



Vector-Borne Diseases

Arbovirus and other vector-borne disease surveillance in NSW

NSW ANNUAL REPORT

2018

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ACRONYMS AND ABBREVIATIONS

VBD **Vector-borne diseases**

BFV	Barmah Forest virus	MAL	Malaria
CHIKV	Chikungunya virus	MVE	Murray Valley encephalitis
DENV	Dengue virus	RRV	Ross River virus
KUNV	Kunjin virus (a West Nile virus subtype)	ZIKV	Zika virus

LHD **Local health district**

CC	Central Coast LHD	NS	Northern Sydney LHD
FW	Far West LHD	SES	South Eastern Sydney LHD
HNE	Hunter New England LHD	SNSW	Southern NSW LHD
IS	Illawarra Shoalhaven LHD	SWS	South Western Sydney LHD
M	Murrumbidgee LHD	SYD	Sydney LHD
MNC	Mid-North Coast LHD	WNSW	Western NSW LHD
NBM	Nepean Blue Mountains LHD	WS	Western Sydney LHD
NNSW	Northern NSW LHD	NSW	New South Wales

SA2 Statistical Area Level 2 ¹

¹ The SA2 is the lowest level of the geographical boundary structure for which Australian Bureau of Statistics (ABS) estimated resident population (ERP) data are generally available. For more information see the [ABS SA2 description](#).

SUMMARY – VECTOR-BORNE DISEASES IN NSW

This report summarises NSW vector-borne disease (VBD)² surveillance data for notifiable arboviruses (arthropod-borne viruses) and other notifiable arthropod-borne diseases in humans for 2018. The report notes changes in notifications over time and describes likely areas of disease acquisition for both local and exotic infections. NSW Health undertakes VBD surveillance to monitor VBD trends with the aim of implementing control measures to prevent further illness within the community from endemic local VBDs (such as Ross River virus and Barmah Forest virus), and to inform appropriate prevention messages for travellers to areas of the world with exotic vector-borne diseases (such as dengue, chikungunya, malaria and Zika virus).

Notified incidence of local and exotic vector-borne diseases in NSW, 2018*

	2018		5 Year Mean		% change from 2017 [#]
	Count	Rate*	Count	Rate*	
Barmah Forest virus	74	0.9	147.2	1.9	-40%
Chikungunya	15	0.2	32.0	0.4	-68%
Dengue	288	3.6	311.2	4.1	-8%
Malaria	70	0.9	60.4	0.8	4%
Ross River virus	572	7.1	801.8	10.4	-63%
Zika	1	0.0	8.4	0.1	-80%

* Cases per 100,000 population, NSW (see Methods for population calculations).

Percentage change in condition case count in 2018 relative to the 2017 case count.

There were no cases of human infection with Japanese Encephalitis virus, Yellow Fever virus, Kunjin virus, Murray Valley Encephalitis virus, Sindbis virus, 'Flavivirus – unspecified' or other arboviruses reported in 2018. There were also no reports of epidemic typhus.

Key trends in 2018

- **Ross River virus** – moderate RRV activity this year following the large RRV outbreak seen in 2016-17. Activity highest in coastal and inland areas of the state known to be endemic for RRV.
- **Chikungunya virus** – a marked fall in notifications, reversing the upward trend seen since 2013. Four out of every five notifications were related to travel to India.
- **Dengue virus** – a small decrease in notifications compared to the previous year. Infections were acquired in south-east Asia, south Asia and Pacific Island nations.
- **Barmah Forest virus** – a decrease in notifications compared to 2017 and continued low activity overall.
- **Malaria** – no major changes in notifications; over two thirds of cases were acquired in African countries, including 91% of *P. falciparum* cases, which was the most common malaria species.
- **Zika virus** – there was only one notification, most likely acquired in Vanuatu.

Mosquito and sentinel chicken surveillance for vector-borne arboviruses

In NSW, arbovirus surveillance in the environment is achieved through surveillance of chicken flocks and trapping of mosquitoes for virus isolation. Chicken surveillance aims to provide early warning of the emergence of two important flaviviruses – Murray Valley Encephalitis virus and Kunjin virus – in the northern inland areas of NSW. Chickens in these sentinel flocks are regularly tested from November to April for evidence of seroconversion to these rare but serious human pathogens.

For further information and reports see the Environmental Health Branch VBD Surveillance website – <https://www.health.nsw.gov.au/environment/pests/vector/Pages/surveillance.aspx>.

² In this report arbovirus and other arthropod-borne infections are collectively referred to as vector-borne diseases.

BARMAH FOREST VIRUS

Barmah Forest virus (BFV) infection is a vector-borne disease which is endemic in many parts of NSW. Infection rates are generally highest in the summer and autumn months. Cases are usually only followed up if they are believed to have been acquired in a non-endemic area.

The major mosquito vector in inland areas is *Culex annulirostris* which breeds in freshwater habitats. BFV transmission in coastal areas is most commonly due to saltmarsh mosquitoes, including a number of *Aedes* species.

In 2018, notifications of BFV infections decreased compared to the previous year and remained well below the historical average. Notifications were again highest along the north coast of NSW, particularly among residents of the Northern NSW Local Health District.

Summary 2018

- Case count: 74
- Notification rate: 0.9 per 100,000 population

Overall trend:

- Annual notifications fell by 40% compared to the annual total in 2017 (123 cases)
- Notification rate well below the 5 year mean (1.9 per 100,000)

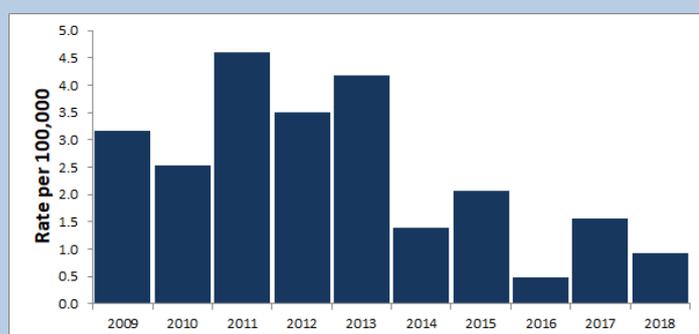
Groups with highest notification rates in 2018

- Age: 40-49 years – 2.0 per 100,000 (28% of cases)
- Sex: Male – 1.0 per 100,000 (53% of cases)
- Local health district:
Northern NSW – 11.5 per 100,000 (47% of cases)

