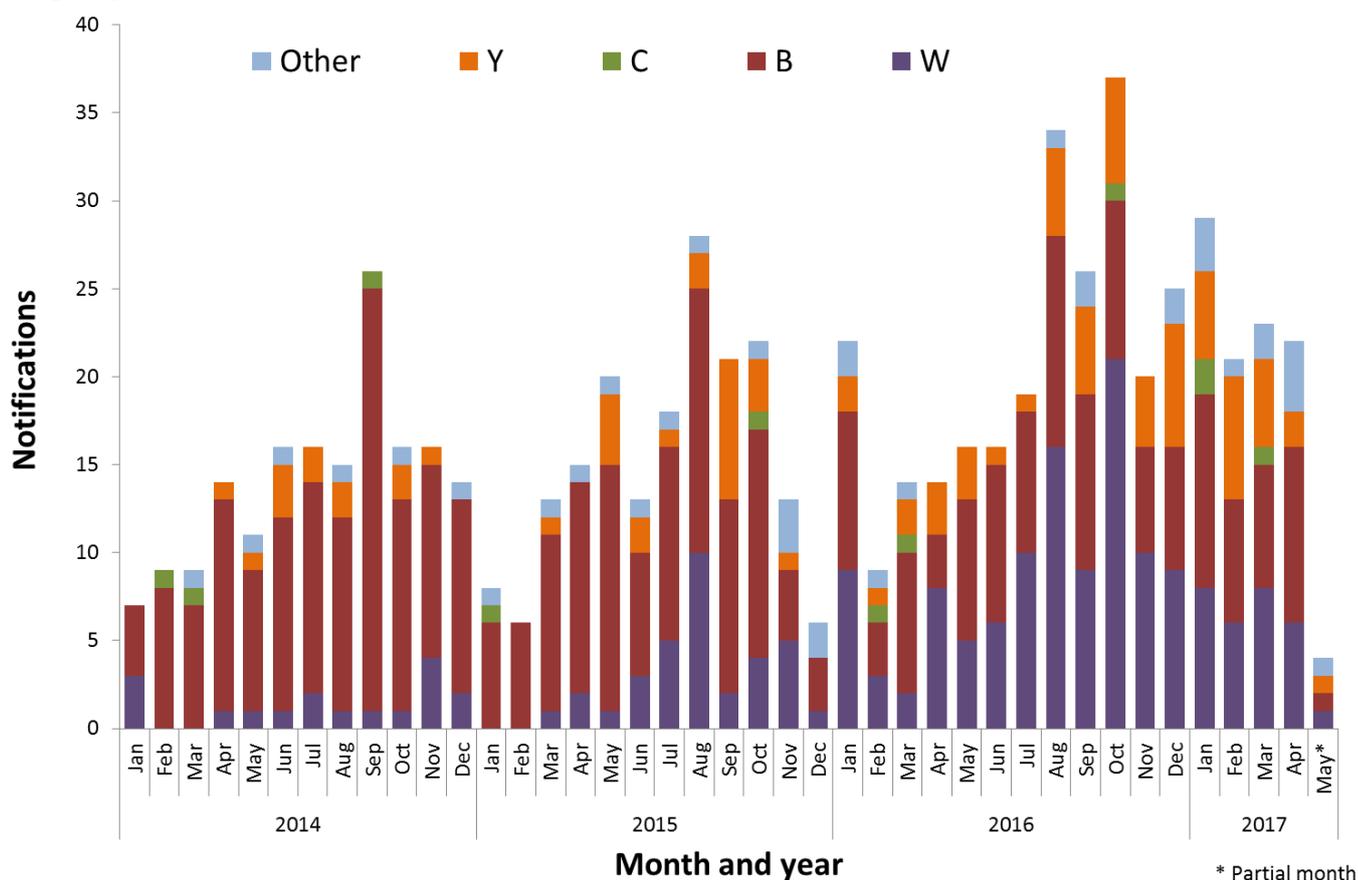
Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 15 May 2017.

^y The rate for 2017 YTD has been annualised.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in December 2016 (n=25), January 2017 (n=29), February 2017 (n=21), March 2017 (n=23) and April 2017 (n=22) were also high when compared to the same months in previous years (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD*, by month and year of diagnosis and serogroup



* Partial month

Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 15 May 2017.

Geographical distribution

- MenW accounted for 29% (29 cases) of notifications of IMD reported in 2017 YTD. Across jurisdiction this ranged from 0% in the Australian Capital Territory (ACT) to 80% (n=4) in Tasmania (Table 1).

Table 1. Notifications and rates of IMD, Australia, 2017 YTD by state and territory and serogroup

State or territory	Notifications							Total	Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	Other*			
ACT	0	0	0	0	0	0	0	0	-	-
NSW	0	14	2	3	0	3	5	27	0.4	1.3
NT	0	0	0	1	0	1	0	2	0.8	3.0
QLD	0	10	0	3	0	9	3	25	0.5	1.9
SA	0	3	0	2	0	2	0	7	0.4	1.5
TAS	0	0	0	4	0	0	1	5	1.0	3.5
VIC	0	6	0	11	0	5	1	23	0.4	1.4
WA	0	3	1	5	0	0	1	10	0.4	1.4
Australia	0	36	3	29	0	20	11	99	0.4	1.5

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- The highest rate of IMD due to MenW in 2017 YTD has been reported in Tasmania with an annualised rate of 2.8 cases per 100,000 population (Table 2).

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	25	0	13	5	4	48	12	108
2017 YTD	0	3	1	3	2	4	11	5	29
Rate (per 100,000 population)									
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.3	0.3	-	0.3	0.3	0.8	0.8	0.5	0.5
2017 YTD rate	-	0.0	0.4	0.1	0.1	0.8	0.2	0.2	0.1
2017 annualised rate	-	0.1	1.5	0.2	0.4	2.8	0.7	0.7	0.4

Indigenous status

- Between 2014 and 2017 YTD, a total of 75 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (Table 3). The majority (68%, 51/75) of IMD cases reported in Aboriginal and Torres Strait Islander peoples were due to MenB. However, an increase in MenW notifications has also been observed.

Table 3. Notifications of IMD, Australia, 2014-2017 YTD by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	-	92
	2017 YTD	7	29	-	36
C	2014	-	3	-	3
	2015	-	2	-	2
	2016	-	3	-	3
	2017 YTD	-	3	-	3
W	2014	-	17	-	17
	2015	3	30	1	34
	2016	10	98	-	108
	2017	5	24	-	29
Y	2014	-	12	-	12
	2015	-	22	-	22
	2016	2	38	-	40
	2017 YTD	1	19	-	20
Other*	2014	1	5	-	6
	2015	2	11	-	13
	2016	-	9	-	9
	2017 YTD	-	11	-	11
TOTAL		75	622	6	703

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 13 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 5.4 per 100,000 population), compared to 86 cases reported in non-Indigenous populations (annualised rate = 1.0 per 100,000). Of the 13 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 7 cases were due to MenB, 5 cases were due to MenW, and 1 case was due to MenY (Table 4).

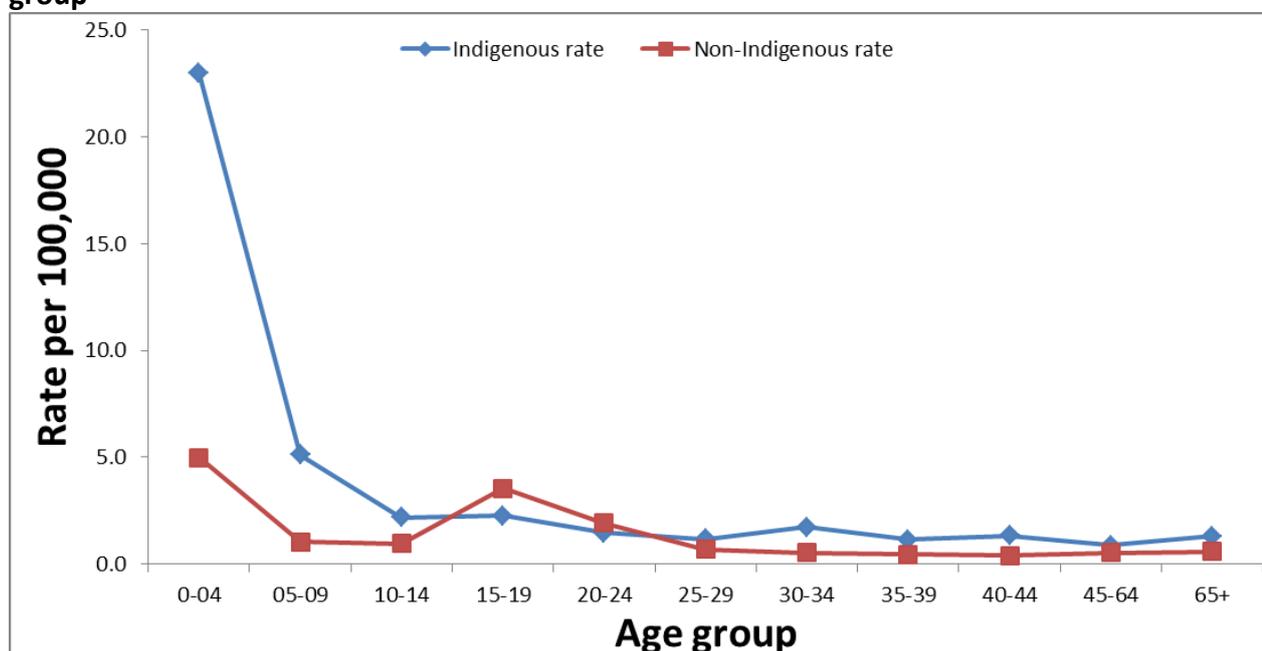
Table 4. Notifications and rates of IMD, Australia, 2017 YTD by Indigenous status and serogroup

IMD serogroup	Indigenous			Non-Indigenous		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	7	1.1	2.9	29	0.1	0.3
C	0	-	-	3	<0.1	<0.1
W	5	0.8	2.1	24	0.1	0.3
X	0	-	-	0	-	-
Y	1	0.2	0.4	19	0.1	0.2
Other*	0	-	-	11	<0.1	0.1
Total	13	2.0	5.4	86	0.4	1.0

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Since 2002, the notification rates of IMD have been higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (23 per 100,000) and 5-9 years (5.1 per 100,000) compared to those who reported as non-Indigenous; 5 per 100,000 and 1.0 per 100,000 respectively.

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD*, by Indigenous status and age group



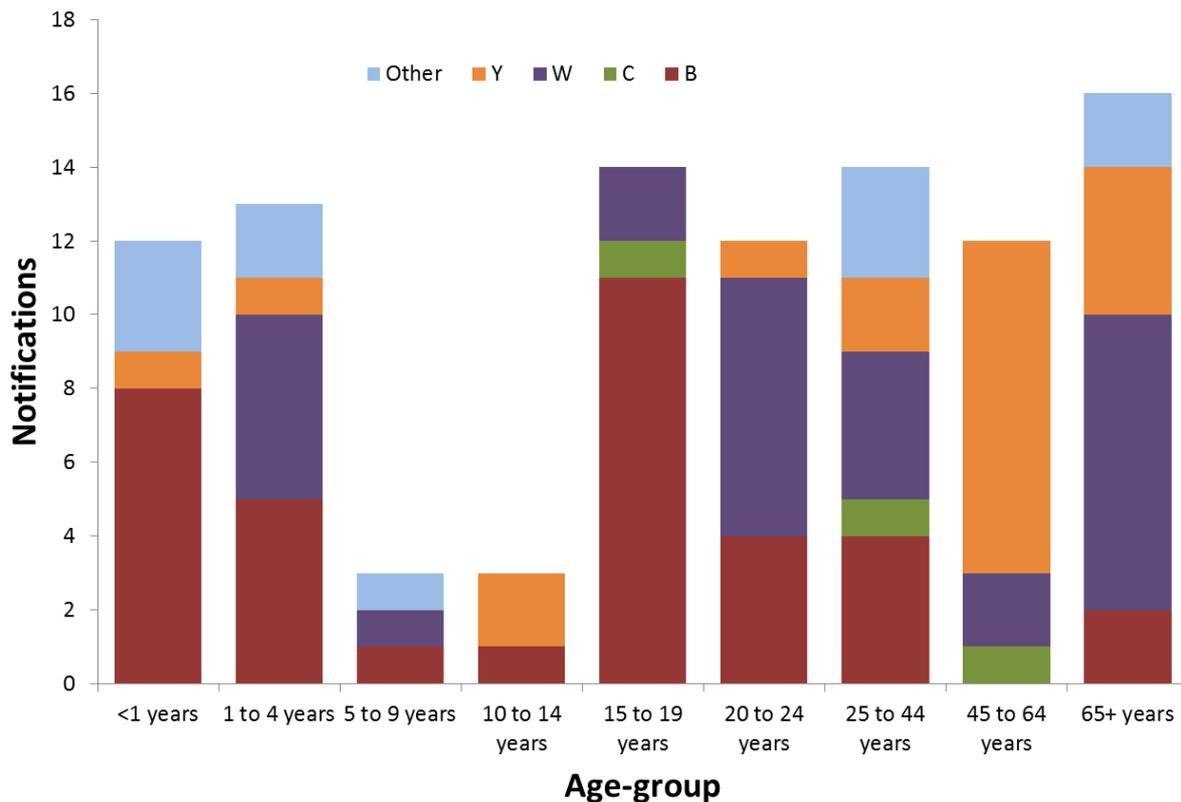
*Data extracted from the National Notifiable Diseases Surveillance System on 15 May 2017.

Age distribution

- So far in 2017, MenW has been reported in age groups, 1-4 years (n=5), 5-9 years (n=1), 15-19 years (n=2), 20-24 years (n=7), 25-44 years (n=4), 45-64 (n=2) and 65 and over (n=8) (Figure 4).
- In 2017 YTD, 34% (n=10) of MenW notifications and 65% (n=13) of MenY notifications have been in people 45 years and older. This is a similar distribution to 2016; 46% (n=40) and 63% (25) respectively.

- Age-specific rates of MenW, while remaining low, have increase in most age groups since 2012. Taking into account that 2017 data are partially complete, annualised rates for the 20 to 24 year age group in 2017 YTD (1.1 per 100,000 population) are high when compared with rates in 2016 (0.4 per 100,000) and in 2015 (0.2 per 100,000) for the same age group (Figure 4).
- In addition, prior to 2016, notifications of MenW remained low in children aged less than 5 years, with no more than 2 cases reported annually in children aged less than 1 year and no more than 4 cases reported annually in children aged between 1 and 5 years since reporting began in 2002 (Figure 4). In 2016, this increased with 21 cases in children less than 5 years.
- In 2017 YTD, 5 cases of MenW have been reported in children aged between 1 and 4 years. Taking into account that 2017 data are partially complete, annualised rates for the 1 to 4 year age group in 2017 YTD (1.1 per 100,000 population and 2016 (1.0 per 100,000) are high when compared to 2015 (0.3 per 100,000) and 2014 (0 per 100,000) for the same age group (Figure 4).

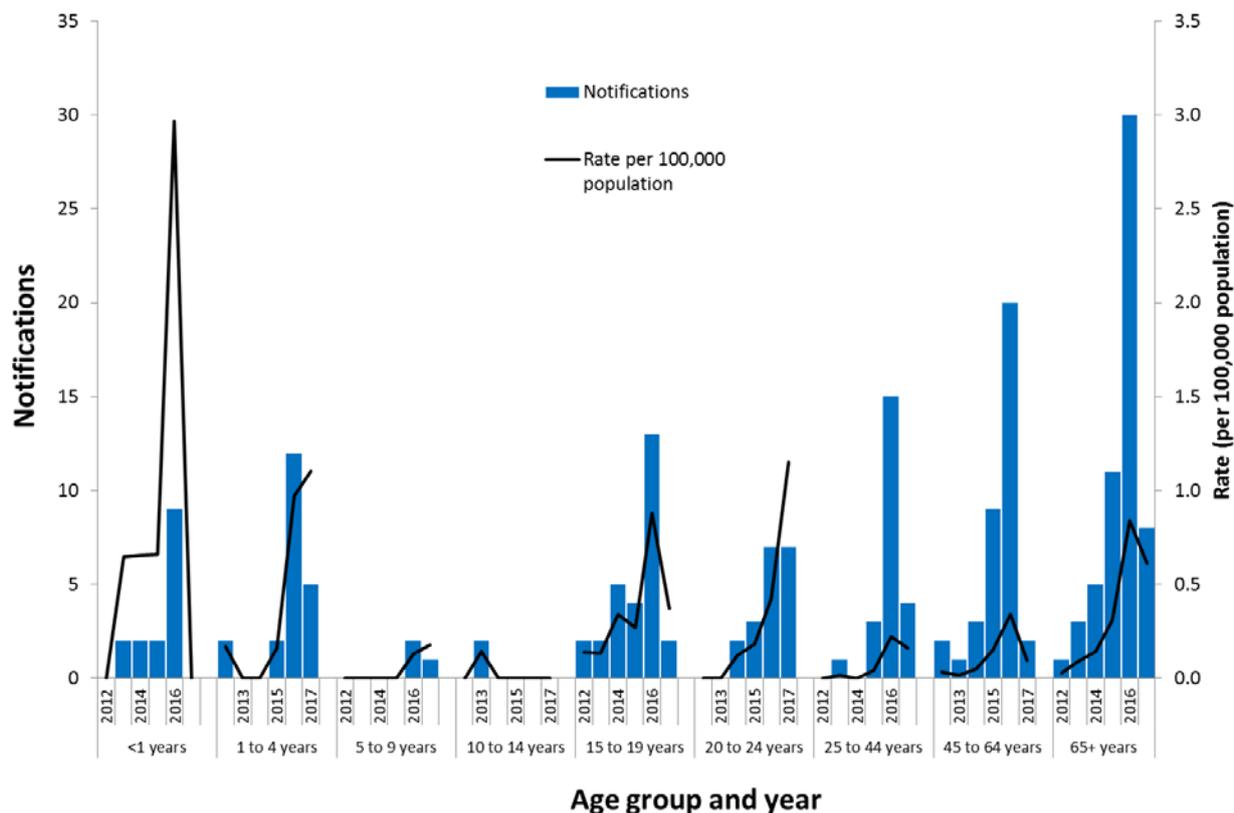
Figure 4. Notifications of IMD, Australia, 2017 YTD*, by age group and serogroup



*Data extracted from the National Notifiable Diseases Surveillance System on 15 May 2017.

- The 2017 annualised notification rates for IMD are exceeding the 2016 rates in the 1 to 4 years, 5 to 9 years and 20 to 24 years age groups (Figure 5).

Figure 5. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD*



^y2017 rates are annualised.

*Data extracted from the National Notifiable Diseases Surveillance System on 15 May 2017.

Clinical presentation and severity

- In 2017 YTD, there have been 5 deaths reported; 2 due to MenW, 2 due to MenB and 1 due to MenC.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the ST 11 clonal complex (CC 11). This was verified by the enhanced data collected in January 2017 for 237 of the 259 IMD cases reported in 2016. Of the 110 cases of MenW reported in 2016, 69 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were strain ST 11 (35 of 69 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is nearly double the CFR of IMD due to all other serogroups (5%). In 2017 YTD, the CFR for MenW is 7% (2/29).
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.

- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 15 May 2017.
- Line-listed de-identified enhanced data on 237 IMD cases from 1 January 2016 to 16 January 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date

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- ¹ Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523*.
- ² Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*



SUMMARY

- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a significant cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 109 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 120 cases of IMD have been reported to the NNDSS. Of these, 41 cases were due to MenB, 41 cases were due to MenW, 23 cases were due to serogroup Y (MenY), 5 cases were due to serogroup C (MenC) and the serogroup for the remaining 10 cases is pending or unknown.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 13 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 7 cases were due to MenB, 5 cases were due to MenW, and 1 case was due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications reported between December 2016 and May 2017 were also high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent sequence type (ST) 11, which is part of the ST 11 clonal complex (CC 11). ST 11 is associated with a higher risk of invasive disease and a higher case fatality rate. Three deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since from 2011. A total of 23 cases of MenY have been reported in 2017 YTD, accounting for 19% of notifications.

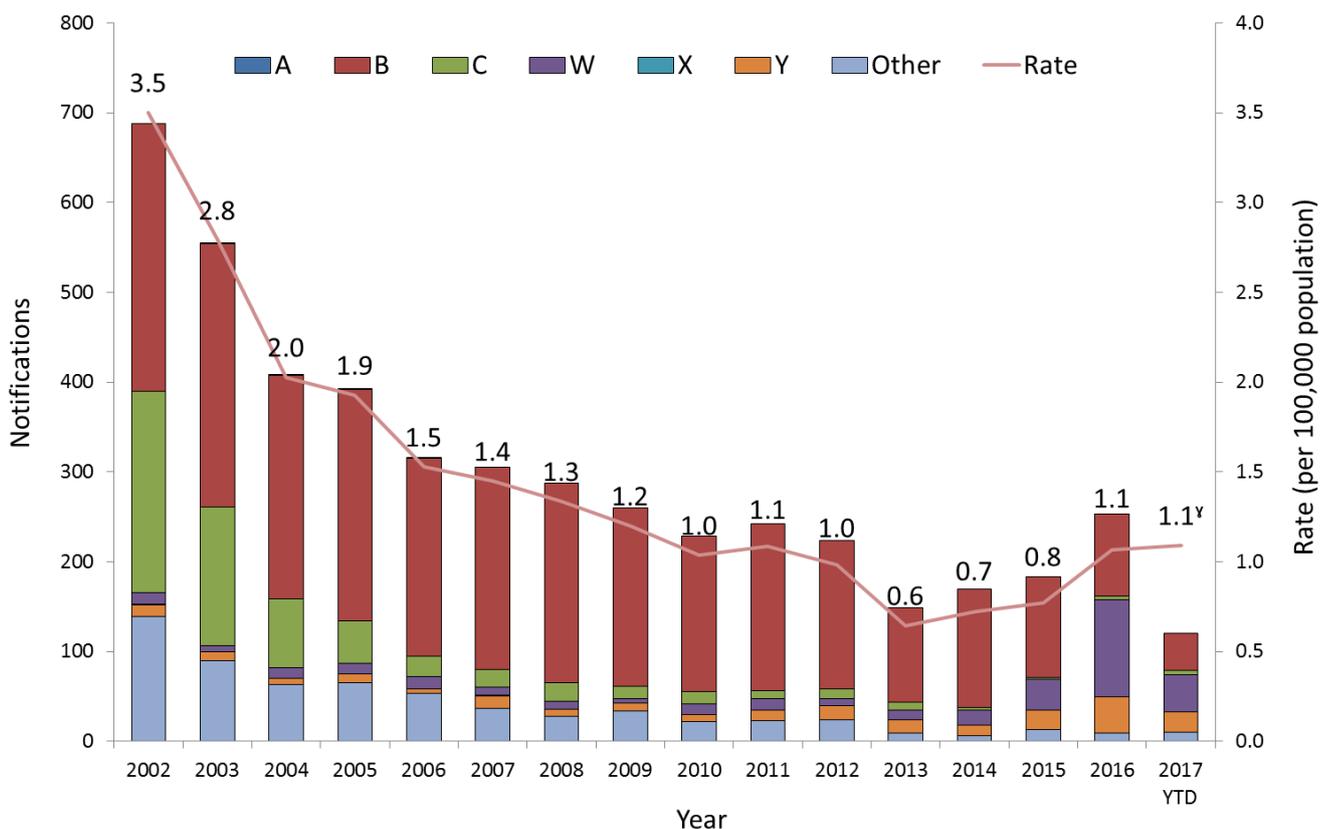
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD, there have been a total of 120 cases of IMD (0.5 per 100,000 (annualised rate 1.1 per 100,000)) compared to 253 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 34% of IMD cases (n=41) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 5 MenC cases have been notified to the NNDSS, one of which was acquired overseas.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (109). In 2017 YTD, 34% of IMD cases (n=41) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 23 MenY cases have been notified to the NNDSS, accounting for 19% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD*, by serogroup



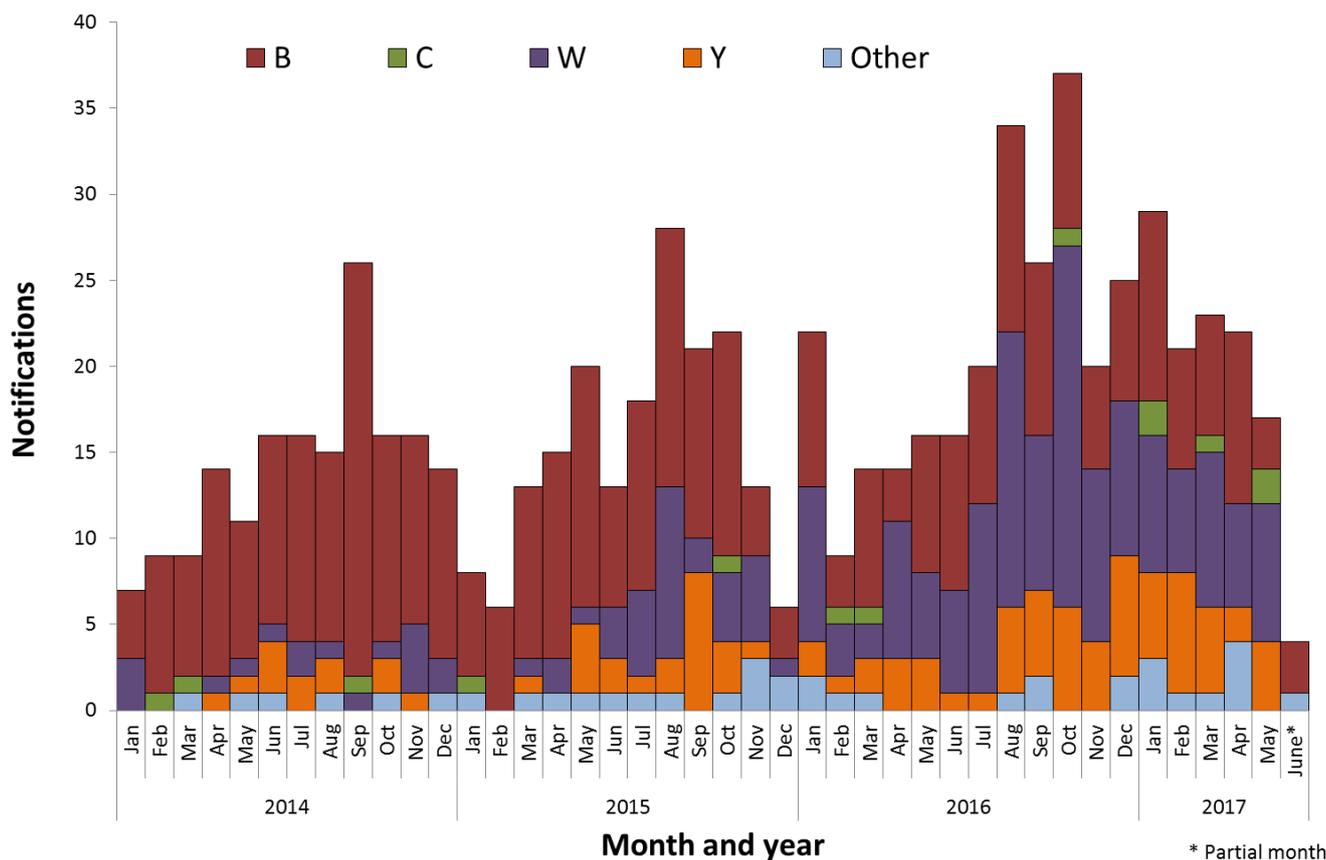
Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 19 June 2017.

