Following very little flu activity during 2018 there was a sudden increase in cases in early November which developed into a large influenza season and spread across the Top End. By 31 December there had been 1171 cases for the year with 935 of those since 5 November when the season was considered to have started. The season is primarily of type A/H1N1 and the analysis by the WHO Collaborating Centre has revealed that the circulating virus strain is still covered by the seasonal flu vaccine (A/Michigan/45/2015-like).

Rates in the Aboriginal population have been about 4 times that of the non-Aboriginal population with the highest rates in those aged between 6 months and 9 years and also in Aboriginal people aged over 50 years. The hospitalisation rate in the Aboriginal population is about 5.8 times that in the non-Aboriginal population. There have been 4 flu-related deaths since 5 November and a total of 6 for 2018. This compares with 10 in 2017.

While noting that lab-confirmed flu rates have been gradually increasing year-on-year due to an increased amount of testing, the numbers in this outbreak definitely indicate an ‘intense’ flu season with weekly notifications exceeding 200 for the first time since the 2009 pandemic, putting a strain on hospital services. There were 4 weeks (26 November-23 December) with more than 150 notifications per week and 680 cases were notified in December of whom 254 were hospitalised.

As at 31 December it was confined to the Top End and had affected communities to the south-west of Darwin, urban Darwin and East and West Arnhem.
districts, with some remote communities having very high rates of influenza-like illness presentations. There was also activity reported in communities in the Katherine region (Figure 1).

Measures of case-specific severity such as case-specific hospitalisation rate, length of stay and case fatality rate suggested that the virus was no more virulent than previous years. Nevertheless transmission was high and it was the first time since flu became notifiable in 1997 that a flu season has started in November (Figure 2).

Figure 1. Laboratory-confirmed influenza by week commencing and region; from June through December 2018

Figure 2. Laboratory-confirmed influenza cases; 2010-2018 by month
The Northern Territory Disease Control Bulletin Vol 25, No. 4, December 2018

Johanna Warren, Centre for Disease Control, Darwin

The following is a summary review of the recently published Burden of disease and injury study: Impact and causes of illness, injury and death in the Northern Territory, 2004-2013, by Xiaohua Zhang, Yuejen Zhao and Steven Guthridge, Department of Health.1

The burden of disease and injury (BOD) methodology is an epidemiological tool developed to inform health policy and the distribution of resources, by estimating the relative impacts of both fatal and non-fatal conditions in a population. The BOD methodology collates information on more than 200 conditions, which when added together represents the total burden of disease and injury for a population. The method is used to compare different populations and to assess the influence of a range of risk factors on the health of a population. The average BOD per person in a population is measured in disability-adjusted life years (DALY), which incorporates years of life lost, or fatalities (YLL) and years lived with disability, or non-fatal disease (YLD).2

Since the first report in 1996,2 the World Health Organization has regularly published global BOD reports,3-5 which have provided the key platform for maintaining and developing the DALY methodology. The Australian Institute of Health and Welfare (AIHW) published the first Australian BOD study in 19996 and the second in 2007.7 The AIHW has recently completed the third Australian BOD study,8,9 and for the first time included a component specifically for the Aboriginal and Torres Strait Islander population.10,11 In the Northern Territory (NT), the first 2 BOD studies were undertaken for the periods 1994-1998 and 1999-200312,13 to align with national studies.

Previous Australian and NT BOD studies indicated the NT had the highest BOD on a per capita basis among all jurisdictions.7,12,13 The third NT BOD study commenced in 2016 to update information about BOD for the NT in 2004-2013, in comparison with the updated national results and to inform health care policy and support regional health service planning.14,15

This article summarises key findings from the third NT BOD study, as published in 2018.

Total burden of disease

YLL (48%) and YLD (52%) each accounted for about half of total BOD in the NT population. Total BOD (age-adjusted DALY rate) was greater for males than females. Males had a higher fatal burden but females had a higher non-fatal burden. Males had a greater BOD than females from injuries (particularly suicide and road traffic accidents), cancers and cardiovascular diseases (particularly coronary heart disease).

The NT population’s BOD per person (i.e. age-adjusted DALY rate) was 80% higher than the total Australian population. This disparity was largely driven by the poor health of the NT Aboriginal population. Total BOD was more than 3 times higher for the NT Aboriginal population than the non-Aboriginal population.

For the non-Aboriginal population, the leading BOD groups by total DALYs were unintentional injuries (19%), cancer (16%) and cardiovascular diseases (13%). For the Aboriginal population, the leading BOD groups were cardiovascular diseases (15%), unintentional injuries (13%) and infectious diseases (9%). The differences in age patterns for disease groups are shown in Figures 1 and 2.

DALY rates for the Aboriginal population were higher than non-Aboriginal population DALY rates across all disease groups. The greatest gaps were for kidney/urinary diseases (9.7 times higher), endocrine disorders (7.3 times higher) and mental/alcohol disorders (6.6 times higher). There was a pattern of greater burden occurring at younger ages in the Aboriginal population when compared with the non-Aboriginal population. The BOD gap was greatest in the age groups of 0-4 years and 35-54 years.
Non-fatal burden of disease

The leading non-fatal disease groups in the Aboriginal population were infectious diseases (13%), unintentional injuries (13%), mental/ alcohol disorders (10%) and cardiovascular diseases (10%). In the non-Aboriginal population, the leading non-fatal disease groups were unintentional injuries (21%), gastrointestinal disorders (11%), and reproductive/maternal conditions (10%).
disorders, homicide and violence, lower respiratory infections and chronic kidney disease while for non-Aboriginal people they were falls, skin infections/cellulitis and diabetes.

**Fatal burden of disease**

There were 311,131 YLLs due to premature deaths from 2004 to 2013. Males accounted for 64% of YLLs while comprising only 52% of the NT population. YLLs in Aboriginal people were also disproportionately higher (57%) relative to their proportion of the population (30%), with a rate ratio of 2.96.

For non-Aboriginal people, the age-specific YLL rate was low until about age 50 years, thereafter increased rapidly (Figure 3). Aboriginal people had higher YLL rates in all age-groups and YLL rates increased steadily from childhood throughout adult life. The largest disparity in YLL between Aboriginal and non-Aboriginal people was in the middle adult years (35-54 years).

The leading fatal disease groups in the Aboriginal population were cardiovascular diseases, unintentional injuries and cancers. In the non-Aboriginal population, the leading non-fatal disease groups were cancers, cardiovascular diseases and unintentional injuries. The difference in total YLL rates between the Aboriginal and non-Aboriginal populations was largely due to a greater incidence of cardiovascular diseases, cancers and endocrine disorders in the Aboriginal population.

The top 20 specific causes accounted for 62% of total YLLs. Coronary heart disease, and suicide and self-inflicted injuries were the leading causes for both Aboriginal and non-Aboriginal people. Chronic liver disease, diabetes and chronic kidney disease accounted for a higher proportion of YLLs in Aboriginal than non-Aboriginal people, while road traffic injuries involving motor vehicle occupants accounted for a higher proportion in non-Aboriginal people.

**Contribution of risk factors**

The risk factors contributing the most to total burden of disease for both Aboriginal and non-Aboriginal people were socio-economic disadvantage, tobacco smoking, high body mass, physical inactivity and alcohol (Table 1). Contributions by most risk factors, including tobacco smoking, high body mass, physical inactivity, alcohol, low fruit and vegetable intake and intimate partner violence, were higher in the Aboriginal population than in non-Aboriginal population.
Disadvantage, Index of Economic Resource, Index of Education and Occupation, individually contributed between 14.3% and 19.0%, with a combined score from all 4 indexes accounting for 18.6% of the health inequality.

Gap between Indigenous and non-Indigenous populations

The gap in total burden between Aboriginal and non-Aboriginal populations was measured using age-standardised DALY rates. This gap was wider in the NT when compared to the gap in Australia as a whole (Table 2).

The leading 20 causes contributing to the gap in DALYs were responsible for nearly three-quarters (72%) of the gap. Coronary heart disease, diabetes, chronic kidney disease and COPD were the top contributors, each accounting for around 6-8% of total DALYs.

Variation across geographical areas

BOD was greater for those living in remote areas, largely due to a greater proportion of Aboriginal people living in these areas.

Aboriginal people living in remote areas had lower burden of disease than those in non-remote areas, while the opposite was true for the non-Aboriginal population (Figure 4). Thus, the gap in total burden between Aboriginal and non-Aboriginal populations was greater in non-remote areas than remote areas.

Comparison to national average

The average BOD per person, as measured by the age-standardised DALY rate, was higher for the NT population when compared to Australia as a whole, for both males and females. This excess was spread across almost all disease groups, with the exceptions of musculoskeletal, oral and mental/alcohol conditions.