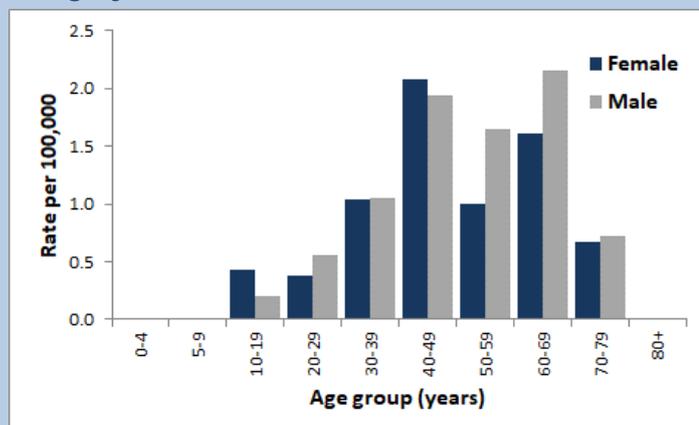
Seasonality

- Notifications were highest in May (24 cases) and June (25 cases)

Notification rate per 100,000 population by year, 2009 – 2018, NSW



Notification rate per 100,000 population by age category and sex, 2018, NSW



Number of cases and rates (per 100,000) by Local Health District, 2018, NSW

LHD	Count		Rate/100,000	
	2018	5yr mean	2018	5yr mean
CC	2	7.0	0.6	2.1
FW	0	0.8	0.0	2.7
HNE	16	31.2	1.7	3.4
IS	0	4.2	0.0	1.0
M	0	5.8	0.0	2.0
MNC	11	41.8	5.0	19.4
NBM	0	3.0	0.0	0.8
NNSW	35	74.8	11.5	25.3
NS	0	1.8	0.0	0.2
SES	1	1.0	0.1	0.1
SNSW	5	5.8	2.4	2.8
SWS	0	1.0	0.0	0.1
SYD	1	0.8	0.1	0.1
WNSW	3	5.6	1.1	2.0
WS	0	0.6	0.0	0.1
NSW	74	147.2	0.9	1.9

Barmah Forest virus – continued

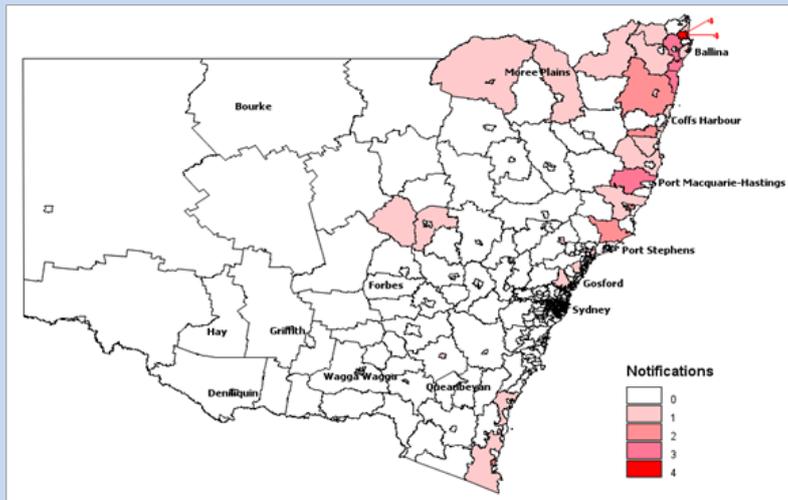
Place of acquisition

Place of residence is used as a surrogate for place of acquisition for BFV infection. Most cases were reported from residents of coastal regions.

The highest numbers of BFV notifications were again in the Northern NSW LHD, particularly the Mullumbimby and Brunswick Heads - Ocean Shores regions. The highest population incidence rates were for residents in the Evans Head and Port Macquarie regions.

Barmah Forest virus notifications by Statistical Area-2 (SA2) district, 2018, NSW.

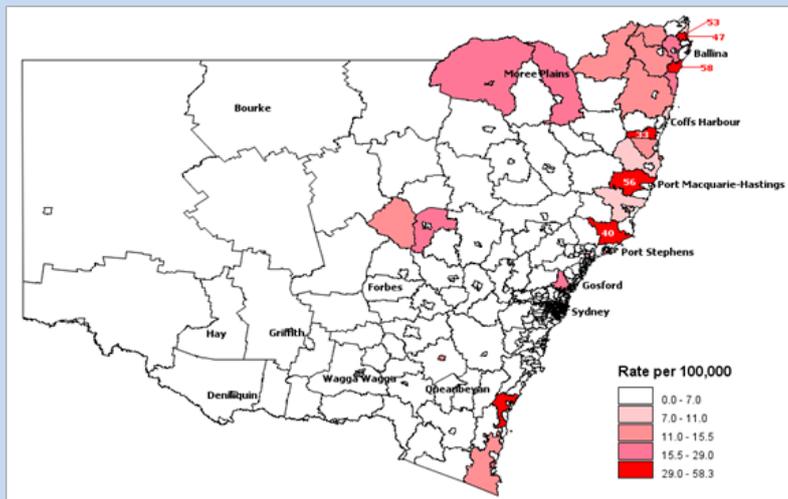
BFV notifications by Statistical Area-2 (SA2) district, 2018, NSW



Number of cases and rates (per 100,000) by Statistical Area-2 (SA2), 2018, NSW *

Region (SA2)	Count	Rate/100,000
Mullumbimby	4	52.8
Brunswick Heads - Ocean Shores	4	47.0
Evans Head	3	58.3
Port Macquarie Region	3	55.8
Byron Bay	3	30.3
Goonellabah	3	22.6
Lismore Region	3	19.4
Macleay - Yamba - Iluka	3	18.2
Bulahdelah - Stroud	2	40.2
Bellingen	2	33.1
Merimbula - Tura Beach	2	19.4
Grafton Region	2	13.1
Ballina	2	11.7
Taree	2	9.5

BFV notification rates per 100,000 population by Statistical Area-2 (SA2) district, 2018, NSW



* Data presented for the 14 regions with two or more BFV notifications in 2018.

CHIKUNGUNYA VIRUS

Chikungunya virus (CHIKV) is an alphavirus, the same genus as Ross River virus, Barmah Forest virus and Sindbis virus. CHIKV infections occur in many parts of Africa and Asia, including many areas where dengue is also common.

CHIKV is transmitted by the bite of an infected *Aedes* spp. mosquito, predominantly *Ae. aegypti* and *Ae. albopictus*. While there have been no reports of chikungunya virus acquired in Australia, transmission remains a risk in parts of north Queensland where transmission-competent mosquitoes circulate.

