

Meningococcal vaccines

MENINGOCOCCAL VACCINES FOR AUSTRALIANS: INFORMATION FOR IMMUNISATION PROVIDERS

This fact sheet provides information for immunisation providers on meningococcal disease and the use of meningococcal vaccines in Australia. It can be used in conjunction with the NCIRS fact sheet [Meningococcal vaccines – frequently asked questions](#) to facilitate discussions with parents or other individuals considering receiving meningococcal vaccines.

Disease and epidemiology

- Meningococcal disease is a rare but serious infection caused by the bacterium *Neisseria meningitidis* (*N. meningitidis*). There are 13 serogroups. Meningococcal disease is most commonly caused by serogroups A, B, C, W and Y.
- Septicaemia and/or meningitis are the most common clinical manifestations of invasive meningococcal disease (IMD). The highest incidence of meningococcal disease is in children aged <2 years and adolescents aged 15–19 years. Carriage rates of the bacteria are highest in older adolescents and young adults.
- The incidence of meningococcal disease fluctuates naturally over time. Meningococcal B disease had been dominant until a rise in the incidence of meningococcal W disease from 2013 resulted in the W serogroup being most common in 2016. In 2017, serogroups B and W caused similar numbers of meningococcal disease cases in Australia (37.5% and 38.1% respectively of cases with an identified serogroup). Following the introduction of several state- and territory-funded MenACWY vaccination programs targeting the W and Y serogroup, serogroup B disease became dominant again in 2018.
- Meningococcal B disease remains the most common cause of IMD in children, adolescents and young adults. Meningococcal W and Y disease occurs over a more diverse age range and may present with less typical clinical manifestations than disease due to other serogroups.

Vaccines

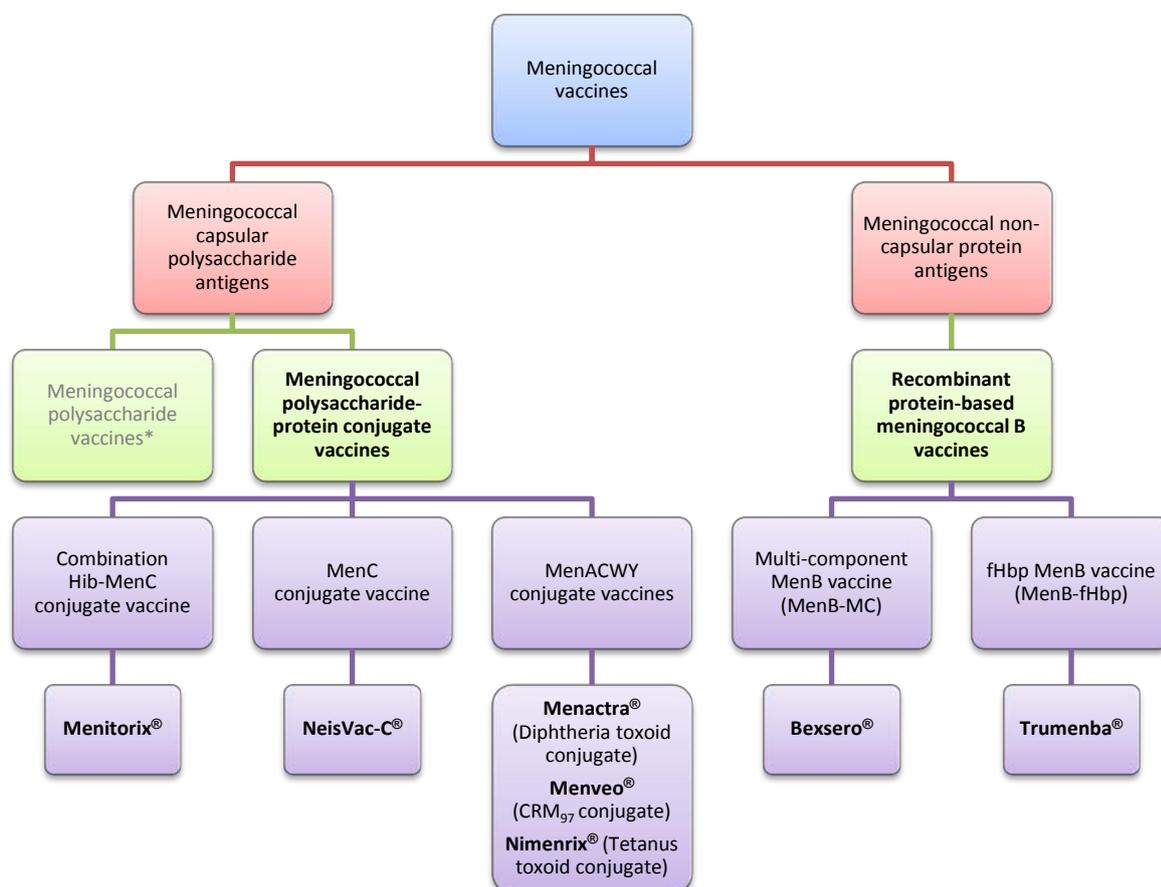
- Three types of meningococcal vaccines are available in Australia (see also [Figure 1](#)):
 - recombinant meningococcal B (MenB) vaccines: Bexsero[®], Trumenba[®]
 - quadrivalent (A, C, W, Y) meningococcal (MenACWY) conjugate vaccines: Menactra[®], Menveo[®], Nimenrix[®]
 - meningococcal C (MenC) conjugate vaccine: Menitorix[®] (combination formulation with the *Haemophilus influenzae* type b vaccine), NeisVac-C[®] (monovalent meningococcal C vaccine)

Who should be vaccinated ([Table 1](#))

- **People in age groups with increased incidence of IMD or high carriage rates of *N. meningitidis*:**
 - **Infants and young children aged <2 years:** All infants and children aged <2 years are recommended to receive MenB and MenACWY vaccines. A routine single dose of Nimenrix (MenACWY vaccine) at 12 months of age is recommended and funded under the National Immunisation Program (NIP). MenACWY vaccine is available for infants <12 months of age through private prescription from 6 weeks of age, and requires more doses. MenB vaccine (Bexsero[®] only for this age group) is not funded under the NIP, but South Australia has free MenB vaccine for infants in response to higher local rates and predominance of MenB disease (refer to [Table 2](#)).
 - **Adolescents and some young adults:** MenB and MenACWY vaccine are recommended for all adolescents aged 15–19 years and additionally for young adults aged 20–24 years who live in close quarters (such as new military recruits and students living in residential accommodation) or who are current smokers. In April 2019, Nimenrix (MenACWY vaccine) will be introduced on the NIP for adolescents aged 14–19 years. Until that time, adolescents in some Australian states are eligible for state-funded MenACWY vaccines. MenB vaccine will be funded for 15–20-year-olds in South Australia in 2019 (refer to [Table 2](#)).

