Abstract

Background
Pharmacist administered vaccinations (PAV) have been shown to be safe, accessible and to improve health outcomes both internationally and more recently in Australia. In February 2014, Minister Robyn Lambley announced “changes to the Medicines, Poisons and Therapeutic Goods Act that would provide safe and easy access for Territorians to vaccines,” allowing pharmacists to administer certain vaccines to adults in their community pharmacies. A Northern Territory pharmacist-led immunisation pilot (NT-PLIP) was established to investigate the benefits of suitably trained, registered pharmacists administering adult immunisations in the community pharmacy setting. This study reports on the evaluation of NT-PLIP, including accessibility, acceptability and safety of PAV to inform future pharmacist immunisation service delivery in the NT.

Methods
Quantitative data was obtained about each vaccine administered by pharmacists from pharmacy software. A questionnaire was administered post-vaccination at the service to determine reasons for accessing PAV and assess participant satisfaction with the service. Pharmacist vaccinators were asked to complete a questionnaire about service delivery and feasibility. Pharmacists enrolled in the NT-PLIP were invited to complete an interview for feedback on strengths and limitations of service delivery.
Results
A total of 189 people were vaccinated by 5 community pharmacies in the NT. All those vaccinated reported satisfaction with service delivery and accessibility and 33% reported they would not have been vaccinated if the service was not available in the community pharmacy. There were no adverse events following immunisation. Pharmacists and those vaccinated who were surveyed reported that they would like to see the service continue outside the pilot.

Discussion
The PAV service is safe, accessible and increases options for accessing vaccinations for adults in the community. Staffing levels were a recognised hurdle to offering the service and further opportunities for ongoing education for pharmacists was identified as a need. Interaction with other health care professionals was mostly supportive and collaborative.

Conclusion
Pharmacist administered vaccination in the NT was well received by the public and pharmacists. Both pharmacists and those vaccinated have demonstrated a willingness for the service to continue.

Key words: pharmacy; vaccinations; immunisation; pharmacist administered vaccination.

Background
Internationally, pharmacists in the USA, Canada, New Zealand, Portugal and the UK can administer vaccinations.1-3 Recently jurisdictional regulations across all Australian states and territories have been modified to enable pharmacists to administer vaccines.4-10 Research indicates that pharmacist administered vaccinations (PAV) do not cause a reduction in the number of vaccines administered by established vaccinators, such as medical doctors and nurses, but add to the total number of adult vaccinations given. Increased vaccination is linked with a decreased disease burden and associated cost benefits. Data reveals that PAV are not linked with an increased incidence of adverse events or safety issues.3

In February 2014, Minister Robyn Lambley announced “changes to the Medicines, Poisons and Therapeutic Goods Act (2012) that would provide safe and easy access for Territorians to vaccines,” allowing appropriately trained pharmacists to administer certain vaccines to adults in their community pharmacies.

In response to this announcement the Chief Health Officer (CHO) established a pharmacist-led vaccination Working Party in July 2014. The role of the Working Party was to provide recommendations on safe service delivery of PAV including the qualifications and educational standards required, the facilities, documentation and recording, indemnity, equipment for storing vaccines needed and how to dispose of equipment and medical waste.

In June 2015, the CHO authorised a pilot study, namely the NT Pharmacist-Led Immunisation Pilot (NT-PLIP) based on the Queensland Pharmacist Immunisation Pilot (QPIP), to be conducted under the NT Medicines, Poisons and Therapeutic Goods Act.11, 12 The aims of the NT-PLIP were to investigate the benefits of appropriately trained, registered pharmacists in administering adult (aged >16 years) immunisations including influenza, measles-mumps-rubella (MMR), diphtheria, tetanus and pertussis (dTpa) to members of the general public in the community pharmacy setting. The pilot further aimed to review the accessibility, acceptability and safety of PAV in the NT and inform future service delivery.11

According to the Scheduled Substance Treatment Protocol for Pharmacist-Led Immunisation in Pharmacy Businesses and Pharmacy Department, pharmacists administering vaccines under the pilot had to have completed an approved training program, have current first aid and cardiopulmonary resuscitation certificates and hold current professional indemnity insurance.13 Community pharmacies offering the services conformed to the requirements of the NT Pharmacy Premises Committee: Premises and equipment standards for Pharmacy based Immunisation Programs.14

Methods
All 5 community pharmacies enrolled in the NT-PLIP used the GuildCare® Vaccination Recording program software to document service delivery. Permission was sought, from the Human Research Ethics Committee of the NT Department of Health and Menzies School of Health Research, to obtain de-identified data from this software to evaluate the pilot and
identify the total number of vaccines administered.

To help identify consumer satisfaction and obtain information in addition to that gathered in GuildCare® those vaccinated were invited to complete a questionnaire during the required 15 minute observation period directly following immunisation. The questionnaire contained no personal identifiers and asked about reasons for accessing pharmacy vaccinations and length of time since the person’s last vaccination. Data was analysed using Excel and STATA and the number of people vaccinated by vaccine type, age and sex was aggregated. The number of Adverse Events Following Immunisation (AEFI) was collated and analysed.

Feedback from pharmacists was also collated. All pharmacist vaccinators enrolled in the NT-PLIP were asked to complete a questionnaire. The questionnaire aimed to obtain information from pharmacists about training, service feasibility, the strengths of the pilot and suggestions for changes in the future. Qualitative interviews with pharmacists were also conducted to further explore trends, illuminate data and help inform future directions.

Results

In total, 5 community pharmacies participated in NT-PLIP. Of the pharmacies participating, 2 were located in Darwin, 1 was located in Palmerston and 2 were located in Alice Springs, Central Australia. All pharmacy sites were assessed by the NT Medicines and Poisons Control staff and met the requirements for an approved site. All pharmacies displayed publically their approved pilot site certificate.

All 5 community pharmacies were located within a shopping complex. Pharmacies were from a range of banner groups and opening hours differed between sites.

Participant information

The 3 vaccines approved for administration by pharmacists participating in the NT-PLIP were, influenza, measles-mumps-rubella (MMR) and adult pertussis-containing vaccine (dTpa). Immunisation data from the Pharmacy Guild software between 1 March and 30 September 2016 showed 189 vaccines were given; 180 (95%) influenza vaccine and 9 (5%) dTpa vaccines. No MMR vaccines were administered. During the pilot study, 189 people were administered vaccines of whom 64 (34%) voluntarily completed the questionnaire. Data reveals that the 45–65 year age-group received the most PAVs (36%). This was followed by the 31-45 year (27%) and 16-30 year age-groups (25%).

From the questionnaire, 1 participant (1.6%) identified as being Aboriginal or Torres Strait Islander. There were 6 participants (9%) who had chronic medical illnesses that required regular medical follow up or hospitalisation. Chronic medical illnesses that were identified included underactive thyroid, asthma, eczema, migraines and coronary artery bypass graft.

Of the participants who completed the questionnaire 38 (59.4%) indicated that in previous years they had been vaccinated at a general practice clinic (participants were not asked to indicate the type of health professional that administered previous vaccines), 15 participants (23.4%) reported they had been previously vaccinated at work, and 3 (4.69 %) reported being vaccinated at either a community or Aboriginal Health Service. There were 5 participants (7.8%) who reported they had never been vaccinated; however, the survey instrument did not differentiate between whether they had never been vaccinated with the influenza vaccine that they received in the pharmacy that day, or if they had never been vaccinated in their lifetime. ‘Other’ locations for previous vaccinations were cited by 10 participants (15.62%), which included schools, private health fund providers, hospitals, a pharmacy (administered by a nurse) and a university.

Almost half (48%) of the participants reported that they had received their last vaccine in the past year, while 39% reported they received their last vaccine more than a year ago and 5% reported the last vaccine they had received was as a child. One participant (2%) reportedly had never been vaccinated and 1 was unsure of any past vaccination.

Why did participants receive their vaccination at the pharmacy?

When participants were asked why they had received their vaccination at the pharmacy that day, the most frequently selected response was “I don’t want to get sick” (27%) followed by “The service was quick and easy to
access” (22%); “Friendly staff and relaxed environment” (22%) and “No appointment required/It was easy to book an appointment” (20%). There were 2 participants (3%) who indicated that their general practitioner (GP) had recommended the service (Table 1).

Table 1. Why participants received their vaccine in the pharmacy setting (n=64)

<table>
<thead>
<tr>
<th>Reason</th>
<th>%</th>
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<tr>
<td>I don’t want to get sick</td>
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</tr>
<tr>
<td>Service quick and easy to access</td>
<td>22</td>
</tr>
<tr>
<td>Friendly staff and relaxed environment</td>
<td>22</td>
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<tr>
<td>No appointment required/easy to book an appointment</td>
<td>20</td>
</tr>
<tr>
<td>Pharmacist recommended</td>
<td>17</td>
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<tr>
<td>Flexibility to choose where I get immunised</td>
<td>16</td>
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<td>14</td>
</tr>
<tr>
<td>Travelling overseas</td>
<td>9</td>
</tr>
<tr>
<td>Travelling Australia</td>
<td>3</td>
</tr>
<tr>
<td>Work requirement</td>
<td>3</td>
</tr>
<tr>
<td>GP recommended</td>
<td>3</td>
</tr>
</tbody>
</table>

Where would participants have been vaccinated if the service was not available in the pharmacy?

The majority of participants (63%) indicated that they would have been vaccinated by a GP if they did not receive their vaccination in the pharmacy. Of importance, 30% indicated that they would not have been vaccinated if the service was not offered at the pharmacy.

Participant perception of pharmacist administered vaccinations

The service was well received. All vaccine recipients (100%) recorded that they would be happy to both receive a vaccination in the pharmacy in the future and recommend this service to others. Participant satisfaction was recorded using a 5 point Likert scale, where participants indicated a score of 1 if they were ‘very unsatisfied’ or a score of 5 for ‘very satisfied’ with service delivery in the pharmacy. Participants reported a mean satisfaction score of 4.5, indicating an overall high level of satisfaction with pharmacist-led immunisations.

Comments provided in the open text box at completion of the survey stated that the service could be improved by: “removal of the 15 minute wait period”, “advertisement—tell more people”, and “more pharmacies on board”. Other comments recorded include: “excellent service and convenience” “great service—thanks” “very easy and convenient and probably wouldn’t have got vaccinated this year if I didn’t have it here”, “was satisfied with customer care and very helpful—thank you”, “nicely done! Great idea”, and “I’ll be back next year”.

Pharmacist feedback

Feedback was sought from pharmacists who participated in the NT-PLIP in 2 ways. Pharmacists were required to complete a ‘Pharmacist Feedback form’ and were invited to participate in a semi-structured guided interview. The interview aimed to obtain pharmacists thoughts, perspectives and experience administering vaccinations in the community pharmacy setting. Further the interview aimed to further collate information about how the service was actually rolled out in the unique environment of the NT. Interviews were transcribed, listed as a numbered pharmacist at each of the 5 pharmacy sites and manually analysed for themes. Themes that arose are discussed below.

NT pharmacists mainly focused on advertising and administering the influenza vaccine

While pharmacists were approved to administer 3 vaccinations according to the NT-PLIP guidelines, pharmacists across sites tended to focus their attention on promoting and advertising the administration of the influenza vaccine. “So we have mainly been focusing on the influenza vaccine” (Pharmacist 2, Site 1).

Another pharmacist reported that approximately 90% of vaccinations they administered were the influenza vaccine. The MMR vaccine, although approved for pharmacist administration, was not administered any of the sites during the NT-PLIP.

Improving vaccination uptake, a recognised benefit

Pharmacists reported that 1 of the main benefits of service delivery was improving immunisation
rates in the NT, particularly for those individuals not captured under the National Immunisation Program (NIP). Pharmacists identified that accessibility of the service, combined with the ability to walk into an appointment allowed people who may not have been immunised otherwise to be vaccinated.

“…the primary health care need for people who are not going to the doctor to get a vaccination, because of being time poor don’t want to see a doctor for some reason I don’t know, that was certainly the market that we seem to be capturing” (Pharmacist 6, Site 4).

People eligible under the NIP elected to have vaccine administered by a pharmacist

It was identified that some people who met the criteria for a free vaccination under the NIP elected to pay for and have the vaccine administered by a pharmacist. Every pharmacist reported providing all eligible participants with a choice of having the vaccine administered by a GP. Pharmacists reported that people chose to access PAV due to better accessibility, reduced or no wait time (particularly in Central Australia), and the likelihood of having to pay a gap fee at the doctors that was likely to be more than the cost of having the vaccine administered in the pharmacy.

“We always use the pre-vaccination checklist to screen for eligibility. Once I identified that someone was eligible I would let them know they could have a free vaccine from their doctor subsidised by the government. More than several people said they didn’t have time to wait at the GP and wanted to have their vaccine still in the pharmacy. They were happy to pay for the vaccine and the service in-full for the convenience. Also, not all doctors bulk bill so sometimes the gap fee is roughly the same price as our service in full” (Pharmacist 3, Site 1).

“Weell obviously we do the checklist, and if I see that they are eligible and they can get it, I always try and refer them to the GP clinic. There was probably 3 or 4 people, and it was mainly travellers as well as they couldn’t get appointments with the doctors, so they much preferred just getting it in the pharmacy. Very few doctors here bulk bill, so us providing the service it actually cheaper as well” (Pharmacist 5, Site 3).

Staffing levels, a recognised hurdle

Pharmacists recognised that administration of vaccines takes a pharmacist off the floor. This increases wait times for other core services which may generate more profit. In sole pharmacist stores, due to feasibility, at this stage the delivery of vaccinations does not allow for employment of another pharmacist on the floor.

“We would only offer that service if someone came in requesting a vaccination and there was only 1 of us here, we would only offer it when both of us would be on. So they may have to come back the following day.” (Pharmacist 6, Site 4).

General practitioners mostly supportive

Despite pharmacists reporting initial concerns about overlapping with GP clinics in their scope of practice, all but 1 pharmacist reported that NT GPs were largely supportive of the service. Of note, some GPs would direct their own patients for a PAV.

“Um, I think I’ve been concerned this would be a sticky subject even though we are looking at capturing clients who would not have visited the GP anyway due to time constraints and trying to offer an after-hour service, although this has been a bit difficult because you have to have the right number of trained staff. We have had some doctors writing scripts and then going—‘go to your pharmacist to have it injected’—that has happened once or twice before.” (Pharmacist 2, Site 1).

Cost saving for the government budget

As pharmacists are not renumerated for administering vaccinations, when people elect to have a vaccine administered by their pharmacist instead of seeing a GP, the government saves money from 1 less Medicare Benefits Schedule claim. Pharmacists reported that consumers identified that cost was equivalent or in some cases less than paying a Medicare gap. Other consumers reported that the accessibility of the service was worth paying for despite being eligible for a free NIP vaccine administered via a GP.

“…of 3 or 4 people who were entitled and those people said ‘Look I pay to go and see my doctor any way I may as well just pay you and have the
vaccine done, have it quickly done’. So I didn’t need to do any referrals’” (Pharmacist 4, Site 2).

