



TEXAS
Health and Human
Services

**Texas Department of State
Health Services**

Arbovirus Activity in Texas 2018 Surveillance Report

August 2019

**Texas Department of State Health Services
Zoonosis Control Branch**

Overview

Viruses transmitted by mosquitoes are referred to as **arthropod-borne** viruses or arboviruses. Arboviruses reported in Texas may include California (CAL) serogroup viruses, chikungunya virus (CHIKV), dengue virus (DENV), eastern equine encephalitis virus (EEEV), Saint Louis encephalitis virus (SLEV), western equine encephalitis virus (WEEV), West Nile virus (WNV), and Zika virus (ZIKV), many of which are endemic or enzootic in the state. In 2018, reported human arboviral disease cases were attributed to WNV (82%), DENV (11%), CHIKV (4%), ZIKV (2%), and CAL (1%) (Table 1). In addition, there were two cases reported as arbovirus disease cases which could not be diagnostically or epidemiologically differentiated between DENV and ZIKV. Animal infections or disease caused by WNV and SLEV were also reported during 2018. Local transmission of DENV, SLEV, and WNV was documented during 2018 (Figure 1). No reports of EEEV or WEEV were received during 2018.

Table 1. Year-End Arbovirus Activity Summary, Texas, 2018

Arbovirus	Positive Mosquito Pools	Avian	Equine	Human*						TOTAL
				Fever	Neuroinvasive	Severe	TOTAL (Human)	Deaths	PVD‡	
CAL					1		1			1
CHIK				7			7			7
DEN				20			20			20
SLE	2						0			2
WN	1,021	6	19	38	108		146	11	24	1,192
Zika**							4			4
TOTAL	1,023	6	19	65	109	0	178	11	24	1,226

CAL - California serogroup includes California encephalitis, Jamestown Canyon, Keystone, La Crosse, Snowshoe hare and Trivittatus viruses

CHIK - Chikungunya

DEN - Dengue

SLE - Saint Louis encephalitis

WN - West Nile

‡PVD - Presumptive viremic blood donors are people who had no symptoms at the time of donating blood through a blood collection agency, but whose blood tested positive when screened for the presence of West Nile virus or Zika virus. Unless they meet the case reporting criteria, they are not counted as a case for official reporting purposes and are not included in the "Total" columns.

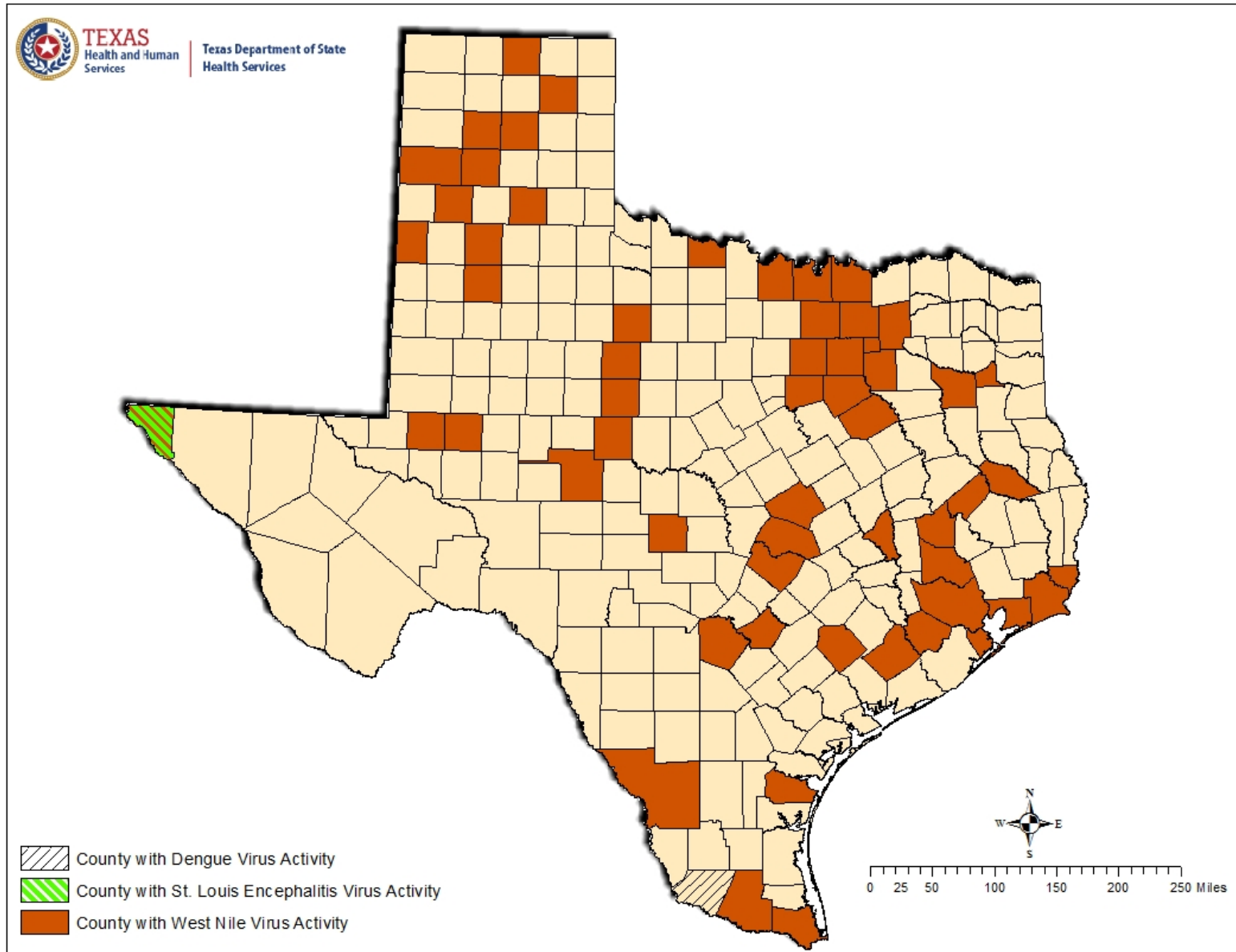
*Does not include two cases which could not be differentiated between dengue and Zika viruses.