^y The rate for 2017 YTD has been annualised.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in 2017 YTD were higher when compared to the same months in previous years (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD*, by month and year of diagnosis and serogroup



* Partial month

Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 19 June 2017.

Geographical distribution

- MenW accounted for 34% (41 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 83% (n=5) in Tasmania (Table 1).

Table 1. Notifications and rates of IMD, Australia, 2017 YTD by state and territory and serogroup

State or territory	Notifications								Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	Other*	Total		
ACT	0	0	0	0	0	0	0	0	-	-
NSW	0	15	2	4	0	3	5	29	0.4	0.8
NT	0	0	0	1	0	1	0	2	0.8	1.8
QLD	0	10	0	7	0	11	3	31	0.6	1.4
SA	0	6	0	4	0	2	0	12	0.7	1.5
TAS	0	1	0	5	0	0	0	6	1.2	2.5
VIC	0	6	2	15	0	6	1	30	0.5	1.1
WA	0	3	1	5	0	0	1	10	0.4	0.8
Australia	0	41	5	41	0	23	10	120	0.5	1.1

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- The highest rate of IMD due to MenW in 2017 YTD has been reported in Tasmania with an annualised rate of 2.1 cases per 100,000 population (Table 2).

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	26	0	13	5	4	48	12	109
2017 YTD	0	4	1	7	4	5	15	5	41
	Rate (per 100,000 population)								
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.3	0.3	-	0.3	0.3	0.8	0.8	0.5	0.5
2017 YTD rate	-	0.1	0.4	0.1	0.2	1.0	0.3	0.2	0.2
2017 annualised rate	-	0.1	0.9	0.3	0.5	2.1	0.5	0.4	0.4

Indigenous status

- Between 2014 and 2017 YTD, a total of 75 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (Table 3). The majority (68%, 51/75) of IMD cases reported in Aboriginal and Torres Strait Islander peoples were due to MenB.

Table 3. Notifications of IMD, Australia, 2014-2017 YTD by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	-	92
	2017 YTD	7	34	-	41
C	2014	-	3	-	3
	2015	-	2	-	2
	2016	-	3	-	3
	2017 YTD	-	5	-	5
W	2014	-	17	-	17
	2015	3	30	1	34
	2016	10	99	-	109
	2017 YTD	5	36	-	41
Y	2014	-	12	-	12
	2015	-	22	-	22
	2016	2	38	-	40
	2017 YTD	1	21	1	23
Other*	2014	1	5	-	6
	2015	2	11	-	13
	2016	-	9	-	9
	2017 YTD	-	10	-	10
TOTAL		75	643	7	725

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 13 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 4.3 per 100,000 population), compared to 106 cases reported in non-Indigenous populations (annualised rate = 1.0 per 100,000). Of the 13 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 7 cases were due to MenB, 5 cases were due to MenW, and 1 case was due to MenY (Table 4).

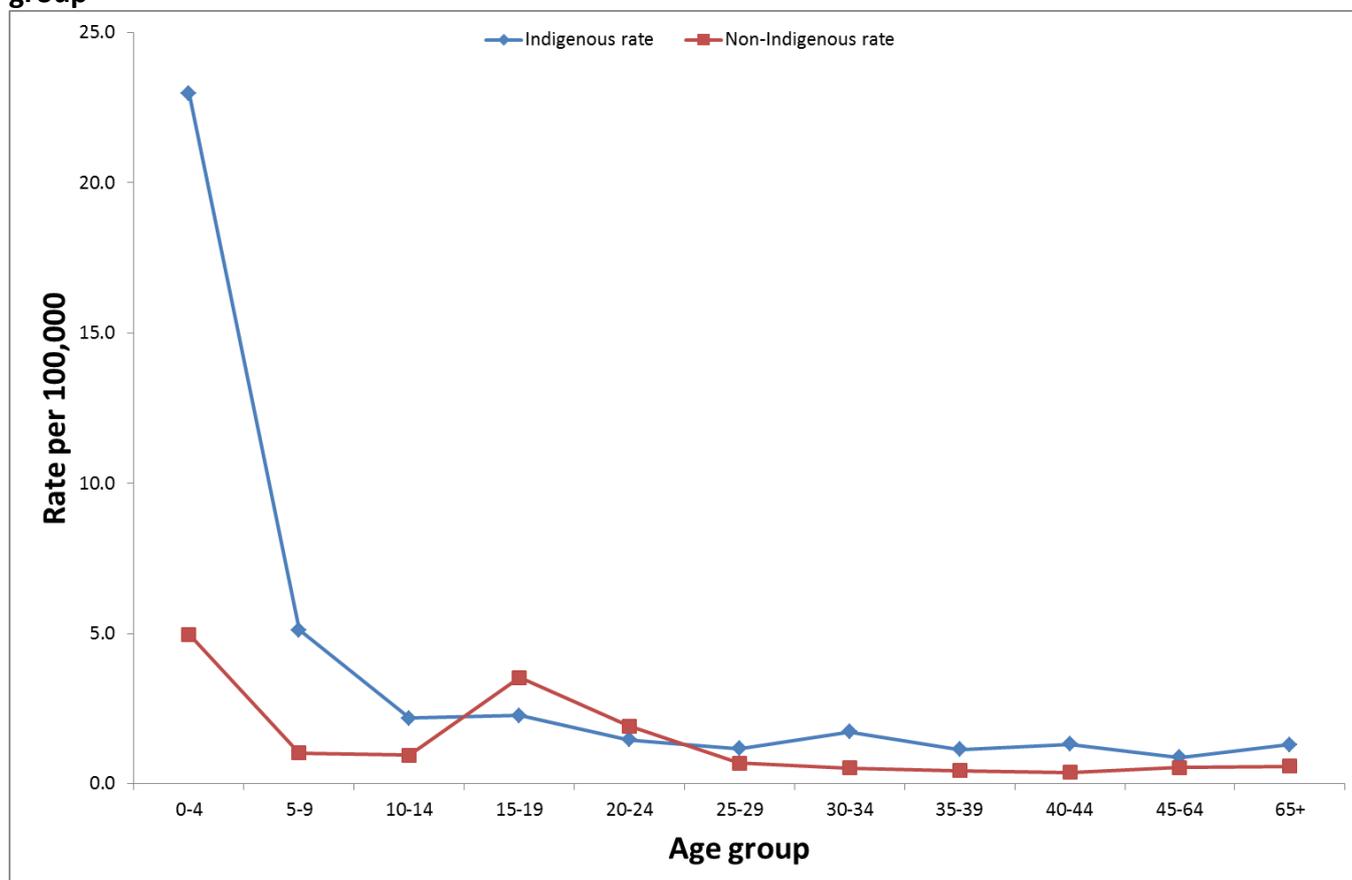
Table 4. Notifications and rates of IMD, Australia, 2017 YTD by Indigenous status and serogroup

IMD serogroup	Indigenous			Non-Indigenous		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	7	1.1	2.3	34	0.1	0.3
C	0	-	-	5	0.0	0.0
W	5	0.8	1.6	36	0.2	0.3
X	0	-	-	0	-	-
Y	1	0.2	0.3	21	0.1	0.2
Other*	0	-	-	10	0.0	0.1
Total	13	2.0	4.3	106	0.4	1.0

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Since 2002, the notification rates of IMD have been higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (23 per 100,000) and 5-9 years (5.1 per 100,000) compared to those who reported as non-Indigenous; 5.0 per 100,000 and 1.0 per 100,000 respectively (Figure 3).

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD*, by Indigenous status and age group

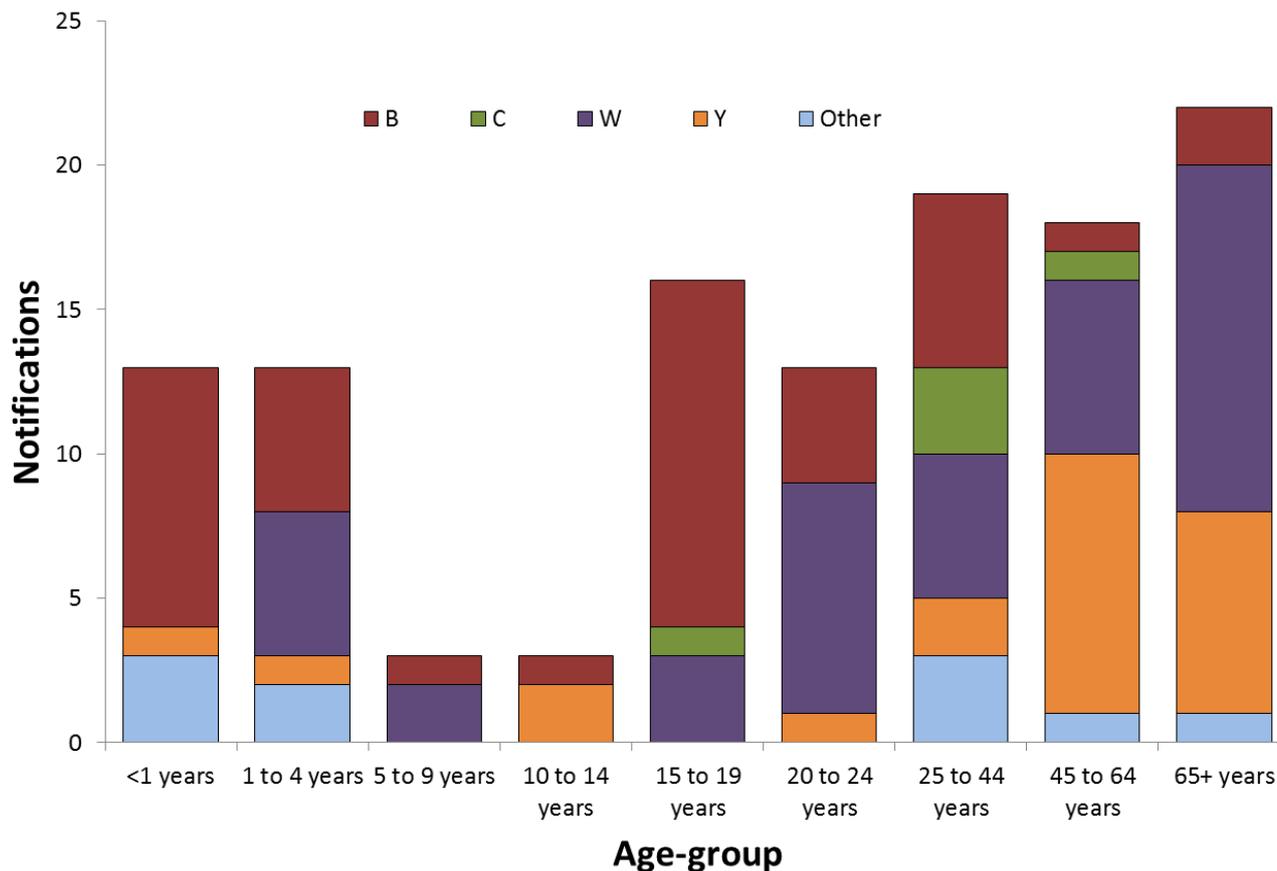


*Data extracted from the National Notifiable Diseases Surveillance System on 19 June 2017.

Age distribution

- So far in 2017, MenW has been reported in age groups, 1-4 years (n=5), 5-9 years (n=2), 15-19 years (n=3), 20-24 years (n=8), 25-44 years (n=5), 45-64 (n=6) and 65 and over (n=12) (Figure 4).
- In 2017 YTD, 44% (18/41) of MenW notifications and 70% (16/23) of MenY notifications have been in people 45 years and older. This is a similar distribution to 2016; 46% (50/109) and 63% (25/40) respectively.

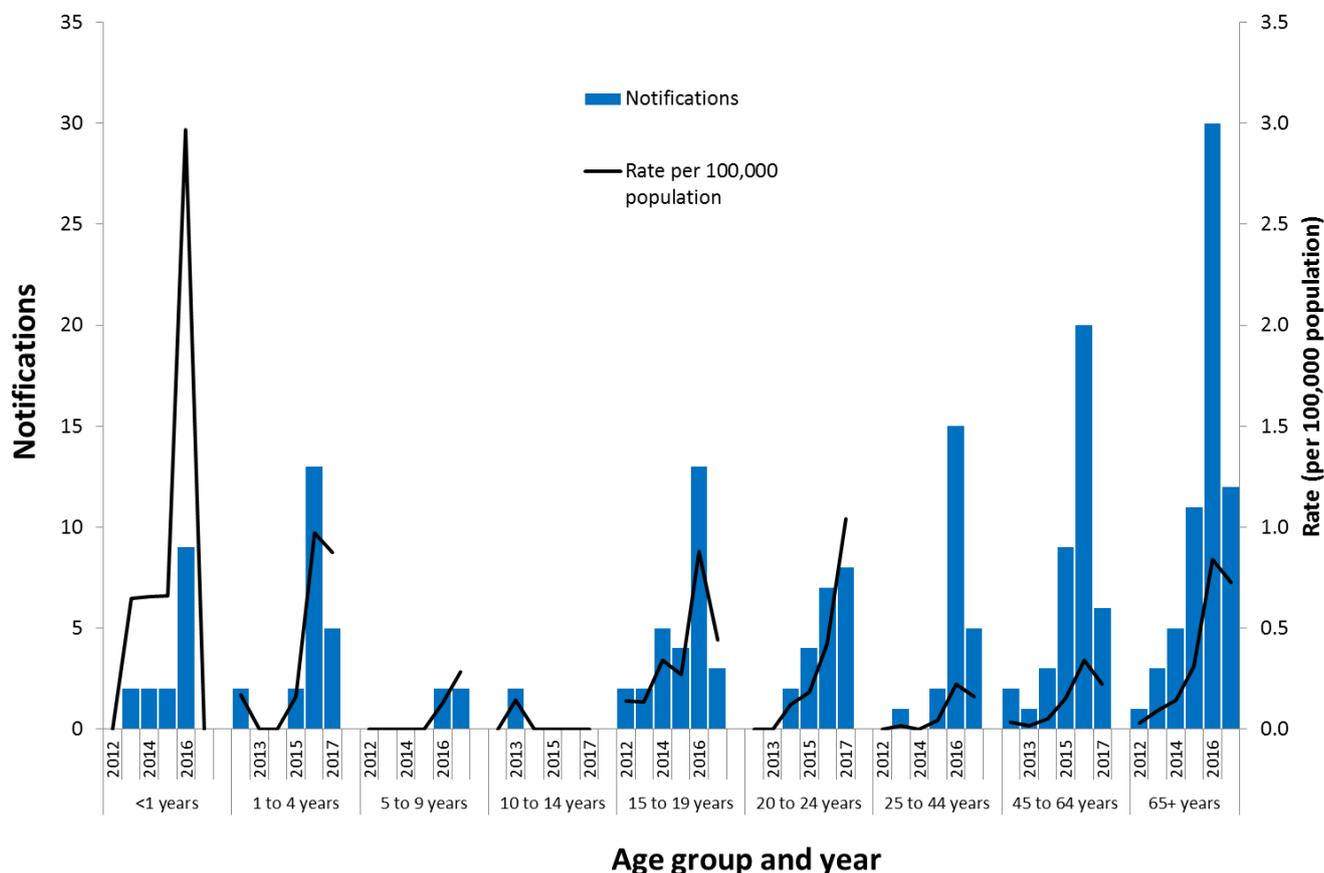
Figure 4. Notifications of IMD, Australia, 2017 YTD*, by age group and serogroup



*Data extracted from the National Notifiable Diseases Surveillance System on 19 June 2017.

- Age-specific rates of MenW, while remaining low, have increase in most age groups since 2012. The 2017 annualised notification rates for IMD are exceeding the 2016 rates in the 5 to 9 years and 20 to 24 years age groups (Figure 5).

Figure 5. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD*



^y2017 rates are annualised.

*Data extracted from the National Notifiable Diseases Surveillance System on 19 June 2017.

Clinical presentation and severity

- In 2017 YTD, there have been 6 deaths reported; 3 due to MenW, 2 due to MenB and 1 due to MenC.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the ST 11 clonal complex (CC 11). This was verified by the enhanced data collected in January 2017 for 237 of the 259 IMD cases reported in 2016. Of the 110 cases of MenW reported in 2016, 69 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were strain ST 11 (35 of 69 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is greater the CFR of IMD due to all other serogroups (5%). In 2017 YTD, the CFR for MenW is 7% (3/41).
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck

stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.

- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 19 June 2017.
- Line-listed de-identified enhanced data on 237 IMD cases from 1 January 2016 to 16 January 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date

REFERENCES

- ¹ Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523.*
- ² Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*



SUMMARY

- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a significant cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 109 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 158 cases of IMD have been reported to the NNDSS. Of these, 60 cases were due to MenB, 53 cases were due to MenW, 31 cases were due to serogroup Y (MenY), 6 cases were due to serogroup C (MenC) and the serogroup for the remaining 8 cases is pending or unknown.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 16 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 9 cases were due to MenB, 6 cases were due to MenW, and 1 case was due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications reported between December 2016 and July 2017 were also high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent sequence type (ST) 11, which is part of the ST 11 clonal complex (CC 11). ST 11 is associated with a higher risk of invasive disease and a higher case fatality rate. Three deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since from 2011. A total of 31 cases of MenY have been reported in 2017 YTD, accounting for 20% of notifications.

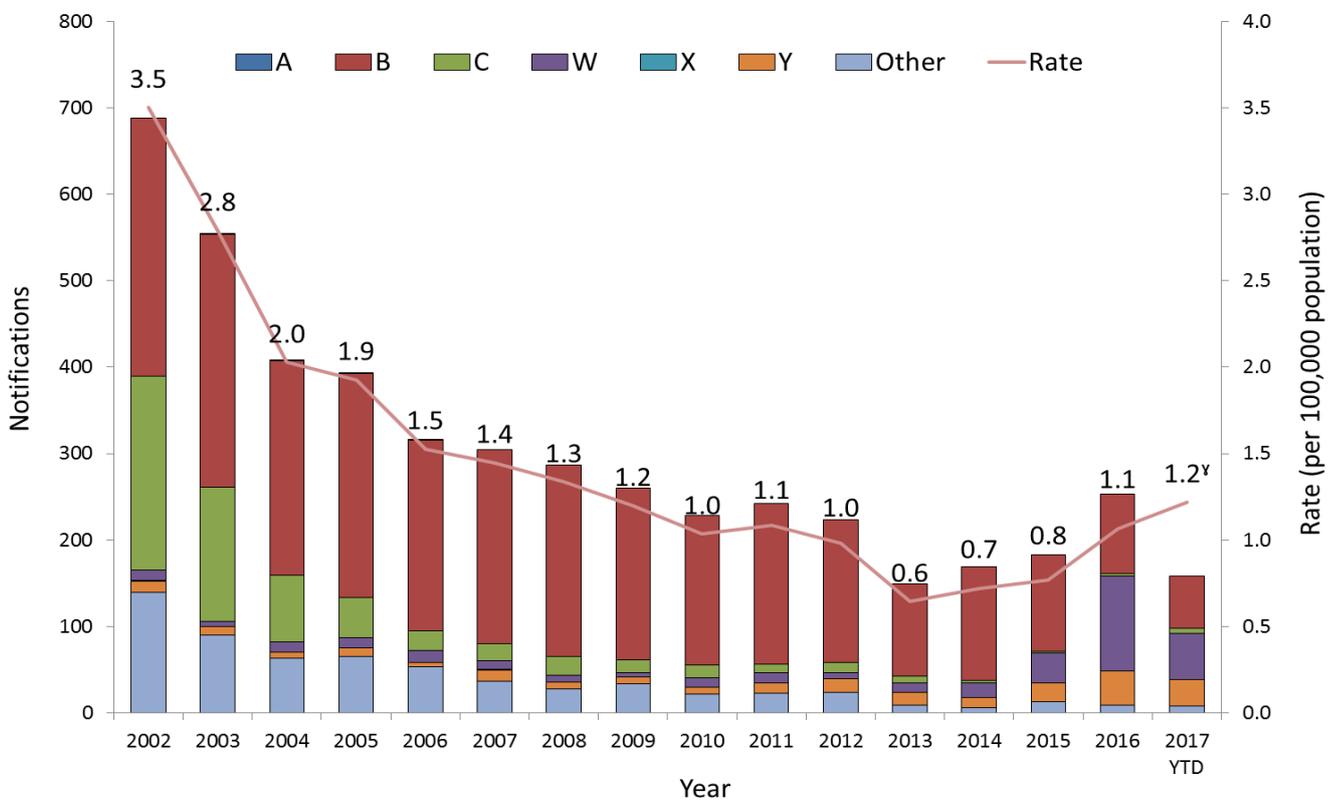
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD, there have been a total of 158 cases of IMD (0.7 per 100,000 (annualised rate 1.2 per 100,000) compared to 253 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 38% of IMD cases (n=60) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 6 MenC cases have been notified to the NNDSS, one of which was acquired overseas.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (109). In 2017 YTD, 34% of IMD cases (n=53) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 31 MenY cases have been notified to the NNDSS, accounting for 20% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD*, by serogroup



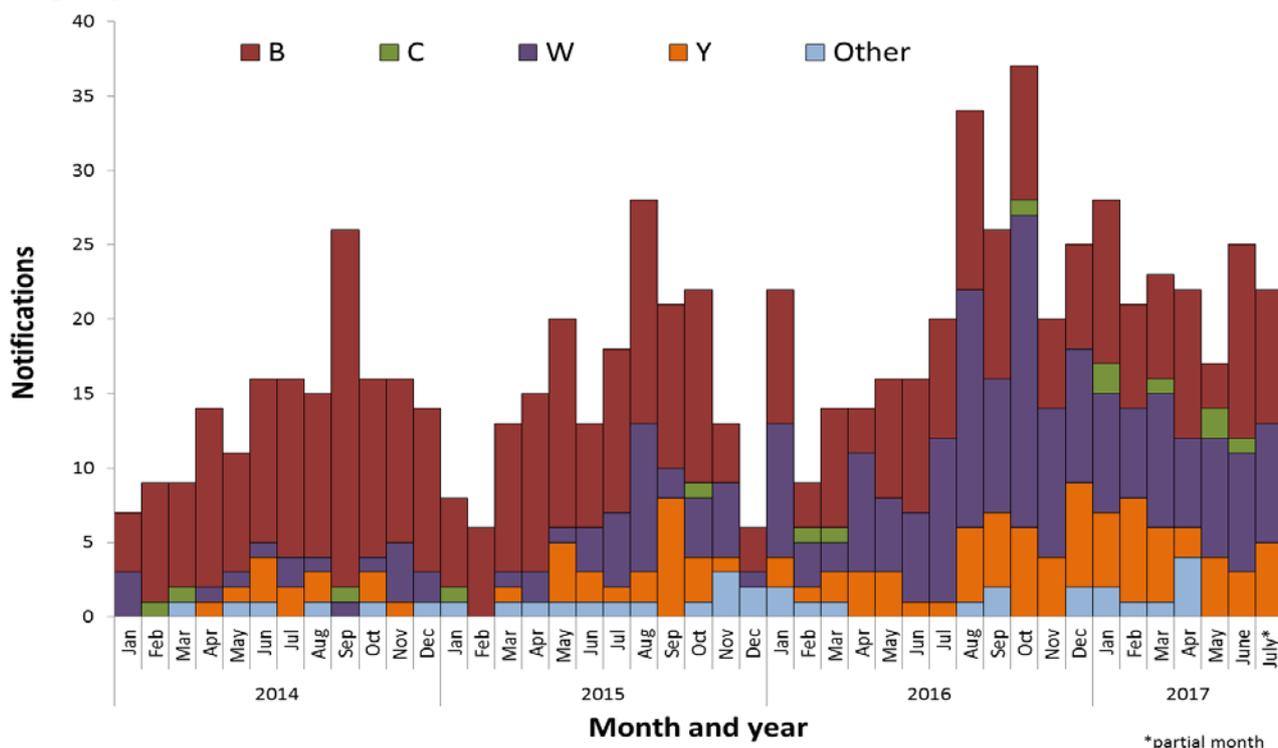
Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

^y The rate for 2017 YTD has been annualised.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in 2017 YTD were higher when compared to the same months in previous years (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD*, by month and year of diagnosis and serogroup



Note: Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

Geographical distribution

- MenW accounted for 34% (53 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 71% (n=5) in Tasmania (Table 1).

