Rabies exposure encounters and prophylaxis in those using health services in the Northern Territory 2007-2011

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Abstract

Since the first reports of rabies in dogs in Bali in 2008, the Northern Territory (NT) has seen a significant increase in the number of people seeking post-exposure prophylaxis (PEP) for rabies. Between 2007 and 2011, 92 people presented to a NT health facility for PEP for animal bites acquired overseas and 58 doses of rabies immunoglobulin (RIG) were administered. Of the 92 possible exposures, 66 were caused by interactions with animals in Bali, which included monkeys (53), dogs (7), cats (2), squirrels (3) and a bat(1). Current guidelines do not recommend pre-trip vaccination for tourists taking short trips to endemic areas. It is our suggestion that given the close contact a large number of tourists in Bali come into with monkeys and dogs, perhaps the guidelines should be revised to include these travellers for pre-trip vaccination for rabies.

Key words: rabies; prophylaxis

Background

It was with interest that we read Mills¹ article on rabies exposure in Australian travellers where the most at-risk age-group, the most common overseas destinations and animals were highlighted. The article importantly noted the difficulties most travellers experienced in obtaining rabies post-exposure prophylaxis overseas. We have encountered similar experiences in the Northern Territory (NT), especially since the introduction of rabies into Bali in 2008. We decided to critically interrogate our data to further inform the discussion around the best approach to protecting and educating those at risk of rabies.
Methods

We looked at our prospectively collected data on people receiving rabies prophylaxis from the Centre for Disease Control (CDC) in the NT from 2007 to 2011 inclusive, specifically looking at the number of people seeking post-exposure prophylaxis (PEP) vaccination and rabies immunoglobulin (RIG) and the nature of the animal exposure. This information is kept on an Excel database by the Immunisation Unit at the CDC in Darwin. All doses of RIG administered are reported to the national database maintained by the Commonwealth for people potentially exposed to rabies and Australian Bat Lyssavirus. We did not include any data for people who had contact with Australian bats and potential exposure to Australian Bat Lyssavirus for this review.

Results

In total, there were 92 people with animal exposure encounters (possible rabies exposure cases), with 87 people given PEP in the NT (Table 1) with 58 of whom were given RIG (Table 2). The 6 encounters in 2007 were people exposed to animals in Thailand (3), the Philippines (1), Vietnam (1), and Timor (1). By 2011 there were 40 exposures, with 31 from Bali.

Table 3 shows the implicated animals. Overall from 2007-2011 there were 59 exposures to monkeys, 53 of which were in Bali. The vast majority were monkey bites, although there were 5 cases of monkey scratches and 4 cases of people being both bitten and scratched. There were 23 exposures to dog bites in Bali (7), Thailand (5), Timor (4), Vietnam (2), Cambodia (2), China (1), Mongolia (1) and Ethiopia (1). Other animals included 3 squirrels (all in Bali), 5 cats, a civet cat (in Bali), and 1 bat (in Bali).

Only 1 person received RIG overseas. Post-exposure vaccination was instigated overseas in 43 cases (some people received more than 1 dose of the 4 dose vaccination schedule), 18 people received their first dose of vaccine overseas and returned to Australia for RIG and follow-up vaccine. Of note, RIG was sent from Darwin to Timor for 3 Defence Force personnel, as well as 1 course of PEP vaccine and RIG sent to Timor for a Timorese resident.

Table 2 indicates why RIG was not administered to some returning travellers.

No cases of human rabies were reported in our study population. There was 1 case of confirmed rabies in a dog that had bitten a person in Bali. The person had pre-departure vaccination in the year prior to the bite and was given 2 doses of rabies vaccine post-exposure in Darwin in accordance with National Health and Medical Research Council recommendations. Due to pre-exposure vaccination, RIG was not indicated.

Discussion

The first year of this study, 2007, rabies had not been documented yet in Bali and only 6 potential animal exposures were reported to the CDC in the NT. In 2008 rabies was first documented in Bali and by 2011 there were 40 potential rabies animal encounters reported to the CDC in the NT, 31 from Bali.

Our study population had a pre-trip vaccination rate of 6.5% compared to 1.5% in the Mills study. Given the number of possible exposures it is clear that many could have been avoided if the uptake of pre-exposure vaccination could be increased.

Table 1. Rabies exposure encounters and PEP given

<table>
<thead>
<tr>
<th></th>
<th>Encounters</th>
<th>Encounters in Bali</th>
<th>Number given PEP in the NT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2008</td>
<td>8</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>2009</td>
<td>17</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>2010</td>
<td>21</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>2011</td>
<td>40</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>66</td>
<td>87</td>
</tr>
</tbody>
</table>
The costs associated with PEP including RIG are enormous compared to pre-exposure vaccination. Without pre-exposure vaccination, RIG is required in addition to a PEP vaccine course. Before June 2010 this consisted of 5 doses of vaccine on days 0, 3, 7, 14, 28 for all exposures. Since June 2010, the schedule reduced to 4 doses on days 0, 3, 7, 14 in immune-competent persons, with an additional dose on day 28 only for immune-compromised persons.

RIG is the expensive item – but the vaccines are time and resource-intensive. The average cost of PEP vaccine with RIG for a 70kg person is $2170, whereas pre-exposure prophylaxis of 3 doses of vaccine costs $270 and the 2 dose course of vaccine required after a potential rabies encounter for people previously vaccinated is only $180. We have only recovered the costs of 1 course of PEP and RIG from a travel insurance company during the last 5 years. An attempt is made in overseas travellers and people bitten as a result of a work injury.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number pre-vaccinated (did not require RIG)</th>
<th>Number given RIG</th>
<th>Number not given RIG (excludes those pre-vaccinated)</th>
<th>Reason for not giving RIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>Presented &gt;7 days after first vaccine given overseas</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>Presented &gt;7 days after first vaccine given overseas</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>12</td>
<td>4</td>
<td>Presented &gt;7 days after first vaccine given overseas</td>
</tr>
<tr>
<td>2010</td>
<td>3</td>
<td>15</td>
<td>2</td>
<td>Presented &gt;7 days after first vaccine given overseas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Pet dog reported well 10 days post bite</td>
</tr>
<tr>
<td>2011</td>
<td>1</td>
<td>23</td>
<td>10</td>
<td>Presented &gt;7 days after first vaccine given overseas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Licks to skin – no PEP required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Minor skin breaks with no bleeding (vaccine only)</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>58</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Monkey scratch/bite</th>
<th>Dog scratch/bite</th>
<th>Cat scratch/bite</th>
<th>Squirrel scratch/bite</th>
<th>Bat scratch/bite</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2010</td>
<td>14</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>25</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>23</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
related injury (e.g. wild-care workers, veterinarians), to gain payment for PEP vaccines, however, this occurs infrequently. The Northern Territory and Australian Government public health budgets jointly currently cover the cost of all doses of RIG that are administered.

The NT Government Department of Health website provides information under the heading, ‘Travelling to South East Asia’ where it “strongly advised travellers to take out overseas travel insurance from a reputable company before departing”2. It also informs travellers that rabies is a deadly viral infection that can be transmitted by infected animals across South East Asia and can be transmitted to humans from bites, scratches or licks to broken skin or the mouth or eyes. It warns travellers not to approach, stroke or pat dogs, cats, monkeys or other animals. It directs that any scratches or bites should be washed thoroughly and medical attention must be sought so that treatment can be given, emphasising that rabies is a fatal disease. It raises the point that some people may have rabies vaccinations before they travel and this possibility should be discussed with their doctor. It cautions that people vaccinated against rabies before travel must still seek medical attention post exposure as further (although less extensive and less expensive) treatment is still required.

The current Australian Immunisation Handbook3 only recommends pre-exposure vaccination for those travelling to an endemic area for over 1 month or for those intending to handle animals in endemic areas. Data does not get collected on how long people had been travelling overseas when having their rabies exposure encounters. We do have data on occupation though and have identified 2 people who should have been vaccinated according to current recommendations. One person was a dog catcher working in Thailand and the other was a Defence Force worker in Timor. One dog catcher in Bali and 3 Defence Force workers in Timor were appropriately vaccinated prior to exposure.

A recent study from GeoSentinel4, a global surveillance network that runs a database collecting data of diseases reported in international travellers and immigrants from 53 clinical sites in 24 countries, reported rabies PEP as the third most common notable specific diagnosis among returned travellers. This was behind malaria and giardia. The top countries for rabies-potential bites and scratches were reported to be Thailand, Indonesia, China and India.4

We think the Guidelines3 should reflect the high-risk nature of being around uncaged and unpredictable animals, such as the monkeys in areas of Bali and expand the target ‘at-risk’ group. It is perhaps reasonable to advise vaccination for tourists going to Bali who plan to be outside the immediate Denpasar area no matter the length of their stay. Further information is required to determine whether the 1 month recommendation is too prescriptive. Regardless, public education should be increased and targeted at overseas travellers to raise awareness of the disease, its prevalence in tourist areas and the role of both pre and post-vaccination.

References

Influenza (flu) season is again upon us, and the Northern Territory (NT) Centre for Disease Control (CDC), together with colleagues in Infection Control, are once again planning the campaign to encourage as many people as possible to be vaccinated. There has been much media attention recently about the high incidence of influenza in North America that unfortunately led to the deaths of a number of people, many of whom were vulnerable due to extremes of age, or as a result of underlying medical conditions. In the NT cases of H3N2 and H1N1 have already been reported, both of which are strains covered in this year’s vaccine.

