Mycobacterium ulcerans in Queensland

‘Daintree’ or ‘Buruli’ ulcer

2002-2016

Queensland Government

***Mycobacterium ulcerans* in Queensland, 2002-2016**

Published by the State of Queensland (Queensland Health), October 2017

For more information contact:
Communicable Diseases Branch, Department of Health, GPO Box 48, Brisbane QLD 4001, email epi@health.qld.gov.au, phone 07 3328 9728.

An electronic version of this document is available at
https://www.health.qld.gov.au/clinical-practice/guidelines-procedures/diseases-infection/diseases/tuberculosis/surveillance

Contents

Figures

Tables

Acknowledgements

This report was prepared by the Communicable Diseases Branch, Queensland Department of Health. We gratefully acknowledge the clinicians in the Tropical Public Health Unit in the Cairns Hospital and Health Service who monitor and collect surveillance data for *M. ulcerans* cases, alongside the Queensland Mycobacterium Reference Laboratory for the continued provision of laboratory services to detect *M. ulcerans* in Queensland.

Introduction

Mycobacteria ulcerans infection, also known as Daintree, Buruli or Bairnsdale ulcer, is a nontuberculous mycobacterial infection. It has been reported in 33 counties, with most cases recorded in tropical and subtropical regions (although cases in temperate climates have also been reported in Australian, China and Japan) (1). It is a slow growing, environmental bacterium that causes skin and soft tissue infection, often starting as a painless nodule or plaque, leading to progressive destruction of subcutaneous tissue and ulceration with undermining edges, white cotton wool-like appearance and a thickening and darkening of the skin surrounding the lesion (1-4). The bacteria produce a toxin (mycolactone) which causes tissue damage and inhibits the immune response (1, 5, 6). Lesions most frequently occur on the limbs; 55% on the lower limbs, 35% on the upper limbs, and 10% on the other parts of the body (1, 3). Without treatment, infection can lead to a chronic debilitating infection that can cause permanent disfigurement and disability (1). While historically, wide surgical incision and repair was the principal treatment, current treatment and prevention guidelines in Australia recommend treatment with a combination of two antibiotics, as antibiotics alone have been found to lead to healing of lesions without recurrence (6).

M. ulcerans infection occurs in specific, endemic coastal areas in Australia, particularly coastal Victoria and a small area in the Daintree River catchment in the Cairns region of north Queensland (6, 7). Rarely, cases have also been found elsewhere in Australia without travel to a known endemic area, in particular in New South Wales and the Northern Territory (6, 8). In Queensland, published reports have identified cases associated with the Douglas Shire, incorporating the localities of Daintree, Miallo, Wonga and Cooya Beach (7, 9), and a small number of cases on the Capricorn Coast region of central Queensland (10). More recently, an increasing number of cases and geographic spread of *M. ulcerans* in Victoria has resulted in health advisory statements being issued to health professionals in that jurisdiction (11, 12).

This report describes notified cases of *M. ulcerans* in Queensland in 2002-2016, including the demographic profile, laboratory testing and clinical details.

Methods

M. ulcerans infection is notifiable as a subset of the nontuberculous mycobacteria based on pathological diagnosis under the Queensland *Public Health Regulation 2005.* This requires pathology providers to notify the Department of Health of any positive tests for nontuberculous mycobacteria as per the Queensland notification criteria guidelines for laboratories (13). Cases were classified as per the Queensland case definition at the time of notification (Box 1).

Box 1: Queensland *M. ulcerans* case definition

Case definition

2006-2012

Isolation or detection by NAT of *M. ulcerans* AND a clinically compatible illness

2013 onwards

Isolation or detection by NAT of *M. ulcerans* from any site

Culture was undertaken at the Queensland Mycobacterium Reference Laboratory inoculating *Mycobacterium ulcerans* media incubated at 32^0C in addition to standard mycobacterium culture methods. Nucleic acid testing was undertaken using a real time PCR assay targeting the insertion sequence 2404.

Data for this report were extracted from the Notifiable Diseases System on 15 September 2017 for all cases of *M. ulcerans* notified from 1 January 2002 to 31 December 2016. Cases were assigned to a geographic Hospital and Health Service (HHS) area based on their residential address at the time of notification. Cases were geocoded to suburb level (to the geographic centre of the suburb), with mapping undertaken in EpiInfo 7™. Descriptive analyses were performed using Microsoft Excel™. Notification rates were calculated using the Queensland Estimated Resident Population (ERP) 2002-2015 (14). The 2015 population was used to calculate 2016 rates as 2016 ERP was not available at time of report. Average notification rates were calculated using 2009 ERP.