Table 1. Disability-adjusted life years (DALYs) attributed to risk factors, Aboriginal and non-Aboriginal populations, Northern Territory, 2004-2013

<table>
<thead>
<tr>
<th>Risk factor*</th>
<th>Aboriginal</th>
<th>Non-Aboriginal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Socio-economic inequality*</td>
<td>29,726</td>
<td>8.0</td>
<td>18,688</td>
</tr>
<tr>
<td>Tobacco</td>
<td>30,129</td>
<td>8.2</td>
<td>15,762</td>
</tr>
<tr>
<td>High body mass</td>
<td>27,665</td>
<td>7.5</td>
<td>15,398</td>
</tr>
<tr>
<td>Physical Inactivity</td>
<td>27,504</td>
<td>7.4</td>
<td>14,463</td>
</tr>
<tr>
<td>Alcohol</td>
<td>13,718</td>
<td>3.7</td>
<td>11,586</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>10,492</td>
<td>2.8</td>
<td>10,301</td>
</tr>
<tr>
<td>High blood cholesterol</td>
<td>14,142</td>
<td>3.8</td>
<td>6,130</td>
</tr>
<tr>
<td>Low fruit and vegetable intake</td>
<td>7,557</td>
<td>2.0</td>
<td>1,203</td>
</tr>
<tr>
<td>Intimate partner violence</td>
<td>3,557</td>
<td>1.0</td>
<td>2,863</td>
</tr>
<tr>
<td>Unsafe sex</td>
<td>3,025</td>
<td>0.8</td>
<td>3,221</td>
</tr>
<tr>
<td>Child sexual abuse</td>
<td>2,082</td>
<td>0.6</td>
<td>632</td>
</tr>
<tr>
<td>Occupational exposures*</td>
<td>6,320</td>
<td>2.2</td>
<td>6,320</td>
</tr>
<tr>
<td>Osteoporosis*</td>
<td>1,939</td>
<td>0.7</td>
<td>1,939</td>
</tr>
<tr>
<td>Air pollution - long term*</td>
<td>1,225</td>
<td>0.4</td>
<td>1,225</td>
</tr>
<tr>
<td>Particulates - short term*</td>
<td>237</td>
<td>0.1</td>
<td>237</td>
</tr>
<tr>
<td>Ozone - short term*</td>
<td>290</td>
<td>0.1</td>
<td>290</td>
</tr>
</tbody>
</table>

Table 2. Age-standardised disability-adjusted life year rates by Aboriginality, Northern Territory 2004-2013 and Australia 2011

<table>
<thead>
<tr>
<th>Rate*</th>
<th>Aboriginal</th>
<th>Non-Aboriginal</th>
<th>Aboriginal vs Non-Aboriginal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rate ratio</td>
<td>Rate difference</td>
<td></td>
</tr>
<tr>
<td>Northern Territory</td>
<td>760.1</td>
<td>222.2</td>
<td>3.4</td>
</tr>
<tr>
<td>Australia</td>
<td>429.4</td>
<td>185.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

* The separate attribution of each risk factor cannot be summed to provide a total for all risk factors because of the possible joint effect of multiple risk factors.

* Socio-economic disadvantage was only assessed for total NT population due to the unavailability of data.

* The risk factors of occupational exposure, osteoporosis and environmental exposure were not assessed for Aboriginal population because of their relatively lower exposure and harm by these risk factors.
The DALY rate was slightly higher (Rate Ratio 1.2, or 20%) for non-Aboriginal people in the NT than non-Aboriginal people Australia-wide. The DALY rate was higher for some disease groups and lower for others in the NT than the Australian non-Aboriginal population (Table 3).

For Aboriginal Australians, the DALY rate was much higher (Rate Ratio of 1.8,) in the NT than the Australian population. The DALY rate was higher for almost all disease groups with injuries and cardiovascular diseases making the largest contribution to the excess in the NT.

### Changes between 1999 and 2013

There was a considerable improvement in fatal BOD between 1999 and 2013 but this was mostly offset by an increase in non-fatal BOD. As a result, there was only a small reduction in total BOD over this period. The increase in non-fatal BOD may have been a result of fewer people with serious disease(s) dying but instead living longer with disability.

Cardiovascular diseases had the largest decrease in DALY rate (25%), with a rate difference of...
17.4 per 1,000 accounting for two-thirds of the total DALY rate decrease. There were large relative decreases for several disease groups but the absolute differences were only moderate:

- Infant/congenital diseases decreased by 31% (rate difference 4.0, all by 2004-2008)
- Endocrine diseases decreased by 20% (rate difference 3.1, all after 2004-2008)
- Respiratory diseases decreased by 19% (rate difference 4.5).

There was little change in DALY rate for most other disease groups.

The DALY rate increased by 20% or more for 2 disease groups (neurological and oral) but the absolute rate increases were small (2.1 and 0.4 per 1,000 respectively).

The gap between Aboriginal and non-Aboriginal DALY rates narrowed by 11% between 1999-2003 and 2009-2013. This reduction occurred almost entirely in YLLs. There was almost no decrease in YLDs (Figure 5). The key disease groups which contributed to closing this gap were cardiovascular diseases and respiratory diseases. These accounted for over two-thirds of the reduction (69.9%), with cardiovascular diseases alone accounting for almost half (47.7%). The gap also narrowed moderately for skin disorders, endocrine disorders and infectious diseases, but widened moderately for cancer, unintentional injuries and gastrointestinal disorders.

**Future projections**

The total number of DALYs was projected for 5 year periods from 2014 to 2028. Projections assumed that the age-sex-cause specific DALY rates for 2009-2013 would remain stable until 2028 and that the NT population would increase as projected by the NT Department of Treasury and Finance.

The projected increase in total burden is slightly slower for Aboriginal males than other population groups (Figure 6). At a disease group level, the largest increases for both Aboriginal and non-Aboriginal populations are expected to be cardiovascular diseases and cancer; with rate of increase much faster for the Aboriginal population.

**References**

4. Murray CJ, Ezzati M, Flaxman AD, Lim S,

**********
The vision of Kidsafe NT is to develop a culture of safety within the Northern Territory (NT) so that children will not be injured or killed in accidents. Since 1983 Kidsafe NT has been the NT’s leading non-government, not-for-profit, charitable community organisation dedicated to the prevention of unintentional childhood injuries. The aim of Kidsafe NT is to reduce the resulting deaths and disabilities associated with injuries from children aged from birth to 15 years through education, research, advocacy and environmental, legislative and behaviour change.

Kidsafe NT is a regular feature at community events sharing messages about what parents and carers can do to help reduce the risk of their child being injured in an accident. Kidsafe NT focuses on safety at home, play and on the roads. Kidsafe NT offers a car restraint fitting and checking service with Type 1 Accredited Fitters, and has baby capsules, toddler seats, boosters and high chairs available for hire. Parent groups in the Darwin region are regularly visited, and organisations working with children can access Transporting Children Safely Workshops.

**Car Seats for Kids Program**

Children living in remote communities have benefited from the Car Seats for Kids (CSFK) program run by Kidsafe NT. The CSFK program involves fitting car restraints into vehicles and promoting child injury prevention messages in each community. The CSFK program has visited a total of 18 communities (including 3 re-visits) across the NT over 18 months to date, fitting 1116 car restraints into vehicles (Figure 1).

This CSFK program was born out of the successful Buckle Up Borroloola program held in 2016. The Buckle Up Borroloola program was a joint initiative of the NT Motor Accidents Compensation Commission, McArthur River Mine and Mabunji Aboriginal Resource Indigenous Corporation. It was supported by the NT Police and delivered by Kidsafe NT. CSFK recently won the 2018 3M Diamond Australasian College of Road Safety award, which is the most prestigious award in road safety.

Maningrida and Gunbalanya communities each received a re-visit by the CSFK program this year. On this second visit, 85% of community members engaging with the program were new to the program (47 out of 55 families). A car restraint upgrade was provided for 8 families who had a car restraint fitted last visit. This type of participation and recognition of ongoing need for safety upgrades suggests that the program and education is being well received.

Kidsafe NT are branching out further into playground safety, having the NT’s first independent accredited playground consultant on staff. The inclusion of this program will further reduce the risk of children in the NT being injured in playgrounds.

More information regarding Kidsafe activities can be found on the Kidsafe NT website (www.kidsafent.com.au) and on the Kidsafe NT Facebook page.
STINGER SAFETY
Stay out of the sea in Stinger Season October - May

Identifying Box Jellyfish

How can you best identify the Box Jellyfish (Chironex fleckeri)?

- The Box Jellyfish grows up to 30cm across the bell
- It has up to 60 flat tentacles each up to 3 metres long
- They can weigh up to 2 kilograms
- Their sting causes a severe burning pain which is often excruciating and the venom may cause the victim to stop breathing or their heart to stop

www.health.nt.gov.au
Look for and obey water safety signs and stay out of the water in Stinger Season
1 October - 31 May

How can you best protect yourself against Box Jellyfish?

- Small children are especially at risk – always cover them up
- Stay out of the sea water between 1 October and 31 May. This includes shallows, tidal creeks and near boat ramps
- Between June and September cover up the kids as a priority, and also yourself. Wear long-sleeved tops and long shorts, but a full-body suit such as lycra provides a good level of protection
- Enter the water slowly – this gives the Box Jellyfish time to move away
- Look for and obey water safety signs
- Don’t touch Stinglers that are washed up on the beach as they can still sting you.

The Box Jellyfish has up to 60 flail tentacles each up to 3 metres long.

What to do if you are stung?

- Remove the person from the water
- Call for help – dial 000
- Assess the person and commence CPR as necessary
- Liberally douse the stung area with vinegar to neutralise the stinging cells – do not wash with fresh water, or rub with towels or sand
- If vinegar is unavailable, pick off any remnants of the tentacles – the skin on your fingertips is too thick to penetrate – and brace sting well with sea water (not fresh water)
- Seek medical assistance and transport to hospital immediately.

STAY OUT OF THE SEA IN STINGER SEASON

The Box Jellyfish sting causes a severe burning pain which is often excruciating and the venom may cause the victim to stop breathing or their heart to stop.
In April 2018, Tropical Data, a consortium of scientific, technological and implementing partners, offered Trachoma Super Training in the World Health Organization (WHO) Western Pacific Region for the first time. Previously this training has only been offered in African countries. This training ensures all trachoma graders are recognised by WHO as ‘expert’ graders. Given the close proximity, staff involved in trachoma elimination in Australia were offered the opportunity to attend. Three representatives from Australia attended; Donna Mak, a doctor from Western Australia, Robyn Cooper, a nurse from South Australia and Paula Wines, a Clinical Nurse Specialist, from the Northern Territory. The training was also attended by representatives from Pacific nations including the Solomon Islands, Fiji, Vanuatu, Nauru, Kiribati, Papua New Guinea and Tonga.

Grader training was conducted in 2 parts. The initial sessions were classroom-based where trainees were introduced to the WHO simplified trachoma grading system and instructed on the practical aspects of trachoma grading. The sessions concluded with an assessment of the trainee’s abilities to recognise trachomatous folliculitis (TF) on 50 WHO standardised slides, which were very similar to those included in the Centre for Eye Research Australia online trachoma grading course. All trainees were required to achieve a kappa score of ≥ 0.7 to be able to progress to the practical sessions. This type of classroom-based training was undertaken in all countries, including Australia.