- **Aboriginal and/or Torres Strait Islander people:**
 - Aboriginal and Torres Strait Islander people aged 2 months to 19 years are recommended to receive MenB and MenACWY vaccines.
- **People with medical conditions associated with an increased risk of IMD:**
 - People with complement disorders, asplenia and other immunocompromising conditions are recommended to receive MenB and MenACWY vaccines.
- **Travellers:**
 - People travelling to certain destinations where there is an increased risk of exposure to serogroups A, C, W or Y (including, but not limited to, the ‘meningitis belt’ of sub-Saharan Africa and pilgrims to the Hajj in Mecca, Saudi Arabia) are recommended to receive MenACWY vaccine.
- **People who have occupational risk:**
 - Laboratory personnel who frequently handle *N. meningitidis* should be vaccinated with MenB and MenACWY vaccines.
- **Anyone wishing to reduce their risk of IMD:**
 - Vaccination with MenB and MenACWY vaccines may be offered to anyone aged ≥6 weeks.

Figure 1: Classification of meningococcal vaccines available in Australia



* Meningococcal polysaccharide vaccines are no longer supplied or recommended for use in Australia

Table 1: People and age groups strongly recommended to receive meningococcal vaccination

Population	6 weeks–23 months	2–4 years	5–14 years	15–19 years	20–24 years	≥25 years
Healthy Aboriginal or Torres Strait Islander people	MenB MenACWY	MenB MenACWY	MenB MenACWY	MenB MenACWY		
Healthy non-Indigenous Australians	MenB MenACWY			MenB MenACWY		
Increased medical risk*	MenB MenACWY	MenB MenACWY	MenB MenACWY	MenB MenACWY	MenB MenACWY	MenB MenACWY
People living in close quarters†				MenB MenACWY	MenB MenACWY	
Current smokers				MenB MenACWY	MenB MenACWY	
Occupational risk‡				MenB MenACWY	MenB MenACWY	MenB MenACWY
Travellers§	MenACWY	MenACWY	MenACWY	MenACWY	MenACWY	MenACWY

* Includes those with a specified medical condition associated with increased risk of meningococcal disease, including inherited defects or deficiency of properdin or complement components, current or future treatment with eculizumab, functional or anatomical asplenia, HIV infection and haematopoietic stem cell transplant.

† Includes students living in residential accommodation and new military recruits.

‡ Includes laboratory personnel who are at occupational risk of exposure to *Neisseria meningitidis*.

§ People (age ≥6 weeks) who are travelling to areas where meningococcal disease is more common and there is an increased risk of exposure to meningococcal serogroups A, C, W or Y disease.

Table 2: Meningococcal vaccines available for use in Australia and current access/availability

Trade name	Formulation	Current access/availability as of January 2019
Recombinant meningococcal B (MenB) vaccines* against B serogroup		
Bexsero®	Recombinant multicomponent MenB (MenB-MC)	MenB vaccine available nationally through private prescription (Trumenba can only be used for people aged ≥10 years). In South Australia, Bexsero is available for free to infants aged 6 weeks to 12 months (with catch-up for those aged 12 months to <4 years until December 2019), and will be available for free to adolescents aged 15–16 years (catch-up for those aged 16 to <21 years until December 2019) from February 2019.†
Trumenba®	Recombinant bivalent fHBP MenB (MenB-fHbp)	
Quadrivalent meningococcal (MenACWY) conjugate vaccines‡ against A, C, W, and Y serogroups		
Menactra®	Quadrivalent diphtheria toxoid conjugate	Nimenrix is NIP-funded for a single dose at age 12 months. NIP funding for those aged 14–19 years will be available from April 2019 and will replace state programs. MenACWY vaccine available through state-funded routine vaccination programs in ACT, NSW, QLD, VIC and WA for adolescents. Also, WA funds vaccination for children aged 1–4 years (until December 2019) and Aboriginal and Torres Strait Islander children aged 6 weeks to 4 years.† NT and TAS also fund MenACWY vaccine for some infants and children. Please check state health department websites for details.† All brands available through private prescription for other age groups. [Note: Menactra is not licensed for infants aged <9 months.]
Menveo®	Quadrivalent CRM ₁₉₇ conjugate	
Nimenrix®	Quadrivalent tetanus toxoid conjugate	
Meningococcal C (MenC) conjugate vaccines against C serogroup		
Menitorix®	Haemophilus influenzae type b and MenC conjugate combination	Combination Hib–MenC conjugate vaccine at 12 months of age replaced by MenACWY vaccine (Nimenrix) and monovalent Hib (Act-HIB) on the NIP from 1 July 2018. Monovalent MenC vaccine available on the NIP for those requiring catch-up of the 12-month childhood dose (if they are not eligible to receive MenACWY vaccine).
NeisVac-C®	Monovalent MenC conjugate	

* There are many strains of serogroup B meningococcus. Laboratory tests indicate that both MenB vaccines are likely to protect against a large proportion (>75%) of MenB strains in Australia, but there is as yet inadequate information about the exact proportion or any difference between the two vaccines. Refer to [Table 4](#) for dosing guidelines.

† Refer to state and territory health department [websites](#).

‡ Vaccine brands are registered for use in different age groups (refer to [Table 3](#)).

The disease

Meningococcal disease is a relatively rare but serious infection caused by the bacterium *Neisseria meningitidis*, commonly known as the meningococcus. There are 13 serogroups, distinguished by differences in the surface polysaccharides of the organism's outer membrane capsule. Globally, most cases of meningococcal disease are caused by serogroups A, B, C, W and Y.

Currently, even with antibiotic treatment, the mortality rate for meningococcal disease is around 5–10%. About 10–30% of children and adolescents who survive the disease develop permanent complications such as limb deformity, skin scarring, deafness and neurological deficits.¹⁻³

Clinical features

Invasive meningococcal disease (IMD; defined by isolation of meningococci from body sites that are normally sterile) most commonly manifests as septicaemia and meningitis. Typical symptoms are often non-specific and can include sudden onset of fever, a rash that can be petechial or purpuric (like red-purple spots or bruises) or maculopapular (a flat or raised non-specific rash), headache, neck stiffness, photophobia, altered consciousness, muscle aches, joint pain, nausea and vomiting.^{1,4-6} Other less common manifestations of meningococcal disease include pneumonia, arthritis, epiglottitis, pericarditis and conjunctivitis.^{4,5,7}

Not all symptoms or signs may be present at disease onset. The characteristic rash of meningococcal disease (a rash which does not disappear with gentle pressure on the skin) is not always present. Meningococcal W disease, in particular, has been associated with higher rates of atypical presentations in up to 20% of cases.⁸

Transmission

Meningococci are carried and transmitted only by humans. Individuals within a population can carry meningococci in their throat and/or nose. The prevalence and duration of carriage varies over time and in different populations and age groups, with peak carriage rates (>20%) occurring in adolescents.⁹ Smokers have increased carriage rates¹⁰⁻¹² which may increase transmission and invasive disease.

