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ACT Population Health Bulletin

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Introduction

A message from the Chief Health Officer

This Issue of the Bulletin is devoted to one of the most successful and most cost-effective of public health interventions, namely immunisation. To clarify terminology, the World Health Organization defines immunisation as the process whereby a person is made immune to an infectious disease, typically by the administration of a vaccine. Vaccination is the administration of antigenic material (a vaccine) to stimulate an individual's immune system to develop adaptive immunity to a pathogen. For the purpose of this Issue we have used the terms interchangeably. The topics covered include the history of vaccination, the role of surveillance including for adverse events related to vaccination and specific considerations for vaccination in specific populations or circumstances.

The ACT is in a unique position in Australia with our centralised approach to immunisation policy, vaccine purchasing, storage and delivery, education to providers and the public, monitoring and surveillance implemented by one section of the Health Protection Service. In terms of the administration of vaccines and reporting this is a true and successful partnership with clinicians in ACT Health and importantly with private health service providers in the community, notably general practitioners. In 2016, a new portal of access to influenza vaccination has become available with pharmacists authorised to vaccinate for influenza within pharmacies.

In the ACT, we are rightly proud of our record on immunisation as we are frequently the best performing jurisdiction in Australia. Similar to other states and territories, our challenges continue to be in the area of school-based and adult immunisation as well as reaching those who do not access vaccination services. This is largely a philosophical issue in Australia where personal agency in decision making rather than broader community values are paramount considerations, the diseases which we are attempting to protect the population from are now rare and where science and anecdote are given equal exposure, notably on the internet and in social media. The long held view that decisions about vaccination should be based on the counterfactual of preventing potentially life-threatening diseases in the community is now outweighed by the real or perceived risk of adverse events related to vaccination of individuals.

A successful immunisation program requires strong monitoring of performance, achieved through strong data collection systems and rigorous analysis of that data we collect. Through this surveillance, we can detect local challenges such as decreased vaccination rates in indigenous children and the emergence of new strains of illness not covered by current vaccines. The utility of the analysis of local data is demonstrated in several articles in this Issue.

The future for immunisation is bright, but likely to become more complex. The National Immunisation Program continues to expand. New vaccines are continually being developed as well as new technologies for production and delivery systems which could revolutionise vaccination programs by providing easier, simpler delivery and more effective longer-lasting protection.

This Issue would not have been published without the excellent work of Carolyn Banks who is the head of the immunisation section, guest editor and the author of several articles. Thanks also to the other contributors and as always to the editorial committee for their rapid and comprehensive editing and advice.

Dr Paul Kelly
ACT Chief Health Officer
August 2016

Breaking News

Student innovation for healthier high schools: *It's Your Move* pilot has positive impact on health of ACT students

On 5 August 2016, the Assistant Minister for Health, Meegan Fitzharris MLA, joined 75 Canberra high school students, teachers and mentors for the *It's Your Move* celebration event at Gorman House, Braddon. *It's Your Move* (IYM) is an ACT Government initiative that empowers high school students to create innovative health improvement projects.

Minister Fitzharris presented the IYM pilot results, which ran from 2012-2014 with Melrose, Alfred Deakin and Calwell High Schools, in partnership with Deakin University. The results show that students at the three schools involved in the pilot program are making healthier choices. The evaluation, undertaken in partnership with Deakin University, shows two of the three schools achieved a significant decrease in overweight and obesity, with the third school remaining stable. In addition, there was an increase in the proportion of students eating five or more vegetables daily and an increase in the proportion of students drinking four or more glasses of water at school.

The Minister played How-to Guide videos on projects from three of the current nine schools participating in IYM. Videos included Mount Stromlo High's 'Move It' which gamifies active travel by enabling students to scan a QR code or take a selfie as evidence that they ride to school; Amaroo High's 'Project Yum' which involves students in the production of fresh food as part of a Year 9 elective and Campbell High School's 'Street Hero' sun smart campaign.

Campbell, Lanyon, Amaroo, Canberra and Mount Stromlo High schools also took part in a design thinking workshop run by ThinkPlace, Canberra. Mick Spencer, from OnTheGo sports and winner from Shark Tank, spoke about how to make a successful pitch. Business and community mentors worked with each school, including Ingrid McCarthy from Inspiring Australia, Carlo Krikowa from boyandgirlco, Carrie Graf, Head Coach of the Canberra Capitals, Deborah Shroot from Ernst and Young, Amber Standley from APositive Augmented Reality, Dr Amit Paradkar, expert in commercialisation, Emma Tattam from the Physical Activity Foundation and Leanne Elliston from Nutrition Australia ACT.

Throughout the IYM event, students and teachers trialled some of the IYM: Design Thinking for Health learning materials. The materials will enable teachers to take students on a design thinking journey to develop and implement health improvement projects. A further example was shown using the How-to Guide video on Lanyon and Calwell High School's new cafe-style canteen dining spaces.

ACT Government, catholic and independent high schools will have access to IYM: Design Thinking for Health from 2017 for Years 9 and 10. It will include digital learning materials, small start up grants, classroom resources, teacher professional learning, business mentors and networking. For more information about IYM, email itsyourmove@act.gov.au, phone 6207 0725 or visit www.health.act.gov.au/itsyourmove.

Image: Campbell High students proudly show their 'Street Hero' project How-to Guide

Art In, Butt Out

On 24 August 2016, Minister for Health, Simon Corbell MLA presented the award to the winner of the 2016 *Art In, Butt Out* competition. The winner for 2016 is Louisa Langston from Canberra High School.

Image: *Art In, Butt Out* Awards Ceremony. AMA

The *Art In, Butt Out* competition is an initiative of the Australian Medical Association (AMA) ACT's Tobacco Task Force. *Art In, Butt Out* is a competition for young designers in Year 8 secondary school (public, private and home schooled) to design an anti-smoking advertisement for Canberra Milk bottles to be distributed across the Territory in September 2016. Canberra Milk will distribute the artwork on its milk bottles for a period of approximately six weeks, on an estimated 60,000 milk bottles. Students were asked to design an anti-smoking advertisement in line with the goals of the AMA Tobacco Task Force, which are to reduce the uptake of smoking and promote smoking cessation.

The AMA Tobacco Task Force's goal is to engage with young people to develop peer-to-peer anti-smoking messages. *Art In, Butt Out* is a public health campaign that aims to encourage young people's involvement in spreading the anti-smoking message to their peers, increase awareness of the negative health effects of tobacco smoking and tobacco products, and reduce the uptake of smoking by young people.

Smoking rates among ACT secondary students are declining, however further reductions are required. In 1996, over 20 percent of our secondary school students were current smokers. Today, that figure has dropped to around 5.2 percent (2014 data). In 1996, only 44 percent of ACT secondary school students had never smoked. Today, that figure has nearly doubled to 81 percent (2014 data).

The ACT Government continues to build on its work to denormalise smoking and reduce young people's exposure to smoking and second-hand smoke.

Breaking News

Launch of *Game Changer+*

On 29 July 2016, the Assistant Health Minister, Meegan Fitzharris MLA, launched a new pilot program in the ACT that aims to provide students in Years 9 and 10 with the skills to critically analyse alcohol advertising and marketing messages.

Image: *Game Changer+* Launch. Foundation for Alcohol Research and Education

Game Changer+ is an initiative of the Foundation for Alcohol Research and Education (FARE) and is being piloted in four ACT secondary schools (Canberra High School, Caroline Chisholm School, Namadgi School and Radford College) through funding provided by the ACT Health Promotion Grants Program.

Game Changer+ is an eight lesson media literacy program that aligns with the Australian Curriculum for English and also complements existing health education curriculum. It includes lessons on:

- alcohol, including products and brands;
- alcohol advertising and other promotions such as sponsorship, social media, merchandise and product placement;
- media literacy skills such as deconstructing advertisements and creating counter advertisements; and
- advocacy to reduce underage drinking and binge drinking.

Game Changer+ is based on the Alcohol Truth project that was developed by the Centre for Health and Social Research at the Australian Catholic University in Melbourne.

The National Drug Strategy Household Survey 2013 indicates that the average age at which young people aged 14–24 first tried alcohol is 15.7 years. The ACT Chief Health Officer's Report 2016 indicates that more than half (56 percent) of ACT secondary school students have consumed alcohol at a level that put them at risk of injury on a single occasion of drinking.

A range of research points to the fact that young people are exposed to a constant stream of alcohol advertising and marketing. The Australian Medical Association has called for a new policy agenda around alcohol marketing and young people. Programs such as *Game Changer+* are aimed at supporting and empowering young people to make healthier, more informed choices around alcohol consumption that will become a foundation for their adult lives.

More information about *Game Changer+* is available from FARE www.fare.org.au

Acronyms and Resources

Acronyms

ACIR	Australian Childhood Immunisation Register
ADRS	Adverse Drug Reactions System
AEFI	Adverse event following immunisation
AIR	Australian Immunisation Register
AMA	Australian Medical Association
ASVR	Australian School Vaccination Register
ATAGI	Australian Technical Advisory Group on Immunisation
BOS	Birth Outcomes System
CDC	Communicable Disease Control
CDNA	Communicable Disease Network of Australia
CHO	Chief Health Officer
DTPa	Diphtheria, tetanus, and pertussis
FARE	Foundation for Alcohol Research and Education
GP	General Practitioner
HPS	Health Protection Service
HPV	Human Papillomavirus
IMD	Invasive meningococcal disease
in vivo	Within the living
IYM	It's Your Move
MMR	Measles-mumps-rubella
NIP	National Immunisation Program
NNDL	National Notifiable Disease List
NNDSS	National Notifiable Disease Surveillance System
PHN	Public Health Nurse
QIV	Quadrivalent influenza vaccines
TGA	Therapeutic Goods Administration
TIV	Trivalent influenza vaccines
VMU	Vaccine Management Unit
VPD	Vaccine preventable disease
WHO	World Health Organization

Resources

- ACT Health Immunisation - http://www.health.act.gov.au/our-services/immunisation
- Australian Immunisation Handbook (10th Edition) - www.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home
- Immunise Australia - http://www.immunise.health.gov.au/
- National Centre for Immunisation Research and Surveillance - www.ncirs.edu.au
- National Notifiable Diseases Surveillance database - http://www.health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-annlrpt-nndssar.htm
- Immunise Australia Program, about the program, http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/about-the-program
- No Jab, No Pay - http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/67D8681A67167949CA257E2E000EE07D/$File/No-Jab-No-Pay.pdf
- Foundation for Alcohol Research and Education - www.fare.org.au
- *It's Your Move* - www.health.act.gov.au/itsyourmove
- *Art In, Butt Out* - https://ama.com.au/act/art-butt-out-2016

A brief history of vaccination

Dr Belinda Jones, Office of the Chief Health Officer, Population Health Protection & Prevention

The development of vaccination to prevent communicable disease is one of the greatest public health successes of all time. The story of vaccination begins with Edward Jenner in the 18th century and through the work of many notable scientists has continued to advance over subsequent centuries. Further research into vaccine development holds the potential for new vaccines against old diseases, and extension into new areas beyond communicable disease.

The history of vaccination is often told as beginning with the work of Edward Jenner, whose publications on the use of cowpox to protect against smallpox in the 18th century heralded the debut of the fields of immunisation and vaccinology. However, the concept of exposing people to infectious agents to induce protection was around much earlier than this. Variolation was the process of directly inoculating a person with live unmodified smallpox virus to induce infection and immunity.[1] Historical records suggest variolation was practiced in India and China as early as the 11th century.[2] As the process of variolation involved the use of unmodified virus, it was often associated with significant morbidity and mortality (either from the disease itself or from diseases (e.g. tuberculosis and syphilis) transmitted by the procedure). It would take several centuries and the further work of numerous scientists, such as Louis Pasteur, before vaccination would become the much safer process it is today.

Image: Edward Jenner. Public Domain

Returning to Jenner in the 18th century, he observed that farmers in England who had been infected by cowpox (a diseases resembling mild smallpox), were protected against smallpox.[1] Whilst not widely practiced, the deliberate inoculation with cowpox to protect against smallpox had been practised by others, including farmer Benjamin Jesty, who inoculated his family.[1] However, it was Jenner who formally tested this theory by inoculating a young boy, James Phipps, with cowpox and subsequently exposing the boy to smallpox via variolation.[1] Jenner's publications reporting the success of this method and its improved safety compared to variolation, was a major breakthrough in disease prevention. The use of inoculation with cowpox virus to protect against smallpox became widespread; indeed, the origin of the word 'vaccination' stems from the Latin for cow; "vacca".[3]

Types of vaccines

Vaccines can produce immunity to infectious agents in several different ways. The three categories of vaccines currently widely available today are live attenuated, inactivated or killed, and subunit vaccines.

Some of the earliest vaccines were live attenuated vaccines; produced by making the pathogen less virulent by exposing it to oxygen, chemicals or high temperatures.[2,3] The principles behind attenuation of pathogens were based on Pasteur's work on *Pasteurella multocida*, a bacteria causing cholera in chickens. Pasteur discovered that when he inoculated chickens with an old culture of *P. multocida*, left on the laboratory bench whilst he was on vacation, the inoculum not only failed to cause severe disease, but provided the chickens with protection from subsequent infection when they were exposed to a fresh culture of the bacteria.[2] This provided the theoretical basis that certain environmental exposures could weaken infectious agents, rendering them incapable of causing significant infection in the host, but still able to stimulate a protective immune response that would prevent infection if later exposed to the 'wild' version of the pathogen.[2] Pasteur contributed other significant insights in the field of vaccinology, including his observations that when a non-host animal species was serially inoculated with a pathogen, the pathogen would eventually become more virulent in that animal species, but less virulent to the usual host.[1] Pasteur and his team used serial inoculations of the rabies virus in rabbits to develop an attenuated strain less virulent to dogs, and then further attenuated the virus by air drying the spinal cord of the infected rabbits. Dogs undergoing serial inoculation with this attenuated form of the virus were then protected from developing rabies when directly exposed to the virus.[1] Pasteur used this method to successfully treat a young boy who had been bitten by a dog suspected to be rabid, with adoption of this method becoming the first treatment to prevent rabies after exposure to rabid animals.[1]

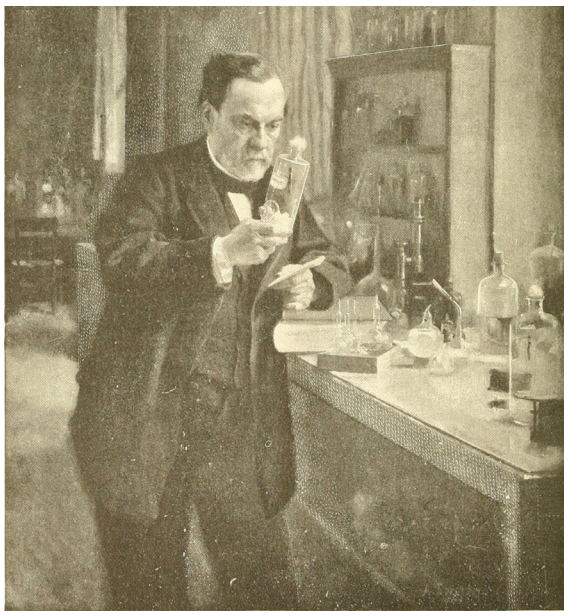

Image: Louis Pasteur in his laboratory. Public Domain

Another method of vaccination, using 'inactivated' or 'killed' pathogen, was developed in the 19th century.[3] American scientists, Daniel Salmon and Theobald Smith, found that the inoculation of pigs with dead hog cholera provided protection against the live pathogen.[1] This observation was confirmed by the work of Pasteur's colleagues Emile Roux and Charles Chamberland, who showed that *Salmonella* killed by high temperatures were unable to cause infection in birds and provided protection against exposure to the live bacteria.[1] This same method of using killed or inactivated pathogen that is incapable of causing disease but still immunogenic continues to be used today in the production of vaccines against hepatitis A and poliomyelitis.

A brief history of vaccination *(continued)*

Despite the improved safety provided by inactivated or killed vaccines, some vaccines produced this way caused undesirable side effects. Even when killed, the components of some pathogens, such as the bacteria *Bordetella pertussis*, still caused adverse effects.[1] This led to the concept of using only a part of the pathogen (a subunit) to induce immunity rather than the whole organism. This was made possible by the cumulative work of several scientists in the late 19th century, including Emile Roux, Alexandre Yersin and Shibasaburo Kitasato, whose work led to the identification and isolation of the bacterial toxins causing tetanus and diphtheria.[2] Further work by Emil Von Behring and Shibasaburo Kitasato established that animals infected with sub-lethal doses of these toxin-producing bacteria developed antibodies against the toxin.[1,3] The antibody-containing serum from these animals could then be given to humans to provide passive protection against the toxins produced by the bacteria.[1,3] Although this was a step forward in protecting against these diseases it was not without its own side effects; many people developed serum sickness as a result of human antibodies forming immune-complexes with protein antigens from the animal sera.[3]

The further refinement of subunit vaccines occurred after the simultaneous discovery by American scientists Alexander Glenny and Barbara Hopkins, and French scientist Gaston Ramon, that diphtheria toxin left in formalin became weakly toxic but retained its immunogenicity.[4] The modified toxin, or toxoid, could be used to directly induce an immune response and immunity in humans. However, as the toxoids were only weakly immunogenic, further development was required to ensure an adequate immune response was achieved. This led to the exploration into the use of adjuvants, such as aluminium hydroxide, which triggered a greater inflammatory response and increased immunity.[1,3] By the 1930s and 1940s the use of diphtheria and tetanus toxoid vaccines was widespread across Europe and the United States.[3] This was shortly followed by the development of another type of subunit vaccine, the polysaccharide vaccine, against *pneumococcus* in 1946.[5] This type of subunit vaccine uses purified polysaccharides, often found on the surface of bacteria, to prime the immune system to recognise that polysaccharide and therefore that bacteria when encountered in future. In the 1970s, the discovery that combining a polysaccharide with another protein, such as a toxoid, increased the immune response, led to the development of conjugate vaccines.[5] This allowed for the development of effective vaccines against organisms such as *Haemophilus influenzae* type b, as previously the polysaccharide-only vaccine did not produce a sufficient immune response in children.[5]

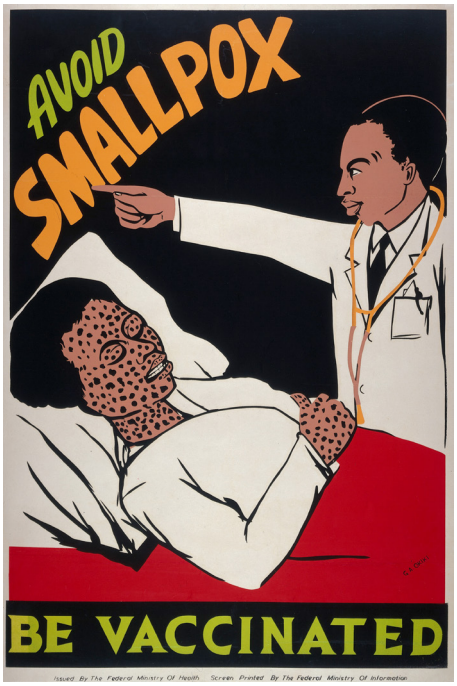

Image: Smallpox poster from the 1950's. Wellcome Trust

Image: Polio vaccine being given to children on lump of sugar. Wellcome Trust.