Summary 2018

- Case count: 15
- Notification rate: 0.2 per 100,000 population
- Major source country: India (80%)

Overall trend:

- Notifications fell 68% compared to 2017 (47 cases), reversing the upward trend seen since 2013.
- India was the major source of infections in 2018, with no cases reported from Bangladesh, the major source in 2017.

Groups with highest notification rates in 2018

- Age: 30-39 years – 0.6 per 100,000 (47% of cases)
- Sex: Female – 0.2 per 100,000 (53% of cases)
- Local health district: Western Sydney – 1.1 per 100,000 (73% of cases)

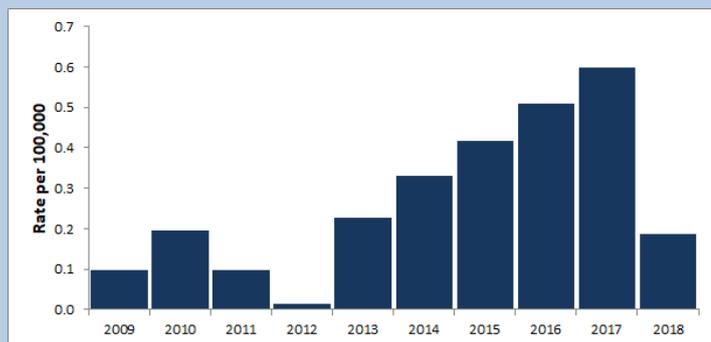
Seasonality

- All but one of the 15 cases were reported from September to December.

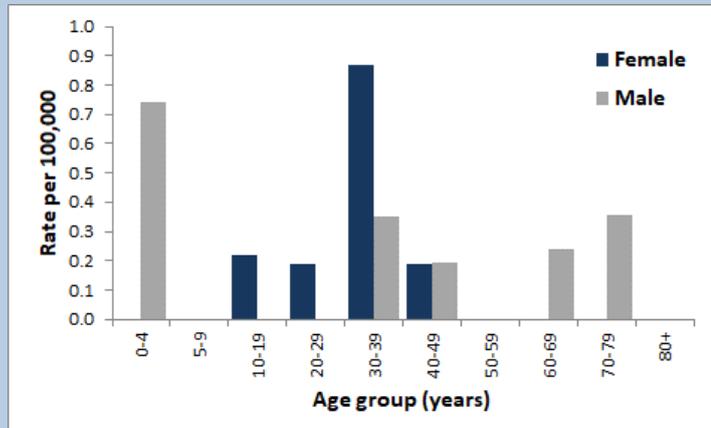
Place of acquisition in 2018

- India (80%)

Notification rate per 100,000 population, by year, 2009 – 2018, NSW



Notification rate per 100,000 population by age category and sex, 2018, NSW



Number of cases and rate (per 100,000) by Local Health District, 2018, NSW

LHD	Count		Rate	
	2018	5yr mean	2018	5yr mean
CC	0	1.0	0.0	0.3
FW	0	0.0	0.0	0.0
HNE	0	1.2	0.0	0.1
IS	0	1.8	0.0	0.4
M	0	0.0	0.0	0.0
MNC	0	0.4	0.0	0.2
NBM	0	1.2	0.0	0.3
NNSW	1	0.8	0.3	0.3
NS	1	3.6	0.1	0.4
SES	0	5.6	0.0	0.6
SNSW	0	1.0	0.0	0.5
SWS	1	4.2	0.1	0.4
SYD	1	4.8	0.1	0.7
WNSW	0	0.4	0.0	0.1
WS	11	8.6	1.1	0.9
NSW	15	32.0	0.2	0.4

Chikungunya – continued

Place of acquisition

India was the most common source of chikungunya infection amongst notified cases in 2018, with 12 cases (80%) notified. Single cases were linked to travel to the Philippines, Samoa and Thailand.

There were no locally-acquired cases of chikungunya in 2018.

Number of cases of chikungunya by country of acquisition, 2018, NSW.

Country of acquisition	Total	% Total
India	12	80%
Philippines	1	7%
Samoa	1	7%
Thailand	1	7%
Total	15	

DENGUE VIRUS

Dengue virus (DENV) is a flavivirus. Four serotypes of dengue viruses have been described - dengue 1, 2, 3 and 4. Each of the 4 serotypes is capable of causing the full spectrum of clinical manifestations following DENV infection. Humans and non-human primates are reservoirs for the virus and maintain it in limited forest settings of Asia, Africa, and the Americas. Periodic dengue outbreaks in Pacific Islands and Territories also put NSW travellers at risk.

Transmission is via the bite of an infective female mosquito, principally *Aedes aegypti*. This is a highly domesticated urban mosquito found in countries of the tropics and subtropics. In Australia, this mosquito is currently confined to parts of northern Queensland. *Ae. aegypti* is a day-biting species, with increased biting activity in the few hours after sunrise and before sunset. Humans are the preferred source of blood. *Ae. albopictus* can also transmit DENV.

Summary 2018

- Case count: 288
- Notification rate: 3.6 per 100,000 population
- Most common country acquired: Thailand

Overall trend:

- An 8% decrease in notifications compared to 2017 (313 cases) and a similar notification rate to the 5 year mean
- DENV-2 remained the most common serotype, linked to 50% of cases where serotype information was available

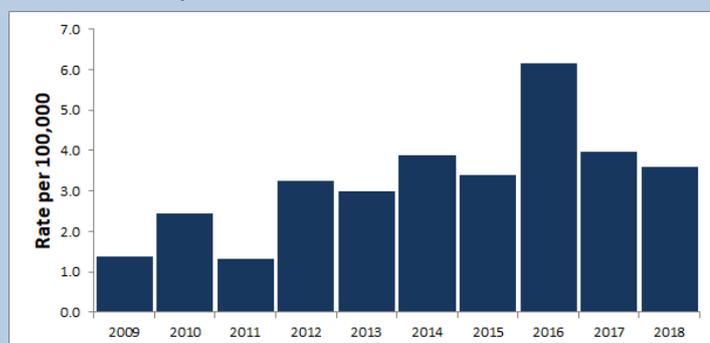
Groups with highest notification rates in 2018

- Age: 30-39 years – 5.9 per 100,000 (23% of cases)
- Sex: Male – 3.6 per 100,000 (50.3% of cases)
- Local health district:
Western Sydney – 6.2 per 100,000 (22% of cases)
South Eastern Sydney – 4.7 per 100,000 (15% of cases)