Meningococcal bacteria are transmitted via respiratory droplets. The risk of acquiring infection is increased by regular, prolonged close contact, such as living in the same household or intimate kissing.

The disease has an incubation period of 1–10 days, most commonly 3–4 days.

Risk factors for acquiring the disease

People who are immunocompromised due to certain disorders of the immune system (particularly complement

deficiencies), certain medical treatments, or functional or anatomical asplenia have an increased risk of acquiring the disease.

Other risk factors for meningococcal infection include occupational exposure to meningococci in microbiological laboratories, smoking or exposure to smokers, crowded living conditions, intimate kissing with multiple partners, and recent or current viral infection of the upper respiratory tract.^{4,6}

Management of meningococcal disease

IMD is notifiable in all states and territories, and prompt diagnosis and medical treatment is important. If meningococcal disease is suspected, the patient should be treated promptly with appropriate intravenous antibiotics and hospitalised for further management. The relevant state or territory public health authority should be notified as soon as possible so that contacts can be identified and the appropriate public health response determined in accordance with national guidelines.¹³ This may include vaccination of contacts (refer to [Use of vaccines for close contacts...](#)).

Epidemiology

Meningococcal disease is both sporadic and epidemic throughout the world. Its incidence fluctuates naturally over time. In Australia, meningococcal disease follows a seasonal trend, with most cases occurring in winter or early spring.^{14,15} Notification rates decreased from a peak of 3.5 cases per 100,000 in 2002 to 0.6 per 100,000 in 2013. Notification rates have since increased, reaching 1.6 per 100,000 in 2017^{16,17} (Figure 2). Most meningococcal disease occurs in young children aged <2 years and in older adolescents and young adults aged 15–24 years.¹⁴

Nationally, for over a decade, from 2006 to 2015, serogroup B (MenB) was the most common serogroup causing IMD, accounting for 63% to 88% of annual notified cases where a serogroup was identified.¹⁸ MenB rates have slowly declined but it still remains the major cause of IMD in children aged <2 years, particularly infants aged <1 year, adolescents and young adults (Figure 3).

Since 2013, serogroup W (MenW) has emerged as an increasing cause of meningococcal disease (17 cases, 10.4% of cases with an identified serogroup in 2017),⁸ surpassing MenB disease in 2016, and being comparable with MenB disease in 2017 (139 MenW cases, 38.1% and 137 MenB cases, 37.5%).^{8,17,19} Many MenW cases have been due to a single clone of meningococcus, the ST11 strain type, suggesting sustained person-to-person transmission.¹⁷ As of June 2018, MenB had become the dominant serogroup again, causing 25 of 56 cases compared with 16 cases due to MenW.²⁰

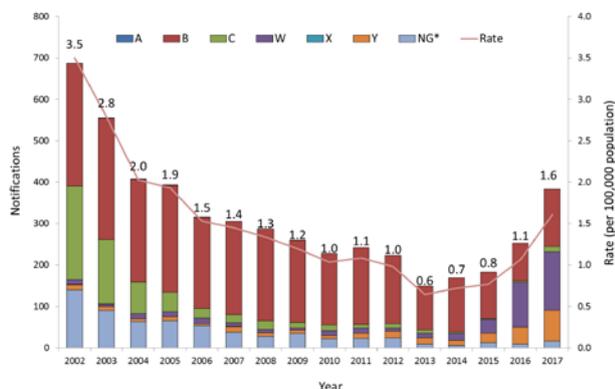
While the incidence of MenW disease (like MenB) has peaks in the <2 years and 15–19 years age groups, a larger proportion of MenW cases occurs in adults aged ≥45 years (median age of MenW cases is 44 years) compared to MenB cases.⁸

MenW disease appears to have a higher case fatality rate than disease caused by other serogroups (about 9.3% for MenW versus about 5% for MenB).¹⁹ This may indicate a tendency towards more severe infection.⁸

A smaller but notable increase in serogroup Y disease has occurred in the recent few years, from 12 cases (7.4% of those with an identified serogroup) in 2014 to 75 cases (20.5% of cases with an identified serogroup) in 2017.^{8,17,19} Serogroup Y disease is more common in older adults, with 61% of cases (46/75) in 2017 occurring in people aged ≥45 years.²¹

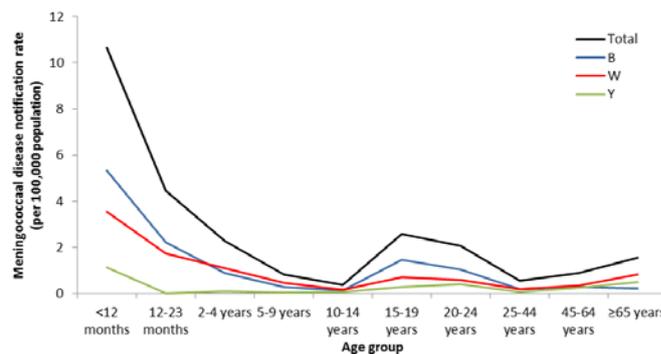
Serogroup C (MenC) disease has decreased markedly after the implementation of the national MenC conjugate vaccination program in 2003, with the number of cases falling from 225 in 2002 to 14 (3.8% of cases with an identified serogroup) in 2017.^{17,19} Serogroup A disease remains rare in Australia. Updated epidemiological data on meningococcal disease are available at [the Australian Government Department of Health](http://www.health.gov.au) website.