The composition of the vaccine has changed from last year and contains the following components:
- A/California/7/2009 (H1N1)-like virus
- A/Victoria/361/2011 (H3N2)-like virus
- B/Wisconsin/1/2010-like virus

It is well accepted that the influenza vaccine does not offer perfect individual protection, with efficacy reported at around 60% and possibly lower in older adults. However, public health departments worldwide continue to recommend the vaccine as the main tool we currently have to reduce the burden of disease. Individuals particularly at risk from complications, and over-represented among those who die from influenza, include those with chronic heart, lung, renal and neurological disorders, pregnant women, elderly patients and those of Indigenous origin. Healthcare staff should actively promote the vaccine to everyone but especially to those who may be at risk from complications and to those living in areas burdened by poor health literacy or geographical isolation. People over the age of 6 months with specific chronic health conditions will be eligible for free vaccination under the National Immunisation Program and further information about these groups can be found at the following CDC internet link: http://health.nt.gov.au/Flu/index.aspx

**Children**

Following reports of severe adverse reactions among young children who had received Fluvax® brand of influenza vaccine in 2010, this specific brand of vaccine (Fluvax® produced by bio CSL) is not to be used in children under the age of 10 years. Options for children under the age of 10 years who are eligible for free influenza vaccination with other brands of influenza vaccine under the National Immunisation Program are as follows:

**Table. National Immunisation Guidelines**

<table>
<thead>
<tr>
<th>Category</th>
<th>Vaccine Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>All children 3 years &lt; 10 years with medical conditions that predispose them to severe influenza (per categories listed above)</td>
<td>VAXIGRP® 0.5 ml IMI * (1 or 2 doses may be required)</td>
</tr>
<tr>
<td>All children 6 months – 35 months with medical conditions that predispose them to severe influenza (per categories listed above)</td>
<td>VAXIGRIP JUNIOR® 0.25 ml IMI * (1 or 2 doses may be required)</td>
</tr>
</tbody>
</table>

*Note:
- 2 doses of vaccine given at least 1 month apart are recommended for children ≤ 9 years of age who are receiving influenza vaccine for the first time.
- If a child 6 months ≤ 9 years of age receiving influenza vaccine for the first time inadvertently does not receive the second dose in the same year, he/she should have 2 doses given in the following year.
- Children requiring 2 doses of influenza vaccine should have them administered no closer than 28 days apart.
- Where 2 doses of 2013 seasonal influenza vaccine are required the same brand of vaccine should be administered where possible.
Healthcare staff

Encouraging healthcare staff to take up the offer of vaccination against influenza is always challenging; in part, because many young healthcare workers perceive themselves to be fit and healthy, “not at risk”, and associate the need for vaccination with older individuals. A meta-analysis of studies investigating attitudes to influenza vaccination among healthcare workers found that predictors of vaccination included an individual’s knowledge about the infectiousness of influenza, belief in the ability of the vaccine to protect, and a desire to protect themselves and their families. Interestingly, healthcare workers in these studies were less influenced by the desire to protect vulnerable patients. A local study in 2007 found the most common reasons cited for not being immunised were being too busy; immunisation not being offered conveniently and being unaware of how to access the vaccine. A higher level of knowledge about influenza vaccination was strongly associated with ever having received immunisation. Whatever their motivation for doing so, we would encourage as many staff as possible to consider being vaccinated this year and have been actively promoting the vaccine in a number of departmental sessions throughout the hospitals.

Getting the influenza vaccine

For many years, the NT Department of Health (DoH) has committed to funding the vaccine for its staff. It will be offered to all DoH staff in all regions of the NT. Details of the locations of staff vaccination clinics can be found at the following CDC intranet link:


In the hospitals, the Infection Control teams will be organising mobile clinics to visit clinical areas.

Other healthcare agencies outside of the DoH often fund the influenza vaccine for their staff and readers are advised to contact their managers to discuss this further.

Key messages

- The influenza vaccine has to be given every year as protection only lasts for around 12 months.
- You cannot catch the flu from having the vaccine, as it does not contain any live virus.
- This year’s influenza vaccine covers the most prevalent strains of influenza causing disease this year and is different from last year’s vaccine.
- Individuals with chronic diseases such as diabetes, heart, lung or kidney disease are more at risk of developing severe complications from influenza, as are women who are pregnant.
- Having the influenza vaccine means you are less likely to transmit the flu to your families. Remember young babies and elderly people can be severely affected by influenza.
- Having the influenza vaccine reduces the risk of transmitting the flu to your patients, many of whom will have chronic diseases which render them more likely to have severe complications.

Further information

For further information about the influenza vaccine, or about any vaccines, please contact CDC in your local area, visit the CDC intranet or internet pages, or visit the national Immunise Australia website on: http://www.immunise.health.gov.au/

References

Important notice:
Influenza vaccine for children

- Bio CSL’s seasonal influenza vaccine Fluvax® is NOT registered for use in children under 5 years.
- There is also a ‘precaution’ for the use of Fluvax® in children aged 5 years to < 10 years.
- The recommendation in the NT is to use alternative influenza vaccines for children between 6 months and < 10 years of age.

**National Immunisation Program – funded vaccine for children with medical conditions predisposing them to severe influenza**

<table>
<thead>
<tr>
<th>All children 6 months – 35 months</th>
<th>VAXIGRIP JUNIOR® 0.25ml IMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* (1 or 2 doses may be required)</td>
</tr>
<tr>
<td>All children 3 years - &lt;10 years</td>
<td>VAXIGRIP ® 0.5ml IMI</td>
</tr>
<tr>
<td></td>
<td>* (1 or 2 doses may be required)</td>
</tr>
</tbody>
</table>

* 2 doses of vaccine given at least 1 month apart are recommended for children ≤ 9 years of age who are receiving influenza vaccine for the first time

* If a child 6 months - ≤ 9 years of age receiving influenza vaccine for the first time inadvertently does not receive the second dose in the same year, he/she should have 2 doses given in the following year

Children not eligible for the funded influenza vaccine under the National Immunisation Program can purchase the vaccine if their parents wish them to be vaccinated. Vaxigrip®, Aggripal®, Fluarix® and Influvac® can be used in any children 6 months of age or older.


All healthcare workers are encouraged to be vaccinated against influenza. Personal protective measures such as handwashing and covering the mouth and nose when sneezing and coughing are important but vaccination against influenza is the best way to protect staff and patients.


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It is here—the newest edition of *The Australian Immunisation Handbook* 10th edition Check it out

NCIRS has developed a slide set for immunisation service providers, summarising what’s new in the latest edition of *The Australian Immunisation Handbook*. It is intended as an educational teaching tool to accompany the 10th edition of the Handbook which was released by the Australian Government Department of Health and Ageing in March 2013.

Abstract

There were 475 cases of laboratory confirmed influenza notified in the NT in 2012. There was a pre-seasonal increase in the Top End in March and April and the season commenced in early May, starting in Central Australia. Significant numbers of cases were notified until mid-December. Even though the annual total was the lowest since the pandemic year (2009), rates in the non-Indigenous population were the highest since 2009 and the number of non-Indigenous people hospitalised was the highest since recording began in 2007. Alice Springs town and the Katherine region had the highest rates. Data from other influenza surveillance systems are summarised.

Introduction

Until 2006, influenza surveillance in the Northern Territory (NT) consisted of just 2 arms; the notification of laboratory-confirmed cases through the Notifiable Diseases System notifications (NTNDS) and GP sentinel surveillance of influenza-like illness through the Territory Influenza Sentinel Surveillance System (TISS). By 2012, it had increased to involve daily syndromic surveillance from all NT Emergency Departments, volunteer reporting of cough and fever through an internet-based reporting system (FluTracking) and the involvement of Alice Springs Hospital in the national sentinel hospital surveillance (FluCan). This report summarises these surveillance systems and describes the epidemiology of influenza in the NT in 2012.

Methods

Laboratory-confirmed influenza cases are notified by NT laboratories to the Centre for Disease Control (CDC) and entered into the NTNDS which gets migrated nightly to the Department of Health’s data warehouse. The data are interrogated using either STATA or Business Objects, the Department’s business intelligence software. Population data were derived from the population data file from Health Gains Planning Branch; the 2009 and 2010 population extrapolated in a linear fashion to derive the 2012 data. Cases which tested positive to influenza A but negative to the specific subtype A/H1N1 were assumed to be A/H3N2 for the purposes of this analysis.

GP sentinel surveillance in the NT used to be run from CDC via TISS but now comes under the Australian Sentinel Practice Research Network (ASPREN). GP services report to the ASPREN website the details of cases of influenza-like illness (ILI) they have seen together with the total number of consultations per week. The statistic derived is the rate of ILI cases per 1,000 consultations. Data from this system are derived from the ASPREN website.

Data for the Emergency Department Influenza-like Illness Surveillance System (EDILIS) are derived from the presenting complaint field in the Caresys ED module on all cases presenting to all NT emergency departments. Here ILI is defined as any presentation with the following 4 classifications; febrile illness, viral illness, respiratory infection or cough. These are also migrated into the data warehouse and interrogated using Business Objects and Excel. EDILIS is a syndromic surveillance system designed to detect the first increase in symptoms in the community; hence the usual statistic used is the “CuSum” which is the cumulative sum of the difference between the daily count and the number of cases expected (based on a running mean). However, for the seasonal analysis, just the weekly counts of ILI were analysed.

FluTracking works by sending weekly emails to several hundred NT volunteers asking questions about recent flu-like symptoms and vaccination status through a website. The data for the NT are collated by the FluTracking office in Newcastle, sent to CDC weekly and analysed using STATA.

This year CDC also received data from FluCan which is a national surveillance system monitoring admissions for ILI in sentinel hospitals. In 2012, Alice Springs Hospital joined the other 12 hospitals to report on ILI hospitalisations and outcomes. The results from this system will not be included in this report.
The Royal Darwin Hospital laboratory actively contributes to global virological surveillance by referring specimens to the World Health Organisation Collaborating Centre for influenza in Melbourne for strain analysis. This is done either directly or through the Western Australian reference laboratory (PathWest).

