

Influenza vaccines

FREQUENTLY ASKED QUESTIONS

This fact sheet provides responses to common questions about influenza viruses and seasonal influenza vaccines, including the new influenza vaccine programs in 2018. More detailed information about influenza viruses and the available influenza vaccines can be found in the NCIRS factsheet [Influenza vaccines for Australians: information for vaccination providers](#).

Questions about the “enhanced” influenza vaccines available in 2018

- Q1. I’ve heard there are “enhanced” influenza vaccines available this year. Who are they for and how are they different from other influenza vaccines?
- Q2. How well do the “enhanced” influenza vaccines work? Are they equally effective?
- Q3. If I have received one of the “enhanced” influenza vaccines, should I also receive a quadrivalent influenza vaccine (QIV) to cover the missing alternative B strain?
- Q4. Are the “enhanced” influenza vaccines equally safe?

Questions about influenza virus and influenza vaccines

- Q5. What’s the difference between influenza and the common cold?
- Q6. Is it worth getting the influenza vaccine? I’m a healthy person and have heard that influenza isn’t serious.
- Q7. Why do healthy young children need an influenza vaccine?
- Q8. If the influenza vaccine is recommended for everyone then why can only certain people get it for free?
- Q9. I’m travelling to the northern hemisphere and it is influenza season at my destination. How do I protect myself from influenza while travelling?
- Q10. Does the influenza vaccine work? I’ve had the vaccine before and I still got sick that year.
- Q11. When is it too late in the season to get the influenza vaccine?
- Q12. Is the influenza vaccine available all year round?

Questions about the safety of influenza vaccines

- Q13. I’ve heard one of the side effects after having the vaccine is getting sick with influenza. Is that true?
- Q14. I’ve heard influenza vaccine causes seizures or convulsions in young children. Is that true?
- Q15. What is being done in Australia to make sure vaccines are safe to give to the public?
- Q16. I’ve been told to get the influenza vaccine when pregnant to protect me and my baby. Is this safe?
- Q17. Can I get the influenza vaccine if I have an egg or latex allergy?
- Q18. Can the influenza vaccine be given to someone who has had Guillain-Barré syndrome?

Questions about the “enhanced” influenza vaccines available in 2018

Q1. I've heard there are “enhanced” influenza vaccines available this year. Who are they for and how are they different from other influenza vaccines?

In 2018, two additional new influenza vaccines (Fluzone High-Dose and Fluvad) are available free of charge via the National Immunisation Program (NIP) for people aged ≥ 65 years.¹

Fluzone High-Dose and Fluvad contain 3 strains of influenza virus – 2 influenza A strains and 1 influenza B strain (i.e. trivalent influenza vaccines or TIVs). Other influenza vaccines available in Australia contain 4 influenza virus strains – the same strains in a TIV and an additional influenza B strain (i.e. quadrivalent influenza vaccines or QIVs).

The highest disease burden from influenza occurs in the elderly. They are at greater risk of serious complications from influenza infection, and have the highest influenza-associated death rates.² The elderly do not respond as well to the influenza vaccine as healthy adults do, as the immune system weakens with age, and so the level of protection they get from the influenza vaccine is usually less than that in a younger person. This underpins the need for “enhanced” influenza vaccines for people aged ≥ 65 years, to better protect them from influenza infection. Fluzone High-Dose and Fluvad are designed specifically to increase the immune system's response to the vaccine, especially against the influenza A/H3N2 strain which is more common and severe in the elderly and against which the standard dose vaccines protect less well. Fluzone High-Dose contains 4 times the amount of antigen (the part of the vaccine that prompts the body to generate an immune response) than that in a standard dose influenza vaccine. Fluvad contains an adjuvant - an ingredient that stimulates and boosts the immune response to a vaccine.

Although the “enhanced” vaccines contain one less B strain, the benefits of better protection against the strains included, especially against the A/H3N2 strain, in Fluzone High-Dose and Fluvad among those aged ≥ 65 years are likely to outweigh the potential loss of protection against the missing alternative B strain. Research studies have shown that older people tend to have some level of immunity to B strains because of exposure to these strains in prior seasons.

In contrast to this, influenza B contributes to a more substantial portion of disease burden in infants and children than in older adults.^{3,4} Therefore, infants and children will benefit more from the broader protection from the inclusion of a second B virus strain in QIVs than older adults.

Fluzone High-Dose and Fluvad are only licensed for use in people aged ≥ 65 years as the effectiveness and safety of these two vaccines in younger populations have not been adequately examined.