**Zika disease cases

California Serogroup Viruses

California serogroup viruses are bunyaviruses and include California encephalitis virus (CEV), Jamestown Canyon virus, Keystone virus, La Crosse virus (LACV), snowshoe hare virus, and Trivittatus virus. These viruses are maintained in a cycle between mosquito vectors and vertebrate hosts in forest habitats. In the United States (U.S.), approximately 40-100 reported cases of human neuroinvasive disease are caused by LACV each year, mostly in mid-Atlantic and southeastern states. From 2002-2017, Texas reported a total of five cases of human CAL serogroup virus disease (range: 0-3 cases/year): one case of CEV neuroinvasive disease and four cases of LACV neuroinvasive disease. In 2018, Texas reported one travel-associated human case of LACV neuroinvasive disease.

Figure 1. Texas Counties Reporting Arbovirus Activity* in Any Species, 2018

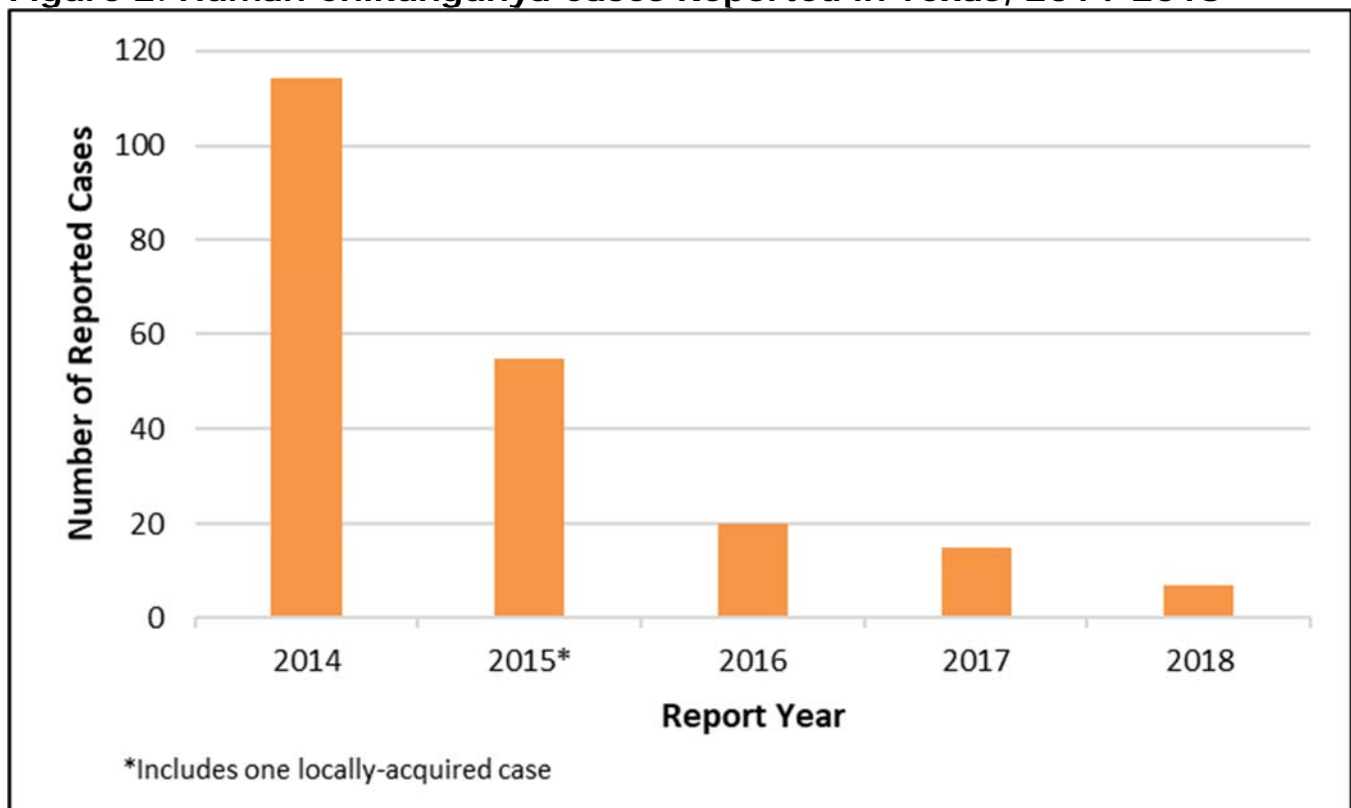


* Indicated by an arbovirus-positive bird, mosquito pool, sentinel chicken, horse, or human (disease case or presumptive viremic donor). Excludes imported cases of chikungunya, dengue, Zika, and other arboviruses. Absence of reported activity from counties may be due to absence of a surveillance program for non-human cases.