The emergence of the fields of molecular biology and genetic engineering in the 1950s led to a surge in vaccine development.[1] The attenuation of viruses through passage in cell cultures and selection of mutants that were not capable of causing human disease led to the production of several new vaccines for diseases such as varicella, measles and polio.[2] By the 1980s the use of recombinant gene technology allowed genes coding for a specific pathogen proteins to be inserted into cell lines, such as yeast cells, that could produce large amounts of the protein that could then be purified and used in production of the vaccine.[1,2] The first vaccine to be produced in this way was the hepatitis B vaccine.[1,2] Similarly, recombinant technology has been used to insert genes encoding immune inducing proteins from the pathogen into non-pathogenic live viruses or bacteria, which then act as vectors that express the gene *in vivo* without causing disease.[1,2]

With these advances in technology an increasing number of vaccines against communicable diseases have been developed and the safety of these vaccines continues to improve. However, even with modern technology many technical challenges to the development of vaccines remain. Vaccines against many important human diseases such as human immunodeficiency virus (HIV) and malaria have proven elusive. Despite these challenges, ongoing research and innovation into vaccine development not only promises the potential for new vaccines and the opportunity to respond to novel emerging infectious diseases, but also the possibility of the extension of vaccination to new uses such as prevention of cancer and autoimmune diseases.[2]

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Recent and upcoming changes to the National Immunisation Program

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

The aim of the National Immunisation Program (NIP) is to protect people from potentially harmful diseases before they come into contact with them in the community. As well as providing free vaccinations against 16 different diseases, the NIP also produces resources for health professionals and the public, and supports the national immunisation registers.[1] The national schedule of recommended (and funded) vaccines is regularly updated to reflect any new policies and to take into account the availability of new products.[2]

No Jab No Pay Policy

The biggest recent change to immunisation is the 'No Jab, No Pay' policy. Since 1 January 2016, only parents of children and young adults (less than 20 years of age) that are fully immunised can access the Child Care Benefit, the Child Care Rebate and the Family Tax Benefit Part A end of year supplement. Fully immunised means that a child is immunised according to the NIP early childhood vaccination schedule (vaccines given before five years of age), on an appropriate catch-up schedule, or has an approved medical exemption. Conscientious objection and vaccination objection on non-medical grounds (e.g. religious beliefs) are no longer valid exemptions from immunisation requirements.[3]

One of the advantages of this policy is that vaccines for all children less than ten years of age can and will continue to be accessed free under the NIP. For children aged less than ten years, vaccines required for catch up are all available under the NIP and are routinely stored in immunisation provider fridges.

Sometimes different vaccines are required for older children and adolescents (aged 10 to 19 years). Due to this, vaccines have been purchased for use in this age group and will be available until 31 December 2017.[3]

This policy has caused considerable extra work for immunisation providers and health departments alike. As well as the administration of vaccines, there have been queries from parents, extra vaccines to be ordered and the development of catch-up schedules. However, the benefits that will come from this policy include higher immunisation rates in the community, improved herd immunity and greater protection against vaccine preventable diseases for vulnerable people.[3]

18 month diphtheria, tetanus and pertussis immunisation

In March 2016, a booster dose of the diphtheria, tetanus and pertussis (DTPa) vaccine was introduced onto the NIP for children at 18 months of age. This additional booster dose of DTPa complements those currently administered at two, four and six months, four years of age and year seven of school.[4]

The Australian Technical Advisory Group on Immunisation (ATAGI) considers the introduction of a pertussis booster at 18 months necessary from a public health perspective to improve pertussis control. This is due to waning immunity following primary immunisation and an increase in the disease in the two to nine year age group in recent years.[4]

Introduction of the 18 month booster dose on the NIP is intended to lead to a reduction in cases of pertussis in the 18 month to four year old age group. While pertussis is not a severe disease in the majority of these children, this cohort plays an important role in disease transmission, particularly to vulnerable younger infants. A high proportion of hospitalisations and almost all deaths attributed to pertussis occur in infants too young to have received more than one dose of pertussis-containing vaccine.[4]

Images: Immunisation posters. ACT Health

Recent and upcoming changes to the National Immunisation Program *(continued)*

Herpes Zoster vaccine

From November 2016, a single dose of herpes zoster vaccine will be funded on the NIP for all adults at 70 years of age. A single catch-up dose will also be funded for adults aged 71–79 years for a five year period.[5]

For most people, herpes zoster (commonly known as shingles) infection causes an acute, self-limiting, vesicular rash which is often painful and lasts approximately 10–15 days. The rash is usually only on one side of the body. In 80 percent of shingles cases, the person feels unwell 48–72 hours before the appearance of the rash with symptoms of itching, tingling or severe pain in the affected area and sometimes headache, photophobia and malaise. The most common complication of shingles is persistent chronic neuropathic pain known as post-herpetic neuralgia. Post-herpetic neuralgia can have a substantial impact on quality of life.[5]

There is currently one herpes zoster vaccine registered in Australia. Studies have found that this vaccine is efficacious in reducing the incidence of herpes zoster and post-herpetic neuralgia. Clinical trials and post marketing surveillance have shown the vaccine to be safe and well tolerated.[5]

Changes to immunisation registers

From September 2016, the Australian Childhood Immunisation Register (ACIR) will expand further to become the Australian Immunisation Register (AIR) to capture all vaccines administered throughout a person's life (birth to death). This will include all vaccines funded under the NIP, as well as privately funded vaccines.[6]

From the beginning of the 2017 school year, the HPV Register, which currently only captures data on Human Papillomavirus (HPV) vaccine will be expanded to become the Australian School Vaccination Register (ASVR). It will capture all adolescent vaccinations given through school programs. Vaccines to be recorded include varicella (chickenpox), the diphtheria, tetanus and pertussis (whooping cough) booster, and the HPV vaccine. This will provide tools such as recall and reminder systems to improve adolescent vaccination rates.[6]

Expansion of the registers will improve the capture of immunisation data in Australia. This will allow immunisation rates among adolescents and adults to be better understood, ultimately leading to improved immunisation coverage rates. At present, vaccination coverage among adolescents and particularly adults is not well understood as there is no comprehensive national data collected for these age groups.[6]

The new AIR will improve access to records for immunisation providers including ACT Health and individuals. Immunisation providers will have secure access to a range of due and overdue reports, which will allow them to improve vaccine uptake among their older patients. ACT Health will be able to identify areas of low coverage within the ACT to enable targeted information or other interventions to boost immunisation rates among adults in these areas.[6]

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Invasive meningococcal disease: the emergence of serogroup W

Marlena Kaczmarek, Communicable Disease Control, Population Health Protection & Prevention

Historically in Australia, cases of invasive meningococcal disease (IMD) have been predominantly caused by serogroups B and C. In the last few years, a growing proportion of IMD cases have been caused by serogroup W. The epidemiology of serogroup W IMD, particularly the affected age groups and clinical presentations, has been found to differ from IMD caused by serogroups B and C. Clinicians should be alert for, and consider testing, 'atypical' presentations that could be caused by serogroup W IMD.

Background

Invasive meningococcal disease (IMD) is caused by the bacteria *Neisseria meningitidis*. There are 13 known types (serogroups) of *N. meningitidis*, which are referred to as letters of the alphabet. Globally, serogroups A, B, C, W, and Y most commonly cause disease, and it is these five serogroups that can be prevented through vaccination.[1]

In Australia, IMD cases have been predominantly caused by serogroups B and C. Typically, serogroup B was responsible for IMD among young children (aged <5 years) while serogroup C mainly caused IMD among young adults (aged 15-24 years).[1]

N. meningitidis infection can cause meningitis, septicaemia, or a combination of the two. Between five to ten percent of cases die, despite appropriate antibiotic therapy, and among survivors, between ten to 20 percent develop long term sequelae, such as limb deformity, skin scarring, and neurological deficits.[1]

In 2003, a meningococcal C vaccine was added to the Australian Immunisation Schedule for children at 12 months of age, and a catch up program for all children aged 1 to 19 years was funded between January 2003 and June 2008.[1] Prior to this program approximately half of IMD in Australia was caused by serogroup C, however following the introduction of the vaccine's there was a sustained decline in the proportion of serogroup C cases as well as the overall number of cases (see Figure 1 on page 9). In 2002, a total of 393 cases of IMD were notified, of which 41 percent (n=162) were serogroup C, but by 2007, the overall number of cases had dropped to 281, of which only six percent (n=17) were serogroup C.[2]

Vaccines are also available to protect against the other meningococcal serogroups (A, B, W, Y). These vaccines are not funded under the National Immunisation Program, and they are currently only recommended for high-risk individuals, such as children and adults with certain medical conditions, laboratory staff who frequently handle *N. meningitidis*, or travellers to regions with endemic meningococcal activity.[1]

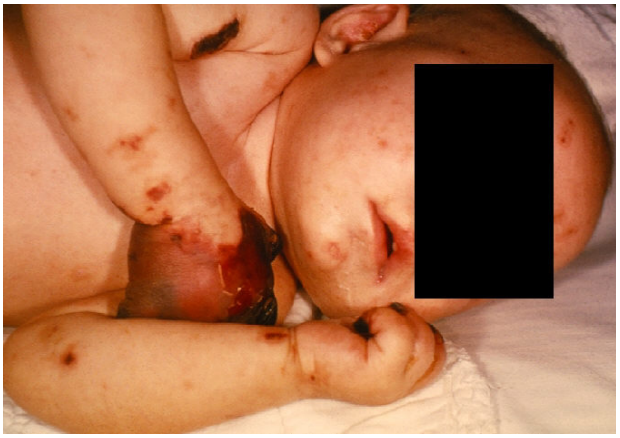


Image: 4 month old female with gangrene of hands due to meningococcaemia. Public Health Image Library

Issue

After 2007 the overall number of IMD cases continued to decline across Australia with serogroup B responsible for the vast majority of IMD cases. However the incidence of IMD began to increase in 2013, and there has been an increase in the proportion of serogroup W cases, particularly in Victoria and New South Wales (NSW).[3, 4] This trend has also been observed internationally, particularly in the United Kingdom and South America,[5, 6] where the increase in serogroup W IMD cases has been linked to a hypervirulent serogroup W strain.[7, 8]

In Australia and overseas, cases of serogroup W IMD have occurred across all age groups, and have been associated with atypical presentations, in contrast to the typical meningitis and/or septicaemia associated with serogroups B and C.[3-9] In one region of the United Kingdom between 2011 and 2013, of the 14 cases of serogroup W IMD identified, half presented with atypical meningococcal symptoms, including presentations of cellulitis, abdominal pain, diarrhoea, vomiting, and a septic joint.[9] A review of French IMD cases between 1999 and 2002 also found that serogroup W was significantly more likely to be associated with septic arthritis and pneumonia presentations compared to other serogroups.[10]

In Victoria, an increase in serogroup W has been observed from 2014, with four cases notified in 2014, 17 cases in 2015, and 13 cases so far in 2016.[4] Rates of serogroup W IMD have been highest in those aged over 50 years, 15-24 years, and less than five years.[4] In Victoria, the most common presentation for serogroup W IMD cases has been severe sepsis (bacteraemia), and typical meningitis symptoms have been less common. Other atypical presentations have also occurred, including presentations of septic arthritis and epiglottitis.[4]

Similarly, in NSW increasing serogroup W cases have been reported since 2015.[3] So far in 2016, 26 cases of IMD have been reported, of which ten (38.5 percent) were caused by serogroup W.[3] The most recent case of serogroup W IMD presented with septic arthritis.[3]

In the ACT, so far in 2016, only one case of IMD has been reported and this was due to serogroup W and had an atypical presentation (pneumonia).

Take home message

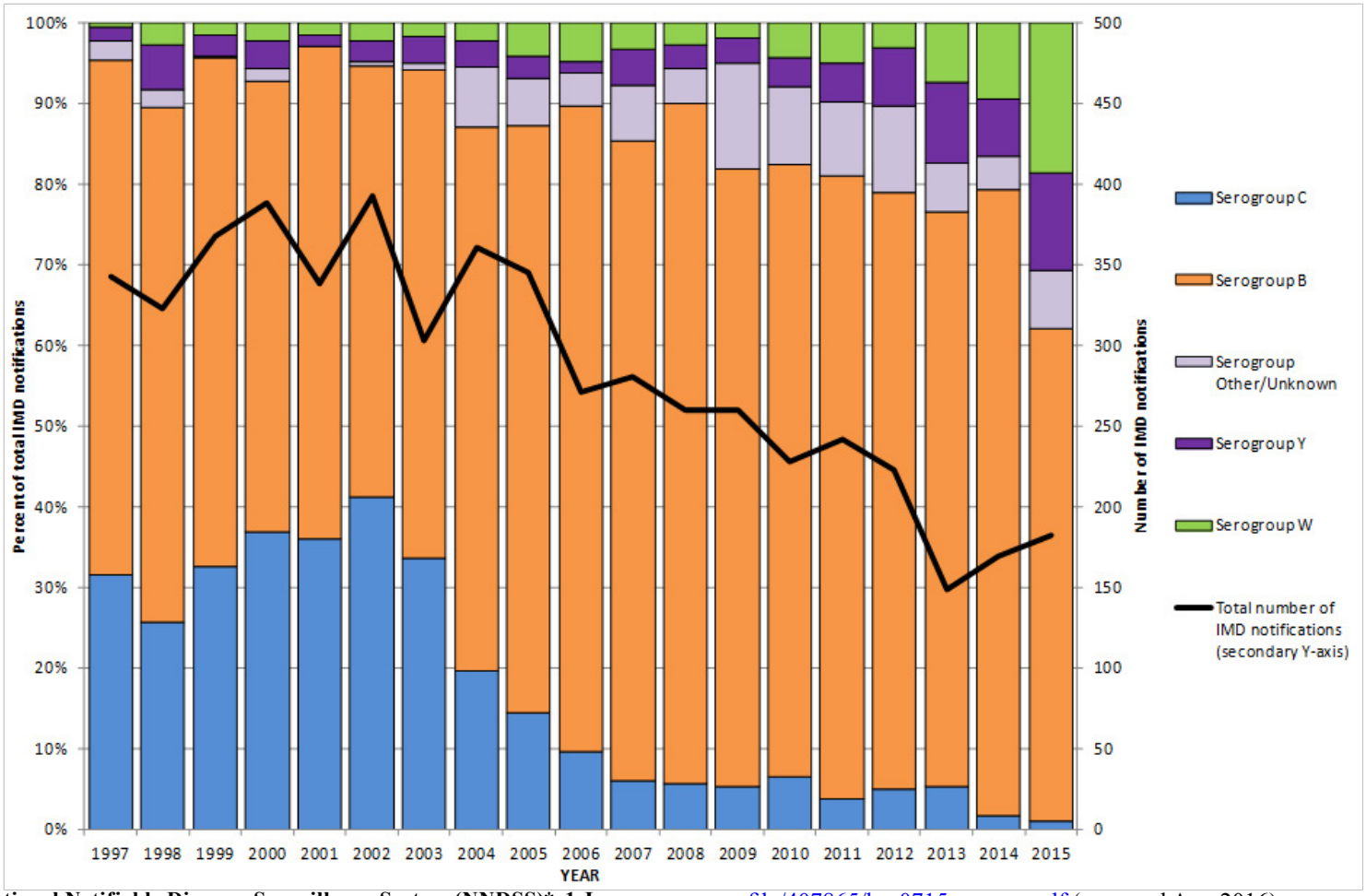
It is important that clinicians are aware of the changing epidemiology of IMD particularly associated with serogroup W. Cases of serogroup W IMD can occur across all age groups and may have atypical presentations, including septic arthritis, pneumonia, abdominal pain, gastrointestinal symptoms (vomiting and/or diarrhoea), bacteraemia, or epiglotittis.

With the increasing proportion of serogroup W IMD cases across Australia, clinicians in the ACT should be alert and should consider testing patients with fever of unknown origin and some of the atypical presentations listed above for IMD.

Any suspected and confirmed cases of IMD (caused by any serogroup) in the ACT must be notified to the Health Protection Service as quickly as possible (within 24 hours) by calling (02) 6205 2155 to allow rapid appropriate public health action to prevent further transmission of the disease.

Figure: Invasive meningococcal disease (IMD) notified to the Na-

Invasive meningococcal disease: the emergence of serogroup W *(continued)*



tional Notifiable Diseases Surveillance System (NNDSS)*, 1 January 1997 to 31 December 2015, Australia

*** Collation of data from the NNDSS Meningococcal Disease (Invasive) Public Dataset (2009-2015, available here:** http://www9.health.gov.au/cda/source/pub_menin.cfm**), ACT Health notification data (2009-2015), and publicly available annual reports of the Australian Meningococcal Surveillance Program (1997-2008, available here:** http://health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-annlrpt-menganrep.htm**)**

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Vaccine hesitancy

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

As vaccine preventable diseases become less common, parents appear to be expressing more concerns about the safety and necessity of vaccines. This may lead to decreased vaccination coverage rates and the re-emergence of some diseases of public health significance.

Health professionals are an important influence on a parent's decision to vaccinate their child. Good communication strategies can motivate a hesitant parent towards vaccination and, more broadly, influence the community when parents discuss their immunisation experience with others. Immunisation providers need to understand individual parental concerns and the influences that shape them so that these concerns and fears can be addressed.[1]

Background

The development of safe and effective vaccines is one the greatest medical triumphs[1] and the benefits of childhood vaccination are well established.[2] Although vaccine uptake rates in most industrialised countries are generally high,[2] vaccine hesitancy is becoming increasingly recognised as an issue in Australia. Vaccine hesitancy occurs as concerns about vaccines and their safety predominate over concerns about the risk of vaccine-preventable diseases.[4] Most immunisation providers will encounter vaccine-hesitant parents in their practices[1] and each year a few parents will refuse to have their child vaccinated.

There is concern that if healthcare providers do not adequately address parents' concerns, vaccine confidence and trust will be further eroded.[4] Clear and flexible communication strategies for healthcare providers to undertake effective discussions with vaccine-hesitant parents are the key to addressing concerns about vaccination.

What is vaccine hesitancy?

Vaccine hesitancy refers to delay in acceptance or refusal of vaccines despite availability of vaccination services.[5]

The World Health Organization (WHO) has defined vaccine hesitancy as: "A behaviour, influenced by a number of factors including:

- confidence (do not trust the vaccine or provider); and
- complacency (do not perceive a need for a vaccine or do not value the vaccine)".

Vaccine-hesitant parents are a group who have varying degrees of indecision about specific vaccines or vaccination in general. Vaccine-hesitant individuals may accept all vaccines but remain concerned, some may refuse or delay some vaccines but accept others (adopt a "selective schedule"); and some individuals may refuse all vaccines.[6]

In Australia it is estimated that up to one-third of parents have concerns about recommended vaccination schedules and express distrust and reluctance to have their children vaccinated.[4]

Why are some parents hesitant?

Immunisation is a safe and effective health intervention that prevents death or serious sequelae from vaccine-preventable diseases.[1] Most parents agree that vaccinations are the best way to protect children against disease, even though they may be unfamiliar with the diseases that the vaccines prevent and are troubled that the vaccines may be painful.[3] However, immunisation remains an emotional issue for many parents[1] and an increasing number of parents wonder if vaccinations are really necessary or safe.