People with an allergy or sensitivity to latex should not receive Fluvad as latex is present in the sheath covering the needle of this vaccine. Fluzone High-Dose and QIVs used in Australia are safe for use by people with a latex allergy or sensitivity.

Q2. How well do the “enhanced” influenza vaccines work? Are they equally effective?

Results from a clinical trial suggest Fluzone High-Dose is 24% more effective in preventing influenza infection compared to standard TIVs.⁵ Unlike Fluzone High-Dose, there are no clinical trials on Fluvad that demonstrated greater effectiveness against influenza infection. However, Fluvad is estimated to be 25% more effective in preventing hospitalisation for influenza or pneumonia compared to standard TIVs.⁶

Fluzone High-Dose and Fluvad are preferentially recommended over quadrivalent influenza vaccines (QIVs) for people aged ≥ 65 years. They have not been compared directly to each other and there is no preference for use between Fluzone High-Dose and Fluvad. If either “enhanced” vaccine is not available, vaccination should not be delayed and a suitable QIV should be used instead.

Q3. If I have received one of the “enhanced” influenza vaccines, should I also receive a quadrivalent influenza vaccine (QIV) to cover the missing alternative B strain?

There is no recommendation to give a QIV to people who have received an “enhanced” influenza vaccine, and the use of multiple types of vaccines in one season has not yet been studied. While not recommended, administration of both vaccine types to an individual is not contraindicated and there are no serious safety concerns.

Q4. Are the “enhanced” influenza vaccines equally safe?

Swelling, redness and pain at the injection site are more common after vaccination with Fluzone High-Dose and Fluvad compared with standard TIV. The majority of the reactions are mild or moderate in severity. Despite a higher rate of

injection site reactions, severe or serious adverse events are not expected at a higher frequency following administration of Fluzone High-Dose and Flud. ⁷⁻⁹

Questions about influenza virus and influenza vaccines

Q5. What's the difference between influenza and the common cold?

Influenza is a respiratory illness that occurs following an infection with influenza viruses.¹⁰ Influenza is often referred to as 'the flu'. Sometimes the term 'the flu' is used incorrectly to describe the common cold, other respiratory viruses or even gastrointestinal illnesses. This is because their symptoms can be similar to those caused by influenza. There are many different viruses and some bacteria that can cause these symptoms. The influenza vaccine will only protect you from the influenza virus.¹¹

The following table compares symptoms from the common cold and influenza and shows on average how frequently the symptoms affect people. Usually influenza is more severe and lasts longer than a cold or other viral respiratory illness.

Cold	Symptom	Influenza
☹	Fever	☹☹☹
☹	Headache	☹☹☹
☹☹	General aches and pains	☹☹☹
☹☹	Tired and weak	☹☹☹
☹	Extreme fatigue	☹☹☹
☹☹☹	Runny, stuffy nose	☹☹
☹☹☹	Sneezing	☹☹
☹☹☹	Sore throat	☹☹☹
☹☹	Chest discomfort, coughing	☹☹☹

☹ = rarely; ☹☹ = sometimes; ☹☹☹ = often

Table adapted from: Immunize Canada, 2010. Is it a cold or influenza? Available from: www.immunize.ca/sites/default/files/resources/176e.pdf (Accessed March 2018)

Q6. Is it worth getting the influenza vaccine? I'm a healthy person and have heard that influenza isn't serious.

Most Australians who get influenza are quite sick for a few days with fever, aches and pains, and sore throat, and then recover without lasting effects (*see Q5*). However, influenza can be very serious in some people, causing hospitalisation or even death. It is not possible to predict who will be severely affected by influenza; each year, previously healthy people are hospitalised and die from the virus. Although around 100 deaths and 5,100 hospitalisations due to influenza are reported each year,² many cases don't get identified, so the true impact of influenza is much greater.

Even if a person does not get severely ill from influenza, it's still a big inconvenience to their lives. For example, influenza can cause people to miss time from childcare, school or work because either they are too sick to attend or they have to take time off to care for a sick child. They may need to buy medications and visit the doctor or even the hospital. One study has shown that parents of children younger than 3 years of age missed an average of 3 days of work to stay home and care for their sick child.¹² The estimated cost to the Australian healthcare system for GP visits and hospitalisations was \$115 million per year for each year between April 2000 and March 2006.¹³

In addition to protecting you from influenza, vaccination also helps to protect people around you. If you don't catch influenza, then you cannot spread the infection. It is particularly important to protect vulnerable people who cannot receive the vaccine themselves such as young babies less than 6 months old and those who have low immunity.^{14,15}

You can think of the influenza vaccine as a seatbelt. When used properly, a seatbelt reduces the likelihood that you'd be injured in a car accident. However, they aren't perfect and won't prevent all injuries. Like a seatbelt, the influenza vaccine isn't perfect because the flu strain chosen to be in the vaccine each year needs to match the one that is circulating in the community. However, the vaccine will reduce the chance of getting influenza and its potentially serious complications, including death.