Table 1. Notifications and rates of IMD, Australia, 2017 YTD* by state and territory and serogroup

State or territory	Notifications							Total	Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	Other [#]			
ACT	0	0	0	0	0	0	0	0	-	-
NSW	0	18	3	7	0	5	3	36	0.5	0.8
NT	0	1	0	2	0	1	0	4	1.6	2.8
QLD	0	12	0	9	0	13	3	37	0.8	1.3
SA	0	12	0	5	0	2	0	19	1.1	1.9
TAS	0	2	0	5	0	0	0	7	1.4	2.3
VIC	0	11	2	18	0	9	1	41	0.7	1.2
WA	0	4	1	7	0	1	1	14	0.5	0.9
Australia	0	60	6	53	0	31	8	158	0.7	1.1

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

[#]Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- The highest rate of IMD due to MenW in 2017 YTD has been reported in Tasmania with an annualised rate of 1.8 cases per 100,000 population (Table 2).

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD*, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	26	0	13	5	4	48	12	109
2017 YTD	0	7	2	9	5	5	18	7	53
	Rate (per 100,000 population)								
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.3	0.3	-	0.3	0.3	0.8	0.8	0.5	0.5
2017 YTD rate	-	0.1	0.8	0.2	0.3	1.0	0.3	0.3	0.2
2017 annualised rate	-	0.2	1.5	0.3	0.5	1.8	0.6	0.5	0.4

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

Indigenous status

- Between 2014 and 2017 YTD, a total of 77 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (Table 3). The majority (69%, 53/77) of IMD cases reported in Aboriginal and Torres Strait Islander peoples were due to MenB.

Table 3. Notifications of IMD, Australia, 2014-2017 YTD* by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	-	92
	2017 YTD	9	49	2	60
C	2014	-	3	-	3
	2015	-	2	-	2
	2016	-	3	-	3
	2017 YTD	-	6	-	6
W	2014	-	17	-	17
	2015	3	30	1	34
	2016	10	98	-	108
	2017	6	47	-	53
Y	2014	-	12	-	12
	2015	-	22	-	22
	2016	2	38	-	40
	2017 YTD	1	29	1	31
Other[#]	2014	1	4	-	5
	2015	1	11	-	12
	2016	-	9	-	9
	2017 YTD	-	8	-	8
TOTAL		77	674	9	760

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

[#]Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 16 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 4.5 per 100,000 population), compared to 142 cases reported in non-Indigenous populations (annualised rate = 1.1 per 100,000). Of the 16 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 9 cases were due to MenB, 6 cases were due to MenW, and 1 case was due to MenY (Table 4).

Table 4. Notifications and rates of IMD, Australia, 2017 YTD* by Indigenous status and serogroup

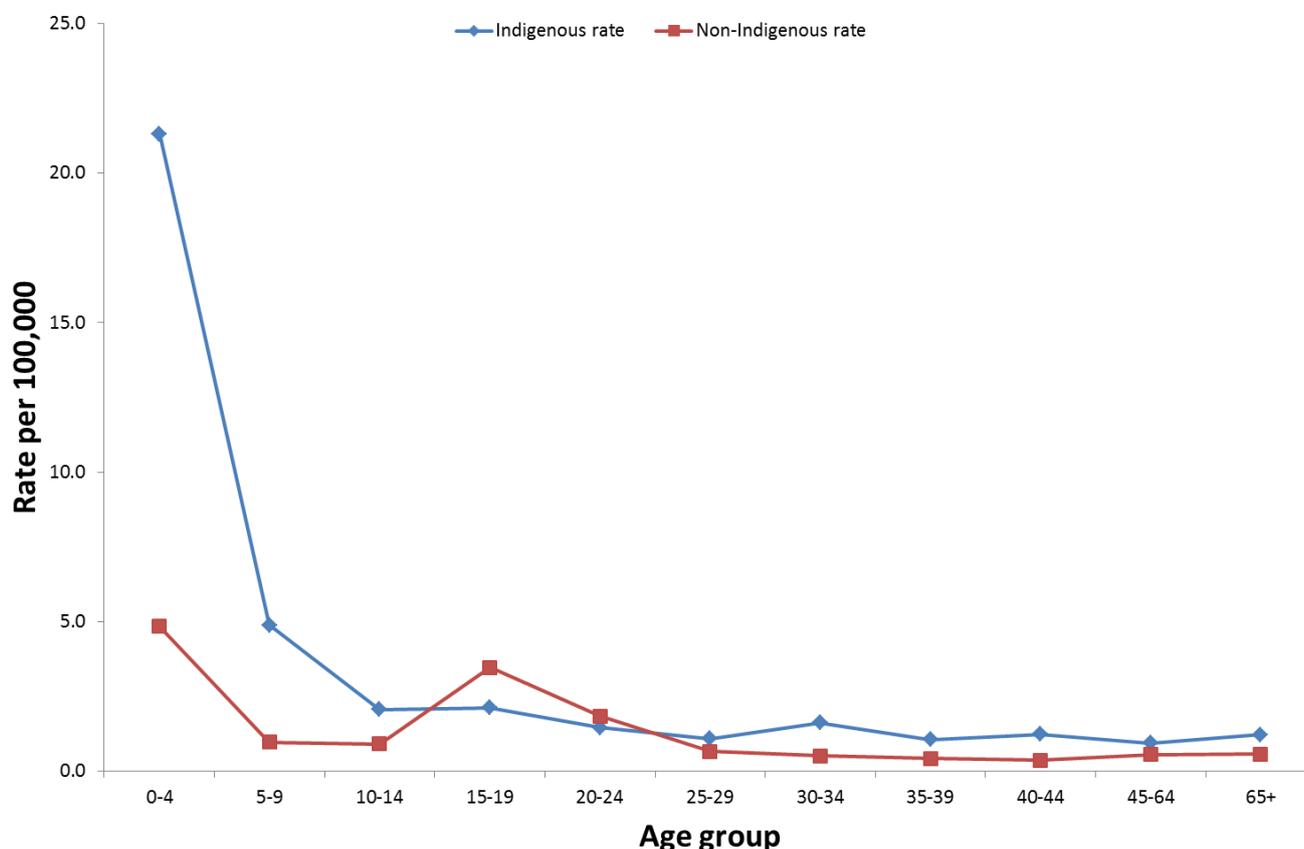
IMD serogroup	Indigenous			Non-Indigenous		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	9	1.4	2.5	51	0.2	0.4
C	0	-	-	6	0.0	0.0
W	6	0.9	1.7	47	0.2	0.3
X	0	-	-	0	-	-
Y	1	0.2	0.3	30	0.1	0.2
Other [#]	0	-	-	8	0.0	0.1
Total	16	2.4	4.5	142	0.6	1.1

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

[#]Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Since 2002, the notification rates of IMD have been higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (21.3 per 100,000) and 5-9 years (4.9 per 100,000) compared to those who reported as non-Indigenous; 4.9 per 100,000 and 1.0 per 100,000 respectively (Figure 3).

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD*, by Indigenous status and age group

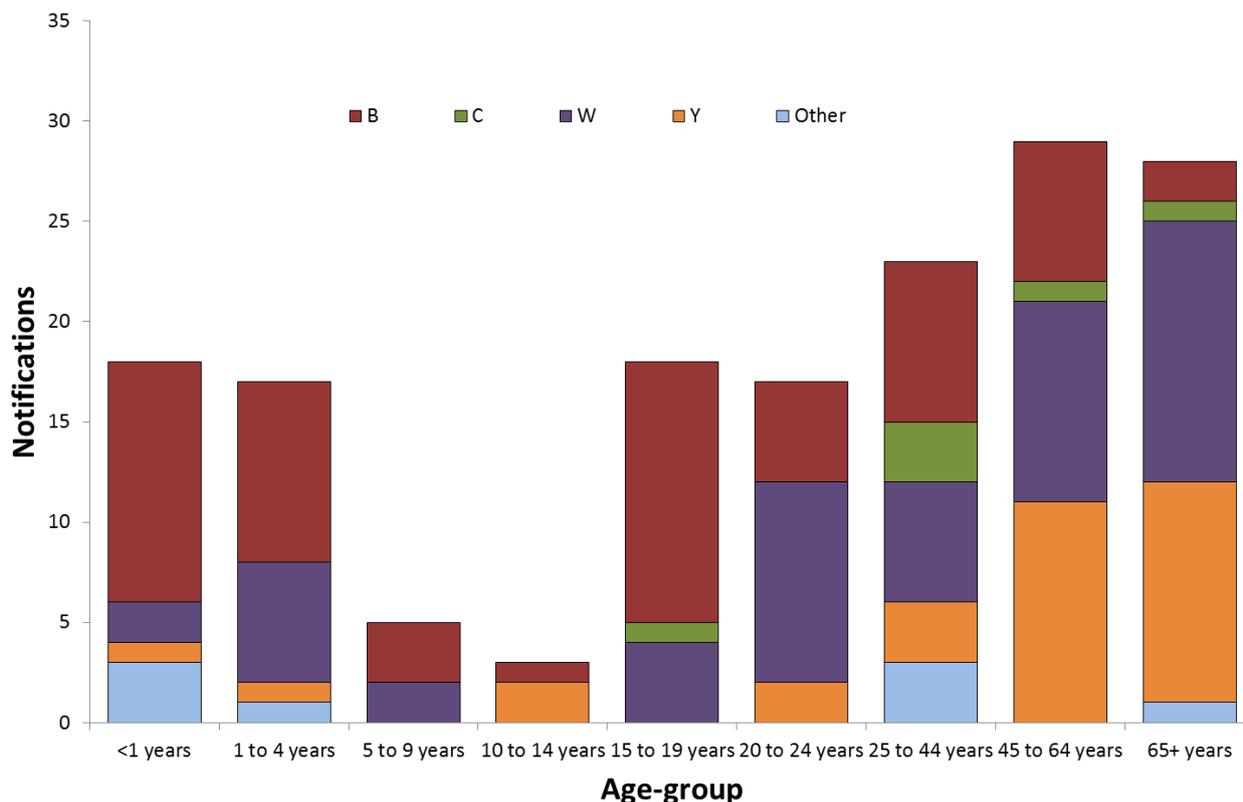


*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

Age distribution

- So far in 2017, MenW has been reported in age groups, less than 1 year (n=2), 1-4 years (n=6), 5-9 years (n=2), 15-19 years (n=4), 20-24 years (n=10), 25-44 years (n=6), 45-64 (n=10) and 65 and over (n=13) (Figure 4).
- In 2017 YTD, 43% (23/53) of MenW notifications and 72% (23/32) of MenY notifications have been in people 45 years and older. For MenW this is a similar distribution of notifications in 2016 with 46% (50/109), but higher for MenY with 63% (25/40) of notifications reported for this age group in 2016.

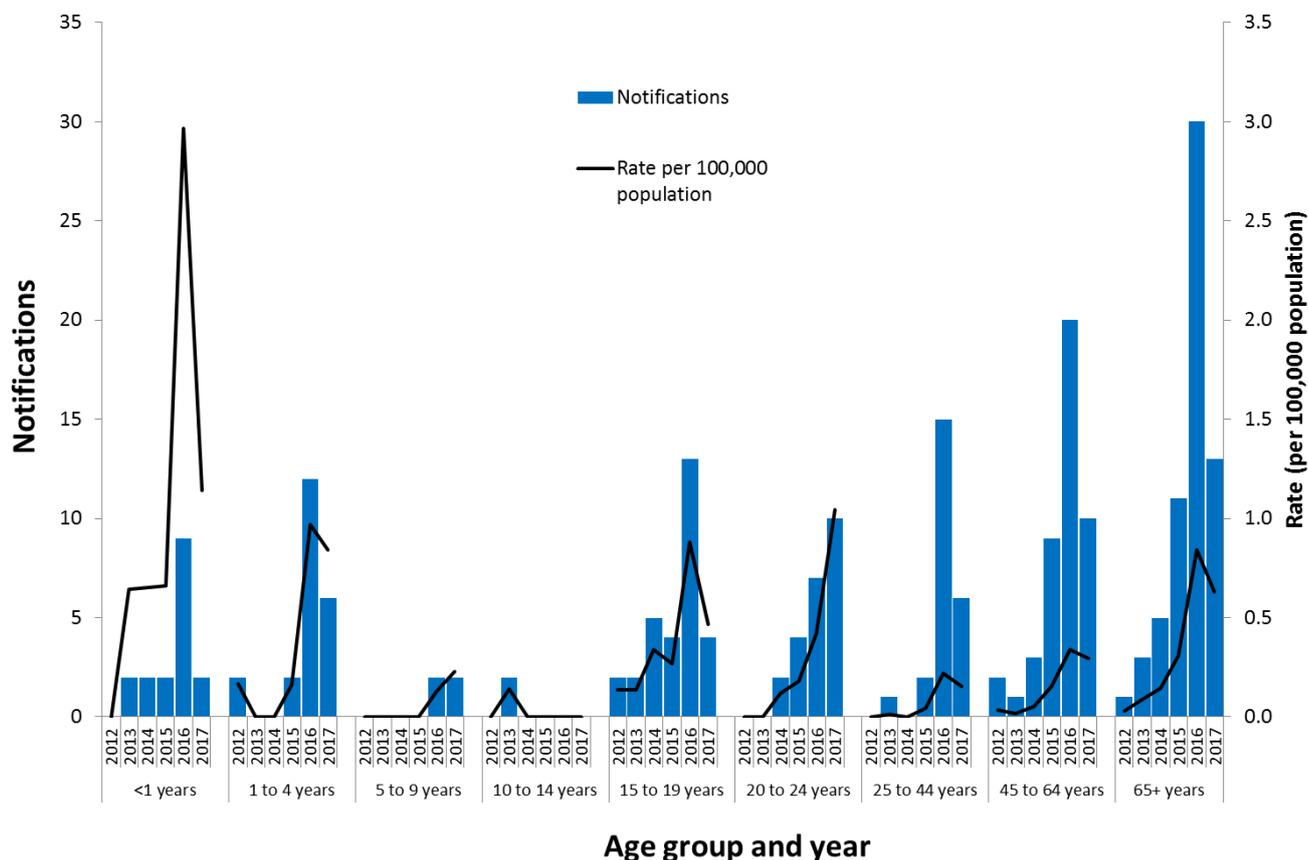
Figure 4. Notifications of IMD, Australia, 2017 YTD*, by age group and serogroup



*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

- Age-specific rates of MenW, while remaining low, have increased in most age groups since 2012. The 2017 annualised notification rates for IMD are exceeding the 2016 rates in the 5 to 9 years and 20 to 24 years age groups (Figure 5).

Figure 5. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD*



^y2017 rates are annualised.

*Data extracted from the National Notifiable Diseases Surveillance System on 19 July 2017.

Clinical presentation and severity

- In 2017 YTD, there have been 9 deaths reported; 4 due to MenB, 3 due to MenW, 1 due to MenC and 1 due to MenY.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the ST 11 clonal complex (CC 11). This was verified by the enhanced data collected in January 2017 for 237 of the 259 IMD cases reported in 2016. Of the 110 cases of MenW reported in 2016, 69 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were strain ST 11 (35 of 69 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is greater the CFR of IMD due to all other serogroups (5%). In 2017 YTD, the CFR for MenW is 7% (3/41).
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck

stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.

- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 19 July 2017.
- Line-listed de-identified enhanced data on 237 IMD cases from 1 January 2016 to 16 January 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date

REFERENCES

- ¹ Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523.*
- ² Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*



SUMMARY

- The number of cases of invasive meningococcal disease (IMD) and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a significant cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 109 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 182 cases of IMD have been reported to the NNDSS. Of these, 69 cases were due to MenB, 55 cases were due to MenW, 35 cases were due to serogroup Y (MenY), 8 cases were due to serogroup C (MenC) and the serogroup for the remaining 15 cases is pending or unknown.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 18 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 9 cases were due to MenB, 6 cases were due to MenW, 2 cases were due to MenY and 1 case was reported as pending or unknown.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications reported between December 2016 and August 2017 were also high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 5 years since 2015.
- Many of the MenW cases belong to the hypervirulent sequence type (ST) 11, which is part of the ST 11 clonal complex (CC 11). ST 11 is associated with a higher risk of invasive disease and a higher case fatality rate. Three deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since from 2011. A total of 35 cases of MenY have been reported in 2017 YTD, accounting for 19% of notifications.

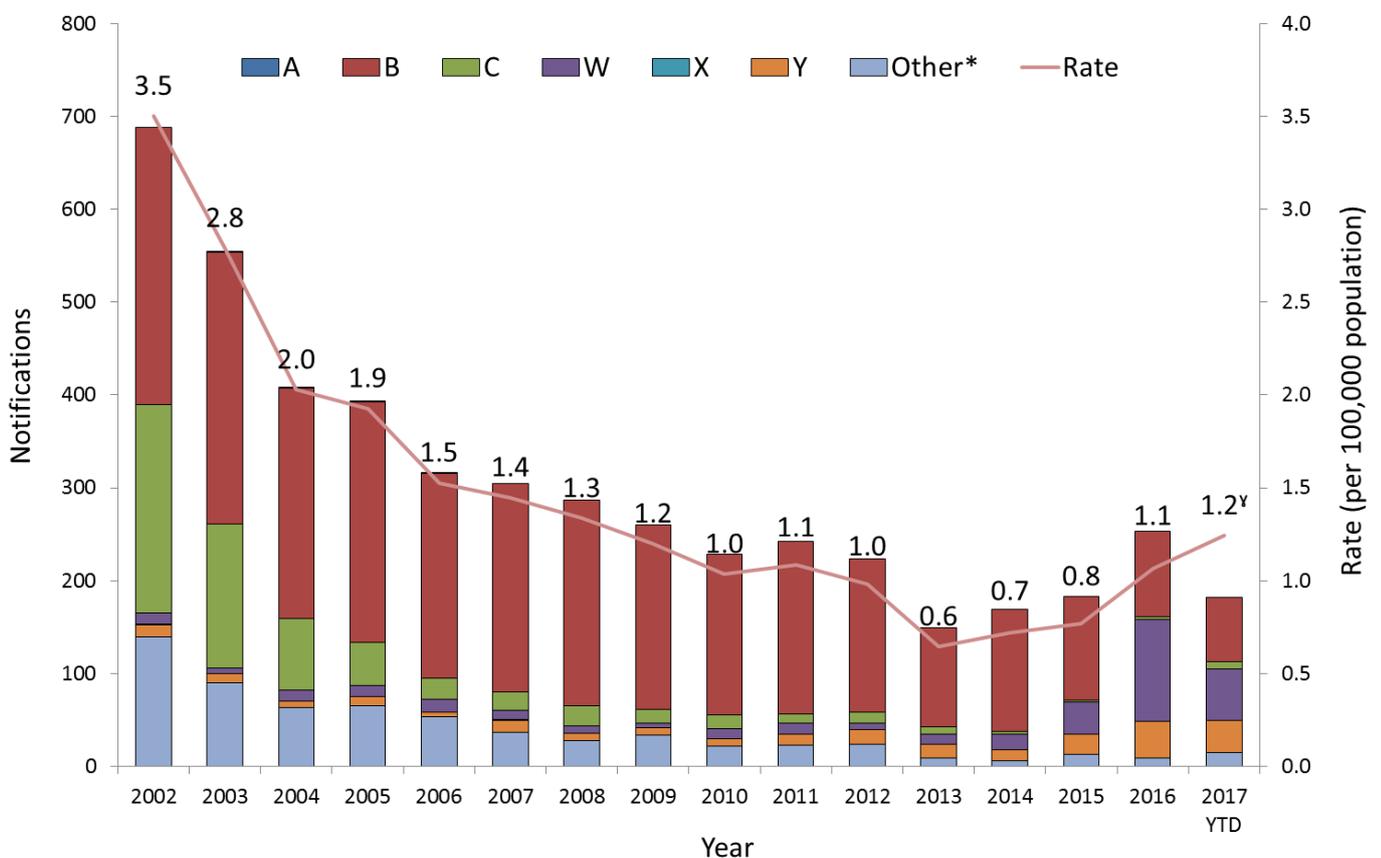
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD, there have been a total of 182 cases of IMD (0.7 per 100,000 (annualised rate 1.2 per 100,000) compared to 253 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 38% of IMD cases (n=69) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 8 MenC cases have been notified to the NNDSS, one of which was acquired overseas.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (109). In 2017 YTD, 30% of IMD cases (n=55) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 35 MenY cases have been notified to the NNDSS, accounting for 19% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD[#], by serogroup



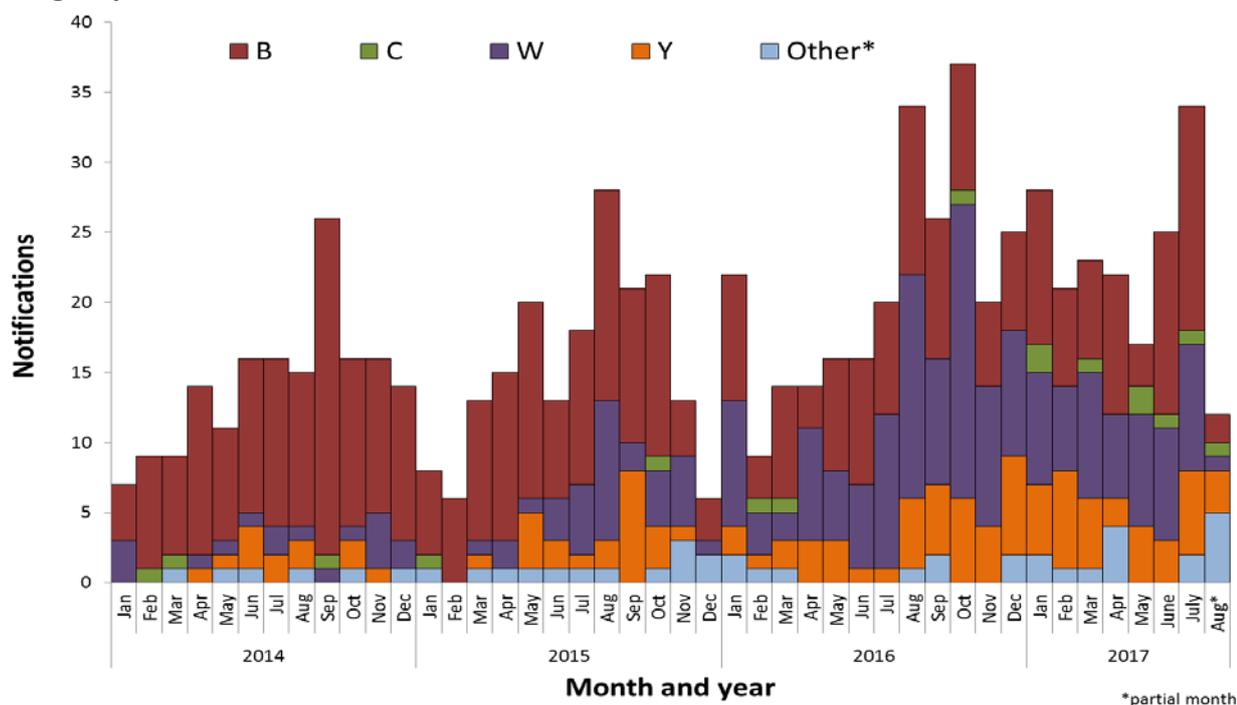
[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

^{*}Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

^yThe rate for 2017 YTD has been annualised.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in 2017 YTD were higher when compared to the same months in previous years (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD[#], by month and year of diagnosis and serogroup



*partial month

[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Geographical distribution

- MenW accounted for 30% (55 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 71% (n=5) in Tasmania (Table 1).