“And for some vaccines, it’s cost effective for the government as well. Getting it at a pharmacy would probably be more of a cost-saving measure even to the government.” (Pharmacist 5, Site 3).

Pharmacists would like to see the service continue in the NT

Pharmacists, both those who reported being very confident and those indicating they were not as confident, agreed that PAV should continue in the NT. Pharmacists identified that the service had increased availability and uptake of vaccinations and therefore may improve individual and community health outcomes.

“I think it’s great, I think especially in rural areas where seeing a doctor would actually be pretty hard, you have to wait a week or 2 sometimes, it’s definitely helping more people get their vaccinations, so that is a positive.” (Pharmacist 5, Site 3).

Pharmacists reported that being able to provide a direct healthcare service to individuals increased public perception that pharmacists are highly trained health professionals. The service delivery was linked with increased job satisfaction for some pharmacists.

“It actually became a very good part of my job.” (Pharmacist 4, Site 2).

“Really really good, the service needs to continue, it’s a positive for vaccination uptake and for the pharmacy profession.” (Pharmacist 3, Site 1).

Discussion

Consistent with the findings from the QPIP, NT participants were very satisfied with service delivery and would be happy to have their vaccinations from a pharmacist in the future.

While position statements from the Australian Medical Association voiced opposition to PAVs, data from the pilot identified that in the NT, medical doctors were mostly supportive, with some even referring patients to their pharmacist for vaccinations.

While the pilot enabled pharmacists to administer the different vaccines (influenza, dTpa, MMR) the MMR vaccine was not administered. This is most likely due to a lack of awareness and publicity about pharmacists being able to administer the vaccine. Increased advertisement and publicity that pharmacists can administer (MMR and dTpa) vaccinations in addition to the influenza vaccine should see more people utilise the service.

Conclusion

The findings of the pilot are consistent with findings reported both internationally and in other Australian jurisdictions on PAVs. Specifically, PAVs are safe, accessible, linked with consumer satisfaction and increase vaccination uptake. Further, appropriately trained pharmacists report increased job satisfaction with their expanded scope of practice. An increase in the number of pharmacists trained to administer vaccinations is needed to address workforce and workflow issues. It is appropriate to continue to offer PAVs in the NT outside the pilot study.

References

2. Traynor K. With Maine on board, pharmacists in all 50 states can vaccinate. ASHP 2009.
Shoe project to raise awareness about melioidosis and its prevention

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Abstract

Melioidosis is a potentially fatal infection caused by bacteria found in the soil in tropical locations including the Top End of the Northern Territory. The disease most frequently occurs in The Wet season with certain population groups at higher risk. Prior to each Wet season the Centre for Disease Control undertakes an awareness campaign to raise public awareness regarding measures that can be taken to avoid getting the disease, melioidosis. One of the main messages is to wear shoes in The Wet. This article summarises a novel, collaborative approach aiming to raise awareness and to reduce melioidosis incidence among the homeless community of Darwin.

Key words: melioidosis; Burkholderia pseudomallei; shoes; Northern Territory.

Background

Melioidosis is a potentially life-threatening disease caused by infection from the bacterium Burkholderia pseudomallei.1 The bacterium is found in the soil and surface water in melioidosis-endemic regions including the tropics of northern Australia and Southeast Asia.2 The disease is more common in The Wet season months of November to April in the Northern Territory (NT).

Infection occurs via percutaneous inoculation, (for example when the bacteria enter the body through an open wound) by inhalation of aerosolised bacteria or on rare occasion by ingestion.2 Melioidosis spans a wide spectrum of illness from single skin lesions that may or may not heal spontaneously through to pneumonia, genitourinary infection, septic arthritis,
abscesses in internal organs such as the liver, spleen and prostate and in some cases septic shock and death.\textsuperscript{3,4} Improved diagnosis and treatment in the NT has resulted in mortality from melioidosis falling from 30\% in the 1990s to less than 10\% at present.\textsuperscript{4}

The annual incidence rate of melioidosis in the Top End of the NT is 50 cases per 100,000 people.\textsuperscript{4} The incidence of melioidosis peaks between 40–60 years of age and occurs less frequently in children.\textsuperscript{5} Certain groups of people are more at risk of the disease. These groups include diabetics, hazardous alcohol users (including binge drinkers), those who are immuno-suppressed, have cancer, chronic lung disease or renal disease.\textsuperscript{4} Males and Aboriginal people are also at higher risk.\textsuperscript{4}

**Shoe project**

Each year the NT Centre for Disease Control (CDC) conducts an awareness campaign to increase public awareness of melioidosis. In 2015 the CDC identified the need to increase melioidosis awareness in the Top End with a specific emphasis on targeting those most at risk.\textsuperscript{6} Part of the campaign involved working with Larrakia Nation to increase melioidosis awareness in the homeless community of Darwin.

Larrakia Nation is an Aboriginal Corporation that provides support, services and membership to Darwin’s Indigenous people—the Larrakia people. The Larrakia Health Outreach and Assistance in the Long-grass (HEAL) branch improves the health and wellbeing of people living rough, commonly known as ‘long-grassers.’ The HEAL program staff monitor people’s health, provide information and primary health interventions such as the provision of thongs and condoms, conduct environmental safety audits of campsites and facilitate a weekly arts workshop called ‘Arts in the Grass.’\textsuperscript{7}

The ‘Arts in the Grass’ program is held every Wednesday morning at various locations around Darwin but most frequently at Vestey’s Beach. The HEAL program staff provide art materials for homeless people in the area and a BBQ lunch that provides a means to observe the health of this community with the aim to provide helpful assistance.

Larrakia Nation and CDC teamed together to engage the homeless community in a shoe art project as part of the ‘Arts in the Grass’ program in the Wet seasons of 2015/16 and 2016/17. The project received generous sponsorship in late 2015 from Inpex as well as from Big W and Target to purchase shoes and painting materials. Attendees at the ‘Arts in the Grass’ program were encouraged to paint shoes (see Figure 1). The shoes were photographed when finished and then the artist kept and wore their newly decorated shoes.

CDC staff members attended the ‘Arts in the Grass’ program to engage with the homeless community and provide melioidosis prevention messages according to the CDC melioidosis fact sheet (see pages 11-12).\textsuperscript{8} A key message was to wear shoes in The Wet. HEAL program staff were also provided with informal education regarding melioidosis and reinforced the melioidosis prevention messages during the program.

In The Wet season of 2016/17 the project targeted a broader audience. This time shoes were delivered by Larrakia Nation staff to the Darwin Sobering Up Shelter at Coconut Grove and St Vincent De Paul Society’s Ozanam House at Stuart Park to encourage homeless people at risk of melioidosis to wear shoes. The CDC melioidosis poster ‘Don’t Get Melioidosis’\textsuperscript{9} was distributed to the facilities to provide further education regarding melioidosis (see page 10). Shoes and painting materials were
provided to the Larrakia Nation’s Palmerston Culture and Family Centre. This Centre held shoe painting workshops (see Figure 2) and provided melioidosis messages to Aboriginal families in Palmerston by distributing the CDC ‘Don’t Get Melioidosis’ poster, the melioidosis fact sheet and via personal discussions regarding melioidosis.

Shoes were also provided to renal dialysis patients at Nightcliff Renal Service to help prevent this high risk group from getting melioidosis. Education regarding melioidosis was provided by CDC staff to renal staff on site to reinforce the melioidosis messages to be delivered to renal dialysis clients. The generous sponsorship by the companies above enabled the purchase of 630 pairs of shoes over 2 years as well as large quantities of paint and painting materials.

Conclusion

The shoe art project to raise awareness about melioidosis is an innovative approach, using local organisations and businesses to deliver a key melioidosis prevention message, i.e. to wear shoes. This served as a focal point for further melioidosis prevention and awareness messages. CDC will continue to raise public awareness about melioidosis each Wet season in the aim of reducing the incidence of this debilitating and sometimes fatal disease.

Acknowledgements

Larrakia Nation HEAL Program staff and Palmerston Culture and Family Centre staff for their dedication to the project. Inpex, Target Palmerston and Big W Casuarina for their financial support for this project. Anthony Draper and Vicki Krause from CDC for their direction and involvement in the project.

References


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Don’t get MELIOIDOSIS

Melioidosis is a serious disease caused by germs in our soil that surface after heavy rains. These germs enter your body through cuts and sores or you can breathe them in.

Your risk is greater if you have diabetes, kidney disease, drink too much alcohol, or have a weakened immune system.

Protect yourself from melioidosis

- Wear shoes during the wet season
- Wear gloves when working outside
- Wear a mask when using a high pressure hose
- Stay indoors during storms
- Take it easy with alcohol

For more information visit health.nt.gov.au or search ‘melioidosis fact sheet’
What is melioidosis?
Melioidosis is a disease caused by bacteria known as *Burkholderia pseudomallei*. The bacteria live below the soil's surface during the dry season but after heavy rainfall are found in surface water and mud and may become airborne.

How is it spread?
The bacteria that causes melioidosis usually enters the body via cuts and sores in the skin or via inhalation of dust or droplets and very rarely by ingestion of contaminated water.

The disease has been found among some domestic and farm animals. Melioidosis does not usually spread from one person to another or from animals to humans.

Where does melioidosis usually occur?
Melioidosis is found in tropical areas throughout the world, particularly in South East Asia and northern Australia.

In Australia cases typically occur in the Top End of the Northern Territory (NT) and in far north Queensland and the Kimberley region of Western Australia. Cases have been found in the NT occasionally as far south as the Tennant Creek region.

What are the symptoms?
The symptoms of melioidosis depend on the site of the infection and this can vary. Often it starts as a chest infection with shortness of breath, productive cough and fever. Other possible presentations include fever with headache and confusion, or pain and/or difficulty passing urine. People can become ill from 1 to 21 days after being infected and the onset of symptoms may be sudden or gradual.

The infection can be fatal and melioidosis requires urgent medical attention and treatment with specific antibiotics.

In some cases the illness may come on much more slowly with weight loss, intermittent fever, chest pain and a cough. Some people may present with skin ulcers, boils or joint or bone infections.

There have also been cases where the disease has caused illness many years after the initial infection. In these cases, the bacteria have been carried by the person and have become active due to a weakening of the immune system.

The diagnosis of melioidosis is made by growing the bacteria with laboratory testing of blood, sputum, urine or a swab from an abscess or non-healing ulcer.

Who is at risk?
People most at risk are those with conditions such as diabetes, heavy alcohol consumption, kidney disease, lung disease, and cancer and those on immunosuppressive therapy including steroids.

Healthy people can also get the disease if they work in muddy soil without good hand and foot protection. Children are at a lower risk for acquiring melioidosis compared with adults. However, it is still possible for children to acquire melioidosis during the wet season, particularly those with chronic diseases or weakened immune systems.

What is the treatment?
All patients should be admitted to hospital initially. They are treated with antibiotics which usually have to be continued for at least
3 months. If treatment is started early, recovery is usually complete. It is important to complete all antibiotics to prevent a relapse.

How can melioidosis be prevented?
There is currently no vaccine against melioidosis. Therefore preventive measures are the key to avoiding infection. People with past melioidosis can be infected again after new exposure.

Waterproof shoes or boots will protect your feet when you walk in wet soil where there is pooled water or you work in muddy conditions, for example, when gardening or working in excavations. Open footwear such as sandals are not very good protection. Protective gloves should be worn when handling soil, particularly during the wet season.

Wounds should be promptly and thoroughly washed clean and covered.

If necessary, use pumping equipment to control water ingress when working in excavations.

Due to the potential for aerosolisation (airborne droplets) of *Burkholderia pseudomallei* people with risk factors such as diabetes, heavy alcohol consumption, kidney disease, lung disease and cancer and those on immunosuppressive therapy should stay indoors during periods of heavy wind and rain in the Top End. People using high pressure hoses around soil should cover their mouths and noses with a mask to avoid inhalation of bacteria.

Children should avoid playing in muddy areas, wet sandpits or places where water has pooled in grassy areas or where grassed areas are boggy. Sandpits which are dry or dry enough to comfortably play in are also low risk.

These preventative measures are most important if you have any of the following conditions:
- diabetes
- heavy alcohol consumption (>20 standard drinks a week or binge drinking)
- kidney disease
- lung disease
- cancer
- receiving immunosuppressive therapy, including steroids
- cuts or sores in your skin, particularly on the hands and feet.

For more information contact the Centre for Disease Control in your region

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<th>Contact Number</th>
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or

Syndromic surveillance for influenza: how well do remote primary health care diagnoses correlate with notified cases?

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Abstract

The Department of Health’s Primary Care Information System (PCIS) contains clinical data for all the Department’s clinics across the Northern Territory (NT) and can be analysed through the data warehouse using the reporting tool, Business Intelligence (formerly Business Objects). Utilising PCIS data for influenza surveillance will allow a greater understanding of trends and outbreaks of flu in remote communities and better prepare the NT for the next flu pandemic. Deriving relevant indicators from the data is a key step on the way to implementing a new surveillance system.

A 7 year extract of PCIS data containing all likely codes (from the International Classification of Primary Care list) relating to influenza encounters was analysed. Weekly counts of each code were compared with the counts of laboratory confirmed influenza from the NT Notifiable Diseases System using Pearson’s correlation coefficient. There were 10 codes whose counts were significantly correlated with the laboratory confirmed cases and had an r value >0.25. Their sum had a coefficient of 0.59. These codes will form the basis of indicators to monitor influenza trends in remote areas.

Introduction

Syndromic surveillance is a public health tool that involves the real-time (or near real-time) collection and analysis of data to identify a significant illness cluster before diagnoses are confirmed.1 This can enable the early identification of the impact—or absence of impact—of potential public health threats and may allow the early initiation of a public health response. Syndromic surveillance can be used to monitor the temporal and spatial distribution of an outbreak, evaluate outbreak control measures, facilitate planning and strengthen the capacity of local health services when needed. In the case of influenza, it can also assist with preparedness for future influenza or ‘flu’ pandemics, give a better picture of the epidemiology of influenza and help to inform vaccine policy.2 It is not based on laboratory-confirmed diagnoses of disease but on non-specific clinical signs, symptoms and proxy measures for health that constitute a provisional diagnosis (or ‘syndrome’). It is intended to supplement, not replace, existing active and passive surveillance systems.

Syndromic surveillance may function by the automatic generation of electronic signals from sentinel health care providers such as Emergency Departments or General Practitioners (GPs), which subsequently transmit the information to public health units.3 Public health officials monitor this information either continuously or at regular intervals each day. Automated systems then detect a rise in cases (‘signal’) above a certain threshold that is considered normal for that population (‘noise’) in time and place and subsequently generate an alert. In order to be cost-effective, the system needs to be as highly automated as possible to minimise the workload on busy clinical and public health staff.

For the last 10 years, there has been increased interest in enhancing the quality and quantity of influenza surveillance in the Northern Territory (NT), particularly to prepare for future influenza pandemics.