Q7. Why do healthy young children need an influenza vaccine?

Compared with older children and adults, infants and children less than 5 years of age, including those without pre-existing medical conditions, are more likely to get severe influenza infection, resulting in hospitalisation.^{2,16} In 2017, approximately 1 in 400 children were diagnosed with laboratory-confirmed influenza. Previously healthy children can be severely ill and suffer from influenza-associated complication such as pneumonia and encephalitis.¹⁷⁻¹⁹

Q8. If the influenza vaccine is recommended for everyone then why can only certain people get it for free?

The influenza vaccine is available free of charge via the government-funded Australian NIP for certain groups of people who are at the greatest risk of severe influenza or more likely to get complications from influenza than the general population.¹ This includes the elderly, Aboriginal and Torres Strait Islander Australians, pregnant women and people with certain underlying medical conditions. In addition, because young children experience the highest hospitalisation rates from influenza and are just as likely as adults to be admitted to ICU, most states and territories (WA, QLD, NSW, ACT, VIC and TAS) are providing free influenza vaccine for children aged 6 months to <5 years in 2018.

Since 2005, decisions on what vaccines are provided for free, and for whom, are made following a process that involves the Pharmaceutical Benefits Advisory Committee.²⁰ This ensures any government spending on a health intervention is cost-effective. This is important as there is a limited amount of money that is available for healthcare in Australia and these funds need to be used to bring about the greatest benefit for the whole population.

However, individuals who are not eligible for influenza vaccine on the NIP will still benefit from vaccination (*see Q6*). *The Australian Immunisation Handbook*, the national clinical guideline advising on the safest and most effective use of vaccines in Australia, recommends the influenza vaccine from 6 months of age.²¹ Influenza vaccines can be purchased for around \$10–\$20 each.

Q9. I'm travelling to the northern hemisphere and it is influenza season at my destination. How do I protect myself from influenza while travelling?

Depending on the time of year and destination, travellers may be exposed to the influenza virus at any time throughout the year. The influenza season in the southern hemisphere is mostly during the months of April to September; in the northern hemisphere, influenza activity occurs during October to April. Influenza activity has been reported throughout the year in the tropics.

Travellers may be exposed to the influenza virus while travelling regardless of their destination. Travellers in large tourist groups or involving travel in confined circumstances for days to weeks, such as on a cruise ship, are at particular risk of influenza.^{22,23} Infection can be acquired either before departure or from travel to areas of the world where influenza is currently circulating.

Influenza vaccination is recommended if travelling during the influenza season, especially if it is known before travel that influenza is circulating in the destination region. Current southern hemisphere influenza vaccine is available for about 10 months of the year, from March through to January the following year (when the vaccine expires). This vaccine can be used at any time to protect travellers, if they have not already received an influenza vaccine.

Q10. Does the influenza vaccine work? I've had the vaccine before and I still got sick that year.

There have been many research studies that have shown the effectiveness of the influenza vaccine. It takes 2 weeks for the vaccine to become effective and for immunity to develop after vaccination. However, how well the influenza vaccine works can vary among different people and in different years, as it depends on several factors.

For example, the age and health of the person receiving the influenza vaccine can impact how effective it is. Influenza vaccination can prevent illness in about 50–60% of healthy adults under the age of 65 years, although this figure varies year by year.²⁴ Similar levels of protection occur in young children.²⁵ However, people with an underlying medical condition, such as those with low immunity or the elderly, may not respond as well to the influenza vaccine as healthy adults do and so the level of protection they get from the vaccine may be less. Importantly, among high-risk individuals such as nursing home residents, the vaccine prevents pneumonia and hospitalisation due to influenza.²⁶ Because of the higher risk of severe influenza in the elderly, any protection provided by vaccination against influenza is worthwhile.

Because the vaccine is not 100% effective, it means a small proportion of people may catch the virus after getting the vaccine. However, in many instances, people may think they have caught influenza after being vaccinated but that is not the case. For example, often people catch influenza before getting the influenza vaccine but their symptoms don't appear until shortly after being vaccinated, making them think the vaccine didn't work, or even (mistakenly) that the vaccine made them sick (*see* [Q11](#)).