Results

Laboratory confirmed cases

There were 475 cases of laboratory-confirmed influenza notified to CDC in 2012. This compares with 638 in 2011 and 503 in 2010 and was the lowest annual total since testing increased during the 2009 pandemic. The “flu season” commenced in Central Australia (mostly type B) in early May and in the Top End in June (mostly A/H3N2). In the Top End there was an increase in both A and B types in March and April 2012 prior to the “flu season” commencing. This is consistent with the small rise which happens at that time in most years and low levels of notifications continued through April and May. The season peaked in early July in both the Centre and Top End then persisted until the middle of December, lasting for over 7 months (Figure 1).

There were 219 cases (46%) of subtype A/H3N2 while another 59 (12%) were type A with no further typing. There were 184 (39%) type B cases and just 13 (3%) subtype A/H1N1, the 2009 pandemic strain.

The age-specific rates in the Indigenous and non-Indigenous populations are illustrated in Figure 2. Interestingly, rates in the age-groups between 5 and 44 years were similar in both groups while the Indigenous population had much higher rates in the under 5 year age-group and in those 45 years and over. In the non-Indigenous population rates were higher in the 65 year and over age group compared with younger age-groups. The rate of laboratory-confirmed influenza was 299 per 100,000 in the Indigenous population compared to 159 per 100,000 in the non-Indigenous population, a rate ratio of 1.88 (not shown). The indirect age-standardised incidence ratio was 1.84. This compared with a crude rate ratio in 2011 of 6.46, when the rates in the Indigenous and non-Indigenous populations were 670 and 104 per 100,000 respectively.

In 2012, 251 cases or 53% of notifications were in hospitalised cases. This compares with 50% in 2010 and 32% in 2010. There were 154 Indigenous people (75% of cases) admitted with influenza and 97 (38% of cases) non-Indigenous. Hospitalisation rates were 216 per 100,000 in the Indigenous population and 59 per 100,000 in the non-Indigenous population given a rate ratio of 3.7 (95%CI: 2.82-4.77; p<10^-5). This compared with a rate ratio of 12.4 during the 2009 pandemic. There were more non-Indigenous cases of influenza admitted to hospital in 2012 than in 2009 (79) or in any of the years since. The median length of hospital stay was greater in the Indigenous population than the non-Indigenous (4 days v 3 days; Wilcoxin rank-sum test, p=0.025).

Figure 1. Count of laboratory-confirmed influenza by week and region; 2012.

Figure 2. Age-specific rates of laboratory-confirmed influenza by Indigenous status; 2012
Rates were higher in the Alice Springs town and Katherine region and lowest in urban Darwin (Table).

Overall, 24% of laboratory-confirmed cases were vaccinated against influenza for the season, 30% of Indigenous cases and 18% of non-Indigenous. Of interest was that 30.4% of cases of subtype A/H3N2 were vaccinated compared with 17.6% of cases of influenza B (p=0.005). This compares with the figures of 23.2% and 21.4% respectively in 2011 (p=0.724).

Among the non-Indigenous population cases were distributed evenly between males and females, however in the Indigenous population then was a greater number of female cases (122 v 81; binomial probability, p=0.005).

Pregnancy status was recorded on 98 of the 128 female cases of childbearing age, of these 16 (16%) were pregnant which is about 3 times what might be expected*. Interestingly 7 of these had influenza B and the proportion of cases who were pregnant was not influenced by the type of influenza. There were no deaths attributable to influenza notified in 2012.

**Sentinel GP surveillance from ASPREN**

The sentinel GP surveillance pattern was consistent with the other systems apart from a spurious rise in January and February which was not confirmed elsewhere (Figure 3). The ILI rate peaked at 28 per 1,000 consultations in the first week of July, almost coinciding with the peak week in the laboratory-confirmed case numbers, however it did not indicate the persistence of the season until December.

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*It is estimated that 5% of women of child bearing age will be pregnant.

**Emergency Department ILI Surveillance**

The EDILIS system was useful as a monitoring tool during 2012 and the pattern of weekly counts mirrored that of the laboratory-confirmed notifications (Figure 4, p.12).

**FluTracking**

The FluTracking system attracted about 700 volunteers from the NT in 2012 with about 53% reporting having had the seasonal influenza vaccine. An average of 530 volunteers reported each week but with the mean weekly count of cough and fever being only 16 (2.9%), this was probably not enough to get meaningful patterns from the data. Overall the pattern of illness did not correlate well with the other surveillance systems.

**Discussion**

The 2012 influenza season was an average flu season with fewer cases of laboratory-confirmed disease than the previous 2 years but more hospitalisations than 2010 and a similar number to 2011. Surveillance based on laboratory notifications is always subject to the variations in testing behaviour and it is likely that the

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*Table. Laboratory-confirmed case numbers and rates per 100,000 by region.*

<table>
<thead>
<tr>
<th>Region of residence</th>
<th>Cases</th>
<th>Rate /100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice Springs Rural</td>
<td>36</td>
<td>248</td>
</tr>
<tr>
<td>Alice Springs Urban</td>
<td>100</td>
<td>338</td>
</tr>
<tr>
<td>Barkly</td>
<td>21</td>
<td>308</td>
</tr>
<tr>
<td>Darwin Rural</td>
<td>34</td>
<td>196</td>
</tr>
<tr>
<td>Darwin Urban</td>
<td>141</td>
<td>108</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>39</td>
<td>226</td>
</tr>
<tr>
<td>Katherine</td>
<td>66</td>
<td>321</td>
</tr>
<tr>
<td>Overseas</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Interstate</td>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>475</strong></td>
<td><strong>185</strong></td>
</tr>
</tbody>
</table>

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*Figure 3. Rates of influenza-like illness in sentinel GP practices by week; 2012 (ASPREN data)*
number of tests being performed, particularly in the primary care setting, has slowly declined since the 2009 pandemic.

The season was unusual in that it started early and finished late such that the pre-season March-April increase merged with start of the season in May and June, and the season then continued until December. The start of the season in the Centre (excluding the Top End March-April increase) was several weeks before any other jurisdiction and the end of the season in December was later than elsewhere.

The other unusual feature was that, in comparison to previous years, the non-Indigenous population was more affected. Rates were still higher in the Indigenous population but the rate ratio (1.84 adjusted) was significantly lower than previous years and much lower than during the 2009 pandemic (4.9). In addition, more non-Indigenous people were admitted to hospital than previous years, the most since hospitalisation status was first recorded in 2007.

This increase in the non-Indigenous population may have been due to a fall in vaccination rates in the non-Indigenous population or reflect the population immunity in the Indigenous population, due to vaccination campaigns and previous high rates of disease.

It is noteworthy that a significantly larger proportion of cases with influenza A/H3N2 were vaccinated compared with those with type B. This might reflect the strain drift in 2012 from the strain used for the 2012 vaccine (Perth/16/2009) to Victoria/361/2011. While the vaccine would have provided good cross-protection for this new strain, it may explain the difference and also the small increase in proportion of cases vaccinated from previous years. The Victoria/361/2011-like strain was included in the 2013 trivalent vaccine. The higher proportion of vaccine recipients among the Indigenous cases is likely to reflect the higher vaccine coverage rate.

The predominance of female cases in the Indigenous population has been noted before and is of interest. Also of note is the fact that the proportion of women of child-bearing age who were pregnant was greater than expected suggesting susceptibility to influenza infection is independent of strain type. This reinforces the need for immunisation of pregnant women.

Figure 4. Counts* of influenza-like illness presenting to NT Emergency Departments by week; 2012

*Y scale truncated at 150
In 2013, there will be further enhancement of the influenza surveillance capacity in CDC. This will include analysis of respiratory-related mortality, monitoring of call-centre data and attempting to get better information about testing data from laboratories.

Acknowledgements

CDC staff in all districts worked tirelessly to collect the extra data on laboratory-confirmed influenza cases, but in particular Lesley Scott who collects and collates the data and liaises with WHO concerning NT strain types. CDC also thanks Didier Palmer and the NT Emergency Departments for the availability of the ED data for influenza surveillance and acknowledges ASPREN, FluTracking and FluCan for their data.

References


2013 FluTracking

FluTracking, the web-based, influenza surveillance project is about to kick off again in 2013.

FluTracking is designed to detect warning signs of severe influenza outbreaks, monitor flu activity in the community and provide feedback on the effectiveness of the yearly seasonal influenza vaccine. FluTracking contributes significantly to flu surveillance in the NT by the Centre for Disease Control.

To maximise the program's benefits, and ensure that the results accurately represent the population at large, as many people as possible should be part of the survey. Enrolment takes about 30 seconds. You will then receive a weekly email during the influenza season (May to October) requiring a 10-15 second response about any symptoms of influenza-like illness you may have had in the previous week. You can use your private email address or your workplace email address. Participation is voluntary and all information will be kept strictly confidential. You may refuse to answer questions or end your participation at any time.

For those of you who participated last year, you do not need to re-enrol, but should receive an email asking you to update your details. Please click on http://www.flutracking.net to learn more about the project and enroll in the 2013 program.
An outbreak of Shiga toxin-producing *E. coli* (STEC) gastroenteritis associated with eating kangaroo - a case study from the Northern Territory

Anthony Draper, CDC, Darwin and Teem-Wing Yip, CDC, Alice Springs

Abstract

We report an outbreak of 5 cases (4 males and 1 female) of severe bloody diarrhoea in a remote Northern Territory community following their consumption of locally caught and killed kangaroo. Stool samples were obtained from 2 cases, with Shiga toxin-producing *E. coli* (STEC) being detected in 1 case.

Keywords: shiga toxin-producing *E. coli* (STEC); kangaroo; food safety; gastroenteritis; outbreak

The Outbreak

In September 2012, the Northern Territory (NT) Centre for Disease Control (CDC) was alerted to an outbreak of gastroenteritis in a remote area of the NT. The outbreak consisted of 4 males and 1 female with bloody diarrhoea, with 3 males unwell enough to warrant their transfer to the regional hospital 125km away.