Chikungunya Virus

Chikungunya virus is an alphavirus that is maintained in a cycle between *Aedes aegypti* or *Ae. albopictus* mosquitoes and human hosts. Since 2004, several extensive outbreaks have been reported from countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, the first local transmission of CHIKV in the Americas was reported in the Caribbean. Since then, locally-acquired cases of chikungunya disease (CHIK) have been reported throughout the region, including the U.S. Prior to the emergence of CHIKV in the Americas in 2013, Texas had reported fewer than five travel-associated CHIK cases. In contrast, from 2014-2017, Texas reported a total of 203 travel-associated CHIK cases (range: 15-114 cases/year) and one locally-acquired case in Cameron County (2015) (Figure 2). In 2018, Texas reported six travel-associated cases of CHIK, one case where travel status was unknown as the case was lost to follow-up, and no locally-acquired cases. Reported cases traveled to India (50%), Aruba (17%), Mexico (17%), and the Philippines (17%).

Figure 2. Human Chikungunya Cases Reported in Texas, 2014-2018

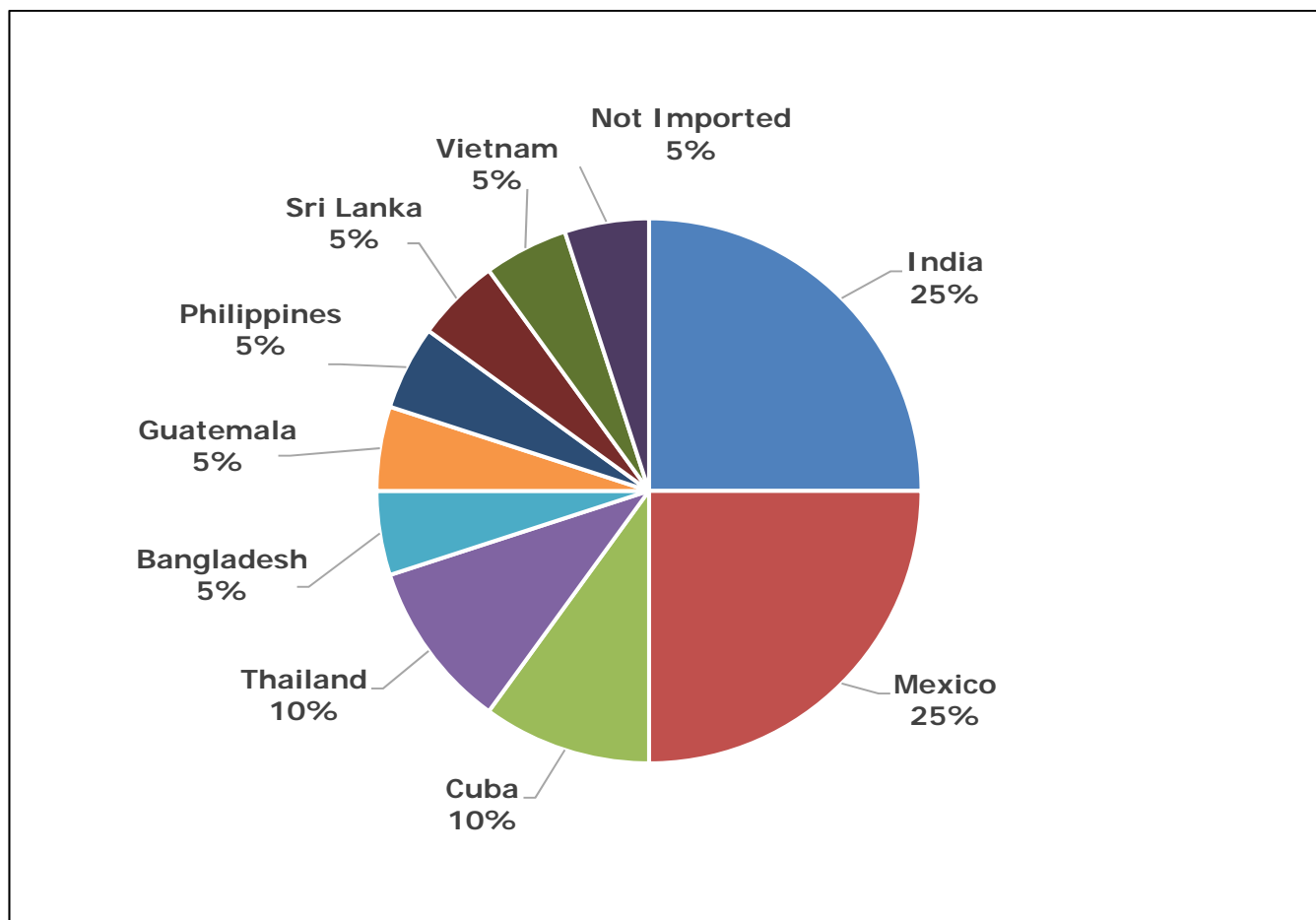


Dengue Virus

Dengue virus is a flavivirus that is maintained in a cycle between *Ae. aegypti* or *Ae. albopictus* mosquitoes and human hosts. It is established throughout the tropical and subtropical Americas, including northern Mexico. Human cases are most often imported into the U.S. as a result of travel to a dengue-endemic country, but locally-acquired cases have been reported in Florida, Hawaii, and Texas. From 2003-2017, Texas reported a total of 403 cases of dengue (annual median = 21 cases, range: 1-95 cases/year). During this time period, 27 cases of locally-