Influenza surveillance in the NT now includes 6 separate data sources:

- Laboratory-confirmed notifications, entered in the NT Notifiable Disease System (NTNDS)
- Emergency Department Influenza-Like Illness (ILI) Syndromic Surveillance (EDILISS) at all NT hospitals
- Sentinel GPs reporting rates of ILI in their practices through the Australian Sentinel Practices Research Network (ASPREN)
- The results of NT residents reporting weekly to the national web-based survey (FluTracking)
- Respiratory-related mortality figures from the Births, Deaths and Marriages and Reporting from the NT sentinel hospital as part of the national active surveillance system (FluCan).
These systems set up the NT to be in a good position to monitor the next flu pandemic in urban centres. However in the past there has been variation in the patterns of flu between urban and remote settings, both in the timing and size of flu epidemics (Unpublished data, CDC NT). Due to the low numbers of sentinel GPs participating in ASPREN in remote areas, surveillance is reliant upon health care staff testing for flu, ad hoc reporting of an increase of ILI cases to the Centre for Disease Control (CDC) by phone or the evacuation of the more severe cases to hospital. This means that detection of flu outbreaks in remote communities can be delayed. Given that many residents of remote communities are vulnerable to severe complications of influenza, early detection of outbreaks and pandemic planning are especially important.

Approximately 50% of remote community health services in the NT are run by the NT Department of Health and use a single clinical information system, the Primary Care Information System (PCIS). The data from PCIS is transferred to the data warehouse allowing analysis through the Department’s business analysis software (Business Intelligence, formerly Business Objects). Hence, analysis of the PCIS data looking for indicators of ILI, might be an easy and cost-efficient way of monitoring ILI in remote communities, in a similar way to the Emergency Department Syndromic Surveillance, which has been in place since 2008.

This paper describes a study that took the first steps towards a syndromic influenza surveillance system for remote communities in the NT. It aimed to determine which indicators in remote primary health care provide the best correlation with the number of confirmed influenza cases reported to CDC by laboratories via the Territory-wide NTNDS. This study used historical data and a technique previously described to identify ILI indicators in the Emergency Department setting3 that was used to establish the EDILISS for the NT in 2008.

Methods

Following examination of the data dictionary of items collected by PCIS, it was decided that the item most likely to yield meaningful data was ‘Primary ICPC’ (International Classification Of Primary Care). At the conclusion of each patient consult, PCIS requires clinicians to enter a ‘reason for the encounter’ into this field from a modified list of the International Classification of Primary Care 2nd Edition list of codes (ICPC-2 Plus). After consulting with the Remote Primary Health Care Reporting Unit, data of all ICPC-2 Plus reasons for encounter codes related to ILI for the 7 years from 01/01/2010 to 31/12/2016 were made available. The presentation codes chosen were all those which possibly might relate to a case of influenza. These are listed in Table 1.

Weekly counts for each ICPC-2 Plus code were calculated using STATA (Intercooled version 13.1) and ranked in frequency of occurrence, with a view of finding a group of codes with significant positive correlations which could then be summed for a total ILI indicator.

### Table 1. All ICPC-2 Plus codes investigated

<table>
<thead>
<tr>
<th>A – General and unspecified</th>
<th>R – Respiratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>A02001 Chills</td>
<td>R05002 Cough;smokers;febrile</td>
</tr>
<tr>
<td>A02003 Feeling;cold</td>
<td>R05004 Cough</td>
</tr>
<tr>
<td>A02004 Rigors</td>
<td>R05005 Cough;productive</td>
</tr>
<tr>
<td>A02005 Shivering</td>
<td>R05006 Cough;non-productive</td>
</tr>
<tr>
<td>A02006 Feeling;hot and cold</td>
<td>R05008 Cough;persistent</td>
</tr>
<tr>
<td>A03001 Feeling;feverish</td>
<td>R05009 Cough;nocturnal</td>
</tr>
<tr>
<td>A03002 Fever</td>
<td>R05010 Cough;post viral</td>
</tr>
<tr>
<td>A03003 Fever;unknown origin</td>
<td>R74007 Infection;upper resp tract</td>
</tr>
<tr>
<td>A03005 Pyrexia;unknown origin</td>
<td>R74009 Pyrexial cold</td>
</tr>
<tr>
<td>A03006 Temperature;high</td>
<td>R78001 Infection;chest</td>
</tr>
<tr>
<td>A03008 Fever;viral</td>
<td>R78002 Bronchitis</td>
</tr>
<tr>
<td>A29021 Feeling;hot</td>
<td>R78003 Bronchitis;acute</td>
</tr>
<tr>
<td>A77005 Viral illness</td>
<td>R78007 Infection;lower resp tract</td>
</tr>
<tr>
<td>A77010 Infection;viral</td>
<td>R80001 Flu</td>
</tr>
<tr>
<td>A77017 Viraemia</td>
<td>R80002 Influenza</td>
</tr>
<tr>
<td>A77020 Virus</td>
<td>R80004 Para influenza</td>
</tr>
<tr>
<td>A78008 Disease;infectious</td>
<td>R80005 Flu like illness</td>
</tr>
<tr>
<td>A78013 Fever;relapsing</td>
<td>R80006 Influenza;H1N1</td>
</tr>
<tr>
<td>A78051 Infection</td>
<td>R81001 Pneumonia;bronchopneumonia</td>
</tr>
<tr>
<td></td>
<td>R81002 Pneumonia;influenza</td>
</tr>
<tr>
<td></td>
<td>R81005 Pneumonia;viral</td>
</tr>
<tr>
<td></td>
<td>R81012 Pneumonia</td>
</tr>
<tr>
<td></td>
<td>R83009 Infection;respiratory</td>
</tr>
</tbody>
</table>
Uncommon codes (i.e. those with less than 1000 presentations over the 7 year period) were removed in order to avoid spurious correlations.

Pair-wise correlations were calculated for each ICPC code, comparing the weekly count of events for each code with the corresponding weekly count of influenza notifications derived from the NTNDS. Notifications for the whole of the NT were used and no regard was given to resident location. The correlations were subsequently ranked in order of increasing coefficient (Pearson’s r).

Identifiable data were not required for this study. This study was classified as ‘negligible risk’ under the National Health and Medical Research Council’s National Statement on Ethical Conduct in Human Research. Additionally, the study was classed as negligible/low risk on the Human Research Ethics Committee of the NT Department of Health and Menzies School of Research’s risk assessment checklist.

**Results**

The final analysis incorporated 120,616 primary care presentations and included 42 ICPC-2 Plus codes. Of these, 18 codes appeared in weekly counts at least 1000 times during the study period.

Fifteen of these ICPC-2 Plus codes had positive correlation coefficients and corresponding p-values below 0.05. The highest correlation coefficients (between 0.26 and 0.45) were for 10 codes that related to influenza or other respiratory syndromes (Table 2). These were all plausible surrogates for ILI, and all had p-values below 0.001. The other significantly correlated diagnosis codes had higher p-values.

The weekly counts of these ‘best 10’ ICPC-2 Plus codes were summed into a new time series and the correlation with the notifiable disease data set was calculated. The correlation coefficient for these 10 diagnoses combined was 0.59 (p<0.001). Figure 1 compares the sum of the 10 combined ICPC-2 Plus codes with notification counts by week.

**Discussion**

This study showed that presentations of ILI at remote primary health care clinics in the NT significantly correlated with notified influenza cases across the Territory. It identified 10 ICPC-2 Plus codes which were independently and significantly associated on a week-to-week basis with notified influenza.

This study only involved remote health clinics that use PCIS i.e. remote health clinics that are run by the NT Department of Health. Of the remote primary health care clinics in the NT, 50% are Aboriginal Community Controlled Health Services. These clinics are in communities that are generally clustered in geographic regions e.g. East Arnhem Land (Miwatj Health) and Katherine East (Sunrise Health Services) and may therefore have different influenza epidemiology. These services use a different clinical information system and so the same process of identifying ILI

<table>
<thead>
<tr>
<th>ICPC-2 Plus code</th>
<th>Description</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R80005</td>
<td>Flu like illness</td>
<td>0.447</td>
</tr>
<tr>
<td>A03002</td>
<td>Fever</td>
<td>0.391</td>
</tr>
<tr>
<td>A77005</td>
<td>Viral illness</td>
<td>0.383</td>
</tr>
<tr>
<td>R05004</td>
<td>Cough</td>
<td>0.363</td>
</tr>
<tr>
<td>R74007</td>
<td>Upper respiratory tract infection</td>
<td>0.357</td>
</tr>
<tr>
<td>R81012</td>
<td>Pneumonia</td>
<td>0.352</td>
</tr>
<tr>
<td>R78001</td>
<td>Chest infection</td>
<td>0.321</td>
</tr>
<tr>
<td>R80001</td>
<td>Flu</td>
<td>0.305</td>
</tr>
<tr>
<td>A03008</td>
<td>Viral fever</td>
<td>0.280</td>
</tr>
<tr>
<td>R78007</td>
<td>Lower respiratory tract infection</td>
<td>0.262</td>
</tr>
<tr>
<td><strong>Sum of top 10 codes</strong></td>
<td></td>
<td><strong>0.590</strong></td>
</tr>
</tbody>
</table>
presentations would not be able to be implemented, however the feasibility of a similar project should be assessed. The expansion of the project to include these clinics would give a much more accurate picture, as well as the ability to quickly detect an influenza outbreak occurring in these geographic areas.

Using linear correlation to compare time series data is not strictly the ideal method because of ‘autocorrelation,’ there is an association between counts in 1 time interval with counts in nearby intervals, thereby violating the assumption that the data are independent. However for the purposes of simply ranking the correlation coefficients of each presentation code it was assumed to be adequate.

All of the NT influenza surveillance systems, including the NTNDS, reflect separate samples of the total population with ILI in the NT. Each has its own unique strengths and weaknesses relating to sensitivity, specificity and sampling biases. All systems potentially play an important role in the early detection of influenza outbreaks. The advantage of remote community syndromic surveillance is that it can provide automated surveillance year-round of patients presenting to remote clinics. This study suggests it may be possible to detect an impending influenza outbreak using routinely collected primary health care data from remote communities.

The next challenge is to use the identified codes to develop indicators and thresholds that can be used by CDC to monitor ILI patterns by place and person and predict the onset of influenza seasons. Retrospective data analysis using the same data for this project could assist with establishing thresholds and cut-offs for contemporaneous analysis of the new data. This will involve a trade-off between sensitivity and specificity in that the system needs to be sensitive enough to detect an outbreak in its early stages without generating too many ‘false alarms’ requiring unnecessary investigation. A protocol will need to be developed for the CDC to investigate alarms and issue alerts once the cut-offs are reached.

The proposed system should automatically generate reports on the frequency of the identified ICPC-2 Plus codes that can be analysed on a daily or weekly basis by the Surveillance Unit at CDC. This would ultimately help identify when ILI is increasing in remote communities and provide a more timely warning of outbreaks.
The aim will be to complement current influenza surveillance systems, with laboratory-confirmed diagnoses continuing to validate the syndromic surveillance. This system will ultimately prepare the CDC to monitor the impact of future flu pandemics on remote communities in real time, resulting in early identification, decision making and appropriate rapid responses.

Acknowledgements

Liana Riley, PCIS data custodian.

References


Audit of provision of hepatitis B vaccines for Aboriginal and Torres Strait Islander people aged 15-50 years in the Northern Territory in 2015-2016

Paul Fitzgerald, Medical Student, Flinders University and Centre for Disease Control, Darwin

Abstract

Hepatitis B Virus (HBV) infects the liver and can result in liver cirrhosis, cancer, and death. Aboriginal and Torres Strait Islander (ATSI) people in the Northern Territory (NT) have high rates of chronic hepatitis B infection. The NT Hepatitis B Vaccination and Public Health Guidelines 2013⁴ includes ATSI people aged 15-50 years without immunity to hepatitis B as a ‘high risk’ group and recommends they receive vaccination. In 2015 the NT Government provided funding for hepatitis B vaccine for ATSI people aged 20-50 years. This is an audit of the vaccine uptake in this group to determine if the funding changes influenced uptake of Guideline recommendations.

In 2014-15 a total of 3,163 vaccines were given with 42.2% in ATSI people. In the following year, 2015–16, a total of 2,788 were given with 58% in ATSI people. Despite an overall reduction in the number of vaccines given, there was a proportional increase to the ATSI high risk group. This is in line with the Guideline recommendation that ATSI people aged 15-50 years who are not immune either by natural infection or previous immunisation should receive vaccination. The audit is limited in that it cannot comment on current rates of testing for immunity and people still needing vaccination. It also identified that there is possible variation in patients receiving all 3 doses of the vaccine. Recommendations include further auditing of HBV serology testing and continued support for primary healthcare workers to implement the Guidelines including providing all 3 hepatitis B vaccine doses.

Key words: Audit; Hepatitis B; Aboriginal; Northern Territory.

Background

Hepatitis is a disease characterised by the inflammation of the liver. It is typically caused by viral infection from hepatitis causing viruses, such as hepatitis A, B and C. Hepatitis B virus (HBV) is a DNA virus which primarily replicates in the liver resulting in either acute or chronic disease states. Transmission can occur through a variety of mechanisms including mother-to-child (vertical) transmission during childbirth or exposure to infected bodily products e.g. blood, saliva, semen, amniotic fluid.² The most common transmission route is mother-to-child during childbirth but sharing of paraphernalia for injective drug use and nosocomial exposure from contaminated equipment such as needle-stick injuries in a healthcare setting are also risks.² The incubation period for HBV is between 1 and 4 months, with patients remaining infectious for as long as the hepatitis B surface antigen (HBsAg) is present.²,³
This can typically result in 2 different patient groups. Those with acute hepatitis who clear the infection and those that do not effectively clear the infection (chronic hepatitis). Development of a chronic HBV infection is most influenced by age, with an 80-90% risk of developing chronic infection in those infected in the perinatal period and those in childhood still have a 30% risk of developing chronic HBV infections. The sequelae of chronic HBV can range from asymptomatic disease, to decompensated liver failure, cirrhosis, hepatocellular carcinoma (HCC) and death. Vaccination does exist for the prevention of HBV infections and is highly effective.

Acute HBV has been a notifiable disease in the Northern Territory (NT) since 1992 and in 2006 all HBV infections became notifiable. Vaccinations have been included in the NT childhood immunisation schedule since 1988. In 2011, there were around 218,000 people living with chronic hepatitis in Australia, although only an estimated 56% of cases have been identified. Of the cases of HBV, approximately 55% are born overseas and therefore could not be prevented with childhood immunisations in Australia, although only an estimated 9% of the cases of HBV in Australia were in Aboriginal and Torres Strait Islander (ATSI) people. ATSI people represent 2.6% of the total population of Australia and are therefore disproportionately represented in HBV infections. Evidence from a study looking at ATSI women indicates that infection rates in this group have fallen since introduction of the HBV vaccine from 3.5% (prior to 1982) to 0.8% (1989 and later). Further to this, since introduction of the vaccine there has been a 96% reduction in HBV in ATSI people. This study also noted that regional differences existed, with the prevalence in Central Australia 1.57 times that of the Top End, and rural areas 3 times that of urban areas. Other smaller studies have indicated higher rates of chronic infection in those over the age of 15 years in regional areas.