Shiga toxin testing is not routine in the NT so the CDC officer on duty contacted the laboratory to ensure that the stools were tested.

The CDC officer was notified by the treating clinicians that the 5 cases were from a group of 7 who had all eaten kangaroo the day prior to onset of symptoms (attack rate = 71%). This kangaroo was killed, cooked and eaten in the remote community. Of the 5 cases, only the 3 who were transferred to hospital submitted a stool sample for analysis. Of these 3 samples, 1 was not processed due to insufficient labelling and 1 tested negative for norovirus, rotavirus, parasites and bacterial pathogens as well as testing negative for Shiga toxin-producing *E. coli* (STEC). One sample tested positive for the stx2 toxin gene produced by Shiga toxin-producing *E. coli* (STEC). Multiplex PCR testing confirmed this result.

No food sampling was conducted on the kangaroo carcass due to the remoteness of the area and the logistic barriers involved in transporting a sample. STEC was only isolated from 1 case however all 5 cases experienced concurrent bloody diarrhoea after sharing a common food source. The kangaroo meat was identified as the likely source of the Shiga toxin-producing *E. coli* (STEC).

Discussion

Shiga toxin-producing *E. coli* (STEC) are named after the potent Shiga toxins (stx1 and stx2) that they produce which can cause symptoms ranging from mild diarrhoea to heavily blood stained stools. STEC is important as it is the main diarrhoeic cause of haemolytic uraemic syndrome (HUS). As a result, it is a notifiable disease Australia-wide. Typically, 2-7% of those infected with STEC will go on to develop HUS within a week after onset of diarrhoea. HUS is a severe and life-threatening condition which can be characterised by acute microangiopathic anaemia, acute renal impairment (haematuria, proteinuria or elevated creatinine) and thrombocytopenia.

STEC was first identified as an important foodborne pathogen in 1982 in the United States of America where it was associated with undercooked beef mince. Australia’s largest outbreak occurred in 1995 in South Australia (SA) when 23 cases of HUS were associated with mettwurst that was contaminated with *E. coli* O111:NM.

As a result of this outbreak SA screens all blood-stained stools for STEC. This has resulted in a notification rate in SA of 2.58 cases per 100,000 population compared to the rest of Australia which has a notification rate of 0.32 cases per 100,000 population. It is likely that STEC is under-reported in the NT as not all blood-stained stools are screened in this jurisdiction. STEC notifications are extremely rare in the NT with only 1 or 2 per year notified (NTNDS).

The intestinal tracts of cattle and sheep are normally considered the major reservoirs of
STEC. STEC can be found in the faeces of healthy animals and animals with diarrhoea, on the hides of animals prior to slaughter and in the environment when animal manure is used as a fertiliser. A recent study from Queensland showed that Shiga-toxigenic E. coli are also carried by a number or wallaby and kangaroo species and a case study in 2007 attributed 3 cases of STEC in 1 family exposed to kangaroos and koalas at a wildlife sanctuary.

**Conclusion**

Kangaroo meat was epidemiologically implicated as the likely source of an outbreak of diarrhoea attributed to Shiga toxin-producing E. coli (STEC). Kangaroos have been shown to be carriers of STEC. To prevent infection with STEC, it is advisable to cook kangaroo meat completely through (e.g. to 160°F/72°C) to ensure killing of all microbes. Bacterial contamination of game meat can occur when the same knife is used to kill, clean and gut the animal and then re-used in butchering or preparation. Likewise, bacteria can spread via unwashed hands, particularly when the slaughterer then butchers or handles food immediately prior to consumption. To prevent contamination of hunted meat, clean hands and knives with soap and water. Wash hands and knives regularly while butchering an animal to avoid contaminating the carcass with dirt, insects, grass, bacteria from the gut or other contaminants.

STEC is a rare infection in the NT but is likely to be under-reported. Detection of STEC can be enhanced if all blood-stained stools are routinely screened by laboratories for pathogenic E. coli.

**References**

7. Hocking A. Foodborne Microorganisms of Public Health Significance. 6th ed. Waterloo (NSW); Australian Institute of Food Science and Technology Incorporated; 2003.

**************
Updates by the Infectious Diseases Unit, Royal Darwin Hospital and Centre for Disease Control (CDC) saw the publication in 2012 of the 6th edition of the Northern Territory Guidelines for Malaria.

These Guidelines include both treatment guidelines and the public health management of malaria in the Northern Territory (NT).

Content includes:
- Initial management of malaria
- Ward monitoring and discharge plan
- Management at Hospital in the Home (HITH)
- Treatment, including prophylaxis
- Follow-up
- Public health management
- Medical Entomology investigation
- Malaria fact sheet (including Indonesian translation).

Changes in the 2012 edition

In this edition the algorithms for management of cases have been simplified and managed according to severity of disease on presentation as well as the type of malaria. The discharge plan has incorporated the capacity to discharge patients to Hospital in the Home after ensuring that the initial treatment has commenced and is being tolerated.

Prevention of life-threatening complications, particularly from *Falciparum malaria* and avoidance of transmission of the malaria parasite to mosquito vectors in the Northern Territory remain the priority in the requirement for hospital admission and public health management.

The public health response has been expanded to include the role of the CDC Malaria Surveillance Officer.


Guideline authors: Royal Darwin Hospital, Department of Infectious Diseases and Global and Tropical Health Division, Menzies School of Health Research: *Professor Bart Currie, Professor Nicholas Anstey, Professor Ric Price.*
Centre for Disease Control: *Associate Professor Vicki Krause (Director Centre for Disease Control), Dr Peter Markey, Mr Peter Whelan and Ms Lesley Scott.*

Guidelines for malaria 2012
Lesley Scott, CDC, Darwin

Measuring alcohol related harm using health department data  
Steven Skov, CDC, Darwin

Abstract

This article discusses the key concepts and issues in measuring alcohol related harm from hospital admissions and emergency department presentations and also proposes a range of indicators which might be used in the Northern Territory.

Key words: alcohol; harm, indicators

Introduction

Alcohol is an integral component of most Western societies. It is greatly enjoyed as an adjunct to food and social occasions. But a great deal of harm in many forms also arises from alcohol consumption and this harm is the subject of great concern to society. In order to reduce and alleviate this harm, much effort is expended by Government and civil society in policy concerning the availability of alcohol, in education for people about appropriate use of alcohol and in responding to the various harms be they in the form of social dysfunction, antisocial behaviour, criminal activity, injuries or illness. We need to be able to measure alcohol related harms in a robust and reliable way in order to assess the overall burden of disease, the economic cost and to monitor the impact of policy interventions and programs. This article discusses the key concepts and issues in measuring alcohol related harm from hospital admissions and emergency department presentations and also proposes a range of indicators which might be used in the Northern Territory (NT).

The principal diagnosis

The information systems for both hospital admissions and Emergency Department (ED) presentations have the capacity to record the “principal diagnosis” and a large number (up to 50) secondary diagnoses. For hospital admissions, this is done by hospital coders using ICD 10 codes after the person has been discharged and the discharge summary completed by the medical officer. In EDs in the NT it is done by medical officers and for the great majority of cases, only a principal diagnosis is recorded.

Attributing cause: Population

Attributable Fractions

A limited range of health conditions are entirely attributable to alcohol consumption, for example all cases of alcohol intoxication, withdrawal or poisoning, alcoholic liver cirrhosis, and alcohol induced acute pancreatitis are entirely due to alcohol. However, such “wholly attributable” conditions only contribute a small minority of the total harm of alcohol in the community - in the NT they account for about 1% of all ED presentations – although they do make up a larger proportion of alcohol attributable deaths (e.g. due to liver cirrhosis). There is a large number of other conditions for which alcohol can be causal, but only for some of the harm. For example, it will contribute to some but not all assaults, road crashes, cancers, strokes etc. Other factors may also contribute to these conditions. Determining what proportion of these other conditions is attributable to alcohol is a challenge.

It is often thought that a common sense approach to monitoring alcohol related harm is simply for someone to record whether an event was alcohol related or not. It is possible for information systems to record whether a presentation is alcohol related. In the NT, the Gove hospital has such a system wherein the triage nurse has a compulsory data field in which he or she enters whether the presentation was alcohol related.

Such a system can be useful but they can have important limitations. Firstly, to be robust would require criteria for determining alcohol relatedness that are well informed, clear and used in the same way across all regions and
over time. Secondly any such system must be mandatory, that is it must be impossible for staff to not enter data into this field. Otherwise, the data becomes very difficult to interpret. Missing data might mean that the presentation was not alcohol related or that the staff member just did not enter it.

In academic alcohol research Population Attributable Fractions (PAFs) are used to estimate the degree to which alcohol causes various conditions. These are derived by the so-called “direct” and “indirect” methods of calculation. In the “direct” method, estimates of PAFs are made using the pooled results of case series. In contrast, the “indirect” method calculates PAFs using a statistical formula and

- the relative risk of a certain level of alcohol consumption leading to being hospitalised or dying from a particular condition based on a meta analysis of case control and cohort studies, and
- the various levels of consumption of alcohol in a specific population usually based on surveys of drinking patterns.

Generally, PAFs based on the “indirect” method are considered more robust. In case series analysis the issue remains that “alcohol relatedness” has been subjectively judged by criteria which may be unclear and certainly different in different studies. In addition, the drinking patterns in the population from which the case series was drawn may be different from the population of interest. With the “indirect” method, estimates of relative risk are more robust being based on the association between certain level of alcohol consumption and the outcome of hospitalisation or death. In addition, although the relative risks may be based on populations different to the one of interest, by using recent consumption data from the local population a PAF can be calculated which is specific to it at least in that sense.