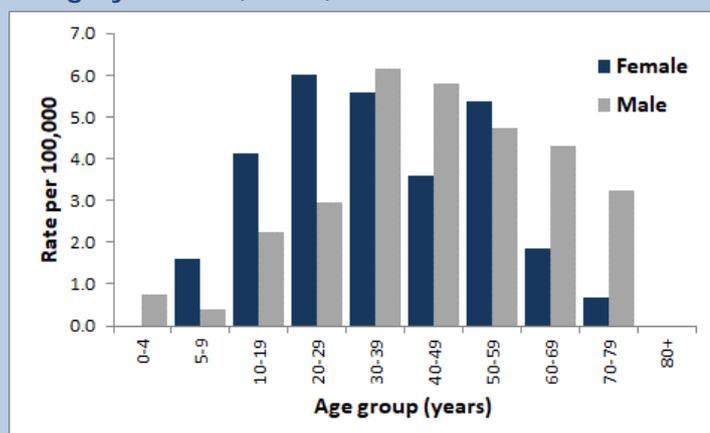
Place of acquisition in 2018

- Thailand – 16% of cases
- India – 15% of cases
- Indonesia – 11% of cases

Notification rate per 100,000 population by year, 2009 – 2018, NSW



Notification rate per 100,000 population by age category and sex, 2018, NSW



Number of cases and rates (per 100,000) by Local Health District, 2018, NSW

LHD	Count		Rate	
	2018	5yr mean	2018	5yr mean
CC	12	22.4	3.5	6.7
FW	0	0.0	0.0	0.0
HNE	12	30.0	1.3	3.3
IS	18	23.0	4.3	5.7
M	9	6.4	3.0	2.2
MNC	3	8.2	1.4	3.8
NBM	10	8.0	2.6	2.2
NNSW	12	31.2	3.9	10.5
NS	39	52.2	4.1	5.8
SES	44	73.6	4.7	8.1
SNSW	2	7.2	0.9	3.5
SWS	27	17.2	2.7	1.8
SYD	32	24.2	4.7	3.7
WNSW	5	4.8	1.8	1.7
WS	63	49.4	6.2	5.3
NSW	288	311.2	3.6	4.1

Dengue virus – continued

Place of acquisition

Thailand and India were the most common source country for dengue infection in 2018, followed by Indonesia. There was also a notable increase in cases acquired in Pacific Island nations, particularly Samoa, Fiji and Tonga.

There were no locally-acquired cases of DENV in 2018, and no cases imported from other parts of Australia.

Dengue serotypes

Dengue serotyping was available for 12.5% of cases. Dengue serotype 2 (DENV-2) remained the most common serotype reported, accounting for 6.3% of cases overall, and 50% of the cases where serotype was available.

Number of cases of DENV infection by country of acquisition and serotype (DENV 1-4), 2018, NSW.

County of acquisition	Dengue serotype					Total	% Total
	DENV-1	DENV-2	DENV-3	DENV-4	UNK#		
Bangladesh	0	0	1	0	7	8	2.8%
Cambodia	0	0	0	0	7	7	2.4%
China	0	0	0	0	2	2	0.7%
Fiji	0	3	0	0	13	16	5.6%
French Polynesia	0	0	0	0	2	2	0.7%
India	2	3	0	0	38	43	14.9%
Indonesia	1	0	2	1	28	32	11.1%
Kiribati	0	1	0	0	2	3	1.0%
Malaysia	0	1	0	0	5	6	2.1%
Maldives	0	0	1	0	4	5	1.7%
Mexico	0	0	0	0	1	1	0.3%
Myanmar	0	0	0	0	1	1	0.3%
New Caledonia	0	1	0	0	1	2	0.7%
Nigeria	0	0	0	0	1	1	0.3%
Pakistan	0	0	0	0	1	1	0.3%
Palau	0	0	0	0	1	1	0.3%
Papua New Guinea	0	0	0	0	8	8	2.8%
Philippines	0	0	1	0	17	18	6.3%
Samoa	0	3	0	0	28	31	10.8%
South Africa	0	0	0	0	1	1	0.3%
South America, NEC	0	0	0	0	1	1	0.3%
South-East Asia, NEC	3	0	0	0	1	4	1.4%
Southern Asia, NEC	0	0	0	0	1	1	0.3%
Sri Lanka	1	1	0	0	18	20	6.9%
Tanzania	0	0	0	0	1	1	0.3%
Thailand	3	4	1	0	38	46	16.0%
Tonga	0	1	0	0	12	13	4.5%
Vanuatu	0	0	0	0	1	1	0.3%
Vietnam	1	0	0	0	10	11	3.8%
Unknown	0	0	0	0	1	1	0.3%
Total	11	18	6	1	252	288	
(% of all cases)	(3.8%)	(6.3%)	(2.1%)	(0.3%)	(87.5%)		

UNK – unknown; * NEC – not elsewhere coded. Multiple possible exposure countries reported.

MALARIA

Malaria is an infection of the liver and red blood cells caused by microscopic protozoan parasites of the *Plasmodium* type. There are five species of parasites that cause malaria: *P. falciparum*, *P. ovale*, *P. malariae*, *P. vivax* and, rarely, *P. knowlesi*. Malaria due to *P. falciparum* is associated with more severe symptoms and most fatal cases.

Malaria parasites are spread through the bite of infective *Anopheles* mosquitoes. There are no competent vectors of malaria known to occur in NSW. Effective chemoprophylaxis is available for travellers to protect against malaria.

Mainland Australia is free of malaria but it is occasionally detected in the Torres Strait. Travellers are at risk of contracting malaria when travelling without appropriate protection in malaria-endemic parts of tropical and subtropical areas of Asia, Africa, Central and South America, the Pacific Islands and parts of the Middle East.