Figure 2: National notification rates for invasive meningococcal disease by serogroup, Australia, 2002–2017



Source: National Notifiable Diseases Surveillance System (NNDSS) data, analysis completed by Office of Health Protection, Australian Government Department of Health. Invasive meningococcal disease national report, December 2017. Full report available at: <http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-meningococcal-W.htm>

Figure 3: Notifications of invasive meningococcal disease by age group and serogroup, Australia, 2016–2017



Source: Australian Technical Advisory Group on Immunisation. Public consultation on changes to the recommended use of meningococcal and *Haemophilus influenzae* type B vaccines. April 2018. Available at: <https://consultations.health.gov.au/ohp-immunisation-branch/proposed-changes-to-meningococcal-and-hib/>

Vaccines

There is no single vaccine that offers protection against all serogroups that cause meningococcal disease. There are three types of meningococcal vaccines registered in Australia, which cover different serogroups (Figure 1):

- recombinant meningococcal B (MenB) vaccines
- quadrivalent (A, C, W, Y) meningococcal (MenACWY) conjugate vaccines.
- meningococcal C (MenC) conjugate vaccines

Quadrivalent meningococcal (MenACWY) conjugate vaccines

There are three brands of MenACWY vaccines, which each use a different carrier protein to conjugate the polysaccharide antigens of four serogroups (A, C, W and Y). Clinical trials have demonstrated the immunogenicity of MenACWY vaccine in children, adolescents and adults. All studies indicate that MenACWY vaccines are safe and immunogenic.²² It is preferable to use the same brand of MenACWY vaccine to complete a primary vaccination course. Any brand of vaccine may be used as a booster dose.

MenACWY vaccines available for use in Australia are:

- **Menactra**[®] (Sanofi Pasteur)
- **Menveo**[®] (GlaxoSmithKline)
- **Nimenrix**[®] (Pfizer)

Nimenrix is NIP-funded at 12 months of age.²³ The Hib booster (4th) dose previously administered at 12 months, is now given at 18 months as a monovalent vaccine (Act-HIB). From April 2019, Nimenrix will also be NIP-funded for adolescents aged 14–19 years. The other two vaccines are not available through the NIP.

Dosage for MenACWY vaccines depends on the age group and indication (refer to [Table 3](#)). There is some evidence that antibody response after Nimenrix or

Menveo is modestly higher than that after Menactra, especially for serogroups W and Y.²⁴⁻²⁶ There is also some evidence showing that immunity decreases more quickly with Menactra than with Nimenrix or Menveo.^{25,27,28}

Therefore, **when available, for people aged ≥2 years, Nimenrix or Menveo is preferred to Menactra.** If Nimenrix or Menveo are not available, Menactra should be given as it is still significantly better than no vaccination. For infants and toddlers aged <2 years, any of the three brands may be given in the age-appropriate dosing schedule (refer to [Table 3](#)).

MenACWY vaccines can be given concomitantly (at the same time) with most routine childhood and adolescent vaccines. However, be aware of the following issues:

- Menactra should not be given at the same time as 13 valent pneumococcal conjugate vaccine (13vPCV) at any age because of possible interference in the immune response to some pneumococcal serotypes. Ideally Nimenrix/Menveo should be co-administered with 13vPCV instead, noting Nimenrix (MenACWY) is the vaccine currently on the NIP. If only Menactra is available, 13vPCV should be given first followed by Menactra at least 1 month later. If Menactra is inadvertently co-administered with 13vPCV, a repeat dose of 13vPCV (at least two months later) may be indicated, particularly in people at increased risk of invasive pneumococcal disease. This should be discussed with a treating specialist(s) or immunisation expert.
- Co-administration of Nimenrix and a tetanus toxoid (TT) containing vaccine such as Infanrix Hexa or Boostrix does not affect meningococcal immune response. However, in studies where Nimenrix **followed** a TT-containing vaccine by approximately 1 month, lower meningococcal antibody responses for some serogroups were shown in children aged 12–23 months²⁹ and adults aged 18–64 years.³⁰ Other age groups have not been studied, and therefore these findings should not be generalised to other age groups. In particular they **do not** warrant delaying vaccination with Nimenrix or other routine NIP vaccines in infants aged <12 months.

The clinical significance of these findings is as yet unclear. However, if administration of Nimenrix and a TT-containing vaccine is anticipated in the second year of life or later, it is preferable to plan for Nimenrix to be administered either before or ideally concomitantly with the TT-containing vaccine.

- A similar interaction is possible when Menactra is given 1 month after a diphtheria toxoid (DT)-containing vaccine (shown in those aged 4–6 and 11–17 years).^{31,32} If planning administration of these

vaccines, it is preferable to co-administer them or give Menactra prior to the DT-containing vaccine.

The optimal interval of Nimenrix or Menactra following a TT- or DT-containing vaccine, respectively, is unknown. Therefore if a TT- or DT-containing vaccine has already been administered, the dose of Nimenrix or Menactra should not be delayed, as vaccination in this sequential order is still preferred to delaying or missing the dose.

Recombinant meningococcal B (MenB) vaccines

There are two brands of MenB vaccines available in Australia. Note that the two vaccines are registered for different age groups and in different dosing schedules (refer to [Table 4](#)).

Bexsero[®] (Novartis) is a recombinant multicomponent vaccine (MenB-MC) designed to provide protection against multiple strains of MenB. It contains four major antigens that are highly conserved across multiple MenB strains. On the basis of laboratory tests, it is estimated that the vaccine induces protective antibodies against about 75% of MenB strains in Australia.³³

The primary vaccination course of Bexsero consists of 2 to 4 doses, depending on the age at which the course commences and presence of medical conditions associated with increased IMD risk (refer to [Table 4](#)). Antibody response in healthy children has been shown to be the same with 3 doses compared with 4 in infants commencing vaccination between the ages of 6 weeks to 5 months.^{34,35} Data from the UK, where an infant MenB vaccination program using 3 doses was introduced in 2015, shows the effectiveness of the first 2 doses given in infants to be 82.9%.³⁵

Bexsero may be administered concurrently, at separate injection sites, with MenACWY vaccine or other infant vaccines in the NIP schedule. However, a moderately high rate of fever in young children aged <2 years following Bexsero has been observed. The frequency of vaccine-related adverse reactions, most notably fever, is higher when Bexsero is given with other vaccines compared to when Bexsero or other vaccines are administered on their own. Because of this concern, the prophylactic use of paracetamol is recommended with every dose of Bexsero for children <2 years of age (refer to [Vaccine safety](#)).

People who have previously received other meningococcal vaccines can receive Bexsero.

Trumenba[®] (Pfizer) is a recombinant bivalent human factor H binding protein (MenB-fHBP) vaccine consisting of two surface proteins that are highly conserved across >95% MenB strains. It is registered for use in people aged ≥10 years.

Clinical trials have shown that this vaccine is safe and immunogenic and it can be used in a 2- or 3-dose schedule depending on the person's medical risk of IMD (refer to [Table 4](#)).^{36,37} Trumenba may be administered concomitantly with other vaccines.

