

THE NORTHERN TERRITORY DISEASE CONTROL BULLETIN



Vol. 15, No. 4, December 2008

ISSN 1440-883X

Closing the gap – the challenge

CDC Action Plan Vicki Krause, CDC Darwin

In Prime Minister Rudd's "Apology to Australia's Indigenous Peoples" on 13 February 2008 he moved that:

"...For the future we take heart; resolving that this new page in the history of our great continent can now be written...A future where we harness the determination of all Australians, Indigenous and non-Indigenous, to close the gap that lies between us in life expectancy, educational achievement and economic opportunity...A future where we embrace the possibility of new solutions to enduring problems where old approaches have failed...

A future where all Australians whatever their origins are truly equal partners with equal opportunities and with equal stake in shaping the next chapter in the history of this great country, Australia...."

He went on to say that Australians are a passionate lot - but also a very practical lot and it is not sentiment that makes history but actions. He said the apology was aimed at building a bridge between Indigenous and non-Indigenous Australians with the challenge to cross the bridge and embrace a new partnership. The core of the partnership for the future is "to close the gap" between Indigenous and non-Indigenous on, life expectancy, for one. The new partnership to close the gap will set concrete targets for the future,

specifically that the goal within a decade is to halve the appalling gap in infant mortality rates between Indigenous and non-Indigenous children, and within a generation, to close the equally appalling 17-year life gap between Indigenous and non-Indigenous in overall life expectancy.

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"Let us resolve today to start with the children.... Let us over the next five years for every Indigenous under-4-year-old in a remote Indigenous community resolve to provide proper primary and preventive health care to begin the task of rolling back the obscenity that we find today in infant mortality rates in remote communities — up to four times higher than in other communities."

It was acknowledged that none of this will be easy ... and that most of it will be very hard. The challenge put forth was

"Let us seize the day..."

The challenge is to be focused in our day-to-day work on those actions that will consistently contribute to "closing that gap". With this as our guiding principle, the Centre for Disease (CDC) of the Department of Health and Families in the Northern Territory (NT), has made the following recommendation.

Recommendation:

That the CDC of the NT put forward a Five Year Action Plan with targets to work towards "closing the gap". The Action Plan focus will be on the following 5 areas:

- 1. To continue to work to improve **Indigenous** status reporting
 - With the target for all diseases to be at least 95% complete
 - With the target for indicator diseases to be 99% complete

with the 18 indicator diseases being

Donovanosis
Gonococcal infection
Syphilis infection
Chlamydial infection
HIV
TB
Leprosy
Haemophilus influenzae type b (Hib)
Invasive pneumococcal disease (IPD)
Hepatitis A
Meningococcal disease
Measles
Mumps
Pertussis

Influenza Rotavirus Shigellosis Salmonella infection.

2. To analyse the **age-adjusted rates of the above indicator diseases** using data from 2000-2007 and to consider the gap between Indigenous and non-Indigenous rates.

To use these data to continue to formulate, refine and implement policy, guidelines and recommendations to improve the public's health and react to threats.

To set targets for closing the gap for each indicator disease for the years 2009-2013 with yearly reporting during that period (see following article).

3. To **report on vaccine coverage in detail** e.g. by age groups, urban and remote residence and timeliness.

To set 5 year targets for closing the gap in coverage in these groups and timeliness (details and targets to be reported in the next *Bulletin*).

4. To continue to work towards **provision of a** "Whole of Life" Immunisation Register for the NT while awaiting a national approach.

To date all childhood and adult vaccinations given in the NT, with the exception of influenza vaccinations, are entered into the NT Immunisation Database (assuming vaccination reporting duty carried out by the vaccine provider).

5. To prioritise the diseases that are predominantly affecting Indigenous populations i.e. trachoma and rheumatic fever (RF)/rheumatic heart disease (RHD) and improve the control of these diseases by having:

For trachoma

- Strategies in place to measure trachoma rates and to support and progress trachoma control programs.
- To set the target for trachoma reduction to be:
 - A prevalence rate of trachoma of less than 5% within 5 years for all remote Indigenous communities in the NT.

For RF/RHD

- Strategies in place to:
 - Increase adherence for prophylaxis from 50 to 80% within 5 years through culturally appropriate health promotion.
 - Determine the proportion of patients who have had 11 out of 13 injections in the past 12 months.
 - Decrease recurrence rates by promoting family meetings to all patients who have missed more than 2 injections.
- To set the target for RF/RHD reduction to be:
 - to have no deaths occur for 2 consecutive years in the NT as a result of RF/RHD or complications thereof, in persons less than 25 years of age over the next 5 years.

The core business of CDC is to provide surveillance on communicable diseases (as well as adverse conditions such as injury) of public health importance and to formulate and policy, guidelines implement recommendations to improve the public's health and react to threats. Inherent to this core business has been to collect data that allows for useful analysis with the ability to detect vulnerable populations that require interventions, more tailored responses, or new strategies. By focusing on our core business in this Action Plan our goal is to reach these targets and realise a "closing of the gap" between Indigenous and non-Indigenous population disease rates and to work for a more equitable future for all. Our aim is to report yearly on this Five Year Action Plan.

Acknowledgements

Tracy Ward, Peter Markey, Stephanie Davis, Lesley Scott, Dale Thompson, Rosalie Schultz, Cate Coffey.

Closing the gap - targets for indicator diseases

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Introduction

With the "Apology to Australia's Indigenous People" speech on 13 February, the Prime Minister challenged all Australians, but particularly those involved in service delivery to Indigenous people, to close the gap between the level of health, educational and living standards experienced by Indigenous and non-Indigenous Australians.¹

That there is a gap is widely recognised. The most widely quoted (and perhaps easily understandable gap) is the 17-year gap in life expectancy of Indigenous and non-Indigenous Australians,² which in the Territory is driven mainly by preventable, chronic disease.3 However there is also a clear gap between the rates at which Indigenous and non-Indigenous people suffer from communicable diseases. Apart from the inherent suffering that disease invariably brings, even short-term communicable diseases can impact on longerterm health. Obvious examples of this are

repeated streptococcal infections leading to rheumatic heart disease and sexually transmitted infections causing infertility and increased risk of ectopic pregnancy.^{4,5}

As the agency with legislative responsibility for notifiable diseases in the Northern Territory (NT), the Centre for Disease Control (CDC) has responded to the Prime Minister's challenge by putting forward an Action Plan as outlined in the above article. This report addresses point 2, the analysis of age-adjusted rates of the indicator diseases with the aim to visually represent the "gap" between Indigenous and non-Indigenous notification rates of 18 indicator diseases, predict future rates of disease and then set target rates for the next 5 years including a discussion of strategies of how to attain these targets.

Methods

Data was extracted from the Northern Territory Notifiable Diseases System (NTNDS) for notifications of the indicator diseases listed in the above article between January 1 2000 and December 31 2007. For most diseases, direct age-standardisation was used to provide a comparison between Indigenous and non-Indigenous rates of disease. For diseases with more severe consequences in specific age groups (e.g. shigellosis) or that occur almost exclusively in one age group (e.g. rotavirus) Indigenous and non-Indigenous rates were calculated for the relevant age group. Australian Bureau of Statistics (ABS) NT population figures from 2000-2007 were used to calculate rates with the 2001 Australian census population as the standard population for age-standardisation. Where the Indigenous status of cases was unknown, cases were distributed within their age stratum according to the ratio of cases of known Indigenous status. Poisson regression was used to predict rates of diseases to 2013. All analysis was done using Business Objects software, Microsoft Excel and intercooled STATA version 9.

A panel of experts was convened to set target rates for 2013. Taken into account when setting target rates were current trends in notification rates and factors that affect disease transmission and which may be affected by public health interventions over the coming years. Public health interventions included those which are considered within the traditional realm of health departments such as new vaccines, and those

which are intrinsic to health but not traditionally within the realm of health departments such as improved housing.

Results

The results of the analysis for 3 of the 18 indicator diseases are reported below.

Shigellosis

There were a total of 1064 cases of shigellosis notified in the NT between the years 2000 to 2007 of which 61% (555 cases) were notified in the under 5 year old age group. Of these, 93% (521 cases) were Indigenous. Recognition that the bulk of illness is in the under 5 year old age group, and that the effects of shigellosis can be more severe in this age group led to the comparison of rates being limited to those under the age of 5 years.

Between the years 2000 to 2007 the rates of both Indigenous and non-Indigenous cases remained fairly steady and subsequently the predicted 2013 rates did not vary greatly from the observed 2007 rates (Figure 1).

We set a target rate for non-Indigenous children under the age of 5 years of 15 cases per 100,000 (slightly below the 2013 predicted rate of 17.49 per 100,000) and for Indigenous children a target

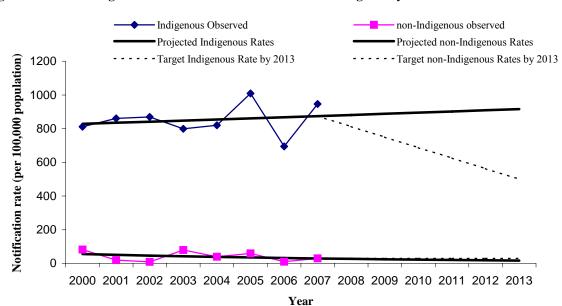


Figure 1. Rates of shigellosis notifications in children under the age of 5 years

rate of 500 cases per 100,000 (compared with a predicted rate of 916 cases per 100,000). This is roughly halving the predicted "gap".

The strategies considered when setting this target were:

- Continuing health promotion activities around hand washing and other hygiene measures (for example the "No Germs on Me" program currently being run by Environmental Health).
- Anticipated health hardware improvements: including improvements in housing and infrastructure to decrease overcrowding and improve sanitation and the provision of adequate hygiene and food preparation facilities.

Tuberculosis

There were a total of 258 cases of tuberculosis (TB) notified in the NT between 2000 to 2007 (n.b. this figure includes overseas migrants but excludes illegal foreign fisherman who are screened for TB when apprehended). Of these, 157 (61%) were Indigenous. Age-standardised rates for both the Indigenous and non-Indigenous population generally decreased. There was a marked spike in the Indigenous rate in 2007 that was mainly due to cases found following a community screen prompted by 2 active TB cases being diagnosed in one community (Figure 2). Predicted rates for 2013 were 8.24 cases per

100,000 for the Indigenous population and 3.04 cases per 100,000 for the non-Indigenous population.

We set a target rate of 3 cases per 100,000 for both the Indigenous and non-Indigenous population for the year 2013. This is "closing the gap" entirely.

The strategies considered when setting this target were:

- Continued surveillance, treatment and contact tracing of notified cases.
- Screening of at risk groups and treatment of latent TB infection.
- Anticipated improvements in housing leading to decreased overcrowding.