Similarly, a person who is vaccinated against influenza may catch a different virus that is mistaken for influenza (*see* [Q5](#)). For instance, respiratory syncytial virus (RSV) and parainfluenza are viruses that cause symptoms similar to those of influenza, spread in the community at the same time influenza does and can cause severe illness and complications just like influenza.²⁷

Q11. When is it too late in the season to get the influenza vaccine?

There is no time when it is considered too late to be vaccinated against influenza. Vaccine is available from March through to January the following year, when the vaccine expires (*see* [Q12](#)). Vaccination should continue to be offered throughout the influenza season, as long as unexpired vaccine is available.

The peak of influenza activity in Australia can vary from season to season. Typically it occurs between June and September, but infections can still occur year round, particularly in tropical areas where influenza peaks can commonly occur outside of the typical winter epidemics.

The influenza vaccine can therefore be effective in preventing infection whenever it is given. However, recent evidence suggests optimal protection occurs in the 3–4 months following vaccination and so vaccination before the expected winter peak is advisable.^{28,29}

Q12. Is the influenza vaccine available all year round?

The influenza vaccine is available for about 10 months of the year, from March through to January the following year (when the vaccine expires). This means there is a gap of about 2 months where no influenza vaccine is available.

Questions about the safety of influenza vaccines

Q13. I've heard one of the side effects after having the vaccine is getting sick with influenza. Is that true?

It is not possible for the influenza vaccine to give you influenza. This is because all influenza vaccines in use in Australia are 'inactivated' which means the vaccine is only made with the outside 'shell' of the influenza virus, and it is not alive or functioning like a whole virus.³⁰ Think of it as like the outside shell of a car without the motor – it looks like a car but doesn't actually run.

Sometimes the normal responses the body has to getting the vaccine (i.e. side effects) are similar to the early signs of influenza which can make people think they have gotten influenza from the vaccine. For example, the expected side effects of the vaccine are swelling, redness and pain at the injection site but also fever, tiredness and muscle aches which also occur when you get influenza (*see* [Q5](#), [Q10](#)). However, these side effects are a sign that the vaccine is triggering an immune response, which is what it is designed to do. The symptoms can start within a few hours of being vaccinated and sometimes last 1–2 days. These symptoms go away on their own once your body has successfully made an immune response to the vaccine which will protect you from influenza virus.³¹

Q14. I've heard influenza vaccine causes seizures or convulsions in young children. Is that true?

Febrile seizures (or convulsions) can be triggered by fever of any cause. A small proportion of children (2–4%) are susceptible to febrile seizures until 6 years of age.³² The seizures themselves usually last around 1 or 2 minutes and loss

of consciousness is possible. Nearly all children who have a febrile seizure, regardless of the cause, will recover quickly without any ongoing effects or permanent neurological (brain) damage.

Influenza itself can cause fever which may result in febrile seizures. Influenza is one of the most common infectious causes of febrile seizures in children hospitalised in the winter in Australia.³³ Febrile seizures related to fever after influenza vaccination are uncommon and occur in approximately 1 in every 20,000 children who receive the vaccine.³⁴

In Australia in 2010, higher than expected numbers of fever and febrile convulsions following influenza vaccination were detected in children under 5 years of age, particularly children under 3 years of age.³⁵ Upon investigation, the reports were linked to only one manufacturer's influenza vaccine (Seqirus [previously bioCSL] Fluvax and Fluvax Junior). The use of this vaccine in Australia was suspended while further investigations by the Therapeutic Goods Administration (TGA) were undertaken. The investigations revealed that the issue was likely caused by the manufacturing process used by bioCSL at the time.³⁶⁻³⁸ This vaccine is no longer available in Australia.

Enhanced safety monitoring systems for influenza vaccines introduced in recent years, such as [AusVaxSafety](#) (*see Q15*), have confirmed that influenza vaccine is safe in children less than 5 years of age, with low rates of fever and medical attendance reported after vaccination.³²

Q15. What is being done in Australia to make sure vaccines are safe to give to the public?

Reviewing and monitoring the safety of vaccines is included at all stages of the vaccine development process, from initial lab-based research, vaccine registration including authorities for use, recommendations on use of the vaccine to ongoing surveillance once the vaccine is being used in the population.