acquired dengue were reported from the Lower Rio Grande Valley region of Texas: 24 in Cameron County, 2 in Hidalgo County, and 1 in Willacy County. In 2018, Texas reported 19 travel-associated cases of dengue and one locally-acquired case of dengue in Starr County (Figure 1). This local transmission event likely resulted from increased dengue transmission in the neighboring Mexican states of Tamaulipas and Nuevo Leon during the fall of 2018. The majority of cases reported travel to Mexico (25%), India (25%), and Southeast Asia (20%) (Figure 3).

Figure 3. Reported Cases of Dengue by Country of Acquisition, Texas, 2018 (N = 20)



Saint Louis Encephalitis Virus

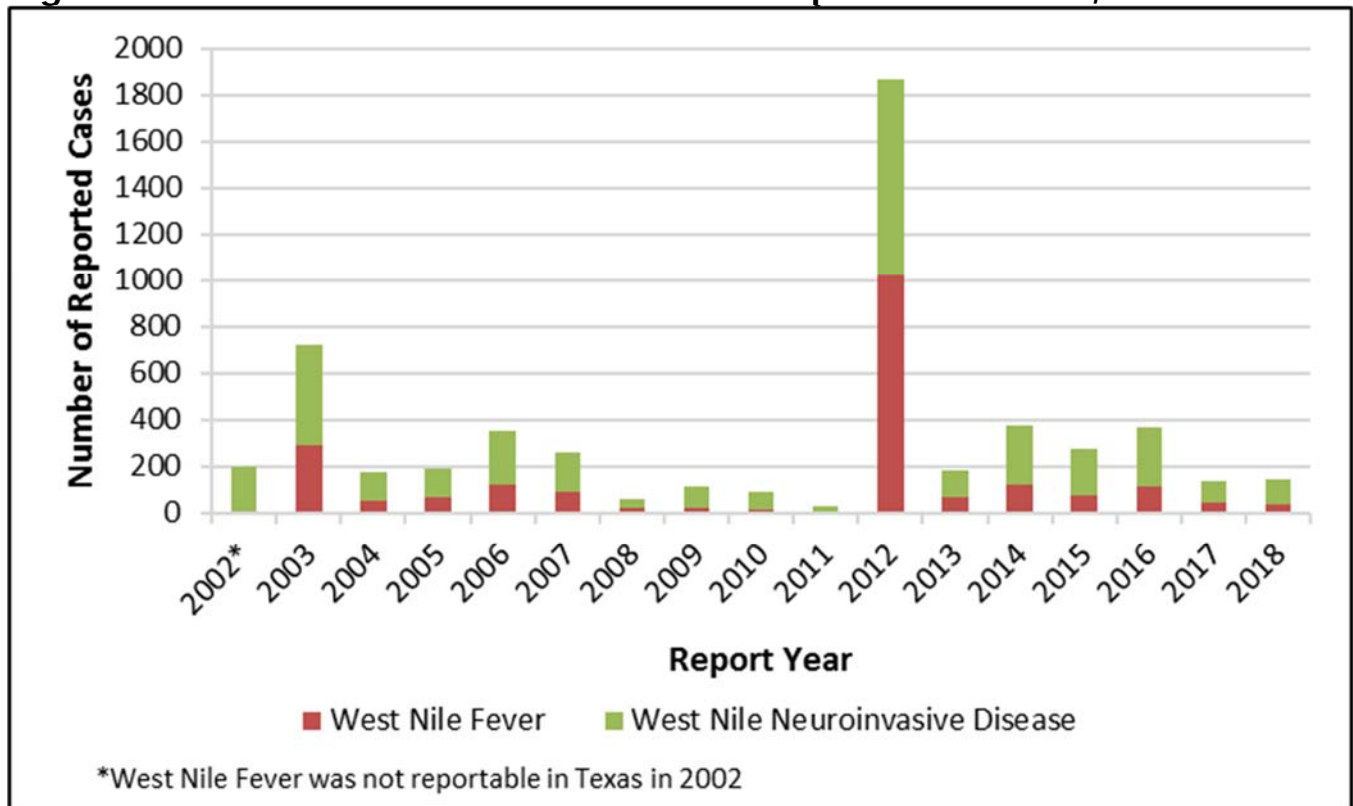
Saint Louis encephalitis (SLE) virus is a flavivirus maintained in a cycle between *Culex* species mosquitoes and birds, with occasional transmission to humans. The geographic range of SLEV extends from North to South America, but the majority of human cases have occurred in the eastern and central U.S., where periodic epidemics have occurred since the 1930s. In Texas and states with milder climates, SLEV can circulate year-round. From 2003-2017, Texas reported 38 cases of SLE in humans (annual median = 1 case, range: 0-18 cases/year). In 2018, two SLEV-positive mosquito pools were identified in El Paso County (Figure 1). No human cases of SLE were reported in 2018.