Table 1. Notifications and rates of IMD, Australia, 2017 YTD[#] by state and territory and serogroup

State or territory	Notifications								Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	Other*	Total		
ACT	0	0	0	0	0	0	0	0	0.0	-
NSW	0	24	3	8	0	6	8	49	0.6	1.0
NT	0	1	0	2	0	1	1	5	2.0	3.3
QLD	0	13	0	9	0	15	4	41	0.9	1.4
SA	0	14	0	5	0	2	0	21	1.2	2.0
TAS	0	2	0	5	0	0	0	7	1.4	2.2
VIC	0	11	4	19	0	9	1	44	0.7	1.2
WA	0	4	1	7	0	2	1	15	0.6	0.9
Australia	0	69	8	55	0	35	15	182	0.8	1.2

[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- The highest rate of IMD due to MenW in 2017 YTD has been reported in Tasmania with an annualised rate of 1.6 cases per 100,000 population (Table 2).

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD*, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	26	0	13	5	4	48	12	109
2017 YTD	0	8	2	9	5	5	19	7	55
	Rate (per 100,000 population)								
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.3	0.3	-	0.3	0.3	0.8	0.8	0.5	0.5
	0.0	0.1	0.8	0.2	0.3	1.0	0.3	0.3	0.2
2017 annualised rate	0.0	0.2	1.3	0.3	0.5	1.6	0.5	0.4	0.4

*Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

Indigenous status

- Between 2014 and 2017 YTD, a total of 79 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (Table 3). The majority (67%, 53/79) of IMD cases reported in Aboriginal and Torres Strait Islander peoples were due to MenB.

Table 3. Notifications of IMD, Australia, 2014 to 2017 YTD# by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	-	92
	2017 YTD	9	60	-	69
C	2014	-	3	-	3
	2015	-	2	-	2
	2016	-	3	-	3
	2017 YTD	-	8	-	8
W	2014	-	17	-	17
	2015	3	30	1	34
	2016	10	98	-	108
	2017	6	48	1	55
Y	2014	-	12	-	12
	2015	-	22	-	22
	2016	2	38	-	40
	2017 YTD	2	33	-	35
Other*	2014	1	4	-	5
	2015	1	11	-	12
	2016	-	9	-	9
	2017 YTD	1	14	-	15
TOTAL		79	698	7	784

#Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 18 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 4.4 per 100,000 population), compared to 164 cases reported in non-Indigenous populations (annualised rate = 1.1 per 100,000). Of the 18 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 9 cases were due to MenB, 6 cases were due to MenW, 2 cases were due to MenY and 1 case was reported as other (Table 4).

Table 4. Notifications and rates of IMD, Australia, 2017 YTD[#] by Indigenous status and serogroup

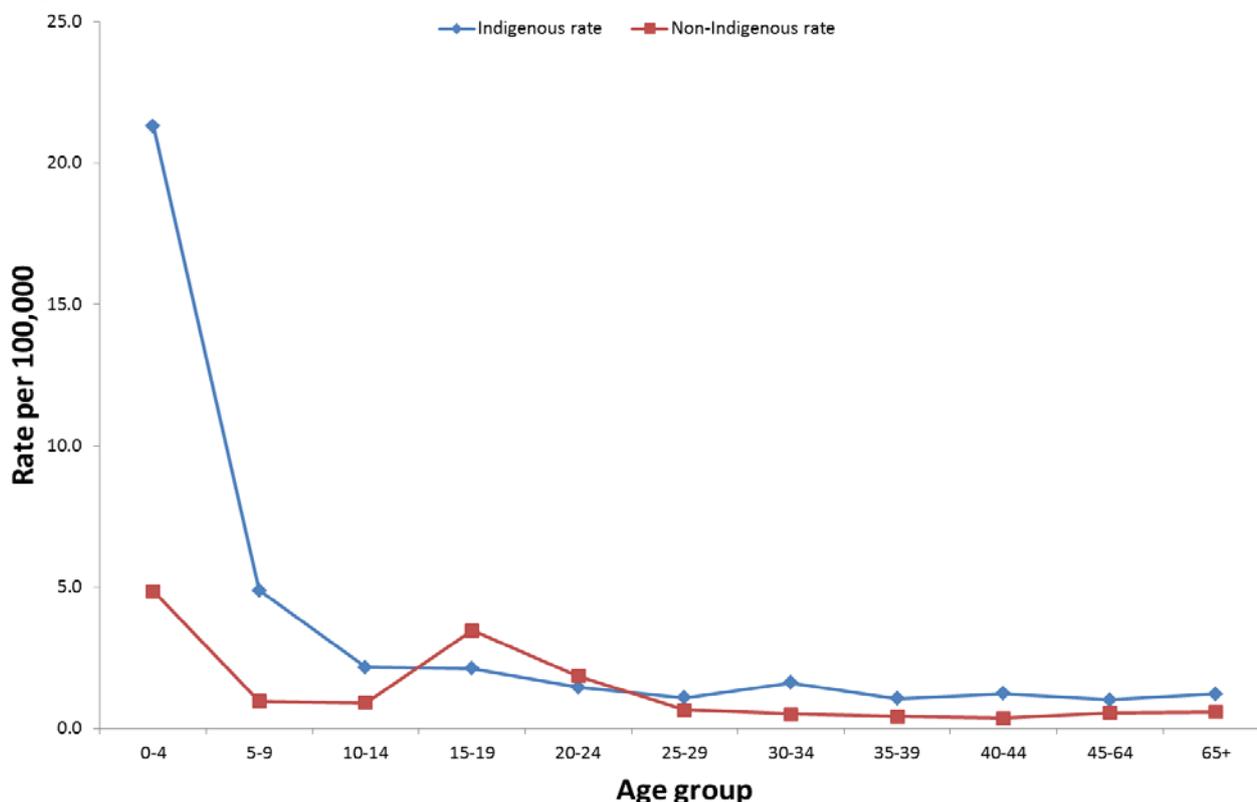
IMD serogroup	Indigenous			Non-Indigenous		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	9	1.4	2.2	60	0.3	0.4
C	0	-	-	8	0.0	0.1
W	6	0.9	1.5	49	0.2	0.3
X	0	-	-	0	-	-
Y	2	0.3	0.5	33	0.1	0.2
Other*	1	0.2	0.2	14	0.1	0.1
Total	18	2.7	4.4	164	0.7	1.1

[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Since 2002, the notification rates of IMD have been higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (21.3 per 100,000) and 5-9 years (4.9 per 100,000) compared to those who reported as non-Indigenous; 4.9 per 100,000 and 1.0 per 100,000 respectively (Figure 3).

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD[#], by Indigenous status and age group

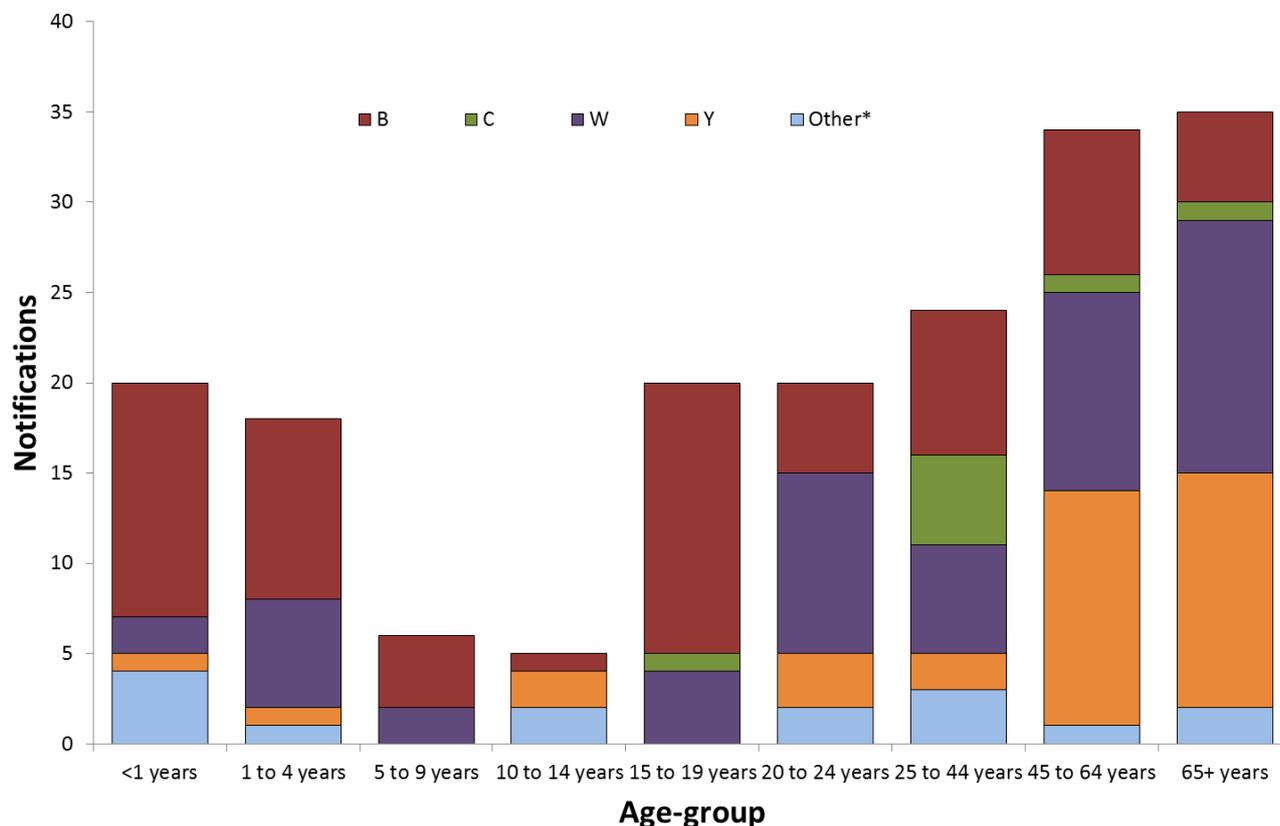


[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

Age distribution

- So far in 2017, MenW has been reported in the following age groups, less than 1 year (n=2), 1-4 years (n=6), 5-9 years (n=2), 15-19 years (n=4), 20-24 years (n=10), 25-44 years (n=6), 45-64 (n=11) and 65 and over (n=14) (Figure 4).
- In 2017 YTD, 45% (25/55) of MenW notifications and 74% (26/35) of MenY notifications have been in people 45 years and older. For MenW this is a similar distribution of notifications in 2016 with 46% (50/109), but higher for MenY with 63% (25/40) of notifications reported for this age group in 2016.

Figure 4. Notifications of IMD, Australia, 2017 YTD[#], by age group and serogroup

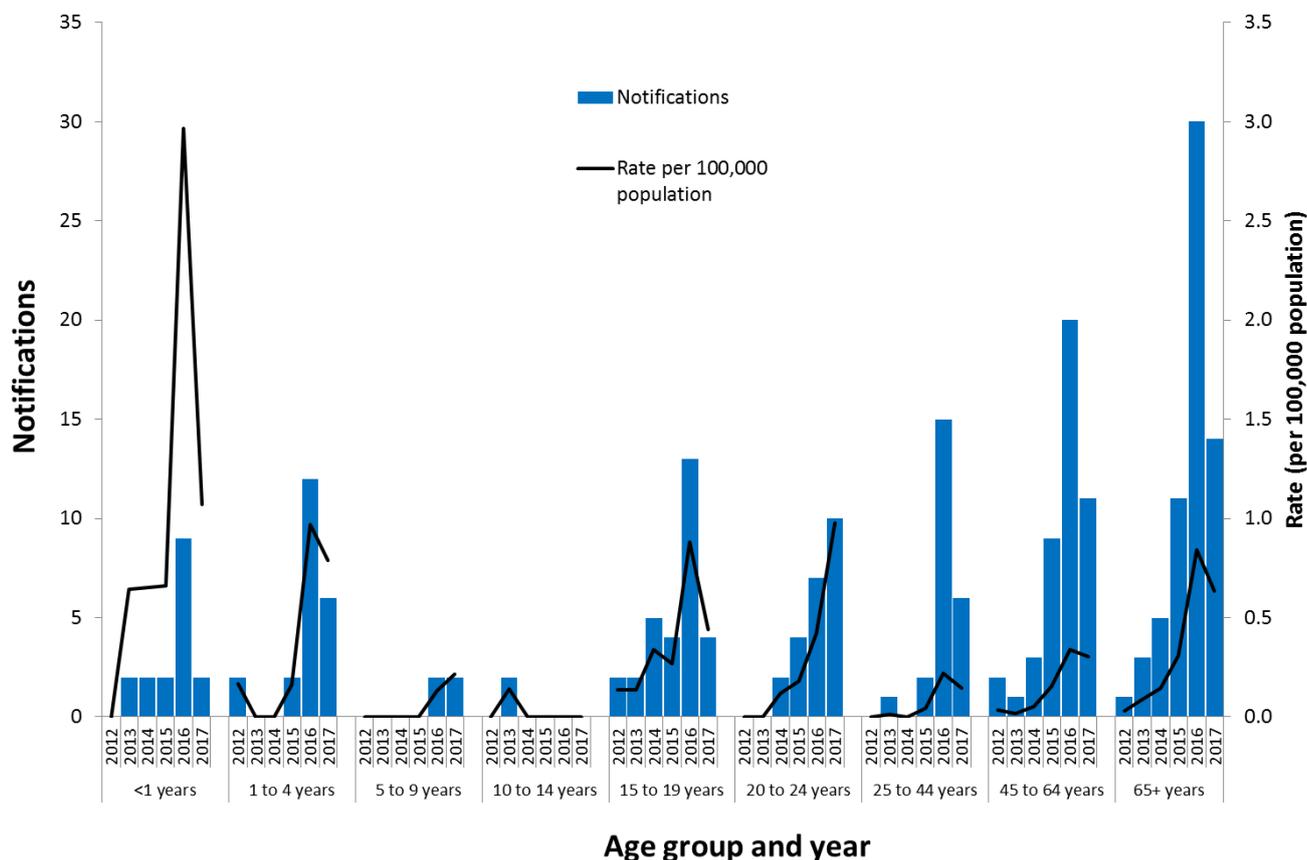


[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

*Other includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Age-specific rates of MenW, while remaining low, have increased in most age groups since 2012. The 2017 annualised notification rates for IMD are exceeding the 2016 rates in the 5 to 9 years and 20 to 24 years age groups (Figure 5).

Figure 5. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD[#]



^y2017 rates are annualised.

[#]Data extracted from the National Notifiable Diseases Surveillance System on 14 August 2017.

Clinical presentation and severity

- In 2017 YTD, there have been 9 deaths reported; 4 due to MenB, 3 due to MenW, 1 due to MenC and 1 due to MenY.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the ST 11 clonal complex (CC 11). This was verified by the enhanced data collected in January 2017 for 237 of the 259 IMD cases reported in 2016. Of the 110 cases of MenW reported in 2016, 69 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were ST 11 (35 of 69 isolates).
- Of the 23 MenW case reported in the first quarter of 2017 (1 January to 30 April), 14 isolates had sufficient typing information. The majority of the MenW C11 isolates were ST 11 (10 of 14 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.¹
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (8%) is greater the CFR of IMD due to all other serogroups (5%). In 2017 YTD, the CFR for MenW is 6% (3/55).
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.

- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.²
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 14 August 2017.
- Line-listed de-identified enhanced data on 237 IMD cases from 1 January 2016 to 16 January 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date

REFERENCES

- ¹ Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523.*
- ² Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*



SUMMARY

- Nationally the number of invasive meningococcal disease (IMD) cases and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a considerable cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 109 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 271 cases of IMD have been reported to the NNDSS. Of these, 104 cases were due to MenB, 94 cases were due to MenW, 50 cases were due to serogroup Y (MenY), 8 cases were due to serogroup C (MenC) and the remaining 15 cases are yet to be classified.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 40 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 12 cases were due to MenB, 23 cases were due to MenW, 2 cases were due to MenY and 3 cases are yet to be classified.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. However since 2016, notifications have peaked later, with 34 and 37 cases reported in August and October of 2016, and 42 and 59 cases reported in August and September of 2017.
- IMD notifications reported between December 2016 and September 2017 were high when compared to the same months in previous years.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 10 years since 2015.
- Many of the MenW cases belong to the hypervirulent sequence type (ST) 11, which is part of the ST 11 clonal complex (CC 11). ST 11 is associated with a higher risk of invasive disease and a higher case fatality rate. Nine deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since from 2011. A total of 52 cases of MenY have been reported in 2017 YTD, accounting for 19% of notifications.

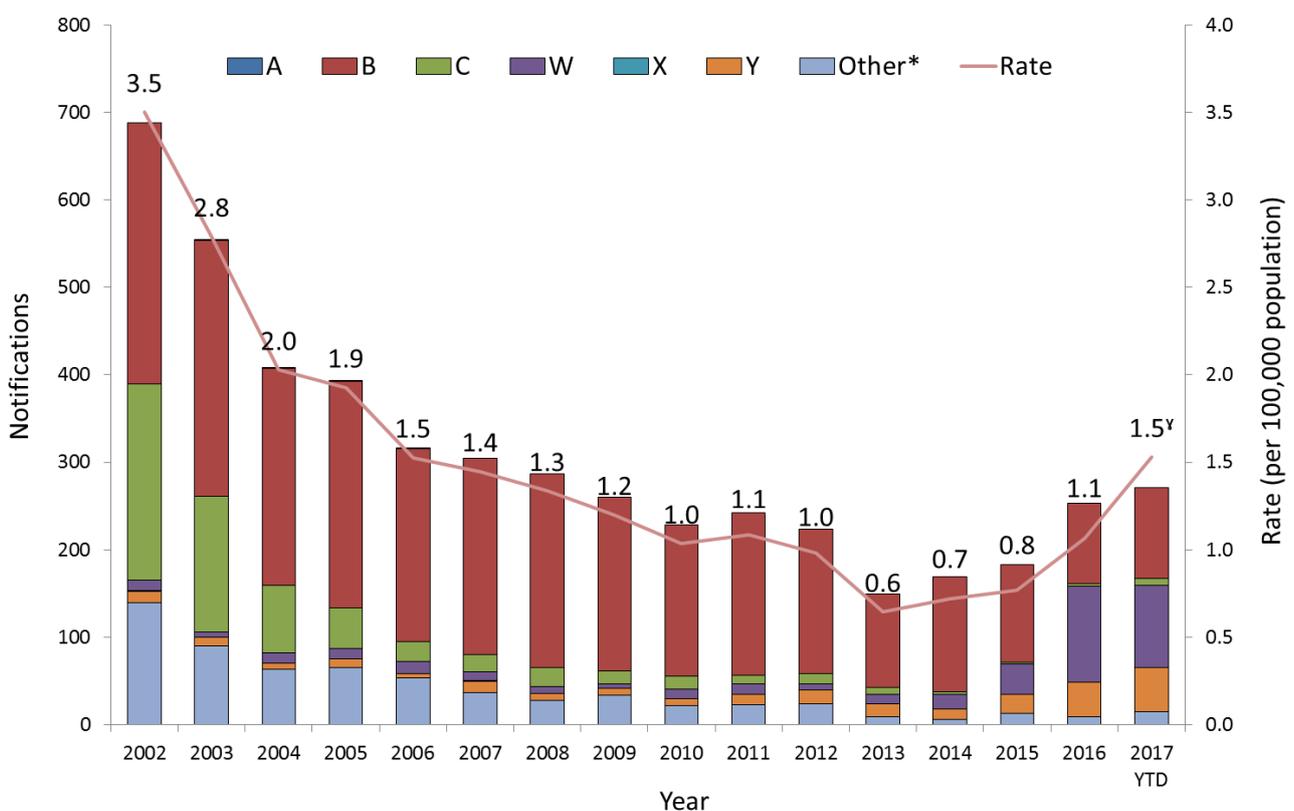
ANALYSIS

Serogroup trends

- Overall there has been a decline in IMD cases since the 2003 introduction of the MenC vaccine on the National Immunisation Program (NIP) with the overall rate of IMD decreasing 82% from 3.5 per 100,000 (688 cases) in 2002 to 0.6 per 100,000 (149 cases) in 2013. However, from 2014 the overall rate of IMD has increased. In 2017 YTD, there have been a total of 271 cases of IMD (1.1 per 100,000 (annualised rate 1.5 per 100,000) compared to 253 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 38% of IMD cases (n=104) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation programme since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 8 MenC cases have been notified to the NNDSS.
- Notifications of MenW doubled from 2014 (17) to 2015 (34), then more than tripled in 2016 (109). In 2017 YTD, 35% of IMD cases (n=94) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 50 MenY cases have been notified to the NNDSS, accounting for 18% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD[#], by serogroup



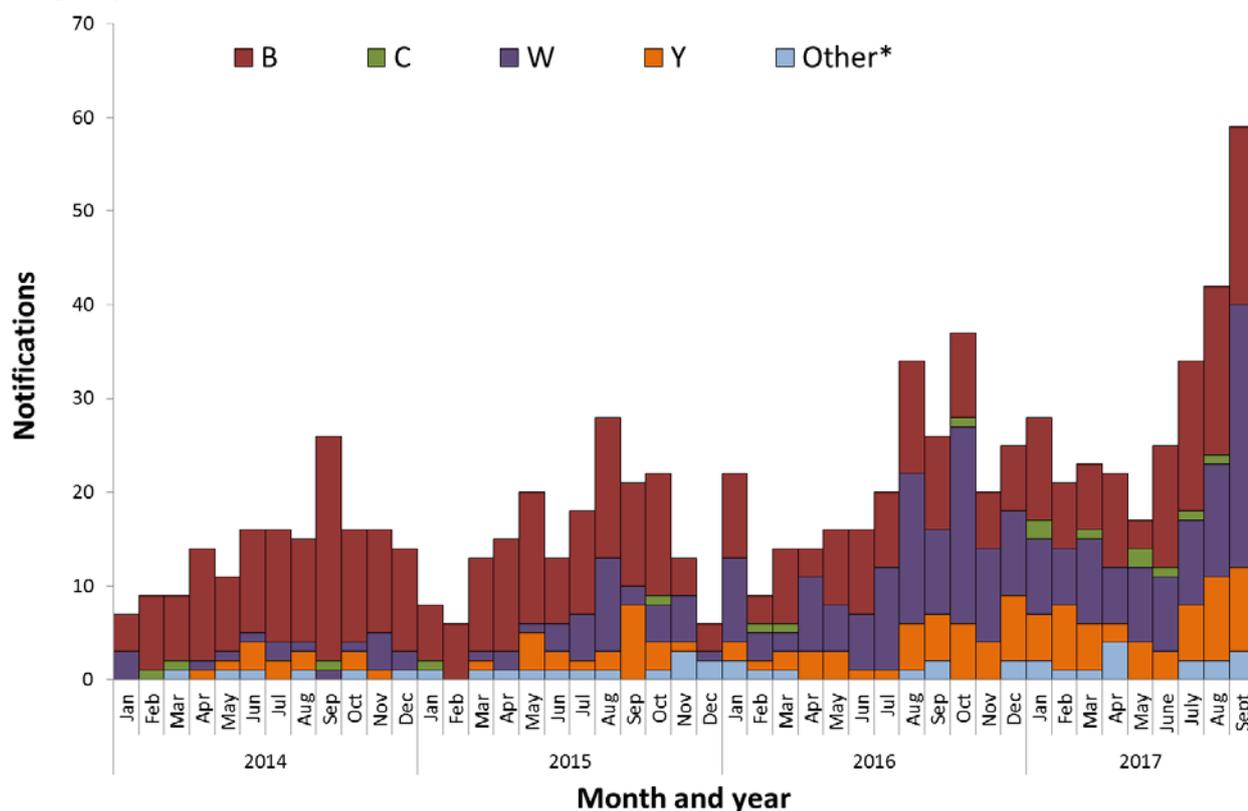
[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

[†]The rate for 2017 YTD has been annualised.