Participants from other countries were trained in the use of the ‘Tropical Data’ system, a data collection tool used in trachoma surveys. Called ‘recorder training’ it was carried out alongside the 2-part grader training. Australians did not participate in this ‘recorder training’ which was undertaken by the participants from all the other countries working to eliminate trachoma.

The second part of the training, the Inter Graders Assessment (IGA), not yet undertaken in Australia, was undertaken in the ‘field,’ which in this case was a local primary school in Honiara.

Approximately 20 trainees and 4 Expert Grader Trainers (EGTs) arrived at the school and within 40 minutes there were 200 children calmly lined up in 4 groups. Each child had both eyes examined by the EGTs and then the same child was examined again by 4-5 trainees. Results were documented independently and then reviewed back in the classroom. I was amazed at how quickly the children were organised, how well behaved they were and how accepting they were of having their eyelids everted several times. It was expected that each case found was discussed among trainees and EGTs and any discrepancies clarified by examining the child again. Unfortunately, due to time constraints this was not possible, which made it difficult to determine why incorrect assessments had been made and therefore difficult to learn fully from the EGT. This process occurred twice over the next 2 days at different schools with grader or grader trainer status officially assessed on the final screen. To pass the assessment, the trainee was required to see 5 eyes with TF and achieve a Kappa of >= 0.7 in comparison with the EGT to achieve expert grader status; to pass the assessment as a grader trainer, the trainee was required to achieve a kappa of >=0.8 in comparison with the EGT.
On the final day, graders and recorders worked in pairs under the supervision of an EGT to conduct and record 2 household surveys in a village outside Honiara. This gave me the opportunity to see what data, apart from evidence of trachoma, were collected by the recorders. The head of household was asked whether the household had running water and asked to show the grader the water source. They were also asked if they had latrines and were asked to show these to the recorders.

Learnings:

- The trachoma situation in several Pacific Island nations is complex. Follicles meeting the WHO criteria for TF have been found however there is no evidence of trachomatous trichiasis (TT). To further clarify the situation, enhanced testing and screening will occur in these nations. Testing will include blood spots for chlamydia antibodies and screening for Herbert’s pits and pannus as precursors for TF.
- It was fascinating to learn how trachoma elimination programs are implemented across the region - there are large numbers of children being screened, with good acceptance and collaboration with primary health services on the ground.
- It was disappointing not to be able to compare findings with the EGTs in the field.
- While it has been possible to complete the classroom-based theory sessions in Australia, it may be difficult to conduct the clinical training in the field in Australian communities in the same manner.
- Fred Hollows Foundation Melbourne office is willing to support expert grader training in the field in Australia.

Consequent to relationships developed with the Fred Hollows Foundation Melbourne staff during the training in the Solomon Islands we have been successful in adapting the second part of the grader training, the ‘field’ aspect, for Central Australia. This was done by collaborating with ETGs who worked alongside the screening staff of the Northern Territory Trachoma Team in Central Australia in September 2018 (see following article).

I would like to thank Kirby Institute at the University of New South Wales for providing all funding and logistical support for me to travel to the Solomon Islands for the training.

References


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The Trachoma Team in the Northern Territory (NT) (Photo 1) are working towards the World Health Organization’s (WHO) goal of Global Elimination of Blinding Trachoma by 2020 (GET 2020). One of the criteria that must be met is that those performing grading need to be assessed by a recognised expert grader trainer (EGT). In order for this criterion to be met, 2 EGTs worked with the Trachoma Team in September 2018 in the Central Australian region.

The 2 EGTs were Richard Le Mesurier and Oliver Sokana. Richard is the Medical Director of The Fred Hollows Foundation and based in Melbourne. Richard is responsible for eye health programs in up to 19 countries and has recently trained trachoma graders, in Western Australia. Oliver is from the Solomon Islands and is a registered nurse with postgraduate qualifications in Public Health and is recognised as a Tropical Data Expert Grader trainer (Photo 2 and 3). Oliver coordinates trachoma surveys in the Solomon Islands and provides grader training internationally. This was Oliver’s first trip to Alice Springs and although Richard has travelled to Alice Springs before, this was his first time travelling to remote communities in Central Australia. Over the 2 weeks in September, Oliver travelled to Harts Range, Bonya, Ti Tree and Yuendumu. Richard travelled to Yuendumu and Nyirripi to conduct trachoma grader training.

In preparation for grader training in the field, all staff completed an online test. This consisted of 50 WHO standardised slides of everted eyelids. Staff were required to independently identify and record the cases of trachomatous folliculitis (TF) according to the WHO simplified trachoma grading tool.

Each person was required to achieve a kappa statistic of $\geq 0.7$. The WHO standardised slides enabled the group to test our trachoma grading skills under pressure. It also provided insight to what the grader training would be like.

Each participant in the grader training program had to examine a minimum of 50 eyes (25 children) and have identified at least 5 eyes with TF. The grading process took place...
predominately on the school site in a private room. The trainee everted the child’s upper eyelid, then using 2.5 x magnification loupes, examined for trachoma. After the trainee had finished they would continue holding the child’s eyelid and step aside to allow either Richard or Oliver to examine the eye. Once they completed the assessment, the trainee and EGT would record their results independently. They would then discuss discrepancies and findings.

The discussion allowed the trainee and the EGT to communicate their observations and resolve any discrepancies by re-examining the everted eyelid. The results were then documented and submitted to the trainers for marking. Richard and Oliver were able to assess 8 nurses and 1 doctor, all of whom passed i.e the whole team were assessed as expert trachoma graders. It will be useful and valuable to our team, having so many staff trained as graders who will participate in future trips.

The process was successful overall. It was a useful learning exercise being able to discuss cases immediately after both members observed the eyelid. If there was a difference in opinions, we were able to resolve this in a timely manner by re-examining the eyelid and immediately discussing the case.

The process has also reassured the NT Trachoma Team that they are able to correctly identify trachoma in the field at a consistently high standard.

There were few barriers during the grading. The children were patient and cooperative with the 2 people carrying out the screening. We used the same process to screen the children as we usually do on our working trips. The majority of the parents were happy for their child to be screened and were supportive of the process.

We are extremely appreciative of Richard and Oliver making the trip to Alice Springs and for their willingness to travel to each community to carry out the grading. We have gained immense knowledge and increased confidence in our ability to carry outwork. We look forward to further collaborations with Richard or Oliver in the future.

References


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CLEAN FACES, STRONG EYES!
National focus on HTLV-1

HTLV-1 stands for Human T-cell Lymphotropic Virus Type 1 which is a virus that infects T-lymphocyte white cells. In Australia, the virus has been found in many Aboriginal populations in Central Australia and the Kimberley. In Central Australia, the adult prevalence of the virus in some Aboriginal communities approaches 50%. Prevalence is much lower in Top End communities and close to zero in East Arnhem Land. The virus appears to be extremely uncommon in non-Aboriginal Australians. A forum was held in mid-2018 on HTLV-1 and below is the media release from that meeting that provides the position statement that was agreed on.

On August 28 and 29 in Alice Springs a Collaborative Forum on HTLV-1 was convened by the Central Australian Academic Health Sciences Centre and the Australian Government Chief Medical Officer. The forum included Aboriginal leaders, community and patient representatives, researchers, representatives from Aboriginal community-controlled health services, clinicians, public health officials, and representatives from Commonwealth and state and territory health departments. The forum reaffirmed the importance of Aboriginal leadership in this process and agreed on the following statement.

HTLV-1 in Central Australia

Human T-cell Lymphotropic Type-1 (HTLV-1) is a virus that occurs in diverse communities around the world and has been present among Aboriginal people in Central Australia for thousands of years. The type of the virus found in Central Australia, type C, is unique to our part of the world. Preliminary data suggests high rates of this virus in some communities in Central Australia.

Current evidence shows that infection with this virus is not likely to cause disease in a majority of people. International research shows that, in a small proportion of people after many decades, HTLV-1 causes a rare form of leukaemia and/or a spinal cord disease. Studies have suggested associations with other diseases but it is not yet known whether it causes those diseases or not. The true burden of disease of HTLV-1 in our communities needs further research.

HTLV-1 can be prevented in adolescents and adults by safe sex and not sharing needles. The significant health benefits of breastfeeding are well established and, whilst transmission through breastfeeding can occur, current evidence does not yet warrant a change in practice in Central Australia.

Once acquired, HTLV-1 is present for life, but there are management options for most of the diseases that may arise from it. Further treatment options are being investigated.

There needs to be a major long-term study, developed in partnership with the affected communities, to work out exactly what impacts this virus is having on people in Central Australia.

We will be working to develop better access to effective testing options together with clinical guidelines for HTLV-1 associated conditions. Although the forum did not recommend widespread testing at this stage, more research needs to be done to understand where the virus occurs.

We will continue to work collaboratively to integrate community priorities, research findings, and clinical and public health guidelines into a coordinated approach to HTLV-1 in Australia.

Considering the wide range of health concerns of Aboriginal people in Central Australia we need to continue to strengthen primary health care, address the broader social determinants of health and enable healthy lifestyles.

Media contact: Kay McNiece, Department of Health, 0448 207 226

The Northern Territory Centre for Disease Control Fact sheet on ‘HTLV-1 for health practitioners’ can be found at https://digitallibrary.health.nt.gov.au/prodjspui/bitstream/10137/6760/1/HTLV%201%20for%20Health%20Practitioners%20Fact%20Sheet.pdf

**********
World AIDS Day, 1 December 2018, ‘Everybody Counts’
Letishia Parter and Kat Byron, Centre for Disease Control, Darwin

World AIDS Day is a time to encourage all Australians to educate themselves about HIV and how to prevent infections, and to take action to reduce stigma toward and discrimination of people living with HIV. Stigma and discrimination can lead to social isolation and mental ill health and worsen health outcomes. Fear of discrimination is one of the barriers that can prevent people from accessing the required testing and treatment.