The TGA is responsible for registering vaccines for use in Australia. To ensure their safety and efficacy, vaccines are evaluated using the most up-to-date research and testing information available. Independent medical and scientific advice on the safety, quality and efficacy of vaccines is provided by experts who make up the Advisory Committee on Vaccines (ACV).³⁹ Once vaccines are registered and in use, the TGA continues to monitor their safety and effectiveness through a national monitoring system. The system includes reporting of adverse events by health authorities, immunisation providers, doctors, consumers and vaccine manufacturers. If the TGA receives information that there are safety concerns about a vaccine, the issue is investigated immediately. As part of the investigation, the TGA seeks vaccine safety advice from the ACV.⁴⁰

Another important vaccine safety initiative in Australia is AusVaxSafety, a national, active sentinel based vaccine safety surveillance program. AusVaxSafety collects patient reported outcomes following a vaccination encounter via an SMS-based survey. Data is collected in near real-time and is collated for analysis and to monitor for safety signals.

Another important body is the Australian Technical Advisory Group on Immunisation (ATAGI).⁴¹ This group advises the government on existing, new and emerging vaccines in relation to their effectiveness and use in Australian populations. ATAGI produces *The Australian Immunisation Handbook*, the national clinical guideline advising on the safest and most effective use of vaccines in Australia. ATAGI and the ACV work together with other bodies on matters relating to the implementation of immunisation policies, procedures and vaccine safety.

Q16. I've been told to get the influenza vaccine when pregnant to protect me and my baby. Is this safe?

Influenza can cause severe disease in pregnant women and young babies. Getting sick with influenza while pregnant can lead to complications such as premature delivery and even perinatal death.⁴² Young children, especially those less than 6 months old, are more likely to be hospitalised or die from influenza than older children.

Influenza vaccine is recommended with every pregnancy to protect both the mother and her unborn child against complications from influenza. Babies born to women vaccinated against influenza while pregnant are less likely to be born prematurely or have a low birth weight.^{43,44}

Influenza vaccination protects babies after birth. During pregnancy, protective antibodies are transferred through the placenta from the mother to the baby. Maternal vaccination is estimated to reduce the risk of influenza in infants <6 months of age by 48%.⁴⁵⁻⁴⁷ However, the protection wears off as babies get to 6 months of age, at which time babies can start to receive the vaccine themselves.⁴⁸

Influenza vaccine is safe during pregnancy. A systematic review combining data from multiple studies found no increase in fetal death, spontaneous abortion or congenital malformation after maternal influenza vaccination in pregnancy.⁴³ Expected adverse events after vaccination, like injection site reactions, do not occur any more frequently in pregnant women than in non-pregnant women.

Q17. Can I get the influenza vaccine if I have an egg or latex allergy?

Reactions such as hives, angioedema (a skin reaction with swelling similar to hives) or anaphylaxis (severe allergic reaction) are rare side effects following vaccination for influenza. They can be due to an allergic response to something in the vaccines, such as egg protein.

Although influenza vaccines in Australia are grown in eggs, due to new vaccine manufacturing methods, the amount of material from the egg in the influenza vaccine is small (usually less than 1 microgram of egg protein per dose). Recent studies have shown that people with egg allergy, including egg-induced anaphylaxis, have safely received the influenza vaccine.^{49,50} Although the risk of anaphylaxis or an adverse event is very low, persons with this type of allergy should be vaccinated by healthcare providers experienced in recognising and treating anaphylaxis.

The Australasian Society of Clinical Immunology and Allergy (ASCIA) guidelines should be referred to for additional information on influenza vaccination of individuals with an allergy to eggs, including risk, dosage and observation period.⁵¹

People with an allergy or sensitivity to latex should not receive Fluvad as latex is present in the sheath covering the needle of this vaccine. Other flu vaccines used in Australia, including Fluzone High-Dose and QIVs, are latex-free and safe for use by people with a latex allergy or sensitivity.

Q18. Can the influenza vaccine be given to someone who has had Guillain-Barré syndrome?

Guillain-Barré syndrome (GBS) is a rare disorder in which the immune system damages nerve cells, causing muscle weakness and sometimes paralysis. The symptoms usually last for a few weeks followed by a full or partial recovery. In very rare cases people have died of GBS. The risk of the syndrome increases with age and is greatest for those aged 50 years or older. Diagnosis of GBS is complex and must be made by a doctor.

A small increased risk of GBS was found in people given a specific influenza vaccine in the United States in 1976.⁵² Since then, close monitoring has shown that GBS has occurred at a very low rate of less than 1 in 1 million doses of influenza vaccine.⁵³ Studies suggest that a person is more likely to get GBS from infection with the influenza virus than from the influenza vaccine.⁵⁴

Someone who has a history of GBS has an increased likelihood in general of developing GBS again, and the chance of them coincidentally developing the syndrome following influenza vaccination may be higher than that in persons with no history of GBS.⁵⁵ A history of GBS within 6 weeks following an influenza vaccination is considered a precaution to vaccination. Persons who are not at high risk for severe influenza complications generally should not be vaccinated. However, the benefits of influenza vaccination might outweigh the risks for certain persons who have a history of GBS and who also are at high risk for severe complications from influenza. Concerns should be discussed with, and expert advice sought from, an immunisation specialist.