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year. In 2016, notifications peaked later, with 34 cases in August and 37 cases in October. IMD notifications in 2017 YTD were higher when compared to the same months in previous years, with the highest number of monthly cases (n= 59) reported in September 2017 (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD[#], by month and year of diagnosis and serogroup



[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Geographical distribution

- So far in 2017, IMD cases have been reported across all jurisdictions.
- MenW accounted for 35% (94 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 76% (n=16) in the Northern Territory (Table 1).

Table 1. Notifications and rates of IMD, Australia, 2017 YTD[#] by state and territory and serogroup

State or territory	Notifications							Total	Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	NG*			
ACT	0	0	0	0	0	1	0	1	0.3	0.3
NSW	0	36	3	13	0	12	4	68	0.9	1.2
NT	0	1	0	16	0	2	2	21	8.6	11.4
QLD	0	20	0	11	0	16	4	51	1.1	1.4
SA	0	18	0	8	0	3	0	29	1.7	2.2
TAS	0	2	0	6	0	0	2	10	1.9	2.6
VIC	0	21	4	27	0	11	2	65	1.1	1.4
WA	0	6	1	13	0	5	1	26	1.0	1.3
Australia	0	104	8	94	0	50	15	271	1.1	1.5

[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- The highest rate of IMD due to MenW in 2017 YTD has been reported in The Northern Territory with an annualised rate of 8.6 cases per 100,000 population (Table 2).

- In September 2017, the Northern Territory confirmed an outbreak of MenW in Central Australia, Barkly and Katherine regions.¹ YTD in 2017, the majority of MenW cases occurred in Aboriginal children in these regions.

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD*, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Notifications									
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	25	0	13	5	4	48	12	108
2017 YTD	0	13	16	11	8	6	27	13	94
Rate (per 100,000 population)									
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.2	0.3	-	0.3	0.3	0.8	0.8	0.5	0.4
2017	-	0.2	6.5	0.2	0.5	1.2	0.4	0.5	0.4
2017 annualised rate	-	0.2	8.6	0.3	0.6	1.5	0.6	0.7	0.5

* Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

Indigenous status

- Between 2014 and 2017 YTD, a total of 101 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (Table 3). MenB accounted for 55% (56/101) of IMD cases reported in Aboriginal and Torres Strait Islander people, followed by MenW with 36%.
- Year to date (YTD) in 2017 there have been 40 IMD cases reported in Aboriginal and Torres Strait Islander peoples, of which 58%, (23/40) were due to MenW (Table 3). This is in contrast to IMD cases reported from 2014 to 2015, where MenB was the predominate serogroup (95%, 20/21 in 2014 and 73%, 12/15 in 2015). In 2016, there were 24 case of IMD reported in Aboriginal and Torres Strait Islander peoples. Of these 50% (12/24) were MenB and 42% (10/24) were MenW.

Table 3. Notifications of IMD, Australia, 2014 to 2017 YTD[#] by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	-	92
	2017 YTD	12	87	5	104
C	2014	-	3	-	3
	2015	-	2	-	2
	2016	-	3	-	3
	2017 YTD	-	8	-	8
W	2014	-	17	-	17
	2015	3	30	1	34
	2016	10	98	-	108
	2017	23	66	5	94
Y	2014	-	12	-	12
	2015	-	22	-	22
	2016	2	38	-	40
	2017 YTD	2	47	1	50
NG*	2014	1	4	-	5
	2015	-	11	-	12
	2016	-	9	-	9
	2017 YTD	3	12	-	15
TOTAL		101	755	17	873

[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 40 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 8.1 per 100,000 population), compared to 228 cases reported in non-Indigenous populations (annualised rate = 1.3 per 100,000). Of the 40 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 12 cases were due to MenB, 23 cases were due to MenW, 2 cases were due to MenY and 3 cases are yet to be classified (Table 4).

Table 4. Notifications and rates of IMD, Australia, 2017 YTD[#] by Indigenous status and serogroup

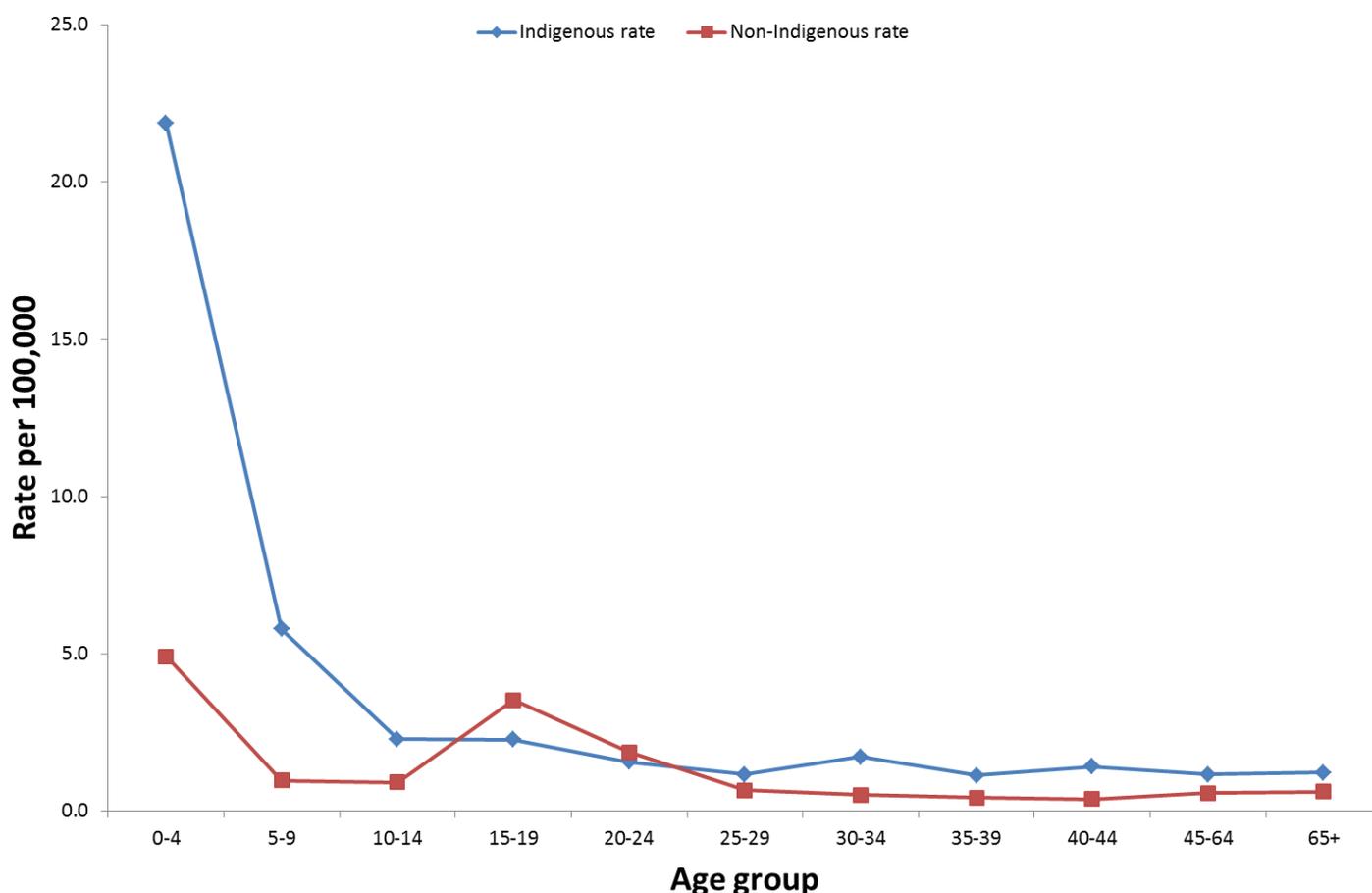
IMD serogroup	Indigenous			Non-Indigenous		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	12	1.8	2.4	87	0.4	0.5
C	0	-	-	8	0.0	0.0
W	23	3.5	4.6	66	0.3	0.4
X	0	-	-	0	-	-
Y	2	0.3	0.4	47	0.2	0.3
NG*	3	0.5	0.6	12	0.1	0.1
Total	40	6.1	8.1	220	0.9	1.2

[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Since 2002, the notification rates of IMD have been higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (22.0 per 100,000) and 5-9 years (5.8 per 100,000) compared to those who reported as non-Indigenous; 4.9 per 100,000 and 1.0 per 100,000 respectively (Figure 3).

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD[#], by Indigenous status and age group

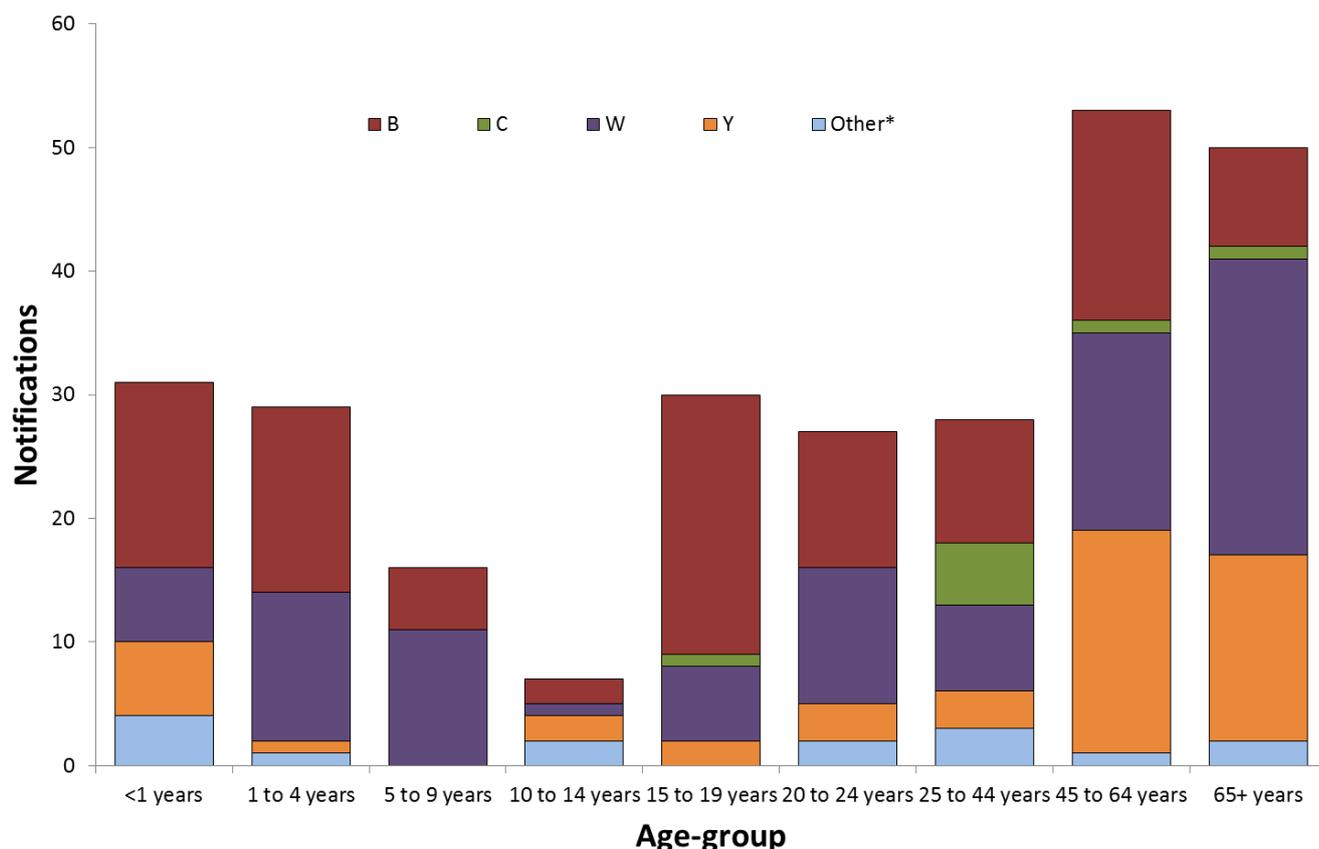


[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

Age distribution

- So far in 2017, MenW has been reported in all age groups. This includes 6 cases for infants less than 1 year, 12 cases in the 1-4 years age group, 11 cases in the 5-9 years age group, 1 case in the 10-14 years age group, 6 cases in the 15-19 years age group, 11 cases in the 20-24 years age group, 7 cases in the 25-44 years age group, 16 cases in the 45-64 age group and 24 cases in the 65 and older age group (Figure 4).
- In 2017 YTD, 57% (54/94) of MenW notifications were aged less than 45 years. Of these 54 cases, 67% (36/54) were aged less than 20 years. This is similar to age distribution seen in 2016, with 54% of MenW notifications aged less than 45 years, but in contrast to 2015, with 59% of MenW notifications aged 45 years and older.
- For MenY notifications 66% (33/50) have been in people aged 45 years or older, which is consistent with 2015 (77%, 17/22) and 2016 (63%, 25/40).

Figure 4. Notifications of IMD, Australia, 2017 YTD[#], by specified age group and serogroup

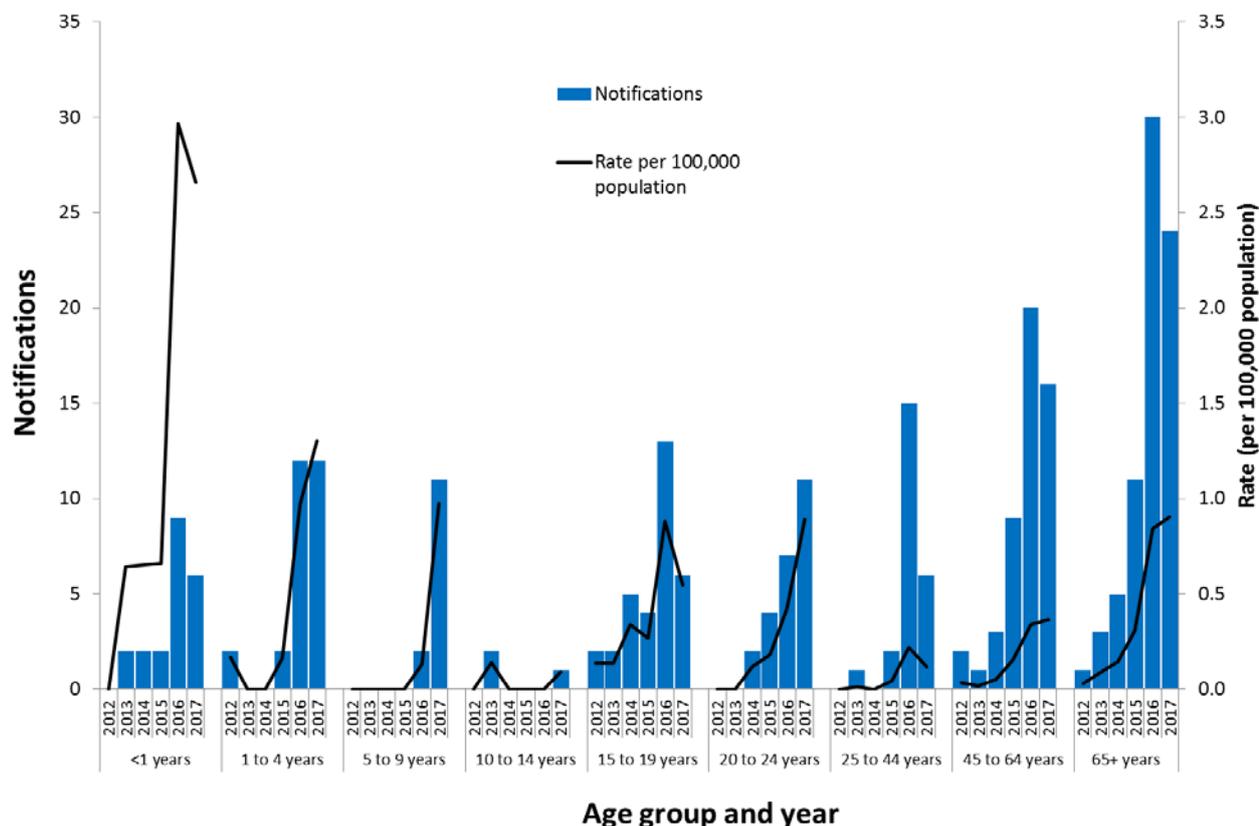


[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- Age-specific rates of MenW, while remaining low, have increased in most age groups since 2012. The 2017 annualised notification rates for IMD are exceeding the 2016 rates in all age groups except the less than 12 months of age, 15-19 years and 25-44 years age groups (Figure 5).

Figure 5. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD[#]



^y2017 rates are annualised.

[#]Data from the National Notifiable Diseases Surveillance System as of 30 September 2017.

Clinical presentation and severity

- In 2017 YTD, there have been 17 deaths reported; 5 due to MenB, 9 due to MenW, 2 due to MenY and 1 due to MenC.
- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (6.5%) is greater than the CFR due to MenB and MenY (3.3%) In 2017 YTD, the CFR for MenW is 10% (9/94).
- It is important to note that mortality reporting against each notification of IMD is not complete, but has improved over time.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the ST 11 clonal complex (CC 11). This was verified by the enhanced data collected in January 2017 for 237 of the 259 IMD cases reported in 2016. Of the 110 cases of MenW reported in 2016, 69 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were ST 11 (35 of 69 isolates).
- Of the 46 MenW case reported in the first and second quarters of 2017 (1 January to 30 June), 38 isolates had sufficient typing information. The majority of the MenW C11 isolates were ST 11 (30 of 38 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.²
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.

- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.³
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 04 October 2017.
- Line-listed de-identified enhanced data on 490 IMD cases from 1 January 2016 to 30 June 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date.

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- ¹ Northern Territory Government, 2017. [Health Alert: Meningococcal outbreak in Central Australia](#)
- ² Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523*.
- ³ Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*.



SUMMARY

- Nationally the number of invasive meningococcal disease (IMD) cases and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a considerable cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 108 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 327 cases of IMD were reported to the NNDSS. Of these, 125 cases were due to MenB, 117 cases were due to MenW, 62 cases were due to serogroup Y (MenY), 12 cases were due to serogroup C (MenC) and the remaining 11 cases are yet to be classified.
- So far in 2017, MenW cases were reported across all jurisdictions, except the Australian Capital Territory.
- In 2017 YTD, a total of 51 IMD cases were reported in Aboriginal and Torres Strait Islander peoples. Of these, 13 cases were due to MenB, 36 cases were due to MenW and 2 cases were due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. However in 2016, notifications peaked later with 37 cases reported in October. In 2017 YTD, notifications were higher compared to the same months in previous years, with highest number of monthly cases reported in September (n=67) of 2017.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 10 years since 2015.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the clonal complex 11 (CC 11). ST11 is associated with a higher risk of invasive disease and a higher case fatality rate. Eleven deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for a larger proportion of cases since 2011. A total of 63 cases of MenY were reported in 2017 YTD, accounting for 19% of notifications, compared with 40 cases (17%) in 2016, 22 cases (12%) in 2015 and 12 cases (7%) in 2014.

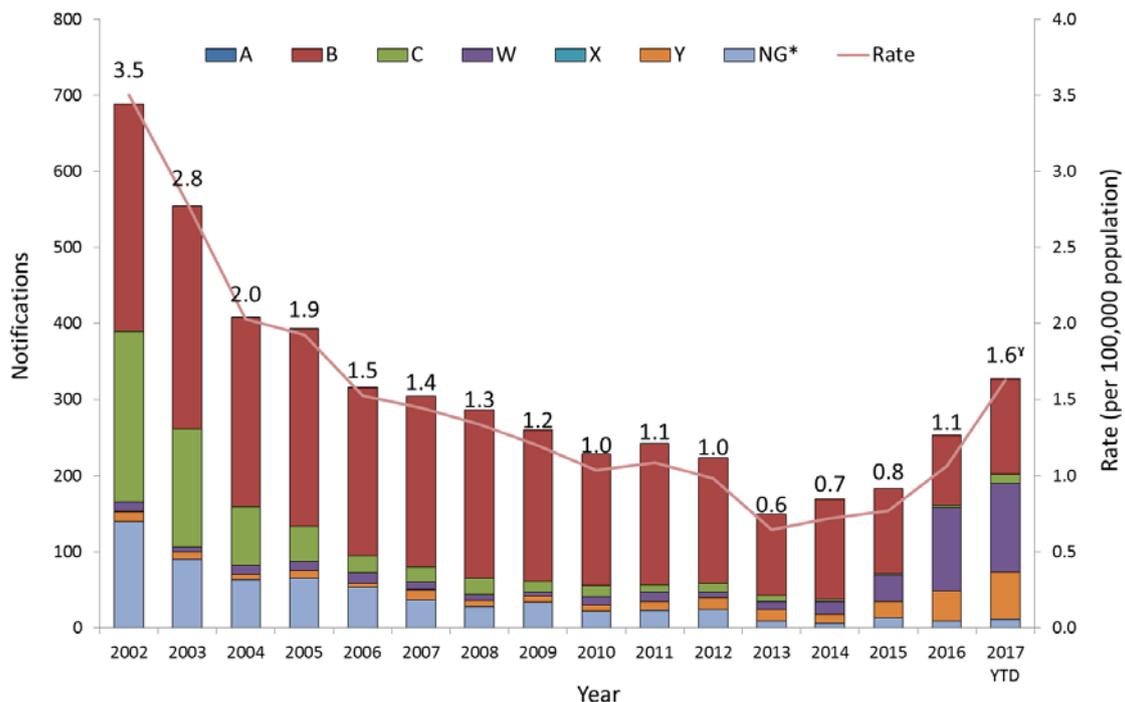
ANALYSIS

Serogroup trends

- Overall, the national incidence IMD in Australia is low. Following the introduction of the meningococcal C (MenC) vaccine on the National Immunisation Program (NIP) the overall rate of IMD decreased from 82% from 3.5 per 100,000 (685 cases) in 2002 to 0.6 per 100,000 (147 cases) in 2013. However from 2014, IMD notifications were rising with numbers year to date in 2017 the highest since 2005. The four most common meningococcal serotypes in Australia are B, C, W and Y.