Prior to World AIDS Day the Northern Territory (NT) CDC Sexual Health and Blood Borne Virus (SHBBV) unit distributed HIV/AIDS awareness day merchandise packs to 7 Department of Health clinics. World AIDS Day stalls were held in Katherine and Wadeye.

On Thursday 29 November 2018, the SHBBV unit held a World AIDS Day information stall in the foyer of the Royal Darwin Hospital (RDH). The team spoke with RDH staff and visitors about HIV and shared red ribbons, wristbands, travel mugs, pens, notepads and information about HIV.

On Friday 30 November 2018 the SHBBV team headed to Casuarina Shopping Centre to use it as a base to provide outreach syphilis point-of-care testing with the long grass mob. Education was provided that explained that sexually transmissible infections such as syphilis can increase the risk of HIV transmission. The morning started with an early BBQ put on by the Casuarina Shopping Centre management and security teams.

Aboriginal and Torres Strait Islander HIV AIDS awareness Week (ATSIHAW) merchandise was given out as an incentive for each syphilis test that was offered. Other organisations involved included OrangeSky (a mobile bus that provides showers and laundry service for people who are sleeping rough), Danila Dilba Health Service, Larrakia Nation, City of Darwin, and Salvation Army. Donations were provided by GPT and Woolworths. On Friday 30 November all Clinic 34 staff wore ‘You and Me, Can stop HIV’ T-shirts to encourage conversations, break down the stigma and support World AIDS Day.

The NT SHBBV unit in collaboration with the community and other stakeholders are working towards achieving the UNAIDS and Australia’s, 90-90-90 targets for HIV diagnosis and treatment by the year 2020. These are:
- 90% of all people living with HIV to be diagnosed
- 90% of all people with diagnosed HIV to be on antiretroviral therapy
- 90% of all people receiving antiretroviral therapy to have a suppressed viral load.

Territorians are strongly encouraged to get checks for HIV to know their status, with the frequency of testing dependent on an individual’s risk. Talk with your healthcare provider or find out more at [https://health.nt.gov.au/professionals/centre-for-disease-control/cdc-programs-and-units/sexual-health-and-blood-borne-viruses](https://health.nt.gov.au/professionals/centre-for-disease-control/cdc-programs-and-units/sexual-health-and-blood-borne-viruses) Free and confidential testing is available at Clinic 34s and through primary healthcare services.
Pre-Exposure Prophylaxis (PrEP) to prevent HIV
Manoji Gunathilake, Centre for Disease Control, Darwin

Australia has a concentrated HIV epidemic with the majority of HIV acquisition occurring in men who have sex with men (MSM). To achieve Australia’s goal of eliminating HIV transmission by 2020 it is essential to promote safe sexual practices such as condoms, clean needles/ syringes as well as biomedical prevention methods.

PrEP, or Pre-Exposure Prophylaxis for HIV, is one of the very useful biomedical tools in the fight against HIV. Daily use of co-formulated tenofovir with emtricitabine as PrEP is proven to prevent HIV in multiple studies nationally and internationally among populations at high risk of HIV acquisition.1-5

From 1 April 2018 co-formulated tenofovir with emtricitabine has become available under the Pharmaceutical Benefits Scheme (PBS) in Australia for HIV prevention. It has enabled Australian residents holding a Medicare card to obtain PrEP from any doctor or general practitioner.

Eligibility assessment
PrEP may be given to anyone at high risk of acquiring HIV. The eligibility assessment for PrEP is based on determining the risk and is two-fold, 1. a behavioural assessment giving consideration to sexual orientation and injecting drug use and a review of prior STIs, and 2. a clinical assessment to establish that the patient does not have undiagnosed HIV and there are no contraindications to the PrEP medications. Clinicians should consider a case-by-case approach when assessing eligibility.

1. Behavioural assessment
To determine behavioural eligibility, clinicians need to obtain a detailed sexual and drug use history especially looking at the previous and future 3 months.

   a. Eligibility criteria for MSM
   The following MSM should be offered the opportunity to commence PrEP:
   - Those who have had condomless anal sex in the previous 3 months
   - Those who report condomless sex with HIV positive partners not taking treatment for HIV or partners with detectable HIV viral loads
   - Those with a diagnosis of rectal gonorrhoea, rectal chlamydia or infectious syphilis in the previous 3 months
   - Those who acknowledge methamphetamine use.

b. Eligibility criteria for transgender and gender diverse people
Limited data are available for this group. The following individuals should be offered the opportunity to commence PrEP:
   - Those who report a history of receptive condomless intercourse during the previous 3 months
   - Those with a diagnosis of rectal or vaginal gonorrhoea
   - Those with a diagnosis of rectal or vaginal chlamydia
   - Those with a diagnosis of infectious syphilis
   - Those who acknowledge methamphetamine use.

c. Eligibility criteria for heterosexual people
The following individuals should be considered for PrEP:
   - Those who engage in condomless sex with HIV positive partners not taking treatment for HIV or partners with detectable HIV viral loads
   - Female patients in serodiscordant heterosexual relationships planning natural conception in the subsequent 3 months
   - Those with sexual partners from countries with high HIV prevalence.

d. Eligibility criteria for people who inject drugs
Those who share injecting equipment with HIV positive people or with gay or bisexual men of unknown HIV status within previous 3 months should be considered for PrEP.

2. Clinical assessment
Determining clinical eligibility criteria includes the following:
   - Documented negative HIV test result using 4th Generation Ag/Ab test within 7 days of starting PrEP
- No signs/symptoms of acute HIV infection
- Normal renal function (GFR >60ml/ min/1.73m$^2$)
- No contraindicated medications.

**Follow up**
Those who receive PrEP require 3-monthly monitoring of HIV serology, and screening for chlamydia, gonorrhoea and syphilis. Serum creatinine and eGFR should be monitored at base line and every 3-6 months. Those who are at risk of hepatitis C should be re-tested. Hepatitis B vaccination should be provided for those who are not immune.

**A note regarding ‘on-demand’ or intermittent PrEP**
Some clients might bring up ‘on–demand’ PrEP that they have heard about. It is non-standard treatment that is NOT being covered by the new PBS criteria and is not endorsed by the Australasian Society for HIV, Viral Hepatitis and Sexual Health Medicine (ASHM). Following the IPERGAY study in France, on demand PrEP is being used in some countries in Europe with a few doses of co-formulated Tenofovir immediately before and after sexual contacts. Some clients would like this approach to reduce pill burden compared to daily PrEP. Data on effectiveness of on-demand PrEP is available for MSM and transgender women only. There needs to be a cautious approach for on-demand, short courses of PrEP. It is necessary to speak to an experienced clinician if someone is requesting ‘on-demand’ PrEP.


**Reference**
Partnership Approach to Sustainably eliminating Chronic Hepatitis B in the Northern Territory - Hep B PAST

Paula Binks¹ and Jane Davies¹ ²

¹ Menzies School of Health Research; ² Infectious Diseases Department, Royal Darwin Hospital

Abstract

The prevalence of chronic hepatitis B in the Northern Territory (NT) is the highest in Australia with the majority of cases occurring in the Aboriginal population. Over the next 5 years a National Health and Medical Research Council partnership grant – Hep B PAST, will see Menzies School of Health Research work together with its partners to eliminate* chronic hepatitis B from the Aboriginal population of the NT.

*Elimination is defined as the absence of newly acquired cases of HBV and minimised morbidity and mortality form existing cases.

Key words: Hepatitis B; partnership grant; health literacy; cascade of care; antiviral treatment.

Chronic hepatitis B virus infection (CHB) is endemic in the Aboriginal communities of the Northern Territory (NT) with a prevalence of 3-12%, meaning the NT has the highest CHB prevalence in Australia at 1.77% (including non-Aboriginal people).¹ Of those living with CHB 25% will die from decompensated cirrhosis or hepatocellular carcinoma (HCC). Liver disease is the third most important contributor to the gap in life expectancy between Aboriginal and non-Aboriginal Australians.²

The Menzies hepatitis B virus HBV research program is a collaboration spanning community and public health, clinical service delivery, epidemiology and laboratory science. Since 2009 this program has grown out of close collaboration and shared goals between Menzies researchers and the Top End Health Service (TEHS), Central Australian Health Service (CAHS), the NT Centre for Disease Control (CDC), the Victorian Infectious Diseases Reference Laboratory (VIDRL) and several remote Aboriginal Controlled Health Services. The overall focus of this program is to decrease HBV-related morbidity and mortality in Aboriginal Australians by implementing NT and national HBV strategies, and by filling important knowledge gaps which currently impede the implementation of these strategies.

All the necessary tools are in place to achieve elimination of CHB: an effective vaccine, effective antivirals and long-term relationships between project partners and Aboriginal communities.

In April this year Dr Jane Davies was successful in winning a National Health and Medical Research Council (NHMRC) partnership grant worth $5.2 million over 5 years (2018-2023) with NHMRC contributing $1,432,909.30 and partners NT Department of Health (NTDoH), Australasian Society for HIV, Viral Hepatitis and Sexual Health Medicine (ASHM), NT AIDS and Hepatitis Council (NTAHC), Miwatj Health Aboriginal Corporation and Katherine West Health Board (KWHB) contributing the rest. The partnership grant titled ‘Partnership Approach to Sustainably eliminating chronic hepatitis B in the Northern Territory – Hep B PAST’ has 2 distinct aims and over the next 5 years, with significant investment, will enable the NT to achieve the key performance indicators of the National Hepatitis B Strategy. At the end of the 5 year period the sero-status of >80% of Aboriginal people will be determined. CHB will be transitioned to a chronic disease care model and >80% of individuals with CHB will be engaged in care with 15% receiving and remaining on treatment. Additionally there will be a substantial improvement in community health literacy.

AIM 1 – To improve health literacy about HBV among Aboriginal communities, people living with HBV and primary healthcare providers.