Vaccine safety and serious adverse events are repeatedly shown to be the top concern for vaccine-hesitant parents.[4] The main concerns that parents express are: fear that vaccines (and/or their additives) are unsafe, concern the vaccine will give the immunised person the infection against which they are designed to protect, or that getting the "natural" disease is healthier/better than the vaccine.[1] As the vaccine schedule becomes more comprehensive and complex in the first few years of life, some parents worry about the number of injections a child may receive at a single visit, and others are concerned that the immune system is "overloaded". Parents may be more fearful of inflicting harm (giving an unsafe vaccine) than allowing harm (taking a chance that their child will develop a disease).[1]

Parents try to make the best decisions on behalf of their children, but this task is made more difficult by many, potentially conflicting, sources of information.[1] Parents can obtain health information from friends, through social media, via television, radio and the internet, as well as from various different health professionals (general practitioner, paediatrician, midwife, etc).[3] The media may focus on perceived vaccine dangers despite absence of credible scientific data to support the claims. Information on the internet can be reliable or it can be cleverly packaged misinformation.[3] Parents who seek information from a variety of sources may find it difficult to separate fact from fiction, and they can be overwhelmed with the availability of information (which is not always accurate).[1] Parental vaccination decisions are based on an array of factors and parents accept information they find or receive according to their personal experience and social context. A parent's trust in the source of information may be more important than what is in the information.[2]

Vaccines have successfully reduced disease incidence and disease-associated mortality. The devastating consequences of polio, diphtheria, and measles are rarely or never seen in modern Australia.[1] Most parents have never seen a child affected by certain vaccine preventable diseases and, as a result, fear of these diseases does not haunt parents as it did historically.[3]

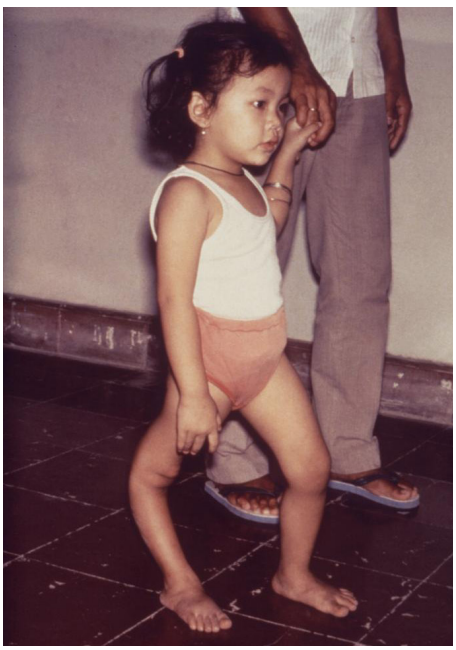

Image: Child displaying a deformity of right lower extremity due to polio caused by the poliovirus. Public Health Image Library

Some vaccine-hesitant parents may belong to a community that espouses an alternative lifestyle or have religious beliefs that oppose immunisation.[9] Parents may refuse all vaccines for their child because of their existing philosophical position on vaccination, and/or negative experiences with the medical system.[2]

Vaccine hesitancy *(continued)*

Effects of vaccine hesitancy

Vaccines can prevent disease and death. They have been so effective that the absence of disease in our community has made us feel safe. When parents refuse to immunise their children, the child is susceptible to diseases which can spread to others and may lead to an increase in incidence of now uncommon diseases in the community. To not immunise a child can have tragic consequences for the child, the child's family and the wider community.[3]

It is clear that pockets of vaccine refusers, including those who delay vaccination or adopt selective vaccination schedules, pose a risk to the whole community by threatening herd immunity. To provide optimal herd immunity, vaccine coverage above 90 percent must be maintained, although for some vaccines, such as measles-mumps-rubella (MMR), 95 percent coverage is optimal.[4] Parental reluctance to have their children vaccinated has been linked to outbreaks of certain vaccine-preventable diseases, particularly measles.[4] Delaying a vaccine may be done with minimal awareness of the consequences for the child and the broader community. The long-term impact of selective schedules on herd immunity and control of now uncommon vaccine preventable diseases in developed countries is unknown.[4]

Categories of vaccine hesitancy

A classification proposed by Leask et al., categorises parents into five distinct groups on the basis of their vaccine concerns (Table 1), these are:

- the 'unquestioning acceptor' (30–40 percent);
- the 'cautious acceptor' (25–35 percent);
- the 'hesitant' (20–30 percent);
- the 'late or selective vaccinator' (2–27 percent); and
- the 'refuser' of all vaccines (<2 percent).[4]

The approximate proportions of each parental group will vary over time, within regions, and between practices.[2] By identifying each group, clinicians can tailor their discussions appropriately and not have long discussions that may be unproductive or even confrontational.[4] For refusers, the aim is to keep the consultation brief, keep the door open for further discussion and provide appropriate resources if wanted.[4]

Role of the Immunisation Provider

Immunisation providers are the most important influence on a parent's final decision on immunisation and have a responsibility to provide guidance to parents.[1] An effective discussion on immunisation can address the concerns of vaccine supportive parents and motivate a hesitant parent towards vaccine acceptance, whereas, poor communication can contribute to rejection of vaccinations and/or dissatisfaction with care.[2] More broadly an effective vaccination consultation can increase immunisation rates within communities as parents talk with each other about their immunisation experiences.[8]

While most parents will accept vaccination, attendance at the immunisation consultation should not be presumed to indicate consent. Health professionals have a responsibility to ensure that parental consent for vaccination is valid,[2] and the parent has the opportunity to ask questions supports the process of obtaining valid consent.[8]

If health professionals have a nuanced understanding of vaccines and vaccine hesitancy, they will be better prepared for a guiding partnership in vaccine decisions with parents. Confident recommendations combined with respectful engagement, narrative and personalised approaches that address the needs of vaccine-hesitant parents appear to be the most constructive way to positively influence their decision.[7]

Talking to vaccine hesitant parents

Immunisation providers should establish an open, non-confrontational relationship with vaccine hesitant parents at an early stage.[1] Vaccine discussions with healthcare providers can and should occur antenatally, as studies have shown that the vaccine decision-making process begins before the baby is born.[4] To effectively communicate with vaccine-hesitant parents, immunisation providers must understand the concerns of parents regarding immunisation and understand the influences that can lead to misinformation about the safety and effectiveness of vaccines.[1] Parents have a diversity of concerns about vaccines, therefore it is imperative that immunisation providers individualise each parent's set of concerns and guard against making erroneous assumptions about their attitudes.[1]

Parental position	
Unquestioning acceptor	• Want to vaccinate – no specific questions • Good relationship with their healthcare provider • Don't require much information about immunisation at all – most trust Immunisation Providers to provide the right guidance
Cautious acceptor	• Vaccinate despite minor concerns • Believe benefits of vaccines outweigh the risks and hope their child won't be affected by a rare or serious adverse event
Hesitant	• Vaccinate but have significant concerns • Focused on vaccine risk • Trust in healthcare provider is key • Often want a lot of information about vaccination and the individual vaccines
Late or selective vaccinator	• Significant concerns regarding vaccination • Prefer to delay vaccines up to 2 years or adopt a selective schedule • Significant doubts about safety, necessity and number of vaccines • Will actively seek more information
Refuser	• Refuse all vaccines • Specific religious, philosophical or alternative lifestyle beliefs or negative experience with vaccination • Knowledge of vaccines is often limited

Table 1. A proposed classification of parental position on vaccination by Leask et al[4]

Vaccine hesitancy *(continued)*

Motivational interviewing is a form of communication that uses a more guiding style rather than a directing style. This is useful for discussions where there is ambivalence and resistance to change. Motivational interviewing involves asking questions that clarify an individual's responsiveness to change and elicits their own motivations for change. The method has demonstrated effectiveness in a range of health behaviours.[2]

During the conversation, the immunisation provider should avoid excessive persuasion and adversarial debates.[2] The scientific facts should be given by using direct, unambiguous language rather than using "jargon" or qualified statements.[1] Evidence-based data can be used to address the specific fears and concerns of parents.[8] Health professionals' body language ideally indicates that the discussions are important and distractions, such as using computers while talking, are best avoided.[2]

It is important to communicate risk effectively. It is recommended that health professionals give information about common but minor side effects, and rare but serious ones.[2] Parents should also be advised about how to manage the common side effects of vaccinations and how to seek help if they have further concerns.[2]

Resources

Written materials, web links, or decision aids given prior to, or used during, the consultation can be helpful. This information is most effective when it is timely, consistent, relevant, up to date, and, where available, local. Written resources may be available in electronic/online or paper format.[2] Some suggested useful resources to support vaccine discussions are provided in Table 2.

Resources	Suggestions
National disease surveillance data	• National Notifiable Disease Surveillance database (NNDSS), http://www.health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-annlrpt-nndssar.htm
Fact sheets	• National Centre for Immunisation Research and Surveillance http://www.ncirs.edu.au/provider-resources/ncirs-fact-sheets/ • ACT Health http://www.health.act.gov.au/our-services/immunisation/forms-and-information • Immunisation handbook www.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home
Decision aids	• National Centre for Immunisation Research and Surveillance MMR vaccine decision aid,www.ncirs.edu.au/immunisation/education/mmr-decision/index.php
Websites	• National Centre for Immunisation Research and Surveillance (NCIRS), www.ncirs.edu.au • Immunise Australia http://www.immunise.health.gov.au/ • ACT Health http://www.health.act.gov.au/our-services/immunisation
Other information	• Myths and Realities – Responding to arguments against vaccination: a guide for providers http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/uci-myths-guideprov • The Science of Immunisation https://www.science.org.au/learning/general-audience/science-booklets/science-immunisation • Jabbed: Love, fear and vaccines (documentary) http://www.sbs.com.au/shows/jabbed • Immunisation handbook www.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home

Table 2. Suggested useful resources to support vaccine discussions[4]

Supplementing this information with posters advocating immunisation in waiting areas or examination rooms also may be helpful. Although these items are no substitute for effective communication between concerned parents and the immunisation provider, they help raise awareness of immunisation.[1]

Summary

In order to effectively address vaccine hesitancy, at a time when concerns about vaccines and their safety predominate over concerns about the risk of the vaccine-preventable diseases, it is clear that effective communication strategies for immunisation providers to undertake discussions with vaccine-hesitant families are the way forward. These discussions can occur in both the primary and secondary care setting and should occur from the prenatal to the postnatal period and beyond.[4]

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Sending reminder letters to parents of children overdue for immunisation: does it work?

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

Immunisation is one of the most effective and cost-efficient public health measures to prevent disease. Achieving and maintaining high immunisation coverage rates remains an ongoing challenge for health departments across Australia. Every three months the Health Protection Service (HPS) send letters to the parents or guardians of children who are reported by the Australian Childhood Immunisation Register (ACIR) as being overdue for immunisations seven to ten months, 19 to 22 months and 55 to 58 months of age. Children overdue for immunisation are identified by requesting a report via the ACIR secure site. The letters serve as a reminder for immunisation and also request that the parents or guardians contact the HPS if they feel this information is incorrect or if they have any questions regarding their child's immunisation.

Approximately 25 percent of parents who receive a vaccination reminder letter return a phone call to the HPS. If contacted by parents, HPS staff complete a short questionnaire. The calls fall into three main categories:

- The child has had their immunisation but the data is not recorded on ACIR, immunisation records not received by ACIR or the child was immunised overseas;
- The child is overdue for their immunisations due to parent's being unaware of immunisation requirements or inability to complete timely vaccination; or
- Other – natural immunity, conscientious objector or currently overseas.

Any missing data for vaccines administered in Australia is collected and entered onto the ACIR. Advice on the transcription of records of vaccines given overseas is provided and any questions parents may have regarding vaccination are answered.

Information on anomalies such as incorrect date of birth, incorrect address, misspelt names, and children who are currently overseas is also collected. This information is sent to ACIR to update the database.

A repeat report is requested from ACIR one month following the initial report as there are parents who, on receipt of the immunisation reminder letter, take their child to be immunised without contacting the HPS.

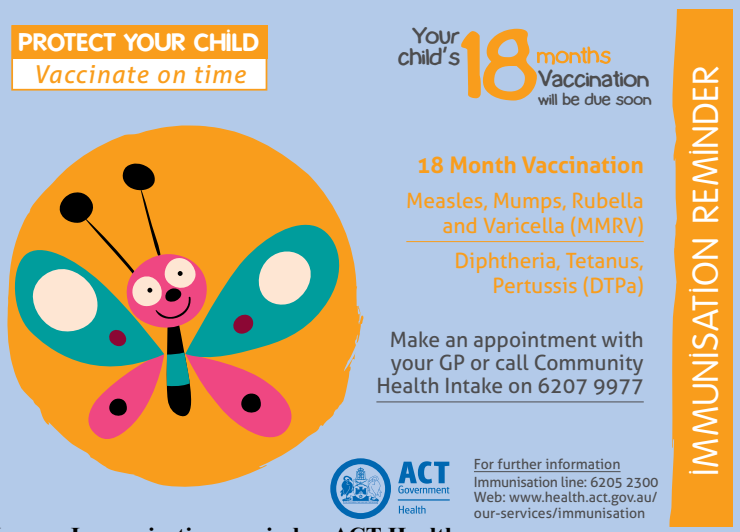

Image: Immunisation reminder. ACT Health

In 2015, a total of 2,272 children were identified as being overdue for immunisation on the ACIR reports. One month after the overdue report letters were sent to the parents or guardians of these children, 1,634 remained overdue. The results indicate that a total of 638 children were immunised or had missing data corrected as a result of the overdue report letters.

The greatest number of children recorded as overdue for immunisation is consistently in the 19-22 month cohort. This could be due to parents being unaware of the 18 month measles, mumps, rubella and varicella (and more recently the diphtheria, tetanus and pertussis booster) being administered at this age or they are unaware of the importance of these vaccines being administered on time. Recently there has been an increase in the number of children recorded as overdue for immunisations in the 55-58 month cohort. This rise is, in part, due to children who missed their 18 month vaccinations and are still to be caught up.

It is believed that the follow up of children who are overdue for immunisation has made a significant contribution to the immunisation coverage rates in the ACT.[1] Cohort numbers in the ACT for each quarterly coverage report are relatively small, approximately 1,200 to 1,400 children, therefore as few as 12 to 14 children can change coverage rates, up or down, by one percent depending on whether they are recorded on the ACIR as being fully immunised or not.[1] Although achieving and maintaining high immunisation coverage rates remains an ongoing challenge, sending out reminder letters for overdue immunisations has proved to be beneficial in the ACT.

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How to develop a vaccination catch-up schedule

Jacqui Hennock, Communicable Disease Control, Population Health Protection & Prevention

When a child has not received the recommended immunisations for their age, a vaccine catch-up schedule can be developed to bring the child up to date with the National Immunisation Program. The demand for developing a catch-up schedule has increased since the implementation of the national "No Jab, No Pay" policy.

The development a catch-up schedule requires the health professional to take into consideration the evidence of previous vaccinations, the child's age and the clinically recommended vaccines for the child's age range.

The National Immunisation Program (NIP) was implemented by the Australian Government to provide free vaccinations against a range of diseases. The aim is to help protect people from potentially harmful diseases.[1]

When an individual does not have documented evidence of receiving the vaccines recommended on the NIP appropriate for their age then a catch-up schedule can be developed.

The catch-up schedule takes into consideration the vaccinations the individual has received and the vaccinations recommended for the individual's age, employment and lifestyle.[1] The objective of the catch-up schedule is to complete a course of vaccination and provide optimal protection as quickly as possible.[1]

The catch-up schedule is discussed with the person to be vaccinated, or their parent/carer, to gain agreement of the vaccinations to be given, how many vaccinations are to be given at one time and the time frame for the catch-up schedule.[1]

The first step to developing a catch-up schedule is to confirm the individual's vaccination history. The history needs to be provided as written documentation of vaccination. This may be a child's Australian Childhood Immunisation Register (ACIR) record, or a personal health record/vaccination card that has the date, name of vaccine, and signature or stamp of the immunisation provider. If documentation of vaccination is unable to be supplied, is illegible or is missing data, it should be assumed that the vaccine(s) required have not been given previously.[1] For most vaccines there are no adverse events associated with additional doses if given to an already immune individual. In the case of vaccines containing diphtheria-tetanus-pertussis and pneumococcal polysaccharide, frequent additional doses may be associated with an increase in local adverse events; however the benefits of protection may outweigh the risk of an adverse reaction.[1]

Once a vaccination history is obtained the vaccine doses need to be confirmed as 'valid'. A 'valid' dose is a dose that is given at an appropriate age and at the minimal interval since the last dose of the same vaccine.[1] The validity of each dose is specific to the vaccination and more information on this can be found in the Australian Immunisation Handbook (10th edition) which is available online.

If the vaccination history, for children and young adults aged 19 years and under, was completed in another country the valid doses should be entered onto the ACIR.

The method of working out a catch-up schedule is dependent on the age group of the individual, which is grouped as: children aged younger than ten years; and persons aged ten years and older.

Children aged younger than ten years

The vaccination history is used to determine the number of doses received for each vaccine. Refer to the Australian Immunisation Handbook (10th edition) Table 2.1.6 Number of vaccines doses that should have been administered by the current age of the child and compare the number of doses the child has received with the number of doses required based on their current age. Where the doses received are less than the doses required a catch-up dose is due.[1]

Where more than one catch-up dose of the same vaccine are required, a minimal time interval for doses can be found in the Australian Immunisation Handbook (10th Edition) Table 2.1.7 Minimum acceptable dose intervals for children <10 years of age.

The catch-up doses and time frames can then be placed into a matrix. Table 1 provides an example catch up schedule for a two year old child who needs:

- three catch-up doses of hepatitis B;
- three catch-up doses of poliomyelitis; and
- one catch-up dose of diphtheria, tetanus, pertussis.

First dose	Hepatitis B Paediatric vaccine	Combined diphtheria, tetanus, pertussis and poliomyelitis vaccine
Second dose (given 4 weeks after 1st dose)	Hepatitis B Paediatric vaccine	Polio vaccine
Third dose (given 4 weeks after 2nd dose)		Polio vaccine
Third dose (given 8 weeks after 2nd dose)	Hepatitis B Paediatric vaccine	

Table 1: Example case aged younger than ten years

Once the child has completed the catch-up schedule they then continue to follow the schedule according to the NIP.

Image: Child being immunised. FreeDigitalPhotos.net

How to develop a vaccination catch-up schedule *(continued)*

Persons aged ten years and older

Using the vaccination history, the number of doses received for each vaccine is determined. Refer to the Australian Immunisation Handbook (10th edition) Table 2.1.12 Catch-up schedule for persons ≥10 years of age (for vaccines recommended on a population level) and compare the number of doses the individual has received with the number of doses required for the individual. Where the doses received are less than the doses required a catch-up dose is due. Where more than one catch-up dose of the same vaccine is required a minimal time interval for doses can be found in the same table.[1]

The catch-up doses and time frames can then be placed into a matrix. Table 2 provides an example catch up schedule for a case aged 16 years old who needs:

- two catch-up doses of hepatitis B; and
- two catch up doses of measles, mumps, and rubella.

First dose	Hepatitis B Paediatric vaccine	Combined measles, mumps, rubella vaccine
Second dose (given 4 weeks after 1st dose)		Combined measles, mumps, rubella vaccine
Second dose (given 8 weeks after 1st dose)	Hepatitis B Paediatric vaccine	

Table 2: Example case aged ten years or older

No Jab, No Pay

On 1 January 2016, new immunisation requirements were introduced for family assistance programs.[2] Under the No Jab, No Pay policy, only parents of children (under 20 years of age) who are fully immunised or are on a recognised catch-up schedule can receive the Child Care Benefit, the Child Care Rebate and the Family Tax Benefit Part A end of year supplement.[2] The required vaccinations are those on the NIP, which covers the vaccines given before the age of five years. The vaccinations of the child must be recorded on ACIR. Children with medical contraindications or natural immunity for certain diseases will continue to be exempt from the requirements.[2]

For children aged younger than ten years who are overdue for vaccines on the NIP, a catch-up schedule can be developed using the funded vaccines usually administered to those aged younger than five years. For children aged ten to 19 years who missed vaccine while younger than ten years, there are a number of vaccines required that are not registered for use in this age group. As such, alternative vaccines have been made available to immunisation providers at no cost for a limited time period (until 31 December 2017) to allow catch-up.[2] Immunisation providers in the ACT have been supplied with special order forms to order catch-up vaccines for children aged ten to 19 years.