Summary 2018

- Case count: 70
- Notification rate: 0.9 per 100,000 population

Overall trend:

- A 4% increase in notifications compared to 2017, but a similar notification rate to the 5 year mean

Malaria species

- 66% *P. falciparum*, 26% *P. vivax*, where species known

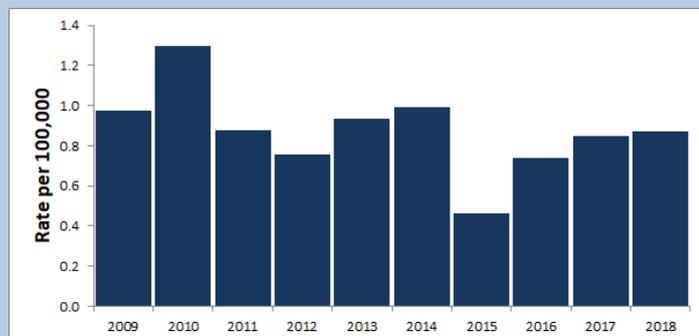
Groups with highest notification rates in 2018

- Age: 20-29 years – 1.6 per 100,000 (24% of cases)
30-39 years - 1.2 per 100,000 (20% of cases)
- Sex: Male – 1.2 per 100,000 (69% of cases)
- Local health district:
Murrumbidgee – 3.4 per 100,000 (14% of cases)
Western Sydney – 1.5 per 100,000 (21% of cases)

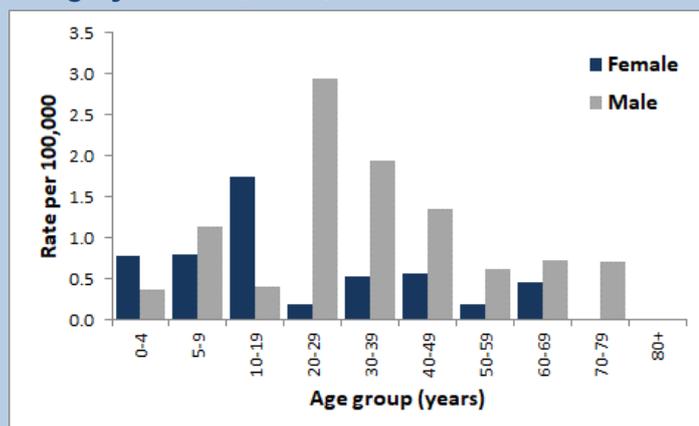
Place of acquisition in 2018

- Sudan (11% of cases), Nigeria (10% of cases)
- Africa – 69% of cases acquired in African countries, including 91% of *P. falciparum* cases

Notification rate per 100,000 population by year, 2009 – 2018, NSW



Notification rate per 100,000 population by age category and sex, 2018, NSW



Number of cases and rates (per 100,000) by Local Health District, 2018, NSW

LHD	Count		Rate	
	2018	5yr mean	2018	5yr mean
CC	4	0.4	1.2	0.1
FW	0	0.4	0.0	1.3
HNE	3	4.2	0.3	0.5
IS	3	4.6	0.7	1.1
M	10	1.8	3.4	0.6
MNC	1	3.2	0.5	1.5
NBM	3	2.8	0.8	0.8
NNSW	3	2.6	1.0	0.9
NS	4	3.4	0.4	0.4
SES	4	6.2	0.4	0.7
SNSW	2	1.4	0.9	0.7
SWS	7	4.4	0.7	0.5
SYD	9	8.6	1.3	1.3
WNSW	2	1.6	0.7	0.6
WS	15	22.4	1.5	2.4
NSW	70	60.4	0.9	0.8

Malaria – continued

Place of acquisition

Sudan and Nigeria were the common source countries for malaria cases notified in 2018, and countries in Africa collectively accounted for 48 cases (69%). Papua New Guinea and India were the most common source countries for malaria in the Asia Pacific region, with travel to these countries linked to 6 and 5 cases, respectively.

There were no locally-acquired cases of malaria in 2018.

Malaria species

P. falciparum was the again most common species identified, accounting for 45 (66%) of the 68 cases where species information was available, followed by *P. vivax* (26%). All but three of the 45 *P. falciparum* cases were acquired in countries in Africa while most of the *P. vivax* cases were associated with travel to India, Pakistan or Papua New Guinea.

Number of cases of malaria by country of acquisition and species, 2018, NSW.

County of acquisition	Malaria species					Total	% Total
	<i>P. falciparum</i>	<i>P. malariae</i>	<i>P. ovale</i>	<i>P. vivax</i>	UK [#]		
Cambodia	1	0	0	0	0	1	1.4%
Cameroon	0	1	0	0	0	1	1.4%
Central and West Africa, NEC*	2	0	0	0	0	2	2.9%
Congo, Democratic Republic of	0	0	0	0	2	2	2.9%
Ghana	1	0	1	0	0	2	2.9%
Guinea	1	0	0	0	0	1	1.4%
India	0	0	0	5	0	5	7.1%
Kenya	4	0	0	0	0	4	5.7%
Korea, Republic of (South)	0	0	0	1	0	1	1.4%
Liberia	1	0	0	0	0	1	1.4%
Malawi	3	0	0	0	0	3	4.3%
Nigeria	5	1	1	0	0	7	10.0%
Pakistan	0	0	0	5	0	5	7.1%
Papua New Guinea	2	0	0	4	0	6	8.6%
Senegal	1	0	0	0	0	1	1.4%
Sierra Leone	5	0	1	0	0	6	8.6%
Solomon Islands	1	0	0	2	0	3	4.3%
South Sudan	2	0	0	0	0	2	2.9%
Sudan	8	0	0	0	0	8	11.4%
Tanzania	3	0	0	0	0	3	4.3%
Uganda	4	0	0	0	0	4	5.7%
Vietnam	0	0	0	1	0	1	1.4%
Zambia	1	0	0	0	0	1	1.4%
Total (% of all cases)	45 (64.3%)	2 (2.9%)	3 (4.3%)	18 (25.7%)	2 (2.9%)	70	

UK – unknown; * NEC – not elsewhere coded. Multiple possible exposure countries reported.

ROSS RIVER VIRUS

Ross River virus (RRV) infection is a vector-borne disease which is endemic in many parts of NSW. Infection rates are generally highest in the summer and autumn months. Cases are usually only followed up if they are believed to have been acquired in a non-endemic area.

As with BFV infection, the major mosquito vector for RRV in inland areas is *Culex annulirostris* which breeds in freshwater habitats. RRV transmission in coastal areas is most commonly due to saltmarsh mosquitoes, including a number of *Aedes* species.

Some marsupials are a natural reservoir for RRV and are likely to be important in the circulation of RRV that includes sporadic transmission to humans.