For the first time people living with CHB and their communities will have access to culturally appropriate effective education tools in their first language. The existing ‘Hep B Story’ educational app will be evaluated and translated into a further 10 Aboriginal languages which
will cover >70% of the NT Aboriginal population (Table 1). Currently the app is available in Yolŋu Matha and English. This educational tool is being used in viral hepatitis clinics and has been crucial in developing treatment partnerships for Aboriginal patients with CHB. The app is freely available through the Apple app store, the Google Play store and the Menzies website, allowing use on all tablets, computers and smartphones (only needs credit to download once and is then cached so can be used when there is no credit on the phone).

Table 1. Aboriginal languages planned for translation

<table>
<thead>
<tr>
<th>Language</th>
<th>No. of speakers</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kriol</td>
<td>20,000</td>
<td>Katherine</td>
</tr>
<tr>
<td>Yolŋu Matha</td>
<td>6806</td>
<td>East Arnhem</td>
</tr>
<tr>
<td>Arrernte</td>
<td>5475</td>
<td>Alice Springs</td>
</tr>
<tr>
<td>Murrinh-Patha</td>
<td>3100</td>
<td>Wadeye</td>
</tr>
<tr>
<td>Pitjantjatjara</td>
<td>3000</td>
<td>Western Desert</td>
</tr>
<tr>
<td>Warlpiri</td>
<td>2509</td>
<td>Central</td>
</tr>
<tr>
<td>Tiwi</td>
<td>2102</td>
<td>Tiwi Islands</td>
</tr>
<tr>
<td>Kunwinjku</td>
<td>2000</td>
<td>West Arnhem</td>
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<tr>
<td>Anindilyakwa</td>
<td>1600</td>
<td>Groote Eylandt</td>
</tr>
<tr>
<td>Burarra</td>
<td>1000</td>
<td>Maningrida</td>
</tr>
<tr>
<td>Gurindji</td>
<td>900</td>
<td>Katherine West</td>
</tr>
</tbody>
</table>

The use of the Hep B Story app will improve HBV health literacy among both patients and health care providers. Training in the use of the app will be provided to health practitioners as each new language becomes available. Community consultation is currently underway for the evaluation of the app and it is anticipated the evaluation will be completed by June 2019. The additional Aboriginal languages will gradually become available over the next 5 years following a process of evaluation and translation for each language group.

**AIM 2 – Improve the cascade of care for individuals living with CHB in the NT**

This aim will enable care for individuals living with CHB to be delivered in a systematic, sustainable way so no one is left behind. CHB care will be transitioned into the primary care setting so most people can receive the care they need close to home. A hub and spoke approach (see Figure 1) will allow central coordination through a NT HBV clinical care facilitation tool the ‘Hep B Hub’ and an allocated core clinical care team to improve the cascade of care for CHB patients.

There are 3 main steps to this process: Step 1 will involve assigning a sero-status to >80% of NT Aboriginal individuals i.e. knowing for each individual if they are infected, immune, require vaccination or need a blood test to determine their status and then acting accordingly. As of
July 2018 sero-coding for 13,395 of 14,919 Aboriginal individuals in the TEHS has been completed through the TEHS sero-coding project. This process will continue over the next 5 years to assign sero-status to all Aboriginal clients of CAHS, Miwatj and KWHB. The remaining Aboriginal Controlled Health Services (ACHS) will be approached individually to determine if they wish to be included in the process. CHB patients will be added to the Hep B Hub where care plans for individuals will be activated ensuring each CHB patient receives gold standard care.

The next part - Step 2 involves enabling and maintaining a competent cohort of healthcare professionals (as not all GPs can prescribe antivirals for hepatitis B, specific training through ASHM’s S100 prescriber course is required) to provide gold standard CHB care and prescribe HBV antivirals when needed. In partnership with ASHM the S100 prescriber course will be delivered annually in Darwin and Alice Springs. Ongoing mentorship and education will also occur annually in Darwin and Alice Springs for General Practitioner prescribers who have previously completed the course. Together with ASHM and TEHS the S100 prescriber course will be further developed and adapted to focus on the Aboriginal Health Practitioner (AHP) role which is essential to the implementation of the proposed co-ordinated CHB chronic disease model of care.

Step 3 sees the implementation and evaluation of gold standard care of CHB into primary care using a hub and spoke care co-ordination model. Participants will be individuals identified living with CHB in a consenting health service. Using the Hep B Hub, a CHB care bundle will be implemented in 3 stages 3a, 3b and 3c. In stage 3a for each participant a care plan will be allocated together with clinical recalls in an active continuous quality improvement CQI process. The addition of a core care group established in partnership with each service follows (stage 3b) with the following key essential elements; i) an AHP with training in viral hepatitis; ii) an S100-trained GP prescriber or specialist; and iii) access to ultrasound and Fibroscan® as needed either in community or a regional hub depending on service/location. The final stage (3c) CHB specific training will be provided to all patients in their first/preferred language.

This complex intervention successfully implemented will systematically address all 4 priority action areas outlined in the NT Hep B Action Plan (2014) as well as provide an evidence base as to which aspects deliver the most benefit.

References


SAVE THE DATE

Australasian Society for Infectious Diseases (ASID)
Annual Scientific Meeting 2019

Tropical and Topical Infectious Diseases

Darwin Convention Centre, Darwin
16-18 May 2019
In July 2018, the STRONG TL (Surveillance, Training, Research Opportunities, National Guidelines for Timor-Leste) project commenced in Timor-Leste. The STRONG TL project is a 3 year project funded by the Australian Government’s Indo-Pacific Centre for Health Security which sits under the Department of Foreign Affairs and Trade. The STRONG TL project is administrated by the Menzies School of Health Research and aims to increase the capacity of the Timorese government to conduct surveillance of and respond to communicable diseases. The STRONG TL project is truly multi-sectoral and involves collaboration between the Northern Territory (NT) Centre for Disease Control (CDC), Royal Darwin Hospital (RDH), National Critical Care and Trauma Response Centre, Australian National University, Maluk Timor, the World Health Organization, Universidade Nacional Timor-Lorosa’e and the Ministerio da Saude Timor-Leste.

The 3 main objectives of the STRONG TL project are to:

1. Understand how improved capacity for clinical and laboratory based communicable disease surveillance in Timor-Leste can rapidly identify and report on shifts in epidemiology and emerging threats
2. Improve health service delivery through implementation of evidence-based national guidelines for public health and clinical responses to key infectious diseases and antimicrobial resistance
3. Promote collaboration and training in health systems and operational research in Timor-Leste and Northern Australia.

There are 3 main arms to the STRONG TL project that are working collaboratively. Firstly, microbiology scientists from the RDH pathology laboratory have begun visits to Dili to provide mentoring to staff and improve the ability of the Timor-Leste National Referral Laboratory to detect pathogens and report antimicrobial susceptibilities. In addition, they are developing guidelines and protocols to increase the reliability of results, improving communication of results to clinicians and surveillance officers and promoting the use of the diagnostic microbiology laboratory in Timor-Leste (Figure 1).

Figure 1. An education session for clinicians was facilitated by RDH medical scientists, Luke Tennant and Gloria Castro to explain the testing undertaken in the microbiology laboratory at the NRL and to promote the collection of diagnostic samples.
Secondly, there is a clinical arm of the STRONG TL project. An adult infectious disease physician and a paediatrician are currently employed by the STRONG TL project and working alongside Timorese colleagues at the main hospital in Dili, Hospital Nacional Guido Valadares. The aims of these clinicians are to provide professional development, postgraduate medical training in hospital and clinic settings, to increase knowledge amongst Timorese colleagues of the epidemiology of infectious diseases, to promote the use of specimen collection and testing for diagnosis of infectious diseases, and to promote the recognition and notification of communicable diseases to surveillance officer to facilitate public health action.

Finally, 2 epidemiologists from the NT CDC have been working in the Departamento Vijilansia Epidemiolojia (Surveillance and Epidemiology Department) as mentors to improve surveillance and response to notifiable diseases. NT CDC staff have already participated in outbreak investigations and are contributing to the revision of Timor-Leste’s Integrated Disease Surveillance and Response document which guides surveillance and public health response activities. Additionally, NT CDC staff have been involved in the formation of the Timor-Leste One Health Working Group, the development of rabies response guidelines and assisting Timor-Leste prepare for the Joint External Evaluation of their capacity to prevent, detect and rapidly respond to public health risks in accordance with the International Health Regulations.

The STRONG TL project continues until 2021. There are already stronger links and relationships being forged between laboratory, clinical and epidemiological stakeholders (Figure 3) and indeed between international and Timorese colleagues.

References

Figure 3. Australia’s foreign minister, the Hon. Julie Bishop officially launched the STRONG TL project in August 2018 in Dili. Pictured from L-R: Professor David Brewster (paediatrician), Anthony Draper (epidemiologist and medical scientist), Dr Josh Francis (paediatrician and infectious disease specialist), Virginia ‘Lulu’ da Conceicao (medical scientist), Nevio Sarmento (medical scientist)
Abstracts from peer reviewed published articles related to the Northern Territory

Influenza epidemiology, vaccine coverage and vaccine effectiveness in children admitted to sentinel Australian hospitals in 2017: Results from the PAEDS-FluCAN Collaboration


Clinical Infectious Diseases, ciy597, https://doi.org/10.1093/cid/ciy597

Background: In 2017, Australia experienced record influenza notifications. Two surveillance programs combined to summarize the epidemiology of hospitalized influenza in children and report on vaccine effectiveness (VE) in the context of a limited nationally funded vaccination program.

Methods: Subjects were prospectively recruited (April–October 2017). Case patients were children aged ≤16 years admitted to 11 hospitals with an acute respiratory illness and laboratory-confirmed influenza. Controls were hospitalized with acute respiratory illness and tested negative for influenza. VE estimates were calculated using the test-negative design.

Results: A total of 1268 children were hospitalized with influenza: 31.5% were <2 years old, 8.3% were Indigenous, and 45.1% had comorbid conditions predisposing to severe influenza. Influenza B was detected in 34.1% with influenza A/H1N1 and A/H3N2 detected in 47.2% and 52.8% of subtyped influenza A specimens. The median length of stay was 3 days (interquartile range, 1–5), 14.5% were admitted to the intensive care unit, and 15.9% received oseltamivir. Four in-hospital deaths occurred (0.3%): 1 was considered influenza associated. Only 17.1% of test-negative-controls were vaccinated. The VE of inactivated quadrivalent influenza vaccine for preventing hospitalized influenza was estimated at 30.3% (95% confidence interval, 2.6%–50.2%).