The ACT Immunisation line can be contacted on (02) 6205 2300 during business hours for further advice.

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Image: Promotional materials. ACT Health

Surveillance of vaccine preventable disease

Rachael Crane, Communicable Disease Control, Population Health Protection & Prevention

Both local and national disease surveillance systems are essential to ensuring that the incidence of vaccine preventable disease is monitored and public health responses initiated accordingly. The collection, analysis and interpretation of disease surveillance data are vital to guide public health policy and immunisation programs.

Disease surveillance systems collect, analyse and disseminate data on diseases of public health importance so that appropriate action can be taken to either prevent or limit further spread of disease.[1] Disease surveillance is the primary means for informing the development of public health strategies and activities, aiming to reduce the significant disease burden that vaccine preventable diseases (VPDs) can have on the population.

Efficient and well established disease surveillance systems are required to effectively monitor and respond to VPDs. Surveillance systems can be used to:

- Predict or detect disease outbreaks;
- Help to identify high-risk populations or geographical areas requiring additional attention;
- Identify areas in which system performance is poor, so that corrective measures can be taken such as in cold chain failure;
- Determine the frequency of occurrence and overall burden of disease;
- Monitor program effectiveness by documenting the effects of immunisation on disease burden and epidemiology over time; and
- Identify circulating strains including serotypes, genotypes and subtypes.[1]

Collaborative disease surveillance systems in Australia ensure that VPDs are monitored and responded to both locally and nationally in order to minimise the harm caused by sporadic cases and outbreaks.

National Surveillance

Disease surveillance is closely linked with public health action, and is vital to planning and evaluating disease control strategies such as the National Immunisation Program (NIP).

National surveillance of VPDs in Australia is facilitated by the National Notifiable Diseases Surveillance System (NNDSS). The NNDSS was established in 1990, and is administered by the Australian Government Department of Health in collaboration with the States and Territories.[2] The NNDSS co-ordinates the national surveillance of more than 50 communicable diseases or disease groups, as defined in the National Notifiable Diseases List (NNDL).[3] More than 40,000 cases of VPDs are reported annually through this national surveillance system.[2]

The NNDSS relies on clinicians and laboratories to diagnose and notify diseases at the jurisdictional level. Disease notifications are collected by State and Territory health authorities in accordance with public health legislation relevant to each jurisdiction.

States and Territories then promptly provide de-identified, computerised records of notifications to the Australian Government via the NNDSS for collation, analysis and publication.[2] This information is provided under the provisions of the *National Health Security Act 2007*.[4] Notification data provided to the NNDSS includes a unique record number, State or Territory identifier, disease code, date of onset, date of notification to the relevant health authority, sex, age, Indigenous status and postcode of residence. Additional data may also be collected and provided including information about risk factors, disease typing and vaccination status.

States and Territories also contribute to the development and co-ordination of national surveillance programs for communicable diseases via the Communicable Disease Network of Australia (CDNA). CDNA representatives from each State and Territory meet fortnightly to share and evaluate the latest information and developments in communicable disease surveillance in order to provide high quality surveillance of communicable and notifiable diseases - including VPDs.

Local Surveillance

In the ACT, the collection of information related to disease notifications is a legislative requirement under the *Public Health Act 1997*.[5] General practitioners (GPs), nurse practitioners, pathology laboratories and hospitals are required to notify the Communicable Disease Control section (CDC) of the Health Protection Service if they suspect or confirm a diagnosis of any one of more than 65 infectious conditions or diseases, including the following VPDs:

- Diphtheria;
- Haemophilus influenzae type b;
- Hepatitis A and B;
- Influenza (laboratory confirmed);
- Measles;
- Mumps;
- Pertussis;
- Invasive pneumococcal disease;
- Invasive meningococcal disease;
- Lyssavirus;
- Poliovirus infection;
- Rotavirus;
- Rubella or congenital rubella syndrome;
- Tetanus;
- Varicella zoster infection (Chickenpox or Shingles);
- Typhoid fever;
- Q fever; and
- Yellow fever.

States and Territories are responsible for monitoring and responding to all notified VPD cases that reside in their jurisdiction. In the ACT, VPD notifications and outbreaks are followed up and investigated by Public Health Officers from the CDC section in line with national and local disease control guidelines. The process for the follow up of notifications and outbreaks varies from disease to disease, but can include:

- Confirming the diagnosis with further testing;
- Ensuring appropriate treatment of cases to reduce the possibility of transmission;
- Identifying others who may have been exposed and are at risk of infection; and
- Implementing other disease control measures such as isolation and exclusion of infectious cases and, where applicable, providing post exposure prophylaxis to contacts.

States and Territories each have their own surveillance systems. In the ACT, notifications are received and entered daily into a disease surveillance database, and data are uploaded daily to the NNDSS. In addition, local surveillance data are regularly reviewed by CDC staff to describe and assess trends in the incidence of VPDs in the ACT. Regular analysis and review of local disease surveillance data is vital to evaluate whether local and/or national control strategies are effective or to inform new control strategies.

Surveillance of vaccine preventable disease *(continued)*

The ACT's de-identified surveillance data is aggregated with data from other jurisdictions into the NNDSS, which allows analysis of national trends, and the detection of outbreaks that may be more widespread (i.e. occurring across more than one jurisdiction).

States and Territories often need to adapt surveillance systems in order to be responsive to emerging diseases, changing patterns of existing notifiable diseases, and the requirement to monitor diseases following the addition of new vaccines to the NIP.

Conclusion

Surveillance is essential to inform strategies to reduce the incidence, prevalence, morbidity and mortality associated with VPDs in the population. Immunisation programs are the cornerstone to controlling these diseases. Good quality surveillance data are vital for monitoring the effectiveness of immunisation programs and emerging issues such as new virus strains, waning immunity or vaccine failure.

In Australia, the presence of an effective surveillance system in the form of the NNDSS, in combination with good local surveillance systems and jurisdictional co-operation, means that the capacity to monitor, identify and respond to cases of VPDs is strong.

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Image: Promotional materials. ACT Health

Adverse event surveillance

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Immunisation is a safe and effective preventative health measure that has saved numerous children from death or serious sequelae from vaccine preventable disease. However, sometimes an individual receiving a vaccination will experience an unwanted or unexpected event following vaccination. The adverse reaction can range from mild to severe, last a couple of hours to long term, and may resolve completely or have ongoing effects for the individual. Any unexpected or unwanted event following vaccination that occurs in the ACT should be reported to Immunisation Unit at ACT Health.

Adverse events following immunisation

Immunisations are designed to produce an immunologic response in the body.[1] This is what gives protection against disease, however sometimes immunisations can also produce unwanted reactions. An adverse event following immunisation (AEFI) is any unwanted or unexpected event following the administration of immunisation(s). An AEFI may be due to:

- the immunisation(s);
- the system delivering the immunisation (from vaccine manufacture through to injection technique); or
- coincidence (the event would have occurred regardless of the immunisation).[1]

The most common side effects are:

- Mild fever (less than 38.5°C) of short duration;
- The site of injection: sore, red, feel hot, itchy or swollen for one to two days, and/or a small, hard lump can be present for a few weeks;
- Babies can be grizzly, unsettled, unhappy and sleepy for a few days; and
- Teenagers/adults can experience fainting and/or muscle aches.[2]

These side effects are common and do not contraindicate further vaccination. Paracetamol and a cool compress may help to relieve symptoms.[3] These reactions typically resolve in one to two days, however medical attention should be sought if there are any concerns about any reaction following immunisation.

In addition to the common side effects a very small number of people may have more serious and significant AEFIs. These may include anaphylaxis (allergic response), seizures, thrombocytopenia, and hypotonic hyporesponsive episodes.[1] It is recommended that following immunisation, recipients should be observed for at least 15 minutes. This is to ensure that if an immediate adverse event occurs it can be treated. The most severe AEFI is an anaphylactic reaction. Anaphylaxis has a rapid onset, and can cause respiratory compromise and/or circulatory collapse. Most life-threatening adverse events, including anaphylaxis, begin within ten minutes of vaccination.[2]

It is important to remember that most AEFI's are mild and transient, and that the benefits of vaccination outweigh the small risk of unwanted reactions. More information about vaccine side effects is available in the current Australian Immunisation Handbook (10th edition).

Reporting an AEFI

Reporting of AEFIs is important as it improves the understanding of safety issues around vaccines.[1] All AEFIs that occur in the ACT should be reported to ACT Health using the reporting form available on the ACT Health Website. Reports of AEFI are accepted from immunisation providers, any member of the public, and any health professional. There is no time limit for reporting an AEFI.

ACT Health review all AEFIs reported at a monthly meeting. The AEFIs are discussed and advice for further vaccinations is considered. The meeting is attended by a panel of relevant experts including nurses, and doctors. Any recommendations for future vaccinations are communicated via a letter to the individual/child's parent/guardian and the appropriate General Practitioner.

All AEFIs received by ACT Health are also forwarded to the Therapeutic Goods Administration (TGA). Each report of AEFI that the TGA receives is entered into the Australian Adverse Drug Reactions System (ADRS). The information is analysed by the TGA staff to monitor the rates and trends of AEFIs across Australia and identify possible safety concerns. If the TGA identifies a possible safety concern with a reported adverse event it undertakes an assessment to establish whether the vaccine was in any way responsible and, where required, takes action to manage the risks.[2] An example of this was when one brand of influenza vaccine was linked to higher rates of fever and febrile convulsions in children. An investigation was conducted and the one brand responsible for these reactions was no longer approved for use in children younger than five years of age.[4]

AEFI Case Study

A 12 year old child received two vaccinations, one in each arm, and then waited in a recovery area. Within five minutes of the vaccination, the child stated they had an itch in the lower left arm and an ice pack was applied. Five minutes later (10 minutes after vaccination) the child stated they had an itch in the throat and neck and tightness in the chest. No respiratory distress was observed. Salbutamol was administered with good effect. The itching symptoms continued with no respiratory distress and an ambulance was called. On arrival, ambulance officers reviewed the child and then transferred them to an emergency department. Following receipt of the AEFI report, the Immunisation public health nurse spoke to the child's parent. The parent stated the child had been treated with antihistamines, oral steroids and adrenaline at the emergency department and discharged the same day after a period of observation. The child experienced similar symptoms the following day and again presented to an emergency department. The child was treated with adrenaline and oral steroids, observed and then discharged with oral steroids for three days. The Immunisation public health nurse contacted the parent three weeks later and the child had not experienced any further issues.The case was discussed at the ACT Health AEFI meeting. The recommendation for this child was that they be referred to an Immunologist for further investigation of the reaction. If recommended by the Immunologist, the child's subsequent vaccinations could be provided at the Special Immunisation Clinic at the Women's and Children's Hospital. The child's parents and General Practitioner were sent letters informing them of the recommendation.

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Considerations for travel vaccinations

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

With an ever increasing number of Australians travelling overseas and adventuring to more exotic locations, General Practitioners are more likely to have clients requiring a pre-travel consultation.

In a pre-travel consultation, a General Practitioner or Health Care Provider needs to assess the patient and their itinerary in order to identify the travel and health risks for 'this person, this trip, this time'. The consultation/s will involve educating the traveller on the potential risks and relevant mitigation strategies, empowering the traveller to manage his/her own health during the trip as well as pre-travel vaccination and, possibly, medications for prophylaxis.

Australians are increasingly choosing to holiday and travel overseas with more than five million short term departures from Australia occurring annually.[1] Over half of these departures travelled to destinations other than New Zealand, North America or Europe.[2] More than ever, high risk groups such as the elderly, pregnant women or immunosuppresed persons are choosing to travel overseas.[1] Due to the increasing tendency of Australians to travel overseas, the choice of more exotic locations and the less than optimal health of some travellers, travel health is becoming an increasingly common presentation at general practices. General Practitioners are often the first point of call for travellers and are an important source of accurate and up to date information for them.[3]

Travel medicine is based on an assessment of the risk of travel,[3] the possibility of harm during the trip,[4] and implementing mitigation strategies to reduce the risk. Rather than totally eliminating any risks associated with travelling, the goal in travel medicine is managing the risks.[4] The risk for the traveller should be assessed for the individual person and their specific itinerary. It should be calculated for 'this person, this trip, this time'.[3]

Images: Travel destinations. FreeDigitalPhotos.net

To determine the best risk mitigation for each traveller a detailed assessment of their health and travel itinerary is required. Issues to consider are:

- Medical conditions including current medications, allergies and vaccination history;
- Previous travel;
- Reason for travel;
- Style of travel (including accommodation);
- Duration of travel;
- Destinations;
- Season; and
- Budget.[3]

Although this article will concentrate on the vaccination requirements for people who travel overseas it should be noted that infectious diseases are not the only health risks faced by travellers. Only ten percent of deaths among international travellers are caused by infections. The most common causes of death among travellers are heart disease, traffic accidents, drowning, assaults and other injuries.[5]

With this in mind, recommending and administering vaccines is not the only component of a pre-travel consultation.[2] Safe behaviours can prevent more illness and death than vaccination and prophylactic medication. Health education should be discussed as well as encouraging personal responsibility.[1] The main areas that require education to promote safe behaviour are:

- Safe food and drinks;
- Insect avoidance;
- Environmental and animal exposures;
- Heat/sun/cold weather safety and dehydration;
- Substance abuse;
- Safe sex;
- Injury;
- Managing travellers' diarrhoea;
- First aid; and
- The need for travel insurance.[1]

Ideally the initial travel consultation should occur well in advance, preferably, six to eight weeks prior to travel.[1] This allows time for any medical treatment or tests required, the administration of vaccines that require more than one dose, and allows time for the vaccine/s to induce an immune response.[5] To discuss all travel related health issues, sufficient time should be allocated for the first consultation.[1]

Vaccinations for travellers

Vaccines relevant for travelling are not restricted to those for prevention of diseases that most commonly occur overseas.[2] Recommendation of a vaccine for travelling only on the basis of the destination country is undesirable and there is no correct list of vaccines for travelling to any single country.[2] Individual protection is not the only reason to use or recommend travel vaccines. Many have important public health benefits and reduce potential transmission to others, both during travel and on return home.[1]

Vaccination procedures, recommendations and contraindication for the administration of vaccines as described in the Australian Immunisation Handbook (10th edition) (the Handbook) should be followed for all vaccinations. As the electronic version of the Handbook is periodically updated, immunisation providers are encouraged to ensure that they are using the current recommendations, available on the Immunise Australia website.

Routine vaccinations

All travellers should be up to date with standard vaccination recommendations. Consideration should be given to any other vaccines that may be relevant to the individual's health status, medical conditions, occupation or lifestyle. The probability of exposure to some of the diseases covered by routine vaccinations may be

Considerations for travel vaccinations*(continued)*

greater while travelling overseas, even to developed countries[2] and regardless of destination the benefit of giving these vaccines goes beyond the travel period.[4]

Recommended vaccinations

The need for specific vaccines is based on the travel destination, length of travel and the purpose of travel (e.g. conference vs adventure travel).[4] Potential risks of disease exposure and protective benefits from vaccinations should be weighed against potential adverse effects and financial costs. Priority should be given to vaccines for diseases that are common and are of significant impact (influenza, hepatitis A) and to those diseases that, although less common, can have severe outcomes (Japanese encephalitis, rabies).[2] The availability of post exposure prophylaxis available in the destination country also needs to be considered. For example, recent surveys show that, in up to 37 percent of locations worldwide, rabies vaccine or immunoglobulin is available only 'sometimes' to 'never'.[4]

Required vaccinations

Only two vaccines are categorically required for some travellers; meningococcal vaccine for pilgrims travelling to Mecca during the Hajj or Umrah and yellow fever vaccine for travellers to certain countries in Africa and South America.[4] These vaccines should be prioritised if required as the traveller may be denied entry to the country without proof of vaccination.[4]

Yellow fever is the only mandatory vaccination under the International Health Regulations (2005).[1] Some countries, including Australia, may require documented evidence of yellow fever vaccination as a condition of entry or exit.[2] Even if a traveller is only staying in a yellow fever endemic country for a brief period, such as transit through an airport, evidence of vaccination to enter other countries on their itinerary may still be required.[4] In 2014, the World Health Assembly of the World Health Organization agreed to extend the validity of the International Certificate of Vaccination or Prophylaxis against yellow fever from 10 years to the duration of the life of the vaccinated person, based on evidence demonstrating that a single dose of yellow fever vaccine provides protection for many decades in most individuals. This change in the IHR took effect in June 2016 but yellow fever vaccination entry requirements for some countries may still vary.[2] The requirements for yellow fever vaccination prior to entry are subject to change at any time. Updates can be found at www.who.int/ith.[2] Yellow fever vaccinations can only be administered by centres that have been approved by the State and Territory health authorities. A list of Accredited Yellow Fever Vaccination centres in the ACT is at http://www.health.act.gov.au/our-services/immunisation/are-you-risk

The Ministry of Health of Saudi Arabia annually issues specific requirements and recommendations for entry visas for travellers on pilgrimage to Mecca in Saudi Arabia (Hajj and Umrah). For pilgrims travelling directly from Australia only evidence of quadrivalent meningococcal vaccination is currently mandatory. Current requirements should be referred to when advising prospective Hajj and Umrah pilgrims.[2] Recommendations for travellers on pilgrimage to Mecca are published annually in the Weekly Epidemiological Record at http://www.who.int/wer/en/.

Documentation

Travellers should be given a record of their vaccination. Yellow fever vaccination must be documented on a yellow International Certificate of Vaccination. If required Vaccination cards for adults and adolescents are available from the Health Protection Service. These can be used to record routine and recommended vaccinations but not yellow fever vaccine. The following information should be recorded in the patient's clinical record and in the patient's copy of their immunisation record:[1]

- Name of vaccine and brand;
- Batch number;
- Date, dose, route and site of vaccination; and
- Name of person administering vaccine.