There is no preference between Trumenba and Bexsero in people aged ≥ 10 years. However, they are not interchangeable and the same vaccine should be used to complete the vaccination course.

Meningococcal C (MenC) conjugate vaccine

In MenC conjugate vaccines, the serogroup C antigen is conjugated to a carrier protein. At 12 months of age, Nimenrix (MenACWY vaccine) is now given rather than MenC vaccine as it covers additional A, W, and Y serogroups. The combination formulation of meningococcal C conjugate and *Haemophilus influenzae* type b (Hib–MenC) vaccine, **Menitorix**[®] (GlaxoSmithKline) and monovalent meningococcal C vaccine, **NeisVac-C**[®] (Pfizer) are still used as the catch-up MenC vaccines for the cohort of children who were older than 12 months prior to the introduction of Nimenrix in the NIP (1st July 2018).

Who should be vaccinated

[Table 1](#) summarises vaccination recommendations. [Table 2](#) provides a summary of meningococcal vaccines registered for use in Australia. Recommended brands and doses by age group for MenACWY vaccines can be found in [Table 3](#) and for MenB vaccines in [Table 4](#). Refer also to the NCIRS fact sheet [Meningococcal vaccines – frequently asked questions](#).

Healthy infants and younger children (<2 years)

- A single dose of Nimenrix (MenACWY vaccine) is recommended and funded under the NIP for all children at 12 months of age. This vaccination is required for parents to be able to claim child care subsidies and family assistance benefits.
- Only the 12-month dose of Nimenrix is funded under the NIP. Vaccination using other brands or at an earlier age (from 6 weeks old) is available through private prescription, but there are differences in the number of MenACWY vaccine doses required between vaccine brands for children aged <2 years.
- MenB vaccine (Bexsero only) is also recommended for infants and young children aged <2 years, but is not funded under the NIP.
- Some states/territories are providing free MenACWY or MenB vaccine for infants and children. The programs vary by age and other eligibility criteria. Check state or territory health department [websites](#) for further information.

Healthy adolescents (15–19 years)

- A single dose of MenACWY vaccine is recommended for adolescents. Nimenrix or Menveo, if available, are preferred over Menactra. Free vaccine is available to some adolescents under targeted programs in some states or territories until commencement of the NIP program in April 2019 (refer to [Table 1](#)). Check state or territory health department [websites](#) for further information.
- Healthy adolescents should also receive a 2-dose schedule of MenB vaccine (funded only in South Australia from February 2019). Either MenB vaccine can be given, but the same vaccine should be used to complete the series.

Healthy people in other age groups

- MenACWY and MenB vaccines are available through private prescription to anyone aged ≥ 6 weeks who wants to reduce their likelihood of becoming ill with meningococcal disease.

Aboriginal and Torres Strait Islander people

- Aboriginal and Torres Strait Islander people are at increased risk of IMD, particularly from serogroups B and W. Both MenACWY and MenB vaccines are recommended for anyone aged 2 months to 19 years.

Current smokers (adolescents and young adults aged 15–24 years)

- Smokers have increased carriage rates and are at increased risk of IMD. A single dose of MenACWY vaccine and 2 doses of MenB vaccine are recommended.

Adolescents and young adults (aged 15–24 years) living in close contact

- Healthy adolescents and young adults living in close contact conditions, such as military recruits or those in residential accommodation, should receive a 2-dose schedule of MenB vaccine and a single dose of MenACWY vaccine.

People with specified medical conditions associated with an increased risk of meningococcal disease

- MenACWY and MenB vaccines are recommended for individuals with specified medical conditions associated with an increased risk of meningococcal disease. These conditions include inherited defects or deficiency of properdin or complement components, current or future treatment with eculizumab, functional or anatomical asplenia, HIV infection and haematopoietic stem cell transplant. Ongoing boosters of MenACWY vaccine are recommended (refer to [Table 3](#)).

Laboratory personnel who frequently handle *Neisseria meningitidis*

- For people with occupational exposure risks, a single primary dose of MenACWY vaccine and a primary

course of 2 doses of MenB vaccine are recommended. MenACWY vaccine boosters every 5 years are also recommended.

Travellers

- For travellers, MenACWY vaccine is recommended for people (aged ≥ 6 weeks) who intend to travel to parts of

the world where epidemics of group A, C, W or Y disease are frequent. Vaccination is a requirement for pilgrims attending the annual Hajj in Mecca (certificate of vaccination is a condition of entry to Saudi Arabia for this purpose).

Table 3: Dose schedule recommendations for immunisation using MenACWY vaccines, by age and vaccine brand, the number of doses required and minimum intervals

Age at commencement of vaccine course	MenACWY vaccine brand	Healthy individuals, including Aboriginal and Torres Strait Islander people, travellers and laboratory personnel	With any specified medical conditions associated with increased risk of meningococcal disease (see footnote Table 1)
6 weeks–5 months	Menveo*	3 doses (8 weeks between 1st and 2nd doses; 3rd dose at 12 months of age)	4 doses (8 weeks between doses; 4th dose at 12 months of age or 8 weeks after 3rd dose, whichever is later)
	Nimenrix		
6–8 months	Menveo*	2 doses (2nd dose at 12 months of age)	3 doses (8 weeks between 1st and 2nd doses; 3rd dose at 12 months or 8 weeks after 2nd dose, whichever is later)
	Nimenrix		
9–11 months	Menveo	2 doses (2nd dose at 12 months of age or 8 weeks after 1st dose, whichever is later)	3 doses (8 weeks between each dose)
	Nimenrix		
	Menactra [#]		
12–23 months	Menveo	2 doses (8 weeks between doses)	2 doses (8 weeks between doses)
	Menactra [#]	2 doses (8 weeks between doses)	
	Nimenrix	1 dose	
≥2 years [†]	Menveo	1 dose	2 doses (8 weeks between doses)
	Menactra ^{#§}		
	Nimenrix		
Booster doses for all ages	Any brand	Required only for travellers and laboratory personnel facing ongoing risks, who completed the primary series at: a) ≤6 years of age: 3 years after completion of primary immunisation schedule, then every 5 years thereafter b) ≥7 years of age: every 5 years after completion of the primary immunisation schedule	For those with ongoing increased risk for IMD who completed the primary series at: a) ≤6 years of age: 3 years after completion of primary immunisation schedule, then every 5 years thereafter b) ≥7 years of age: every 5 years after completion of the primary immunisation schedule

* The product information for Menveo states that infants aged 2–6 months should receive 3 primary doses and a booster dose at age 12 months. However, ATAGI recommends that healthy infants aged 6 weeks–5 months should receive 2 primary doses (8 weeks apart) and a booster dose at age 12 months. ATAGI also recommends that healthy infants aged 6–11 months should receive 1 primary dose and a booster dose at age 12 months

Do not co-administer Menactra with 13vPCV (Prevenar 13). Ideally Menveo or Nimenrix should be used instead. If only Menactra is available, 13vPCV should be given first followed by Menactra, with a minimum interval of 4 weeks between the dose of 13vPCV and Menactra. If Menactra is inadvertently co-administered, a repeat of the 13vPCV dose ≥8 weeks after the first 13vPCV dose may be required.