Additional resources for primary medical care/vaccination providers

- National Centre for Immunisation Research and Surveillance (NCIRS) influenza fact sheet
www.ncirs.edu.au/assets/provider_resources/fact-sheets/influenza-fact-sheet.pdf
- Australian Technical Advisory Group on Immunisation (ATAGI) advice for immunisation providers regarding the administration of seasonal influenza vaccines in 2018
<https://beta.health.gov.au/resources/publications/atagi-advice-on-seasonal-influenza-vaccines-in-2018>
- Immunise Australia website
www.immunise.health.gov.au
- National Immunisation Program schedule
www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/national-immunisation-program-schedule

References

1. Australian Technical Advisory Group on Immunisation (ATAGI). Australian Technical Advisory Group on Immunisation (ATAGI) advice for immunisation providers regarding the administration of seasonal influenza vaccines in 2018. Canberra: Australian Technical Advisory Group on Immunisation (ATAGI); 2018. Available from: <https://beta.health.gov.au/resources/publications/atagi-advice-on-seasonal-influenza-vaccines-in-2018> (Accessed 5 April 2018).
2. Li-Kim-Moy J, Yin JK, Patel C, et al. Australian vaccine preventable disease epidemiological review series: Influenza 2006 to 2015. *Communicable Diseases Intelligence* 2016;40:E482-95.
3. Beyer WEP, Palache AM, Boulfich M, Osterhaus A. Rationale for two influenza B lineages in seasonal vaccines: a meta-regression study on immunogenicity and controlled field trials. *Vaccine* 2017;35:4167-76.
4. Moa AM, Muscatello DJ, Turner RM, MacIntyre CR. Epidemiology of influenza B in Australia: 2001-2014 influenza seasons. *Influenza and Other Respiratory Viruses* 2017;11:102-9.
5. Shay DK, Chillarige Y, Kelman J, et al. Comparative Effectiveness of High-Dose Versus Standard-Dose Influenza Vaccines Among US Medicare Beneficiaries in Preventing Postinfluenza Deaths During 2012-2013 and 2013-2014. *Journal of Infectious Diseases* 2017;215:510-7.
6. Mannino S, Villa M, Apolone G, et al. Effectiveness of adjuvanted influenza vaccination in elderly subjects in northern Italy. *American Journal of Epidemiology* 2012;176:527-33.
7. DiazGranados CA, Dunning AJ, Kimmel M, et al. Efficacy of high-dose versus standard-dose influenza vaccine in older adults. *The New England Journal of Medicine* 2014;371:635-45.
8. Falsey AR, Treanor JJ, Tornieporth N, Capellan J, Gorse GJ. Randomized, double-blind controlled phase 3 trial comparing the immunogenicity of high-dose and standard-dose influenza vaccine in adults 65 years of age and older. *Journal of Infectious Diseases* 2009;200:172-80.
9. Novartis Vaccines and Diagnostics Inc. FDA advisory committee briefing document: Fluad – seasonal adjuvanted trivalent influenza vaccine (aTIV). Vaccines and Related Biological Products Advisory Committee, meeting date: September 15, 2015. 2015. Available from: <http://wayback.archive-it.org/7993/20170405194039/https://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/BloodVaccinesandOtherBiologics/VaccinesandRelatedBiologicalProductsAdvisoryCommittee/UCM461917.pdf> (Accessed 5 March 2018).
10. Eccles R. Understanding the symptoms of the common cold and influenza. *The Lancet Infectious Diseases* 2005;5:718-25.
11. Nichol KL, Lind A, Margolis KL, et al. The effectiveness of vaccination against influenza in healthy, working adults. *New England Journal of Medicine* 1995;333:889-93.
12. Heikkinen T, Silvennoinen H, Peltola V, et al. Burden of influenza in children in the community. *Journal of Infectious Diseases* 2004;190:1369-73.
13. Newall AT, Scuffham PA. Influenza-related disease: the cost to the Australian healthcare system. *Vaccine* 2008;26:6818-23.
14. Mertz D, Kim TH, Johnstone J, et al. Populations at risk for severe or complicated influenza illness: systematic review and meta-analysis. *BMJ* 2013;347:f5061.
15. Rasmussen SA, Jamieson DJ, Uyeki TM. Effects of influenza on pregnant women and infants. *American Journal of Obstetrics and Gynecology* 2012;207(3 Suppl):S3-8.
16. Izurieta HS, Thompson WW, Kramarz P, et al. Influenza and the rates of hospitalization for respiratory disease among infants and young children. *New England Journal of Medicine* 2000;342:232-9.
17. Coffin SE, Zaoutis TE, Rosenquist AB, et al. Incidence, complications, and risk factors for prolonged stay in children hospitalized with community-acquired influenza. *Pediatrics* 2007;119:740-8.