Conclusions: Significant influenza-associated morbidity was observed in 2017 in Australia. Most hospitalized children had no comorbid conditions. Vaccine coverage and antiviral use was inadequate. Influenza vaccine was protective in 2017, yet VE was lower than previous seasons. Multiple Australian states have introduced funded preschool vaccination programs in 2018. Additional efforts to promote vaccination and monitor effectiveness are required.

Current antenatal pertussis vaccination guidelines miss preterm infants: An epidemiological study from the Northern Territory

Janagaraj PD, Gurusamy PSR, Webby R

Aust N Z J Obstet Gynaecol 2018; 1–8

Importance: Assessing gaps in antenatal pertussis vaccination to increase coverage.

Introduction: Antenatal pertussis vaccination has been proven effective in reducing pertussis disease in infants. Current guidelines recommend maternal pertussis vaccination from 28 weeks gestation. The aim of this study is to determine antenatal pertussis vaccination coverage in the Northern Territory (NT) and potential socio-demographic factors affecting uptake, using validated birth and immunisation data.

Methods: Cross-sectional population study including all viable births (from 24 weeks gestation) in NT public hospitals in 2016.

Results: There were 3392 viable delivery episodes in 2016 with 48.9% coverage against maternal pertussis based on current guidelines. Mothers <35 years old were more likely to receive antenatal vaccination (adjusted odds ratio (aOR) = 1.26, CI 1.035–1.52, P = 0.021). Pertussis vaccination coverage for preterm births was low at 0% for extreme, 18.86% for very preterm and 39.8% for moderate preterm births, with an overall coverage of 33.5% for all preterm births. Term births were 2 times more
likely than preterm births to have had mothers receive an antenatal diphtheria toxoid, tetanus toxoid and acellular pertussis vaccine (aOR= 1.957, CI 1.53–2.50, P < 0.001).

Conclusions: A significant proportion (66.5%) of preterm babies are not benefiting from protection against pertussis with the current pertussis vaccination policy from 28 weeks gestation. As timing of birth cannot be predetermined, a review of safety and acceptability of pertussis vaccine administration in the second trimester is needed. Implementation of pertussis vaccination from 20 weeks gestation will provide a wider vaccination period and maximise the protection of all infants including pre-term infants from pertussis.

A biological model of scabies infection dynamics and treatment informs mass drug administration strategies to increase the likelihood of elimination.


Mathematical Biosciences (2018), doi: https://doi.org/10.1016/j.mbs.2018.08.007

Infections with Sarcoptes scabiei, or scabies, remain common in many disadvantaged populations. Mass drug administration (MDA) has been used in such settings to achieve a rapid reduction in infection and transmission, with the goal of eliminating the public health burden of scabies. While prevalence has been observed to fall substantially following such an intervention, in some instances resurgence of infection to baseline levels has occurred over several years. To explore the biology underpinning this phenomenon, we have developed a theoretical model of scabies life-cycle and transmission dynamics in a homogeneously mixing population, and simulate the impact of mass drug treatment strategies acting on egg and mite life cycle stages (ovicidal) or mites alone (non-ovicidal). In order to investigate the dynamics of the system, we first define and calculate the optimal interval between treatment doses. We calculate the probability of eradication as a function of the number of optimally-timed successive treatment doses and the number of years over which a program is run. For the non-ovicidal intervention, we first show that at least two optimally-timed doses are required to achieve eradication. We then demonstrate that while more doses over a small number of years provides the highest chance of eradication, a similar outcome can be achieved with fewer doses delivered annually over a longer period of time. For the ovicidal intervention, we find that doses should be delivered as close together as possible. This work provides a platform for further research into optimal treatment strategies which may incorporate heterogeneity of transmission, and the interplay between MDA and enhancement of continuing scabies surveillance and treatment strategies.

The role of social determinants of health in the risk and prevention of group A streptococcal infection, acute rheumatic fever and rheumatic heart disease: A systematic review

Coffey P, Ralph A, Krause V

PLOS Neglected Tropical Diseases | https://doi.org/10.1371/journal.pntd.0006577 June 13, 2018

Background: Rheumatic heart disease (RHD) poses a major disease burden among disadvantaged populations globally. It results from acute rheumatic fever (ARF), a complication of Group A Streptococcal (GAS) infection. These conditions are acknowledged as diseases of poverty, however the role of specific social and environmental factors in GAS infection and progression to ARF/RHD is not well understood. The aim of this systematic review was to determine the association between social determinants of health and GAS infection, ARF and RHD, and the effect of interventions targeting these.

Methodology: We conducted a systematic literature review using PubMed, the Cochrane Library and Embase. Observational and experimental studies that measured: crowding, dwelling characteristics, education, employment, income, nutrition, or socioeconomic status and the relationship with GAS infection, ARF or RHD were included. Findings for each factor were assessed against the Bradford Hill criteria for evidence of causation. Study quality was assessed using a standardised tool.
Principle findings: 1,164 publications were identified. 90 met inclusion criteria, comprising 91 individual studies. 49 (50.5%) were poor quality in relation to the specific study question. The proportion of studies reporting significant associations between socioeconomic determinants and risk of GAS infection was 57.1%, and with ARF/RHD was 50%. Crowding was the most assessed factor (14 studies with GAS infection, 36 studies with ARF/RHD) followed by socioeconomic status (6 and 36 respectively). The majority of studies assessing crowding, dwelling characteristics, education and employment status of parents or cases, and nutrition, reported a positive association with risk of GAS infection, ARF or RHD. Crowding and socioeconomic status satisfactorily met the criteria of a causal association. There was substantial heterogeneity across all key study aspects.

Conclusion: The extensive literature examining the role of social determinants in GAS infection, ARF and RHD risk lacks quality. Most were observational, not interventional. Crowding as a cause of GAS infection and ARF/RHD presents a practical target for prevention actions.

Human immunodeficiency virus-infected young people in Australia: data from the Australian HIV Observational Database


Background: Individuals aged 13-24 years undergo vast physical, cognitive, social and psychological changes. Australian data regarding clinical outcomes of those diagnosed with HIV in this age are sparse.

Aim: We aimed to describe demographic factors, virologic and clinical outcomes of individuals aged 13-24 years diagnosed with human immunodeficiency virus (HIV).

Methods: Patients diagnosed with HIV after 1997 in the Australian HIV Observational Database were divided into young adults, diagnosed at age <25 years (n = 223), and older adults (n = 1957). Demographic and clinical factors were compared between groups.

Results: Young adults had a median age at
diagnosis of 22 years (inter quartile range (IQR) 20-24) and median age at treatment initiation of 24 years (IQR 22-26). They were more likely to be female than the older cohort (21.1 vs 10.8%; P < 0.001). Men who have sex with men was the most common exposure category in both groups. CD4 count at diagnosis was significantly higher in younger than older adults (median 460 vs 400 cells/mm$^3$, $P = 0.006$), whereas HIV viral load at diagnosis was lower (35,400 vs 61,659 copies/mL, $P = 0.011$). The rate of loss to follow up (LTFU) was higher in young adults (8.0 vs 4.3 per 100PY, $P < 0.001$). Young adults were more likely to have a treatment interruption compared to older adults (5.3 vs 4.0 per 100PY, $P = 0.039$). Rates of treatment switch, time to treatment change, and CD4 and viral load responses to treatment were similar between groups.

**Conclusions:** Young adults were diagnosed with HIV at higher CD4 counts and lower viral loads than their older counterparts. LTFU and treatment interruption were more common highlighting the need for extra efforts directed towards retention in care and education regarding the risks of treatment interruptions.

**Cost impact of high staff turnover on primary care in remote Australia**

Zhao Y, Russel D, Guthridge S, Ramjan M, Jones M, Humphreys J, Wakerman J

_Australian Health Review_  
[https://doi.org/10.1071/AH17262](https://doi.org/10.1071/AH17262)

**Objectives:** The aim of this study was to estimate the costs of providing primary care and quantify the cost impact of high staff turnover in Northern Territory (NT) remote communities.

**Methods:** This cost impact assessment used administrative data from NT Department of Health datasets, including the government accounting system and personnel information and payroll systems between 2004 and 2015, and the primary care information system from 2007 to 2015. Data related to 54 government-managed clinics providing primary care for approximately 27 200 Aboriginal and non-Aboriginal people. Main outcome measures were average costs per consultation and per capita, cost differentials by clinic, year and levels of staff turnover. Linear regression and dominance analysis were used to assess clinician compliance with the CDC guidelines.

**Results:** Thirty-three infants were identified as being at risk of CS, 26 low risk and 7 high risk. Hospital management at birth conformed well with the guidelines, with 85% of low risk, and 100% of high risk infants receiving treatment and 92% of low risk and 86% of high risk having appropriate serology. Follow-up was poorly compliant, with only 48% of infants completing serological follow-up and less than 15% undergoing clinical examination. No definitive case of CS was identified among the at-risk children.

**Conclusion:** Overall, peri-natal management of infants was performed well, but follow-up was poor. Effective systems to transfer care from hospitals to primary care are required to improve this. The fact that no infant had direct evidence of syphilis infection suggests consideration should be given to modifying the Australian surveillance case definition.

**An audit on the management and outcomes of infants at risk of congenital syphilis in the Top End of the Northern Territory, Australia, 2005-2013**

Rode N, Ryder N, Su JY

_Commun Dis Intell_ 2018;42(P2):S2209-6051 (18)00018-0) Epub 17/12/2018

**Introduction:** Congenital syphilis (CS) remains a condition of serious clinical and public health importance, particularly in the Aboriginal populations of northern Australia, which have seen a recent resurgence in cases. In 2005, the Northern Territory (NT) Centre for Disease Control (CDC) published guidelines for management of infants at risk of CS. We audited the management and outcomes of infants at risk of CS who were born between 2005 and 2013 in the Darwin and Katherine regions of the NT.