- Since 2013, the overall rate of IMD has increased in Australia. In 2017 YTD, there were a total of 329 cases of IMD (1.4 per 100,000 (annualised rate 1.6 per 100,000)) compared with 252 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. Over this time, MenB notifications declined despite a targeted vaccine not being available on the NIP. So far in 2017, 37% of IMD cases (n=125) notified to the NNDSS are MenB.
 - MenC, the target of a national immunisation program since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 12 MenC cases were notified to the NNDSS.
 - Notifications of MenW doubled from 2014 (n=17) to 2015 (n=34), then more than tripled in 2016 (n=108). In 2017 YTD, 36% of IMD cases (n=117) notified to the NNDSS are MenW.
 - Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared with 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 62 MenY cases were notified to the NNDSS, accounting for 19% of notifications.
 - Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There were no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD[#], by serogroup



[#]Data from the NNDSS as of 31 October 2017.

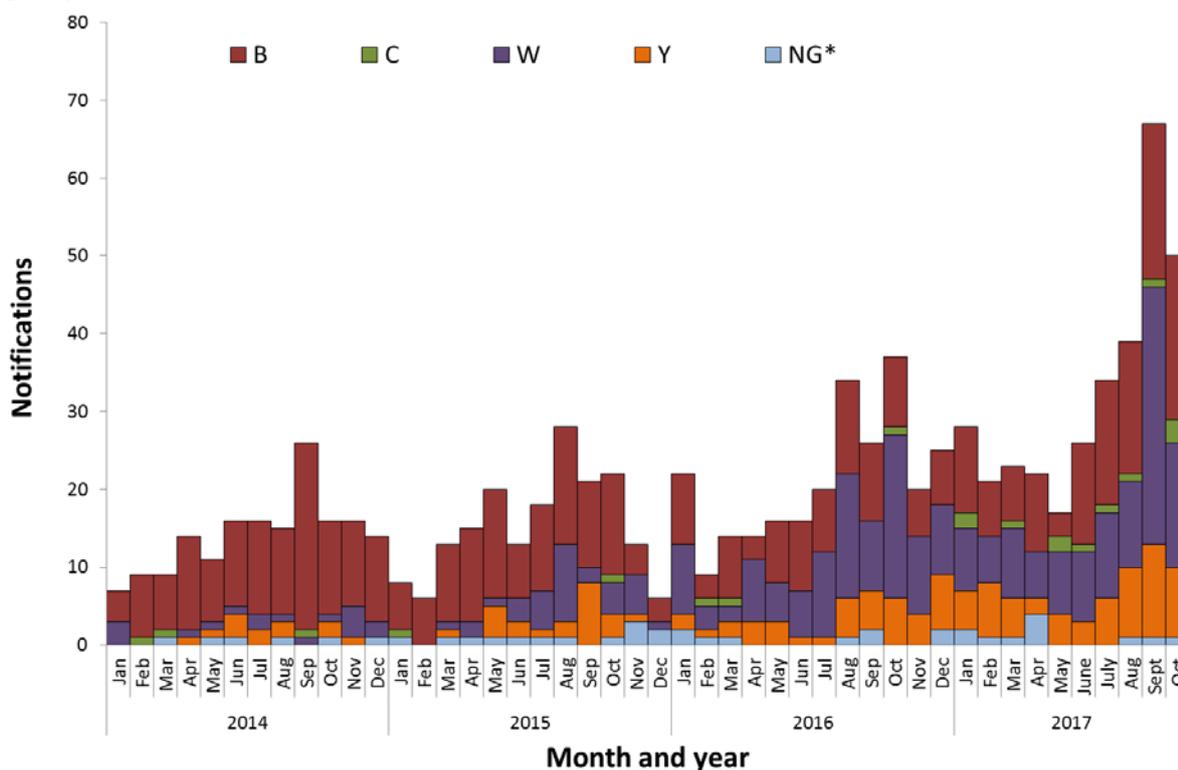
*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

[†]The rate for 2017 YTD were annualised.

Seasonality

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year.
- In 2016, notifications peaked later with 37 cases reported in October. YTD in 2017, notifications were higher compared to the same months in previous years, with highest number of monthly cases reported in September (n= 67) and October (n=50) (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD[#], by month and year of diagnosis and serogroup



[#]Data from the NNDSS as of 31 October 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Geographical distribution

- So far in 2017, IMD cases were reported across all jurisdictions.
- MenW accounted for 36% (117 cases) of notifications of IMD reported in 2017 YTD. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 83% (n=24) in the Northern Territory (Table 1).
- The highest rate of IMD due to MenW in 2017 YTD was in the Northern Territory with an annualised rate of 11.8 cases per 100,000 population (Table 2).
- YTD in 2017, the Northern Territory reported 29 cases of IMD, compared with 2 cases in 2016, 1 case in 2015 and 3 cases in 2014.

Central Australia MenW outbreak

- In September 2017, the Northern Territory confirmed an outbreak of MenW in the Central Australia, Barkly and Katherine regions.¹
- Cases associated with the outbreak have also been reported in South Australia and Western Australia.

Table 1. Notifications and rates of IMD, Australia, 2017 YTD[#] by state and territory and serogroup

State or territory	Notifications								Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	NG*	Total		
ACT	0	0	0	0	0	2	0	2	0.5	0.6
NSW	0	43	5	15	0	14	4	81	1.0	1.3
NT	0	3	0	24	0	2	0	29	11.8	14.2
QLD	0	23	0	15	0	19	4	61	1.3	1.5
SA	0	21	0	10	0	3	0	34	2.0	2.4
TAS	0	2	0	8	0	1	1	12	2.3	2.8
VIC	0	24	6	30	0	14	1	75	1.2	1.5
WA	0	9	1	15	0	7	1	33	1.3	1.6
Australia	0	125	12	117	0	62	11	327	1.4	1.6

[#]Data from the NNDSS as of 31 October 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD*, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	25	0	13	5	4	48	12	108
2017 YTD	0	15	24	15	10	8	30	15	117
	Rate (per 100,000 population)								
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.2	0.3	-	0.3	0.3	0.8	0.8	0.5	0.4
2017 YTD	0.0	0.2	9.8	0.3	0.6	1.5	0.5	0.6	0.5
2017 annualised rate	0.0	0.2	11.8	1.5	0.7	1.9	0.6	0.7	0.6

* Data from the NNDSS as of 31 October 2017.

Indigenous status

- Between 2014 and 2017 YTD, a total of 112 IMD cases were reported in Aboriginal and Torres Strait Islander peoples (Table 3). MenB accounted for 51% (57/112) of IMD cases reported in Aboriginal and Torres Strait Islander people, followed by MenW with 44% (49/112).
- YTD in 2017, 51 IMD cases were reported in Aboriginal and Torres Strait Islander peoples, of which 71% (36/51) were due to MenW (Table 3).
- This is in contrast to IMD cases reported from 2014 to 2015, where MenB was the predominant serogroup (95%, 20/21 in 2014 and 73%, 12/16 in 2015). In 2016, there were 24 cases of IMD reported in Aboriginal and Torres Strait Islander peoples. Of these 50% (12/24) were MenB and 42% (10/24) were MenW.
- This is in contrast to IMD cases reported from 2014 to 2015, where MenB was the predominant serogroup (95%, 20/21 in 2014 and 75%, 12/16 in 2015). In 2016, there were 24 cases of IMD reported in Aboriginal and Torres Strait Islander peoples. Of these 50% (12/24) were MenB and 42% (10/24) were MenW.

Table 3. Notifications of IMD, Australia, 2014 to 2017 YTD[#] by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	0	92
	2017 YTD	13	108	4	125
C	2014	0	3	0	3
	2015	0	2	0	2
	2016	0	3	0	3
	2017 YTD	0	11	0	11
W	2014	0	17	0	17
	2015	3	30	1	34
	2016	10	98	0	108
	2017	36	79	2	117
Y	2014	0	12	0	12
	2015	0	22	0	22
	2016	2	38	0	40
	2017 YTD	2	59	1	62
NG*	2014	1	4	0	5
	2015	1	11	0	12
	2016	0	9	0	9
	2017 YTD	0	11	0	11
TOTAL		112	803	13	928

[#]Data from the NNDSS as of 31 October 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

- In 2017 YTD, a total of 51 IMD cases were reported in Aboriginal and Torres Strait Islander peoples (annualised rate = 9.3 per 100,000 population), compared to 276 cases reported in non-Indigenous populations (annualised rate = 1.4 per 100,000). Of the 51 IMD cases reported in Aboriginal and Torres Strait Islander peoples, 13 cases were due to MenB, 36 cases were due to MenW and 2 cases were due to MenY (Table 4).

Table 4. Notifications and rates of IMD, Australia, 2017 YTD[#] by Indigenous status and serogroup

IMD serogroup	Indigenous			Non-Indigenous [^]		
	Notifications	Rate per 100,000	Annualised rate per 100,000	Notifications	Rate per 100,000	Annualised rate per 100,000
A	0	-	-	0	-	-
B	13	2.0	2.4	112	0.5	0.6
C	0	-	-	12	0.1	0.1
W	36	5.5	6.6	81	0.3	0.4
X	0	-	-	0	-	-
Y	2	0.3	0.4	60	0.3	0.3
NG*	0	-	-	11	0.0	0.1
All IMD	51	7.7	9.3	276	1.1	1.4

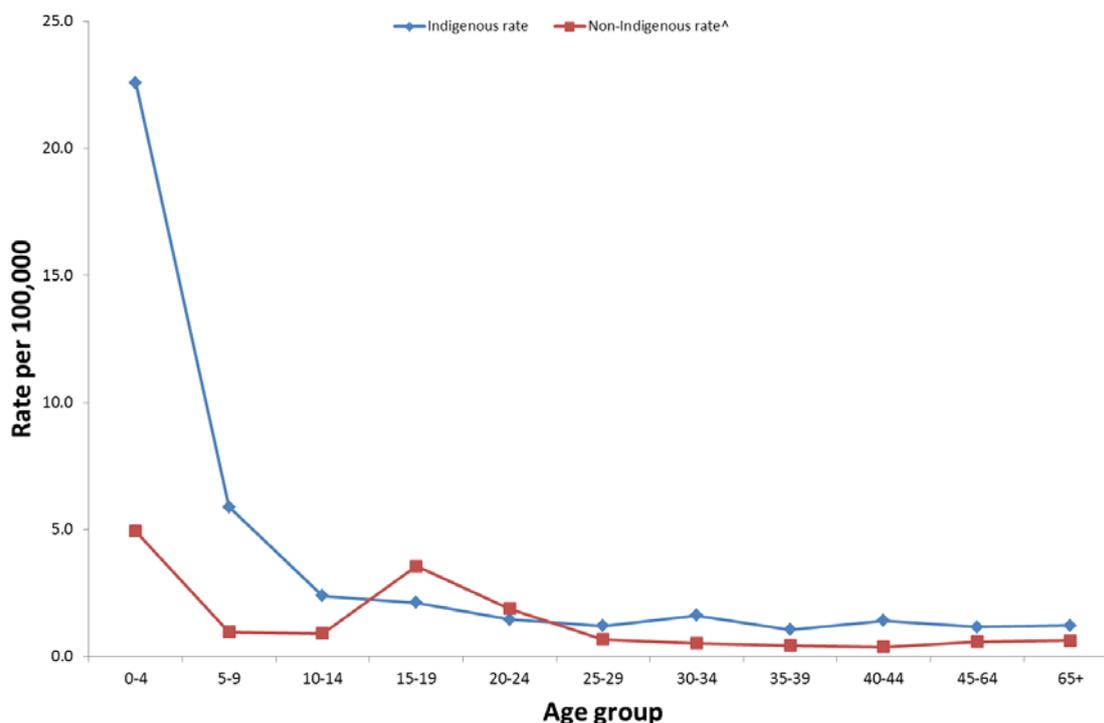
[#]Data from the NNDSS as of 31 October 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

[^]Non-Indigenous includes case reported as non-Indigenous and not stated.

- Since 2002, the notification rates of IMD were higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (22.6 per 100,000) and 5-9 years (5.9 per 100,000) compared to those who reported as non-Indigenous; 4.9 per 100,000 and 1.0 per 100,000 respectively (Figure 3).

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD[#], by Indigenous status and age group



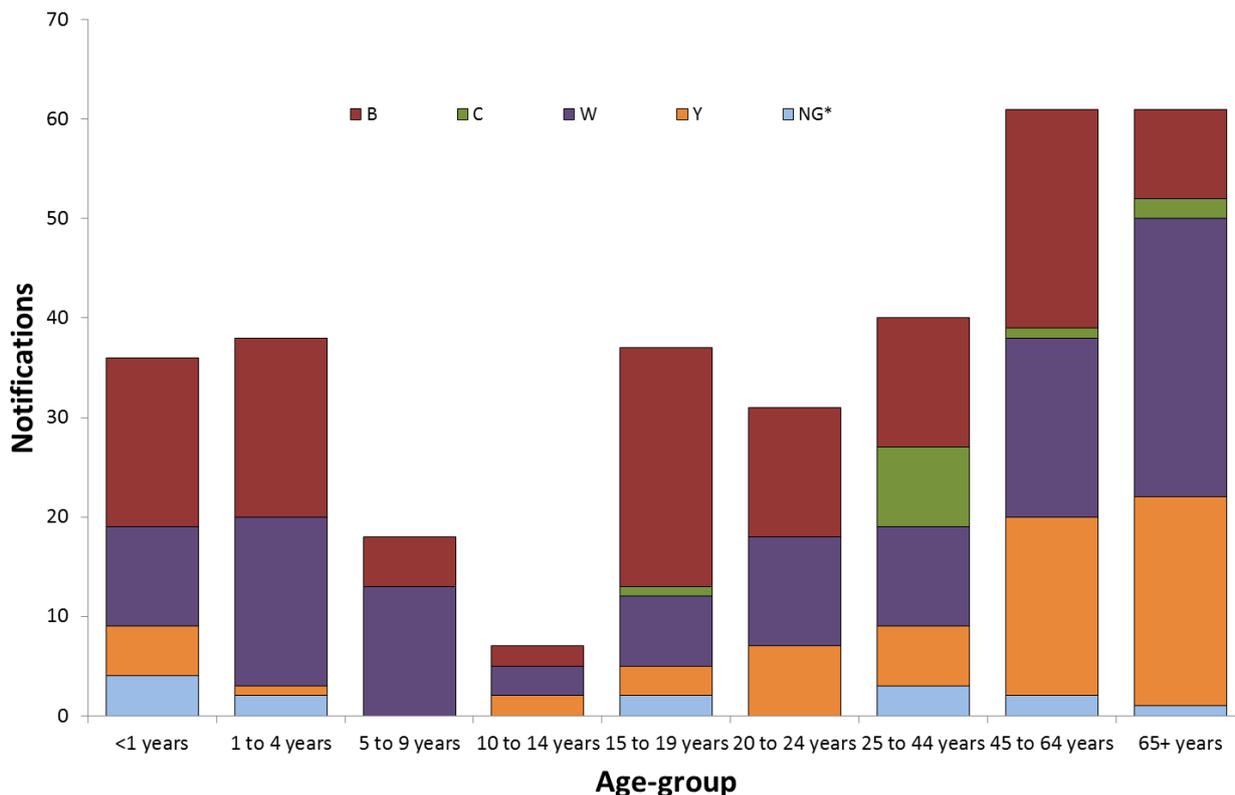
[#]Data from the National Notifiable Diseases Surveillance System as of 31 October 2017.

[^]Non-Indigenous includes case reported as non-Indigenous and not stated.

Age distribution

- So far in 2017, MenW has been reported in all age groups. This includes 10 cases for infants less than 1 year, 17 cases in the 1-4 years age group, 13 cases in the 5-9 years age group, 3 cases in the 10-14 years age group, 7 cases in the 15-19 years age group, 11 cases in the 20-24 years age group, 10 cases in the 25-44 years age group, 18 cases in the 45-64 age group and 28 cases in the 65 and older age group (Figure 4).
- In 2017 YTD, 61% (71/117) of MenW notifications were aged less than 45 years. This is slightly higher than the age distribution seen in 2016, with 54% of MenW notifications aged less than 45 years.
- For MenY notifications 62% (39/63) were in people aged 45 years or older, compared with 2015 (77%, 17/22) and 2016 (63%, 25/40).
- Age-specific rates of MenW, while remaining low, have increased in most age groups since 2012. The 2017 annualised notification rates for IMD exceed the 2016 rates in all age groups except the 15-19 years and 25-44 years age groups (Figure 5).

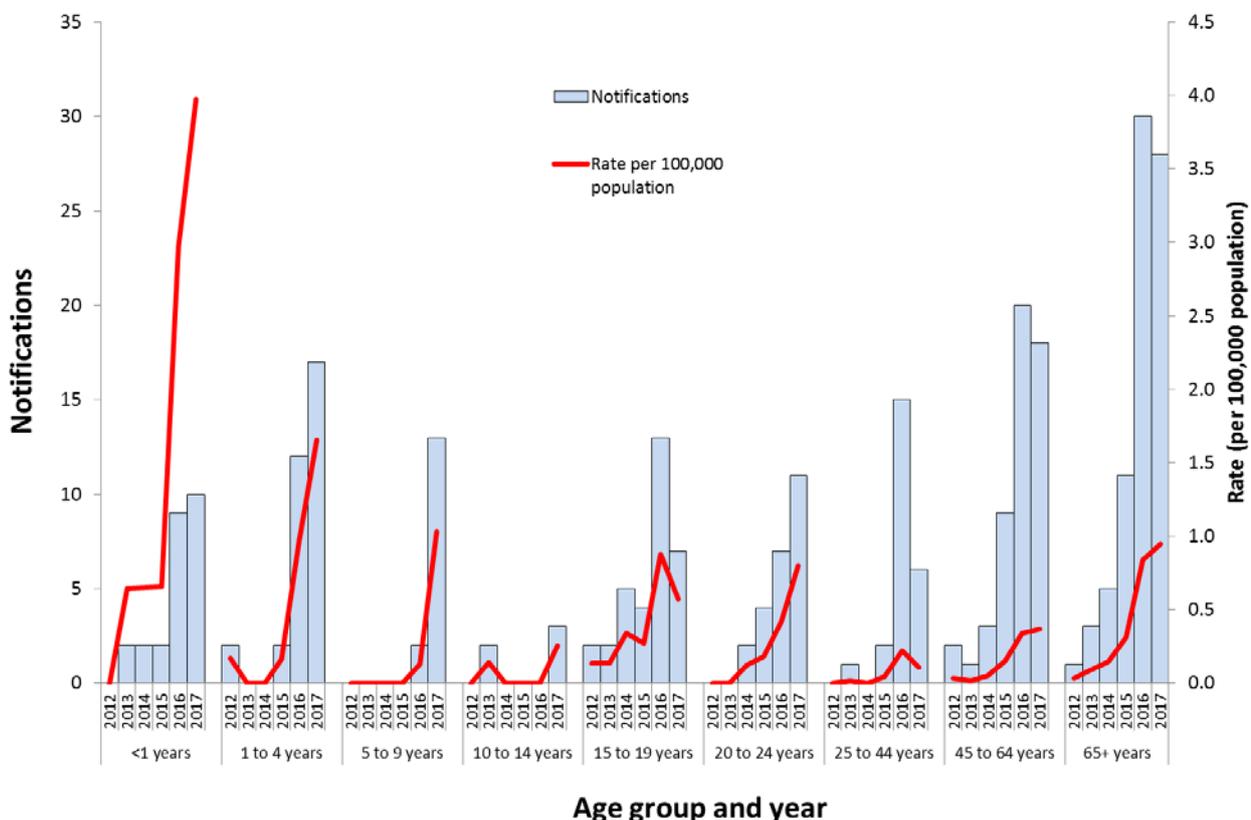
Figure 4. Notifications of IMD, Australia, 2017 YTD[#], by specified age group and serogroup



[#]Data from the NNDSS as of 31 October 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Figure 5. Age-specific notifications and rates[†] of MenW, Australia, 2012 to 2017 YTD[#]



[†]The rate for 2017 YTD were annualised.

[#]Data from the National Notifiable Diseases Surveillance System as of 31 October 2017.

Clinical presentation and severity

- In 2017 YTD, there were 20 deaths reported; 6 due to MenB, 11 due to MenW, 2 due to MenY and 1 due to MenC.

- 14 of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (6.5%) was greater than the CFR due to MenB and MenY (3.3%) for the same period. In 2017 YTD, the CFR for MenW was 9.4% (11/117).
- The mortality reporting against each notification of IMD is not complete, but has improved over time.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the clonal complex 11 (CC 11). This was verified by the enhanced data collected in January 2017 for the cases reported in 2016. Of the 108 cases of MenW reported in 2016, 98 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were ST 11 (70 of 98 isolates).
- Of the 46 MenW case reported in the first and second quarters of 2017 (1 January to 30 June), 38 isolates had sufficient typing information. The majority of the MenW C11 isolates were ST 11 (30 of 38 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.²
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.³
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 09 November 2017.
- Line-listed de-identified enhanced data on 489 IMD cases from 1 January 2016 to 30 June 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date.

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- ¹ Northern Territory Government, 2017. [Health Alert: Meningococcal outbreak in Central Australia](#)
- ² Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523*.
- ³ Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61*.



SUMMARY

- Nationally the number of invasive meningococcal disease (IMD) cases and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a considerable cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 108 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017 year-to-date (YTD), a total of 358 cases of IMD have been reported to the NNDSS. Of these, 136 cases were due to MenB, 128 cases were due to MenW, 69 cases were due to serogroup Y (MenY), 14 cases were due to serogroup C (MenC) and the remaining 11 cases are yet to be classified.
- So far in 2017, MenW cases have been reported across all jurisdictions, except the Australian Capital Territory.
- In 2017, YTD, a total of 56 IMD cases have been reported in Aboriginal and Torres Strait Islander peoples. Of these, 13 cases were due to MenB, 41 cases were due to MenW and 2 cases were due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. However in 2016, notifications peaked later with 37 cases reported in October. In 2017 YTD notifications were higher compared with the same months in previous years, with highest number of monthly cases reported in September (n=68) of 2017.
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 10 years since 2015.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the clonal complex 11 (CC 11). ST11 is associated with a higher risk of invasive disease and a higher case fatality rate. Fourteen deaths have occurred in 2017 YTD due to MenW.
- Also of interest is the increase in MenY notifications, which is accounting for an increasing proportion of cases since 2011. A total of 69 cases of MenY were reported in 2017 YTD, accounting for 19% of notifications, compared with 40 cases (17%) in 2016, 22 cases (12%) in 2015 and 12 cases (7%) in 2014.

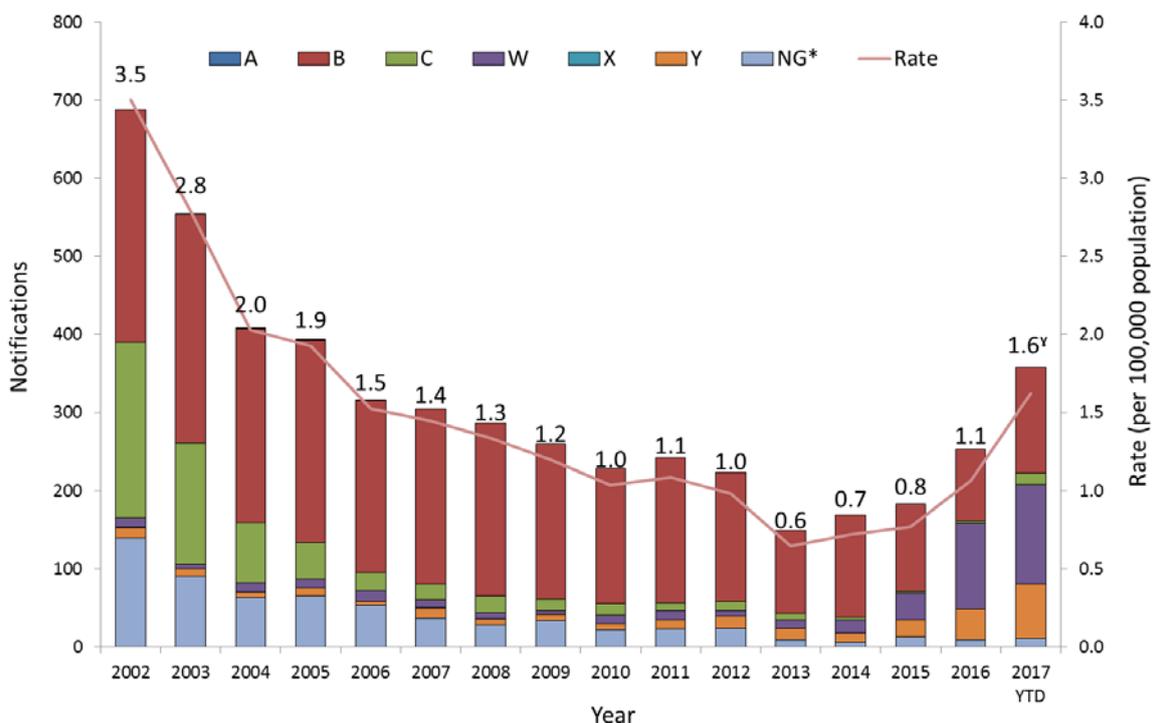
ANALYSIS

Serogroup trends

- Overall, the national incidence of IMD in Australia is low. Following the introduction of the meningococcal C (MenC) vaccine on the National Immunisation Program (NIP) the overall rate of IMD decreased by 82% from 3.5 per 100,000 (685 cases) in 2002 to 0.6 per 100,000 (147 cases) in 2013. However from 2014, IMD notifications increased with numbers YTD in 2017 the highest since 2005. The four most common meningococcal serotypes in Australia are B, C, W and Y.
- Since 2013, the overall rate of IMD has increased in Australia. In 2017 YTD, there have been a total of 358 cases of IMD (1.5 per 100,000 (annualised rate 1.6 per 100,000)) compared with 252 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. So far in 2017, 38% of IMD cases (n=136) notified to the NNDSS are MenB.