The NT Hepatitis B Vaccination and Public Health Guidelines 2013 recommended vaccination for ‘Infants and unvaccinated people born on or after 1 August 1990’ and for those with ‘selected occupational risk and other high risk groups’. As identified above, ATSI people are included in the ‘high risk’ groups. Provision of vaccinations and monitoring of notifiable disease is currently overseen by the NT Centre for Disease Control (CDC). Direct administering of vaccination is typically the task of primary health care providers and this is recorded in the NT Immunisation Register (NTIR) (records since 2011).

ATSI people have a disproportionately large burden of HBV infection, a condition which could be entirely prevented through effective vaccination. HBV can result in morbidity and mortality and considerable cost to the health budget. In 2015, the NT Government made hepatitis B immunisation free to Aboriginal people aged 20-50 years who were ‘not previously vaccinated or who do not have immunity through natural infection.’ to further reduce the rates of HBV infection in the NT. This audit is to assess if under the Guideline, Aboriginal people are receiving vaccinations and if the enhanced funding provided starting in mid-2015 has affected the uptake.

Introduction

The CDC in the NT oversees multiple public health programs; within these are sexual health and blood borne virus surveillance. This includes the surveillance of HBV infection rates and advice and the provision of vaccinations for the prevention of disease.

In 2015 HBV immunisations became available at no cost to ATSI people aged 20-50 years who ‘were not previously vaccinated’ or did not have ‘immunity through natural infection.’ Vaccinations are recorded in the NTIR by the primary health care provider. With the current Guidelines and NT Government funding change, it is important to audit if effective vaccination occurs for this high risk group. The CDC has reported decreasing notifications of HBV with 24 cases in the first quarter of 2016 compared with the expected 51 notifications. Auditing of the HBV vaccination for high risk groups is important to further improve HBV vaccination coverage in the NT.

The aims of this audit:

- To audit the provision of vaccination to ATSI people aged 20-50 years since introduction of the free immunisation (July 2015-March 2016). The ideal standard would be a relative
Overall increased uptake in vaccinations of under-immunised ATSI people compared to the same time period in the pre-funding era in the NT (July 2014-March 2015). A specific percentage increase is not available as the number of unvaccinated people is not known, and as the increasing vaccination coverage occurs, there would be a corresponding reduction in vaccinations provided. The standard it will be compared to will be the overall changes from the previous time period.

Secondary outcomes:

Method
A retrospective audit of data was conducted using vaccinations recorded on the NTIR. There were 2 time frames accessed, July 2014-March 2015 for the pre-funded era and July 2015-March 2016 for auditing uptake of hepatitis B vaccinations since the NT Government funding of vaccinations to ATSI people who were not previously immunised or had natural immunity through infection.

Inclusion criteria
All patients aged 15-50 years registered as having had a HBV vaccination between July 2015-March 2016 and July 2014-March 2015. Data collected included gender, ethnicity, age, date of immunisation and latest location.

Exclusion criteria
Patients not specific to the inclusion criteria were excluded.

Analysis of data
Data analysis was done using Microsoft Excel© 2013. Patient locations were grouped into 7 NT regions; Alice Springs Urban, Alice Springs Urban, Barkly, Darwin Rural, Darwin Urban, East Arnhem and Katherine.

Audit approval
Approval for the audit was given by the NT Director of CDC. No personal identifiers were retrieved from the NTIR in the process of this audit. This audit is to assess the use of the Guidelines and the impact of enhanced funding to those Guidelines and is one of the processes for assessing continual quality improvement.

Data safety
All data was accessed exclusively, de-identified, analysed and stored on a secure server at the CDC in Darwin.

Results
Following the introduction of CDC NT Government funding for hepatitis B vaccinations for ATSI people, between July 2015 and March 2016, a total of 2,788 vaccinations were given (this includes repeat vaccines as part of the 3 dose regimen). A total of 1,254 first dose, 829 second dose, 702 third dose, and 3 fourth dose vaccines were given. Females received 48.7% and males received 51.3% with an average overall age at vaccination of 33 years (± 0.3 CI 95%). Of the vaccinations given, 55.8% were Aboriginal, 0.4% Torres Strait Islander, 1.7% were ATSI, 36.2% were neither ATSI and 5.8% were not stated. A total of 58% of the vaccines were given to ATSI people. The site of vaccination provision was predominantly in urban areas with 1,078 (39%) in Darwin Urban and 313 (11%) in Alice Springs Urban. Of these, a majority (611/1078 and 179/313 respectively) were given to non-Indigenous people. In regional areas, this was inverse, with a majority of vaccinations given to ATSI populations (Table 1).

Analysis was also done for audit comparison, on vaccination provision prior to the introduction of hepatitis B government funding (July 2014-March 2015). A total of 3,163 vaccines were administered (total vaccines given as part of 3 dose regimen). A total of 1,423 first dose, 936 second dose, 795 third dose and 9 fourth dose vaccines were given. Females received 48.9% and males 51.1%. The overall average age of those receiving a vaccine was 32 years (±0.3 CI 95%). Of vaccines given, 41.1% were Aboriginal, 0.1% were Torres Strait, 0.9% were ATSI, 51.2% were neither Aboriginal or Torres Strait Islander and 6.5% were not stated. A total of 42.2% were from ATSI groups. Vaccinations were predominantly given in urban centers with 1,565 (49%) in Darwin Urban, 273 (9%) in Alice Springs and 339 (11%) in Katherine. Of total vaccines given, 36.6% were in Darwin Urban in non ATSI persons. With the exception of Alice Springs Urban, all other areas had a majority of vaccines being given to ATSI persons (Table 2).
Between July 2015 and March 2016 a total of 1,616 vaccines were given to ATSI persons (1,556 Aboriginal, 12 TSI, 48 ATSI). This is in contrast to 1,336 vaccines (1,302 Aboriginal, 4 TSI, 30 ATSI) given in the same time period 12 months earlier. Despite an overall reduction in total vaccine provision in the NT, there was a 21% increase in provision of vaccines to ATSI people. Between July 2015 and March 2016 there were 1,010 vaccines provided to non ATSI people and in the previous 12 months 1,620 vaccines had been given; a 38% reduction. A total of 207 vaccines were given to people of no stated ethnicity in 2014-15, and a further 162 in 2015-16 (Figure 1). Overall reduction in HBV vaccinations occurred across the NT in 2015-16 compared to 2014-15 (2,788 vs 3,163 respectively) however, there was a relative change in regions which provided vaccinations.

In 2015-16 there was a relative increase (14% increase) of provision of vaccination in rural areas compared with the previous 12 months. Of the 2,788 vaccines provided in 2015-16, 1,269 were provided in rural areas (Katherine, Barkly, Alice Springs Rural, Darwin Rural, East Arnhem), compared to 1,116 of the 3,163 vaccines provided in 2014-15. The majority of vaccines were given in urban regions (Alice Springs Urban and Darwin Urban) in both time periods, but a relative reduction of vaccines given in urban areas of 24% in 2015-16 compared to 2014-15.

**Discussion**

The NT CDC oversees the monitoring and provision of public health interventions in the NT, including HBV vaccination. Outlined in
Audit results revealed that overall there has been a relative increase in uptake of vaccinations for ATSI people in the NT. Historically, hepatitis B vaccination programs have been highly successful in reducing infection rates in the NT, however ATSI people bare a disproportionate burden of disease.4,6 Between July 2015 and March 2016, a total of 2,788 vaccinations were given (Table 1) reduced from 3,163 the prior year (Table 2). This could represent an increase of HBV vaccine coverage in at risk groups as more unvaccinated individuals were started on a hepatitis B vaccination course. Increased coverage in the earlier years results in a decreased pool of unvaccinated people. Although there was an absolute reduction in HBV vaccinations in the NT, there was a proportional change in who received them and where. There was a 21% increase in provision of hepatitis B vaccinations to ATSI populations (Figure 1) and a 14% increase in provision of vaccinations to rural regions (Figure 2). This audit identified that there was variation in the number of vaccine doses administered to different groups, but was not designed to investigate this further. The NT Hepatitis B Vaccination and Public Health Guidelines1 identify ATSI people as a high risk group, this audit indicates that there is good adherence to this Guideline and that ATSI people are receiving increased vaccinations.

There are significant limitations to this audit on rates of vaccination coverage in the ATSI population of the NT. This audit identified those that have received HBV vaccination and relies on reporting within the NT Whole of Life register. However, this method cannot ascertain number of ‘high risk’ people still requiring vaccination, including ATSI people. This would require further auditing of patient records for HBV serology testing, as is also recommended in the Guidelines. Who to further specifically
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Target for vaccination remains elusive. The NTIR allows rapid collection of data, which is reproducible and effective for repeat auditing. This would complete the audit cycle and help to determine if vaccinations are consistently given as per the Guidelines. Regions where the vaccines were given could be audited more effectively by developing a Geographical Information System (GIS) to consistently cross reference register data with regions of provision, potentially providing real-time data. This audit also revealed the possible lack of completion of the 3 doses of the HBV vaccine. This could potentially be an entry error and people may receive all 3 with incorrect registry information, or it may in fact reflect a poor overall compliance to all 3 doses of the vaccine. Patient data entered by primary health care practitioners often did not include a complete set of the 3 doses of vaccine required, with high variability between 1 and 4 doses for individuals given.

Recommendations

1. Audit current rates of testing hepatitis B immunity in community.

2. Encourage primary healthcare workers to educate and support those requiring hepatitis B vaccination to commence and complete the full schedule of 3 vaccines of hepatitis B vaccinations.

3. Audit annually the provision of hepatitis B across the NT with the expectation that it may decrease with increasing population immunity.

4. Educate and inform primary healthcare providers of importance to test and vaccinate high risk groups to increase coverage of the vaccine and reduce incidence of hepatitis B and its complications.

5. Consider including further high risk groups (as per the Guidelines) for funding of free hepatitis B vaccinations.

Conclusions

Within the NT Hepatitis B Vaccination and Public Health Guidelines 2013, ATSI people are identified as a high risk group due to high rates of hepatitis B infection in adults. In 2015 changes of funding occurred to provide extra
funding for provision of vaccines for this group. This audit was conducted to determine if current provision of vaccines is in accordance with recommendations for this high risk group. In 2014–2015 there were 3,163 vaccines provided for hepatitis B in the NT, this reduced to 2,788 in 2015–2016. However, in the same time period there was an increase in vaccines specifically to ATSI people and in regional areas. Evidenced by this audit, current hepatitis B vaccines have increased in an acknowledged at risk group and are given in accordance with the Guidelines, however the absolute numbers of non-immune people is not known. Further work is needed to determine HBV testing rates of high risk and number still needed to be vaccinated.

References


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Save the date
13-15 September 2017, Darwin

Northern Territory Centre for Disease Control Conference
Prevention, Promotion, Participation
at
Museum and Art Gallery of the Northern Territory
Abstract

The Northern Territory (NT) Water Safety Strategy 2017-2021 is being launched in July 2017. It was developed by the NT Water Safety Advisory Council and builds on previous Water Safety Plans and strategies. It is aligned to the Australian Water Safety Strategy 2016-2020 and focuses on water safety education, research and data collection and standards. This article will provide an historical overview of drownings in the NT with emphasis on the 2015/2016 findings and then highlight the key priorities and strategies in the document. It will also highlight the dangers of combining alcohol and aquatic activity.

Key words: drowning; non-fatal drowning; alcohol and other drugs.

Background to drownings in the Northern Territory

Over the 14-year period from 2002/03 to 2014/15, the Northern Territory (NT) had the highest rate of drowning in Australia. The average incidence over that period in the NT was 3.88 per 100,000 population per year. The next highest was Tasmania (2.11/100,000) followed by Queensland (1.55/100,000). As seen in Figure 1 the incidence fluctuated over that 14 year period from a low of 1.33/100,000 in 2008/09 to a high of 6.53/100,000 the following year. The 14 deaths in the NT in 2015/16 signify an increase of 5 deaths above the 14-year NT average (9 deaths per year). There is no evidence of a downward trend.

Over the 10-year period 2004/5 to 2014/15 there were 91 drowning deaths in the NT, of which, 85% were in males (Figure 2). In this 10-year period the leading locations for drowning were as follows:

- Rivers, creeks and streams (42%)
- Swimming pools (16%)
- Ocean/harbour (14%).

Swimming and recreation (34%) and falls into the water (20%) were the most common activities prior to drowning.

Looking at findings in those people who drowned in the NT in 2015/16, the predominant

Figure 1: Drowning deaths and rate/100,000 population by year—NT

Figure 2: Drownings in the Northern Territory 2004/5 to 2014/15 by sex

85% drownings were in males
The at-risk group continues to be males (93%). The greatest number of deaths occurred in the 25–34 year age-group (29%) but numbers were similar in adjacent age groups indicating most of the deaths occurred between the ages of 18–44 years (Figure 3).

In 2015/16 the leading locations for drownings were rivers/creeks/streams (29%) and swimming pools (29%) (Figure 4).

Inland waterways continue to be the leading location for drowning in Australia and in 2015/16 the NT was the only jurisdiction to record an increase against the 10 year average, 7 drownings against a 10 year average of 5.\(^3\)

The most common known activities prior to drowning in 2015/16 were swimming and recreation (22%) and falling into water (22%) (Figure 5).

### Alcohol and other drugs

Data on alcohol and other drugs in association with drownings are not available for the NT. However nationally in 2015/16, of the 280 drowning deaths, 44 (14%) people had positive readings for alcohol and 40% of these individuals recorded readings 4 times over the legal limit (0.2mg/L).\(^3\) There were 41 people nationally who drowned and were found to have some kind of drug in their system when they drowned. In 29% the drugs were illegal or abuse of legal drugs. Commonly occurring illegal drugs were cannabis, which accounted for 58% of those involving illegal drugs and methamphetamine (33%).

### Non-fatal drowning

Fatals drownings are but one part of the story. Non-fatal drownings occur more frequently than fatal drownings and can result in hospitalisation and long term sequelae. A retrospective study by Wallis et al\(^5\) looked at fatal and non-fatal drownings among children aged 0–19 years in Queensland between 2002 and 2008. They found that for every fatal drowning there were 10 non-fatal drownings, of which 2 out of 3 required admission to hospital (hospitalised to
non-hospitalised ratio 1.7:1). An Australian Institute of Health and Welfare (AIHW) Report found that 5% of an estimated 721 incident cases of non-fatal drowning had persistent morbidity, of which 60% were in individuals aged 10–39 years. They found that about 94.2% of cases with persisting morbidity had either a traumatic brain injury or a spinal cord injury.5

The NT Water Safety Strategy 2017-2021

There are 3 Key Priority Areas in the NT Water Safety Strategy 2017-2021:

- Improving community awareness of water safety
  - Increase community awareness and participation in water safety skills and events
  - Reduce drowning deaths in all age groups taking a ‘stages of life approach’ to addressing risks
- Targeting high risk groups, activities and locations including regional and remote waterways
  - Identify and target high risk groups and activities to promote safer aquatic behaviours
  - Reduce drownings in both inland waterways and beaches
- Focusing on key drowning challenges
  - In particular reducing drownings in males and those attributable to the use of alcohol and other drugs.