**Methods:** Data, including serology, clinical examination, treatment, follow-up and infant outcomes at 12 months, were extracted from the Syphilis Register, medical and pathology records to assess clinician compliance with the CDC guidelines.

**Results:** Thirty-three infants were identified as being at risk of CS, 26 low risk and 7 high risk. Hospital management at birth conformed well with the guidelines, with 85% of low risk, and 100% of high risk infants receiving treatment and 92% of low risk and 86% of high risk having appropriate serology. Follow-up was poorly compliant, with only 48% of infants completing serological follow-up and less than 15% undergoing clinical examination. No definitive case of CS was identified among the at-risk children.

**Conclusion:** Overall, peri-natal management of infants was performed well, but follow-up was poor. Effective systems to transfer care from hospitals to primary care are required to improve this. The fact that no infant had direct evidence of syphilis infection suggests consideration should be given to modifying the Australian surveillance case definition.
assess the effect of staff turnover on primary care costs, after adjusting for remoteness and weighting analysis by service population. Both current and constant prices were used.

**Results:** On average, in constant prices, there was a nearly 10% annual increase in remote clinic expenditure between 2004 and 2015 and an almost 15% annual increase in consultation numbers since 2007. In real terms, the average costs per consultation decreased markedly from A$273 in 2007 to A$197 in 2015, a figure still well above the Medicare bulkbilling rate. The cost differentials between clinics were proportional to staff turnover and remoteness (both $P < 0.001$). A 10% higher annual turnover rate pertains to an A$6.12 increase in costs per consultation.

**Conclusions:** High staff turnover exacerbates the already high costs of providing primary care in remote areas, costing approximately A$50 extra per consultation. This equates to an extra A$400,000 per clinic per year on average, or A$21 million annually for the NT government. Over time, sustained investments in developing a more stable primary care workforce should not only improve primary care in remote areas, but also reduce the costs of excessive turnover and overall service delivery costs.

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**Northern Territory malaria notifications July to September 2018**

*Liz Stephenson, CDC Darwin*

There were 6 cases of malaria notified in the 3rd quarter of 2018. 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 of cases</th>
<th>Origin of infection</th>
<th>Agent</th>
<th>Chemoprophylaxis</th>
<th>NT region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uganda</td>
<td><em>P. falciparum</em></td>
<td>No</td>
<td>Alice Springs</td>
</tr>
<tr>
<td>1</td>
<td>Uganda</td>
<td><em>P. falciparum</em></td>
<td>No</td>
<td>Darwin</td>
</tr>
<tr>
<td>2</td>
<td>Tanzania</td>
<td><em>P. falciparum</em></td>
<td>No</td>
<td>Darwin</td>
</tr>
<tr>
<td>1</td>
<td>Democratic Republic of Congo</td>
<td><em>P. falciparum</em></td>
<td>No</td>
<td>Darwin</td>
</tr>
<tr>
<td>1</td>
<td>Indonesia</td>
<td><em>P. vivax</em></td>
<td>No</td>
<td>Darwin</td>
</tr>
</tbody>
</table>

---

**********
What is melioidosis?
Melioidosis is a disease caused by bacteria known as *Burkholderia pseudomallei*. The bacteria live below the soil’s surface during the dry season but after heavy rainfall are found in surface water and mud and may become airborne.

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

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

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

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

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

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

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

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

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

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

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

**How can melioidosis be prevented?**

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

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

Wounds should be promptly and thoroughly washed clean and covered.

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

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

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

These preventative measures are most important if you have any of the following conditions:

- diabetes
- heavy alcohol consumption (>20 standard drinks a week or binge drinking)
- kidney disease
- lung disease
- cancer
- receiving immunosuppressive therapy, including steroids
- cuts or sores in your skin, particularly on the hands and feet.

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

- Alice Springs, 8951 7540
- Darwin, 8922 8044
- Katherine, 8973 9049
- Nhulunbuy, 8987 0357
- Tennant Creek, 8962 4259

or

### NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS
#### 1 July-31 September 2018 and 2017

<table>
<thead>
<tr>
<th>Disease</th>
<th>Alice Springs</th>
<th>Barkly</th>
<th>Darwin</th>
<th>East Arnhem</th>
<th>Katherine</th>
<th>NT</th>
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<tr>
<td>Acute post-strep glomerulonephritis</td>
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<td>32</td>
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<td>102</td>
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<td>HIV</td>
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<td>HTLV1 asymptomatic/unspecified</td>
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<tr>
<td>Rheumatic Fever</td>
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<td>11</td>
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<td>Ross River Virus</td>
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<td>0</td>
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<td>5</td>
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<td>14</td>
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<td>4</td>
<td>69</td>
<td>64</td>
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<td>Shigellosis</td>
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<td>16</td>
<td>16</td>
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<td>STEC/VTEC</td>
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<td>0</td>
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<td>0</td>
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</tr>
<tr>
<td>Syphilis &lt; 2 yrs duration</td>
<td>27</td>
<td>14</td>
<td>2</td>
<td>2</td>
<td>42</td>
<td>52</td>
</tr>
<tr>
<td>Syphilis &gt; 2 yrs or unknown duration</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Syphilis congenital</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trichomoniasis</td>
<td>248</td>
<td>270</td>
<td>43</td>
<td>61</td>
<td>219</td>
<td>278</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Typhus</td>
<td>0</td>
<td>1</td>
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<td>0</td>
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<td>Varicella - unspecified</td>
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<td>2</td>
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<tr>
<td>Vibrio food poisoning</td>
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<td>Vibrio invasive</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>Yersiniosis</td>
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<td>0</td>
<td>0</td>
<td>4</td>
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<td>Zoster</td>
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<td>12</td>
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<td>2</td>
<td>86</td>
<td>96</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>966</strong></td>
<td><strong>1,204</strong></td>
<td><strong>135</strong></td>
<td><strong>231</strong></td>
<td><strong>1,182</strong></td>
<td><strong>1,548</strong></td>
</tr>
</tbody>
</table>
Ratio of the number of notifications in the 3rd quarter of 2018 to the 5 year mean (2013-17): selected diseases

Ratio of the number of notifications in the 3rd quarter of 2018 to the 5 year mean (2013-2017): sexually transmitted diseases
Comments on notifications

HIV

Of the 16 cases notified in the 3rd quarter, 11 were previously diagnosed and had transferred their care from interstate or overseas. Those newly diagnosed have primarily acquired their infection overseas or interstate.

Gonococcal infection

There were 547 cases of gonococcal infection notified in the 3rd quarter, 16% more than the 5 year mean. This increase is occurring in men and women of both the Top End and Central regions.

Trichomoniasis

Trichomoniasis notifications decreased to 723 in the 3rd quarter following on from a 2nd quarter fall and indicating a recent downward trend. This decrease has occurred across primarily rural districts of the Top End and Central regions.

Chlamydial conjunctivitis

There were 12 cases of chlamydial conjunctivitis in the 3rd quarter this year which was 3.5 times the 5 year mean. The cases occurred in communities in which trachoma, caused by infection with ocular strains of *Chlamydia trachomatis*, is known to be endemic. Trachoma is usually asymptomatic and the diagnosis is made clinically using a standardised WHO screening methodology during the trachoma control program’s community screening events. The clinical diagnosis made during the screen is not notifiable, however the data are collected and reported on according to the agreement with the Commonwealth and the National Trachoma Surveillance and Control Reference Group. However it is known that ocular strains of *C. trachomatis* can cause acute conjunctivitis.

During 2018 there was an outbreak of acute conjunctivitis in some Central Australian communities which led clinicians to take swabs from affected children, some of which were positive on PCR for *C. trachomatis*. We do not know the results of any other tests taken for other organisms which are not notifiable. It is possible that these children had an acute chlamydial conjunctivitis but it is also possible that the swab was identifying children who had an acute viral or non-chlamydial bacterial conjunctivitis, but who also had underlying trachoma.

The trachoma control program’s screening activities have confirmed that trachoma is still endemic in communities in Central Australia, but a marked increase in prevalence was not detected in screening carried out in the 2nd half of 2018.

**********
### Immunisation coverage for children aged 12 to < 15 months at 30 September 2018

<table>
<thead>
<tr>
<th>SA3 Name</th>
<th>Number in SA3</th>
<th>DTP %</th>
<th>Polio %</th>
<th>HIB %</th>
<th>HEP %</th>
<th>Pneumo %</th>
<th>Fully vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin city</td>
<td>118</td>
<td>94.92</td>
<td>94.92</td>
<td>94.92</td>
<td>95.76</td>
<td>97.46</td>
<td>94.92</td>
</tr>
<tr>
<td>Darwin suburbs</td>
<td>213</td>
<td>93.90</td>
<td>93.90</td>
<td>93.90</td>
<td>94.37</td>
<td>94.84</td>
<td>93.90</td>
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<tr>
<td>Litchfield</td>
<td>61</td>
<td>93.44</td>
<td>93.44</td>
<td>93.44</td>
<td>94.44</td>
<td>95.08</td>
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<tr>
<td>Palmerston</td>
<td>185</td>
<td>96.22</td>
<td>96.22</td>
<td>96.22</td>
<td>96.22</td>
<td>96.76</td>
<td>96.22</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>103</td>
<td>93.20</td>
<td>93.20</td>
<td>93.20</td>
<td>94.17</td>
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<td>17</td>
<td>94.12</td>
<td>94.12</td>
<td>94.12</td>
<td>94.12</td>
<td>100</td>
<td>94.12</td>
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<tr>
<td>Daly - Tiwi - West Arnhem</td>
<td>28</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>East Arnhem</td>
<td>62</td>
<td>93.55</td>
<td>93.55</td>
<td>95.16</td>
<td>95.16</td>
<td>98.39</td>
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<tr>
<td>Katherine</td>
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<td>88.89</td>
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<td>Not mapped*</td>
<td>94</td>
<td>97.87</td>
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<td>97.87</td>
<td>98.94</td>
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<tr>
<td>Non-Aboriginal (NT)</td>
<td>625</td>
<td>94.40</td>
<td>94.40</td>
<td>94.40</td>
<td>94.60</td>
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<td>94.50</td>
<td>94.60</td>
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<td>Australia</td>
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<td>94.70</td>
<td>94.50</td>
<td>94.60</td>
<td>96.50</td>
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### Immunisation coverage for children aged 24 to < 27 months at 30 September 2018