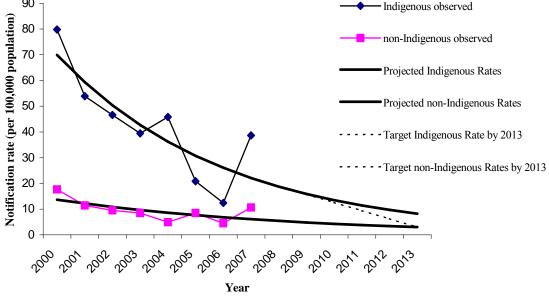
Influenza

There were a total of 708 cases of influenza notified between 2000-2007 of which 49% (352 cases) were in children less than 5 years of age. Of these, 88% (308 cases) were in Indigenous children. Recognising again that the bulk of disease was in the under 5 year old age group and the more severe effects of influenza in this age group, rates were only compared in those under the age of 5 years.

Rates for both Indigenous and non-Indigenous children varied greatly between 2000-2007



Figure 2. Age-standardised rates of tuberculosis notifications



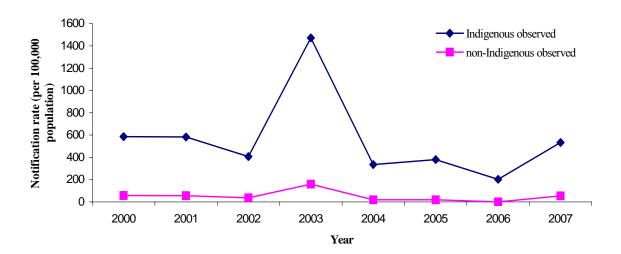


Figure 3. Rates of influenza notifications in those less than 5 years

(Figure 3) reflecting the epidemic nature of the disease. Because of this unpredictability Poisson regression was not suitable to predict future rates or set targets in relations to these. Instead we set a target of 1:1 notifications (i.e. an equal number) for Indigenous to non-Indigenous children for the year 2013.

The strategies considered when setting this target were:

- Prospect of universal influenza vaccination being extended to young children (6 months to 2 or 5 years) and to pregnant women.
- Continuing health education around decreasing children to household smoke exposure.
- Continuing health promotion activities around hand washing and other hygiene measures (for example the "No Germs on Me" program currently being run by Environmental Health).
- Anticipated improvements in housing to decrease overcrowding.

Discussion

The methods and results presented in this are subject to a number of limitations. Firstly the model used for projecting future rates is simplistic and takes only time into account as a variable. It also uses Poisson regression to predict future rates when this method is

generally used to predict future counts, although we did find however, with these data there was little difference between predicting future counts and then converting these to rates and predicting future rates. These factors do have an effect on the model's accuracy, particularly for diseases where rates vary greatly between years either because of changing disease patterns or small numbers leading to instability of rates. Secondly notification rates do not always accurately represent disease incidence within a population and may at least in part be a result of different testing patterns within the Indigenous and non-Indigenous population. Thirdly, while advice was sought by experienced practitioners and experts in the field, the method used for setting target rates was somewhat arbitrary.

However this report does iterate some important facts; that there is a large "gap" between Indigenous and non-Indigenous rates communicable disease and, more importantly, that there are strategies to reduce this gap. None of the strategies identified for "closing the gap" in this study are new, and to use a colloquialism, they are not rocket science. Some of these strategies, such as influenza vaccination for young children and pregnant women, although dependent on funding and resource support, are under the control of CDC and other branches of the Department of Health and Families (DHF). Many, such as improved housing, infrastructure and education are well beyond CDC and DHF control. It is important to acknowledge that the gap in communicable diseases will not improve consistently until these latter factors are addressed and, that by addressing them, the gap can be closed in the foreseeable future.

Conclusion

The "closing the gap" initiative has brought an unprecedented opportunity to improve the health and wellbeing of Indigenous Territorians. The target rates set in this report are optimistic, but we think achievable. To quote Tom Calma, the Aboriginal and Torres Strait Islander Social Justice Commissioner "Why... should we believe we can halve poverty in Africa by 2015 – as the Millennium Development Goals promise to do – and yet we are not bold enough to commit to action for Indigenous health within Australia?"

We hope that by 2013 we are able to show the target rates for communicable diseases in this report have been realised and may even, in part, be exceeded.

Acknowledgements

The author would like to thank the following for their input into this analysis and report: Vicki Krause, Peter Markey, Allen Cheng, Ross Andrews, Wendy Armstrong and Scott Cameron. The Commonwealth Department of Health and Ageing funds the Master of Applied Epidemiology Program.

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Top End TB Outbreak

Kerryn Coleman, Elizabeth Stephenson and Vicki Krause, CDC Darwin

Introduction

A TB outbreak in 2008 in a Northern Territory (NT) Top End community has required quick and co-ordinated action from both the community and health professionals. In the 10 years from 1998 to 2007, this community of around 1,000 Aboriginal people had 3 cases of tuberculosis (TB) diagnosed, with the most recent case in 2005. In 2008 a total of 8 cases have been notified to date.

Identifying an outbreak is important as it suggests a high level of disease transmission has occurred. This implies that a large number of resources will be necessary for immediate and on-going management.

Background

Over a 3 day period in late May 2008, 2 TB cases from this Top End community were diagnosed at Royal Darwin Hospital (RDH). Case 1, an Aboriginal male in his 30s with a 12 month history of productive cough, weight loss and fevers, had upper lobe infiltrates with cavitation on a chest X-ray and was positive for acid fast bacillus (AFB) on sputum microscopy. Case 2, also an Aboriginal male in his 30s, had been unwell for an unknown period of time. Widespread pulmonary infiltrates were seen on the chest X-ray, and sputum microscopy identified AFBs confirmed by polymerase chain reaction (PCR) as *Mycobacterium tuberculosis*.

Initial discussions between Darwin TB clinic staff and the remote community health centre noted and reviewed a third case of active TB diagnosed 3 months earlier. Case 3, an Aboriginal female in her late 20s, had intrathoracic nodal and AFB smear negative, culture positive, pulmonary TB. She was receiving full TB treatment but contact tracing was incomplete.

The 2 main public health actions taken in response were:

- 1. Contact tracing for the 2 new cases, and a review of the initial case.
 - High priority contacts were identified in this and 3 other communities, and were followed up by local remote health and CDC staff. As all 3 cases identified were resident within 1 main household this was the initial focus.
- 2. A community screen, which is recommended in the NT TB guidelines¹ when:
 - Secondary cases are detected in a routine contact tracing investigation; OR
 - When 2 or more cases of active TB are diagnosed within 1 year of each other in a community.

A community population list was obtained and updated by remote health staff. This community consists of several defined camps, between which mixing is rare, and therefore it was decided to initiate screening of the affected camp first. Consultation with all parties identified an appropriate week to visit the community to conduct screening. The visiting team consisted of medical officers, public health nurses and radiographers. Depending on age individuals were assessed by a Mantoux test (tuberculin skin test), or chest X-ray and clinical review according to guidelines.¹

Table 1. Household contacts by age, Mantoux status[‡] and TB cases diagnosed

Age group	Number of contacts		Mantoux r	eading	Number of cases	Number on LTBI treatment	
	-	<5mm	5-<10mm	≥10mm	Other	_	
<5 years	6	1	1	3	1*	2	3*
5-<15 years	5		1	4		1	4^{\dagger}
≥15 years	11			11^{\ddagger}		2	8#
Total	22	1	2	18	1	5	15

^{*1} infant of early case already on INH treatment as primary preventive treatment

[†]1 child with Mx 5-<10mm offered LTBI treatment due to high degree of contact

[‡]includes new and previously recorded Mantoux

^{#1} adult receiving 2½ year clinical follow up

Table 2. Community population by age group and screening technique

Population group	Total population	Mantoux	Mantoux result (n)	CXR	Other review	Total number reviewed (%)
Children						
<5 years	36	28	0 (28)	0	0	28 (78)
5-<15 years	49	43	0 (43)	2*	0	45 (92)
Adults	189	6^{\dagger}	$0 (6^{\dagger})$	123	3 [‡]	132 (70)
Total	276	79	0 (79)	125	3	207 (79)

^{*} CXR done before Mantoux read because of concern that patient would not return for reading

Results

Contacts

There were 22 additional household members identified. The age distribution and Mantoux test results of these contacts are outlined in Table 1. A further 5 cases of TB were diagnosed, including 4 pulmonary and 1 nodal infection.

A total of 79 additional contacts have been followed up in 3 other communities with an 86% success rate to date with no further active cases identified. Diagnoses of LTBI have been made in these contacts and they are being appropriately managed.

Community Screen

There were 276 individuals on the population list for this camp, with an age range of newborn to 74 years of age (average 26 years).

Under these circumstances the NT TB guidelines recommend a Mantoux test for children under 15 years of age, and a chest X-ray and clinical review in adults 15 years and over. Table 2 identifies the total community population by age group and the number screened by each screening technique.

All 79 Mantoux tests were 0mm. Of the 125 chest X-rays 101(82%) were normal. Of the remaining 22, 1 represented old TB changes and 21(17%) abnormalities were found that were unlikely to be related to TB. Sputum specimens were requested in 18 cases due to abnormal radiological features or clinical symptoms or signs. To date we have received 19 sputum specimens from 15 different individuals. Of these 19 specimens no *M tuberculosis* has been

identified, and 1 sputum has grown a non-tuberculosis mycobacterium.

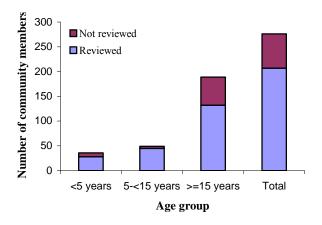
During the screening some community members were found to meet the criteria of contacts and while no disease or LTBI was found they will be reclassified and managed as contacts. Overall 79% of this community camp was screened during the initial phase, with no further cases of TB being identified. Graph 1 shows the percentage screened by age group.

Discussion

This outbreak highlights several important components of the public health response to TB.

Many factors can combine to lead to a delayed diagnosis of TB in remote Aboriginal communities. Maintaining a high level of awareness among health professionals who work with groups at high risk of TB is central to managing and reducing the impact of this disease.

Graph 1. Percentage of community members screened by age group



[†] Mantoux test done instead of CXR as patient located in a community with no radiology facilities

^{*} Pregnant women – clinically reviewed, CXR planned post delivery

Contact tracing of all cases is most important and can lead to the early identification of active TB cases, which in turn reduces the potential transmission of TB. The NT guidelines recommend that high risk contacts of all TB cases should be screened within 1-2 weeks of diagnosis. High risk contacts of TB cases regardless of AFB smear status of index case are those with frequent, prolonged and close contact with the case (e.g. household) and any children under 5 years of age and immunocompromised individuals.

screening is Community an enormous undertaking, involving many resources for at least a 3 year period. A successful screen requires both professionals with TB expertise, radiological skills and local health workers/ professionals with current knowledge of and relationships with the community. particular community the remote health nurses, Aboriginal health workers, radiographer, drivers and doctor played a crucial role in the success of this screen. Previous TB screens carried out in the NT illustrate that well resourced and conducted screens are associated with good outcomes.^{2,3}

The initial success of this screen is characterised by 79% of the population being reviewed in the first 6 months. The children under 5 years of age are at the greatest risk for serious TB disease, and therefore we aim to improve the 78% coverage achieved so far in this group.