18. Britton PN, Blyth CC, Macartney K, et al. The spectrum and burden of influenza-associated neurological disease in children: combined encephalitis and influenza sentinel site surveillance from Australia, 2013-2015. *Clinical Infectious Diseases* 2017;65:653-60.
19. Britton PN, Dale RC, Blyth CC, et al. Influenza-associated encephalitis/encephalopathy identified by the Australian Childhood Encephalitis Study 2013-2015. *Pediatric Infectious Disease Journal* 2017;36:1021-6.
20. Nolan TM. The Australian model of immunization advice and vaccine funding. *Vaccine* 2010;28 Suppl 1:A76-83.
21. Australian Technical Advisory Group on Immunisation (ATAGI). *The Australian Immunisation Handbook* 10th. Canberra: The Australian Government Department of Health and Ageing; 2018. Available from: <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home~handbook10part4~handbook10-4-7> (Accessed 6/4/2018).
22. Steffen R. Influenza in travelers: epidemiology, risk, prevention, and control issues. *Curr Infect Dis Rep* 2010;12:181-5.
23. Marti F, Steffen R, Mutsch M. Influenza vaccine: a travelers' vaccine? *Expert Review of Vaccines* 2008;7:679-87.
24. Osterholm MT, Kelley NS, Sommer A, Belongia EA. Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *The Lancet Infectious Diseases* 2012;12:36-44.
25. Blyth CC, Jacoby P, Effler PV, et al. Effectiveness of trivalent flu vaccine in healthy young children. *Pediatrics* 2014;133:e1218-25.
26. Jefferson T, Di Pietrantonj C, Al-Ansary LA, et al. Vaccines for preventing influenza in the elderly. *Cochrane Database of Systematic Reviews* 2010;(2):CD004876. doi:10.1002/14651858.CD004876.pub3.
27. Zambon MC, Stockton JD, Clewley JP, Fleming DM. Contribution of influenza and respiratory syncytial virus to community cases of influenza-like illness: an observational study. *The Lancet* 2001;358:1410-6.
28. Belongia EA, Sundaram ME, McClure DL, et al. Waning vaccine protection against influenza A (H3N2) illness in children and older adults during a single season. *Vaccine* 2015;33:246-51.
29. Sullivan SG, Komadina N, Grant K, et al. Influenza vaccine effectiveness during the 2012 influenza season in Victoria, Australia: influences of waning immunity and vaccine match. *Journal of Medical Virology* 2014;86:1017-25.
30. Gross PA, Ennis FA, Gaerlan PF, et al. A controlled double-blind comparison of reactogenicity, immunogenicity, and protective efficacy of whole-virus and split-product influenza vaccines in children. *Journal of Infectious Diseases* 1977;136:623-32.
31. Mahajan D, Roomiani I, Gold MS, et al. Annual report: surveillance of adverse events following immunisation in Australia, 2009. *Communicable Diseases Intelligence* 2010;34:259-76.
32. Pillsbury A, Quinn H, Cashman P, Leeb A, Macartney K. Active SMS-based influenza vaccine safety surveillance in Australian children. *Vaccine* 2017;35:7101-6.
33. Francis JR, Richmond P, Robins C, et al. An observational study of febrile seizures: the importance of viral infection and immunization. *BMC Pediatr* 2016;16:202.
34. Tse A, Tseng HF, Greene SK, Vellozzi C, Lee GM. Signal identification and evaluation for risk of febrile seizures in children following trivalent inactivated influenza vaccine in the Vaccine Safety Datalink Project, 2010–2011. *Vaccine* 2012;30:2024-31.
35. Armstrong PK, Dowse GK, Effler PV, et al. Epidemiological study of severe febrile reactions in young children in Western Australia caused by a 2010 trivalent inactivated influenza vaccine. *BMJ Open* 2011;1:e000016.
36. Australian Government Department of Health, Therapeutic Goods Administration. Seasonal flu vaccine: Investigation into febrile reactions in young children following 2010 seasonal trivalent influenza vaccination. Status report as at 2 July 2010 (updated 24 September 2010). Available from: <http://www.tga.gov.au/alert/seasonal-flu-vaccine-investigation-febrile-reactions-young-children-following-2010-seasonal-trivalent-influenza-vaccination> (Accessed 7 March 2018).