In practice both methods are used to estimate alcohol attribution because there are many conditions for which relative risks have not been able to be calculated on the basis of case control or cohort studies and the only data available come from case series. A method has also been proposed to estimate a revised, directly derived PAF based on more recent consumption patterns. The landmark 1995 study by English calculated a broad range of PAFs for the Australian context and is still used as a key reference in Australia and internationally for PAFs, particularly for those directly derived. There have been a number of other papers which have presented both directly and indirectly calculated PAFs that are specific to other populations and/or based on more recent estimates of relative risks. There is some minor variation in these studies as to the range of conditions considered to be alcohol related and also some significant variation in the PAFs derived for the same condition.

In the health domain, the bulk of the epidemiological data available on relative risk concerns deaths and hospitalisations and so can be used to make attribution estimates in relation to deaths and hospitalisations. There is much less of this type of research in relation to emergency department presentations and it is not appropriate to simply extrapolate PAFs for hospitalisations to ED presentations. Some work has been done to estimate aetiological fractions for “all injury” presentations to EDs, including in Australia. A study by Chikritzhs in 2011 provides a comprehensive discussion of this issue, a meta-analysis of relevant Australian data and estimates a PAF for all ED injuries combined. This study estimated a PAF of 34% for all ED injury presentations in the NT.

**Proxy indicators**

Because of the lack of better methods of attributing cause, in many settings proxy indicators are used. For example, in some countries the lack of good data on blood alcohol levels in drivers, means that trends in alcohol related road crashes are monitored by using numbers of late night road crashes especially on weekends. While an exact figure cannot be attributed it is known and agreed that a large proportion of these crashes are alcohol related. While there are directly derived PAFs for assault hospitalisation, assault presentations to emergency departments might also be used as a proxy indicator. Other examples might include injury presentations, particularly if external cause data are available, or weekend late night presentations by young adult males.
Proxy indicators are not useful for establishing the total burden of alcohol related harms, but can be useful for monitoring trend. If the impact of alcohol related harm is declining, it should be reflected in declines in proxy indicators such as assault regardless of whether 40% or 60% of them are alcohol related.

**Composite indicators**

Another approach is to monitor presentations for specific conditions known to have a high PAF. However, in a small jurisdiction like the NT and especially for hospitalisations, the numbers of admissions for many of these conditions on their own may be too low for robust trend analysis. Therefore it may be possible to create composite indicators. That is combine together admissions several conditions with a high PAF conditions into “composite” which could be used for trend analysis. These might be divided into conditions which result from chronic longer term drinking and those due to acute intoxication.

**Death data**

Collation and analysis of death data are dependent on receiving completed data sets from the Australian Bureau of Statistics (ABS). Typically these data are only available at least 3 or 4 years in arrears. This delay limits their utility to burden of disease and economic analyses. In addition, these data are currently not available at the unit record level necessary for this type of analysis due to internal policy decisions of the ABS.

**Hospitalisation data**

Because of delays in coding of hospital admissions, reliable hospitalisation data are only available some time in arrears. In the NT there is about a 9 month delay. Health Gains Planning has the capacity and systems established to estimate alcohol attributable deaths and hospitalisations in the NT. This allows quantification of the total burden of disease and by using age standardised population rates also allows for comparisons between regions and trend monitoring. This may be done at a regional level and, at least with a Top End/ Central Australia split, with breakdown by Indigenous status and gender. It would seem that numbers are sufficient for stable trend analysis for hospitalisation on a 6 monthly basis.

A concern exists regarding the use of all possible conditions that might be alcohol attributable as a means to assess the impact of alcohol policies and programs. It may be that highly attributable conditions (e.g. those with a high PAF) may be more sensitive indicators to use because of the possibility that the relationship between all attributable admissions may be “diluted” by the presence of significant numbers of admissions for conditions with low PAFs.

Beyond the wholly attributable conditions, there are some conditions which are agreed to be highly related to alcohol. For example, assaults are generally assigned a directly derived PAF of 47% and road crash deaths range from 40% to 60% depending on the population. In an economic analysis of alcohol related harms in the NT, it was calculated that the PAF for assault would be 63.8% when adjusted for NT specific alcohol consumption levels.

PAFs specific to the NT were recently calculated for a broad range of conditions. Choosing an arbitrary level of 40% for PAF, there are 10 such conditions for all people in the NT and a few others for some but not all groups. See Figure.

Other high PAF conditions include:
- Rectal cancer in non-Aboriginal females
- Colon cancer and intentional self harm/ suicide in Aboriginal males
- Rectal cancer and haemorrhagic stroke in Aboriginal females.

**Figure. Conditions with a PAF >=40% in all NT persons**

<table>
<thead>
<tr>
<th>Oropharyngeal cancer</th>
<th>Oesophageal varices</th>
<th>Gastro oesophageal haemorrhage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oesophageal cancer</td>
<td>Unspecified liver cirrhosis</td>
<td>Chronic pancreatitis†</td>
</tr>
<tr>
<td>Liver cancer‡</td>
<td>Laryngeal cancer</td>
<td>Assault</td>
</tr>
</tbody>
</table>

*Direct attribution method
‡Indigenous females only 39%
Note that for road crashes, the NT PAFs for death are > 40% in males but for all persons the PAF for hospitalisations is less than 40%.

**NT Emergency Department data**

In the NT, ED presentation data are entered immediately and are available almost in real time. However, a disadvantage in most EDs including those in the NT, is that there is usually only 1 diagnostic code entered. This is a problem for injury presentations for which the nature of the most important injury will be recorded but not the cause of the injury. This greatly limits the utility of these data for injury or alcohol related harm surveillance. While the technical capacity exists to enter more diagnoses, the strong and consistent advice from the directors of EDs is that the staff do not have the time to do so and will not be able to unless extra resources are provided.

The triage nurses also record a ‘presenting problem’. They do not represent a formal medical diagnosis and consist of a combination of medical type classifications (e.g. asthma, laceration) and causes (e.g. assault, stab wound). These entries are selected from a limited list of coded possibilities but there are no formal criteria for how the presenting problem should be classified. However, in spite of these limitations, some presenting problems such as “assault” or “stab wound” may be worth monitoring as proxy trend indicators.

In the ED setting generally, PAFs have not been calculated for individual conditions. Some work has been done in Australia to quantify the proportion of injury presentations that can be attributed to alcohol. These studies have come up with estimates of 25%-30%. In the NT, this has been estimated at 34%\(^\text{10}\) (Chikritzhs 2011) although some ED staff in the NT say that it is more like 60%.

Therefore in ED data one could monitor a combination of specific conditions and proxy indicators. For example:

1. *Wholly alcohol attributable conditions* These constitute about 1% of ED presentations. Therefore total numbers, especially in the smaller hospitals are relatively small, and determining statistically significant trend is difficult.

2. *“Community” injury* This is a definition of a range of ICD-10 codes used by the Australian Institute of Health and Welfare to describe injuries likely to occur in a community setting (ICD 10 codes S00-T75, T79). It might be a proxy indicator on the basis that in the NT somewhere between 34% and 60% of such injuries are alcohol related. In general they constitute 10%-14% of all ED presentations.

3. *Presentations by 15-24 year old males after 2200 hours Thursday to Saturday nights* Similar to late night road crashes, the international literature suggests that such presentations are widely and often related to alcohol. In the NT it may be more useful as an indicator for non-Aboriginal people given the differences that exist in drinking patterns that exist. However, total numbers are relatively small and this may limit its utility for reliable analysis.

4. *Triage “presenting problem” for assault* Triage nurses are well placed to make such an assessment and the criteria issues are relatively straightforward to address technically at least. The international literature attributes 47% of assault hospitalisations and deaths to alcohol and in the NT it is estimated to be as high as 63.8%.

**Analysis of trends**

In the absence of unexpectedly dramatic changes in alcohol related harms, it will generally not be possible to determine whether changes in any of the potential indicators canvassed are significant for at least 12 months.

Many of the potential indicators have relatively small total numbers, especially for hospitalisations and at regional level and so detection of reliable trends will be problematic at times. In addition many of these conditions may be affected by factors other than alcohol and so there is the issue of ascribing any trend detected to changes in alcohol policy in the absence of comparison data.

Within the NT it may be possible at times to compare one region to another where there is a difference in policy or programs. An alternative
approach would be to compare NT data to other similar regions of Australia where populations and circumstances may be broadly similar, for example north Queensland or parts of Western Australia as was done in the re-evaluation of the NT Living With Alcohol (LWA) Program.\textsuperscript{14}

In the absence of control regions, alcohol related indicators could be compared to the occurrence of conditions that are clearly not alcohol related. This approach was also used in the NT LWA Program re-evaluation.\textsuperscript{14}

Analysis of any of these proposed hospital indicators may also be related to total presentations to ED or hospitalisations. For example, a rise or fall in a potential indicator may simply be related to a rise or fall in the population or in all presentations. Age standardised population rates can be calculated. Alternatively, indicators may be monitored as total numbers but also as a percentage of all presentations or in relation to presentations for conditions that are definitely not alcohol related, for example urinary tract infections.

Finally the trends in presentations or hospitalisations over a number of years can be observed and then projected forward from a point in time. That is an estimate can be made of expected presentations based on previous trends. If there is an intervention point in time, the expected trend afterwards can be compared with that actually observed to judge whether there has been a change after the intervention point. This method was also used in the NT LWA evaluations.

Summary of potential indicators from health data

Potential indicators for alcohol related harm to be considered include:

1. Hospitalisation data
   - All alcohol attributable hospitalisations
   - Wholly alcohol attributable admissions
   - Composite of high PAF admissions (PAF >= 40%)
     - Chronic effect (oropharyngeal cancer, oesophageal varices, gastro oesophageal haemorrhage, oesophageal cancer, unspecified liver cirrhosis, chronic pancreatitis, liver cancer, laryngeal cancer)
     - +/- wholly attributable conditions (depending on the total numbers and whether they are sufficient for robust trend analysis)
   - Acute effect (alcohol poisoning, assault, +/- self harm, +/- fire injuries), and

2. Emergency Department data
   - Wholly alcohol attributable conditions
   - Community injury
   - Presentations by 15-24 year old males after 2200 hours Thursday to Saturday nights
   - Triage “presenting problem” for assault.