‘Don’t let your mates drink and drown’

Recognising that 1 in 4 of the 1,932 male drownings nationally in the last 10 years has involved alcohol and that males account for 80% of all drownings, the Royal Life Saving Society of Australia has launched the ‘Don’t Let Your Mates Drink and Drown’ campaign (http://www.royallifesaving.com.au/programs/dont-let-your-mates-drink-and-drown).

It aims to educate people about the risk associated with combining alcohol and aquatic activities. It encourages men to look out for their mates by:

- Standing up to them if they suggest swimming or taking a boat out while under the influence of alcohol
- Suggesting safe alternative activities away from the water when under the influence of alcohol
- Enjoying the water before any alcohol is consumed
- Not leaving them alone if they are under the influence of alcohol around water.

Summary

The NT has the highest rate of drowning deaths in Australia. Non-fatal drownings are now recognised as a significant cause of morbidity and long term disability, mainly of brain and spinal cord injury. In the NT there are particular challenges in addressing drownings in rural and remote areas. Men affected by alcohol are a particularly at risk group. Nationally and locally comprehensive strategies are in place to increase awareness of water safety issues to reduce fatal and non-fatal drownings.

References

Northern Territory Needle and Syringe Program: Minimum Data Set Annual Report 2015

David Decolongon1 and Peter Sidaway2
1. Sexual Health and Blood Borne Virus Unit, Centre for Disease Control, Darwin; 2. Northern Territory AIDS and Hepatitis Council

Abstract

The Northern Territory (NT) Needle and Syringe Program (NSP) Minimum Data Set (MDS) is a monitoring and evaluation tool that collects standardised data from all primary and secondary NSP outlets. The MDS began collecting data on 1 January 2014. Through standardised reporting, the MDS allows trends in equipment distribution and disposal, client demographics, and types of drugs injected to be identified across geographic areas and over time. The data provides an evidence base for strategic and operational decisions to improve the efficiency and effectiveness of the NSP. The report finds a 10% increase in total occasions of service (OOS), increased OOS by women and an increase in clients who identify as Aboriginal or Torres Strait Islander (ATSI) in 2015 compared to 2014. Amphetamines continued to be the most common ‘drug last injected,’ followed by prescribed opioids and performance and image enhancing drugs.

Key words: Annual report; Needle and Syringe Program; Minimum Data Set; Harm Reduction; blood borne virus prevention; drug use; people who inject drugs.

Introduction

Needle and Syringe Programs (NSP) are a successful and cost-effective public health measure to prevent the transmission of blood borne viruses (BBVs) including the human immunodeficiency virus (HIV), hepatitis C (HCV) and hepatitis B (HBV) and reduce injecting-related harm. This is achieved through the provision of sterile injecting equipment, health promotion resources, education through brief interventions and assisting people who inject drugs (PWID) with referrals to link them with health care and social services. NSP operations are informed by the harm reduction pillar of the National Drug Strategy 2010-20151 and by national BBV/STI strategies which promote prevention of infections as a priority area for action.2-5 Nationally, NSPs are estimated to have prevented 128,717 BBV infections (96,667 HCV and 32,050 HIV) from 2000-2009, saving $1.28 billion in direct healthcare costs. The Kirby Institute of University of New South Wales estimates that at the end of 2014 there were 230,470 people living with HCV, 213,300 people living with HBV and 27,150 people living with HIV in Australia.6 Nationally, approximately 90% of HCV, 4% of HBV and 3% of HIV infections were acquired through sharing injecting equipment and 15% percent of PWID reported sharing injecting equipment in the previous year.7

This is the 2nd NT NSP MDS Annual Report and covers the 2015 calendar year. The report describes the NT NSP and MDS collection system, presents and analyses 2015 data with comparisons to the 2014 MDS data.8

The Northern Territory Needle and Syringe Program

The NT NSP began operating in 1989 and is comprised of 28 fixed-site outlets. The Sexual Health and Blood Borne Virus Unit (SHBBVU), Centre for Disease Control (CDC), is responsible for the overall coordination and management of the NSP. The SHBBVU funds the Northern Territory AIDS and Hepatitis Council (NTAHC) to operate the 3 primary NSP outlets in the NT and provides operational support to the 10 secondary outlets.

The 3 primary outlets provide a wide range of free injecting equipment, facilities for the safe disposal of injecting equipment (‘sharps’), health promotion information, and support and referral services for PWID. These outlets are operated by NTAHC in urban areas of Darwin, Palmerston and Alice Springs. NTAHC utilises a peer-led model of service delivery.

The 10 secondary outlets provide a limited range of free injecting equipment and disposal facilities. Injecting equipment is usually dispensed as a ‘Fitkit’ which contains 5x1mL insulin syringes, a sharps container, sterile
filters, swabs, condoms, lubricant, and health promotion material. The sexual health clinics, known as Clinic 34, that operate out of CDC sites in Darwin, Alice Springs, Katherine, Tennant Creek, and Nhulunbuy during business hours are the locations for 5 of the outlets. Four of the outlets are located in the Emergency Departments (ED) of Alice Springs, Katherine, Tennant Creek, and Nhulunbuy public hospital, and provide after-hours access to equipment. The remaining outlet is located in the Yulara Medical Centre.

Pharmacy outlets provide a limited range of sterile injecting equipment for sale in the form of a Fitkit or a commercial equivalent. Extra NSP access points are provided at 15 pharmacy outlets in the Darwin region (urban and rural), Alice Springs, Katherine, and Nhulunbuy. Of these outlets, 8 are supplied by NTAHHC, 7 of which sell Fitkits; 1 pharmacy distributes Fitkits for free. Of the 15 pharmacies 2 accept sharps returns. Pharmacy outlets are not currently included in the MDS collection that informs this report.

The Northern Territory Minimum Data Set (MDS)

All 13 primary and secondary NSP outlets began collecting standardised data for the MDS on 1 January 2014. Data is collected on occasions of service, client demographics, including the types of drugs injected, equipment distributed and returned, and client engagement through brief interventions and referrals. This data provides an evidence base to help assess NSP coverage and service delivery, and to assist with the NSP’s continuous improvement. The data are based on self-reported information and therefore subject to a degree of reporting bias inherent in all self-reported data.

Methods

The data collection and analysis for the MDS involves 4 steps:

1. **Daily data collection.** Each time a PWID, or someone on their behalf, presents to a primary or secondary outlet, the engagement is recorded as an occasion of service (OOS). Other non-identifiable client information on equipment distributed and returned, demographics, and additional services rendered is collected using standardised data fields. Depending on the outlet type and location, this is recorded in either a daily collection form (Figure 1) by NSP staff or a client self-service form by NSP clients.

2. **Monthly data collation.** At the end of each month the daily collection forms are collated into the monthly data entry form at each outlet (Clinic 34 staff enter the data collected at hospital EDs) which is then sent electronically to the SHBBVU.

3. **MDS database input.** A STATA program (Version 13.1, StataCorp) is used to process the data and import it into the NT NSP database for analysis.

4. **MDS Annual Report.** The MDS data is used to produce the NSP Annual Report covering the previous calendar year.

Figure 1. MDS Daily Collection form
Results

Occasions of service

There were 9,169 OOS in 2015 across all primary and secondary outlets. The primary outlets recorded the majority of OOS in 2015 at 78% (n=7,107), followed by ED secondary outlets at 18% (n=1,661) and Clinic 34 secondary outlets at 4% (n=401) (Figure 2). The OOS from primary outlets declined from 84% in 2014 to 78% in 2015. There was also a small decline in OOS at secondary Clinic 34 outlets from 5.1% in 2014 to 4% in 2015. There was a large increase in OOS at secondary ED outlets in 2015 (18%) compared to 2014 (10%). There were no OOS for the Yulara outlet in 2015.

Client demographics

Gender and age

In 2015, 77% (n=7,077) of the OOS were males and 21% (n=1,976) were female. Gender data was missing for 116 OOS and these were not included in the analysis. There was an increase in the number of females (n=1,976) accessing the NSP over the previous year (n=1,794). The OOS by gender was consistent with the 2014 percentages of 78% male and 21% female respectively.

The 30-39 year age group had the greatest proportion of OOS (Table 1) followed by 40-49 year (n=2,235) and 50+ year (n=1,598) age groups. This is consistent with the gender and age distribution between males and females from the previous year. There was a small increase in the number of both males and females in the youngest <20 year age group in 2015. There were more females in this age group (n=36) than in the previous year (n=25). The percentage increase of this age group in 2015 over the previous year was 19%, but this was only a small increase relative to the other age groups over both years (1.3% to 1.5%).

Return and new clients

Clients are asked if they are using the service for the first time at each OOS, which measures new and recurring demand. Of these, 77% (n=6,981) had used the NSP before and 7% (n=630) were doing so for the first time in 2015 (Table 1). This was slightly less than in 2014 which was 82% (n=6,879) and 8.8% (n=735) respectively.

Collecting for others: peer distribution

Peer distribution expands access points to sterile injecting equipment outside the catchment areas and operating hours of NSP outlets. The MDS collects data on this by asking if an NSP client is ‘collecting for others’ for each OOS. In 2015, 31.6% (n=2,862) of clients presenting to NSP

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>36</td>
<td>97</td>
<td>133</td>
<td>1.5%</td>
</tr>
<tr>
<td>20–29</td>
<td>347</td>
<td>1223</td>
<td>1570</td>
<td>17.3%</td>
</tr>
<tr>
<td>30–39</td>
<td>677</td>
<td>2826</td>
<td>3503</td>
<td>42.0%</td>
</tr>
<tr>
<td>40–49</td>
<td>578</td>
<td>1657</td>
<td>2235</td>
<td>24.7%</td>
</tr>
<tr>
<td>&gt;=50</td>
<td>334</td>
<td>1264</td>
<td>1598</td>
<td>17.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indigenous Status</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indigenous</td>
<td>392</td>
<td>1508</td>
<td>1900</td>
<td>21.0%</td>
</tr>
<tr>
<td>Non-Indigenous</td>
<td>1454</td>
<td>4743</td>
<td>6197</td>
<td>68.5%</td>
</tr>
<tr>
<td>Data missing</td>
<td>130</td>
<td>826</td>
<td>956</td>
<td>10.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Return or New Client</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return client</td>
<td>1671</td>
<td>5310</td>
<td>6981</td>
<td>77.1%</td>
</tr>
<tr>
<td>New client</td>
<td>137</td>
<td>493</td>
<td>630</td>
<td>7.0%</td>
</tr>
<tr>
<td>Data missing</td>
<td>168</td>
<td>1274</td>
<td>1442</td>
<td>17.3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Collect for Others</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>913</td>
<td>1949</td>
<td>2862</td>
<td>31.6%</td>
</tr>
<tr>
<td>No</td>
<td>890</td>
<td>3840</td>
<td>4730</td>
<td>52.2%</td>
</tr>
<tr>
<td>Data missing</td>
<td>173</td>
<td>1288</td>
<td>1461</td>
<td>16.1%</td>
</tr>
<tr>
<td>Total*</td>
<td>1976</td>
<td>7077</td>
<td>9053</td>
<td></td>
</tr>
</tbody>
</table>

*Data was missing for 116 people who did not answer the question on gender. These were not included in this table.
outlets recorded that they were collecting equipment for others. This was a small increase compared to 2014 30.7% (n=2,566). Data was missing for 16.1% (n=1,461) of the OOS (Table 1).

**Indigenous status and gender**

Clients are asked if they identify as Aboriginal or Torres Strait Islander (ATSI) at each OOS. Of the total OOS in 2015, 21% (n=1,900) identified as ATSI, with 1,508 being male and 392 female (Figure 3).

The OOS involving NSP clients who self-identified as ATSI increased from 16.5% in 2014 to 21% in 2015. There was a 23% increase in ASTI females in 2015 (n=392) compared to 2014 (n=302), while the increase for ASTI males in 2015 was 29% (n=1,508) over same period (n=1,071). Data was missing for 10.6% of OOS, which was a small increase over 2014 (8.6%).

**Drug last injected**

Amphetamines was the drug most widely reported to be last injected by NSP clients, representing 35.8% (n=3,282) of OOS. This was followed by pharmaceutical opioids (24.1%; n=2,209 and steroids or other performance or image-enhancing drugs (PIEDs) 7.4%; n=682 (Figure 4). This is consistent with the 2014 data which showed amphetamines (38.1%; n=3,149), pharmaceutical opioids (22.2%; n=1,858) and steroids/PIEDs (8.9%; n=744) respectively in that year. Heroin continued to be a drug that is not widely injected in the NT and was reported in only 1.7% (n=160) of the OOS in 2015 (2%; n=170 in 2014).

**Equipment distributed**

A total of 529,359 units of sterile injecting equipment were distributed in 2015. This was 9,863 units (1.8%) less than in 2014. The differences in the quantity of equipment collected in 2015 by the last drug injected are indicated in Figure 5. Opioid users collected the most equipment (44%) followed by amphetamines users (23%) and steroid users (18%).

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Figure 3. Occasions of service by Indigenous status and gender, MDS 2015

Figure 4. Occasions of service by drug last injected, MDS 2015
Figure 6 shows the distribution of equipment by outlet type. Primary outlets continued to distribute most of the injecting equipment (96%; n=506,666). This was a small percentage increase (95.9%) and a slight decrease in numbers compared to 2014 (n=517,229). The proportion of injecting equipment distributed by secondary Clinic 34 and ED outlets (4%) was also consistent with the previous year (4.1%). There was a 139% increase in the units distributed in 2015 from ED outlets (n=10,575) over the previous year (n=4,420). There was a decline in equipment distributed from Clinic 34 outlets over the same period from 17,573 units in 2014 to 12,118 units in 2015.

Most of the equipment was distributed in the Top End (91%; n=486,152) compared to Central Australia (Table 2).