Summary 2018

- Case count: 572
- Notification rate: 7.1 per 100,000 population

Overall trend:

- RRV notifications decreased by 63% compared to 2017 (1551 cases)
- The 2017-2018 RRV season was moderate overall, with peak activity in known endemic areas

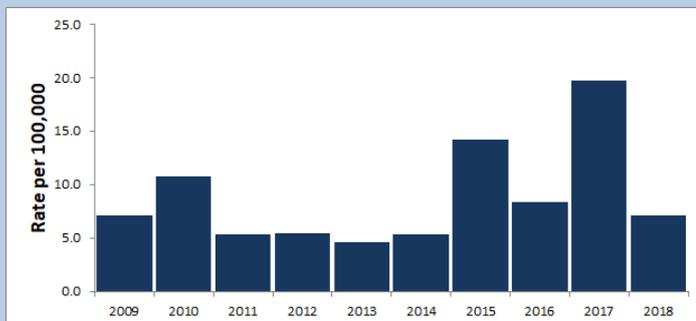
Groups with highest notification rates in 2018

- Age: 40-49 years – 13.2 per 100,000 (24% of cases)
- Sex: Male – 7.2 per 100,000 (50.3% of cases)
- Local health district:
 - Far West – 59.9 per 100,000 (3.1% of cases)
 - Hunter New England – 19.5 per 100,000 (32.0% of cases)

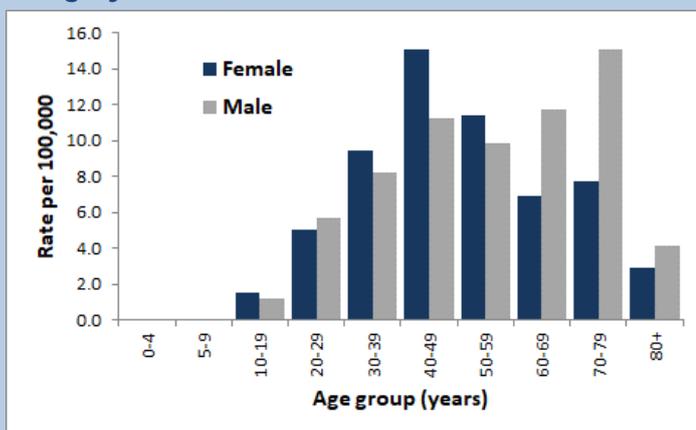
Seasonality

- Notifications peaked in May, returning to the typical autumnal peak case curve seen in most seasons.

Notification rate per 100,000 population by year, 2009 – 2018, NSW



Notification rate per 100,000 population by age category and sex, 2018, NSW



Number of cases and rates (per 100,000) by Local Health District (LHD), 2018, NSW

LHD	Count		Rate	
	2018	5yr mean	2018	5yr mean
CC	19	41.2	5.5	12.3
FW	18	20.0	59.9	66.4
HNE	183	239.4	19.5	26.3
IS	17	20.6	4.1	5.1
M	65	155.4	21.9	53.2
MNC	63	107.4	28.4	49.8
NBM	3	29.0	0.8	7.9
NNSW	61	178.2	20.0	60.2
NS	20	24.2	2.1	2.7
SES	11	17.8	1.2	2.0
SNSW	27	21.6	12.7	10.5
SWS	5	9.2	0.5	1.0
SYD	5	6.8	0.7	1.1
WNSW	69	102.0	24.4	36.6
WS	6	11.6	0.6	1.2
NSW	572	801.8	7.1	10.4

Ross River virus – continued

Place of acquisition

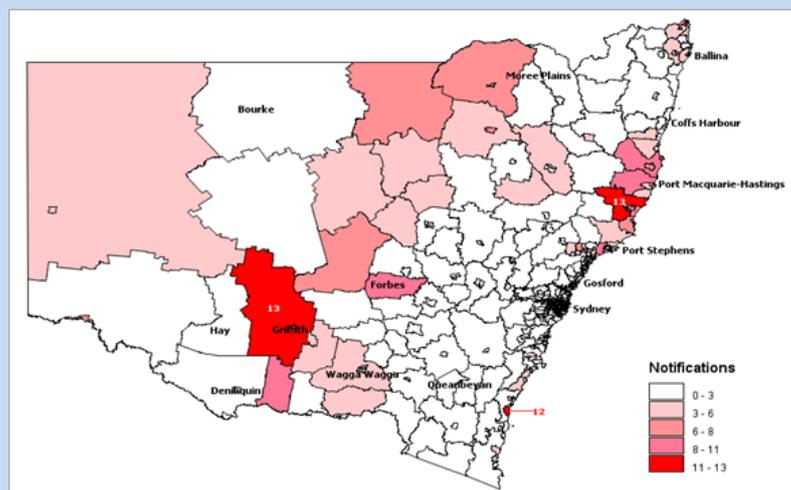
Place of residence is usually used as a surrogate for place of acquisition for Ross River virus infection, but some cases are actively followed up to determine the most likely source of acquisition, particularly when they live in areas not known to be endemic for RRV.

The highest numbers of RRV notifications were for residents of Taree Region, Griffith Region and Moruya – Tuross Head. The highest population incidence rates were for residents in the South West Rocks, Far West, and Moruya – Tuross Head regions.

Ten of the cases were believed to have acquired their infections outside of NSW; nine in other Australian states or territories, and one case believed to have been acquired in Samoa.

Ross River virus notifications by Statistical Area-2 (SA2) district, 2018, NSW.

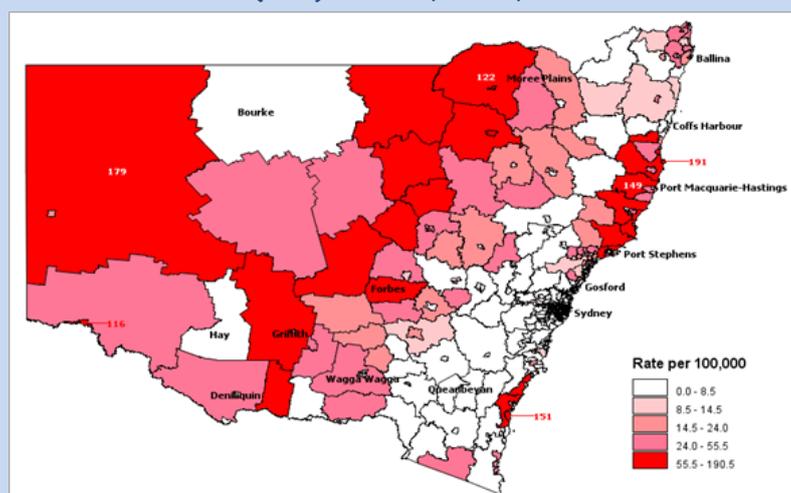
RRV notifications by Statistical Area-2 (SA2) district, 2018, NSW



Number of cases and rates (per 100,000) by Statistical Area-2 (SA2), 2018, NSW *

Region (SA2)	Count	Rate/100,000
Taree Region	13	106.2
Griffith Region	13	98.5
Moruya - Tuross Head	12	150.8
South West Rocks	10	190.5
Tweed Heads	10	52.1
Forbes	9	86.4
Griffith (NSW)	9	47.2
Port Macquarie Region	8	148.8
Kempsey Region	8	85.9
Tocumwal - Finley - Jerilderie	8	83.1
Williamtown - Medowie - Karuah	8	59.7
Moree Region	7	122.1
Wentworth - Buronga	7	116.2
Condobolin	7	97.3
Narrabri	7	95.5
Moree	7	77.8
Kempsey	7	46.9
Maitland - East	7	25.3
Forster-Tuncurry Region	6	101
Walgett - Lightning Ridge	6	83.6
Old Bar - Manning Point - Red Head	6	59.2
Forster	6	41.4
Maitland - West	6	28.9
Taree	6	28.5
Tweed Heads - South	6	21.6

RRV notification rates per 100,000 population by Statistical Area-2 (SA2) district, 2018, NSW



* Data presented for the 25 regions with 6 or more RRV notifications in 2018.