This particular screen involved Aboriginal Resource and Development Services (ARDS) who have many years experience working with Yolngu language groups. During the week of the screen they provided education around germ theory and TB, and generated a lot of From our personal community interest. experience people screened after sessions with ARDS had a much greater level of interest and participation in their screening appointment. We believe the involvement of ARDS contributed significantly both to the coverage of screening achieved and the degree of knowledge and understanding about TB in the community. This education is a crucial aspect for ongoing management, assists the ability of community members to recognise disease and present to the clinic for medical review.

The progress of TB and LTBI treatment is excellent to date. One TB case has completed treatment, and the remainder are on track to complete at the earliest possible time. A significant factor in this success is the employment of a remote nurse based in the community for 12 months dedicated to TB management. The demands associated with 21 people receiving directly observed treatment and ongoing follow up of suspect cases is high and requires these additional resources.

At this stage there is limited evidence of continued community transmission. A further screening review took place between 17-20 November. At this time community-wide TB awareness was carried out by ARDS and loudspeaker announcements in language allowing for the larger community to present should they be concerned or have signs or symptoms. Some individuals missed during the first screening were identified and screened, and others reviewed and followed up as appropriate. Community members on full TB and LTBI treatment were reviewed. One community member self-presented in response to the TB message being delivered community wide, and has been diagnosed with active pulmonary TB.

Reports of the follow up of November's screen will be published in the next Bulletin. Annual reviews specifically of the indicated camp and this community will be ongoing for 2 years.

Acknowledgements: Many thanks are extended to the members of this community, and the remote health, ARDS and CDC staff involved. Without you all this would not be possible!

Key Words: Tuberculosis, outbreak, community screen.

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Mumps in the NT

Kerryn Coleman, Peter Markey and Vicki Krause, CDC Darwin

Introduction

There has been a large increase in the number of mumps notifications reported in the Northern Territory (NT) during 2007 and 2008. This outbreak had epidemiological links to a similar increase in cases in Western Australia, particularly in the Kimberley, and occurred in the context of recent mumps outbreaks worldwide, specifically in the United States, 1,2 Canada and the United Kingdom. 4

One of the important factors to consider in the NT is the change in the immunisation schedule regarding the age at which the initial mumps vaccination is given (Table 1). From 1984 to 1998 the initial (or only) dose of vaccine was recommended at 9 months of age for Indigenous children (vs 12 months for non-Indigenous children and the rest of Australia) as these infants were considered more vulnerable to the measles epidemics of that era. Serological studies at the time confirmed that the response to the measles component of the vaccine at 9 months was adequate; however, the response to the mumps component was not measured.⁵ The barriers to a successful immunisation response in younger children include immaturity of the immune system and interference by passive (maternal) antibodies.⁶ It is possible that this practice led to those Indigenous infants born between 1983 and 1997 in the NT now being at an increased risk of mumps.

The aim of this report is to describe the epidemiology of mumps in the NT during 2007 and 2008, with a particular focus on the outbreak

Table 1. Vaccination policy measles-mumps and measles-mumps-rubella for Indigenous children in the NT

Year	Vaccination policy
<1983	Nil
1983-1984*	1 vaccine at 12 months of age
1984-1994 ^{*,†}	2 vaccines, at 9 months and 18 months
1994-1998 [†]	2 vaccines, at 9 months and 10-12 years
≥1998 [†]	2 vaccines, at 12 months and 4 years

^{*}measles-mumps vaccine

in a specific geographically defined area where the attack rate was higher. This outbreak investigation was possible due to a high level of awareness in the local health clinic about mumps leading to enhanced case detection, and a recent chart audit of local records providing more complete vaccination information..

Methods

All NT notified mumps cases with specimen date between 1 January 1994 and 31 October 2008 were identified and extracted from the Northern Territory Notifiable Disease System (NTNDS) and analysed in Excel and SPSS. The epidemiological analysis for Part 1 included confirmed cases, as defined by the national case definition, resident in the NT and occurring during the outbreak period 1 January 2007-31 October 2008. In addition to demographic details, immunisation status was ascertained, using the Australian Childhood Immunisation Register (ACIR) and the NT CCIS/PCIS databases.

For Part 2 the analysis included both confirmed cases and "outbreak cases" (see definitions below) occurring within a defined geographical area of 2 main communities with surrounding outstations (all within 50kms of each other). For this group, the cases' immunisation details were sought by an audit of local written health records. A comparison of demographic factors and immunisation status was made between the confirmed and outbreak cases, proportions being compared using chi-square analysis.

Definitions

Confirmed case

 Laboratory definitive evidence (mumps virus isolated or detected by nucleic acid amplification test (NAAT) or IgG seroconversion)

OR

• Laboratory suggestive evidence (mumpsspecific IgM) plus clinically compatible illness

OR

[†]measles-mumps-rubella vaccine (>1989)

 Clinically compatible illness with an epidemiological link (confirmed contact) to a confirmed case.

Outbreak case

 Clinically compatible illness with an epidemiological community link to a confirmed case.

Mumps vaccination status

Immunisation status was defined according to the current (2008) Australian Immunisation Schedule (Table 2).

Laboratory methods

Investigations were conducted by the pathology service of Royal Darwin Hospital, Western Diagnostic Pathology and PathWest. These included validated serological tests, NAAT of throat/nasal swabs and viral culture.

Results

Historical Data

Mumps notifications from 1994 to 2006 in the NT averaged 4.2 cases per year, with a range of 0 to 10 notifications. Figure 1 shows the number and rate of notifications for the years 1994 to 31 October 2008, clearly identifying an increase in 2007 and 2008.

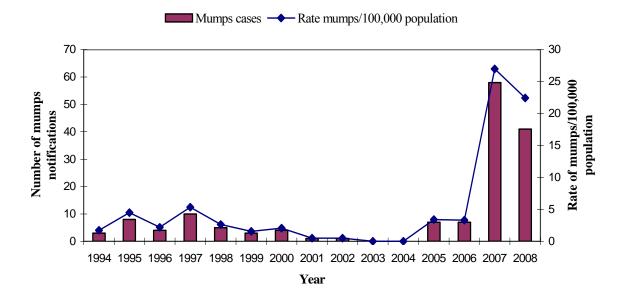
Part 1: NT mumps notifications 2007-2008 (to 31 October 2008)

There were 99 confirmed mumps cases in the NT during the time period 1 January 2007 to 31 October 2008 (Figure 2). The onset for the first case was early March 2007, and numbers increased throughout the year reaching a peak in December 2007 when 9 cases occurred in 1 week. The Darwin region reported 48 (48%)

Table 2. Vaccination status categories

Category	Vaccination status
Presumed natural immunity	Date of birth pre 1970
Fully immunised	Current (2008) acceptable schedule; 2 vaccines at least 4 weeks apart with the first not before 12 months of age and the second not before 4 years of age
Partially immunised	Any mumps containing vaccine/s received that does not meet 'fully immunised' criteria
Not immunised	No mumps containing vaccine recorded
Unknown	No local health or computer database (territory & national) records

Figure 1. Mumps cases by year of onset in the Northern Territory for 1994 to 31 October 2008



■ Top End ■ Central Australia 10 9 8 Number of cases 5 3 2 25/02/2007 07/10/2007 34/11/2007 02/12/2007 30/12/2007 27/01/2008 24/02/2008 35/10/2008 11/2008 20/05/2007 5/07/2007 12/08/2007 Week of onset

Figure 2. Epidemic curve of confirmed mumps cases in the NT 1 January 2007 - 31 October 2008, defined by geographical region

notified cases, followed by Alice Springs with 35 cases (35%) and Katherine with 12 cases (12%). The virus appears to have spread south from Darwin and the Top End, through Katherine and the Barkly to the Alice Springs region where cases increased from mid-2008.

The majority of cases were Indigenous (85/99=86%), and females (54%) and males were evenly represented. As shown by Figure 3 three quarters of cases were in those aged between 10 and 30 years (74%), with the highest rate of notification in the 15 to 19 year olds.

Thirty-eight cases (38%) were confirmed with laboratory suggestive evidence (IgM positive) plus a clinically compatible illness, and 41(41%) were confirmed using PCR identification or virus culture (laboratory definitive evidence). The remaining 18(18%) were clinical with an epidemiological link to a laboratory confirmed case.

Vaccination status was ascertained for 75 cases (Figure 4). Significantly 17 cases had received only 1 mumps vaccine while 18 had received 2 vaccines, but with the first given prior to 12 months of age.

Part 2: Outbreak investigation for defined Top End area 2007

In this defined geographical area 72 cases were identified during 2007, with 33(46%) being confirmed cases and the remaining 39 outbreak cases. The impact of expanding the case definition to include outbreak cases is shown on the following epidemic curve (Figure 5).

Overall, the duration of the outbreak was 40 weeks.

Consistent with the NT-wide situation, the majority of cases were aged between 10 and 30 years (72%). The overall rate of mumps in this outbreak group was 3,700 per 100,000 population. The highest rate was in 15 to 20 year olds (8,200 per 100,000), followed by those aged 25 to 30 years (6,800 per 100,000). The lowest rates were in under 5 year olds (700 per 100,000) and those aged over 45 years.

Vaccination status was known in 61 cases (84%) (Figure 6). More than 2/3 of those partially immunised (21/31) had received 2 vaccinations, but with the first given at less than 12 months of age.