Health care providers should inform patients if booster doses of any vaccines are required and when they are due. It is strongly recommended that the patient make photocopies or an electronic copy of their vaccinations and keep it with a reliable family member or friend.[1]

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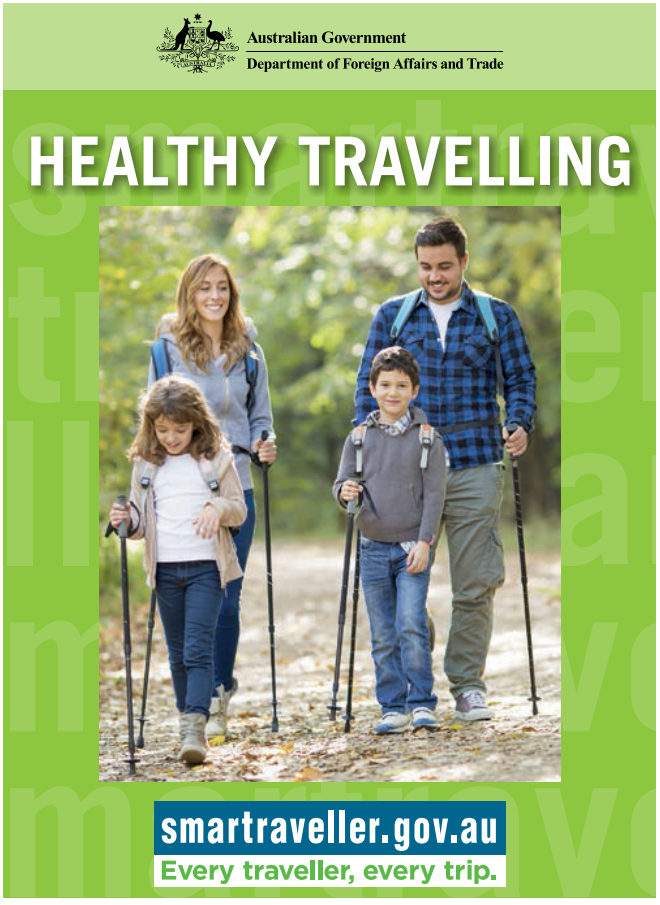

Image: Promotional materials. Australian Government

The flu and flu vaccine

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

In Canberra influenza is a seasonal disease that usually occurs between autumn and spring. The illness can be debilitating even for healthy people and the symptoms include headaches, fever, cough and muscle aches. Some people in the community are at higher risk of developing severe complications including pneumonia, heart and liver complications. The most effective way of preventing the disease is vaccination. The influenza vaccine is safe and in most people effective.

Influenza disease

Influenza is a major contributor to the global and Australian burden of acute respiratory infection. Young children, the elderly and others with underlying medical conditions are at greatest risk of hospitalisation, morbidity and death.[1] Influenza, commonly known as 'the flu', is an illness caused by a group of viruses that infect the respiratory tract. Influenza infection usually has different symptoms and causes a more severe illness than most other common viral respiratory infections and may be a life-threatening infection in certain people. In most parts of Australia, influenza outbreaks are seasonal, occurring between late autumn and early spring. Seasonal outbreaks occur every year and vary from mild sporadic outbreaks to serious epidemics; it is estimated that between five and 20 percent of the population may be infected annually. Occasionally severe worldwide outbreaks (pandemics) occur involving higher infection rates and more severe disease.[2]

Causative agent

Influenza is caused by influenza viruses which are classified as type A, B or C. Only influenza A and B cause major outbreaks and severe disease.[4] Type A influenza viruses are further categorised into subtypes according to two kinds of proteins on their surface: haemagglutinin (H) and neuraminidase (N).[1] Type B influenza viruses are categorised into lineages. There are two influenza B lineages that circulate among humans, Yamagata and Victoria.[3]

Spread of disease

Influenza is easily spread, mainly through droplets generated by sneezing and coughing. Droplets containing the influenza virus can settle onto surfaces, and can then pass from hands to the nose, mouth or eyes. People with influenza can be infectious to others from the 24 hours before symptoms commence until a week after the start of symptoms. The percentage of people in the general community affected by flu each year is typically five to ten percent, but may be up to 20 percent in some years. This percentage is higher for children, with ten to 40 percent infected each year. Influenza is more easily spread where large numbers of people gather together such as in childcare centres, schools, workplaces and aged care facilities.[3]

Clinical features

Influenza symptoms tend to develop abruptly one to three days after infection, and can include: tiredness, high fever, chills, headache, coughing, sneezing, runny noses, poor appetite, and muscle aches. The elderly may present with atypical symptoms such as malaise and confusion.[4] Most people who get the flu will suffer from mild illness and will recover in less than two weeks. Some people can develop longer-term health problems, including pneumonia, bronchitis, chest and sinus infections, heart, blood system or liver complications, which can lead to hospitalisation and even death.[4] People at highest risk of complications from influenza include those with pre-existing medical conditions, the elderly, Aboriginal and Torres Strait Islander persons and pregnant women. However, previously healthy people can also have severe complications.[3]

Each year in Australia approximately 85 deaths and 4000 hospitalisations[3] due to influenza are reported. These figures are an underestimate as many cases are not reported and the true impact of influenza is much greater.[3]

Prevention

Vaccination is the most effective method for preventing influenza virus infection and its complications.[1] Influenza vaccines are available which offer a high degree of protection against seasonal illness and the severe consequences of influenza; however, these must be administered annually due to changes in the influenza viruses. Antiviral medications reduce the risk of hospitalisation and respiratory complications of influenza, and can reduce the transmission of influenza in outbreaks, but must be given early to be effective.[2]

Practising cough etiquette (such as covering the nose and mouth with a tissue when coughing or sneezing) and washing hands before eating can help to reduce the likelihood of transmitting and contracting the influenza virus. Anyone who is unwell with influenza should stay home from work, school and social gatherings and avoid close contact with other people which could lead to transmission of the virus.[3]

Image: Promotional materials. ACT Health

Vaccines

There are two types of inactivated influenza vaccines available in Australia; both are registered for use by the Australian Therapeutic Goods Administration (TGA):

- trivalent influenza vaccines (TIVs) which contain three strains of influenza virus (from two influenza A subtypes and one influenza B lineage). They have been used for many decades.
- quadrivalent influenza vaccines (QIVs) which contain the same three influenza virus strains as TIV plus a strain from the second influenza B lineage not in the TIV.[3]

The flu and flu vaccine *(continued)*

If the extra influenza B virus is circulating during the influenza season, people who receive the QIV will be better protected against it than people who received TIV. However, if any of the other three influenza A or B virus strains are circulating, people who received either TIV or QIV will have the same level of protection.[5]

The strains of circulating influenza virus can change from year to year. The vaccine may also change to protect against the most recent influenza virus strains. Even if the influenza strains do not change, yearly vaccination is still recommended as immunity from influenza vaccination is not long lasting.[4]

Influenza vaccine should be given in autumn before the start of the influenza season as it takes up to 14 days for immunity to develop after vaccination. However, influenza vaccine can still be given after virus circulation has commenced to provide protection for people who have not yet been exposed.[2] Influenza vaccine can be administered at any time of year the vaccine is available. Due to the manufacturing process and, because there are usually annual strain changes, the vaccine is generally available from March to December. Women who become pregnant in the second half of the year often miss having the influenza vaccine. When their children are born early the next year they are unprotected from the influenza virus and are at risk because they are too young to receive the vaccine when the virus in prevalent in the community. For this reason it is important to vaccinate pregnant women even if it is near the end of the year and minimal influenza is circulating in the community.

How well the influenza vaccine works can vary between different people and in different years, as it depends on a number of factors. For example, the age and health status of the person receiving the influenza vaccine can impact its effectiveness. Influenza vaccination can prevent illness in about 60 percent of healthy adults under the age of 65 years. A growing amount of evidence suggests similar levels of protection in young children. People with an underlying medical condition, such as low immunity or who are elderly, do not respond as well to the influenza vaccine as healthy adults and so the level of protection they get from the vaccine can be less.[3] The effectiveness of influenza vaccine also depends on the degree of similarity between the virus strains in the vaccine and those circulating in the community.[2]

All vaccines currently available in Australia must pass stringent safety testing before being approved for use by the TGA.[4]

Who should be vaccinated?

Annual influenza vaccination is recommended for any person aged six months or older[3] as anybody who does not have immunity from recent infection or vaccination can contract influenza; being fit and healthy doesn't protect from infection.[2]

There are a number of groups who are at increased risk of influenza and its complications and annual influenza vaccination is strongly recommended for these people. For some of these groups seasonal influenza vaccination is provided free of charge through the National Immunisation Program (NIP).[3] Groups who are eligible for funded vaccine are:

- People aged 65 years and over;
- Aboriginal and Torres Strait people aged six months to less than five years;
- Aboriginal and Torres Strait Islander people who are aged 15 years and over;
- Pregnant women; and
- People aged six months and over with medical conditions such as severe asthma, lung or heart disease, low immunity or diabetes that can lead to complications from influenza.[4]

Children

Of all vaccine preventable diseases, influenza is the leading cause of hospitalisation among Australian children under five years of age and healthy children under five years are more likely than any other age group to be hospitalised for influenza complications. Children are much more likely to contract influenza in any given season compared to adults. Not only are influenza infection rates generally highest among children, children also contribute greatly to transmission of influenza in the community.[2]

Children can begin to be immunised against influenza from six months of age. Children aged eight years and under require two doses, at least four weeks apart in the first year they receive the vaccine. One dose of influenza vaccine is required for subsequent years and for children aged nine years and over.

Pregnant women

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 neonatal and perinatal death. Young children, especially those less than six months old, are more likely to be hospitalised or die from influenza than older children.[5] Influenza vaccination during pregnancy prevents influenza hospitalisations in nine out of ten babies before they reach six months of age – the age when they can start to receive the vaccine themselves. This is due to the transfer of protective antibodies from the pregnant woman to the baby.

All influenza vaccines in Australia are inactivated vaccines, which can be safely given to pregnant women at any stage during pregnancy. The rate of adverse events after vaccination in pregnant women is no different to the rate in women who are not pregnant.[5]

Images: Children & pregnant woman. ACT Health

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National Immunisation Program influenza vaccine in the ACT

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

Influenza vaccine is available under the National Immunisation Program (NIP) for persons at high risk of complications from influenza infection. Free influenza vaccine is available for:

- People 65 years of age and over;
- Aboriginal and Torres Strait Islander people 15 years of age and over;
- Aboriginal and Torres Strait Islander children from six months to five years;
- Pregnant women; and
- Anyone over six months of age with underlying medical conditions which predisposes them to the risk of complications from influenza.

The Health Protection Service (HPS) distributes influenza vaccine to all immunisation providers in the ACT. Influenza vaccine provided under the NIP administered in general practice, hospitals, correctional facilities and, for children six years of age and under, at Maternal and Child Health Clinics.

Depending on the availability of the influenza vaccine, distribution of supplies usually commences in March or early April each year. The ACT has seen a steady increase in the administration of NIP funded influenza vaccines annually, with just over 57,000 doses of vaccine distributed by the Vaccine Management Unit (VMU) in 2015. The highest demand occurs early in the season with thousands of vaccines being distributed every week. The vaccine can be used until the expiry date (December of the same year or January of the following year) and distribution continues until this time. To calculate the coverage rates and which risk groups are receiving the vaccines, immunisation providers are requested to return data to HPS on the number of vaccines that were administered and to which risk group.

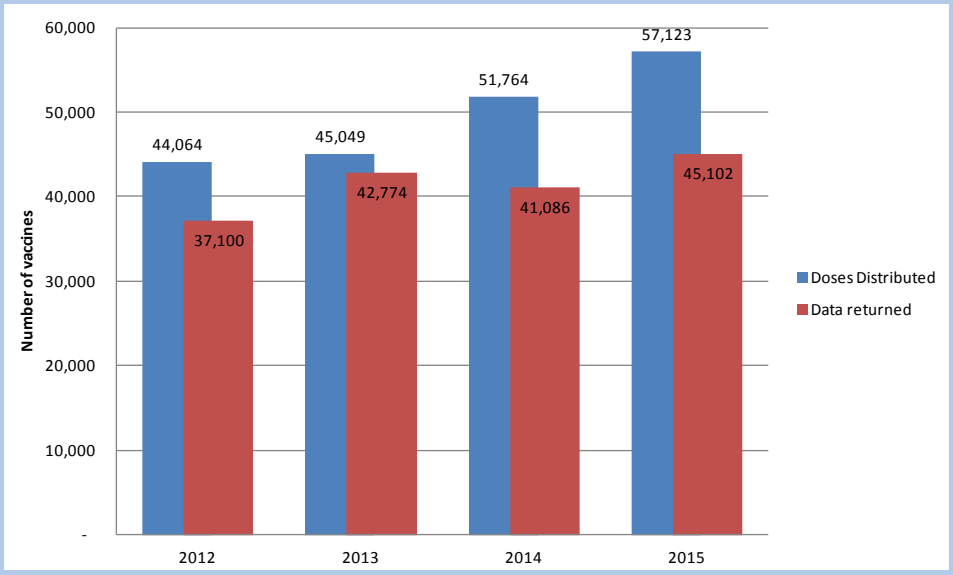

Figure 1: Annual amount of vaccines distributed and data returned; 2012-2015

Year	2012	2013	2014	2015
Percentage of data returned	84%	95%	79%	79%

Table 1: Percentage of data returned; 2012-2015

As only 79 percent to 95 percent of data is returned it is not possible to accurately determine influenza vaccination coverage rates. However, returned data indicates there was an increase in influenza vaccine administered in all targeted groups except Aboriginal and Torres Strait Islander persons. Aboriginal and Torres Strait Islander children six months to five years were included, for the first time, in the NIP influenza vaccination program in 2015.

The HPS does not receive data on influenza vaccinations that are administered to risk groups through other immunisation programs such as workplace influenza immunisation clinics. There is a possibility that some risk groups may access the vaccine through other programs and not receive NIP vaccine through a general practice.

At the present time there is no database that collects the number of influenza doses administered in Australia to persons over 19 years of age. Until the National Immunisation Register is introduced in September 2016 a comparison of influenza doses administered between the States and Territories cannot be completed.

Data on the number of vaccines administered to the groups funded under the NIP is displayed in Figures 2-4 on page 24.

National Immunisation Program influenza vaccine in the ACT *(continued)*

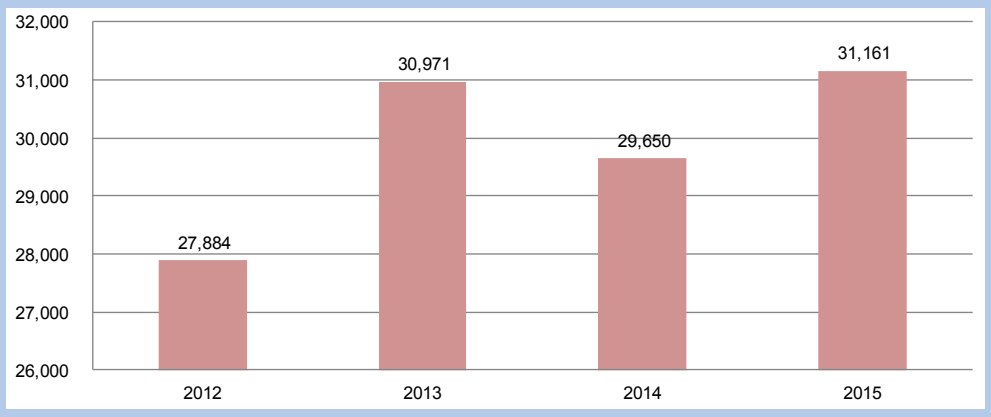

Figure 2: Influenza vaccine data returned for persons 65 years and over; 2012-2015

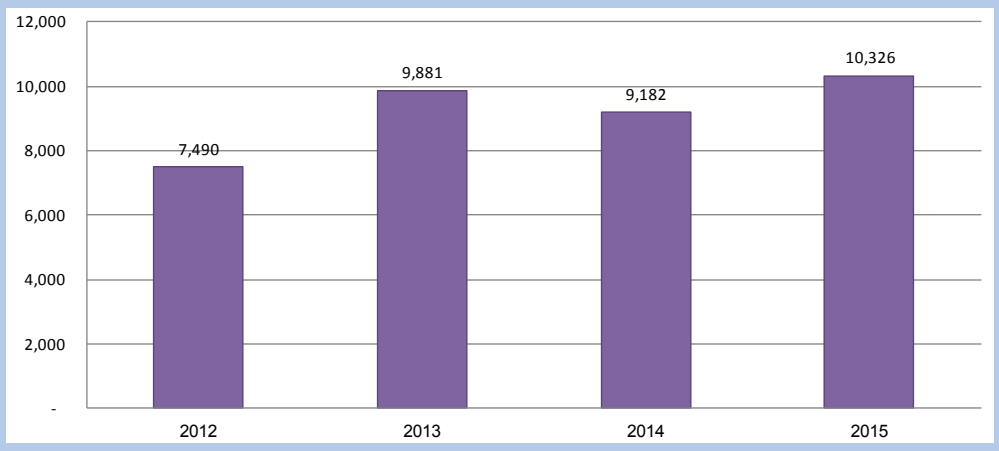

Figure 3: Influenza vaccine data returned for persons >10 years medically at risk; 2012 - 2015

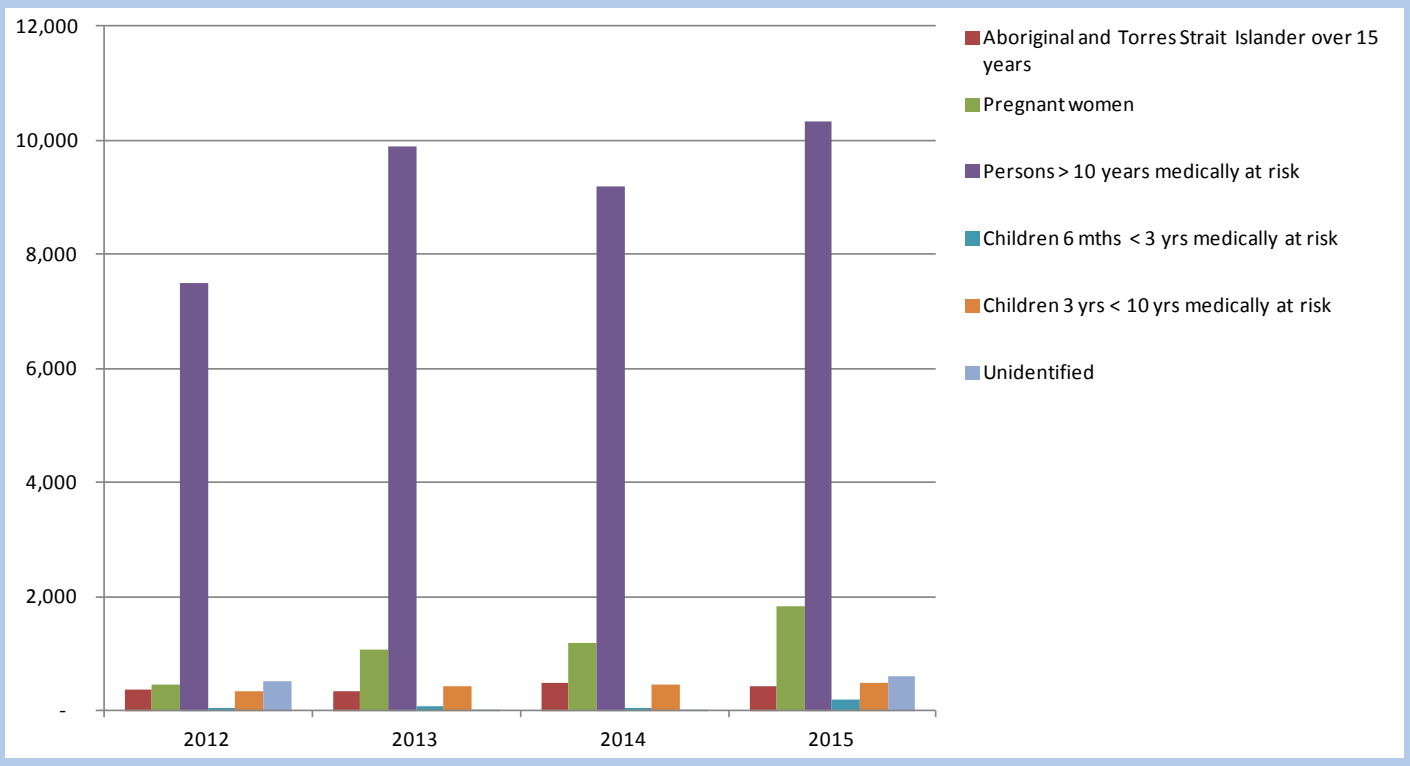

Figure 4: Influenza vaccine data returned for persons in other risk groups; 2012 - 2015

Overview of the Antenatal Pertussis Vaccination Program

Kirstie Allard, Communicable Disease Control, Population Health Protection & Prevention

The Antenatal Pertussis Vaccination Program commenced in the ACT on 28 April 2015. The ACT Government funded program offers a pertussis-containing vaccine (the diphtheria, tetanus, pertussis (dTpa) vaccine) to pregnant women from 28 weeks gestation. The purpose of the program is to reduce the incidence of pertussis (whooping cough) in newborn babies who are most vulnerable to serious complications or mortality from the disease.