Table 2. Equipment distributed by outlet type, region and urban/rural, MDS, 2015

<table>
<thead>
<tr>
<th>Outlet Type</th>
<th>Needles</th>
<th>Insulin syringes</th>
<th>Butterflies</th>
<th>Fit kits</th>
<th>Total Units</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>357,354</td>
<td>125,348</td>
<td>14,549</td>
<td>9,415</td>
<td>506,666</td>
<td>0.96</td>
</tr>
<tr>
<td>Secondary ED</td>
<td>1,600</td>
<td>0</td>
<td>0</td>
<td>8,975</td>
<td>10,575</td>
<td>0.02</td>
</tr>
<tr>
<td>Secondary Clinic 34</td>
<td>9,092</td>
<td>761</td>
<td>0</td>
<td>2,265</td>
<td>12,118</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top End</td>
<td>346,380</td>
<td>115,905</td>
<td>14,347</td>
<td>9,520</td>
<td>486,152</td>
<td>0.92</td>
</tr>
<tr>
<td>Central Australia</td>
<td>21,666</td>
<td>10,204</td>
<td>202</td>
<td>11,135</td>
<td>43,207</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Urban/Rural split</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban (Darwin, Palmerston and Alice Springs)</td>
<td>358,846</td>
<td>126,103</td>
<td>14,549</td>
<td>18,575</td>
<td>518,073</td>
<td>0.98</td>
</tr>
<tr>
<td>Regional Areas (Katherine, Tennant Creek, Nhulunbuy)</td>
<td>9,200</td>
<td>6</td>
<td>0</td>
<td>2,080</td>
<td>11,286</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>368,046</td>
<td>126,109</td>
<td>14,549</td>
<td>20,655</td>
<td>529,359</td>
<td></td>
</tr>
</tbody>
</table>
The differences in the distribution of equipment is even more pronounced, when comparing the urbanised areas of Darwin, Palmerston and Alice Springs accounting for over 97% (n=518,073) of the equipment distributed.

The demand for NSP equipment continued to come primarily from the urban areas of Darwin, Palmerston and Alice Springs (97%), and from the Top End (91%), which was consistent with 2014 (97.5% and 91.9% respectively).

Client engagement: brief interventions and referrals

NSP staff delivered 107 brief interventions in 2015, most (56%; n=60) involving safer use. A total of 27 referrals were made to other services in 2015. The highest proportion of referrals was to alcohol and other drug services (29%; n=8), followed by referrals to sexual health services (22%; n=6). All but 2 of the brief interventions and referrals were delivered by the 3 primary NSPs. Two brief interventions were recorded at secondary ED outlets. Brief interventions and referrals were not reported on in the 2014 MDS annual report due to missing data.

Discussion

The MDS is a monitoring and evaluation tool that provides an evidence base for NSP operations. This is the second NT NSP MDS annual report and first time MDS data has been compared to a previous year. The data are based on self-reported information and therefore subject to a degree of reporting bias inherent in all self-reported data.

The primary outlets continued to provide most of the OOS (78%) and the bulk of the equipment distributed (96%). There was an increase in OOS (n=9,169) but a small decrease in the number of units (n=9,863 or 1.8%) of injecting equipment distributed in 2015 compared to the previous year. The percentage of injecting equipment distributed by secondary outlets (4%) was also consistent with the previous year (4.1%). There was a decline in equipment distributed from Clinic 34 outlets over the same period from 17,573 units to 12,118 units. This was offset by a large increase in the units distributed in 2015 from ED outlets (n=10,575) over the previous year (n= 4,420). The increase in equipment distributed from EDs suggests that more clients in regional and remote areas are collecting their equipment after business hours (when the Clinic 34 outlets are closed). This could be due to the stigma or wish for privacy associated with injecting drug use, particularly in locations with small population sizes.

The central role primary outlets play in NSP service provision in the NT continued. The peer-led approach employed by the primary outlets has been central to encouraging health seeking behaviour and safer injecting practices among NSP clients. The secondary NSPs that are not self-serve are staffed by nurses or administrative staff whose primary functions do not involve NSP client engagement and transactions with clients continued to be limited to equipment distribution and data collection. Secondary outlets continued to play an important role in maintaining NSP coverage across the NT, with 11,286 units of injecting equipment distributed in Nhulunbuy, Tennant Creek and Katherine. This was slightly less than in 2014 (n=13,599). There were no reports of unmet demand outside the areas covered by the NT NSP in 2015, which suggests that NT NSP coverage is adequate.

To date the NT NSP has been able to distribute injecting equipment for free and without placing a limit on the quantity that can be collected (other than the limitation of what is in stock on a particular day). This has allowed clients, especially those who live at some distance from an outlet, to collect the equipment they (and others) need without having to frequently return. While these, coupled with the peer-model utilised by the primary outlets, are definite strengths of the NT NSP, there are number of areas that can be improved to ensure that the NSP continues to be effective and responsive to the needs of PWID including:

- Improving data collection from secondary outlets to reduce the amount of missing data
- Improving access to sterile injecting equipment by diversifying the NSP modalities in the NT
- Expanding NSP coverage by closing the gaps in after-hours access, especially in Darwin and Palmerston, which could be partially achieved by establishing a secondary outlet at the Royal Darwin Hospital.
• Increasing NSP client engagement through brief interventions and referrals to health and social services across all outlet types
• Strengthening the linkages between primary and secondary outlets so that the latter can benefit from the expertise of peer NSP staff
• Improving the standard of training across outlet types so that there is consistency in knowledge about the purpose of NSPs and consistency in quality service delivery.

Addressing the points above will contribute to improved service delivery, better engagement with PWID, more responsive systems and better access to equipment in an operational environment that is expansive and diverse. Improved access to the NSP will reduce the receptive sharing and reuse of injecting equipment and help prevent the transmission of blood borne viruses and reduce injecting-related injury and disease in the NT.

Acknowledgments

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References


************
An update on Hendra virus (HeV), HeV-like illnesses and horses as sentinels for emerging infectious disease

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Abstract

Hendra virus (HeV) causes a usually fatal acute disease in horses mediated by an endothelial vasculitis. It also has a high case fatality rate in humans who may become infected via exposure to an infected horse. We are conducting a project that aims to identify infectious causes of severe acute equine illness presentations other than HeV and evaluate the respective zoonotic potential of any pathogens identified. This will provide much needed additional knowledge for health professionals and the public and will clarify the potential human health risk associated with contact with unwell horses.

Key words: Hendra virus; Australian bat lyssavirus; horse; zoonoses; emerging infectious disease.

Background

Hendra virus (HeV) causes a usually fatal acute disease in horses mediated by an endothelial vasculitis. Following its initial diagnosis, and based on the 1994 cases attended by Dr Peter Reid, HeV was originally thought of as an acute equine respiratory syndrome featuring marked pyrexia¹ which resulted in death predominantly from pulmonary oedema and hypoxia. Most cases had featured terminal, frothy, clear or bloody nasal discharge with interstitial pneumonia and pulmonary haemorrhage. Neurological signs, while present, were not the major clinical features. This emergence of a fatal zoonotic disease in horses has changed the veterinary approach to the investigation of sick horses in Australia to more carefully consider zoonotic risk.

In 2008, the cases at Redlands in Queensland were interpreted and described with more emphasis on neurological signs and other nonspecific signs that included dull demeanor and mild colic with less emphasis on respiratory signs. A review of these cases published in Emerging Infectious Diseases prompted veterinarians and horse owners to consider HeV infection in any horse exhibiting acute-onset febrile illness, regardless of clinical manifestations, and to implement appropriate risk assessment and management strategies in sick horses and in horses in the pre-clinical stage of infection.² Subsequently, experimental live virus challenge studies at the Australian Animal Health Laboratory (AAHL) using the Redlands isolate demonstrated pulmonary pathology and respiratory signs in all horses consistent with that shown previously in 1994.³

Clinical presentations of naturally infected acute field cases since 1994 have shown either or both of these signs. Consequently, an appropriate ‘typical presentation for HeV’ might be considered an ‘acute severe and often rapidly progressing fatal illness usually featuring pyrexia, with respiratory and/or neurological signs.’

A recent, retrospective clinical review of 11 New South Wales cases of HeV between 2006 and 2012 described 5 cases as being found dead or dying along a fence line. This suggested neurological dysfunction likely featured as part of the unobserved clinical deterioration. In most cases, disease presented as an acute illness leading to death within 48 hours. These cases further highlight that HeV should be considered
in cases of acute unexplained equine fatality. Full autopsies were not conducted so therefore pulmonary involvement was not able to be described. When signs of disease were observed, neurological signs predominated.\(^4\)

A review of the emergence of both HeV and another emergent virus in the same family, Nipah virus (NiV), has been recently published in Vaccine by Broder, Weir and Reid.\(^5\) The review discusses virus tissue tropism and cellular entry, replication strategies, pathogenesis, clinical features of human and animal infection, and the development of an effective, safe vaccine and post-exposure prophylaxis.

Veterinarians are reminded of the appropriate samples to collect from suspect animals for HeV testing as described by the Queensland (QLD) Department of Agriculture and Fisheries ‘Guidelines for veterinarians handling potential HeV infection in horses.’\(^6\) The samples include nasal, oral, rectal mucosal, vaginal swabs and where possible urine placed into viral transport medium (obtainable from your government laboratory) or 1mL of saline (in a serum blood tube), as well as blood collected into standard 10.0mL EDTA and 8.5mL serum clot tubes.

Since 2009 testing for HeV has increased throughout QLD,\(^7\) likely in part, due to increased awareness of the disease. Many practicing and government veterinarians have been all too aware of a considerable number of cases that have concerning HeV-like clinical signs involving acute respiratory and or neurological presentation, which are often fatal. Strikingly, the majority of these cases return negative results for HeV testing and yet many are suggestive of an infectious cause. In 2013, 2 such cases that underwent additional testing were found to have died from Australian bat lyssavirus (ABLV), which causes a disease indistinguishable in clinical presentation and outcome to rabies in mammals including in humans.\(^8\) Could more of these cases featuring HeV-like clinical signs, yet testing negative for HeV be posing further zoonotic disease threats? The authors are conducting a project aiming to answer this question and identify other known and unknown pathogens that may be causing such equine illnesses.

The differential diagnoses for acute severe illness in horses includes a long list of both infectious and non-infectious aetiologies (see Box).

Case features or symptoms that may increase the suspicion of infectious causes in the differential

---

**Box. Examples of differential diagnoses that could be considered for acute severe illness in horses by category**

<table>
<thead>
<tr>
<th>Infectious: Bacterial meningitis / abscessation; Bacterial pneumonia; Bacterial systemic toxaemia; Anthrax; Viral infection (encephalitis / meningitis, vasculitis, severe respiratory)##; Mycotic infection - particularly Cryptococcus (pneumonia / encephalitis); Equine protozoal myeloencephalitis*/ Amoebic encephalitis*; Trypanosomiasis*</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Not known to occur in Australia. # Trypanosoma evansi is not found in Australia but is endemic in neighboring countries. Native trypansosomes are of unknown presence or clinical significance in horses. ## See tables for lists of viruses potentially involved in acute equine illness.</td>
</tr>
<tr>
<td>Colic due to acute abdominal conditions (examples include strangulating intestinal or infarctive lesions)</td>
</tr>
<tr>
<td>Toxicity: Snake envenomation – brown, tiger, taipan; Tick paralysis – <em>Ixodes holocyclus</em>; Tetanus; Botulism; Metaldehyde; Ergot alkaloidosis,</td>
</tr>
<tr>
<td>Plant toxicities: Avocado; Pyrrolizidine alkaloids (in the NT Crotalaria spp. especially <em>C. crispate</em>); Annual ryegrass toxicity; Cardiac Glycosides Eg. Indigofera.</td>
</tr>
<tr>
<td>Poisons: 1080; Paraquat; Monensin; Lead</td>
</tr>
<tr>
<td>Trauma: Traumatic encephalopathy</td>
</tr>
<tr>
<td>Neoplastic: Acute clinical signs due to progression (Rare in horse - examples include: Cholesterol granuloma; Adenocarcinoma; Lymphoma; Pituitary adenoma)</td>
</tr>
<tr>
<td>Iatrogenic: Air embolism; Intracarotid injection; Drug overdoses (Moxidectin, Metronidazole, Trimethoprim sulphonamide, Lignocaine)</td>
</tr>
<tr>
<td>Other: Cardiac – ruptured chordae tendinae; aortic root rupture; Metabolic derangement (Hypocalcemia; Hypernatremia; Hypoglycemia); Hypo-/hyperosmolality disorders; Hyperammonemia; severe haemorrhage into a body cavity; Hepatotoxic encephalopathy.</td>
</tr>
</tbody>
</table>
diagnosis include pyrexia, respiratory and/or neurological signs as well as multiple cases occurring in an apparent epidemiological relationship. In such cases, and where HeV testing is negative, the following viruses already detected in Australia could be involved (see Table 1), many of which pose direct or indirect (arthropod vector) human health threats. The viruses in Table 2 are known to cause similar disease in horses internationally. In addition to these viruses those in Table 3 have been recently identified in Australian bats and potentially may follow a similar ‘spill-over’ pathway to horses as HeV with unknown clinical significance. Our project aims to investigate the possibility of infectious causes of severe acute equine

Table 1. Viruses that could be involved

<table>
<thead>
<tr>
<th>Virus</th>
<th>Genus / Family</th>
<th>Reservoir</th>
<th>Insect vector</th>
<th>Confirmed infection in Horses</th>
<th>Confirmed infection in Humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian bat lyssavirus (ABLV)</td>
<td>Lyssavirus / Rubulavirus / Rhabdoviridae</td>
<td>All bats</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Menangle</td>
<td></td>
<td>Flying foxes</td>
<td>None</td>
<td>No#</td>
<td>Yes</td>
</tr>
<tr>
<td>Elsey ELSV</td>
<td></td>
<td>Unknown</td>
<td>Culicoides, mosquitoes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Murray valley encephalitis virus</td>
<td>Flavivirus / Flaviridae</td>
<td>Birds / mosquitoes</td>
<td>Mosquitoes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>West Nile virus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WNV (Kunjin)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese Encephalitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ross River Virus</td>
<td>Alphavirus / Togaviridae</td>
<td>Macropods</td>
<td>Mosquitoes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Equine Herpes viruses1</td>
<td>Varicellivirus / Alphaherpesvirus</td>
<td>Horse</td>
<td>None</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

# Equine seropositivity for this or a very closely related virus has recently been identified as part of this research. Further testing is underway.

Table 2. Viruses known to cause similar disease in horses internationally

<table>
<thead>
<tr>
<th>Virus</th>
<th>Genus / family</th>
<th>Reservoir/vector</th>
<th>Confirmed infection in Horses</th>
<th>Confirmed infection in Humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nipah (NiPV)</td>
<td>Henipavirus / Paramyxoviridae</td>
<td>Flying foxes</td>
<td>Yes*</td>
<td>Yes</td>
</tr>
<tr>
<td>Rabies virus</td>
<td>Lyssavirus / Rhabdoviridae</td>
<td>Terrestrial carnivores and bats</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>African horse sickness virus</td>
<td>Orbivirus / Reoviridae</td>
<td>Culicoides, mosquitoes and ticks</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Equine Encephalosis virus</td>
<td></td>
<td>Culicoides</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Peruvian horse sickness (PHSV)**</td>
<td>Alphavirus / Togaviridae</td>
<td>Mosquitoes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Eastern equine encephalitis virus</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Getah virus</td>
<td>Orthobunyavirus / Bunyaviridae</td>
<td>Culicoides, mosquitoes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Shuni virus</td>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Borna disease virus</td>
<td>Bornavirus / Bornaviridae</td>
<td>Rodents suspected</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>St. Louise encephalitis virus (SLEV)</td>
<td>Flavivirus / Flaviridae</td>
<td>Birds / mosquitoes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Confirmed in 1998/1999 Malaysia / Singapore outbreak. Also a henipavirus outbreak occurred in 2014 in the Philippines that caused fatalities in horses, humans, dogs and a cat and featured human to human transmission—it is thought to have been very closely related to HeV and NiV.