Figure 3. Mumps notifications by age group in the NT for 1 January 2007 to 31 October 2008

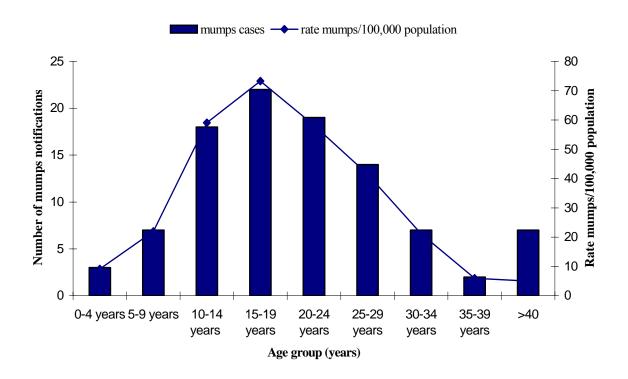


Figure 4. Mumps cases by vaccination status for NT confirmed cases 1 January 07 – 31 October 08

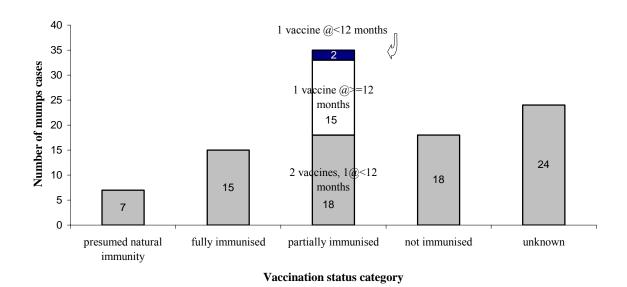


Figure 5. Epidemic curve of mumps cases in the defined geographical area 2007 by case definition status

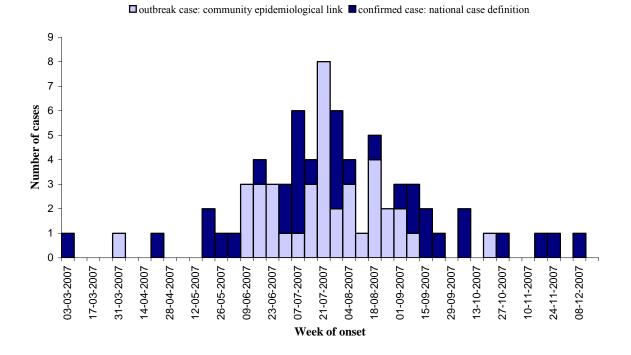


Figure 6. Mumps cases in defined geographical area 2007 by vaccination status

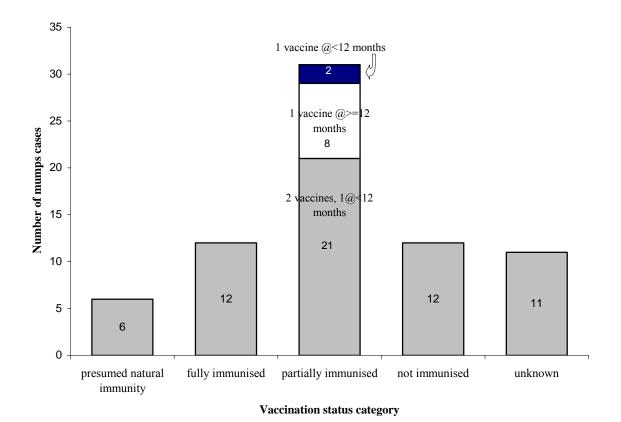


Table 3. Demographic and immunity status of mumps cases for NT-wide and outbreak cases

Demographics	Confirmed	Outbreak
Number of cases	33	39
Indigenous (%)	32 (97%)	37 (95%)
Female (%)	23 (70%)	25 (64%)
Age (years)		
Age group with highest rate	15-19	15-19
Age group with lowest rate	0-4	0-4
Average (mean)	19	20
25 th percentile – 75 th	14-25	14-26
percentile		
Immune status		
Presumed natural immunity	2 (6%)	4 (10%)
Fully immunised	6 (18%)	6 (15%)
Partially immunised	12 (36%)	19 (49%)
1 vaccination (number	4(1)	7 (2)
@<12 months of age)		
2 vaccinations, 1 @<12	8	12
months of age		
Not immune	11 (3%)	3 (8%)
Unknown	2 (6%)	7 (18%)

Table 3 presents a comparison between the confirmed and the outbreak cases in this defined geographical area. The gender (χ^2 =0.2, p=0.6) and age (χ^2 =0.07, p=0.8) is similar between both population groups. Notably more than 2/3 of each population group is in the age range 10-30 years. The overall distribution of immune status is similar between the confirmed and outbreak cases (χ^2 =1.3, p=0.9). When individual immune status categories were looked at separately a significant difference was only detected between the two population groups for the 'not immune' group (χ^2 =6, p=0.006).

Discussion

The 2007-08 outbreak of mumps in the NT primarily occurred in Indigenous individuals aged between 10 to 30 years. While a small percentage were fully immunised, the largest group are those partially immunised followed by the non-immune. Initial vaccination at less than 12 months of age accounts for a large number of those partially immunised. According to historical NT vaccination schedules those now aged between 10 and 24 years would have received their only or first dose of mumps vaccination at less than 12 months of age, which corresponds to the highest rate of mumps identified here.

The epidemiology of this outbreak has features consistent with mumps outbreaks occurring around the world in a similar time frame. Canada, the US and UK have identified teenagers and those in their twenties as being at higher risk. ^{2,4,6} Canada has also seen school-aged children and people in their thirties affected. ⁷ In Canada and the UK the risk of mumps was greatest in those who had received 0 or 1 mumps containing vaccine. ^{3,4} However the US differed in that the majority of cases had received at least 2 vaccines, though the age at vaccination was not reported. ⁸

The mumps component of vaccines has an estimated effectiveness ranging from 60-90% with 1 dose to 95-100% for 2 doses.⁷ This is notably lower than for measles (95 and 99% for doses 1 and 2 respectively) and rubella (>95% for 1 dose).⁹ A major contributor to the NT outbreak is likely to be under vaccination, with around 60% of cases being partially or not vaccinated. It is unlikely that cold chain breaches are a major contributor, given that the cases are widespread throughout the NT and vaccination dates vary over many years. Specifically there is no clustering by time of the fully immunised cases.

Mumps virus cultured in the Western Australian (WA) outbreak, which is likely to have originated in the NT, has been identified as genotype J (personal communication, CDC, WA), a type previously been isolated in Japan and the UK.¹⁰ It is possible that the current mumps vaccine has poor immunogenicity against this strain, and further testing is being undertaken in WA to investigate this possibility.

Environmental and social factors are likely to have played an important role in this outbreak, particularly in remote Indigenous communities. Difficulties in the timely diagnosis of mumps and institution of public health action, and overcrowded social conditions, have probably contributed to a high level of further transmission. Unlike measles, where vaccine given within 72 hours of exposure to a non-immune contact will prevent disease, mumps vaccination does not confer rapid immunity (to protect the non-immune exposed) but would provide protection for next generation transmission.

Contact tracing and public health action in Australia is based on an understanding of what might be called European or developed world culture. Epidemiological links are more likely to be accepted for immediate family households and specific workplaces, and public health action initiated within these definitions. This paper offers an expanded case definition to consider, which includes community epidemiological links in small communities characterised by expanded family structures and extensive social mixing.

During the investigation of this NT mumps outbreak more than 50% of cases were found to be partially or not immunised. Public health action focused on discussions with NT health centres encouraging case identification (and notification) and opportunistic vaccination of those under-vaccinated. This outbreak serves as an opportunity, incentive and reminder to offer opportunistic vaccination to those under-immunised.

Acknowledgements

Thanks to Emily Fearnley and James Walcott for their substantial contribution to data collection.

Key Words: Mumps, outbreak, immunisation

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Measles, mumps vaccination history in the Northern Territory

Chris Nagy, CDC Darwin

To complement the previous article on mumps a literature search was undertaken to determine the timeline for the introduction of measles and mumps containing vaccines throughout the Northern Territory (NT).

It was evident that the introduction of measles (and mumps) containing vaccines throughout the NT was staggered as different combination vaccines became available (e.g. measles only, measles-mumps (MM), measles-mumps-rubella (MMR) and soon to come, measles-mumps-rubella-varicella (MMRV) and schedules were changed to reflect their introduction and the epidemiology of measles outbreaks in the NT (see Table).

There have been periodic outbreaks of measles recorded in the NT. The major ones being in 1948, 1979, 1981, 1986,1992 and 1994.^{1,2}

It was following the measles outbreaks of 1979 and 1981 and the deaths of several Aboriginal children under the age of 2 years that the age for

offering MM vaccine to Aboriginal infants was reduced to 9 months as recommended by the World Health Organization. In addition, during an outbreak it was recommended to reduce the age of vaccination to Aboriginal infants in the outbreak community to 6 months of age (with the recommendation to repeat the vaccine at 12-18 months). This policy remained in place until 1998 when the NT immunisation schedule was changed to recommend MMR dose 1 for all infants at 12 months of age and MMR dose 2 at 4-5 years of age.³

In ongoing efforts to reduce the impact of measles, immunisation schedules have changed and several national measles campaigns have been run over the past 20 years. Early vaccine recommendations were changed from "Just one shot" to in 1990 "2 doses of a measles containing vaccine" and again in 1994 to "2 doses of MMR". This was further complemented by the 1998 "Let's beat measles" campaign. In this campaign all children between 5-12 years were offered a second MMR at school. It was a

Table. The history of Measles and Measles Mumps containing vaccines in the NT

Year of introduction	Vaccine	Posology
1971 - 1983	Measles	12 months
1983 - 1984	Measles-Mumps (MM)	12 months
1984 - 1989	MM	Indigenous @ 9 months* Non-indigenous @ 12 months Indigenous outbreak – give @ 6 months* * Repeat dose at 18 months
1989 - 1994	Measles-Mumps-Rubella (MMR)	Indigenous @ 9 months* Non-indigenous @ 12 months Indigenous outbreak – give @ 6 months* * Repeat dose at 18 months
1994	MMR	All students in Year 6 (replaced Rubella vaccine for girls only given since 1971)
1994 - 1998	MMR	All infants @ 12 months and 10 –12 years
1998	MMR	All infants @ 12 months and 4 years Catch-up all children 5-12 years as part of national "Lets Beat Measles campaign"
2000	MMR	18-30 year old Adult MMR national program
?2009 - 10	MMRV	

Measles outbreak in Central Australia 1979 – 237 cases Measles outbreak in Central Australia 1981-2 - 125 admissions Measles outbreak in Top End (Pt Keats) 1986 -7 – 64 cases Measles outbreak in Darwin high schools 1991-2 – 79 cases Measles outbreak in 1994 - 258 cases (138 Indigenous) hugely successful campaign unlike the 2001 "Adult MMR Program" that opportunistically offered a second dose of MMR to any adult between 18-30 years of age who was not fully immunised.

In the 10 years since the "Let's Beat Measles" campaign of 1998 there have only been 30 cases of measles reported in the NT. There had been 683 cases notified from 1991-1998.

By compiling a historic timeline of vaccine introduction it becomes easier to identify the groups of people who may benefit from targeted immunisation catch-up (e.g. those who may have only received 1 of their 2 doses before 12 months of age and therefore require a further

MMR to be fully vaccinated) in the setting of measles or mumps outbreaks.

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Palmerston safe communities program finalist in awards for excellence

The Palmerston Safe Communities program was recognised for its significant achievements in promoting cross-government collaboration in the 2008 Chief Minister's Awards for Excellence in the Public Sector. The program was a finalist in the cross-government category and Justine Glover received the award on behalf of the Palmerston Safe Communities committee at the awards function on 3 December 2008.