Introduction

Pertussis (whooping cough) is a highly infectious respiratory illness caused by the bacterium *Bordetella pertussis*. Whooping cough can affect people at any age however infants younger than six months of age are most at risk of developing serious - sometimes life threatening - complications from the disease.

On the Australian National Immunisation Program (NIP), an infant pertussis-containing vaccine is scheduled at two, four and six months of age. Newborn babies cannot be vaccinated until they are at least six weeks of age as their immune systems are too immature to respond prior to this. Full protection from the disease is not achieved until completion of the three dose schedule.[1]

In response to a nationwide epidemic in 2012, the United Kingdom (UK) introduced a maternal pertussis vaccination program offering the pertussis vaccine to pregnant women in their third trimester.[2] The program aimed to passively protect infants from birth through maternal antibodies being transferred in utero from vaccinated mothers. Early results from this program indicated vaccine effectiveness over 91 percent for infants younger than three months of age whose mother participated in the maternal vaccination program.[3] This means that vaccination of mothers at least seven days before delivery reduced pertussis disease by 91 percent in infants younger than three months of age.

In March 2015, in response to emerging research, the Australian Immunisation Handbook (10th edition)[4] was amended to include a recommendation that pregnant women, during the third trimester of each pregnancy (optimally between 28 and 32 weeks), be given a pertussis-containing vaccine, as the preferred strategy for reducing the risk of pertussis in young infants.

Based on this amendment, on 7 April 2015, the ACT Minister for Health announced a funded program offering the pertussis vaccine to pregnant women during their third trimester. The commencement date for the program was 28 April 2015.

Program Implementation

The ACT Antenatal Pertussis Vaccination Program (the Program) was developed, implemented and managed by the Communicable Disease Control Section (CDC) of the Health Protection Service (HPS) in consultation with the ACT Health General Practitioner (GP) Advisor and the Office of the Chief Health Officer.

Initial stages of implementation included an emphasis on communications to stakeholders, development and distribution of promotional resources for the target population, negotiations with vaccine suppliers to ensure availability of stock, as well as delivery of vaccines and program information to providers.

A letter announcing the introduction of the program was sent to immunisation providers and other relevant health professionals on 8 April 2015. The letter targeted general practice, obstetricians, hospital maternity units, registered midwives, pharmacists, the ACT Medicare Local, and professional associations (Australian Medical Association and Australian College of Midwives). Formal meetings between ACT Health and relevant stakeholder groups were held during April 2015. The purpose of these meetings was to provide advice and seek engagement with the program.

Delivery of the program was initially targeted at antenatal clinics within hospitals and through general practice. The vaccines stocked in the ACT are the Glaxo-Smith-Kline vaccine "Boostrix™", and the Sanofi Pasteur vaccine "Adacel™". The distribution of vaccines for the program supplies Boostrix™ to hospitals and Adacel™ to general practice.

Referral forms were developed by the HPS and sent to obstetricians as an opportunistic approach to remind pregnant women to visit their GP or antenatal clinic to receive the vaccine. The vaccine is also offered at some obstetric practices.

All stakeholders indicated their enthusiasm for the introduction of the program and this was evident with the willingness of hospitals and other providers to update local policies and procedures to accommodate the new program. Staff of the HPS delivered a series of informal education sessions to hospital staff, practice nurses, GPs and other immunisation providers.

The program was initially communicated through a number of media releases and promotional materials being distributed across the region. Promotional materials developed for the program included posters, pamphlets, and fact sheets. These materials were delivered to all immunisation providers prior to the commencement of the program.

Advertisements promoting the program were aired on a Canberra radio station from June to September 2015 and April to July 2016. Promotion of the importance of influenza vaccine for pregnant women was also included as part of the advertisement.

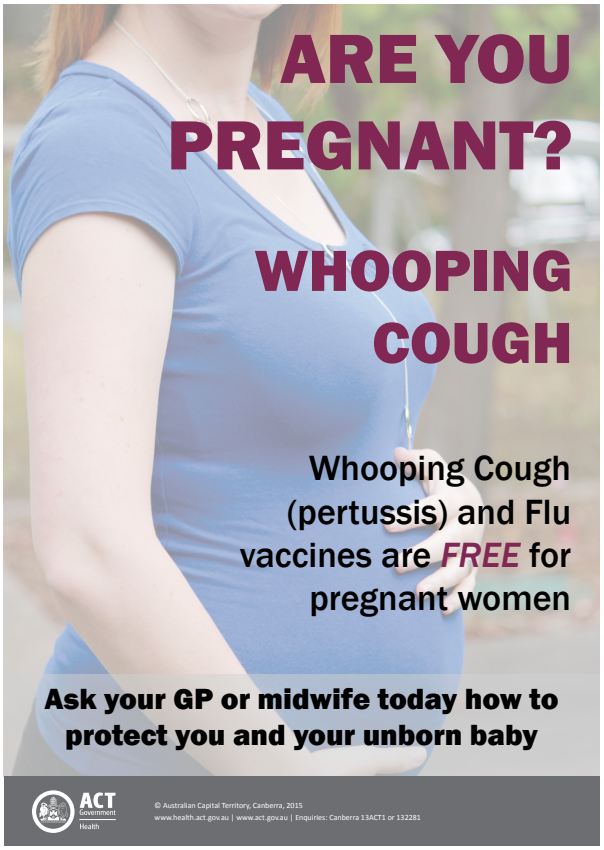

Image: Promotional materials. ACT Health

Overview of the antenatal pertussis vaccination program *(continued)*

Vaccine supply

Due to a worldwide shortage of the vaccines and all Australian States and Territories commencing programs simultaneously, the ACT was required to work closely with the pharmaceutical companies to ensure adequate vaccine supply.

The HPS Vaccine Management Unit (VMU) commenced delivering the vaccine for the program to general practices and hospitals on 20 April 2015. At this time, the seasonal influenza vaccine deliveries also commenced. Delivery of the initial stock of vaccines was completed by the VMU staff within three days and prior to the program commencement date of 28 April 2015. A package consisting of information and promotional materials for both the provider and the public accompanied all deliveries.

Distribution and uptake

A total of 6,931 vaccines were distributed to immunisation providers between commencement of program deliveries on 20 April 2015 and 30 June 2016. Figure 1 provides the number of doses of pertussis containing vaccine delivered by month for the program from April 2015 to June 2016.

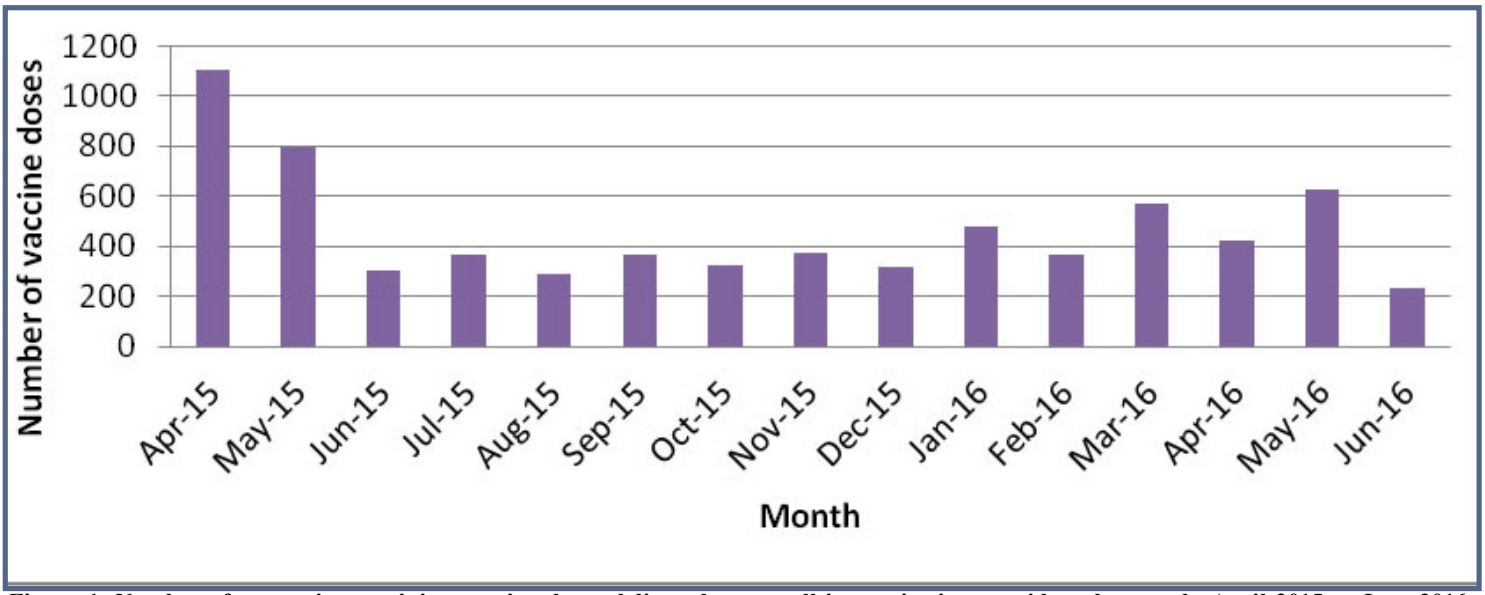

Figure 1: Number of pertussis-containing vaccine doses delivered across all immunisation providers, by month, April 2015 to June 2016. Health Protection Service Vaccine Management Unit delivery data (July 2016).

Vaccines were delivered to antenatal units at the three hospitals, Centenary Hospital for Women and Children, Calvary Healthcare Bruce, and Calvary John James Deakin. Figure 2 provides the number of doses of pertussis-containing vaccine delivered by month to antenatal units, from April 2015 to June 2016.

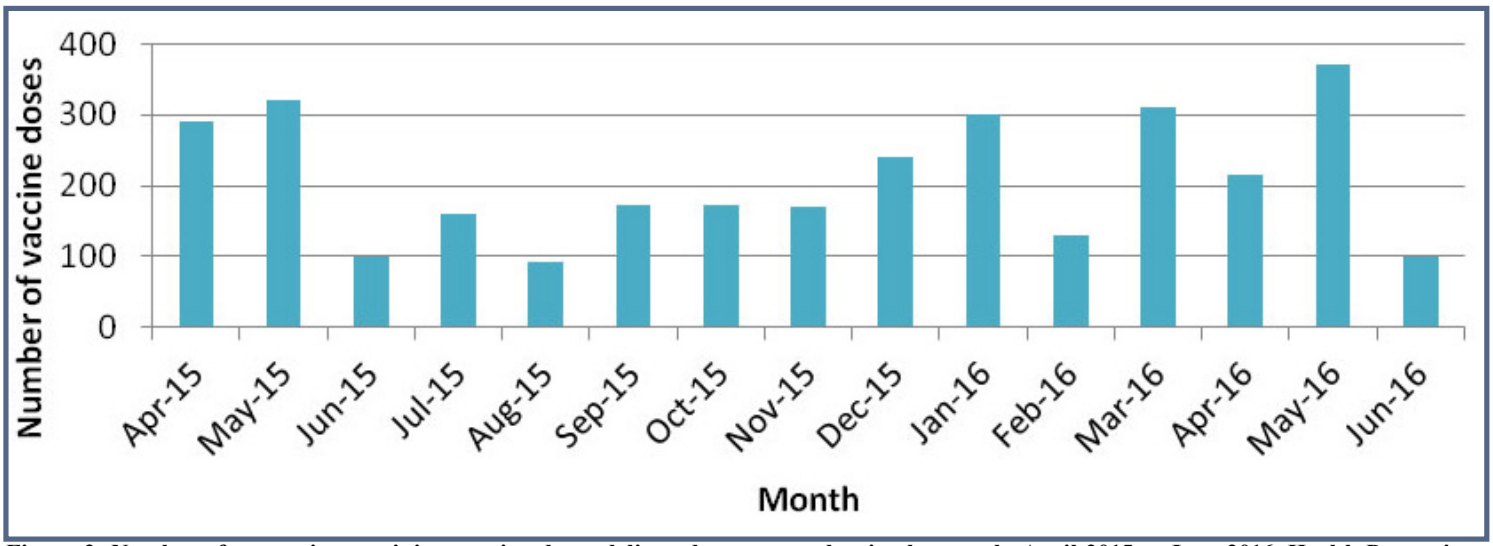

Figure 2: Number of pertussis-containing vaccine doses delivered to antenatal units, by month, April 2015 to June 2016. Health Protection Service Vaccine Management Unit delivery data (July 2016).

Overview of the antenatal pertussis vaccination program *(continued)*

The Birth Outcomes System (BOS) at the Centenary Hospital for Women and Children is a population-based data collection system covering all births within the hospital. De-identified data are provided to the HPS to monitor the number of pregnant women who receive a pertussis-containing vaccine during pregnancy. The data indicates low uptake of pertussis-containing vaccines (Figure 3), however the dataset has limitations that might have resulted in an underestimate of vaccine uptake. These limitations include the ability for users to skip the question about whether the vaccine was given and the possibility of vaccines previously administered by the patient's GP not being recorded in the hospital system. The overall uptake is likely to be an underestimate, as although 59 percent of patients did not have a record of administration of a pertussis-containing vaccine, some of these women may have received one.

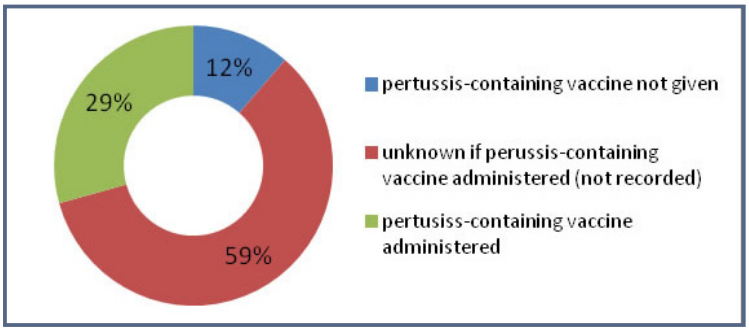

Figure 3: Overall percentage of pertussis-containing vaccine administered at anytime during pregnancy. Centenary Hospital for Women and Children April 2015 to June 2016. Data extracted 12 July 2016 from Birth Outcomes System (BOS) Centenary Hospital for Women and Children.

In addition, general practices were encouraged to return data to the HPS through a specific Antenatal Pertussis Vaccination Program data collection form. Based on data returned by GP's, 64 percent of doses received were administered to pregnant women under this program (Figure 4).

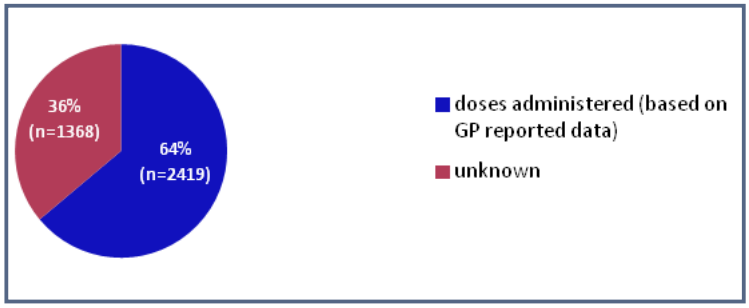

Figure 4: Percentage of pertussis-containing vaccine doses delivered and administered in general practice under the Antenatal Pertussis Vaccination Program. April 2015 to June 2016. Health Protection Service Vaccine Management Unit delivery data (July 2016).

Outcomes

For the 12 month period 1 July 2015 to 30 June 2016, data returned from GPs indicates 1655 doses of pertussis-containing vaccine were administered to pregnant women. The number of doses of pertussis-containing vaccine distributed to hospital antenatal units during the same period was 2434. Based on an average of 5400 births annually in the ACT, the coverage rate for the Antenatal Pertussis Vaccination Program is estimated to be 76 percent. This coverage rate was calculated using the returned data from GPs and presumes all pertussis-containing vaccines delivered to hospital antenatal units were administered as part of the Antenatal Pertussis Vaccination Program.

Summary

Despite caution shown by pregnant women and health care workers to administer medications during pregnancy, the program has received an excellent response from both immunisation providers and the public. This is indicated by the good vaccine uptake being reported.

The emerging research both nationally and internationally will continue to provide guidance for ACT Health on the benefits of an antenatal pertussis vaccination program.

The short timeframe between announcement and commencement of the program proved a challenge for implementation. Promotional activities for the program will need to be sustained to ensure the importance of maternal vaccination continues to remain a focus for the public.

The effectiveness of the Program is currently being evaluated by the HPS. The outcomes of the evaluation will influence how the program is delivered in the future.

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Increasing vaccine uptake in the school program

Louise Hawkins, Erin Cronin, Carolyn Thomas, High School Immunisation Program, Women's Youth & Children Community Health Program

The School Health Team offers the National School Immunisation vaccines to all Year 7 students in the ACT. Scheduled school vaccines under the National Immunisation Program are: the human papillomavirus (HPV), diphtheria, tetanus and acellular pertussis (dTpa) and varicella (chicken pox) vaccines. In 2015 the School Health Team administered 19,486 injections to students in 21 ACT Government, 11 independent and eight Catholic high schools. The team takes pride in delivering a safe and efficient vaccine program that also supports the students, through what can be a stressful experience, in a warm and caring way.

In February 2015, the Canberra Times reported on a study undertaken by BioSCL into parental awareness of the school based vaccination programs across Australia. This survey found that over a third of parents were not aware that their teenager was eligible for the recommended and free vaccinations when starting high school. As a result, a research project looking at 'Increasing parent's awareness of the ACT School Immunisation Program' was conducted by the School Health Team in 2015/16.

A number of changes have been made to address this knowledge gap starting with the "FIND, SIGN, RETURN" campaign beginning in the second half of 2016 which will target parents of students in Year 6. Parents will receive information about the Year 7 vaccination program in the Year 6 'show bag' with the key message to FIND the vaccine consent card and information about the vaccines in the students school bag at the beginning of the 2017 school year, read and SIGN the consent card and RETURN it to the school. The aim of this campaign is to increase parental awareness of the school immunisation program and knowledge of the vaccines to increase the consent card return rates and vaccine uptake rates in the ACT. This message will be reiterated at the start of Year 7 through posters advertised in school newsletters.