West Nile Virus

West Nile virus is a flavivirus maintained in a cycle between mosquitoes (primarily *Culex* species) and birds. West Nile virus circulates on every continent except Antarctica. Before 1999, WNV had not been documented in the Western Hemisphere. In 1999, human disease associated with WNV infection was identified in New York City. By the end of October 1999, WNV infections had been confirmed in multiple native species of birds as well as horses from New York City and areas within a 200-mile radius. Since 1999, WNV infections in humans, birds, equines, other animals, and mosquitoes have been reported throughout the U.S.

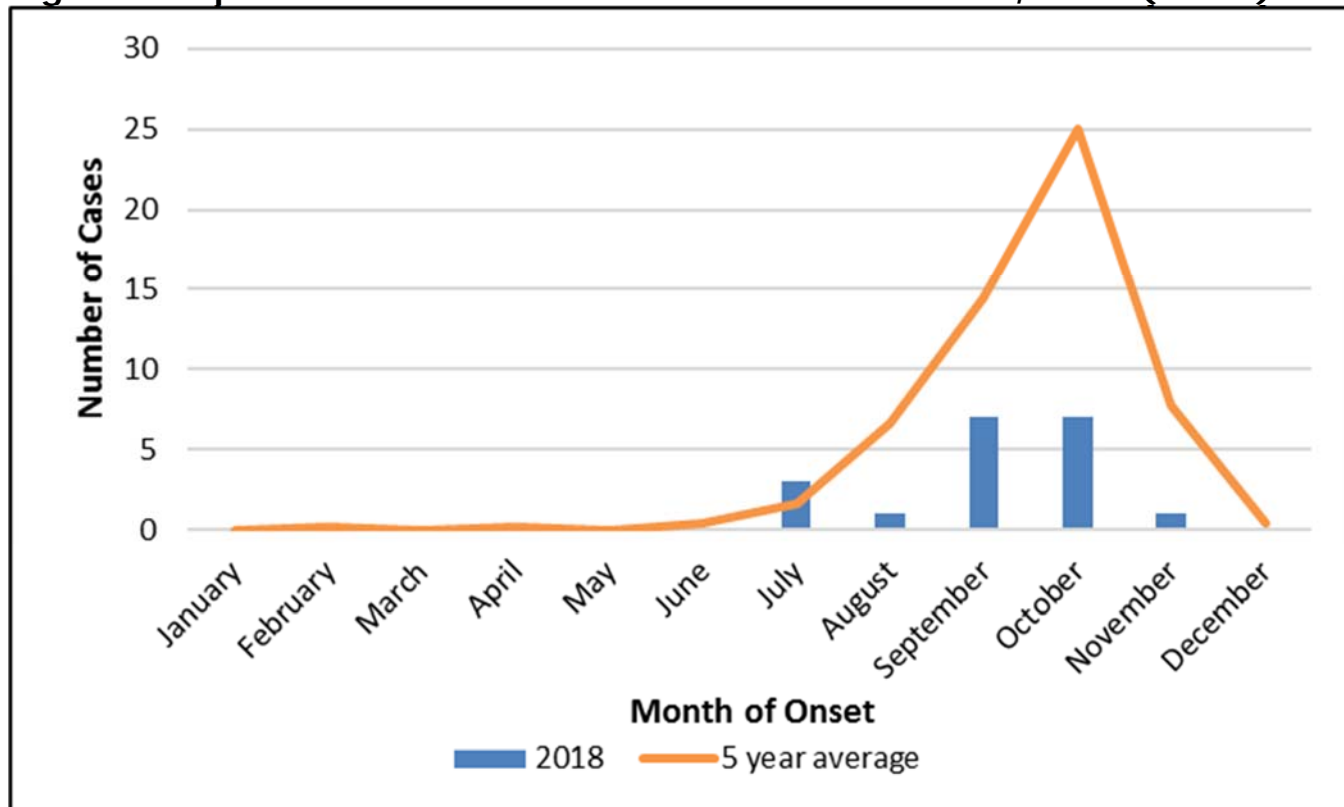
West Nile virus was first reported in Texas in 2002. Initially, only West Nile neuroinvasive disease (WNND) was reportable in humans; West Nile fever (WNF) became a reportable condition in 2003. From 2002-2017, a total of 5,412 human WNV disease cases were reported in Texas (annual median = 198.5 cases, range: 27-1,868 cases/year). In 2011, Texas reported its lowest number of human WNV disease cases, 27, but then a record high number of 1,868 cases were reported in 2012 (Figure 4). In 2018, 146 human WNV disease cases were reported: 108 (74%) WNND and 38 (26%) WNF. Additionally, there were 24 presumptive viremic blood donors (PVDs) reported by blood collection agencies; these individuals are asymptomatic blood donors who test positive for WNV on donor screening tests and represent likely infections with WNV. Presumptive viremic donors are not considered cases unless symptoms consistent with WNV disease develop within two weeks of their positive blood screening test and follow-up testing verifies the infection.

Figure 4. Human West Nile Disease Cases Reported in Texas, 2002-2018



During 2018, evidence of WNV activity (human, horse, bird, mosquito, or sentinel chickens) was reported from 58 (23%) of the 254 counties in Texas (Figure 1). Twenty-four (9%) counties reported WNV-positive mosquito pools, 43 (17%) reported human WNV disease cases, 8 (3%) reported PVDs, 16 (6%) reported equine WNV disease cases, and 1 (~1%) county reported WNV-positive birds. In 2018, WNV infection was reported in 1,021 mosquito pools, 19 horses, and 6 dead birds (Table 2). The majority (95%) of equine WNV disease cases had onsets of illness between July and October (Figure 5).