Justine Glover, of the Safety and Injury Unit in the Centre for Disease Control said she was thrilled to have the Safe Communities program recognised at this level because it is a shining example of what can be achieved through crossgovernment collaboration. This program was started in 2005 when Dr Steven Skov approached the then Mayor, Annette Burke, to consider adopting the Safe Communities model. The City of Palmerston since then has embraced World Organisation the Health Communities Model and in March this year was the first city in the Northern Territory to be formally accredited as an International Safe Community: the 133rd in the world and the 11th in Australia. The Palmerston Safe Communities program comprises of 5 working groups targeting a range of community safety issues that include, child safety, personal and social safety, and alcohol management.





Pertussis program for new parents

Ros Webby, CDC, Darwin

Case

A 5 week old infant was brought to the family's general practitioner (GP) with a 2 week history of cough, runny nose and fever. The GP witnessed an apnoeic episode associated with coughing. The baby was sent immediately to hospital and had decreased oxygen saturation with coughing episodes. The baby was treated with azithromycin for 5 days and remained in hospital during that time period. A nasopharyngeal aspirate confirmed pertussis by PCR testing. The mother reported having a coughing illness 2 weeks before the baby became unwell which was suspicious for pertussis.

Pertussis

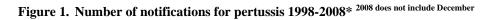
Pertussis is a highly contagious disease. It can cause severe disease and hospitalisation, particularly in infants too young to be vaccinated. Children under 6 months of age are at most risk of complications from pertussis including pneumonia, apnoea and encephalopathy. The case fatality rate in children under 6 months of age is 0.8%. 1,2

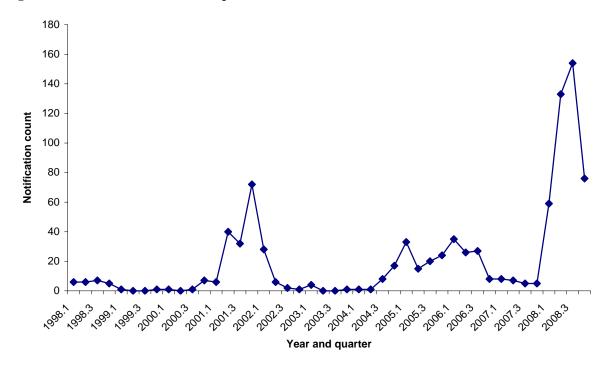
Half of all hospitalisations between 1994-2004 in Australia occurred in infants under 12 weeks of age. These infants were eligible to receive only 1 dose of pertussis containing vaccine at 8 weeks of age.3 In an Australian Paediatric Surveillance Unit study of pertussis hospitalisations in infants in 2001, 18% of infants required intensive care and 4 deaths were reported, all in children under 6 weeks of age.4 Infants under 2 months of age accounted for approximately 30% of pertussis deaths in the 1960s but now, as overall death numbers have decreased, account for over 80% of deaths.³

Source of infection for infants

Immunity to pertussis from infection or vaccination in childhood is not life-long. Immunity after vaccination lasts for about 4-12 years.⁵ Therefore adults are susceptible to infection and able to transmit disease to infants too young to be fully vaccinated.

An Australian study showed the major source of infection in infants under 6 months of age to be adults (in 68%), usually one of the infant's parents.⁶ Other potential sources of infection





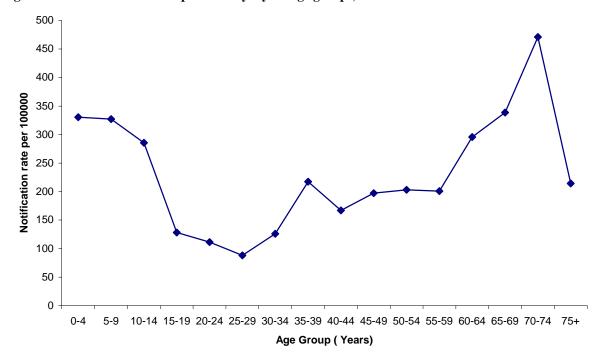


Figure 2. Notification rate for pertussis by 5 year age groups, 2008

were grandparents, other adult family members and health care workers.⁴ Modelling has shown that vaccination of household members of newborns would decrease pertussis cases by 70% in the 0-3 month old age group.⁶ Parental vaccination at birth would reduce pertussis morbidity by 38% and would be cost effective when protection persisted for subsequent children ⁷

2008

There has been an increase in pertussis notifications in 2008 (see Figure 1). In the last 10 years, the NT has had 3 time periods of increased pertussis notifications; in 2001, 2004-2006 and 2008.

By age group, the over 65 year olds have the highest notification rate followed by those under 4 years of age. The lowest notification rate is in the 15-30 year old age group and this partially reflects the impact of the school aged pertussis booster for adolescents. Adults over 30 years in the NT are now most likely to be susceptible to infection and therefore transmit it to infants.

There were 22 children under 12 months of age diagnosed with pertussis in 2008. Almost two thirds 59%(13/22) of these children were hospitalised with 2 requiring care in the

Intensive Care Unit. The source of infection was known in 54%, and of those 7 were mothers, 2 were fathers, 3 were siblings, 1 a grandmother and 1 a health care worker. Several infants had multiple infective contacts.

Who should be vaccinated?

A combination vaccine containing pertussis is routine for all children at 2, 4, and 6 months with a booster at 4 years. An adult diphtheria, tetanus, pertussis vaccine is given at 13 years (Year 8) at school.

A booster is recommended (if no pertussis booster vaccine has been given in the last 10 years) for:

- All new parents as soon as possible after delivery
- Adults planning a pregnancy
- Any adults working or caring with young children including grandparents, health care workers and child care workers
- Anyone who wants to get vaccinated.

Strategies to improve vaccination in new parents

In the NT a free adult diphtheria-tetanuspertussis vaccine (dTpa) is available for all new mothers who deliver after 1 October 2008. Other care-givers including fathers and grandparents are encouraged to obtain a pertussis containing vaccine from their local clinic or general practitioner, at a cost of approximately \$40. An information pamphlet about the vaccine is available for parents and other caregivers.

How the program works

- Adult diphtheria, tetanus, pertussis vaccine can be ordered through the hospital pharmacy for all new mothers delivering after 1 October 2008. GPs can order a small amount of dTpa to vaccinate new mothers who missed out in hospital.
- Some mothers may have received adult diphtheria, pertussis, tetanus vaccine at school. These mothers do not require a further dTpa for 10 years. The NT immunisation database can be contacted for vaccination histories; phone 8922 8315.
- Please supply the NT immunisation database with details of all adult immunisations given – fax 8922 8897

Summary

This strategy will hopefully reduce the burden of pertussis in the community and decrease infection in infants too young to be fully vaccinated.

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Box jellyfish season confirmed

The arrival of the box jellyfish season was confirmed by the recent case of a 3 year old girl with a severe envenomation on the remote community of Milingimbi. The young girl was standing in shallow water when stung by what has been confirmed as a mature box jellyfish.

The child collapsed shortly thereafter and was rushed by her family down the beach to the local Health Centre. She had a severe envenomation syndrome with cardiovascular and respiratory compromise. Thankfully experienced critical care nursing and medical staff were present in the community on the day in question and she

was able to be successfully resuscitated and was subsequently evacuated to Gove District Hospital. The proximity of the Health Centre to the beach may well have been a telling factor in this life threatening envenomation. This case serves to remind us all that the stinger season is here and the best strategy is prevention by avoiding the water and importantly watching out for children entering the water.

Dr Paul Spillane MB BS FACEM FRACGP MPH&TM

Emergency Physician, Royal Darwin Hospital Visiting GP, Milingimbi



Beyond GAA to Healthy Under 5 Kids in the Bush

Adapted from Rationale for Routine Child Health Contacts Draft, November 2007

Tina McKinnon and Madhumati Chatterji, Maternal Child and Youth Health, Health
Development and Oral Health

A growing body of evidence demonstrates the relationship and impact of early life events on the health and well being of children into adult life. Improving maternal health, birth outcomes and health in early childhood helps give children a good start in life, not only in health, but developmental, future educational employment opportunities. A beneficial effect of improving children's health is the potential reduction of chronic diseases in adult life. The World Health Organisation's (WHO) recent publication, 'Investing in children's health; what are the economic benefits?', shows an economic benefit in investing in child health, leading to more productive and better educated adults with potential to reduce intergenerational transmission of poverty.2

In remote Aboriginal communities, the current preventive health care for children under 5 years is essentially selective primary health care, comprising vaccination, growth monitoring, anaemia surveillance, nutritional advice and action planning for children who are not growing well, the Childhood Immunisation and Growth Assessment and Action (GAA) Programs. Currently children are seen at health centres when they present with acute illness, or seen by District Medical Officers and visiting specialists

if they have chronic health problems. Some remote health services and individual staff with an interest in child health provide a more comprehensive service.

For some time now the Maternal Child and Youth Health (MCYH) team has been working on an evidence-based health program for children under 5 living in remote NT communities. The new Healthy Under 5 Kids Program aims to move primary health care delivery beyond selective primary health care to a comprehensive primary health care model, recognising that children's health and well-being is impacted by many factors, as illustrated in Tables 2 and 3.

The new Healthy Under 5 Kids Program will come into effect as of January 2009. The new program incorporates the GAA program with a reduced number of scheduled recalls. That means the timing of the 10 health checks shown below (Table 1) are when a child should be recalled for an assessment. GAA assessments will continue as part of the new Healthy Under 5 Kids Program in the 10 health checks. Additional GAA assessments will be undertaken through 'invitations' as considered appropriate. If there is a concern for a child or family an

 $Table \ 1.10 \ key \ contacts - New \ Healthy \ Under \ 5 \ Kids \ Program \ schedule \ in \ remote \ NT$

Visit	Age at Visit	GAA	Visit	Age at Visit	GAA
1 st	Welcome home On return to the community	Invite for GAA 2 weekly	6 th	12 months*	Invite for GAA monthly
2 nd	8 week baby check* Postnatal check (if not already done)	Invite for GAA 2 weekly	7^{th}	18 months	Invite for GAA 6 monthly
3^{rd}	4 months	Invite for GAA monthly	8^{th}	2 years*	Invite for GAA 6 monthly
4^{th}	6 months	Invite for GAA monthly	9 th	3 years*	Invite for GAA 6 monthly
5 th	9 months	Invite for GAA monthly	10 th	4 years* (start of HSAK [†])	

^{*} Medicare - ATSI child health check, MBS item 708 can be claimed every 9 months if carried out in conjunction with a doctor.