**This virus is considered practically identical to ELSV.
Table 3. Viruses recently identified in Australian bats

<table>
<thead>
<tr>
<th>Virus</th>
<th>Genus / family</th>
<th>Reservoir/vector</th>
<th>Confirmed infection in Humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cedar virus</td>
<td><em>Henipavirus / Paramyxoviridae</em></td>
<td>Flying foxes</td>
<td>no#</td>
</tr>
<tr>
<td>Hervey virus</td>
<td><em>Rubulavirus / Paramyxoviridae</em></td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Grove virus</td>
<td></td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Teviot virus</td>
<td></td>
<td></td>
<td>no#</td>
</tr>
<tr>
<td>Yepoon virus</td>
<td></td>
<td></td>
<td>no</td>
</tr>
</tbody>
</table>

# Equine seropositivity for this or a very closely related virus has recently been identified as part of this research. Further testing is currently underway.

Horses, monitored closely for individual illness that are often heavily exposed to biting insects and featuring a proven spill-over risk for bat borne viruses (HeV and ABLV) are a highly suitable sentinel species for early detection of emerging infectious diseases of potential human and livestock significance.

For veterinarians attending suitable cases please mark submissions for forwarding to AAHL following timely HeV +/- ABLV testing at the Berrimah Veterinary Laboratory, NT Department of Primary Industries and Resources for inclusion in this additional research testing. Please do not hesitate to contact Dr Ed Annand for further information or to discuss case suitability:
Email: ed.annand@sydney.edu.au or Mobile: 0439572329.

Acknowledgements

Kevin De Witte, Chief Veterinary Officer, Department of Primary Industry and Resources, NTG, current Chair of the NT Zoonosis Committee.

References


************
Management of dengue in Australian travellers: a retrospective multicentre analysis


MJA 2006(7)17 April, 2017

Objectives: To describe the epidemiology, clinical and laboratory features and outcomes of dengue in returned Australian travellers, applying the revised WHO dengue classification (2009) to this population.

Design, setting and participants: Retrospective case series analysis of confirmed dengue cases hospitalised at 1 of 4 Australian tertiary hospitals, January 2012-May 2015.

Main outcome measures: Clinical features, laboratory findings and outcomes of patients with dengue; dengue classification according to 2009 WHO guidelines.

Results: 208 hospitalised patients (median age, 32 years; range, 4–76 years) were included in the study. Dengue was most frequently acquired in Indonesia (94 patients, 45%) and Thailand (40, 19%). The most common clinical features were fever (98% of patients) and headache (76%). 84 patients (40%) met the WHO criteria for dengue with warning signs, and 1 the criteria for severe dengue; the most common warning signs were mucosal bleeding (45, 22% of all patients) and abdominal pain (43, 21%). Leukopenia (176 patients, 85%), thrombocytopenia (133, 64%), and elevated liver enzyme levels (154, 76%) were the most common laboratory findings. 46 patients (22%) had serological evidence of previous exposure to dengue virus. WHO guidelines were documented as a management benchmark in ten cases (5%); 46 patients (22%) received non-steroidal anti-inflammatory drugs (NSAIDs).

Conclusions: A significant proportion of returning Australian travellers hospitalised for dengue have unrecognised warning signs of severe disease. Many received NSAIDs, which can increase the risk of haemorrhage in dengue. As travel to Asia from Australia continues to increase, it is vital for averting serious outcomes that clinicians can recognise and manage dengue.

An outbreak of Salmonella Saintpaul gastroenteritis after attending a school camp in the Northern Territory, Australia

Draper A, Morton C, Heath J, Lim J, Markey P


An outbreak of salmonellosis occurred following attendance at a school camp between 5 and 8 August 2014 in a remote area of the Northern Territory, Australia. We conducted a retrospective cohort study via telephone interviews, using a structured questionnaire that recorded symptoms and exposures to foods and activities during the camp. A case was anyone with laboratory confirmed Salmonella Saintpaul infection or a clinically compatible illness after attending the camp. Environmental health officers from the Environmental Health Branch undertook an investigation and collected water and environmental samples. We interviewed 65 (97%) of the 67 people who attended the camp. There were 60 students and 7 adults. Of the 65 people interviewed, 30 became ill (attack rate 46%); all were students; and 4 had laboratory confirmed S. Saintpaul infection. The most commonly reported symptoms were diarrhoea (100% 30/30), abdominal pain (93% 28/30), nausea (93% 28/30) and fever (70% 21/30). Thirteen people sought medical attention but none required hospitalisation. Illness was significantly associated with drinking cordial at lunch on 7 August (RR 3.8, 95% CI 1.3-11, P < 0.01), as well as drinking cordial at lunch on 8 August (RR 2.1, 95% CI 1.1-4.2, P=0.01). Salmonella spp. was not detected in water samples or wallaby faeces collected from the camp ground. The epidemiological investigation suggests the outbreak was caused by environmental contamination of food or drink and could have occurred during ice preparation or storage, preparation of the cordial or from inadequate sanitising of the cooler from which the cordial was served. This outbreak highlights the risks of food or drink contamination with environmental Salmonella. Those preparing food and drink in campground settings should be vigilant with cleaning, handwashing and disinfection to prevent outbreaks of foodborne disease.
An outbreak of salmonellosis associated with duck prosciutto at a Northern Territory restaurant

*Draper A, Morton C, Heath J, Lim J, Schiek A, Davis S, Krause V, Markey P.*


In June 2015, an outbreak of salmonellosis occurred among people who had eaten at a restaurant in Darwin, Northern Territory over 2 consecutive nights. We conducted a retrospective cohort study of diners who ate at the restaurant on 19 and 20 June 2015. Diners were telephoned and a questionnaire recorded symptoms and menu items consumed. An outbreak case was defined as anyone with laboratory confirmed *Salmonella Typhimurium* PT9 (STm9) or a clinically compatible illness after eating at the restaurant. Environmental health officers inspected the premises and collected food samples. We contacted 79/83 of the cohort (response rate 95%); 21 were cases (attack rate 27%), and 9 had laboratory confirmed STm9 infection. The most commonly reported symptoms were diarrhoea (100%), abdominal pain (95%), fever (95%) and nausea (95%). Fifteen people sought medical attention and 7 presented to hospital. The outbreak was most likely caused by consumption of duck prosciutto, which was consumed by all cases (OR 18.6, CI 3.0–∞, P < 0.01) and was prepared on site. *Salmonella* was not detected in any food samples but a standard plate count of 2 x 10⁷ colony forming units per gram on samples of duck prosciutto demonstrated bacterial contamination. The restaurant used inappropriate methodology for curing the duck prosciutto. Restaurants should consider purchasing pre-made cured meats, or if preparing them on site, ensure that they adhere to safe methods of production.

Whole genome sequencing to investigate a putative outbreak of the virulent community-associated methicillin-resistant *Staphylococcus aureus* ST93 clone in a remote Indigenous community


*Microb Genom. 2016 Dec; 2(12): e000098. Published online 2016 Dec 12. doi: 10.1099/mgen.0.000098*

We report 2 cases of severe pneumonia due to clone ST93 methicillin-resistant *Staphylococcus aureus* (MRSA) presenting from a remote Australian Indigenous community within a 2-week period, and the utilization of whole genome sequences to determine whether these were part of an outbreak. *S. aureus* was isolated from 12 of 92 nasal swabs collected from 25 community households (including the 2 index households); one isolate was ST93. Three of 5 skin lesion *S. aureus* isolates obtained at the community were ST93. Whole genome sequencing of the ST93 isolates from this study and a further 20 ST93 isolates from the same region suggested that recent transmission and progression to disease had not taken place. The proximity in time and space of the 2 severe pneumonia cases is probably a reflection of the high burden of disease due to ST93 MRSA in this population where skin infections and household crowding are common.
## NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS
### January–March 2016 and 2017

<table>
<thead>
<tr>
<th>Disease</th>
<th>Alice Springs 2017</th>
<th>Barkly 2017</th>
<th>Darwin 2017</th>
<th>East Arnhem 2017</th>
<th>Katherine 2017</th>
<th>NT 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute post strep glomerulonephritis</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Adverse vaccine reaction</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<td>Amoebiasis</td>
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<td>Barmah Forest</td>
<td>1</td>
<td>0</td>
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<td>5</td>
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<tr>
<td>Campylobacteriosis</td>
<td>20</td>
<td>29</td>
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<td>2</td>
<td>63</td>
<td>74</td>
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<td>Chickenpox</td>
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<td>6</td>
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<td>1</td>
<td>13</td>
<td>50</td>
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<tr>
<td>Chlamydia</td>
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<td>231</td>
<td>26</td>
<td>17</td>
<td>327</td>
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<td>Chlamydial conjunctivitis</td>
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<tr>
<td>Cryptosporidiosis</td>
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<td>39</td>
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<td>9</td>
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<tr>
<td>Dengue</td>
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<td>0</td>
<td>13</td>
<td>27</td>
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<td>Gastro - related cases</td>
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<td>Gonococcal conjunctivitis</td>
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<td>275</td>
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<td>Hepatitis B - chronic</td>
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<td>43</td>
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<td>20</td>
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<td>Meningococcal infection</td>
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<td>Mumps</td>
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<td>6</td>
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<td>Non TB Mycobacteria</td>
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<td>21</td>
<td>23</td>
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<tr>
<td>Syphilis &lt; 2years duration</td>
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<td>39</td>
<td>14</td>
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<td>2</td>
<td>0</td>
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<td>8</td>
<td>12</td>
</tr>
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<td>Trichomoniasis</td>
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<td>235</td>
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<td>44</td>
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<td>Varicella - unspecified</td>
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<td>2</td>
<td>0</td>
<td>65</td>
<td>63</td>
</tr>
<tr>
<td>Total</td>
<td>873</td>
<td>987</td>
<td>150</td>
<td>130</td>
<td>1,694</td>
<td>1,531</td>
</tr>
</tbody>
</table>

*Note: The numbers represent the number of cases reported in each location.*
Ratio of the number of notifications in the 1st quarter 2017 to the 5 year mean (2012–16): selected diseases

- Cryptosporidiosis
- Dengue
- Pneumococcal disease
- Group A strep invasive
- Ross River Virus
- Chickenpox
- Melioidosis
- AdV Vac Reac
- Rotavirus
- Pertussis

DECREASE
- Shigellosis
- Tuberculosis
- Salmonellosis
- Campylobacteriosis
- Zoster
- Acute post strep GN
- Rheumatic Fever
- Malaria

INCREASE
- Influenza
- Meningococcal inf R=5 (3 cases)
- Mumps R=9.2 (22 cases)
- Leptospirosis R=15 (9 cases)

Ratio of 1st quarter 2017 cases to the mean Q1 2012-16

---

Ratio of the number of notifications in the 1st quarter 2017 to the 5 year mean (2012–16): sexually transmitted diseases

- HTLV1
- Hepatitis B - unspec
- Gonococcal infection
- Chlamydia

DECREASE
- Hepatitis C - unspec
- Syphilis > 2yrs duration or unknown

INCREASE
- HIV
- Trichomoniasis
- Syphilis < 2 years duration

Ratio of 1st quarter 2017 cases to the mean Q1 2012–16
Comments on notifications

Syphilis of less than 2 years duration
There were 68 cases of syphilis of less than 2 years duration notified in the 1st quarter which was 3.5 times the expected number (20). This reflects the continuation of the 2014 outbreak which now includes the entire NT and is affecting mainly the 15–29 year age group in Aboriginal people.

Chlamydia
In the 1st quarter of 2017 there were 665 cases of chlamydia notified; 73 (10%) fewer than the 5 year mean for the 1st quarter of 738 and a reduction which was statistically significant. These figures will need to be confirmed but this is the first significant reduction in the quarterly case numbers for chlamydia and hopefully will herald further reductions in the future.

Influenza
The Top End of the NT quite often has a second wave of flu towards the end of The Wet season but this year’s was particularly severe with almost 500 cases being notified in the 1st quarter. This was more than 4.5 times the expected number of cases. The cases mainly occurred in the remote Aboriginal population in East and West Arnhem and the Tiwi Islands.

Mumps
The mumps outbreak continued throughout the 1st quarter of 2017, although with fewer confirmed cases than previous quarters. There were 22 notified cases compared with the expected 2.5 based on the 5 year mean. Public health action to mumps cases is confined to the isolation of cases and ensuring population vaccine coverage rates are as high as possible.

Leptospirosis
There was an outbreak of leptospirosis during the 1st quarter with 9 cases notified whereas the expected number is less than 1 case. This outbreak was associated with a cluster of cattle properties and the investigation is continuing.

Invasive group A streptococcal infection
There were fewer than expected notifications of invasive group A streptococcal (iGAS) disease during the 1st quarter in 2017 (10 cases vs 16 expected). Since 2011 iGAS notifications have ranged between 10 and 23 notifications per quarter.

Meningococcal disease
There were 2 sporadic (unrelated) cases of invasive meningococcal disease notified in the NT in the 1st quarter. In addition there was 1 sporadic case that presented to Alice Springs Hospital in the 1st quarter that was resident in a northern South Australia (SA) community and notified by SA. While these 3 cases were not found to be related in time, place or person, 2 of the cases were type W and the other was type Y. Both W and Y are vaccine preventable. Types W and Y are both increasing nationally and a coordinated national response is to be planned.

************

NT malaria notifications January to March 2017

Liz Stephenson, Centre for Disease Control, Darwin

There were 7 cases of malaria notified in the 1st quarter of 2017. The following table provides details about where the infection was thought to be acquired, the reason exposed, the infecting agent, whether chemoprophylaxis was used and where the patient lived.