- MenC, the target of a national immunisation program since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). So far in 2017, 14 MenC cases have been notified to the NNDSS.
- Notifications of MenW doubled from 2014 (n=17) to 2015 (n=34), then more than tripled in 2016 (n=108). In 2017 YTD, 36% of IMD cases (n=128) notified to the NNDSS are MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared with 22 and 12 in 2015 and 2014, respectively. In 2017 YTD, 69 MenY cases have been notified to the NNDSS, accounting for 19% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There have been no notifications of either MenA or MenX in 2017 YTD.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017 YTD[#], by serogroup



[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

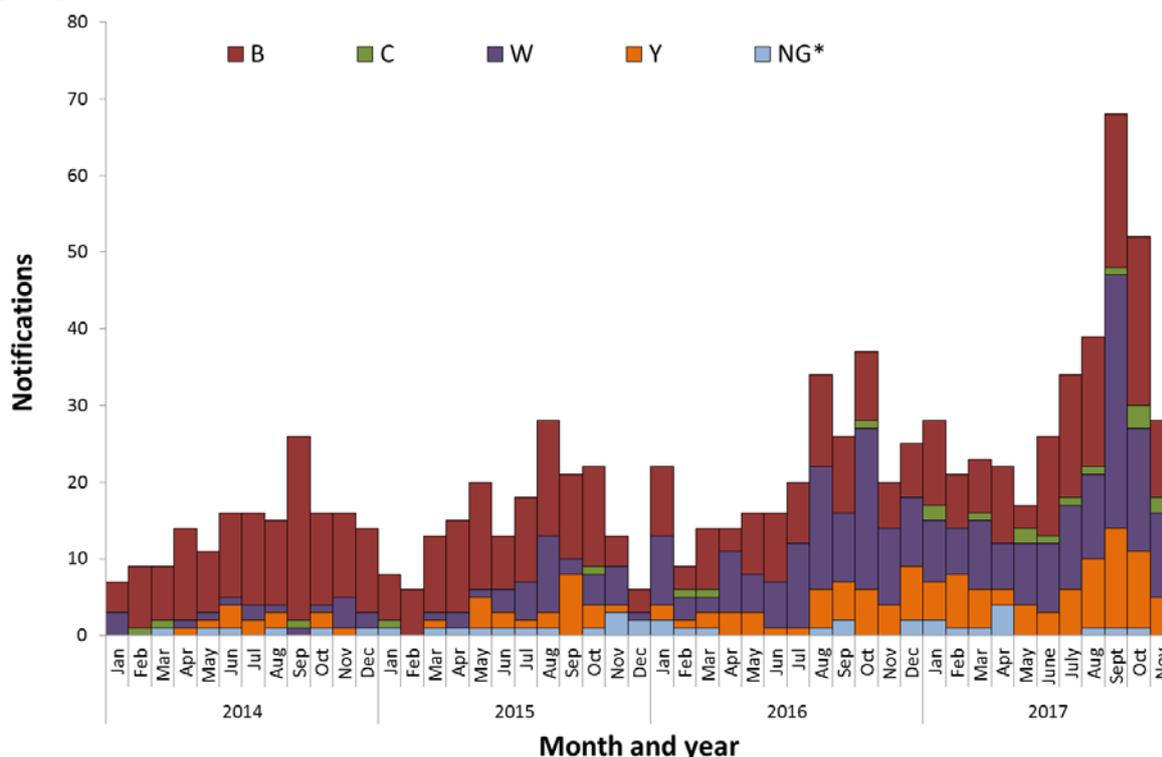
*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

^y The rate for 2017 YTD has been annualised.

Seasonality

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year.
- In 2016, notifications peaked later with 37 cases reported in October. YTD in 2017 notifications have been higher compared to the same months in previous years, with highest number of monthly cases reported in September (n=68) and October (n=52) (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017 YTD[#], by month and year of diagnosis and serogroup



[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Geographical distribution

- So far in 2017, IMD cases were reported across all jurisdictions.
- MenW accounted for 36% (128 cases) of IMD notifications reported YTD in 2017. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 82% (n=27) in the Northern Territory (Table 1).
- The highest rate of IMD due to MenW in 2017 YTD is in the Northern Territory with an annualised rate of 12.1 cases per 100,000 population (Table 2).
- YTD in 2017, the Northern Territory reported 33 cases of IMD, compared with 2 cases in 2016, 1 case in 2015 and 3 cases in 2014.

Central Australia MenW outbreak

- In September 2017, the Northern Territory confirmed an outbreak of MenW in the Central Australia, Barkly and Katherine regions.¹
- Cases associated with the outbreak have also been reported in Queensland, South Australia and Western Australia.

Table 1. Notifications and rates of IMD, Australia, 2017 YTD[#] by state and territory and serogroup

State or territory	Notifications								Rate (per 100,000 population)	Annualised Rate (per 100,000 population)
	A	B	C	W	X	Y	NG*	Total		
ACT	0	0	0	0	0	2	0	2	0.5	0.5
NSW	0	43	5	17	0	16	4	85	1.1	1.2
NT	0	3	0	27	0	3	0	33	13.4	14.7
QLD	0	25	0	15	0	20	4	64	1.3	1.4
SA	0	22	0	10	0	3	0	35	2.0	2.2
TAS	0	6	0	8	0	1	1	16	3.1	3.4
VIC	0	25	8	33	0	17	1	84	1.4	1.5
WA	0	12	1	18	0	7	1	39	1.5	1.7
Australia	0	136	14	128	0	69	11	358	1.5	1.6

[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017 YTD*, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	25	0	13	5	4	48	12	108
2017 YTD	0	17	27	15	10	8	33	18	128
	Rate (per 100,000 population)								
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.2	0.3	-	0.3	0.3	0.8	0.8	0.5	0.4
2017 YTD	0.0	0.2	11.0	0.3	0.6	1.5	0.5	0.7	0.5
2017 annualised rate	0.0	0.2	12.1	1.4	0.6	1.7	0.6	0.8	0.6

[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

Indigenous status

- Between 2014 and 2017 YTD, a total of 117 IMD cases were reported in Aboriginal and Torres Strait Islander peoples (Table 3). MenB accounted for 49% (57/117) of IMD cases reported in Aboriginal and Torres Strait Islander people, followed by MenW with 46% (54/117).
- YTD in 2017, 56 IMD cases were reported in Aboriginal and Torres Strait Islander peoples, of which 73% (41/56) have been due to MenW (Table 4).
- This is in contrast to IMD cases reported from 2014 to 2015, where MenB was the predominant serogroup (95%, 20/21 in 2014 and 73%, 12/16 in 2015). In 2016, there were 24 cases of IMD reported in Aboriginal and Torres Strait Islander peoples. Of these 50% (12/24) were MenB and 42% (10/24) were MenW.
- In 2017 YTD, the annualised rate of MenW reported in Aboriginal and Torres Strait Islander peoples was 6.8 per 100,000 population compared with the annualised rate of 0.4 per 100,000 in non-Indigenous populations (Table 4).

Table 3. Notifications of IMD, Australia, 2014 to 2017 YTD[#] by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	0	92
	2017 YTD	13	120	3	136
C	2014	0	3	0	3
	2015	0	2	0	2
	2016	0	3	0	3
	2017 YTD	0	13	1	14
W	2014	0	17	0	17
	2015	3	30	1	34
	2016	10	98	0	108
	2017	41	85	2	128
Y	2014	0	12	0	12
	2015	0	22	0	22
	2016	2	38	0	40
	2017 YTD	2	66	1	69
NG*	2014	1	4	0	5
	2015	1	11	0	12
	2016	0	9	0	9
	2017 YTD	0	11	0	11
TOTAL		117	830	13	960

[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Table 4. Notifications and rates of IMD, Australia, 2017 YTD[#] by Indigenous status and serogroup

IMD serogroup	Indigenous			Non-Indigenous [^]		
	Notifications	Rate	Annualised	Notifications	Rate	Annualised
		per 100,000	rate per 100,000		per 100,000	rate per 100,000
A	0	-	-	0	-	-
B	13	2.0	2.2	123	0.5	0.6
C	0	-	-	14	0.1	0.1
W	41	6.2	6.8	87	0.3	0.4
X	0	-	-	0	-	-
Y	2	0.3	0.3	67	0.3	0.3
NG*	0	-	-	11	0.0	0.1
All IMD	56	8.5	9.3	302	1.3	1.4

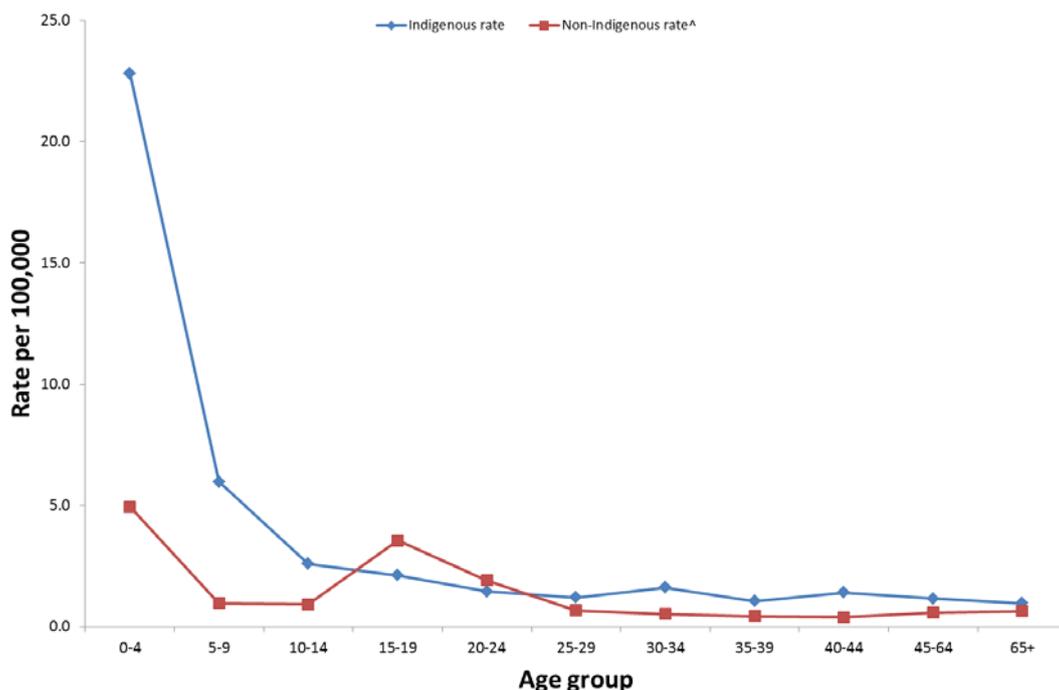
[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

[^]Non-Indigenous includes case reported as non-Indigenous and not stated.

- Since 2002, the notification rates of IMD were higher in Aboriginal and Torres Strait Islander peoples aged 0-4 years (22.8 per 100,000) and 5-9 years (6.0 per 100,000) compared to those who reported as non-Indigenous; 4.9 per 100,000 and 1.0 per 100,000 respectively (Figure 3).

Figure 3. Notification rates of IMD, Australia, 2002 to 2017 YTD[#], by Indigenous status and age group



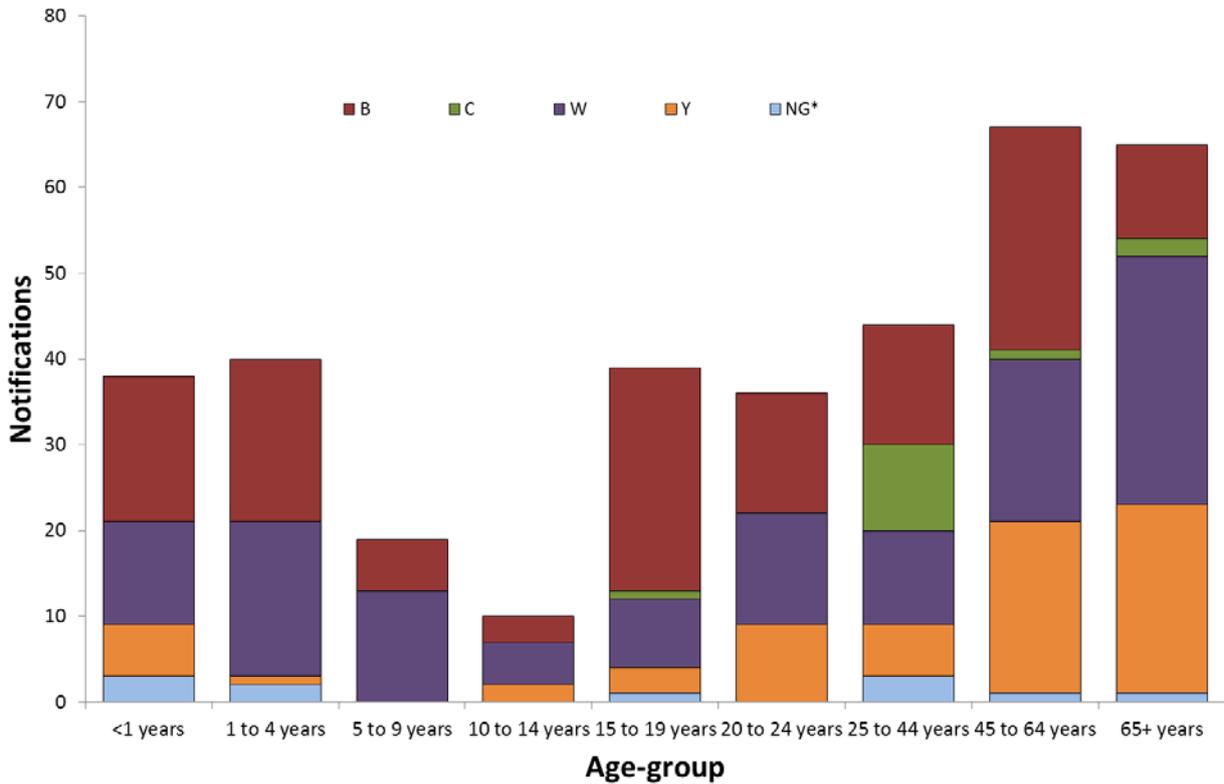
[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

[^]Non-Indigenous includes case reported as non-Indigenous and not stated.

Age distribution

- So far in 2017, MenW has been reported in all age groups. This includes 12 cases for infants less than 1 year, 18 cases in the 1-4 years age group, 13 cases in the 5-9 years age group, 5 cases in the 10-14 years age group, 8 cases in the 15-19 years age group, 13 cases in the 20-24 years age group, 11 cases in the 25-44 years age group, 19 cases in the 45-64 age group and 29 cases in the 65 and older age group (Figure 4).
- In 2017 YTD, 63% (80/128) of MenW notifications were aged less than 45 years. This is slightly higher than the age distribution seen in 2016, with 54% of MenW notifications aged less than 45 years.
- For MenY notifications 61% (42/69) have been in people aged 45 years or older, compared with 2015 (77%, 17/22) and 2016 (63%, 25/40).
- Age-specific rates of MenW, while remaining low, have increased in most age groups since 2012. The 2017 annualised notification rates for IMD exceeded the 2016 rates in all age groups except the 15-19 years and 25-44 years age groups (Figure 5).

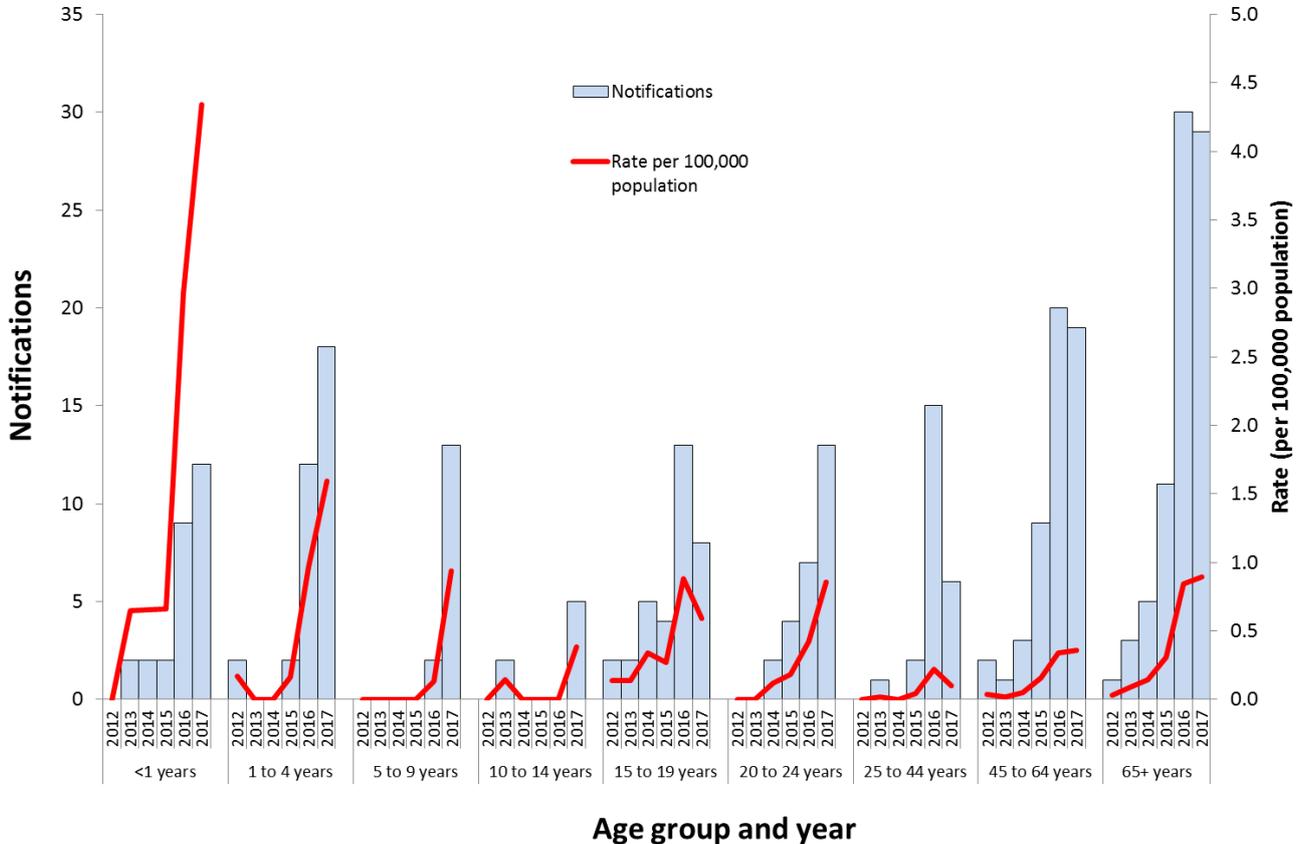
Figure 4. Notifications of IMD, Australia, 2017 YTD[#], by specified age group and serogroup



[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Figure 5. Age-specific notifications and rates^y of MenW, Australia, 2012 to 2017 YTD[#]



^y The rate for 2017 YTD was annualised.

[#]Data from the NNDSS with a diagnosis date up until of 30 November 2017. Data was extracted on 12 December 2017.

Clinical presentation and severity

- In 2017 YTD, there have been 25 deaths reported; 8 due to MenB, 14 due to MenW, 2 due to MenY and 1 due to MenC.
- Fourteen of the 23 deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (6.5%) was greater than the CFR due to MenB and MenY (3.3%). In 2017 YTD, the CFR for MenW was 10.9% (14/128).
- The mortality reporting against each notification of IMD is not complete, but has improved over time.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the clonal complex 11 (CC 11). This was verified by the enhanced data collected in January 2017 for the cases reported in 2016. Of the 108 cases of MenW reported in 2016, 98 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were ST 11 (70 of 98 isolates).
- Of the 101 MenW case reported from the first to the third quarter of 2017 (1 January to 30 September), 89 isolates had sufficient typing information. The majority of MenW C11 isolates were ST 11 (63 of 89 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.²
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.³
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 12 December 2017.
- Line-listed de-identified enhanced data on 529 IMD cases from 1 January 2016 to 30 September 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.

- Data extracted by diagnosis date.

REFERENCES

- ¹ Northern Territory Government, 2017. Health Alert: Meningococcal outbreak in Central Australia
- ² Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523.*
- ³ Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61.*



SUMMARY

- Nationally the number of invasive meningococcal disease (IMD) cases and overall risk remains low; however, since 2013, serogroup W (MenW) has emerged as a considerable cause of IMD.
- From 2002 to 2015 the predominant meningococcal serogroup in Australia was serogroup B (MenB). However, in 2016, MenW became the predominant meningococcal serogroup in Australia with a total of 108 cases reported to the National Notifiable Diseases Surveillance System (NNDSS).
- In 2017, a total of 383 cases of IMD were reported to the NNDSS. Of these, 138 cases were due to MenB, 140 cases were due to MenW, 75 cases were due to serogroup Y (MenY), 14 cases were due to serogroup C (MenC) and the remaining 16 cases are yet to be classified.
- MenW cases were reported across all jurisdictions in 2017, except the Australian Capital Territory.
- In 2017, a total of 61 IMD cases were reported in Aboriginal and Torres Strait Islander peoples. Of these, 13 cases were due to MenB, 46 cases were due to MenW and 2 cases were due to MenY.
- IMD follows a seasonal trend in Australia with notifications usually peaking in winter and early spring. However in 2016, notifications peaked later with 37 cases reported in October. This change in seasonality continued in 2017 with the notifications peaking in September (n=68) and October (n=52).
- While cases of MenW are more common in adults, there has been an increase in cases in children aged less than 10 years since 2015.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the clonal complex 11 (CC 11). ST11 is associated with a higher risk of invasive disease and a higher case fatality rate. Sixteen deaths have occurred in 2017 due to MenW.
- Also of note was the increase in MenY notifications, which accounted for an increasing proportion of cases since 2011. A total of 75 cases of MenY were reported in 2017, accounting for 20% of notifications, compared with 40 cases (17%) in 2016, 22 cases (12%) in 2015 and 12 cases (7%) in 2014.