[†] Healthy School Age Kids Program

Table 2. Risk factors for child health and well being (antenatal period to about 5 years)

Child	Parents and parenting	Family factors and life	Community factors
Characteristics	style	events	-
Low birth weight	Single parent	Family instability, stress,	Socioeconomic disadvantage
Prematurity	Young maternal age	conflict or violence	Housing – poor sewage, limited
Prenatal exposure to	Post natal depression or	Marital disharmony	access to nutritious food
toxins/infections	other mental illness	Poverty	Neighbourhood violence and
Poor maternal	Drug and alcohol misuse	Divorce	crime
nutrition	Tobacco smoking	Disorganised	Lack of support services
Prone sleeping	Harsh or inconsistent	Large family/rapid	Social or cultural discrimination
position	discipline	successive pregnancies	Community behaviour norms
Birth injury	Lack of stimulation of	Absence of father	
Disability	child	Low level of parental	
Low intelligence	Lack of sensitivity	education	
Chronic illness	Lack of warmth &	Social isolation	
Delayed development	affection	Long term unemployment	
Difficult temperament		War/natural disasters	
Poor attachment	Separation from or	Death of a family member	
Poor social skills	rejection of child	Family history of ADHD	
Poor problem solving		Frequent relocations	
Disruptive behaviour	Poor supervision		
Hazardous	Lack of parenting		
environment	knowledge		
Unsupervised play			
Impulsivity			
Poor self esteem			
Alienation			

As risk accumulates so does effect especially if > 2 risk factors present (Centre for Community Child Health, 2001)³

 $Table \ 3. \ Protective \ factors \ for \ child \ health \ and \ well \ being \ (antenatal \ period \ to \ about \ 5 \ years)$

Prenatal and child	Parents and parenting style	Family factors and life	Community factors
characteristics		events	
Good antenatal care and maternal nutrition	Maternal health and well being is good	Family harmony and stability	Supportive social relationships and networks
Breast feeding	Healthy lifestyle	Consistency of primary	Participation in community
Full immunisation	Awareness and use of health	carers	activities
Social skills	and community services	Nurturing environment	Family friendly work and
Secure attachment	Competent stable care	Positive relationships	environments and culture
Easy temperament, active, alert and affectionate	Positive attention from both parents	with extended family Small family size	Cultural identity and pride
At least average intelligence	Supportive relationship with other adults	Spacing siblings >2 years	
Attachment to family	Positive communication between parent and child		
Independence, self help	Fathers involved in parenting		
Good problem solving skills	Mothers education and competence		
Ambition	Competence		
Positive self concept			
Achievement at school			

(Centre for Community Child Health, 2001)³

action plan may require that the child visits the clinic more frequently.

The Healthy Under 5 Kids Program will require active engagement with parents and families. Nationally and internationally there is a move away from screening and surveillance activities towards a more integrated family-focused service that works in 'partnership' with parents to provide timely support, assistance and referral to other services as required. These programs recognise the centrality of the parents in the provision of a safe and caring environment their children are exposed to, and seek to increase the capacity of parents through working with their strengths in a partnership approach.

Support of young children includes the following:⁴

- Start early
- Support families
- Understand children's development
- Promote community awareness and involvement.

In order to improve health and wellbeing outcomes for children, interventions need to occur early in life and in the context of family and community. Support provided to families of young children has a positive impact on child health and well being, particularly for the most disadvantaged families.⁵

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For further information please contact Tina McKinnon, MCYH on 89227712 or <u>tina.</u> mckinnon@nt.gov.au.

Wicked problems: climate change and Indigenous health

Rosalie Schultz, CDC Alice Springs

Health problems facing Territorians, particularly our Indigenous peoples, are wicked problems -"incomplete, contradictory, and with changing requirements. Their solutions are often difficult recognise because of complex interdependencies. While attempting to solve a wicked problem, solving one aspect often demonstrates or creates other, even more complex problems". 1 Some of the consequential problems may be wicked too. Seen this way, one begins to understand why progress in addressing health problems can be so slow, particularly for Indigenous peoples.

The seriousness of health problems does not reduce the need for us to be concerned about climate change in NT. The health problems likely to arise from climate change will be substantial and will affect us all, but particularly the less well off in society.

Warming of the earth's climate is no longer questioned. This warming is very likely to be due to human activities.² Neither adaptation nor mitigation can now avoid all damaging climate change impacts. For example, the carbon dioxide already in the atmosphere will cause global temperatures to rise by 1.2 degrees Celsius, and this will lead to global climatic alterations. Sea levels will continue to rise for many centuries because of the large ocean volume and slow rate of change — even if greenhouse gas concentrations are stabilised.²

Climate change threatens health through changes in ecology, which sustains human survival. In Australia we are particularly concerned about water supply.³

Water shortages leading to changes in the Australian suburban culture are well documented. No major Australian capital city can continue to depend on traditional surface water sources. The need to reconsider our water sources is likely to represent an early manifestation of an inexorable unfolding process. The climate change process has been evolving at slow but measurable rates since the 1970s. While most people and governments now acknowledge the issue, action is slow.

All the cities with data in the *Climate Change in Australia* report are expected to experience a reduction in annual rainfall from 1990 to 2070. Reductions range from 1% less for both Cairns and Darwin, to 19% less for Perth.⁵

Despite less rain overall, with the changing climate there will be more heavy downpours, more intense and more frequent tropical cyclones and more extreme high sea levels.² Changed rainfall patterns and increased temperatures are likely to lead to increased risk of bushfires in many areas: a terrifying prospect for many in Australia.³

Health threats of climate change include stresses on food supply.² Reduction of important food supplies due to extreme weather has already occurred in Australia. For example following Cyclone Larry in 2006 we experienced a shortage and increase in cost of bananas. Increased food prices result from extreme weather events, deterioration of the land where food is grown, reduced rainfall resulting from climate change and increased energy costs for food production.² Higher food prices may lead to people eating more cheap processed foods with higher fat content, and less fresh fruits and vegetables. A likely consequence is overnutrition but deficiencies of micronutrients.⁶

Human beings are amazingly able to adapt and survive in diverse circumstances. However, we do need a life-support system, including oxygen, water and food. Reliability of these is threatened by climate change.⁷

There are challenging times ahead for humankind because of changing ecology.² It is possible that our societies may continue to function in a changing ecology, and that resources and opportunities will be fairly distributed. However inequity of resources may increase, leading to poorer health outcomes overall. The best outcomes will be achieved with awareness and commitment to best practices in mitigation and adaptation to climate change.²

Climate change has all the characteristics of a *wicked* problem. Climate change is the result of

human success in developing healthier environments. We have food and water, some control of infectious disease and we have managed some other threats to human health. We have communications and mobility unimaginable grandparents. even to our However side-effects of these successes are contributing to the burden of diseases now suffered. These are due to overnutrition, deficiencies in micronutrients, and lack of physical activity.8

We use fossil fuels for energy and transport, and also for food and for control of water sources. Our use of fossil fuels influences the physical environment and human health in both positive and negative ways.

Fundamental changes are needed to stabilize the environment and control the burden of disease and. For example reducing use of cars and increased active transport will contribute to reducing carbon dioxide emissions, and increasing physical activity. Reduction in overall consumption and changes in diet may also improve both health and the environment – at some cost to economic activity.

Thus climate change, like Indigenous health, is a wicked problem. It is complex, involves many different sectors and will require change both small scale and large at many levels. The Figure, All Actors Towards a Climate Neutral Society (next page) from the United Nations Environment Program, provides a sound framework for understanding and action.⁹

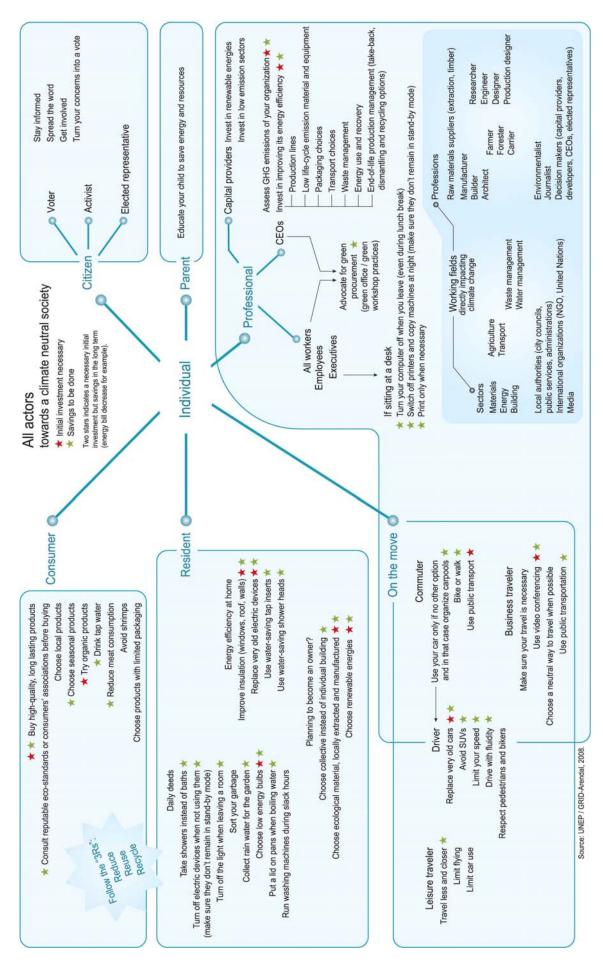
Climate change and Indigenous health are critical issues for health practitioners in NT. Public health as a discipline has much to offer in understanding climate change and formulating a response to it.¹⁰ Public health can draw attention

to broader determinants, bring together a range of agencies and foster effective communication to actively address an issue which threatens the health and well being of us all.

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Figure. All actors towards a climate neutral society*



*Source: United Nations Environment Program. http://maps.grida.no/go/graphic/all-actors-towards-a-climate-neutral-society

Dangers of drugs circulated as "enhancing sexual function" or "herbal viagra"

WARNING to public and ALERT to healthcare providers

There have been reports over the past year of people taking drugs sourced from overseas or the internet that have been billed as "herbal viagra" or "drugs to enhance sexual function" that have lead to harmful consequences. A reported side effect has been hypoglycemia or low blood sugar which has led to unconsciousness, hospitalisations, permanent brain damage and death.

A timely message therefore has gone out to Territorians to remind the public that it is dangerous to take medications or tablets that are not personally prescribed.

It is important also to note that there are risks associated with drug products that are not listed or registered by the Therapeutic Goods Administration (TGA).

Use of products such as the Chinese medication Nangen Zengzhangsu (also known as Nangen or Nangeng) used to enhance sexual function that are sourced from Asia or the Internet can be dangerous.

(see http://www.health.sa.gov.au/PEHS/Alerts-&-Recalls/080815-Nangen-Zengzhangsuchinese.pdf)

Rabies detected in Bali dogs-alert raised via NT media release 12 December 2008

Rabies has been diagnosed in dogs on the Indonesian island of Bali and the Department of Health and Families is warning Territorians visiting the island of the increased health risk.

The disease was found in 2 dogs from the Kuta area – a popular region for Australian tourists.

Bali had previously been considered free of rabies.

Bali authorities have taken steps to control the situation.