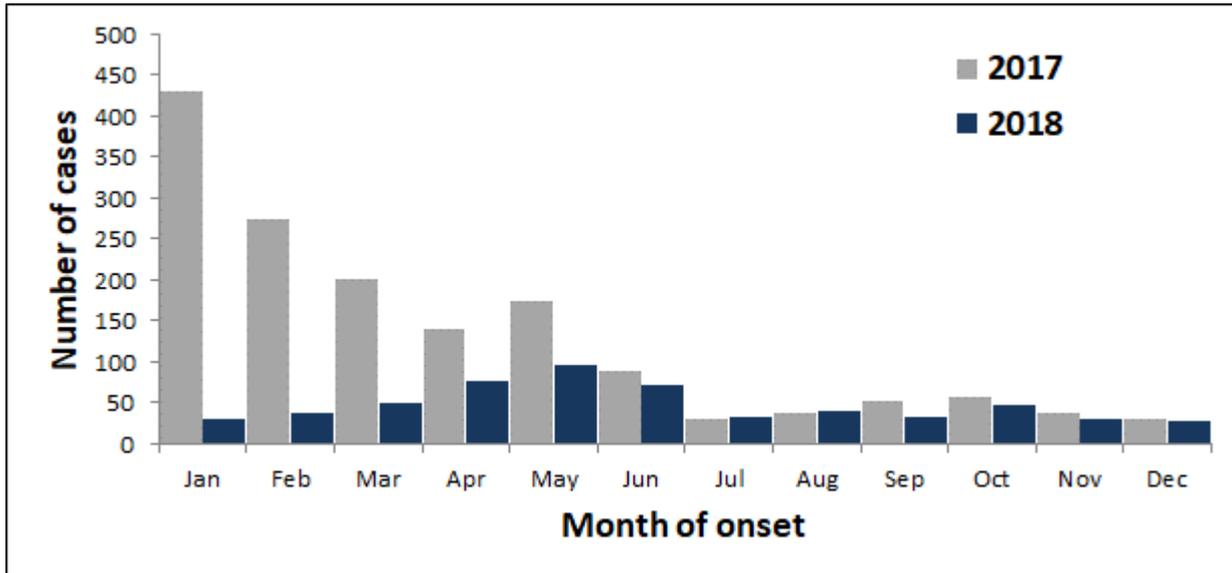
Ross River virus – continued

Month of acquisition

Notifications peaked in May (96 cases) which marked a return to the typical pattern of notifications, unlike the summer peak seen in the previous local arbovirus season, driven by inland flooding in late 2016. There were no marked variations seen in the timing of RRV activity between residents of coastal and inland regions of NSW known to have endemic RRV activity.

RRV notifications received during the winter months when there is little mosquito activity are assumed to mostly represent serological detections of infections from earlier in the year.

Number of RRV cases by month of onset, 2018 compared to 2017, NSW.



ZIKA VIRUS

Zika virus (ZIKV) is a flavivirus, closely related to dengue virus. It was first isolated in 1947 in Uganda's Zika forest. There are two distinct ZIKV lineages: the African lineage and the Asian lineage, the latter of which has emerged more recently in the Pacific and the Americas.

The first outbreak of ZIKV infection identified outside of Africa and Asia, occurred on Yap Island, FSM in 2007. In 2015, ZIKV emerged in South America with widespread outbreaks reported initially in Brazil and Columbia, with subsequent spread to many countries in South and Central America and the Caribbean.

Like dengue, transmission is principally via the bite of an infective *Aedes aegypti* mosquito. Maternal-foetal transmission of ZIKV has also been well documented with potentially serious consequences for the unborn child, including congenital abnormalities such as microcephaly. Sexual transmission of ZIKV is rare but well documented.

Summary 2018

- Case count: 1
- Notification rate: 0.01 per 100,000 population
- Congenital case: 0

Overall trend:

- Further decrease in notifications, consistent with resolving overseas outbreaks from previous years.

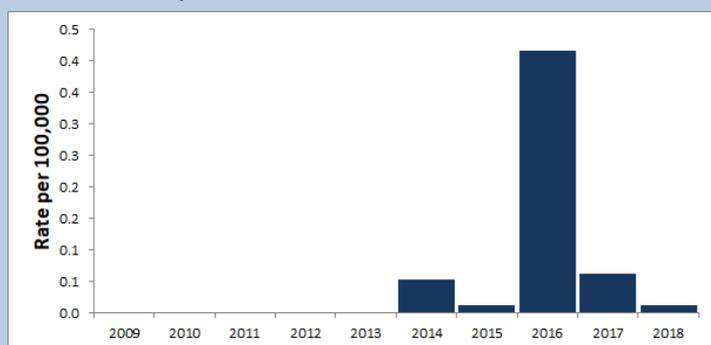
Groups with highest notification rate in 2018

- Age: 50-59 years – 0.1 per 100,000
- Sex: Female - 0.02 per 100,000
- Local health district
Northern NSW – 0.3 per 100,000