† Menveo and Nimenrix are preferred, if available, in individuals aged ≥2 years. If unavailable, use Menactra.

§ There is no registered upper age limit for use of Menveo or Nimenrix. Although Menactra is registered for use up to 55 years of age only, it can be given to people older than 55 years, as per *The Australian Immunisation Handbook*.

Table 4: Recommended brands and doses of MenB vaccine by age group in healthy individuals or those with any specified medical conditions associated with increased risk of meningococcal disease

Age at commencement of vaccine course	Brands registered for use in Australia	Number of doses required	Recommended interval between doses	Notes
6 weeks–5 months	Bexsero®	3 (healthy) 4 (increased risk)	8 weeks	8 weeks between doses; last dose at 12 months Refer to footnote in Table 1 for conditions with increased IMD risk
6–11 months	Bexsero®	3	8 weeks	8 weeks between 1st and 2nd doses; 3rd dose at 12 months or 8 weeks after 2nd dose, whichever is later
12–23 months	Bexsero®	2	8 weeks	
2–9 years	Bexsero®	2	8 weeks	The recommended interval is 8 weeks. The minimum interval is 4 weeks.
≥10 years*	Bexsero®	2	8 weeks	The recommended interval is 8 weeks. The minimum interval is 4 weeks.
	Trumenba®	2 (healthy) 3 (increased risk, see note)	6 months (2 doses); see note for 3 dose schedule	For those with specified medical conditions (refer to footnote in Table 1), 3 doses are required (at least 4 weeks between 1st and 2nd doses; 3rd dose at least 4 months after 2nd dose and at least 6 months after 1st dose)

* Bexsero® and Trumenba® are not interchangeable. The same vaccine should be used to complete the vaccination course.

Note: The requirement for booster doses with MenB vaccine has not yet been determined, and at present booster doses are not recommended.

Vaccine safety

Meningococcal conjugate vaccines

Meningococcal conjugate vaccines are generally considered safe and well tolerated.

MenACWY vaccines

The most frequently reported adverse events following MenACWY vaccine include fever, headache, dizziness³⁸ and erythema at the injection site. Injection site reactions generally resolve within 48–72 hours.⁴

MenACWY vaccines can be safely administered at the same time as other routine vaccines provided to young children through the NIP. In most studies, the frequency of reactions after vaccination was similar regardless of whether the vaccines were given together or separately. Some studies showed slight increases in mild reactions when vaccines were given together.

An initial suspicion of an association between a certain brand of MenACWY vaccine (Menactra) and Guillain-Barré Syndrome (GBS), a rare neurological disorder associated with muscle weakness and paralysis, has been thoroughly investigated and disproven.^{39,40}

Recombinant meningococcal B vaccines

Fever was the most notable systemic reaction in infants and young children in clinical trials for Bexsero. Concurrent administration of Bexsero with other childhood vaccines increases the frequency of fever,^{41,42} as shown in [Table 5](#).

Table 5: Proportion (%) of infants reporting fever within 7 days after at least 1 of the 3 infant doses of Bexsero⁴²

Axillary temperature	Routine vaccines alone	Bexsero alone	Routine vaccines + Bexsero
≥38°C	23–36%	26–41%	51–62%
≥39°C	3–4%	4–8%	10–15%

Fever in infants and young children given Bexsero can be reduced by prophylactic use of paracetamol (refer to [box](#) below). A clinical trial demonstrated that prophylactic use of paracetamol reduced the likelihood of high-grade fever by approximately half with no overall impact on the immunogenicity of Bexsero or the other vaccines given concurrently.⁴³ Other common adverse events following immunisation with Bexsero include tenderness, swelling, erythema or rarely a persistent nodule at the injection site, irritability, sleepiness, change in eating habits, unusual crying, rash, vomiting and diarrhoea. Most of these events were considered mild or moderate and were transient in nature. A recent review of 3 million Bexsero doses given in the UK infant and toddler immunisation program found no significant safety concerns, and specifically, no increase in febrile seizures following vaccination.⁴⁴

Prophylactic use of paracetamol with Bexsero vaccination in children aged <2 years

Prophylactic use of paracetamol is recommended with every dose of Bexsero® administered to children <2 years of age. This is an exception to the general recommendation not to routinely give paracetamol with vaccinations unless it is for relief of fever or pain following immunisation.

Clinical trials of Trumenba administered alone or with other vaccines in adolescents aged ≥10 years showed that the most common adverse events in adolescents aged ≥10 years were injection site pain, redness and swelling at the injection site, headache, fatigue, chills, muscle pain and joint pain. Most of these events were considered mild or moderate and were transient in nature.^{36,37} The safety profiles were similar for the 2- or 3-dose schedules.

Use of vaccines for close contacts of patients or in public health management of meningococcal disease outbreaks

The meningococcal vaccine that covers the relevant serogroup may be considered for individuals who have had close household or household-like contact with someone who has meningococcal disease, or for individuals at increased disease risk because of a local outbreak (such as an outbreak in a residential facility). The relevant state or territory public health authority should be contacted as soon as possible for guidance on determining the risk of disease, and the need for vaccination and clearance antibiotics. (Refer also to [Management of meningococcal disease](#).)

Contraindications/precautions

For all meningococcal vaccines, the absolute contraindications are anaphylaxis following a previous dose of the respective vaccine, or anaphylaxis following any component of the vaccine. Previous meningococcal disease, regardless of the serogroup, is not a contraindication for vaccination.⁴⁵

The product information for Menveo states that the tip cap of the syringe contains natural rubber. The risk of allergy is lower from natural rubber than from latex. However, consider using an alternative product in people with an allergy or sensitivity to latex.