Results

Notifications of *Mycobacterium ulcerans* in Queensland

There were 130 notified cases of *M. ulcerans* from 1 January 2002 to 31 December 2016 (Figure 1). Notifications peaked in 2011 when there was a known outbreak of the disease, with the Queensland notification rate in 2011 being 1.2 cases per 100,000 population. The average notification rate over the fifteen year period was 0.2 cases per 100,000 population per year.

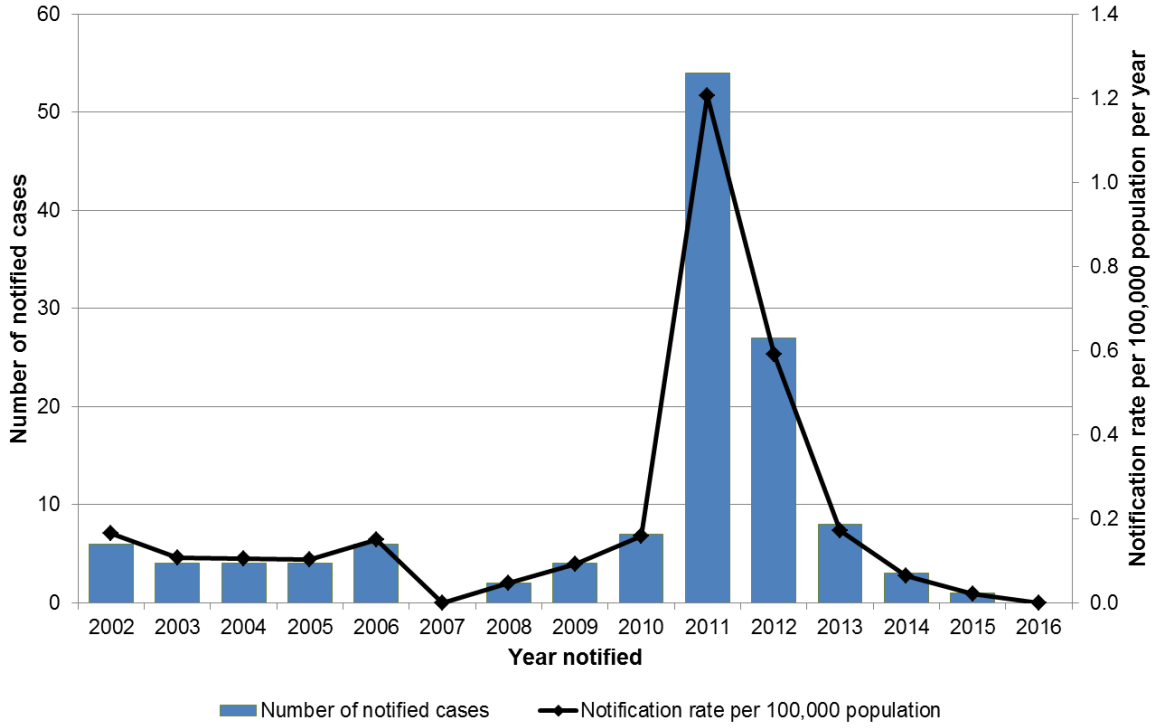

Figure 1: Number of notified cases and notification rate of *M. ulcerans*, Queensland, 2002-2016

Demographic information

Seventy-four cases (57 per cent) were male and 56 cases (43 per cent) were female. The age range was one year to 89 years, with a median age of 49 years. The most frequently notified age group was the 60-64 year old group (Figure 2).