Figure 5. Equine West Nile Virus Disease Cases in Texas, 2018 (N=19)



As with other arboviral diseases, human WNV disease cases are reported by county of residence, but this may not reflect the location of infection with WNV in each case, due to widespread disease transmission risk and possible patient travel outside of the residence county during the disease incubation period. However, since its emergence in Texas in 2002, the vector species, virus, and appropriate conditions for transmission are present in most parts of the state from summer to late fall. Risk of WNV infection is present throughout Texas during the appropriate season, regardless of the detection of WNV in non-human surveillance samples, such as mosquito pools.

It is important to note that Texas does not have a state-wide mosquito surveillance program and that consequently, non-human WNV surveillance varies based on the resources available to each county. A lack of WNV-positive mosquito pools in a county may be due to diminished mosquito trapping and testing capacity and is not necessarily indicative of a lack of WNV transmission risk in the county.

Table 2. WNV Activity Reported by Species and County, Texas, 2018

County	WNV								COUNTY TOTAL
	M	A	E	SC	H				
					WNF	WNND	PVD‡	TOTAL	
Angelina					1			1	1
Bailey						1		1	1
Bell	5							0	5
Bexar	2					1		1	3
Brazos	1				1	1		2	3
Briscoe					1			1	1
Cameron	7					1		1	8
Carson						1		1	1
Castro						1		1	1
Chambers					1			1	1
Collin	23				2	2		4	27
Cooke	1		1					0	2
Dallas	203		2		2	11		13	218
Deaf Smith			1					0	1
Denton	23		2			2		2	27
Ector						1		1	1
El Paso	20				3	3	1	6	26
Ellis						1		1	1
Fort Bend	3					2		2	5
Galveston						1		1	1
Grayson	2							0	2
Gregg						2		2	2
Guadalupe					1			1	1
Hale					1			1	1
Hansford			1		1			1	2
Harris	310	6	1		8	31	13	39	356
Haskell						1		1	1
Hidalgo			1		2	2	3	4	5
Hunt			1			1		1	2
Jefferson	8							0	8
Johnson	5					2		2	7
Jones			2					0	2
Kaufman						1		1	1
Lavaca			1					0	1
Lubbock	5				1	3		4	9
Mason			1					0	1
Midland					1	1	1	2	2
Montague			1					0	1
Montgomery	105				3	8	2	11	116

Table 2 (continued)

County	WNV								COUNTY TOTAL
	M	A	E	SC	H				
					WNF	WNND	PVD‡	TOTAL	
Navarro						1		1	1
Nueces	1							0	1
Orange	3					1		1	4
Potter	1						2	0	1
Randall			1		1		1	1	2
Roberts						1		1	1
Rockwall	1							0	1
Runnels						1		1	1
Smith					1	3		4	4
Tarrant	272		1		6	12		18	291
Taylor			1					0	1
Tom Green						1		1	1
Travis	8				1	3		4	12
Trinity						1		1	1
Walker						1		1	1
Webb						1		1	1
Wharton						1	1	1	1
Wichita	1		1					0	2
Williamson	11							0	11
Total Number of Reports	1,021	6	19	0	38	108	24	146	1,192

M-Mosquito A-Avian E-Equine SC-Sentinel Chicken H-Human
WNV-West Nile Virus WNF-West Nile Fever WNND-West Nile Neuroinvasive Disease
PVD-Presumptive Viremic Blood Donor
‡PVDs are not included in any of the "Total" columns.

Due to the importance of WNV in Texas, additional analysis of human disease data was performed. The median age at onset of illness was 63 years (range: 16-92 years) for all cases. Cases of WNND tended to be slightly older (median = 66 years, range: 16-92 years), while cases of WNF were younger (median = 54 years, range: 16-81 years). The majority (60%) of all WNV disease cases were in non-Hispanic whites, followed by Hispanics (27%) (Table 3).

Of the 108 reported cases of WNND, 60 (56%) presented with encephalitis, including meningoencephalitis, and 35 (32%) presented with meningitis only (Table 3). The most common clinical signs and symptoms reported for WNND cases were fever (94%), headache (59%), altered mental state (58%), severe malaise (58%), and nausea or vomiting (57%). The most common clinical signs and symptoms reported for WNF cases were fever (97%), headache (82%), chills (79%), severe malaise (74%), and myalgia (63%). The majority of WNND cases were hospitalized

(95%), compared with 47% of WNF cases. The median length of hospitalization for WNND cases was 9 days (range: 1-96 days) while the median length of hospitalization for WNF cases was 4.5 days (range: 1-10 days). There were 11 deaths attributed to WNV (10%) among reported cases of WNND in 2018. No WNV-related deaths were reported among WNF cases.