Additional resources for primary medical care/vaccination providers

- NCIRS fact sheet [Meningococcal vaccines – frequently asked questions](#)
- Australian Government Department of Health: Meningococcal W disease

www.health.gov.au/internet/main/publishing.nsf/Content/ohp-meningococcal-W.htm

- Immunise Australia website <https://beta.health.gov.au/health-topics/immunisation>
- National Immunisation Program schedule <https://beta.health.gov.au/health-topics/immunisation/immunisation-throughout-life/national-immunisation-program-schedule>
- National Immunisation Program childhood schedule changes <https://beta.health.gov.au/resources/publications/national-immunisation-program-childhood-schedule-changes-advice-for>
- ATAGI's advice for immunisation providers regarding the use of Bexsero <https://beta.health.gov.au/resources/publications/atagi-advice-on-the-use-of-bexsero-vaccine>
- ACT Health www.health.act.gov.au
- Health.vic www.health.vic.gov.au
- Northern Territory Department of Health <https://health.nt.gov.au>
- NSW Health www.health.nsw.gov.au/immunisation
- Queensland Health www.health.qld.gov.au
- SA Health www.sahealth.sa.gov.au
- Tasmanian Department of Health and Human Services www.dhhs.tas.gov.au
- WA Health www2.health.wa.gov.au
- Centers for Disease Control and Prevention (USA): Meningococcal disease www.cdc.gov/meningococcal

References

1. Apicella MA. *Neisseria meningitidis*. In: Mandell GL, Bennett JE, Dolin R (editors). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases*. 7th. Philadelphia: Churchill Livingstone; 2010.
2. Viner RM, Booy R, Johnson H, et al. Outcomes of invasive meningococcal serogroup B disease in children and adolescents (MOSAIC): a case-control study. *The Lancet Neurology* 2012;11:774-83.
3. Wang B, Clarke M, Thomas N, et al. The clinical burden and predictors of sequelae following invasive meningococcal disease in Australian children. *Pediatric Infectious Disease Journal* 2014;33:316-8.
4. Granoff DM, Pelton S, Harrison LH. Meningococcal vaccines. In: Plotkin SA, Orenstein WA, Offit PA (editors). *Vaccines*. 6th. Philadelphia, PA: Elsevier Saunders; 2013.
5. Pace D, Pollard AJ. Meningococcal disease: clinical presentation and sequelae. *Vaccine* 2012;30 Suppl 2:B3-9.
6. Centers for Disease Control and Prevention. Meningococcal disease. In: Hamborsky J, Kroger A, Wolfe C (editors). *Epidemiology and prevention of vaccine-preventable diseases*. 13th. Washington, DC: Public Health Foundation; 2015. Available from: <http://www.cdc.gov/vaccines/pubs/pinkbook/mening.html> (Accessed March 2018).
7. Rosenstein NE, Perkins BA, Stephens DS, Popovic T, Hughes JM. Meningococcal disease. *New England Journal of Medicine* 2001;344:1378-88.

8. Martin NV, Ong KS, Howden BP, et al. Rise in invasive serogroup W meningococcal disease in Australia 2013–2015. *Communicable Diseases Intelligence* 2016;40:E454–E9.
9. Christensen H, May M, Bowen L, Hickman M, Trotter CL. Meningococcal carriage by age: a systematic review and meta-analysis [erratum appears in *Lancet Infect Dis*. 2011 Aug;11(8):584]. *The Lancet Infectious Diseases* 2010;10:853–61.
10. MacLennan J, Kafatos G, Neal K, et al. Social behavior and meningococcal carriage in British teenagers. *Emerging Infectious Diseases* 2006;12:950–7.
11. Soeters HM, Whaley M, Alexander-Scott N, et al. Meningococcal carriage evaluation in response to a serogroup B meningococcal disease outbreak and mass vaccination campaign at a college-Rhode Island, 2015–2016. *Clinical Infectious Diseases* 2017;64:1115–22.
12. Stuart JM, Cartwright KA, Robinson PM, Noah ND. Effect of smoking on meningococcal carriage. *The Lancet* 1989;2:723–5.
13. Communicable Diseases Network Australia. Invasive meningococcal disease: CDNA national guidelines for Public Health Units (April 2015). Canberra: Australian Government Department of Health; 2015. Available from: <http://www.health.gov.au/internet/main/publishing.nsf/Content/cdnasongs.htm> (Accessed March 2018).
14. NNDSS Annual Report Writing Group. Australia's notifiable disease status, 2012: annual report of the National Notifiable Diseases Surveillance System. *Communicable Diseases Intelligence* 2015;39:E46–E136.
15. Lahra MM, Enriquez RP. Australian Meningococcal Surveillance Programme annual report, 2012. *Communicable Diseases Intelligence* 2013;37:E224–32.
16. The Australian Government Department of Health. Meningococcal W disease. Canberra: The Australian Government Department of Health; 2018. Available from: <http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-meningococcal-W.htm> (Accessed 28 June 2018).
17. Australian Government Department of Health. Invasive meningococcal disease national surveillance report, with a focus on MenW. 31 January 2018. Available from: <http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-meningococcal-W.htm> (Accessed May 2018).
18. Lahra MM, Enriquez RP. Australian Meningococcal Surveillance Programme annual report, 2015. *Communicable Diseases Intelligence* 2016;40:E503–11.
19. The Australian Government Department of Health. Invasive meningococcal disease national surveillance report, with a focus on MenW. Canberra: The Australian Government Department of Health; 2018. Available from: [http://www.health.gov.au/internet/main/publishing.nsf/Content/5FEABC4B495BDEC1CA25807D001327FA/\\$File/31-Mar18-IMD-Surveillance-report.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/5FEABC4B495BDEC1CA25807D001327FA/$File/31-Mar18-IMD-Surveillance-report.pdf) (Accessed 28 June 2018).
20. Australian government Department of Health. Invasive Meningococcal Disease National Surveillance Report. Quarter 2, 2018. 1 May to 30 June 2018. Available from: [http://www.health.gov.au/internet/main/publishing.nsf/Content/5FEABC4B495BDEC1CA25807D001327FA/\\$File/QTR-2-IMD-Surveillance-report-30Jun18.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/5FEABC4B495BDEC1CA25807D001327FA/$File/QTR-2-IMD-Surveillance-report-30Jun18.pdf) (Accessed 03/12/2018).
21. The Australian Government Department of Health. Invasive meningococcal disease national surveillance report, with a focus on MenW. Canberra: The Australian Government Department of Health; 2017. Available from: [http://www.health.gov.au/internet/main/publishing.nsf/Content/5FEABC4B495BDEC1CA25807D001327FA/\\$File/31-Dec17-IMD-Surveillance-report.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/5FEABC4B495BDEC1CA25807D001327FA/$File/31-Dec17-IMD-Surveillance-report.pdf) (Accessed 28 June 2018).
22. Gasparini R, Panatto D. Meningococcal glycoconjugate vaccines. *Human Vaccines* 2011;7:170–82.
23. Australian Technical Advisory Group on Immunisation (ATAGI). ATAGI advice to support changes to the National Immunisation Program from 1 July 2018. Canberra: The Australian Government Department of Health; 2018. Available from: <https://beta.health.gov.au/resources/publications/atagi-advice-to-support-changes-to-the-national-immunisation-program-from-1> (Accessed 28 June 2018).
24. Baxter R, Baine Y, Ensor K, et al. Immunogenicity and safety of an investigational quadrivalent meningococcal ACWY tetanus toxoid conjugate vaccine in healthy adolescents and young adults 10 to 25 years of age. *Pediatric Infectious Disease Journal* 2011;30:e41–8.
25. Baxter R, Baine Y, Kolhe D, et al. Five-year Antibody Persistence and Booster Response to a Single Dose of Meningococcal A, C, W and Y Tetanus Toxoid Conjugate Vaccine in Adolescents and Young Adults: An Open, Randomized Trial. *Pediatric Infectious Disease Journal* 2015;34:1236–43.
26. Jackson LA, Baxter R, Reisinger K, et al. Phase III comparison of an investigational quadrivalent meningococcal conjugate vaccine with the licensed meningococcal ACWY conjugate vaccine in adolescents. *Clinical Infectious Diseases* 2009;49:e1–10.
27. Baxter R, Reisinger K, Block SL, et al. Antibody persistence and booster response of a quadrivalent meningococcal conjugate vaccine in adolescents. *Journal of Pediatrics* 2014;164:1409–15 e4.
28. Baxter R, Reisinger K, Block SL, et al. Antibody persistence after primary and booster doses of a quadrivalent meningococcal conjugate vaccine in adolescents. *Pediatric Infectious Disease Journal* 2014;33:1169–76.
29. Knuf M, Pantazi-Chatzikonstantinou A, Pfletschinger U, et al. An investigational tetravalent meningococcal serogroups A, C, W-135 and Y-tetanus toxoid conjugate vaccine co-administered with Infanrix hexa is immunogenic, with an acceptable safety profile in 12–23-month-old children. *Vaccine* 2011;29:4264–73.
30. Tashani M, Alfelali M, Barasheed O, et al. Effect of Tdap upon antibody response to meningococcal polysaccharide when administered before, with or after the quadrivalent meningococcal TT-conjugate vaccine (coadministered with the 13-valent pneumococcal CRM197-conjugate vaccine) in adult Hajj pilgrims: A randomised controlled trial. *Vaccine* 2018;36:4375–82.
31. Clinicaltrials.gov National Library of Medicine (US). Study of Menactra® in US adolescents when administered concomitantly with Tdap vaccine. Identification number: NCT00777257. 2018. Available from: <https://clinicaltrials.gov/ct2/show/NCT00777257?term=MTA21+menactra&rank=1> (Accessed 27 July 2018).
32. Clinicaltrials.gov National Library of Medicine (US). Study of Menactra® in children aged 4 to 6 years when administered concomitantly with a fifth dose of DAPTACEL®. Identification number: NCT00355121. 2018. Available from: <https://clinicaltrials.gov/ct2/show/NCT00355121?term=NCT00355121&rank=1> (Accessed 27 July 2018).
33. Novartis Vaccines & Diagnostics Pty Ltd. Product information: BEXSERO® suspension for injection. Multicomponent meningococcal group B vaccine (recombinant, adsorbed). 2016. Available from: <https://www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/PI-CMI?OpenForm&t=&q=Bexsero> (Accessed March 2018).
34. Martinon-Torres F, Safadi MAP, Martinez AC, et al. Reduced schedules of 4CMenB vaccine in infants and catch-up series in children: Immunogenicity and safety results from