Acknowledgment

With thanks to Professor Tanya Chikritzhs, National Drug Research Institute, for her assistance in preparing this document and also to Christopher Moon of the Alcohol and Other Drugs program for the conversations in recent years which have led to these indicators being developed.

References


Influenza and its prevention

What is influenza?
Influenza is a respiratory infection caused by the influenza virus of which there are 3 types; A, B and C. Types A and B cause most of the disease in humans and type A has 2 commonly occurring subtypes; H1 and H3. Influenza viruses are characterised by the way they mutate from year to year thereby forming new strains and evading the immune system. Because of this, vaccination is required annually to protect against the current influenza strains.

What is the treatment?
Treatment for influenza includes rest, increased fluids and pain relief. Anti-viral treatment can shorten the duration of illness if commenced within 48 hours of the onset of symptoms.

How is it spread?
Influenza is spread from person to person through respiratory droplets produced during coughing and sneezing. The incubation period is short, usually 1 - 3 days.

How can it be prevented?
Annual vaccination is recommended especially for those most at risk. The influenza vaccine does not contain any live virus, so people cannot catch influenza from having the vaccine. However, it does take around 2 weeks before the body is fully protected after vaccination. If you are exposed to someone with influenza infection during this time you may still become sick because your body is not yet fully protected.

To stop the spread of disease, people should cough into their upper arm or cover their mouths when coughing and wash their hands regularly. Regular hand-washing, even when not coughing, may also help to prevent influenza. People with flu symptoms should stay at home or seek medical treatment as needed.

How are the symptoms?
The presentation of influenza illness often has an abrupt onset with symptoms including; tiredness, fever, headache, chills, sore throat, loss of appetite and muscle aches. There may be an associated cough, nasal discharge and sneezing.

How serious is influenza?
The severity of influenza depends on the strain, the patient's age, previous exposure to the strain and the presence of other medical conditions. Each year those at increased risk for severe disease or dying from influenza are listed in the groups recommended for annual vaccination.

Annual Influenza Vaccination Recommendations
Who is eligible for FREE influenza vaccine?
1. All Indigenous people aged 15 years and older.
2. All non-Indigenous people aged 65 years and older.
3. All pregnant women.
4. People over 6 months of age with conditions predisposing them to complications from influenza including:
   • chronic heart disease (including congenital heart disease, coronary artery disease and valvular rheumatic heart disease)
   • chronic liver disease
   • chronic kidney disease
   • chronic lung disease (including,
bronchiectasis, emphysema and cystic fibrosis)
• severe asthma (requiring frequent hospital visits and multiple medications)
• diabetes and other chronic metabolic diseases requiring regular medical follow-up
• chronic neurological conditions that can affect respiratory function
• haemoglobinopathies
• children less than 10 yrs old on long-term aspirin therapy
• immunosuppression, immunodeficiency or are receiving high dose immunosuppressive therapy.

Groups for which influenza vaccination is recommended but not funded
1. Obesity (BMI ≥30Kg/m2)
2. Contacts of high risk patients including staff of nursing homes, long-term care facilities, all health care providers, carers of immunocompromised patients and household contacts of those in high-risk groups.
3. People travelling in large tourist groups during the influenza season.
4. Residents of nursing homes and other long-term care facilities (may be eligible for FREE vaccine if included in the groups above).
5. Homeless people
6. People working with poultry and pigs.

When to vaccinate?
The vaccine should be administered every year, as soon as it becomes available (usually mid February). Get your vaccine early in the year even if you were vaccinated late in the previous year.

Who gets 2 doses of vaccine given at least 4 weeks apart?
• Immunocompromised people and
• Children 6 months to <9 years of age who are receiving influenza vaccine for the first time.

Side effects
• Local tenderness at the injection site is common.
• Fever and malaise occur less frequently (1-10%).

People with egg allergy, including anaphylaxis, can be vaccinated in facilities where staff can recognise and treat anaphylaxis.

Influenza and pneumococcal vaccine
Recommendations for influenza vaccine in adults are similar to those for pneumococcal vaccine, and the 2 vaccines can be given at the same visit, in different sites. Parents and carers of infants and children receiving influenza and pneumococcal vaccines on the same day should be advised of the increased risk of fever and offered the option of vaccination several (3) days apart.

Further information about vaccines and funding for influenza vaccination is available from your local doctor, health centre or Centre for Disease Control. Information is also available from the Immunise Australia Program website at:
http://www.immunise.health.gov.au

<table>
<thead>
<tr>
<th>Influenza vaccination funding guideline</th>
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<tbody>
<tr>
<td>Free from your health care provider</td>
</tr>
<tr>
<td>All Indigenous people 15 yrs and over</td>
</tr>
<tr>
<td>All non Indigenous people 95 yrs and over</td>
</tr>
<tr>
<td>All pregnant women</td>
</tr>
<tr>
<td>All infants/people 8 months to 64 years with medical conditions predisposing them to complications from influenza as listed in this fact sheet</td>
</tr>
</tbody>
</table>

Those not in the above groups can access the vaccine by prescription through their GP.

For more information contact your nearest Centre for Disease Control.

Darwin 8922 8044 Katherine 8973 9940
Nhulunbuy 8987 0357 Tennant Creek 8962 4259
Alice Springs 8951 7540 or www.nt.gov.au/health/cdc

Influenza and its prevention
Chlamydia testing and retesting patterns at family planning clinics in Australia

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Sexual Health 2012, 10(1):74-81

Introduction: National guidelines recommend opportunistic chlamydia screening of sexually active 16- to 29-year-olds and encourage retesting 3–12 months after a diagnosed chlamydia (Chlamydia trachomatis) infection. We assessed chlamydia testing patterns at five Australian family planning clinics (FPCs).

Methods: Using routine clinic data from 16- to 29-year-olds, we calculated chlamydia testing and positivity rates in 2008–2009. Re-attendance, retesting and positivity rates at retesting within 1.5–4 and 1.5–12 months of a positive result were calculated.

Results: Over 2 years, 13690 individuals aged 16–29 years attended five FPCs (93% female). In 2008, 3159 females (41.4%) and 263 males (57.0%) were tested for chlamydia; positivity was 8% and 19%, respectively. In 2009, 3178 females (39.6%) and 295 males (57.2%) were tested; positivity was 8% and 23%, respectively. Of 7637 females attending in 2008, 38% also attended in 2009, of which 20% were tested both years. Within 1.5–4 months of a positive test, 83 (31.1%) females re-attended; the retesting rate was 13% and 12% retested positive. Within 1.5–12 months of a positive test, 96 (57.5%) females re-attended; the retesting rate was 36% and 13% retested positive.

Conclusions: Approximately 40% of young people attending FPCs were tested for chlamydia but a smaller proportion were tested annually or were retested following chlamydia infection. High positivity rates emphasise that FPCs see a high-risk population. To maximise testing opportunities, clinical prompts, patient reminder systems and non-clinic testing strategies may be needed.

The end of the Australia antigen? An ecological study of the impact of universal newborn hepatitis B vaccination two decades on

Bette Liu⁶, Steven Guthridge², Shu Qin Li², Peter Markey², Vicki Krause², Peter McIntyre³,⁵ Elizabeth Sullivan¹, James Ward¹, Nicholas Wood³,⁵ John M Kaldor⁶

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Vaccine10/2012 Nov 26: 30(50):7309-14

Background: A universal newborn hepatitis B (HBV) vaccination program was introduced in the Northern Territory of Australia in 1990, followed by a school-based catch-up program. We evaluated the prevalence of hepatitis B infection in birthing women up to 20 years after vaccination and compared this to women born before the programs commenced.

Methods: A cohort of birthing mothers was defined from Northern Territory public hospital birth records between 2005 and 2010 and linked to laboratory confirmed notifications of chronic HBV, based principally on a record of hepatitis B surface antigen detection. Prevalence of HBV was compared between women born before or after implementation of the newborn and catch-up vaccination programs.
Findings: Among 10797 birthing mothers, 138 (1.3%) linked to a chronic HBV record. HBV prevalence was substantially higher in Aboriginal women compared to non-Indigenous women (2.4% versus 0.04%; p<0.001). Among 5678 Aboriginal women, those eligible for catch-up and newborn HBV vaccination programs had a significantly lower HBV prevalence than older women born prior to the programs: HBV prevalence respectively 2.2% versus 3.5%, (OR 0.61, 95%CI 0.43-0.88) and 0.8% versus 3.5% (OR 0.21, 95%CI 0.11-0.43). This represents a risk reduction of respectively 40% and 80%.

Interpretation: The progressively greater reduction in the prevalence of chronic HBV in adult Aboriginal women coinciding with eligibility for catch-up and newborn vaccination programs is consistent with a significant impact from both programs. The use of data derived from antenatal screening to track ongoing vaccine impact is applicable to a range of settings globally.

Changes in hospitalisations for acute gastroenteritis in Australia after the national rotavirus vaccination program

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1National Centre for Immunisation Research & Surveillance (NCIRS), Sydney, NSW. 2Discipline of Paediatrics and Child Health, University of Sydney, Sydney, NSW.


Objective: To evaluate the impact of the Australian rotavirus vaccination program on both rotavirus and all-cause acute gastroenteritis (AGE) hospitalisations and to compare outcomes in Indigenous and non-Indigenous people.

Design and setting: Retrospective analysis of the Australian Institute of Health and Welfare National Hospital Morbidity database for hospitalisations coded as rotavirus and all-cause AGE, between 1 July 2001 and 30 June 2010.

Main outcome measures: Age-specific hospitalisation rates in Indigenous and non-Indigenous people, before and after the introduction of the vaccine program in July 2007.