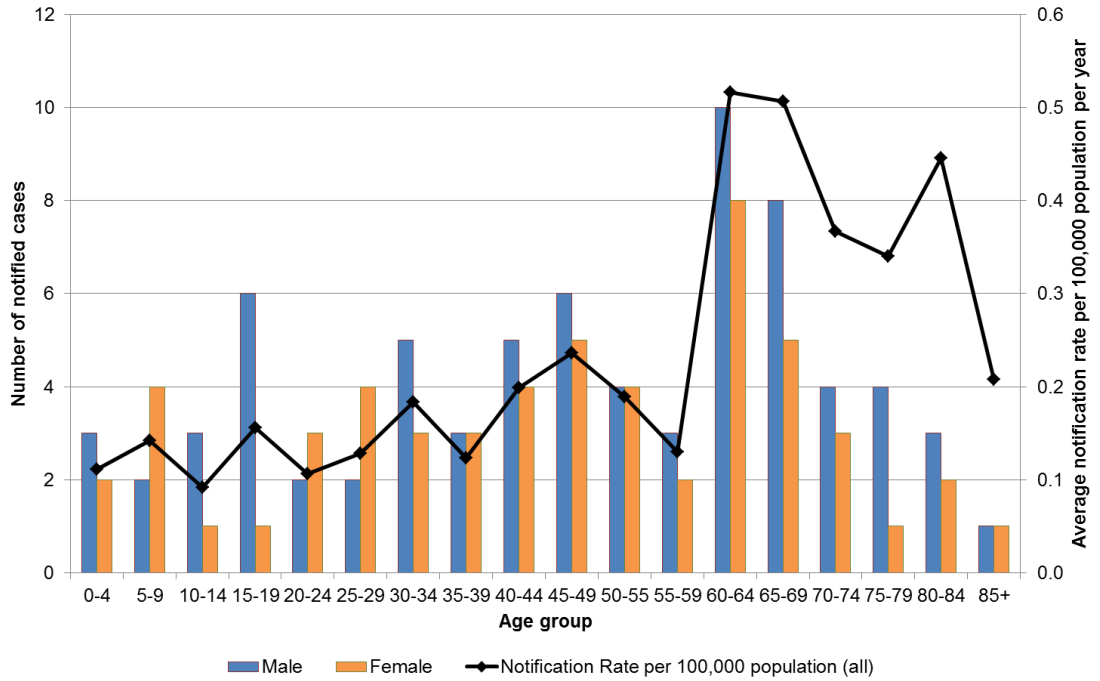

Figure 2: Number of notified cases and average notification rate of *M. ulcerans* by sex and age group, Queensland, 2002-2015

One hundred and ten cases (85 per cent) resided in the Cairns and Hinterland HHS at time of notification (Table 1), with 103 of these cases (94 per cent) residing in Shire of Douglas Local Government Area (LGA). This included 34 cases in the suburb of Mossman, 32 cases in Wonga Beach, 12 cases in Daintree, and the remainder from Port Douglas (6 cases), Forest Creek (5 cases), Miallo (5 cases), and 9 cases in other nearby suburbs. It is unknown whether the remaining cases travelled to the Cairns region or other endemic areas interstate or overseas. Cases were generally clustered around coastal areas (Figure 3).

Table 1: HHS of usual residence of notified cases of M. ulcerans, Queensland, 1 January 2002 - 31 December 2016

HHS	2002	2003	2004	2005	2006	2007	2008	2009
Torres and Cape	-	-	-	-	-	-	-	-
Cairns and Hinterland	2	3	3	2	3	2	3	2
North West	-	-	-	-	-	-	-	-
Townsville	-	-	1	-	1	-	-	-
Mackay	2	-	-	-	-	-	-	2
Central West	-	-	-	-	-	-	-	-
Central Queensland	2	1		2	1			2
Wide Bay	-	-	-	-	-	-	-	-
Sunshine Coast	-	-	-	-	-	-	-	-
Metro North	-	-	-	-	-	-	-	-
Metro South	-	-	-	-	-	-	1	-
West Moreton	-	-	-	-	-	-	-	-
Darling Downs	-	-	-	-	1	-	-	-
South West	-	-	-	-	-	-	-	-
Gold Coast	-	-	-	-	-	-	-	-
Total	**6**	**4**	**4**	**4**	**6**	**2**	**4**	**6**

HHS	2010	2011	2012	2013	2014	2015	2016	Total
Torres and Cape	-	1	-	-	-	-	-	1
Cairns and Hinterland	6	52	26	5	2	1	-	110
North West	-	-	-	-	-	-	-	-
Townsville	-	-	-	-	-	-	-	2
Mackay	-	-	-	-	-	-	-	2
Central West	-	-	-	-	-	-	-	-
Central Queensland		1		1		-	-	8
Wide Bay	1	-	-	-	1	-	-	2
Sunshine Coast	-	-	-	1	-	-	-	1
Metro North	-	-	-	-	-	-	-	-
Metro South			1	1	-	-	-	3
West Moreton	-	-	-	-	-	-	-	-
Darling Downs	-	-	-	-	-	-	-	1
South West	-	-	-	-	-	-	-	-
Gold Coast	-	-	-	-	-	-	-	-
Total	**7**	**54**	**27**	**8**	**3**	**1**	**-**	**130**