37. Rockman S, Becher D, Dyson A, et al. Role of viral RNA and lipid in the adverse events associated with the 2010 Southern Hemisphere trivalent influenza vaccine. *Vaccine* 2014;32:3869-76.
38. Rockman S, Dyson A, Koernig S, et al. Evaluation of the bioactivity of influenza vaccine strains in vitro suggests that the introduction of new strains in the 2010 Southern Hemisphere trivalent influenza vaccine is associated with adverse events. *Vaccine* 2014;32:3861-8.
39. Therapeutic Goods Administration (TGA). Advisory Committee on Vaccines (ACV) Available from: <http://www.tga.gov.au/committee/advisory-committee-vaccines-acv> (Accessed 9 March 2018).
40. Australian Government Department of Health and Ageing. Are vaccines safe. Canberra: 2018. Available from: <https://beta.health.gov.au/topics/immunisation/getting-started/are-vaccines-safe> (Accessed 9 March 2018).
41. Australian Government Department of Health and Ageing. Australian Technical Advisory Group on Immunisation (ATAGI). Available from: <https://beta.health.gov.au/committees-and-groups/australian-technical-advisory-group-on-immunisation> (Accessed 9 March 2018).
42. McMillan M, Porritt K, Kralik D, Costi L, Marshall H. Influenza vaccination during pregnancy: a systematic review of fetal death, spontaneous abortion, and congenital malformation safety outcomes. *Vaccine* 2015;33:2108-17.
43. Fell DB, Dodds L, MacDonald NE, Allen VM, McNeil S. Influenza vaccination and fetal and neonatal outcomes. *Expert Review of Vaccines* 2013;12:1417-30.
44. Legge A, Dodds L, MacDonald NE, Scott J, McNeil S. Rates and determinants of seasonal influenza vaccination in pregnancy and association with neonatal outcomes. *Canadian Medical Association Journal* 2014;186:E157-64.
45. Benowitz I, Esposito DB, Gracey KD, Shapiro ED, Vázquez M. Influenza vaccine given to pregnant women reduces hospitalization due to influenza in their infants. *Clinical Infectious Diseases* 2010;51:1355-61.
46. Nunes MC, Madhi SA. Influenza vaccination during pregnancy for prevention of influenza confirmed illness in the infants: a systematic review and meta-analysis. *Human vaccines & immunotherapeutics* 2017:1-9.
47. Zaman K, Roy E, Arifeen SE, et al. Effectiveness of maternal influenza immunization in mothers and infants. *New England Journal of Medicine* 2008;359:1555-64.
48. Nunes MC, Cutland CL, Jones S, et al. Duration of infant protection against influenza illness conferred by maternal immunization: secondary analysis of a randomized clinical trial. *JAMA Pediatrics* 2016;170:840-7.
49. Des Roches A, Paradis L, Gagnon R, et al. Egg-allergic patients can be safely vaccinated against influenza. *Journal of Allergy and Clinical Immunology* 2012;130:1213-6.e1.
50. Greenhawt MJ, Li JT, Bernstein DI, et al. Administering influenza vaccine to egg allergic recipients: a focused practice parameter update. *Annals of Allergy, Asthma and Immunology* 2011;106:11-6.
51. Australian Society of Clinical Immunology and Allergy (ASCIA). Guidelines: vaccination of the egg-allergic individual. ASCIA; 2017. Available from: https://www.allergy.org.au/images/stories/pospapers/ASCIA_Guidelines_vaccination_egg_allergic_individual_2017.pdf (Accessed 9 March 2018).
52. Haber P, Sejvar J, Mikaeloff Y, DeStefano F. Vaccines and Guillain-Barre syndrome. *Drug Safety* 2009;32:309-23.
53. Nelson KE. Invited commentary: influenza vaccine and Guillain-Barré syndrome – is there a risk? *American Journal of Epidemiology* 2012;175:1129-32.
54. Kwong JC, Vasa PP, Campitelli MA, et al. Risk of Guillain-Barre syndrome after seasonal influenza vaccination and influenza health-care encounters: a self-controlled study. *The Lancet Infectious Diseases* 2013;13:769-76.
55. Burwen DR, Ball R, Bryan WW, et al. Evaluation of Guillain-Barré syndrome among recipients of influenza vaccine in 2000 and 2001. *American Journal of Preventive Medicine* 2010;39:296-304.