A program of culling and vaccinating dogs and vaccinating people in the affected villages has been implemented.

At the moment there is no indication that the disease has spread to animals other than dogs. However any animal should be considered to pose a potential risk.

Anyone who has returned from Bali since 1 August 2008 with bites or scratches from an animal should consult their GP or nearest emergency department as soon as possible.

If you're planning on visiting Bali then avoid direct contact with all dogs, cats, monkeys and other animals. If you are bitten or scratched by an animal, seek medical attention immediately.

Rabies is a disease primarily of animals but it can be transferred to a human via a bite or scratch from an infected animal. The disease affects the brain and is fatal. The usual incubation period is 3 to 8 weeks but is sometimes much longer.

People who are suspected to have been exposed to rabies should receive rabies immunoglobulin (RIG) and a rabies vaccination as soon as possible.

Heathcare providers – take notice:

Sometimes RIG is not available in Bali and the rabies vaccine protocol is started without the RIG and the patient is directed to source the RIG in Australia. The RIG needs to be given as soon as possible within 7 days of starting rabies vaccine protocol. If more than 7 days have elapsed from when the first rabies vaccine is given RIG is no longer recommended.

In the NT RIG is distributed from Darwin and therefore any traveller requiring RIG should obtain it while in Darwin. Travellers to other regional centres should contact the nearest CDC to arrange delivery of the required amount of RIG however delays in delivery should be expected and may not be possible within the 7 day limit.

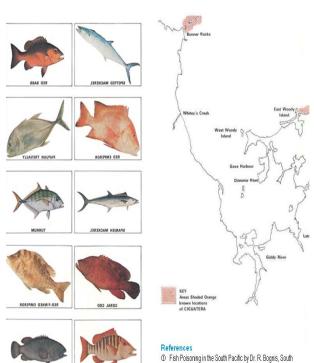
Ciguatera Fish Poisoning

What is ciguatera?

Ciguatera is a type of food poisoning which is acquired from eating certain types of reef fish found in tropical waters.

What is the cause?

Ciguatera is caused by ingestion of **ciguatoxins** which are produced by a particular type of algae (*Gambierdiscus toxicus*) found in coral reefs. These algae are eaten by small fish which are subsequently eaten by larger fish and the toxin in then passed up the food chain concentrating in the larger reef fish. Hence it is large fish which are most likely to be contaminated with ciguatoxins.



Pacific Commission.

W.H.O. news release WP/63 March 1997.
 Findlay & Russell "Marine Toxins and Venomous and

Poisonous Marine Animals" (1971).

The fish illustrated are reproduced from the book "Guide to

co-operation in production of this pamphlet

Queensland Government

Fishes" (Mr. E. M. Grant) by kind permission of the

Acknowledgment is given to Department of Fisheries, NT for their

Where is it found?

The fish associated with ciguatera are found in most tropical and sub tropical waters especially around coral reefs. The known areas in the Northern Territory (NT) are in the Gove & Groote Eylandt area. Fish suspected of causing ciguatera have been caught at the south end of Bremer Island, East Bremer islets, Bonner Rocks, Miles Island and the Cape Arnhem Area, at Gove and Connexion Island off Groote Eylandt. However this does not mean that it cannot be found elsewhere in NT waters.

It What fish types are associated with ciguatera?

More than 300 species of fish have been suspected of causing ciguatera poisoning. The list includes surgeon fish, file fish, moray eel, coral trout, coral cod, red emperor, parrot fish, sweet lip, barracuda, red snapper, groper, mackerel, trevally, queenfish and estuary cod. The toxin cannot be removed by cleaning or cooking the fish.

What are the symptoms?

The symptoms usually appear within 1-10 hours of eating affected fish and may be non-specific such as:

- lethargy
- vomiting
- diarrhoea
- abdominal cramps.

Or might be those more classically associated with cigauatera such as:

- Profuse sweating usually lasting for 24-48 hours
- Lack of muscular co-ordination
- Tingling or numbness about the lips, hands or feet

- Aching joints
- Severe itching
- Headache and feeling that teeth are loose or aching
- Reversal of temperature awareness (hot tea feels freezing cold or cold drinks feel hot)
- Palpitations and irregularity in blood pressure and pulse (mainly low blood pressure, and slow pulse)
- Difficulty in breathing in severe cases.

Some of the classical symptoms can last up to 3 months and in some cases several years and may be exacerbated by stress or excessive alcohol consumption. In severe cases 2-3% may die from respiratory paralysis or electrolyte imbalance. No immunity is conferred by an attack and poisoning may even increase sensitivity in future to the toxin.

How is it diagnosed?

The diagnosis is mainly based on clinical presentation and food history. There is no laboratory diagnostic tool for ciguatera. Remains of the fish are often sent to reference laboratories for research purposes, but the results of these tests are not relevant for diagnosis.

What is the treatment?

At the onset of the symptoms the patient should see the nearest health centre. Treatment is mainly supportive with fluid maintenance.

How do you protect yourself?,

It is best to regard any fish named in this fact sheet as suspect especially if it weighs more than 2.5kg.

If eating warm water ocean fish eat portions no bigger than 200 grams. If symptoms develop do not let others eat the fish and seek medical advice immediately.

Remember also that spoilage can cause you to suffer food poisoning from any fish that has not been cleaned and stored properly.

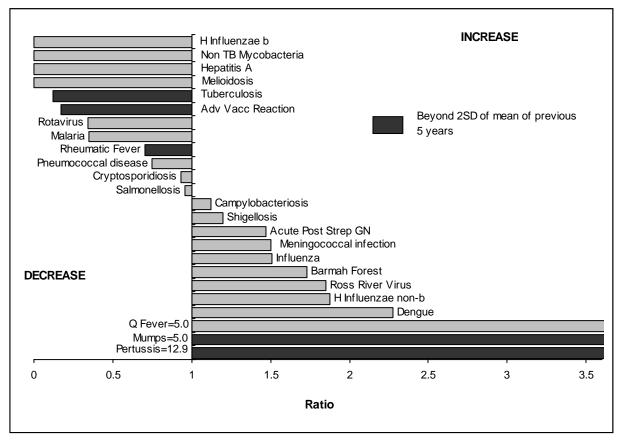
For further information contact Centre for Disease Control

Nhulunbuy 8987 0282 Darwin 8922 8044 Gove District Hospital 8987 0211

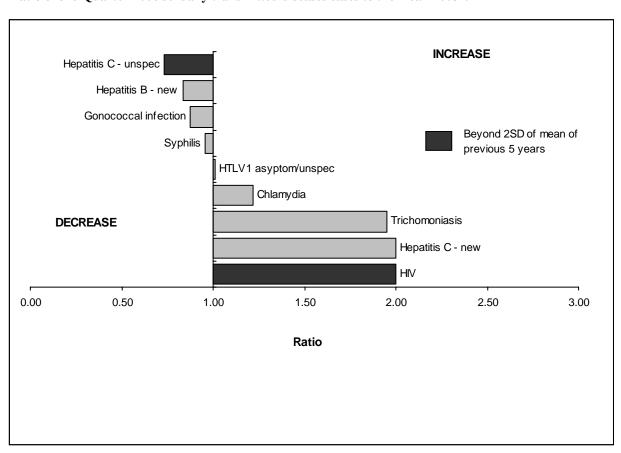
NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS 1 July to 30 September 2008 & 2007

	Alice S	prings	Bar	kly	Dar	win	East A	rnhem	Kath	erine	N	T
	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007
Acute Post Streptococcal GN	3	2	0	0	6	6	1	1	0	1	10	10
Adverse Vaccine Reaction	0	2	0	0	2	6	0	1	0	1	2	10
Amoebiasis	0	0	0	0	2	0	0	0	0	0	2	0
Arbovirus NOS	0	0	0	0	0	1	0	0	0	0	0	1
Barmah Forest	3	2	0	0	13	10	2	1	1	1	19	14
Campylobacteriosis	16	11	0	0	42	56	1	2	7	7	66	76
Chickenpox	1	20	4	0	19	32	3	1	2	35	29	88
Chlamydia	166	138	13	12	208	223	48	47	64	41	499	461
Chlamydial conjunctivitis	6	1	0	0	0	1	0	1	0	0	6	3
Cryptosporidiosis	5	6	0	1	1	7	1	0	1	0	8	14
Dengue	1	0	0	0	3	3	1	0	0	0	5	3
Donovanosis	0	1	0	0	0	0	0	0	0	0	0	1
Food/water borne disease	0	0	0	7	0	0	0	2	0	0	0	9
Gonococcal infection	145	145	19	20	76	100	24	26	57	58	321	349
Gonococcal neon ophthalmia	0	0	0	0	0	2	0	0	0	0	0	2
Hepatitis A	0	0	0	0	0	0	0	0	0	1	0	1
Hepatitis B - chronic	16	21	0	3	9	28	15	42	6	0	46	94
Hepatitis B - new	0	0	0	0	0	2	0	0	1	0	1	2
Hepatitis B - unspecified	10	15	1	1	15	14	1	2	9	6	36	38
Hepatitis C - chronic	0	0	0	0	0	0	2	0	0	0	2	0
Hepatitis C - new	0	1	0	0	2	0	0	1	0	0	2	2
Hepatitis C - unspecified	5	18	1	0	36	37	0	0	0	6	42	61
H Influenzae non-b	2	0	0	1	1	0	0	0	0	0	3	1
HIV	0	0	0	0	3	1	0	0	1	0	4	1
HTLV1 asyptomatic/unspecified	21	22	0	1	0	0	0	0	0	0	21	23
Influenza	48	32	12	3	40	103	1	8	5	15	106	161
Legionellosis	0	0	0	0	1	0	0	0	0	0	1	0
Leprosy	0	0	0	0	1	0	0	0	0	0	1	0
Malaria	0	0	0	0	2	2	1	0	0	0	3	2
Melioidosis	0	0	0	0	0	2	0	0	0	0	0	2
Meningococcal infection	1	0	1	0	1	1	0	0	0	0	3	1
Mumps	19	0	0	0	1	14	0	0	0	2	20	16
Pertussis	7	1	0	0	110	4	0	0	37	0	154	5
Pneumococcal disease	9	11	0	0	8	12	2	0	0	1	19	24
Q Fever	1	0	0	0	0	0	0	0	0	0	1	0
Rheumatic Fever	1	1	2	5	5	7	1	3	2	1	11	17
Ross River Virus	5	2	0	1	34	37	4	2	0	2	43	44
Rotavirus	4	27	7	2 7	18 52	34	10	4	5	8	44 74	75 00
Salmonellosis	12	13	1	-		54 11	5	2	4	14		90
Shigellosis	14 21	16 23	2	0 4	11 27	11	3	5 1	3	4 17	33 60	36 67
Syphilis Trick arraniasis	153	23 116	1	4 17	170	140	_	4 60	8 70	17 84	498	
Trichomoniasis	153	3	19 0	0	0	140 7	77 1	60 0	79 0	84 1	498 1	417 11
Tuberculosis	0	0	0	0	0	2	0	0	0	0	0	2
Typhoid	0	1	0	0	1	0	_	0	0	0	1	1
Varicella unspecified	0	0	0	0	0	1	0	0	0	0	0	1
Vibrio food poisoning	0	0	0	0	1	0	0	0	0	0	1	0
Yersiniosis Zester	6	4	2	0	21	16	0	2	3	1	32	23
Zoster	701	655	∠ 85	85	942	995	207		295	· -	2230	23 2259
Total	701	ชออ	00	00	942	990	207	217	290	307	2230	2239

Ratio of 3rd Quarter 2008 cases of selected diseases to the mean 2003-07



Ratio of 3rd Quarter 2008 sexually transmitted diseases cases to the mean 2003-07



NT Malaria notifications July – September 2008

Merv Fairley, CDC, Darwin

Three notifications of malaria were received for the third quarter of 2008. The following table provides details about where the infection was thought to be acquired, the infecting agent and whether chemoprophylaxis was used.