Information regarding vaccination in the ACT including the school vaccination program can be found at http://www.health.act.gov.au/our-services/immunisation

Clients and parents of children looking for evidence about school vaccination can email: schoolhealthteam@act.gov.au

Clients and parents of children that have enquiries regarding school vaccination can phone: (02) 6205 5052

Image: Immunisation information materials. ACT Health

Vaccine Management Unit

Susan Vousden, Communicable Disease Control, Population Health Protection & Prevention

The Vaccine Management Unit (VMU) is part of the Health Protection Service of the ACT Health, Population Health Division and is responsible for the ordering, storage and distribution of funded vaccine within the ACT. The VMU delivers vaccines funded by the Australian Government through the National Immunisation Program, and the ACT Government funded vaccine program such as vaccines for refugees, pertussis vaccine for pregnant women and rabies vaccines for post exposure prophylaxis. Every month the VMU delivers thousands of vaccines to the 126 immunisation providers in the ACT. For example, in April this year, the team made 394 deliveries of over 34,000 vaccines.

The VMU distributes funded vaccines to general medical practices; medical and travel centres; Maternal and Child Health (MACH) clinics; the School Immunisation Team; wards, specialist areas and pharmacies at Canberra and Calvary hospitals; the Junction Youth Health Centre; obstetricians; correctional centres (The Alexander Machonochie Centre and Bimberi Youth Justice Centre); aboriginal health services (Winnunga Nimmityjah); refugee medical centre (Companion House); the Early Morning Centre for the homeless; and aged care facilities.

The VMU undertakes:

- delivery of vaccines in accordance with the National Immunisation Program - *Strive for 5* National Vaccine Storage Guidelines;
- delivery of immunisation literature and stationery;
- rotation of vaccine stock in immunisation provider fridges to ensure vaccine nearing its expiry date is used first;
- delivery of immunoglobulins and other post exposure vaccines in the event of an emergency or outbreak of a vaccine preventable disease;
- inventories of vaccine held by providers;
- cold chain monitoring of immunisation provider fridges;
- collection and analysis of data and other information related to the provision of vaccines; and
- projects aimed at maintaining or increasing vaccine coverage and decreasing wastage of vaccines.

In the last three financial years, the VMU has purchased between five and six million dollars worth of vaccine annually. The cost of the vaccine purchased is steadily increasing due to the number of vaccine preventable diseases being covered under the National Immunisation Program, the inclusion of new vaccines, the "No Jab No Pay" program, and expansion of ACT Government funded vaccine programs. Since 2008 the Vaccine Management Unit has distributed between 128,000 and 176,000 doses of vaccine each year to Immunisation Providers within the ACT. This figure is based on the number of vaccines purchased each year. The number of the vaccines purchased has steadily increased over time, even though a greater number of combination vaccines are now included on the National Immunisation Schedule. Combination vaccines reduce the number of injections a child requires at each visit. This decreases time spent vaccinating and reduces parental anguish regarding multiple injections. In 2007-08, there was a spike in the cost and number of vaccines purchased (Figures 1-2) due to the commencement of the Human Papilloma Virus (HPV) vaccination program for girls and women aged 12 –26. Another smaller spike in 2013-14 was due to the commencement of a HPV vaccination program for boys who were aged 12-13 and a two year catch up component for boys who were in Year 9.

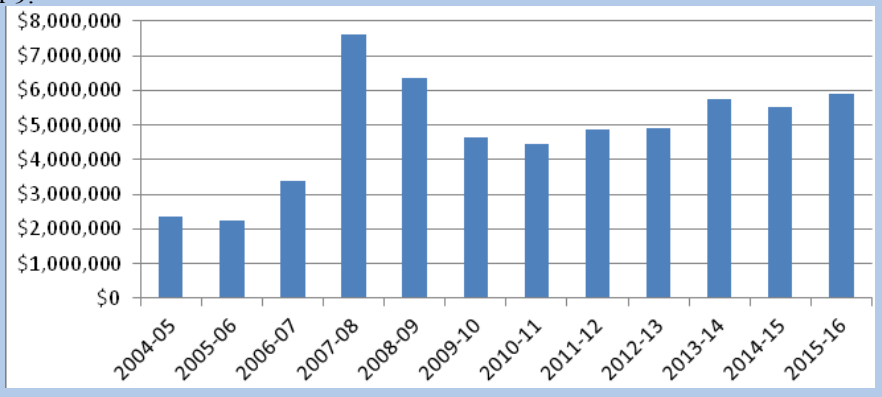

Figure 1: Cost of vaccines (2004-5 to 2015-16)

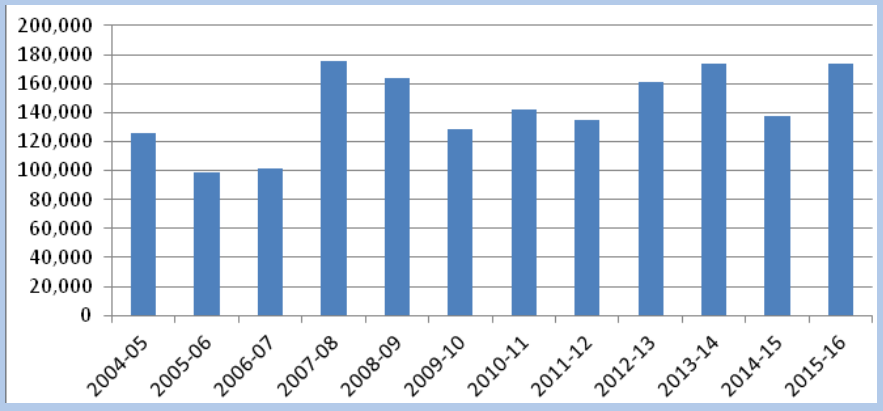

Figure 2: Number of vaccines purchased (2004-5 to 2015-16)

Vaccine storage: ensuring everyone receives viable vaccines

Carolyn Banks, Communicable Disease Control, Population Health Protection & Prevention

It is a responsibility of immunisation providers and health departments to ensure that all vaccines administered are viable. The cold chain is the system of transporting and storing vaccines within the safe temperature range of 2°C to 8°C. Maintenance of the cold chain is essential for maintaining vaccine potency and, in turn, vaccine effectiveness.

Resources, both national and local, are available to support providers in maintaining the vaccine cold chain in their practices and all providers should be familiar with the National Vaccine Storage Guidelines. Despite best efforts there are occasions when the vaccines are exposed to temperatures outside of the safe range (in cold chain breach). Any cold chain breaches should be identified and managed promptly so that damaged vaccines can be removed and any person who received non-viable vaccine can be revaccinated.

Background

Vaccines are delicate biological substances that can become less effective or non-viable if they are stored outside the specified temperature range of 2°C and 8°C and/or exposed to light.[1] The cold chain begins from the time the vaccine is manufactured, moves through to ACT Health's vaccine distribution centre and ends when the vaccine is administered. The success of the system involves three key elements: people, processes and equipment (vaccine refrigerators and monitoring equipment).

Health professionals have a responsibility to ensure that clients receive effective health products. Cold chain breaches left unidentified and/ or inappropriately managed can have serious implications, especially when clients have received compromised vaccine. Good cold chain management precludes the need to revaccinate clients who may have received an ineffective vaccine due to a cold chain event.

Wastage of vaccine through incorrect storage can be costly. Vaccines are expensive and may be in short supply.[1] The total financial value of the vaccines contained within one vaccine refrigerator can be significant. Cold chain breaches can occur due to technical malfunctions, even in well designed and well managed systems. If there are effective procedures in place, problems will be detected and managed before an ineffective vaccine is used. Efficient vaccine storage is a good quality assurance measure of an immunisation provider service.

Image: Vaccine storage and transportation. ACT Health

Principles of vaccine storage management

The Vaccine Storage Guidelines, *Strive for 5* (2nd Edition, 2013) provide information for vaccine storage management. The principles of safe vaccine storage management as listed in the *Strive for 5* are:

1. Storing vaccines in a purpose built vaccine fridge:
    - Purpose built vaccine fridges are specifically designed to store vaccines and are the best practice storage option;
2. Nominating a staff member to be responsible for vaccine management and ensure all people involved in the storage and administration of vaccines are trained in cold chain management;
3. Monitoring the temperature of refrigerators containing vaccines:
    - Cold chain monitoring devices must be checked prior to administering vaccine and at least twice each day staff are present, including at the commencement and completion of an immunisation session. This provides a better indication of any problems in the refrigerator's function and temperature fluctuations over the course of the day. However, the temperature should be viewed and considered every time the refrigerator is opened;
4. Ensure plans are in place for responses to cold chain breaches and power failures:
    - If a cold chain breach occurs do not use the vaccine, immediately isolate it, keeping it between 2°C and 8°C. Inform all other staff of the potential cold chain breach and label the vaccine 'DO NOT USE'. Contact the HPS Immunisation Unit to obtain advice by calling 6205 2300. If affected vaccines had been administered a comprehensive list of any clients who may have been given compromised vaccine will need to be compiled. The client may require a repeat dose of the vaccine, to ensure they have received an effective dose. It is important that the client have the opportunity to discuss the incident and the risks and benefits of revaccination;
5. Perform vaccine self audit at least annually.[1]

Support for vaccine storage management provided by the Health Protection Service

Although safe vaccine storage management in a practice is the responsibility of the staff of the practice, the Health Protection Service (HPS), supports providers in the ACT to maintain good vaccine management. HPS supplies cold chain monitoring devices for each fridge in the ACT that stores government funded vaccines. The data logger is used to continuously monitor the temperature of fridges. They are electronic devices that measure temperature, recording the results over a period of time. The freeze indicators (Freezewatch™) provided by the HPS provide a visual warning that the fridge may have gone below zero degrees. The glass bulb in the freeze indicator breaks to release a bluish/black dye which irreversibly stains the paper behind the glass bulb, providing a visual warning that the product may have been exposed to temperatures below zero degrees Celsius.

As well as delivering vaccines, the VMU also checks and monitors the cold chain in providers' fridges and monitors the cold chain. The HPS sends a cold chain self audit form to all providers annually as well as doing an annual audit on all fridges in the ACT that store government funded vaccines.

The HPS should be notified if a cold chain breach has occurred in a vaccine fridge. The HPS will assess every suspected vaccine cold chain breach and provide advice on further actions. If the HPS assesses that a cold chain breach has occurred the vaccine is no longer viable and must not be used. Do not discard any vaccine, the HPS will arrange a time to collect it for disposal (keep vaccine at 2°C to 8°C until collected).

Staff at the HPS can be contacted on (02) 6205 2300 if further advice on safe vaccine storage practices is required.

References

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Sustaining measles elimination in Australia

Dr Vanessa Johnston, Office of the Chief Health Officer, Population Health Protection & Prevention

Measles is a highly contagious and potentially deadly viral disease that can be easily transmitted between people. As there is no specific treatment for measles, prevention with two doses of measles-containing vaccine is crucial to guard against getting the disease and at a population level, to curtail its transmission in the community. In March 2014, the World Health Organization declared that endemic measles had been eliminated from Australia. This is a major public health milestone but governments, providers and consumers need to maintain their commitment to prevention and remain vigilant to ensure that we are able to sustain measles elimination into the future.

What is measles?

Measles is a highly contagious and potentially deadly viral disease that can be easily transmitted between individuals by direct contact with respiratory secretions of an infected person and/or through droplets in the air.[1] The first sign of measles is usually a high fever, which begins about ten to 12 days after exposure to the virus, and lasts four to seven days. A runny nose, cough, red and watery eyes (conjunctivitis), and small white spots inside the cheeks (so-called Koplik spots) can develop in the initial stage. After several days, a rash erupts, usually on the face and upper neck.[2] The rash continues to spread over the following three days, eventually reaching the hands and feet. Patients are considered to be infectious from 24 hours prior to onset of first symptoms until four days after the onset of rash.[2]

Common complications of measles include middle ear infection as well as viral or bacterial bronchopneumonia. Acute encephalitis (causing brain swelling) occurs rarely. Most measles-related deaths are caused by complications associated with the disease. Those at risk of more severe illness and/or complications include immunocompromised individuals, malnourished children, children younger than five years and adults 20 years of age and older. In addition, infection in pregnant women is associated with increased risk of premature labour, spontaneous miscarriage and low birth weight infants.[1]

Measles remains one of the leading causes of death among young children globally. Approximately 114,900 people died from measles in 2014 – mostly children under five years of age.[2]

Image: Child with measles. Jim Goodson M.P.H

Prevention of measles

There is no specific treatment for measles, so prevention is critical to reducing the number of new cases of measles, as well as health complications arising from the disease. The measles vaccine has been in use for over 50 years and is proven to be safe, effective and inexpensive.[2] Routine measles immunisation for children in all countries combined with mass immunisation campaigns in countries with high case and death rates are key public health strategies to reduce global measles deaths.[2]

In Australia, the measles vaccine was introduced across Australian jurisdictions as a funded vaccine in the early 1970s for children aged 12 months. In 1989, the combined measles-mumps-rubella (MMR) vaccine was introduced onto the national immunisation schedule at the 12-month timepoint.[3] Subsequent national outbreaks of measles led to the introduction of a second dose of a measles-containing vaccine, initially for children aged 10-14 years, but subsequently moved to children aged four years old. Following a second vaccine dose, approximately 99 percent of people will be immune to measles.[3] The current recommendation is for the second dose of measles-containing vaccine to be provided at 18 months of age to improve two-dose coverage and protection against measles in young children.[3]

When a large proportion of the community is immune to a disease the spread of infection is disrupted thereby providing protection to people who are not immune. This is known as herd immunity. To attain herd immunity for measles, two-doses of measles containing vaccine need to be administered to at least 95 percent of the population.[4] In 2014, 92.5 percent of children in Australia who had reached five years of age had received the required two doses.[5] The ACT was the jurisdiction with highest proportion of children fully immunised against measles (93.7 percent).[5]

Measles eliminated in Australia

The World Health Organization (WHO) aims to achieve measles and rubella elimination in at least five WHO regions.[2] Elimination means there is no local (endemic) strain circulating in a defined geographical area for a period of at least 12 months, in the presence of a well-performing surveillance system.

In March 2014, the global health body declared that endemic measles had been eliminated from Australia.[3] This was a significant accomplishment for public health in this county. At the Fourth Annual Meeting of the Regional Verification Commission for Measles Elimination in the Western Pacific held in Macao in 2015, measles elimination in Australia was noted to be "sustained".[6] Australia's progress report outlined that between January 2014 and June 2014, there were 150 imported measles cases. Imported cases are those that occur in non-immune people who have travelled and contracted the disease outside of Australia. Some of these imported cases were associated with relatively small and localised outbreaks.[6] The largest proportion of these cases occurred among adolescents and young adults.[6]

Sustaining measles elimination in Australia

Despite the fact that Australia has eliminated endemic measles for several years now, there are concerns that there remain some immunity gaps, which could potentially pose a threat to the sustained elimination of measles in this country. A national serosurvey conducted in 2012 reported a significantly lower measles seropositivity rate compared with 2007, with most of the increased susceptibility among adolescents and young adults.[6] The Australian Technical Advisory Group on Immunisation will be reviewing additional data relating to this issue at its next meeting in October 2016.[7] These immunity gaps are most likely due to suboptimal vaccination cov-

Sustaining measles elimination in Australia *(continued)*

erage, especially among adolescents and young adults who would have been eligible for vaccination when vaccination coverage was still low. Additionally, Australia and the ACT is still falling short of the two-dose vaccine coverage target of at least 95 percent in successive birth cohorts. Other challenges include maintaining rapid and high quality outbreak response measures, as well as robust surveillance systems.[8]

Continued efforts to maintain high vaccination coverage, improve coverage in vulnerable community groups (i.e. infants and adolescents/young adults), and to sustain high quality epidemiological and virological surveillance will be required if Australia is to preserve its 'measles-free' status.[8] In 2015, the Australian Government announced funding of $26 million over four years to improve immunisation coverage including additional payment incentives to vaccine service providers to catch up overdue children.[8] Further, in early 2016, the "No Jab, No Pay" policy was introduced, whereby parents can only receive government child care payments and an end of year Tax supplement if their children (less than 20 years of age) are fully immunised or on a recognised catch up schedule. The policy also provides free catch up vaccinations to all children under ten years of age (ongoing) and children aged between ten and 19 years from families who currently receive family assistance payments until December 2017.[9] These national strategies are expected to lead to improved uptake of scheduled vaccinations.

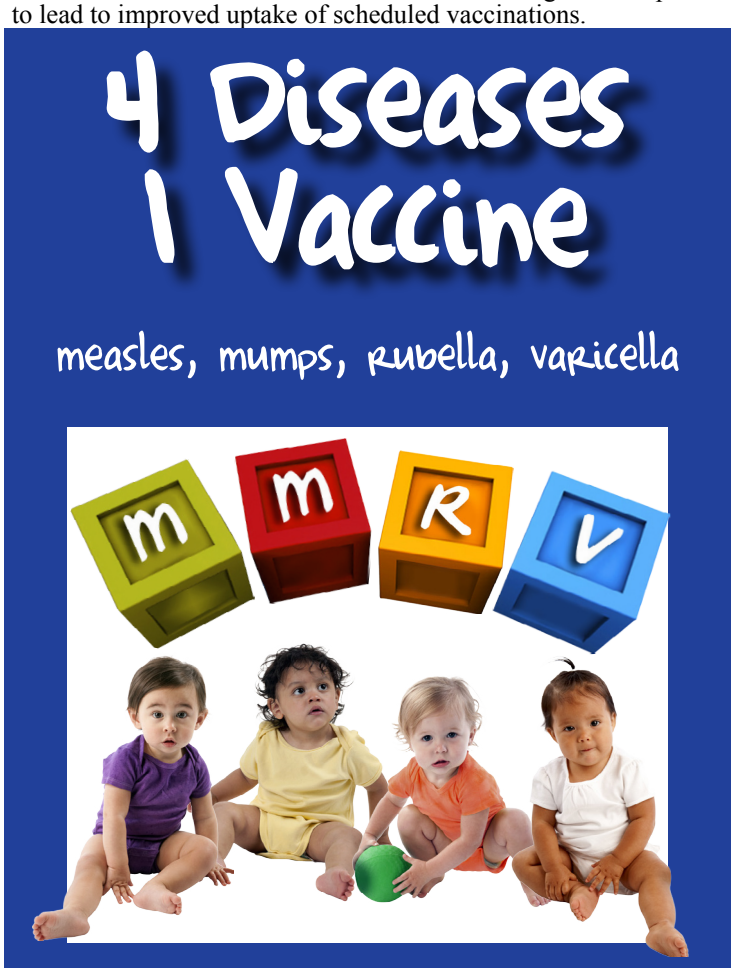

Image: MMRV flyer. Immunise Australia

As noted earlier, the ACT has a high two-dose vaccine coverage rate for measles. The ACT Government purchases a significant number of additional doses of MMR vaccine annually for adolescents and adults who do not have documentation of two doses being administered. This vaccine is distributed to all immunisation providers for administration to this target group. Most of the ACT Government funded MMR vaccine is administered by the Travel Doctor and the University of Canberra.

In the ACT's most recent cases of measles in 2014 and 2015, there has been little or no transmission. This is likely attributable to relatively high immunity in the community and the successful implementation of a rapid outbreak response protocol by the ACT Health Protection Service. A continued commitment to increasing measles immunisation coverage rates and high vigilance for potential measles cases will see the ACT continuing to play its role in sustaining measles elimination in Australia.

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Section Highlight

Immunisation Unit

The Immunisation Unit is a part of the Communicable Disease Control Section (CDC) of the Health Protection Service (HPS). The Immunisation Unit is responsible for:

- Coordination, implementation and promotion of immunisation programs in the ACT;
- distribution of government funded vaccines to ACT GPs and immunisation clinics; and
- Provision of advice immunisation to health care providers and the ACT community.