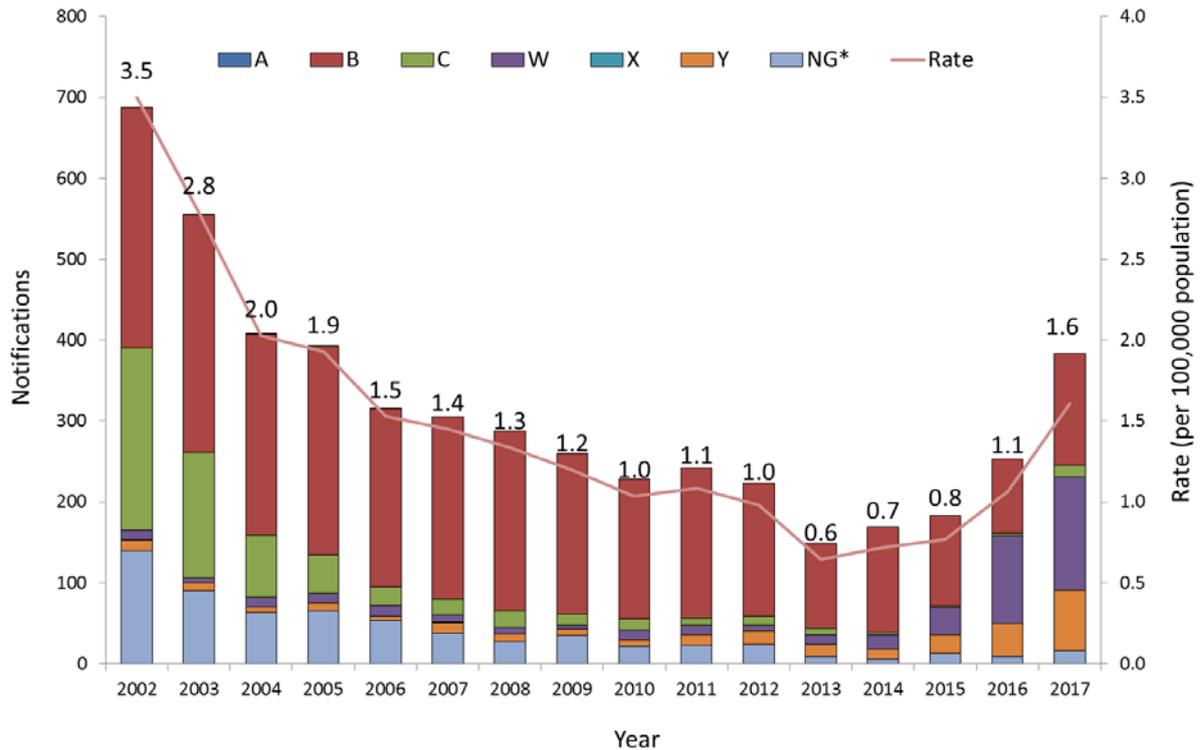
ANALYSIS

Serogroup trends

- Overall, the national incidence of IMD in Australia is low. Following the introduction of the meningococcal C (MenC) vaccine on the National Immunisation Program (NIP) the overall rate of IMD decreased by 82% from 3.5 per 100,000 (685 cases) in 2002 to 0.6 per 100,000 (147 cases) in 2013. However from 2014, IMD notifications were rising with numbers in 2017 the highest since 2005. The four most common meningococcal serotypes in Australia are B, C, W and Y.
- Since 2013, the overall rate of IMD has increased in Australia. In 2017, there were a total of 383 cases of IMD (1.6 per 100,000) compared with 252 IMD cases in 2016 (1.1 per 100,000) (Figure 1).
 - From 2002 to 2015 the predominant meningococcal serogroup in Australia was MenB, accounting for between 43% and 78% of notifications annually. In 2017, 36% of IMD cases (n=138) notified to the NNDSS were MenB.
 - MenC, the target of a national immunisation program since 2003, has dramatically declined from 225 notifications in 2002 to 3 notifications in 2016 (a 99% decline). In 2017, 14 MenC cases were notified to the NNDSS.

- Notifications of MenW doubled from 2014 (n=17) to 2015 (n=34), then more than tripled in 2016 (n=108). In 2017, 37% of IMD cases (n=140) notified to the NNDSS were MenW.
- Annual notifications of MenY have ranged from 5 to 40 since 2002, with an increasing trend since 2011. In 2016, there were 40 notifications of MenY compared to 22 and 12 in 2015 and 2014, respectively. In 2017, 75 MenY cases were notified with the NNDSS, accounting for 20% of notifications.
- Serogroup A (MenA) and serogroup X (MenX) are rare, with a total of only 4 and 2 notifications respectively since 2002. There were no notifications of either MenA or MenX in 2017.

Figure 1. Notifications and rates of IMD, Australia, 2002 to 2017[#], by serogroup



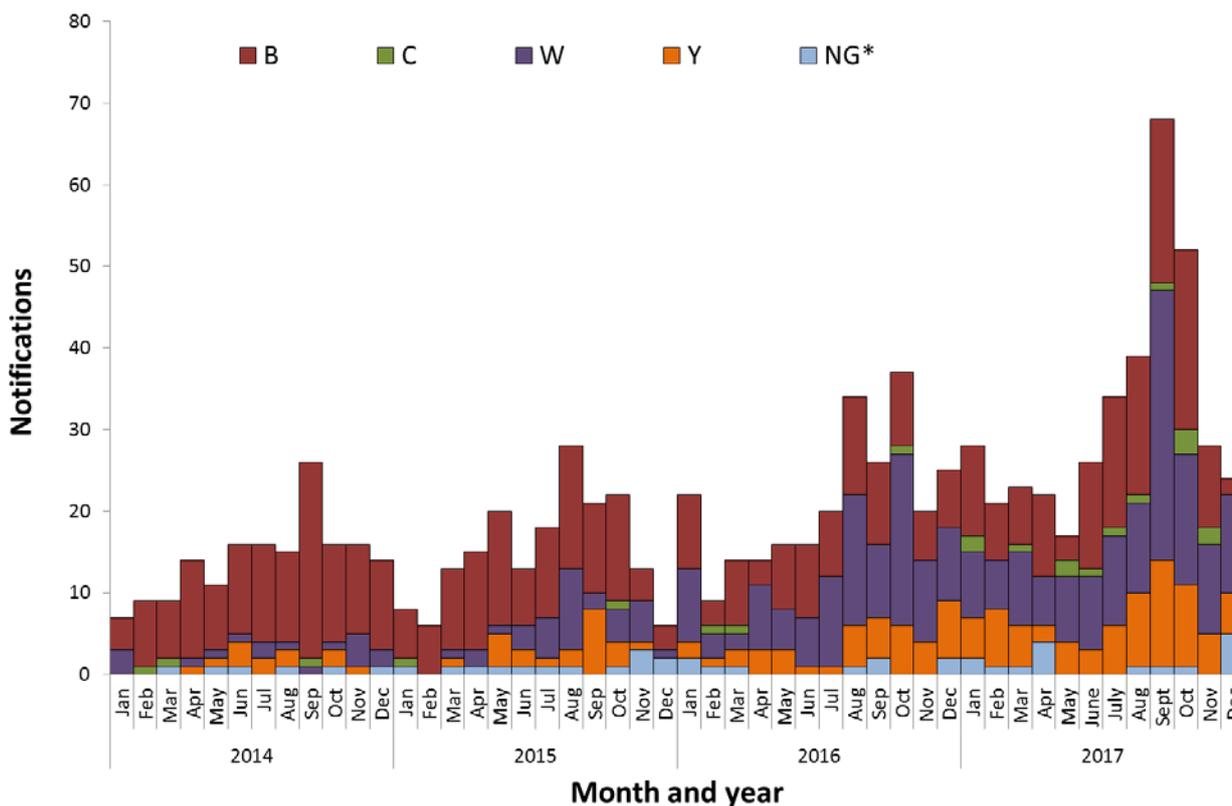
[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Seasonality

- IMD tends to follow a seasonal pattern in Australia, with disease activity increasing between June and September each year.
- In 2016, notifications peaked later with 37 cases reported in October. This change in seasonality continued in 2017, with IMD notifications peaking in September (n=68) and October (n=52) (Figure 2).

Figure 2. Notifications of IMD, Australia, 2014 to 2017[#], by month and year of diagnosis and serogroup



[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Geographical distribution

- In 2017, IMD cases were reported across all jurisdictions.
- MenW accounted for 37% (140 cases) of notifications of IMD reported in 2017. Across jurisdictions this ranged from 0% in the Australian Capital Territory (ACT) to 82% (n=28) in the Northern Territory (Table 1).
- The highest rate of IMD due to MenW in 2017 was in the Northern Territory with a rate of 11.4 cases per 100,000 population (Table 2).
- In 2017, the Northern Territory reported 34 cases of IMD, compared with 2 cases in 2016, 1 case in 2015 and 3 cases in 2014.

Central Australia MenW outbreak

- In September 2017, the Northern Territory confirmed an outbreak of MenW in the Central Australia, Barkly and Katherine regions.¹
- Cases associated with the outbreak have also been reported in Queensland, South Australia and Western Australia.

Table 1. Notifications and rates of IMD, Australia, 2017[#] by state and territory and serogroup

State or territory	Notifications							Total	Rate (per 100,000 population)
	A	B	C	W	X	Y	NG*		
ACT	0	0	0	0	0	2	0	2	0.5
NSW	0	43	5	19	0	16	8	91	1.2
NT	0	3	0	28	0	3	0	34	13.9
QLD	0	26	0	16	0	23	4	69	1.4
SA	0	22	0	11	0	4	0	37	2.2
TAS	0	6	0	8	0	1	1	16	3.1
VIC	0	26	8	35	0	18	2	89	1.4
WA	0	12	1	23	0	8	1	45	1.8
Australia	0	138	14	140	0	75	16	383	1.6

[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Table 2. Notifications and rates of MenW, Australia, 2014 to 2017*, by state and territory

Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
	Notifications								
2014	0	7	0	3	0	1	4	2	17
2015	0	8	0	4	0	1	17	4	34
2016	1	25	0	13	5	4	48	12	108
2017	0	19	28	16	11	8	35	23	140
Rate (per 100,000 population)									
2014	-	0.1	-	0.1	-	0.2	0.1	0.1	0.1
2015	-	0.1	-	0.1	-	0.2	0.3	0.2	0.1
2016	0.2	0.3	-	0.3	0.3	0.8	0.8	0.5	0.4
2017	0.0	0.2	11.4	0.3	0.6	1.5	0.6	0.9	0.6

[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

Indigenous status

- Between 2014 and 2017, a total of 122 IMD cases were reported in Aboriginal and Torres Strait Islander peoples (Table 3). MenW accounted for 48% (59/122) of IMD cases reported in Aboriginal and Torres Strait Islander people, followed by MenB with 47% (57/122).
- In 2017, there were 61 IMD cases were reported in Aboriginal and Torres Strait Islander peoples, of which 75% (46/61) were due to MenW, 21% (13/61) were due to MenB and 3% (2/61) were due to MenY (Table 4).
- This is in contrast to IMD cases reported in Aboriginal and Torres Strait Islander peoples from 2014 to 2015, where MenB was the predominant serogroup (95%, 20/21 in 2014 and 73%, 12/16 in 2015). In 2016, there were 24 cases of IMD reported in Aboriginal and Torres Strait Islander peoples. Of these 50% (12/24) were MenB and 42% (10/24) were MenW.
- In 2017, the rate of MenW for Aboriginal and Torres Strait Islander peoples was 7.0 per 100,000 population compared with 0.4 per 100,000 in non-Indigenous populations (Table 4).

Table 3. Notifications of IMD, Australia, 2014 to 2017[#] by Indigenous status and serogroup

IMD serogroup	Year	Indigenous	Not Indigenous	Not stated	Total
B	2014	20	109	2	131
	2015	12	97	3	112
	2016	12	80	0	92
	2017	13	122	3	138
C	2014	0	3	0	3
	2015	0	2	0	2
	2016	0	3	0	3
	2017	0	13	1	14
W	2014	0	17	0	17
	2015	3	30	1	34
	2016	10	98	0	108
	2017	46	92	2	140
Y	2014	0	12	0	12
	2015	0	22	0	22
	2016	2	38	0	40
	2017	2	72	1	75
NG*	2014	1	4	0	5
	2015	1	11	0	12
	2016	0	9	0	9
	2017	0	16	0	16
TOTAL		122	850	13	985

[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

Table 4. Notifications and rates of IMD, Australia, 2017[#] by Indigenous status and serogroup

IMD serogroup	Indigenous		Non-Indigenous [^]	
	Notifications	Rate per 100,000	Notifications	Rate per 100,000
A	0	-	0	-
B	13	2.0	124	0.5
C	0	-	14	0.1
W	46	7.0	95	0.4
X	0	-	0	-
Y	2	0.3	72	0.3
NG*	0	-	16	0.1
All IMD	61	9.3	321	1.3

[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

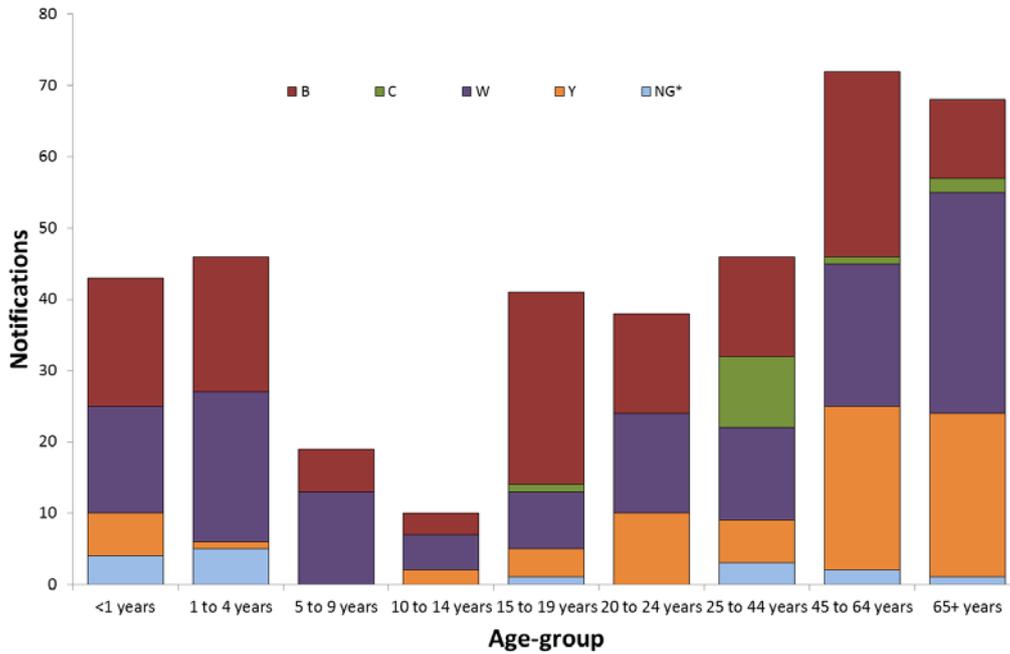
*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

[^]Non-Indigenous includes case reported as non-Indigenous and not stated.

Age distribution

- In 2017, MenW was reported in all age groups. This included 15 cases for infants less than 1 year, 21 cases in the 1-4 years age group, 13 cases in the 5-9 years age group, 5 cases in the 10-14 years age group, 8 cases in the 15-19 years age group, 14 cases in the 20-24 years age group, 13 cases in the 25-44 years age group, 20 cases in the 45-64 age group and 31 cases in the 65 and older age group (Figure 3).
- In 2017, 64% (89/140) of MenW notifications were aged less than 45 years. This is higher than the age distribution seen in 2016, with 54% of MenW notifications aged less than 45 years.
- For MenY notifications, 61% (46/75) were in people aged 45 years or older in 2017, compared with 2015 (77%, 17/22) and 2016 (63%, 25/40).

Figure 3. Notifications of IMD, Australia, 2017[#], by specified age group and serogroup

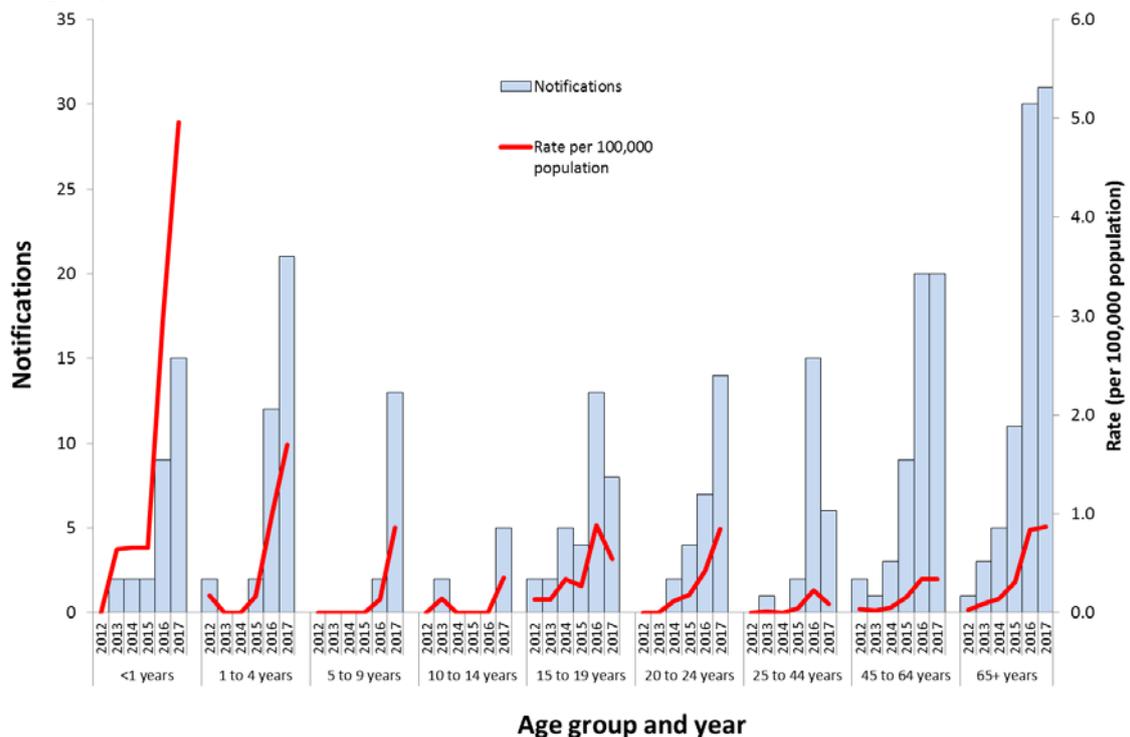


[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

*NG includes where meningococcal isolates could not be identified ('not groupable'), other isolates not grouped and where serogroup was not known.

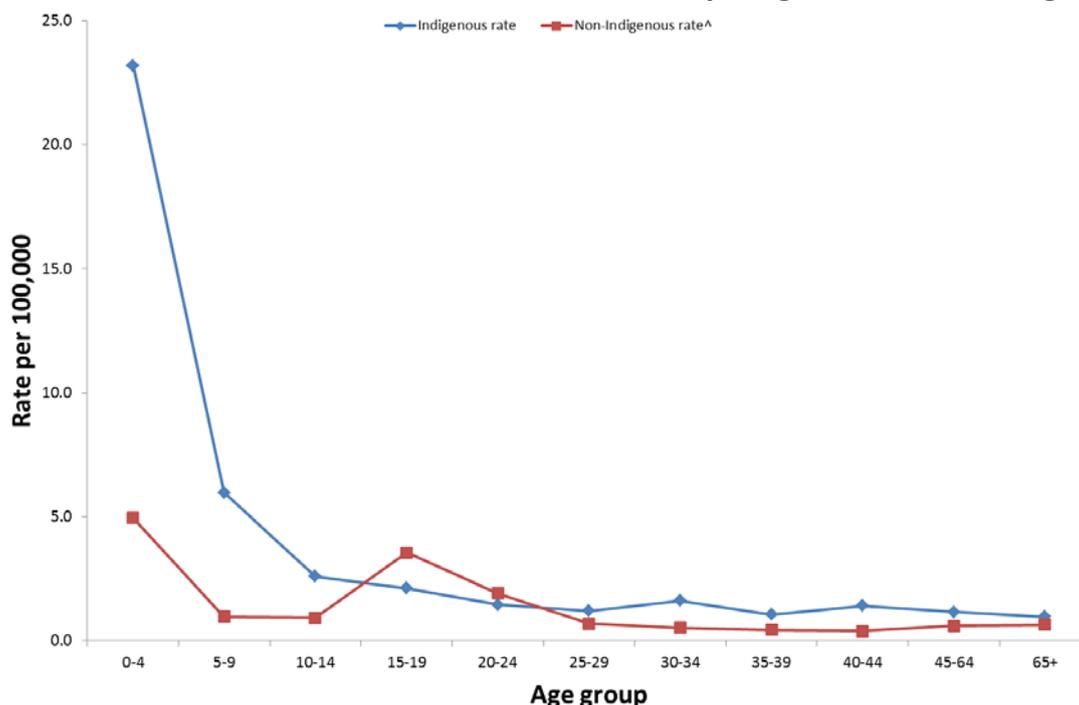
- Age-specific rates of MenW, while remaining low, have increased in most age groups since 2012. The 2017 notification rates for IMD exceeded the 2016 rates in all age groups except the 15-19 years and 25-44 years age groups (Figure 4).
- Age-specific rates for Indigenous and non-Indigenous were similar across all age groups from 2002 to 2017, with the exception of the 0-4 years (23.2 per 100,000 population compared with 5.0 per 100,000 respectively) and 5-9 years (6.0 per 100,000 compared with 1.0 per 100,000 respectively) (Figure 5).

Figure 4. Age-specific notifications and rates of MenW, Australia, 2012 to 2017[#]



[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

Figure 5. Notification rates of IMD, Australia, 2002 to 2017[#], by Indigenous status and age group



[#]Data from the NNDSS with a diagnosis date up until of 31 December 2017. Data was extracted on 5 January 2018.

[^]Non-Indigenous includes case reported as non-Indigenous and not stated.

Clinical presentation and severity

- In 2017, there were 28 deaths reported; 8 due to MenB, 16 due to MenW, 3 due to MenY and 1 due to MenC.
- Fourteen of the 23 (61%) deaths due to IMD in Australia in 2015 and 2016 were due to MenW. The average case fatality rate (CFR) for MenW between 2007 and 2016 (6.5%) was greater than the CFR due to MenB and MenY (3.3%) for the same period.
- In 2017, the CFR for MenW was 11.4% (16/141), which was higher than the CFR for MenB (5.9%, 8/137) MenY (4.1%, 3/74) and MenC (0.07%, 1/14).
- The mortality reporting against each notification of IMD is not complete, but has improved over time.
- Many MenW strains identified in Australia belong to the hypervirulent sequence type ST 11, which is part of the clonal complex 11 (CC 11). This was verified by the enhanced data collected in January 2017 for the cases reported in 2016. Of the 108 cases of MenW reported in 2016, 98 isolates had sufficient fine typing information. The majority of the MenW CC 11 isolates were ST 11 (70 of 98 isolates).
- Of the 101 MenW case reported from the first to the third quarter of 2017 (1 January to 30 September), 89 isolates had sufficient typing information. The majority of MenW C11 isolates were ST 11 (63 of 89 isolates).
- ST 11 strains are associated with a high case fatality and atypical clinical presentation, making early diagnosis challenging.²
- Non-specific presentation is not uncommon for IMD, which can also make early diagnosis challenging.

Background

- Invasive Meningococcal Disease (IMD), manifests as meningitis, sepsis or bacteraemia and mainly affects children aged less than 5 years and adolescents (15-19 years) with a seasonal peak of cases in winter and early spring.
- The clinical manifestations of meningococcal septicaemia and meningitis may be non-specific and can include sudden onset of fever, rash (petechial, purpuric or maculopapular), headache, neck stiffness, photophobia, altered consciousness, muscle ache, cold hands, thirst, joint pain, nausea and vomiting.
- Meningococcal infections can progress rapidly to serious disease or death in previously healthy persons. A number of medical conditions are known to increase the risk of an individual developing IMD. People who survive infection can develop permanent sequelae, including limb deformity, skin scarring, deafness and neurologic deficits.
- The bacteria causing this disease, *Neisseria meningitidis*, is carried by a proportion of the population without developing disease. The prevalence and duration of asymptomatic nasopharyngeal carriage of meningococci vary over time and in different population and age groups. Adolescents have the highest carriage rates, peaking in 19-year olds, and so play an important role in transmission.³
- Vaccination against meningococcal disease in Australia has been targeted at MenC and is given to children at 12 months of age.

Source

- Data extracted from the NNDSS on 05 January 2018.
- Line-listed de-identified enhanced data on 529 IMD cases from 1 January 2016 to 30 June 2017 were collected by excel spreadsheet from all states and territories. Enhanced fields included fine typing information.
- Due to the dynamic nature of the NNDSS, data in 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.
- Data extracted by diagnosis date.

REFERENCES

- ¹ Northern Territory Government, 2017. [Health Alert: Meningococcal outbreak in Central Australia](#)
- ² Mustapha, M. M. et al. 2016. Global epidemiology of capsular group W meningococcal disease(1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex. *Vaccine 34 (13): 1515-1523.*
- ³ Christensen H. et al. 2010. Meningococcal carriage by age: a systematic review and meta-analysis. *Lancet Infectious Diseases Dec 2010: 853-61.*