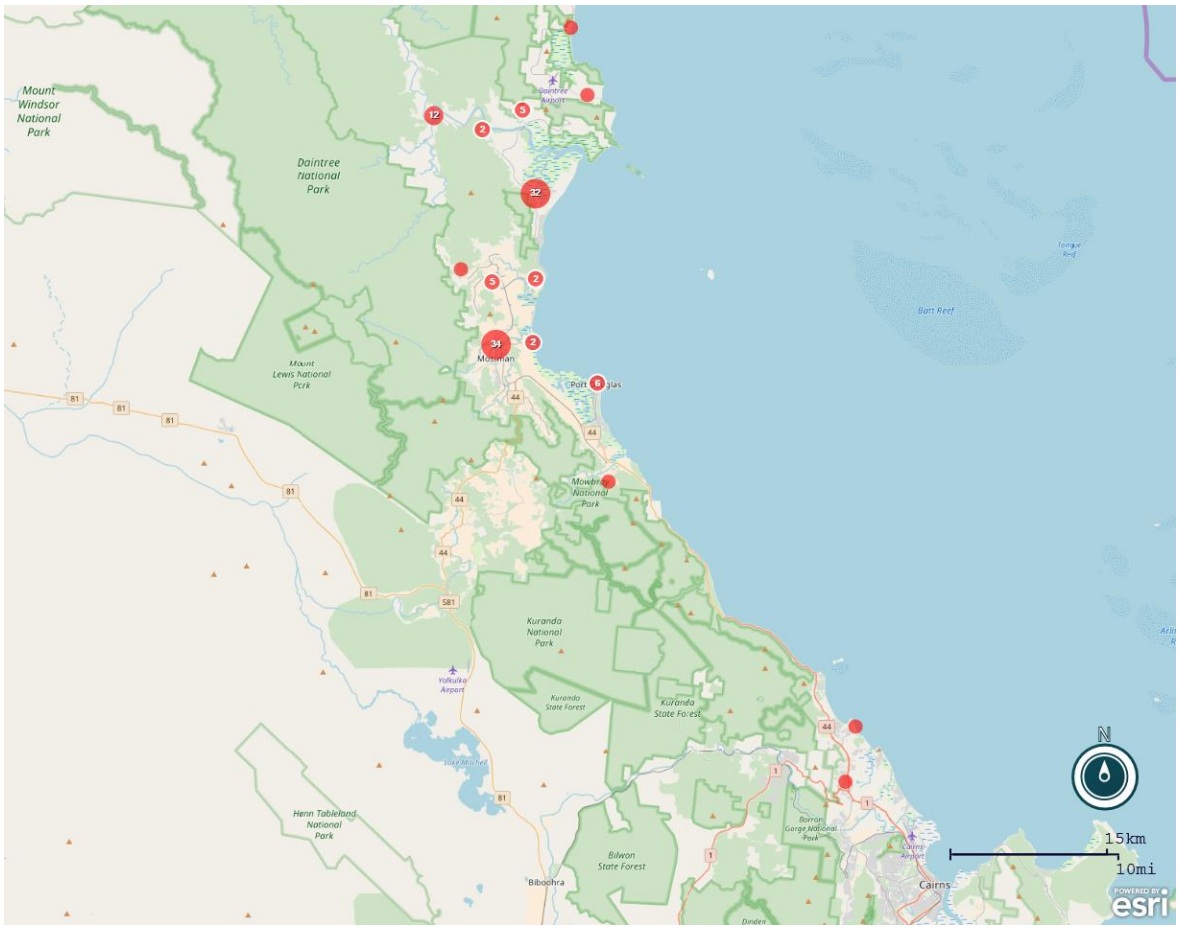

Figure 3: Place of residence of notified cases of *M. ulcerans*, Cairns and Daintree region, 1 January 2002 - 31 December 2016

During the outbreak in 2011-2012, cases were predominantly notified in October and November 2011, with cases continuous through 2012 (Figure 4).