Number of cases	Origin of infection	Reason exposed	Agent	Chemoprophylaxis
1	Papua New Guinea	Holiday	P vivax	No
1	Indonesia	Fisher	P vivax	No
1	Africa	Holiday	P falciparum	Yes

Comments on notifications P 34

Adverse events following immunisation

The volume of vaccines delivered in this 2008 quarter is reduced as very few school based vaccines were delivered in this time frame.

Hep C-unspecified:

The decreasing trend starting from late last year has persisted in this quarter. The cause for this trend is unknown.

HIV

Four new notifications were recorded in this quarter, one of which was not an Australian

resident. All 4 acquired the infection from overseas through heterosexual contact.

Tuberculosis

The relatively long incubation period and unfortunate delay in diagnosis (sometimes up to a year) associated with TB makes the interpretation of 3 month periods difficult (see article page 8).

Pertussis (See article page 20).

Mumps (See article page 11).

Immunisation coverage for children aged 12-<15 months at 30 September 2008

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% Fully vaccinated
Darwin	282	90.1%	90.1%	92.2%	92.9%	89.4%
Winnellie PO Bag	88	94.3%	94.3%	96.6%	96.6%	94.3%
Palmerston/Rural	242	91.3%	91.3%	94.6%	95.0%	90.9%
Katherine	91	90.1%	90.1%	93.4%	94.5%	89.0%
Barkly	34	79.4%	79.4%	91.2%	91.2%	79.4%
Alice Springs	132	88.6%	88.6%	90.2%	90.2%	87.9%
Alice Springs PO Bag	73	86.3%	86.3%	97.3%	97.3%	86.3%
East Arnhem	54	96.3%	96.3%	100.0%	100.0%	96.3%
NT total	996	90.3%	90.3%	93.8%	94.2%	89.8%
NT Indigenous	422	87.4%	87.4%	93.8%	94.1%	87.2%
NT Non-Indigenous	574	92.3%	92.3%	93.7%	94.3%	91.6%
Australian Indigenous	3,414	85.5%	85.4%	92.6%	92.8%	84.8%
Australian Non Indigenous	69,012	92.2%	92.1%	94.6%	94.4%	91.5%
Australian Total	72,426	91.8%	91.8%	94.5%	94.4%	91.2%

Immunisation coverage for children aged 24-<27 months at 30 September 2008

Region	Number in	% DTP	% Polio	% HIB	% Hep B	% MMR	% Fully
	District						vaccinated
Darwin	267	91.0%	91.0%	90.6%	93.3%	91.8%	89.5%
Winnellie PO Bag	104	99.0%	99.0%	97.1%	99.0%	99.0%	97.1%
Palmerston/Rural	210	98.6%	98.6%	94.3%	99.0%	95.2%	94.3%
Katherine	101	100.0%	100.0%	99.0%	100.0%	100.0%	99.0%
Barkly	21	95.2%	95.2%	95.2%	95.2%	95.2%	95.2%
Alice Springs	127	94.5%	94.5%	93.7%	97.6%	93.7%	92.1%
Alice Springs PO Bag	60	98.3%	98.3%	96.7%	98.3%	96.7%	95.0%
East Arnhem	56	96.4%	96.4%	96.4%	98.2%	98.2%	94.6%
NT total	946	95.9%	95.9%	94.3%	97.1%	95.2%	93.6%
NT Indigenous	418	97.1%	97.1%	95.2%	98.6%	96.7%	94.7%
NT Non-Indigenous	528	94.9%	94.9%	93.6%	96.0%	94.1%	92.6%
Australian Indigenous	3,121	93.8%	93.8%	92.5%	96.5%	93.5%	90.7%
Australian Non Indigenous	66,131	94.9%	94.8%	94.4%	95.5%	93.9%	92.6%
Australian Total	69,252	94.8%	94.8%	94.4%	95.5%	93.9%	92.5%

Immunisation coverage for children aged 60-<63 months at 30 September 2008

Region	Number in District	% DTP	% Polio	% MMR	% Fully vaccinated
	District				vaccinateu
Darwin	264	84.5%	84.5%	84.8%	83.3%
Winnellie PO Bag	120	93.3%	93.3%	92.5%	92.5%
Palmerston/Rural	198	79.8%	79.8%	80.3%	79.8%
Katherine	104	92.3%	91.3%	91.3%	91.3%
Barkly	17	94.1%	94.1%	88.2%	88.2%
Alice Springs	137	85.4%	85.4%	86.1%	85.4%
Alice Springs PO Bag	37	94.6%	94.6%	94.6%	94.6%
East Arnhem	60	98.3%	98.3%	98.3%	98.3%
NT total	937	87.1%	87.0%	87.1%	86.4%
NT Indigenous	425	90.8%	90.6%	90.6%	90.1%
NT Non-Indigenous	512	84.0%	84.0%	84.2%	83.4%
Australian Indigenous	2,908	85.6%	85.6%	85.9%	85.0%
Australian Non Indigenous	63,492	87.6%	87.5%	87.3%	86.9%
Australian Total	66,400	87.5%	87.4%	87.2%	86.8%

Immunisation Coverage 30 September 2008

Immunisation coverage rates for NT children by regions based on Medicare address postcode as estimated by the Australian Childhood Immunisation Register are shown on page 36.

Background information to interpret coverage

Winnellie PO Bag is postcode 0822, which includes most Darwin Rural District communities, some East Arnhem District communities and some people who live in the Darwin "rural area" who collect mail from the Virginia store or Bees Creek. Alice Springs PO Bag is postcode 0872, which includes Alice Springs District, Nganampa and Ngaanyatjarra communities

The cohort of children assessed at 12-<15 months of age on 30 September 2008 were born between 1 July 2007 and 30 September 2007 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 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) (latest doses due at 6 months of age). All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24-<27 months of age on 30 September 2008 were born between 1 July 2006 and 30 September 2006 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 3 doses of PRP-OMP Hib or 4 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) and 1 dose of measles, mumps, rubella vaccine (latest doses due at 12 months of age). All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 60-<63 months of age on 30 September 2008 were born between 1 July 2002 and 30 September 2002 inclusive. To be considered fully vaccinated, these children must have received 5 valid doses of vaccines containing diphtheria, tetanus, pertussis antigens, 4 doses of poliomyelitis vaccine and 2 valid doses of measles, mumps, rubella vaccine (latest doses due at 4 years of age). All vaccinations must have been administered by 60 months (5 years) of age.

Interpretation

Immunisation coverage in NT children was above the national average in the 24-<27 months cohort but below the national average in the 12-<15 months and 60-<63 months cohort. Immunisation coverage in Indigenous children in NT was higher across all age groups compared to the national coverage of Indigenous children. Indigenous NT children had lower coverage than non-Indigenous NT children in the younger cohort (ie 12-<15 months) but higher in the other 2 cohorts.

Immunisation coverage for NT children as a whole at 60-<63 months of age (86.4%) remains lower than the younger cohorts, and this is a concern across Australia, with the national average for this cohort being 86.8%, compared to 91.2% (12-<15 months) and 92.5% (24-<27 months). For Indigenous NT children, immunisation coverage is lower at a younger age (ie 87.2% at 12-<15 months cohort) but higher for the older age group (ie 90.1% at 60-<63 months), reflecting a concern that Indigenous children are not immunised in a timely manner in early childhood.

East Arnhem region had the highest immunisation coverage across the NT in 2 of the 3 cohorts, 96.3% (12-<15 months) and 98.3% (60-<63 months).

Disease Control staff updates

RHD/TB

Dale Thompson has moved from the rheumatic heart team in Darwin to take up a position as TB public health nurse in Gove for a limited time. Jeff Tinsley, replaces Dale in Darwin having come from the Coronary Care Unit at RDH. Sharon Livesey, has also come from the Coronary Care Unit, RDH to work in a new rheumatic heart team position in Darwin. Michael Williams has moved from the Darwin TB team to Gove CDC. Gemma Farmer is replacing Mary Verus as Administration Officer TB section.

SH&BBV Alice Springs

Roseanna Higgins commences in reception at the end of December. Roseanna previously worked at FACS . Caitlin Fullerton is taking a position at remote health reception. Mark Rowe commenced in the Remote Zone Male Coordinator position and Robbie Charles in the Remote Zone Male AHW Coordinator position. Astrid Stark has returned to a Clinic 34 public health position. Astrid was previously Youth Policy Officer in Darwin.

Immunisation

Chris Sutton has returned to Community Health having worked on the remote HPV vaccination program for 6 months. Anne Weir is employed with the HPV team now on a part-time basis at CDC while working part-time in the Child and Family Health Team at Casuarina Community Care Centre. For the past 12 months Anne was working at Menzies School of Health Research

on their PneuMum Study. Welcome back to **Holly McLaughan** on return to the data entry team over the semester break and into 2009. HPV data entry staff member, **Adrienne Chalada**, has won a permanent position with the Palliative Care team.

Surveillance

After a 15 months working in the NTNDS data entry position **Lisa Fereday** is moving to Remote Health as a staff administrative coordinator. **Mary Verus** from the Darwin TB team is filling the data entry position for the next 6 months.

Medical Entomology

Peter Whelan is on long service leave until May, with **Allan Warchot**, **Nina Kurucz**, and **Bill Pettit** acting sequentially as section head in Peter's absence.

Congratulations to Dr Natalie Gray

Dr Natalie Gray has won the Faculty Medal for top results in the recent Australasian Faculty of Public Health Medicine (AFPHM) exams. The medal will be awarded at the Faculty function next year.

Natalie completed her training in the NT in CDC and in Health Gains Planning, during her time with the Department Natalie worked on TB and refugee health, public health legislation, avoidable hospitalisation and a cost benefit analysis of water fluoridation.