- a randomised open-label phase 3b trial. *Vaccine* 2017;35:3548-57.
35. Parikh SR, Andrews NJ, Beebeejaun K, et al. Effectiveness and impact of a reduced infant schedule of 4CMenB vaccine against group B meningococcal disease in England: a national observational cohort study. *The Lancet* 2016;388:2775-82.
 36. Vesikari T, Ostergaard L, Diez-Domingo J, et al. Meningococcal serogroup B bivalent rLP2086 vaccine elicits broad and robust serum bactericidal responses in healthy adolescents. *J Pediatric Infect Dis Soc* 2016;5:152-60.
 37. Ostergaard L, Vesikari T, Absalon J, et al. A bivalent meningococcal B vaccine in adolescents and young adults. *The New England Journal of Medicine* 2017;377:2349-62.
 38. Centers for Disease Control and Prevention, Cohn AC, MacNeil JR, et al. Prevention and control of meningococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recommendations and Reports* 2013;62(RR-2):1-28.
 39. Velentgas P, Amato AA, Bohn RL, et al. Risk of Guillain-Barré syndrome after meningococcal conjugate vaccination. *Pharmacoepidemiology and Drug Safety* 2012;21:1350-8.
 40. Yih WK, Weintraub E, Kulldorff M. No risk of Guillain-Barré syndrome found after meningococcal conjugate vaccination in two large cohort studies. *Pharmacoepidemiology and Drug Safety* 2012;21:1359-60.
 41. Vesikari T, Esposito S, Prymula R, et al. Immunogenicity and safety of an investigational multicomponent, recombinant, meningococcal serogroup B vaccine (4CMenB) administered concomitantly with routine infant and child vaccinations: results of two randomised trials. *The Lancet* 2013;381:825-35.
 42. Gossger N, Snape MD, Yu LM, et al. Immunogenicity and tolerability of recombinant serogroup B meningococcal vaccine administered with or without routine infant vaccinations according to different immunization schedules: a randomized controlled trial. *JAMA* 2012;307:573-82.
 43. Prymula R, Esposito S, Zuccotti GV, et al. A phase 2 randomized controlled trial of a multicomponent meningococcal serogroup B vaccine (I): effects of prophylactic paracetamol on immunogenicity and reactogenicity of routine infant vaccines and 4CMenB. *Human Vaccines and Immunotherapeutics* 2014;10:1993-2004.
 44. Bryan P, Seabroke S, Wong J, et al. Safety of multicomponent meningococcal group B vaccine (4CMenB) in routine infant immunisation in the UK: a prospective surveillance study. *The Lancet Child and Global Health* 2018;2:395-403.
 45. Australian Technical Advisory Group on Immunisation (ATAGI). *The Australian Immunisation Handbook*. Canberra: The Australian Government Department of Health; 2018. Available from: <https://immunisationhandbook.health.gov.au/> (Accessed 26/09/2018).