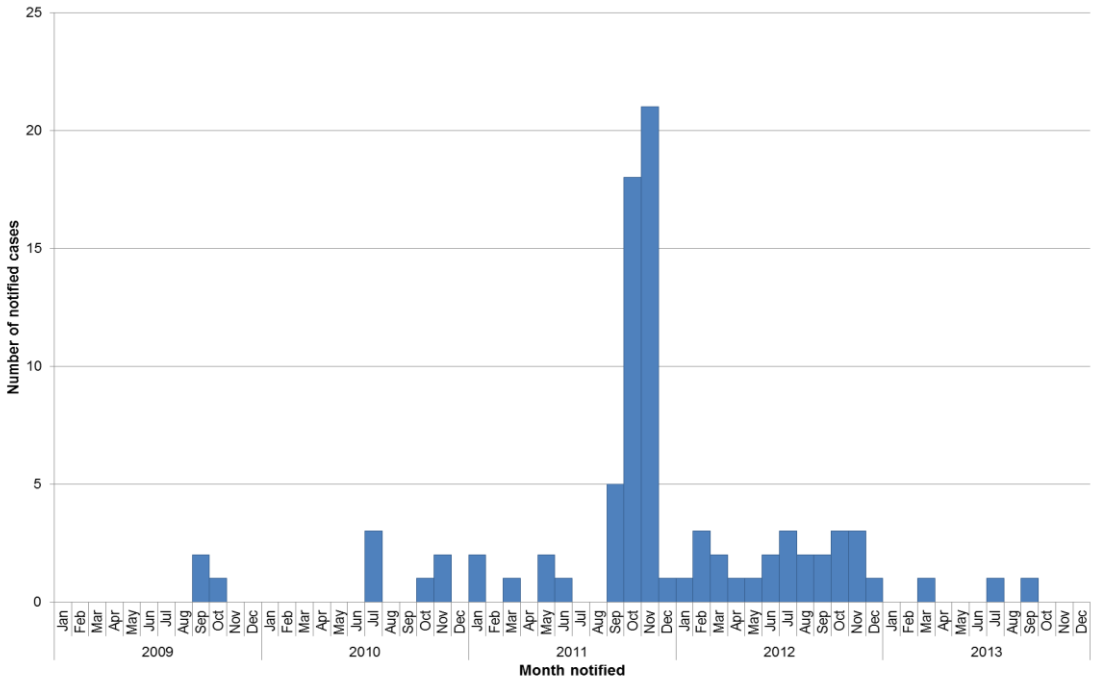

Figure 4: Number of notified cases of *M. ulcerans* in residents of the Shire of Douglas LGA, 1 January 2009 - 31 December 2013

Clinical details and laboratory testing

Wound type was known for 104 cases (80 per cent), with the majority of cases presenting with an ulcer or ulcers (Table 2).

Table 2: *M. ulcerans* cases by wound type, 2002-2016

Wound type	Number of notified cases (%)
Ulcer	81 (62%)
Lesion	6 5%)
Sinus	2 (2%)
Cellulitis	1 (1%)
Nodule	1 (1%)
Oedema	1 (1%)
Osteomyelitis	1 (1%)
Papule	1 (1%)
Plaque	1 (1%)
Wound – unspecified	8 (6%)
Unknown	26 (20%)
Total	**130 (100%)**

Laboratory confirmed specimens were predominantly from limb extremities, with 89 cases (68 per cent) from leg wounds, 28 cases (22 per cent) from the arm, 6 cases (5 per cent) from the torso (including back, buttock, hip and shoulder), and one case (1 per cent) from the face (specimen site unknown for five cases).

Over the fifteen year period, 69 cases (53 per cent) were found to be positive for *M. ulcerans* by culture and by nucleic acid testing (NAT), 45 cases (35 per cent) were found to be positive by NAT only, and 16 cases (12 per cent) were found by culture only.

Conclusion

Notifications of *M.* ulcerans in Queensland peaked in 2011-12 when there was a known outbreak of the disease in north Queensland and have decreased each year since towards a low level of endemnicity. Whilst cases occurred in all age groups, the 60-64 year old age group was most frequently notified. The presenting clinical picture matched that seen worldwide, with the majority of cases diagnosed following ulcer formation with 89 per cent of specimens obtained from limbs, predominantly the legs.

Notified cases of *M. ulcerans* in Queensland have a strong focal point and geographic clustering in the Daintree area of north Queensland, which potentially has a similar climate to areas known to be endemic for *M. ulcerans* in Africa. This area differs from the temperate climate in Victoria where an increasing number and geographic spread of cases has been observed. No similar increase has been seen in Queensland.