Results: There was a 71% decline in rotavirus-coded hospitalisations of children aged < 5 years between periods before and after rotavirus vaccination (from 261 per 100,000 to 75 per 100,000). There was also a 38% decline in non-rotavirus coded AGE hospitalisations (from 1419 per 100,000 to 880 per 100,000). This represented more than 7700 hospitalisations of children aged < 5 years being averted in the financial year 2009-10. Reductions were also observed in the 5-19-years age group, suggesting that transmission of virus was reduced at a population level. Decreases in hospitalisations of Indigenous children were smaller than those for the general population, and fluctuated by location and year.

Conclusions: These data show a sustained and substantial decline in severe rotavirus disease and all-cause AGE since the introduction of rotavirus vaccination, most pronounced in the target age group, but with evidence of herd immunity. The impact of rotavirus vaccination in Indigenous children in hyperendemic settings was less remarkable.

Frequent occurrence of undiagnosed pelvic inflammatory disease in remote communities of central Australia

Bronwyn J Silver1, Janet Knox2, Kirsty S Smith3, James S Ward4, Jacqueline Boyle5, Rebecca J Guy4, John Kaldor2 and Alice R Rumbold1,5.

1Epidemiology and Health Systems, Menzies School of Health Research, Alice Springs, NT. 2The Kirby Institute for Infection and Immunity in Society, University of New South Wales, Sydney, NSW. 3Preventative Health, Baker IDI Heart and Diabetes Institute, Alice Springs, NT. 4Jean Hailes Foundation for Women's Health, Monash University, Melbourne, VIC. 5Obstetrics and Gynaecology, University of Adelaide, Adelaide, SA.


Objective: To assess the extent of diagnosed and undiagnosed pelvic inflammatory disease (PID) in Aboriginal women in remote central Australia.

Design, setting and subjects: Retrospective cross-sectional study in five remote central Australian primary health care centres. Medical records of all resident Aboriginal women aged 14–34 years were examined. Data were from presentations with documented lower abdominal pain, excluding other causes, for 2007–2008.
Main outcome measures: PID investigations undertaken, PID diagnoses made, recommended treatment, and presentations meeting the guideline criteria for diagnosing PID based on pelvic examination, symptom profile or history.

Results: Of 655 medical records reviewed, 119 women (18%) presented 224 times with lower abdominal pain. Recommended investigations to diagnose PID were infrequently undertaken: bimanual examination (15 cases [7%]); testing for gonorrhoea and chlamydia (78 [35%]); and history taking for vaginal discharge (59 [26%]), intermenstrual bleeding (27 [12%]) and dyspareunia (17 [8%]). There were 95 presentations (42%) consistent with guidelines to diagnose PID, most (87 [39%]) based on symptom profile and history. Of these, practitioners made 15 diagnoses of PID, and none had the recommended treatment documented.

Conclusion: Pelvic inflammatory disease occurred frequently among Aboriginal women in central Australia during the study period but was vastly underdiagnosed and poorly treated. Undiagnosed or inadequately treated PID leads to poorer reproductive health outcomes in the long term. Increased awareness of PID symptoms, diagnosis and treatment and a revision of the guidelines is needed to improve detection and management of PID in this high-risk setting.

Experimental comparison of aerial larvicides and habitat modification for controlling disease-carrying Aedes vigilax mosquitoes

Siobhan C de Little, Grant J Williamson, David MJS Bowman, Peter I Whelan, Barry W Brook and Corey JA Bradshaw

1The Environment Institute and School of Earth and Environmental Sciences, The University of Adelaide, Adelaide, South Australia, Australia. 2Department of Plant Science, University of Tasmania, Hobart, Tasmania, Australia. 3Medical Entomology, Centre for Disease Control, Department of Health and Families, Casuarina, Northern Territory, Australia. South Australia Research and Development Institute, 4Henley Beach, South Australia, Australia.

Pest Manag Sci 2012; 68: 709 - 717

Background: Microbial and insect-growth-regulator larvicides dominate current vector control programmes because they reduce larval abundance and are relatively environmentally benign. However, their short persistence makes them expensive, and environmental manipulation of larval habitat might be an alternative control measure. Aedes vigilax is a major vector species in northern Australia. A field experiment was implemented in Darwin, Australia, to test the hypotheses that (1) aerial microbial larvicide application effectively decreases Ae. vigilax larval presence, and therefore adult emergence, and (2) environmental manipulation is an effective alternative control measure. Generalised linear and mixed-effects modelling and information theoretic comparisons were used to test these hypotheses.

Results: It is shown that the current aerial larvicide application campaign is effective at suppressing the emergence of Ae. vigilax, whereas vegetation removal is not as effective in this context. In addition, the results indicate that current larval sampling procedures are inadequate for quantifying larval abundance or adult emergence.

Conclusions: This field-based comparison has shown that the existing larviciding campaign is more effective than a simple environmental management strategy for mosquito control. It has also identified an important knowledge gap in the use of larval sampling to evaluate the effectiveness of vector control strategies.

***************
### NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS

1 January – 31 December 2012 & 2011

<table>
<thead>
<tr>
<th>Disease</th>
<th>Alice Springs</th>
<th>Barkly</th>
<th>Darwin</th>
<th>East Arnhem</th>
<th>Katherine</th>
<th>N T</th>
</tr>
</thead>
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<tr>
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| **Total**                               | 3890          | 2905   | 234    | 77          | 4295       | 4882 |

The Northern Territory Disease Control Bulletin Vol 20, No. 1, March 2013
Ratio of the number of notifications in 2012 to the mean 2007-2011: selected diseases

- Dengue
- Cryptosporidiosis
- Rheumatic Fever
- Melioidosis
- Zoster
- Acute Post Strep GN
- Pertussis
- Barmah Forest
- Tuberculosis
- Shigellosis
- Hepatitis A
- Pneumococcal disease
- Adv Vacc Reaction
- Campylobacteriosis
- Salmonellosis
- Malaria
- Ross River Virus
- Meningococcal infection
- Rotavirus
- Influenza

Ratio of the number of notifications in 2012 to the mean 2007-2011: sexually transmitted diseases

- HIV
- Hepatitis B - unspec
- Syphilis
- HTLV1 asyptom/unspec
- Gonococcal infection
- Chlamydia
- Hepatitis C - unspec
- Trichomoniasis
- Hepatitis B - new
- Hepatitis B - unspec

Beyond 2SD of mean of previous 5 years

Beyond 2SD of mean of 5 previous years
**Comments on notifications for 2012 p 29**

**Rotavirus**

Despite a moderate increase in cases throughout the Northern Territory in August 2012, the absence of any sustained outbreak resulted in fewer than expected overall rotavirus notifications in 2012. This follows the years 2009 and 2010 where considerably larger outbreaks were experienced and 2011 when more disease was reported throughout the year in addition to an August peak. Over 75% of cases occurred in children aged <2 years with Indigenous children over-represented. Vaccine coverage was about 80% in the <2 year olds.

**Acute Rheumatic Fever**

There were 120 cases of acute rheumatic fever notified in 2012. This is almost twice the expected number of 68 cases calculated as the mean of the past 5 years. This is noted along with an increase in invasive group A streptococcus in the NT in 2012. The increase also reflects improved case detection due to health promotion activities by the NT RHD Control Program.

**Hepatitis B unspecified**

There were 327 cases of hepatitis B unspecified in 2012 compared with an expected 164 when looking at the mean of the past 5 years. This increase is still being investigated but is likely to be partly due to the screening of irregular maritime arrivals who have high rates of hepatitis B infection.

**Dengue**

There were 89 cases of dengue notified in 2012, the highest since 2000 and 2.6 times the expected number of 34. There were 50 cases acquired in Indonesia (mainly Bali) compared to 23 cases in 2011 and 26 cases acquired in East Timor compared with 4 cases in 2011. This reflects both the increasing travel to these countries and the increase in dengue transmission which is occurring in the region.

**Cryptosporidiosis**

There were 238 cryptosporidiosis cases reported in 2012 which is 2.1 times higher than the 5 year mean. The majority (196) of these were reported between January and May.

There were 6 outbreaks and 3 clusters of cryptosporidiosis during this period with childcare centres and swimming pools implicated. In 2012, 74% of cases were reported in the 0-4 year old age group.

This serves as a reminder to comply with recommended exclusion periods from child care, school, work or public swimming pools when suffering from gastroenteritis to prevent spread of disease. Furthermore, a shift away from traditional microscopic diagnosis to more sensitive antigen detection tests may have contributed to increased laboratory detection of *Cryptosporidium* species in 2012.

**Haemophilus influenzae non-b**

There were 12 cases of non type-b invasive *Haemophilus influenzae* in 2012, which was 1.6 times the expected 5 year mean of 7.4 and equal to the previous highest year (2006). Typing of the isolates is not yet complete but 6 were documented as untypeable and all of these were from Central Australia. There is increasing interest in disease due to untypeable *H influenzae*.

**HIV**

The increase in HIV notification was mainly due to 14 new diagnoses in irregular maritime arrivals sent to the Immigration Detention Centres in Darwin. Additionally an increased number of cases were in immigrants arriving in Australia with HIV, as well as in cases who acquired HIV while travelling to high prevalence countries. However, of the 22 cases who were not IMAs all but 1 featured the recognised risk factors for HIV.
Immunisation coverage rates for NT children by regions based on Medicare address postcode as estimated by the Australian Childhood Immunisation Register are shown on page 32.

**Background information to interpret coverage**

Winnellie PO Bag is postcode 0822, which includes most Darwin Rural District communities, some East Arnhem District communities and some people who live in 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 December 2012 were born between 1 July 2011 and 30 September 2011 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, and 3 doses of hepatitis B 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 December 2012 were born between 1 July 2010 and 30 September 2010 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.