Table 3. Characteristics of Reported Human WNV Disease Cases, Texas, 2018

Characteristic	WNND (N=108)		WNF (N=38)	
	Number	%	Number	%
Gender				
Male	68	63	26	68
Female	40	37	12	32
Age Group at Onset (years)				
<1-9	-	-	-	-
10-19	1	1	4	11
20-29	1	1	4	11
30-39	5	5	3	8
40-49	22	20	5	13
50-59	12	11	9	24
60-69	24	22	6	16
70-79	34	31	6	16
80+	9	8	1	3
Race/Ethnicity				
Non-Hispanic White	63	58	24	63
Hispanic	30	28	9	24
Asian/Pacific Islander	2	2	3	8
Black	7	6	1	3
American Indian/Alaska Native	-	-	-	-
Unknown	6	6	1	3
Clinical Syndrome				
Encephalitis/Meningoencephalitis	60	56		
Meningitis	35	32		
Other Neuroinvasive Presentation	8	7		
Acute Flaccid Paralysis	3	3		
Guillain-Barré Syndrome	2	2		
Uncomplicated Fever			38	100

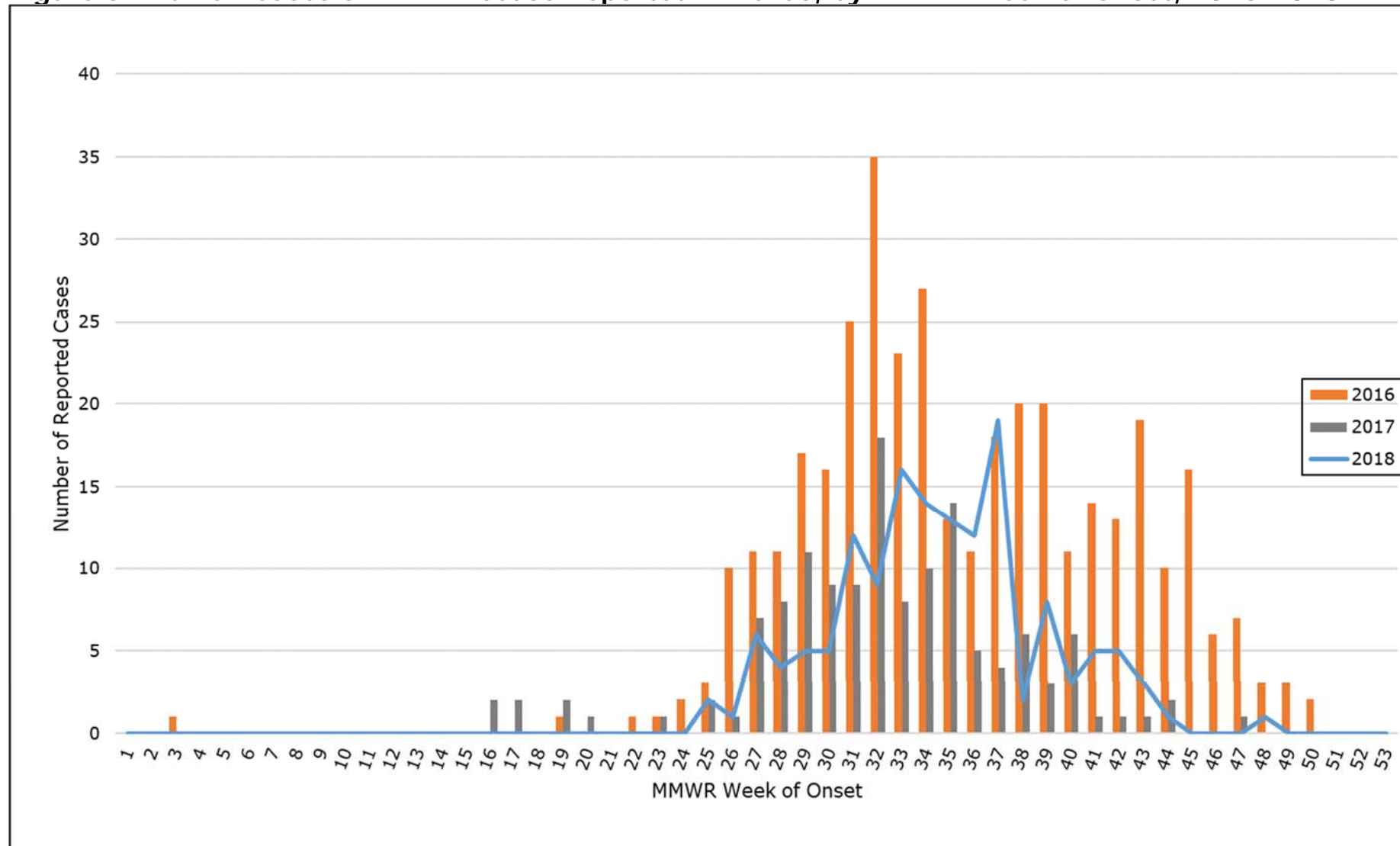
Table 3 (continued)

Characteristic	WNND (N=108)		WNF (N=38)	
	Number	%	Number	%
Clinical Signs/Symptoms				
Fever	101	94	37	97
Headache	64	59	31	82
Altered Mental Status	63	58	3	8
Severe Malaise	63	58	28	74
Nausea or Vomiting	62	57	18	47
CSF Pleocytosis	59	55		
Chills	57	53	30	79
Myalgia	40	37	24	63
Stiff Neck	35	32	9	24
Arthralgia	25	23	18	47
Clinical Course				
Hospitalized	103	95	18	47
Median Length of Stay (Days)	9		4.5	
Death	11	10	-	-

In 2018, onsets of illness for all human WNV disease cases ranged from MMWR week 24 (mid-June) to MMWR week 48 (late November) (Figure 6). The median week of illness onset in 2018 was MMWR week 30 (late August), which is slightly later than the median illness onset in 2017 (MMWR week 32, mid-August) and slightly earlier than the median illness onset in 2016 (MMWR week 35, late August). The majority (97%) of human WNV disease cases had onsets of illness between July and October.