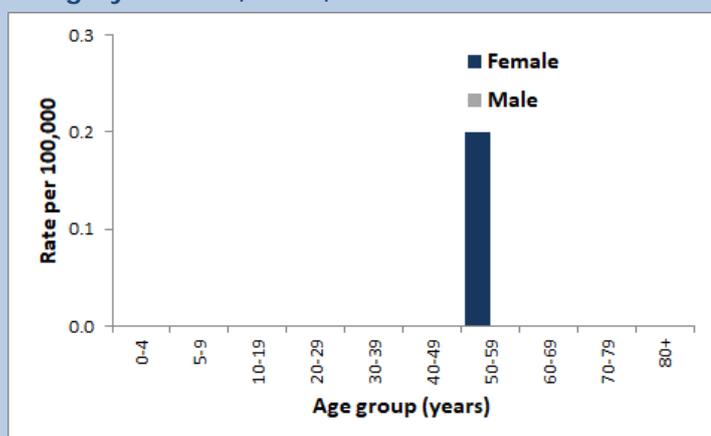
Place of acquisition in 2018

- Vanuatu

Notification rate per 100,000 population by year, 2009 – 2018, NSW



Notification rate per 100,000 population by age category and sex, 2018, NSW



Number of cases and rates (per 100,000) by Local Health District, 2018, NSW

LHD	Count		Rate	
	2018	5yr mean	2018	5yr mean
CC	0	0.8	0.0	0.2
FW	0	0.0	0.0	0.0
HNE	0	0.0	0.0	0.0
IS	0	1.0	0.0	0.2
M	0	0.6	0.0	0.2
MNC	0	0.2	0.0	0.1
NBM	0	0.4	0.0	0.1
NNSW	1	0.2	0.3	0.1
NS	0	1.6	0.0	0.2
SES	0	1.4	0.0	0.2
SNSW	0	0.0	0.0	0.0
SWS	0	0.4	0.0	0.2
SYD	0	1.0	0.0	0.2
WNSW	0	0.2	0.0	0.1
WS	0	0.6	0.0	0.1
NSW	1	8.4	0.0	0.1

METHODS

The data in this report are derived from disease surveillance and outbreak investigation activities undertaken by staff from NSW public health units and Communicable Diseases Branch. The management of human vector-borne disease surveillance in NSW is the shared responsibility of NSW public health units, and both Communicable Diseases Branch and Environmental Health Branch³ of Health Protection NSW.

Notifiable vector-borne diseases in NSW

Under the Public Health Act 2010 (NSW), all arboviral infections are notifiable in NSW. Other notifiable vector-borne diseases are malaria and epidemic typhus. NSW laboratories report cases to NSW public health units. Notifiable disease data are routinely entered by public health unit staff into the NSW Notifiable Conditions Information Management System (NCIMS).⁴

Data sources for this report

Data in this report has been extracted from NCIMS held by Health Protection NSW.

Analysis

We analysed data for all notifiable vector-borne infections for NSW residents. In June 2019, the notification data for the 2018 calendar year were extracted from NCIMS using Secure Analytics for Population Health Research and Intelligence (SaPHARi) and based on the actual or calculated date of onset of disease. The count of notifications of each notifiable vector-borne disease for 2018 was calculated and this was then used to calculate crude annual incidence ('notification') rates for each disease based upon the NSW estimated resident population at 30 June 2018.⁵ Mean annual notification counts and incidence rates for the five year period 2013-2017 were also calculated for comparison with the 2018 data.

Notification maps of BFV and RRV infection by ABS statistical area level 2 (SA2) of residence for 2018 are shown. Place of residence is used as a surrogate for place of acquisition for cases of these infections but the infection may have been acquired elsewhere.

3. Environmental Health Branch auspices the NSW mosquito and sentinel chicken surveillance for vector-borne arboviruses which is coordinated by the Medical Entomology Department, CIDMLS, ICPMR, Pathology West. For surveillance reports see: www.health.nsw.gov.au/environment/pests/vector/Pages/surveillance.aspx.

4. NSW Health Notifiable Conditions Information Management System (NCIMS), Communicable Diseases Branch and Centre for Epidemiology and Evidence, NSW Ministry of Health

5. Notifications per 100,000 estimated resident population based on ABS 2016 Census counts. Population projections by the Centre for Epidemiology and Evidence, NSW Ministry of Health, based on data from the NSW Department of Planning and Environment.

VBD RESOURCES

NSW Health Human VBD fact sheets

- Barmah Forest virus
https://www.health.nsw.gov.au/Infectious/factsheets/Pages/barmah_forest_virus_infection.aspx
- Chikungunya virus
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/chikungunya.aspx>
- Dengue virus
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/dengue.aspx>
- Japanese encephalitis virus
https://www.health.nsw.gov.au/Infectious/factsheets/Pages/japanese_encephalitis.aspx
- Kunjin virus
https://www.health.nsw.gov.au/Infectious/factsheets/Pages/kunjin_virus.aspx
- Lyme borreliosis
https://www.health.nsw.gov.au/Infectious/factsheets/Pages/Lyme_disease.aspx
- Malaria
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/malaria.aspx>
- Murray Valley encephalitis virus
- Ross River virus
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/ross-river-fever.aspx>
- Zika virus
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/zika-virus-infection.aspx>
- Mosquitoes are a health hazard
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/mosquito.aspx>
- Staying healthy when travelling overseas
<https://www.health.nsw.gov.au/Infectious/factsheets/Pages/staying-healthy-when-travelling-overseas.aspx>

NSW Health Environmental VBD surveillance

(<https://www.health.nsw.gov.au/environment/pests/vector/Pages/surveillance.aspx>)

Mosquito monitoring

In NSW, mosquito trapping and monitoring is undertaken by the Institute for Clinical Pathology and Medical Research (ICPMR) on behalf of Health Protection NSW. Mosquito populations are routinely monitored at up to 30 locations across the State from November to April to monitor mosquito types and densities that may indicate increased arboviral risk, and to test for the presence of clinically relevant alphaviruses and flaviviruses.

Sentinel chicken surveillance

In NSW, sentinel chicken surveillance is undertaken by the Institute for Clinical Pathology and Medical Research (ICPMR) on behalf of the Health Protection NSW. Sentinel chicken flocks located at inland locations are bled weekly during the mosquito season (April – November) to detect the transmission of Murray Valley encephalitis virus and Kunjin virus.

Environmental VBD resources

(<https://www.health.nsw.gov.au/environment/pests/vector/Pages/resources.aspx>)

Including *Fight the Bite* campaign posters and related fact sheets.

ACKNOWLEDGEMENTS

The NSW Vector-Borne Diseases Annual Report 2018 was possible due to the collaborative work of many people who contribute in varying capacities to the management of communicable enteric diseases in NSW, including the following:

- NSW public health unit staff for surveillance, reporting and investigation of unusual disease cases and outbreaks
- Public and private laboratories, supported by the NSW Arbovirus Reference Laboratory, Clinical Virology, CIDMLS, ICPMR, Pathology West
- Communicable Diseases Branch, Health Protection NSW, NSW Health.
- Clinicians across NSW who assist in the diagnosis and follow up vector-borne diseases.