The most significant environmental event to occur in the area was Tropical Cyclone Yasi, which made landfall on 3 February 2011 near Mission Beach, approximately 180km from the Daintree area (15). The incubation period of *M. ulcerans* has been described as two to three months (2, 4), with most of the notified cases occurred eight to nine months following the cyclone. It is possible that Tropical Cyclone Yasi, which

has been described as one of the most powerful cyclones to affect Queensland (15), may have affected the ecological environment increasing either the bacterium in the environment, or the risk of acquisition. Given that the infection usually appears as a painless ulcer, there may be a delay in symptom onset and diagnosis (and subsequent notification).

The uncertainty regarding this bacterium in regards to host animals, environmental factors and mechanism of infection can make it difficult to implement preventative actions and public health messaging other than to encourage awareness of symptoms and early presentation to minimise tissue loss and risk of ongoing disability.

References

1. World Health Organization. Buruli Ulcer (*Mycobacterium ulcerans* infection) Fact Sheet 2016 [updated February 20166 September 2016]. Available from: http://www.who.int/mediacentre/factsheets/fs199/en/.
2. Brown-Elliott BA, Wallace Jr. RJ. Infections Caused by Mycobacterium bovis and Nontuberculous Mycobacteria Other than Mycobacterium avium Complex. Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases. 8th ed. Philadelphia: Elsevier; 2015.
3. Centers for Disease Control and Prevention. Buruli Ulcer: For Health Care Workers 2015 [updated 26 January 20156 September 2016]. Available from: https://www.cdc.gov/buruli-ulcer/health-care-workers.html.
4. Heymann DL, editor. Control of Communicable Diseases Manual. 19th ed. Washington: American Public Health Association; 2008.
5. George KM, Chatterjee D, Gunawardana G, Welty D, Hayman J, Lee R, et al. Mycolactone: a polyketide toxin from Mycobacterium ulcerans required for virulence. Science (New York, NY). 1999;283(5403):854-7.
6. O'Brien DP, Jenkin G, Buntine J, Steffen CM, McDonald A, Horne S, et al. Treatment and prevention of Mycobacterium ulcerans infection (Buruli ulcer) in Australia: guideline update. The Medical journal of Australia. 2014;200(5):267-70.
7. Steffen CM, Smith M, McBride WJ. Mycobacterium ulcerans infection in North Queensland: the 'Daintree ulcer'. ANZ journal of surgery. 2010;80(10):732-6.
8. Lavender CJ, Senanayake SN, Fyfe JA, Buntine JA, Globan M, Stinear TP, et al. First case of Mycobacterium ulcerans disease (Bairnsdale or Buruli ulcer) acquired in New South Wales. The Medical journal of Australia. 2007;186(2):62-3.
9. Jenkin GA, Smith M, Fairley M, Johnson PD. Acute, oedematous Mycobacterium ulcerans infection in a farmer from far north Queensland. The Medical journal of Australia. 2002;176(4):180-1.
10. Francis G, Whitby M, Woods M. Mycobacterium ulcerans infection: a rediscovered focus in the Capricorn Coast region of central Queensland. The Medical journal of Australia. 2006;185(3):179-80.
11. Department of Health Victoria. Health advisory 160008: Changing pattern of Buruli (Bairnsdale) ulcer infection in Victoria 2016 [updated 8 August 2016Accessed 6 September 2016]. Available from: https://www2.health.vic.gov.au/about/news-and-events/healthalerts/bairnsdale-buruli-ulcer.
12. Department of Health Victoria. Health advisory 150003: Mycobacterium ulcerans (Bairnsdale or Buruli Ulcer) - 18 March 2015 2015 [updated 18 March 2015Accessed 6 September 2016]. Available from: https://www2.health.vic.gov.au/about/news-and-events/healthalerts/mycobacterium-ulcerans-Bairnsdale-or-Buruli-Ulcer-18-March-2015.
13. Queensland Department of Health. Queensland Notification Criteria - Guidelines for Laboratories [updated March 201621 April 2016]. Available from: https://www.health.qld.gov.au/cdcg/documents/notif-criteria-guide.pdf.
14. Australian Bureau of Statistics. Catalogue No. 3235.0 - Population by Age and Sex, Regions of Australia. Released 18 August 2016; ABS Consultancy for QGSO.
15. Bureau of Meterology. Severe Tropical Cyclone Yasi [11 July 2017]. Available from: http://www.bom.gov.au/cyclone/history/yasi.shtml.