<table>
<thead>
<tr>
<th>No. cases</th>
<th>Origin of Infection</th>
<th>Reason Exposed</th>
<th>Agent</th>
<th>Chemoprophylaxis</th>
<th>NT Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Papua New Guinea</td>
<td>Recreation</td>
<td><em>P. falciparum</em></td>
<td>No</td>
<td>Alice Springs</td>
</tr>
<tr>
<td>1</td>
<td>Papua New Guinea</td>
<td>Recreation</td>
<td><em>P. vivax</em></td>
<td>No</td>
<td>Katherine</td>
</tr>
<tr>
<td>2</td>
<td>Indonesia/Papua</td>
<td>Visiting student</td>
<td><em>P. falciparum</em> and <em>P. vivax</em></td>
<td>No</td>
<td>Darwin</td>
</tr>
<tr>
<td>2</td>
<td>Indonesia/Papua</td>
<td>Visiting student</td>
<td><em>P. vivax</em></td>
<td>No</td>
<td>Darwin</td>
</tr>
<tr>
<td>1</td>
<td>Liberia</td>
<td>Expatriate visiting relatives</td>
<td><em>P. falciparum</em></td>
<td>Yes</td>
<td>Darwin</td>
</tr>
</tbody>
</table>

************
Immunisation coverage for children aged 12-<15 months at 31 March 2017

<table>
<thead>
<tr>
<th>Region</th>
<th>Number in district</th>
<th>%DTP</th>
<th>%Polio</th>
<th>%HIB</th>
<th>%Hep</th>
<th>%Pneumo</th>
<th>%Fully vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin</td>
<td>307</td>
<td>93.8%</td>
<td>93.5%</td>
<td>92.8%</td>
<td>93.2%</td>
<td>93.2%</td>
<td>91.5%</td>
</tr>
<tr>
<td>Winnellie PO Bag</td>
<td>68</td>
<td>92.6%</td>
<td>92.6%</td>
<td>92.6%</td>
<td>95.6%</td>
<td>91.2%</td>
<td>91.2%</td>
</tr>
<tr>
<td>Palmerston/Rural</td>
<td>247</td>
<td>93.9%</td>
<td>93.9%</td>
<td>93.5%</td>
<td>93.9%</td>
<td>93.5%</td>
<td>93.5%</td>
</tr>
<tr>
<td>Katherine</td>
<td>81</td>
<td>98.8%</td>
<td>98.8%</td>
<td>98.8%</td>
<td>98.8%</td>
<td>96.3%</td>
<td>96.3%</td>
</tr>
<tr>
<td>Barkly</td>
<td>16</td>
<td>93.8%</td>
<td>93.8%</td>
<td>87.5%</td>
<td>87.5%</td>
<td>93.8%</td>
<td>87.5%</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>115</td>
<td>93.9%</td>
<td>93.9%</td>
<td>93.9%</td>
<td>93.9%</td>
<td>93.9%</td>
<td>93.9%</td>
</tr>
<tr>
<td>Alice Springs PO Bag</td>
<td>43</td>
<td>93.0%</td>
<td>93.0%</td>
<td>93.0%</td>
<td>93.0%</td>
<td>93.0%</td>
<td>93.0%</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>15</td>
<td>93.3%</td>
<td>93.3%</td>
<td>93.3%</td>
<td>93.3%</td>
<td>93.3%</td>
<td>100.0%</td>
</tr>
<tr>
<td>NT</td>
<td>892</td>
<td>94.2%</td>
<td>94.1%</td>
<td>93.6%</td>
<td>94.1%</td>
<td>93.6%</td>
<td>93.6%</td>
</tr>
<tr>
<td>Non-Indigenous (NT)</td>
<td>581</td>
<td>95.0%</td>
<td>94.8%</td>
<td>94.3%</td>
<td>94.5%</td>
<td>94.7%</td>
<td>93.6%</td>
</tr>
<tr>
<td>Indigenous (NT)</td>
<td>311</td>
<td>92.6%</td>
<td>92.6%</td>
<td>92.3%</td>
<td>93.2%</td>
<td>91.6%</td>
<td>91.3%</td>
</tr>
<tr>
<td>Australia</td>
<td>76155</td>
<td>94.5%</td>
<td>94.5%</td>
<td>94.3%</td>
<td>94.5%</td>
<td>94.1%</td>
<td>93.7%</td>
</tr>
</tbody>
</table>

Immunisation coverage for children aged 24-<27 months at 31 March 2017

<table>
<thead>
<tr>
<th>Region</th>
<th>Number in district</th>
<th>%DTP</th>
<th>%Polio</th>
<th>%HIB</th>
<th>%Hep</th>
<th>%MMR</th>
<th>%MenC</th>
<th>% Fully Varicella vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin</td>
<td>311</td>
<td>92.0%</td>
<td>95.5%</td>
<td>95.2%</td>
<td>95.5%</td>
<td>96.2%</td>
<td>96.2%</td>
<td>90.0%</td>
</tr>
<tr>
<td>Winnellie PO Bag</td>
<td>59</td>
<td>81.4%</td>
<td>96.6%</td>
<td>96.6%</td>
<td>94.9%</td>
<td>94.9%</td>
<td>94.9%</td>
<td>78.0%</td>
</tr>
<tr>
<td>Palm/Rural</td>
<td>262</td>
<td>90.8%</td>
<td>96.9%</td>
<td>95.8%</td>
<td>96.6%</td>
<td>91.5%</td>
<td>92.4%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Katherine</td>
<td>70</td>
<td>88.6%</td>
<td>97.1%</td>
<td>98.6%</td>
<td>97.1%</td>
<td>98.6%</td>
<td>87.1%</td>
<td>81.4%</td>
</tr>
<tr>
<td>Barkly</td>
<td>27</td>
<td>88.9%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>77.8%</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>97</td>
<td>88.7%</td>
<td>92.8%</td>
<td>94.8%</td>
<td>92.8%</td>
<td>90.7%</td>
<td>93.8%</td>
<td>86.6%</td>
</tr>
<tr>
<td>Alice Springs PO Bag</td>
<td>50</td>
<td>82.0%</td>
<td>96.0%</td>
<td>94.0%</td>
<td>96.0%</td>
<td>90.0%</td>
<td>90.0%</td>
<td>72.0%</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>33</td>
<td>97.0%</td>
<td>97.0%</td>
<td>97.0%</td>
<td>97.0%</td>
<td>97.0%</td>
<td>97.0%</td>
<td>97.0%</td>
</tr>
<tr>
<td>NT</td>
<td>909</td>
<td>89.9%</td>
<td>96.0%</td>
<td>95.8%</td>
<td>95.9%</td>
<td>95.4%</td>
<td>95.4%</td>
<td>91.2%</td>
</tr>
<tr>
<td>Non-Indig (NT)</td>
<td>617</td>
<td>91.9%</td>
<td>95.8%</td>
<td>95.5%</td>
<td>95.6%</td>
<td>95.1%</td>
<td>92.5%</td>
<td>90.3%</td>
</tr>
<tr>
<td>Indig (NT)</td>
<td>292</td>
<td>85.6%</td>
<td>96.6%</td>
<td>96.6%</td>
<td>96.6%</td>
<td>93.2%</td>
<td>95.9%</td>
<td>88.4%</td>
</tr>
<tr>
<td>Australia</td>
<td>77752</td>
<td>91.8%</td>
<td>96.3%</td>
<td>95.2%</td>
<td>96.1%</td>
<td>93.3%</td>
<td>93.3%</td>
<td>89.6%</td>
</tr>
</tbody>
</table>

Immunisation coverage for children aged 60-<63 months at 31 March 2017

<table>
<thead>
<tr>
<th>Region</th>
<th>Number in district</th>
<th>%DTP</th>
<th>%Polio</th>
<th>%MMR</th>
<th>%Fully vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin</td>
<td>276</td>
<td>91.7%</td>
<td>91.7%</td>
<td>93.5%</td>
<td>91.3%</td>
</tr>
<tr>
<td>Winnellie PO Bag</td>
<td>47</td>
<td>95.7%</td>
<td>95.7%</td>
<td>95.7%</td>
<td>95.7%</td>
</tr>
<tr>
<td>Palmerston/Rural</td>
<td>218</td>
<td>91.3%</td>
<td>91.3%</td>
<td>91.3%</td>
<td>90.4%</td>
</tr>
<tr>
<td>Katherine</td>
<td>81</td>
<td>93.8%</td>
<td>92.6%</td>
<td>92.6%</td>
<td>90.1%</td>
</tr>
<tr>
<td>Barkly</td>
<td>16</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>109</td>
<td>90.8%</td>
<td>90.8%</td>
<td>89.9%</td>
<td>89.9%</td>
</tr>
<tr>
<td>Alice Springs PO Bag</td>
<td>35</td>
<td>94.3%</td>
<td>94.3%</td>
<td>94.3%</td>
<td>94.3%</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>38</td>
<td>97.4%</td>
<td>97.4%</td>
<td>100.0%</td>
<td>97.4%</td>
</tr>
<tr>
<td>NT</td>
<td>820</td>
<td>92.4%</td>
<td>92.3%</td>
<td>92.9%</td>
<td>91.6%</td>
</tr>
<tr>
<td>Non-Indigenous (NT)</td>
<td>547</td>
<td>90.7%</td>
<td>90.7%</td>
<td>91.6%</td>
<td>90.1%</td>
</tr>
<tr>
<td>Indigenous (NT)</td>
<td>273</td>
<td>96.0%</td>
<td>95.6%</td>
<td>95.6%</td>
<td>94.5%</td>
</tr>
<tr>
<td>Australia</td>
<td>77820</td>
<td>94.2%</td>
<td>94.2%</td>
<td>94.6%</td>
<td>93.4%</td>
</tr>
</tbody>
</table>
Immunisation coverage at 31 March 2017

Holly Carmichael, Centre for Disease Control, Darwin

Background information to interpret coverage

Children were assigned to regions based on the postcode taken from their Medicare address listed in the Australian Immunisation Register (AIR). Children with a PO Box address listed are counted among that PO Box postcode. Winnellie PO Bag is postcode 0822, which includes most Darwin Rural District communities, some East Arnhem District communities and some residents of the Darwin ‘rural area’ who collect mail from the Virginia store or Bees Creek. Alice Springs PO Bag is postcode 0872, which includes Alice Springs District, Nganampa and Ngaanyatjarra communities.

The cohort of children assessed at 12 to <15 months of age on 31 March 2017 were born between 1 October 2015 and 31 December 2015 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 2 or 3 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, 3 doses of hepatitis B vaccine and 3 doses of pneumococcal vaccine. All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24 to <27 months of age on 31 March 2017 were born between 1 October 2014 and 31 December 2014 inclusive. To be considered fully vaccinated, these children must have received meningococcal C vaccination (given at the 12 month schedule point), and a second dose of measles, mumps, rubella (MMR) and the first dose of the varicella vaccination (given in combination as MMRV at the 18 months schedule point). All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 60 to <63 months of age on 31 December 2016 were born between 1 October 2011 and 31 December 2011 inclusive. To be considered fully vaccinated, these children must have received 4 or 5 valid doses of vaccines containing diphtheria, tetanus, pertussis antigens, 4 doses of poliomyelitis vaccine and 2 valid doses of MMR vaccine. All vaccinations must have been administered by 60 months (5 years) of age.

Interpretation and comment

Immunisation coverage rates for NT children by regions as estimated by the AIR are shown on page 43.

Children in the NT were marginally less likely than the national average to be fully immunised in the 12 to <15 months cohort (NT 92.8%, National 93.7%) and the 24 to <27 months cohort (NT 86.8%, National 89.6%). The NT children in the 60 to <63 months cohort were relatively high but still below the national coverage rate (NT 91.6%, National 93.4%).

Indigenous children were less likely to be fully immunised than non-Indigenous children in the 12 to <15 month cohort (Indigenous 91.3%, non-Indigenous 93.6%) and in the 24 to <27 month cohort (Indigenous 79.5%, non-Indigenous 90.3%) but more likely to be fully immunised in the 60 to <63 month cohort (Indigenous 94.5%, non-Indigenous 90.1%).

This is the first quarter to include the 18 month diphtheria, tetanus, pertussis vaccine introduced in March 2016 and coverage has decreased nationally in this age group. CDC are currently reviewing strategies to improve immunisation timeliness and coverage for both Indigenous and non-Indigenous children at 2 years of age. CDC is working with the Australian Immunisation Register to review data quality and processing of vaccine recording to assure the coverage levels are as accurate as possible and CDC is working with key stakeholders to develop increased awareness of the importance of timely vaccination for immunisation providers and the public.

Further information about the Australian Childhood Immunisation Register coverage may be found at: http://ncirs.edu.au/immunisation/coverage/index.php

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Disease Control staff updates April-June 2017

Top End

**Dr Kate Hardie** commenced as the Section Head of Rheumatic Heart Disease in May 2017. Kate worked as the TB and Mycobacterial Public Health Medical Officer in Darwin Centre for Disease Control (CDC) over the last 2 years. Kate will also have a role with supervision of the Public Health and General Practice Registrars.

**Marea Fittock**, Clinical Nurse Manager (CNM)-NT RHD Program Coordinator, has returned from long service leave. **Desley Williams** covered Marea’s position for the team, thanks to Desley. **Emma Childs** and **Narelle Raiss** have completed their short term contract with the RHD Program.

**Dr Peter Markey**, Head of Surveillance is on long service leave until the beginning of October.

**Dr Amulya Duvvuru** has joined Clinic 34 Darwin for 6 months from June. Amulya is the part-time Clinic Medical Officer and she also works as a General Practitioner. **Letisha Parter** has joined the Sexual Health and BBV team as an Aboriginal Health Practitioner/Health Promotion Officer, she has a strong background in sexual health and health promotion and was previously working with True Relationships and Reproductive Health Program on the Sunshine Coast. Letisha will be working across urban and remote programs. **Rebecca Payne** has resigned to take up study for a new career direction. Thank you to Rebecca for her years of service as a Clinical Nurse Specialist (CNS) with the Sexual Health Team and support to the Department of Health and CDC in her various roles.

**Carmel Whalley** retired from the Department of Health in April 2017 after 28 years of service. Carmel commenced with work with the Northern Territory Government in 1983 at the Maternity Unit of the Royal Darwin Hospital. She moved to the Berrimah Community Care Centre, working in the satellite baby clinics of Malak and Karama and then at the Nightcliff Community Clinic as the Quality Assurance Nurse. In 1992 Carmel commenced work at the Katherine Community Care Centre as the Domiciliary Nurse which she continued for 5 years. She then started work as a Lifestyle Nurse in 1998 managing chronic disease including diabetes. This position was transferred to the Centre for Disease and Carmel remained as a Lifestyle and Public Health Nurse until her retirement in April.

**Michelle Daly** has joined Katherine CDC back-filling **Judy Creighton’s** position as the Public Health Nurse TB Unit CNM, while Judy is on long service leave. Michelle has worked as a public health nurse in North Queensland for more than 10 years, with a focus on surveillance and immunisation, and is keen to further her knowledge in TB. Welcome Michelle.

Central Australia

**Jessica Gunner** has joined CDC in the role of Receptionist/ Administrative Support Officer in May 2017. Jess has worked in various administrative positions within the NTG and more recently at Alcohol and Other Drugs Services in Central Australia. The position became vacant following the resignation of **Sonia Donnelly** and **Brianna Sanderson** who were job-sharing in the Receptionist/ Administrative Support Officer position.

**Dr Tanya Jones** joined the TB Program as a part time Clinical Medical Officer in May 2017. Dr Jones previously worked at the Alice Springs Hospital and in GP clinics.

**Alice Ishwar**, CNS, Syphilis Register, and **Mark Russell**, Clinical Nurse Consultant (CNC) Remote Sexual Health Program, returned to work from long service leave at the end of April. **Helen Goodwin, Sarah Wyatt** and **Jessica Harries** who were backfilling long service leave returned to their nominal positions. **Bernard Longbottom** who was backfilling for Helen Goodwin reverted to his nominal position at Alice Springs Hospital.