<table>
<thead>
<tr>
<th>SA3 Name</th>
<th>Number in SA3</th>
<th>DTP %</th>
<th>Polio %</th>
<th>HIB %</th>
<th>HEP %</th>
<th>MMR %</th>
<th>Pneumo %</th>
<th>MenC %</th>
<th>Varicella</th>
<th>Fully vaccinated</th>
</tr>
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<tbody>
<tr>
<td>Darwin City</td>
<td>113</td>
<td>89.38</td>
<td>94.69</td>
<td>93.81</td>
<td>94.69</td>
<td>90.27</td>
<td>93.81</td>
<td>92.04</td>
<td>89.38</td>
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<td>Darwin Suburbs</td>
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<td>94.36</td>
<td>95.90</td>
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<td>98.36</td>
<td>98.36</td>
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<tr>
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<td>89.89</td>
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<td>98.95</td>
<td>98.95</td>
<td>91.58</td>
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<td>86.36</td>
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<td>95.45</td>
<td>90.91</td>
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<td>Daly - Tiwi -</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>96.77</td>
<td>96.77</td>
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<td>96.97</td>
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<td>96.97</td>
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<td>96.97</td>
<td>96.97</td>
<td>84.85</td>
<td>81.82</td>
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<tr>
<td>Katherine</td>
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<td>97.67</td>
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<td>98.84</td>
<td>98.84</td>
<td>93.55</td>
<td>94.19</td>
</tr>
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</table>

| Non-Aboriginal (NT)       | 594           | 94.10  | 97.60   | 97.00  | 97.30  | 93.90  | 96.60    | 97.00   | 93.80     | 92.60           |
| Aboriginal (NT)          | 312           | 89.70  | 98.10   | 95.80  | 98.10  | 91.70  | 98.40    | 96.50   | 86.50     | 84.30           |
| NT                       | 906           | 92.60  | 97.80   | 96.60  | 97.60  | 93.20  | 97.20    | 96.80   | 91.30     | 89.70           |
| Australia                 | 79657         | 93.40  | 96.70   | 95.80  | 96.70  | 93.70  | 96.00    | 95.70   | 93.30     | 91.40           |

* Not mapped: Individual could not be mapped to a specific location. For example a PO Box cannot be mapped to a geographical area.
Immunisation coverage for children aged 60 to < 63 months at 30 September 2018

<table>
<thead>
<tr>
<th>SA3 Name</th>
<th>Number in SA3</th>
<th>%DTP</th>
<th>%Polio</th>
<th>% Fully vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin city</td>
<td>123</td>
<td>96.75</td>
<td>96.75</td>
<td>96.75</td>
</tr>
<tr>
<td>Darwin suburbs</td>
<td>201</td>
<td>93.53</td>
<td>94.03</td>
<td>93.53</td>
</tr>
<tr>
<td>Litchfield</td>
<td>62</td>
<td>95.16</td>
<td>95.16</td>
<td>95.16</td>
</tr>
<tr>
<td>Palmerston</td>
<td>181</td>
<td>92.82</td>
<td>92.27</td>
<td>91.71</td>
</tr>
<tr>
<td>Alice Springs</td>
<td>85</td>
<td>95.29</td>
<td>95.29</td>
<td>95.29</td>
</tr>
<tr>
<td>Barkly</td>
<td>9</td>
<td>100</td>
<td>88.89</td>
<td>88.89</td>
</tr>
<tr>
<td>Daly - Tiwi - West Arnhem</td>
<td>17</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>East Arnhem</td>
<td>34</td>
<td>97.06</td>
<td>97.06</td>
<td>97.06</td>
</tr>
<tr>
<td>Katherine</td>
<td>88</td>
<td>96.59</td>
<td>96.59</td>
<td>96.59</td>
</tr>
<tr>
<td>Not mapped*</td>
<td>88</td>
<td>92.05</td>
<td>92.05</td>
<td>92.05</td>
</tr>
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<td>Non Aboriginal (NT)</td>
<td>583</td>
<td>94.00</td>
<td>94.00</td>
<td>93.70</td>
</tr>
<tr>
<td>Aboriginal (NT)</td>
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<td>95.80</td>
<td>95.50</td>
<td>95.50</td>
</tr>
<tr>
<td>NT</td>
<td>892</td>
<td>94.60</td>
<td>94.50</td>
<td>94.30</td>
</tr>
<tr>
<td>Australia</td>
<td>80298</td>
<td>94.90</td>
<td>95.00</td>
<td>94.80</td>
</tr>
</tbody>
</table>

* Not mapped: Individual could not be mapped to a specific location. For example a PO Box cannot be mapped to a geographical area.

Immunisation coverage at 30 September 2018

Holly Carmichael, Centre for Disease Control, Darwin

Background information to interpret coverage

Immunisation coverage will be reported by Australian Bureau of Statistics (ABS) Statistical Area Level 3 (SA3). SA3s are ABS standardised geographical areas to which children have been assigned based on their Medicare address as recorded on the Australian Immunisation Register (AIR). The region ‘Not Mapped’ captures the children whose residency could not be mapped to a specific location within the Northern Territory (NT), this includes PO Box addresses. Maps of these geographic area boundaries can be found at [http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/B0AC271BC8160338CA257801000E0692/$File/1270055001_asgs_2011_nt_maps.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/B0AC271BC8160338CA257801000E0692/$File/1270055001_asgs_2011_nt_maps.pdf)

The cohort of children assessed at 12 to <15 months of age on 30 September 2018 were born between 1 October 2017 and 31 December 2017 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 2 or 3 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, 3 doses of hepatitis B vaccine and 3 doses of pneumococcal vaccine. All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24 to <27 months of age on 30 September 2018 were born between 1 October 2016 and 31 December 2016 inclusive. To be considered fully vaccinated, these children must have received meningococcal C vaccination (given at the 12month schedule point), and a second dose of measles, mumps, rubella (MMR) and the first dose of the varicella vaccination (given in combination as MMRV at the 18 months schedule point). All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 60 to <63 months of age on 30 September 2018 were born between 1 October 2013 and 31 December 2013 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
The Northern Territory Disease Control Bulletin Vol 25, No. 4, December 2018

Polio vaccine and 2 valid doses of MMR vaccine. All vaccinations must have been administered by 60 months (5 years) of age.

**Interpretation and comment**

Immunisation coverage rates for NT children by SA3 and Aboriginal status, as estimated by the AIR, are shown on pages 44-45. Coverage for all Australian children is also provided.

Children in the NT were more likely to be fully immunised in the 12 <15 month age cohort (NT 94.5%), in comparison to Australia wide coverage rate (National 94.2%). However NT children in both the 24 to <27 month (NT 89.7%, National 91.4%) and 60 to <63 month age cohorts (NT 94.3%, National 94.8%) were less likely to be fully immunised compared the National coverage rates.

Aboriginal children in the NT were less likely to be fully immunised than non-Aboriginal children in the 24-<27 month age cohort (Aboriginal 84.3%, non-Aboriginal 92.6%). Aboriginal children were however more likely to be fully immunised in comparison the non-Aboriginal children in both the 12-<15 month (Aboriginal 94.7%, non-Aboriginal 94.4%) and 60-<63 month cohorts (Aboriginal 95.5%, non-Aboriginal 93.7%).

Coverage by SA3 in the Table shows variation between high and low coverage areas. Darwin suburbs had the lowest Aboriginal coverage in the 24-<27 month cohort (71.1%). The highest Aboriginal coverage area was in the Daly-Tiwi-West Arnhem Region for the 12<15 month cohort (100%). The lowest coverage area for non-Aboriginal children was in Katherine for the 12-<15 month cohort (85.7%) while the highest coverage for non-Aboriginal children was Katherine in the older 24-<27 month cohort (100%). The relative rates tend to vary over time due to the small numbers of children in some locations.

CDC are currently reviewing the reasons for the lower coverage in both Aboriginal and non-Aboriginal children. CDC is working with the Australian Immunisation Register to review data quality and processing of vaccine recording, and reviewing other strategies to improve childhood immunisation coverage Further information about the Australian Childhood Immunisation Register coverage may be found online at: [http://www.ncirs.edu.au/surveillance/immunisation-coverage/](http://www.ncirs.edu.au/surveillance/immunisation-coverage/)

**Table. Area (SA3) with highest and lowest immunisation coverage (must have at least 20 children in area) by Aboriginal Status at 30 September 2018**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Lowest SA3</th>
<th>Highest SA3</th>
<th>Lowest SA3</th>
<th>Highest SA3</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 to &lt;15 months</td>
<td>Alice Springs 90.4% (38/42)*</td>
<td>Daly - Tiwi - West Arnhem 100% (22/22)*</td>
<td>Katherine 85.7% (30/35)*</td>
<td>Palmerston 96.5% (138/143)*</td>
</tr>
<tr>
<td>24 to &lt;27 months</td>
<td>Darwin Suburbs 71.1% (27/38)*</td>
<td>Daly - Tiwi - West Arnhem 95.5% (21/22)*</td>
<td>Darwin City 87.8% (72/82)*</td>
<td>Katherine 100% (31/31)*</td>
</tr>
<tr>
<td>60 to &lt;63 months</td>
<td>Darwin Suburbs 94.6% (35/37)*</td>
<td>Darwin City 97.7% (43/44)*</td>
<td>Palmerston 90.6% (125/138)*</td>
<td>Katherine 96.8% (30/31)*</td>
</tr>
</tbody>
</table>

*Number of individuals fully immunised/ number of individuals in SA3 region

**********