The cohort of children assessed at 60 to <63 months of age on 30 September 2012 were born between 1 July 2007 and 30 September 2007 inclusive. To be considered fully vaccinated, these children must have received 4 or 5 valid doses of vaccines containing diphtheria, tetanus, pertussis, 3 doses of vaccines containing poliomyelitis antigens, either 3 or 4 doses of PRP-OMP Hib or 4 doses of another Hib vaccine, and 3 doses of hepatitis B vaccine and 1 dose of measles-mumps-rubella (MMR) vaccine. All vaccinations must have been administered by 24 months of age.

**Interpretation and comment**

Immunisation coverage in NT children was above the national average across the 24 to <27 months cohort (93.6% NT and 92.6% National) though lower than the national average in the 12 to <15 (90.5% NT and 91.6% National) and 60 to <63 months cohorts (90.5% NT and 91.6% National).

Further information about the Australian Childhood Immunisation Register coverage may be found at: [http://ncirs.edu.au/immunisation/coverage/index.php](http://ncirs.edu.au/immunisation/coverage/index.php)
### Immunisation coverage for children aged 12-<15 months at 31 December 2012

<table>
<thead>
<tr>
<th>Number in district</th>
<th>%DTP</th>
<th>%Polio</th>
<th>%HIB</th>
<th>%HEP B</th>
<th>% Fully vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin</td>
<td>321</td>
<td>89.4%</td>
<td>89.4%</td>
<td>89.1%</td>
<td>88.5%</td>
</tr>
<tr>
<td>Winnellie PO Bag</td>
<td>66</td>
<td>95.5%</td>
<td>95.5%</td>
<td>95.5%</td>
<td>95.5%</td>
</tr>
<tr>
<td>Palmerston/Rural</td>
<td>246</td>
<td>91.9%</td>
<td>91.9%</td>
<td>91.9%</td>
<td>91.9%</td>
</tr>
<tr>
<td>Katherine</td>
<td>102</td>
<td>93.1%</td>
<td>93.1%</td>
<td>93.1%</td>
<td>93.1%</td>
</tr>
<tr>
<td>Barkly</td>
<td>13</td>
<td>92.3%</td>
<td>92.3%</td>
<td>92.3%</td>
<td>92.3%</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>130</td>
<td>86.9%</td>
<td>86.9%</td>
<td>86.9%</td>
<td>86.9%</td>
</tr>
<tr>
<td>Alice Springs PO Bag</td>
<td>50</td>
<td>90.0%</td>
<td>90.0%</td>
<td>90.0%</td>
<td>90.0%</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>45</td>
<td>95.6%</td>
<td>95.6%</td>
<td>95.6%</td>
<td>95.6%</td>
</tr>
<tr>
<td>NT Total</td>
<td>973</td>
<td>90.9%</td>
<td>90.9%</td>
<td>90.8%</td>
<td>90.5%</td>
</tr>
<tr>
<td>Australia Total</td>
<td>75,718</td>
<td>92.1%</td>
<td>92.0%</td>
<td>91.7%</td>
<td>91.6%</td>
</tr>
</tbody>
</table>

### Immunisation coverage for children aged 24-<27 months at 31 December 2012

<table>
<thead>
<tr>
<th>Number in district</th>
<th>%DTP</th>
<th>%Polio</th>
<th>%HIB</th>
<th>%HEP B</th>
<th>%MMR</th>
<th>% Fully vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin</td>
<td>273</td>
<td>93.4%</td>
<td>93.4%</td>
<td>94.1%</td>
<td>92.3%</td>
<td>93.0%</td>
</tr>
<tr>
<td>Winnellie PO Bag</td>
<td>70</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Palmerston/Rural</td>
<td>247</td>
<td>95.5%</td>
<td>95.5%</td>
<td>95.1%</td>
<td>94.7%</td>
<td>94.3%</td>
</tr>
<tr>
<td>Katherine</td>
<td>85</td>
<td>97.6%</td>
<td>97.6%</td>
<td>97.6%</td>
<td>97.6%</td>
<td>97.6%</td>
</tr>
<tr>
<td>Barkly</td>
<td>13</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>113</td>
<td>92.0%</td>
<td>92.0%</td>
<td>92.0%</td>
<td>92.0%</td>
<td>91.2%</td>
</tr>
<tr>
<td>Alice Springs PO Bag</td>
<td>65</td>
<td>96.9%</td>
<td>96.9%</td>
<td>96.9%</td>
<td>96.9%</td>
<td>96.9%</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>66</td>
<td>95.5%</td>
<td>95.5%</td>
<td>95.5%</td>
<td>97.0%</td>
<td>95.5%</td>
</tr>
<tr>
<td>NT Total</td>
<td>932</td>
<td>95.2%</td>
<td>95.2%</td>
<td>95.3%</td>
<td>94.6%</td>
<td>94.7%</td>
</tr>
<tr>
<td>Australia Total</td>
<td>76,105</td>
<td>94.9%</td>
<td>94.8%</td>
<td>95.0%</td>
<td>94.4%</td>
<td>94.0%</td>
</tr>
</tbody>
</table>

### Immunisation coverage for children aged 60-<63 months at 31 December 2012

<table>
<thead>
<tr>
<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>265</td>
<td>84.2%</td>
<td>85.3%</td>
<td>83.8%</td>
</tr>
<tr>
<td>Winnellie PO Bag</td>
<td>67</td>
<td>97.0%</td>
<td>97.0%</td>
<td>97.0%</td>
</tr>
<tr>
<td>Palmerston/Rural</td>
<td>231</td>
<td>92.2%</td>
<td>91.8%</td>
<td>91.8%</td>
</tr>
<tr>
<td>Katherine</td>
<td>81</td>
<td>97.5%</td>
<td>96.3%</td>
<td>96.3%</td>
</tr>
<tr>
<td>Barkly</td>
<td>21</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>116</td>
<td>89.7%</td>
<td>89.7%</td>
<td>89.7%</td>
</tr>
<tr>
<td>Alice Springs PO Bag</td>
<td>55</td>
<td>96.4%</td>
<td>92.7%</td>
<td>92.7%</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>42</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>NT Total</td>
<td>878</td>
<td>91.1%</td>
<td>91.0%</td>
<td>90.5%</td>
</tr>
<tr>
<td>Australia Total</td>
<td>78,616</td>
<td>92.4%</td>
<td>92.3%</td>
<td>91.9%</td>
</tr>
</tbody>
</table>
NT malaria notifications October—December 2012
Elizabeth Stephenson, CDC, Darwin

There were 6 cases of malaria notified in the 4th quarter of 2012. The following table provides details about where the infection was thought to be acquired, 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>3</td>
<td>Sudan</td>
<td>Expatriates visiting relatives</td>
<td><em>P. falciparum</em></td>
<td>2</td>
<td>Alice Springs</td>
</tr>
<tr>
<td>1</td>
<td>Tanzania</td>
<td>Expatriate visiting relatives</td>
<td><em>P. falciparum</em></td>
<td>Nil</td>
<td>Darwin</td>
</tr>
<tr>
<td>1</td>
<td>Indonesia</td>
<td>Expatriate visiting relatives</td>
<td><em>P. vivax</em></td>
<td>Nil</td>
<td>Darwin</td>
</tr>
<tr>
<td>1</td>
<td>India</td>
<td>Expatriate visiting home</td>
<td><em>P. vivax</em></td>
<td>Nil</td>
<td>Darwin</td>
</tr>
</tbody>
</table>

Congratulations to **Greta Enbon**, Sexual Health Coordinator and partner on the birth of their baby boy – Gus in January.

Thank you to **Christina Spinella** who has worked in Administration in Darwin on the Vacation Employment Program. We wish her well in her final year of her Speech Pathology degree.

**Justine Glover**, Senior Policy and Coordination Officer has completed her 6 months secondment to the Health Minister’s office as Department Liaisons Officer. Many thanks to **Jennifer Fry**, Community Paediatrics Project Officer, for acting in the Senior Policy and Coordination Officer position. **Jennifer Fry**, has resigned after 12 months to move with her family to Victoria.

**Alice Springs**

**Rebecca Curr**, Public Health Nurse (Immunisation), has returned to her position at Alice Springs CDC after a short absence.

**Kaylene Prince**, Public Health Nurse, has moved to the position of Infection Control Nurse at Alice Springs Hospital.

Congratulations to **Nina Missen**, Central Australia Rheumatic Heart Disease Register Coordinator and her partner, on the birth of their baby Marshall Eli Lord on 10 January 2013. Nina was also successful in securing the Coordinator position but is currently on maternity leave.
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- Bio CSL’s seasonal influenza vaccine Fluvax® is **NOT** registered for use in children under 5 years.
- There is also a ‘precaution’ for the use of Fluvax® in children aged 5 years to < 10 years.
- The recommendation in the NT is to use alternative influenza vaccines for children between 6 months and < 10 years of age.

**National Immunisation Program – funded vaccine for children with medical conditions predisposing them to severe influenza**

| All children 6 months – 35 months | VAXIGRIP JUNIOR® 0.25ml IMI  
* (1 or 2 doses may be required) |
|----------------------------------|----------------------------------|
| All children 3 years - <10 years | VAXIGRIP ® 0.5ml IMI  
* (1 or 2 doses may be required) |

* 2 doses of vaccine given at least 1 month apart are recommended for children ≤ 9 years of age who are receiving influenza vaccine for the first time

* If a child 6 months - ≤ 9 years of age receiving influenza vaccine for the first time inadvertently does not receive the second dose in the same year, he/she should have 2 doses given in the following year

Children not eligible for the funded influenza vaccine under the National Immunisation Program can purchase the vaccine if their parents wish them to be vaccinated. Vaxigrip®, Aggripal®, Fluarix® and Influvac® can be used in any children 6 months of age or older.


All healthcare workers are encouraged to be vaccinated against influenza. Personal protective measures such as handwashing and covering the mouth and nose when sneezing and coughing are important but vaccination against influenza is the best way to protect staff and patients.