In 2018, the statewide incidence of all human WNV disease cases was 0.5 cases per 100,000 population. The statewide incidence for WNND was 0.4 cases per 100,000 population (Table 4). Overall, WNV disease incidence was highest in Montgomery County (1.9 cases per 100,000 population) and Tarrant County (0.9 cases per 100,000 population). WNND incidence was highest in Montgomery County (1.4 cases per 100,000 population). DSHS Public Health Region (PHR) 1 reported the highest incidence of WNV disease (1.4 cases per 100,000 population) (Table 5).

Figure 6. Human Cases of WNV Disease Reported in Texas, by MMWR Week of Onset, 2016-2018



See <https://wwwn.cdc.gov/nndss/downloads.html> for more information about MMWR week calendars

Table 4. Reported Human WNV Disease Incidence Rates in Counties with Five or More* Cases, 2018

County	Population**	WNF and WNND Cases	Incidence Rate (per 100,000)	Only WNND Cases	Incidence Rate (per 100,000)
Montgomery	578,393	11	1.9	8	1.4
Tarrant	2,074,442	18	0.9	12	0.6
Harris	4,796,235	39	0.8	31	0.6
El Paso	861,801	6	0.7	3	*
Dallas	2,660,575	13	0.5	11	0.4
All Texas Counties	28,716,213	146	0.5	108	0.4

* Calculation of rates is not recommended when there are fewer than five events in the numerator because the calculated rate can be unstable and exhibit wide confidence intervals.

** 2018 population projections accessed 6/21/19, Texas Demographic Center
<https://demographics.texas.gov>

Table 5. Reported Human WNV Disease Cases and Incidence Rates by DSHS Public Health Region (PHR), 2018

PHR	Population*	WNF and WNND Cases	Incidence Rate (per 100,000)
1	882,931	12	1.4
2/3	8,352,500	45	0.5
4/5N	1,533,684	8	0.5
6/5S	7,635,280	57	0.7
7	3,456,025	6	0.2
8	3,019,417	2	**
9/10	1,565,902	10	0.6
11	2,270,474	6	0.3
TOTAL	28,716,213	146	0.5

See <https://www.dshs.texas.gov/regions/state.shtm> for map depicting DSHS PHRs

* 2018 population projections accessed 6/21/19, Texas Demographic Center
<https://demographics.texas.gov>

** Calculation of rates is not recommended when there are fewer than five events in the numerator because the calculated rate can be unstable and exhibit wide confidence intervals.

Zika Virus

Zika virus is a flavivirus that is maintained in a cycle between *Ae. aegypti* or *Ae. albopictus* mosquitoes and human hosts. Zika virus was first discovered in 1947 and is named after the Zika forest in Uganda. The first human cases of disease caused by Zika virus were detected in the 1950s and, since then, sporadic outbreaks of

Zika disease (ZIKVD) have been reported in tropical Africa, Southeast Asia, and the Pacific Islands. In late 2015, the first local transmission of ZIKV in the Americas was reported in Brazil. Beginning in 2016, locally-acquired cases of ZIKVD were reported throughout Latin America, the Caribbean Basin, and the southernmost parts of Florida and Texas.

Similar to WNV and many other arboviral infections, the majority of infections with ZIKV are asymptomatic. Unique among arboviruses, ZIKV can cause birth defects and fetal loss if a pregnant woman is infected during gestation, and ZIKV can be transmitted sexually as well.

Cases of Zika disease (individuals who report symptoms) and Zika infection (individuals who report no symptoms) became nationally notifiable in 2016. Zika infections are not included in public data reports given the minimal impact on distribution of cases across the state and to maintain patient confidentiality.

During 2016, Texas reported 315 ZIKVD cases, including eight locally-acquired cases: six transmitted by mosquitoes and two sexually-transmitted cases. During 2017, Texas reported 55 ZIKVD cases, five of which were locally transmitted by mosquitoes in Cameron and Hidalgo counties.

In 2018, Texas reported four travel-associated ZIKVD cases; cases reported travel to Belize (2), India (1), and Mexico (1). This declining trend reflects the decrease in ZIKV activity throughout the Americas and globally, as the vast majority of Texas cases are acquired during travel.

Resources:

DSHS Arboviral Diseases webpage:

<https://www.dshs.texas.gov/idcu/disease/arboviral/>

CDC La Crosse Encephalitis Virus webpage: <https://www.cdc.gov/lac/>

CDC Chikungunya Virus webpage: <https://www.cdc.gov/chikungunya/>

CDC Dengue Virus webpage: <https://www.cdc.gov/dengue/>

CDC Eastern Equine Encephalitis webpage:

<https://www.cdc.gov/EasternEquineEncephalitis/>

CDC Saint Louis Encephalitis Virus webpage: <https://www.cdc.gov/sle/>

CDC West Nile Virus webpage: <https://www.cdc.gov/westnile/>

CDC Zika webpage: <https://www.cdc.gov/zika/>

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