Some of the Immunisation Unit's significant achievements include:

- The implementation of new immunisation programs such as the ACT Government funded antenatal pertussis program, the 18 month diphtheria, tetanus and pertussis booster; and the No Jab No Pay program;
- Promotion of immunisation to immunisation providers and the Canberra community. This includes resources, updated immunisation website and education events for providers;
- Development and implementation of the ACT Immunisation Strategies;
- Implementation of quality systems to ensure vaccine viability through monitoring of the vaccine cold chain. This includes the receipt of government funded vaccine in the ACT through to distribution and storage of vaccine in GP and immunisation clinic fridges;

Immunisation team

Back row: Kirstie Allard, Debbie Gray, Braiden Smith, Sue Vousden, Sarah Mead.

Front row: Carolyn Banks, Louise Kael, Jacqui Hennock, Rebecca Moroney.

Absent: Jodie Huet

CDC can be contacted on 6205 2300 for immunisation advice or on (02) 6205 2155 for advice on disease surveillance and infection control or email at hps@act.gov.au

Notifiable Disease Report

Number of notifications of notifiable conditions received in the Australian Capital Territory, 1 April to 30 June 2016 (2nd Quarter 2016).

	2nd QTR 2016	YTD 2016	YTD Average 2011-2015	Ratio YTD:YTD average	Annual Total 2015	Annual Average 2011-2015
VACCINE PREVENTABLE CONDITIONS						
INFLUENZA	**71**	**131**	122.4	**1.1**	1205	791.0
PERTUSSIS*	**89**	**166**	226.2	**0.7**	486	442.0
GASTROINTESTINAL DISEASES						
CAMPYLOBACTERIOSIS	**125**	**279**	243.4	**1.1**	608	492.6
CRYPTOSPORIDIOSIS	**10**	**21**	18.4	**1.1**	26	25.4
GIARDIA	**27**	**74**	68.0	**1.1**	140	121.6
HEPATITIS A *	**0**	**1**	1.4	**0.7**	3	3.2
HEPATITIS E	**0**	**1**	0.8	**1.3**	0	1.0
LISTERIOSIS	**0**	**0**	0.2	**0.0**	1	0.8
SALMONELLOSIS	**74**	**156**	132.6	**1.2**	236	226.8
SHIGELLOSIS	**2**	**4**	3.8	**1.1**	7	7.8
STEC/VTEC	**0**	**0**	1.0	**0.0**	0	2.8
TYPHOID	**0**	**0**	0.8	**0.0**	2	2.2
YERSINIOSIS	**2**	**9**	5.4	**1.7**	22	9.8
SEXUALLY TRANSMITTED INFECTIONS						
CHLAMYDIA	**361**	**750**	654.6	**1.1**	1266	1255.2
GONOCOCCAL INFECTION	**39**	**88**	67.4	**1.3**	141	118.8
VECTORBORNE & ARBOVIRUS INFECTIONS						
BARMAH FOREST VIRUS INFECTION	**0**	**0**	1.8	**0.0**	2	2.6
CHIKUNGUNYA^	**0**	**0**	0.4	**0.0**	3	0.6
DENGUE FEVER*	**7**	**20**	9.2	**2.2**	19	16.8
LEPTOSPIROSIS	**0**	**0**	0.2	**0.0**	1	0.4
MALARIA	**1**	**6**	5.4	**1.1**	7	9.8
Q FEVER	**0**	**0**	0.2	**0.0**	0	0.6
ROSS RIVER VIRUS INFECTION	**2**	**7**	5.2	**1.3**	10	7.6
RESPIRATORY CONDITIONS						
TUBERCULOSIS #	**8**	**15**	9.8	**1.5**	16	20.2

All Diseases except Tuberculosis are reported by onset date or closest known test date. Tuberculosis is reported by notification date.

* This condition includes cases that meet the probable and confirmed case definitions. Both probable and confirmed cases are nationally notifiable.

^ Chikungunya infection is received as a notification of an arbovirus not otherwise specified, as it is not currently notifiable. As a result, it is possible that reporting may be incomplete.

For the relevant year, Q1 refers to 1 January to 31 March, Q2 refers to 1 April to 30 June, Q3 refers to 1 July to 30 September, Q4 refers to 1 October to 31 December.

YTD refers to 1 January to 30 June in each respective year.

N.B. Data reported are the number of notifications received by ACT Health. Data are provisional and subject to change.

The number of notifications received for all notifiable diseases in the ACT is available at: http://www9.health.gov.au/cda/source/cda-index.cfm

Overview

Vaccine-preventable Diseases

There have been no cases of measles, mumps, rubella or invasive meningococcal disease notified in the ACT up to 30 June 2016. There were 89 cases of pertussis notified during the second quarter of 2016 (1 April – 30 June 2016) and 166 cases year-to-date (YTD, 1 January to 30 June 2016). The number of pertussis cases in 2016 is below the YTD average over the past five years (2011-2015).

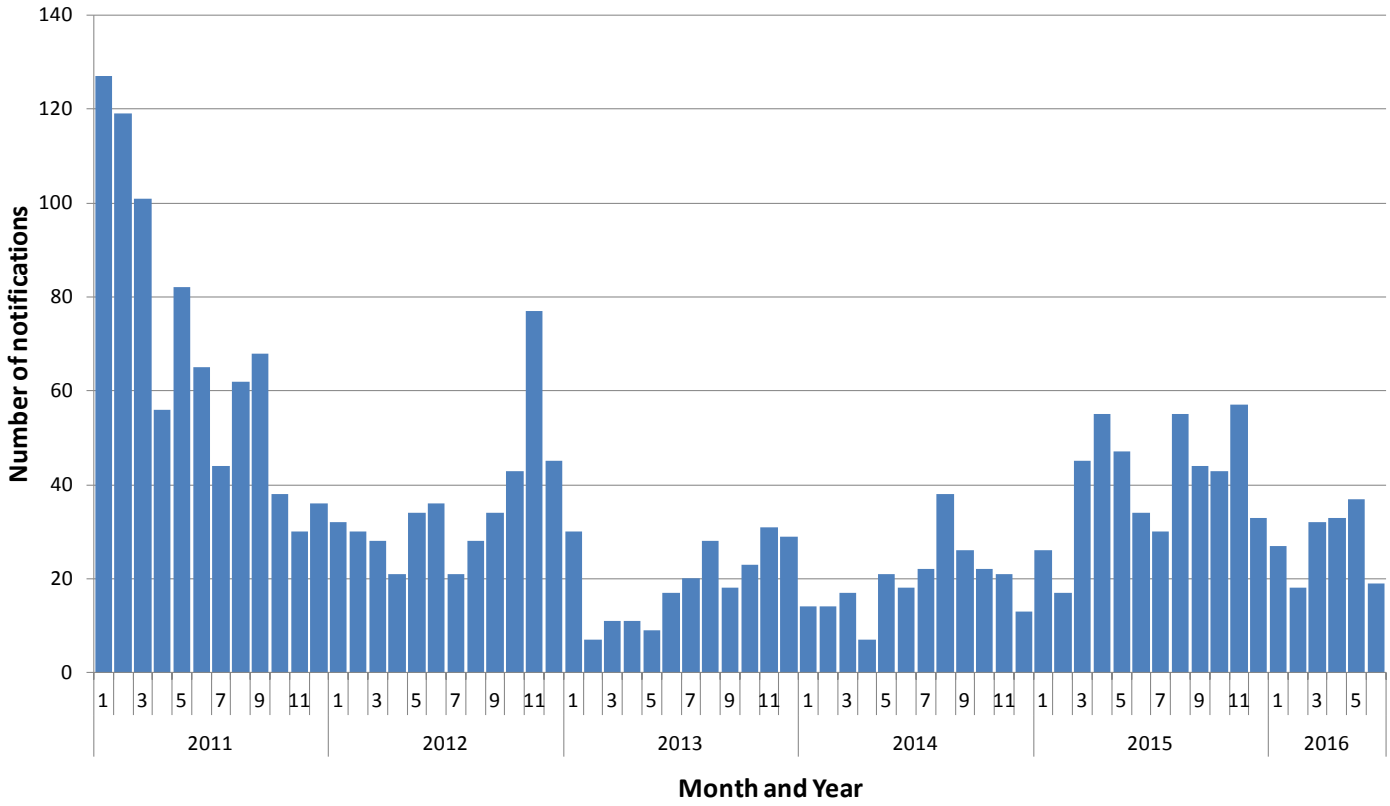

Figure: Number of pertussis notifications in the ACT, 1 January 2011 to 30 June 2016.

Gastrointestinal Diseases

During the second quarter of 2016, notifications of pathogens typically responsible for foodborne disease were similar to the five year second quarter average.

There was one outbreak investigated during the second quarter of 2016 that was determined to be of probable foodborne origin. This outbreak was identified through routine interviewing of notified Salmonella cases. There were 20 laboratory confirmed cases of Salmonella identified in this outbreak, including two hospitalised cases. The outbreak was linked to a food premise and was caused by two different strains of *Salmonella Typhimurium*.

Vectorborne and Arbovirus infections

There were seven notifications of dengue virus infection notified in the second quarter of 2016, in addition to the 13 notified during the first quarter. Year-to-date there have been a total of 20 cases, which is more than double the five year average for this time period. Dengue is a viral illness spread by the Aedes aegypti mosquito. The virus itself is not endemic in Australia, but there is potential for transmission locally due to the presence of Aedes aegypti in parts of northern Australia. Symptoms typically include sudden fever, chills, severe headache with pain behind the eyes, swollen glands, muscle and joint pain and extreme fatigue. All 20 cases diagnosed with dengue infection this year acquired their infections overseas, primarily in countries in south and south-eastern Asia. The best way that travellers can reduce the risk of becoming infected with a mosquito-borne virus is to take measures to prevent being bitten by mosquitos. This includes using appropriate repellents, mosquito nets and covering up with light coloured long clothing.

Respiratory conditions

There were eight notifications of tuberculosis (TB) during the second quarter of 2016, making a total of 15 notifications YTD in 2016, which is 1.5 times the five year YTD average (2011-2015). TB is caused by *Mycobacterium tuberculosis* and it can cause lung disease (pulmonary TB), disease in any other part of the body, most commonly the lymph nodes (extrapulmonary TB), or both pulmonary and extrapulmonary disease. Symptoms of pulmonary TB can include cough, fever, sweats, weight loss, and haemoptysis (coughing up blood). Most people infected with *M. tuberculosis* remain asymptomatic, and only about ten percent develop clinical illness during their lifetime, sometimes many years after the original infection. In 2016, five notified cases had pulmonary TB, nine cases had extrapulmonary TB, and one case had both pulmonary and extrapulmonary TB.

Changes to approvals for controlled medicines

From 1 August 2016, amendments were made to the Medicines Poisons and Therapeutic Goods Regulation to introduce a more flexible approach for controlled medicine approvals. The framework that existed prior to these amendments whilst providing regulatory oversight, was burdensome for prescribers, pharmacists and ACT Health. This change will improve public health outcomes and at the same time reduce unnecessary regulatory burden and red tape. The amendments allow for prescribers to apply for approval via category as set down in the Prescribing Standards or by drug which is consistent with the previous approval approach. These standards have been developed with reference to relevant medical literature, when available, and in consultation with medical specialists and independent experts.

For further information, go to http://www.health.act.gov.au/public-information/businesses/pharmaceutical-services/controlled-medicines or contact (02) 6205 0998 or hps@act.gov.au.

Smoke-free Legislative Amendment Bill 2016

The Smoke-Free Legislation Amendment Bill 2016 came into effect on 1 August 2016. The Bill prohibits the sale of e-cigarettes to children, bans the use of e-cigarettes in identified smoke-free areas, and places restrictions on e-cigarette advertising, displays and marketing.

The Bill applies the same restrictions on the sale and promotion of e-cigarettes as those that currently apply to tobacco products. This includes prohibiting the sale of e-cigarettes to children under 18 years of age and restricting in-store and point-of-sale advertisements and displays. The Bill also prohibits e-cigarette promotions, inclusion in customer reward schemes, sponsorships and product giveaways.

This new legislation aims to protect public health without limiting access to e-cigarettes by adult smokers wanting to quit and aligns with advice from the National Health and Medical Research Council, to minimise potential harm to the community pending further evidence on the safety, quality and efficacy of e-cigarettes.

Image: Health promotion campaign. ACT Health

Outbreak of gastroenteritis in a visiting school group: an example of a frontline public health response

Each year numerous school groups from around the country visit the Australian Capital Territory (ACT). Occasionally, particularly during the winter viral gastroenteritis season, these groups suffer from outbreaks propagated by person-to-person transmission. In unfamiliar settings, with often busy travel schedules, limited staffing resources and children away from home, gastroenteritis outbreaks in visiting school groups are potentially stressful and delicate situations that require special attention from local health services. Paired with the potential for outbreaks to spread into local communities and/or, throughout ACT accommodation facilities and thereby result in pressure on our health services, a timely and coordinated response to these scenarios is required. In August 2016, ACT Health responded to an outbreak of gastroenteritis in a visiting school group at a popular tourist accommodation facility.

Initial notification

Early on 5 August 2016, the ACT Chief Health Officer (CHO) was notified of an outbreak of gastroenteritis by the ACT ambulance service, who received a call out to attend multiple 'gastro' cases in a visiting school group. Twenty students and several teachers were reported to be unwell with vomiting and diarrhoea, out of a group of 60 students and 14 teachers and parent chaperones. Cases had been reviewed and provided oral hydration therapy; no children were hospitalised. The group, who had travelled from Brisbane, had spent time in the ACT and the New South Wales Snowy Mountains and was due to return to Brisbane on a commercial flight via bus to Sydney on Saturday 6 August 2016. Shortly thereafter, staff from the Communicable Disease Control Section (CDC) of the Population Health Division of ACT Health contacted the teacher in charge of the trip who reported that staff had limited capacity at that point to continue to care for the number of sick children, owing to illness and fatigue, and that further cases had developed since ACT Ambulance had attended overnight.

Response

The CDC took on a coordinating role for ACT Health in the management of this outbreak. By mid-morning a team consisting of an infection control officer, public health medical officers and epidemiologists attended the accommodation facility where the group was staying. They brought with them supplies of personal protective equipment for ACT Health staff, as well as for the carers at the facility. The Executive of Calvary Public Hospital offered their support and the CDC requested a team of emergency room clinicians to provide further clinical assessment of cases on site. The Health Emergency Management Unit also contacted the ACT Community Services Directorate (CSD) to request assistance to relieve tired and sick staff members in caring for the children.

On arrival to the site, sick children and staff had been isolated from the rest of the group and the Calvary clinical team were already undertaking their clinical assessments. The CDC team began interviewing cases using a modified generic questionnaire, which included a food history for the previous three days, as well as a description of symptoms and time of onset. After several cases were interviewed, food histories and illness characteristics were assessed. Using this information, and in consultation with the Calvary clinical team, it was hypothesised that person-to-person transmission of a viral agent was the likely source of the outbreak. Food histories were subsequently not continued for the remainder of cases. Data were captured and analysed using Microsoft Excel.

Infection control assessment was undertaken by the infection control officer, who liaised with management to ensure appropriate procedures were in place for environmental cleaning and laundry services. Healthy students and staff members were given an education session about correct hand washing technique and hand hygiene. It was established that the bus company transporting the group had robust infection control procedures in place.

The CSD deployed two staff and enlisted a volunteer from the Red Cross to assist with the care of students, providing valuable relief to the teaching staff. On Friday night, 5 August 2016, in response to a report of the onset of illness in a further five students and three teachers, Calvary Hospital, on request by the on-call CHO deployed an emergency department nurse to provide clinical assessment and assistance. No cases were hospitalised.

Image: HPS staff. ACT Health

Results

A total of 27 students, five teaching/chaperone staff and two accommodation facility staff reported illness, resulting in 34 people unwell in total with ages ranging from 12 to 55, with a median age of 12 years. The index case reported illness onset on Wednesday, 3 August 2016, at 12:00pm. One other case was reported the same day. Nine cases reported onset Thursday, 4 August 2016, and 21 cases reported onset on Friday, 5 August 2016 (figure 1). Two staff from the accommodation facility reported onset of illness on Saturday 6 August 2016 (figure 1).

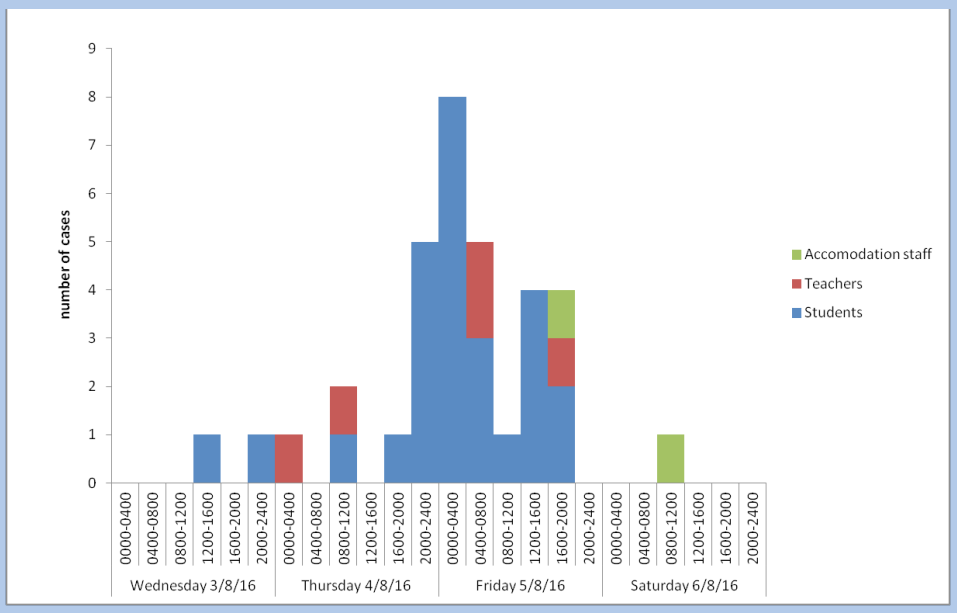

Figure 1: Number of cases by date and time of onset

Among cases interviewed (n=25) 20 (80 percent) of cases reported vomiting, 13 (52 percent) reported diarrhoea, 20 (80 percent) reported nausea, nine (36 percent) reported fever, 14 (56 percent) reported chills, eight (32 percent) reported Muscle aches and pains, 14 (56 percent) reported headache and 17 (68 percent) reported fatigue. Five cases reported 'other symptoms', three reported sore throats, one reported dizziness and one reported flu-like symptoms. On Saturday 6 August 2016 the on-call CHO contacted the school group to get a situation update. The teacher reported no further cases overnight and as of 8.00am no students or teachers were symptomatic. The commercial airline the group was booked with was advised and was happy to accept the school group on board for travel, providing all cases were asymptomatic. The group was cleared to depart and return to Brisbane.

Conclusion

Considering the frequency of school group travel to the ACT, it is important to be prepared for gastroenteritis outbreaks in these groups. The timely response to this outbreak coordinated between multiple Divisions within ACT Health (supported by ACT ambulance and Calvary Public Hospital) resulted in the successful treatment, containment and resolution of the outbreak, without the need for a single case to receive hospital-based treatment. This highlights the resilience of the ACT Health system to respond to outbreaks of this nature and the capacity for different ACT Government and external agencies to work together. Further, it demonstrates how timely public health intervention in the community can be a highly effective hospital-avoidance strategy.