



TEXAS
Health and Human
Services

Texas Department of State
Health Services

Arbovirus Activity in Texas 2015 Surveillance Report

April 2017

**Texas Department of State Health Services
Infectious Disease Control Unit
Zoonosis Control Branch**

Overview

Viruses transmitted by mosquitoes are referred to as arthropod-borne viruses or arboviruses. Arboviruses causing reported human infection in Texas include California serogroup viruses (CAL), chikungunya virus (CHIKV), dengue virus (DENV), eastern equine encephalitis virus (EEEV), Saint Louis encephalitis virus (SLEV), West Nile virus (WNV), and Zika virus (ZIKV), many of which are endemic to the state. In 2015, human arbovirus infection in Texas was attributed to WNV (74%), CHIKV (15%), DENV (9%), and ZIKV (2%) (Table 1).

Table 1. Year-End Arbovirus Activity Summary, Texas, 2015

Disease	Positive Mosquito Pools	Avian	Equine	Sentinel Chicken	Human						TOTAL
					Fever	Neuroinvasive	Severe	TOTAL (HUMAN)	Deaths	Presumptive Viremic Donors [‡]	
CAL	1				0	0		0	0		1
CHIKV	0				55	0		55	0		55
DENV	0				30	0	2	32	0		32
EEEV	0	0	8	28	0	0		0	0		36
SLEV	4	0		1	0	0		0	0		5
WNV	1565	14	31	1	79	196		275	16	32	1886
ZIKV	0				8	0		8	0	0	8
TOTAL	1570	14	39	30	172	196	2	370	16	32	2023

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

CHIKV - Chikungunya Virus

DENV - Dengue Virus

EEEV - Eastern Equine Encephalitis Virus

SLEV - Saint Louis Encephalitis Virus

WNV - West Nile Virus

ZIKV - Zika Virus

[‡]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 WNV and ZIKV. 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 reports" column.

California Serogroup Viruses

CAL serogroup viruses found in the United States include California encephalitis virus (CE), Jamestown Canyon virus, Keystone virus, La Crosse (LACV), Snowshoe hare virus and Trivittatus virus. These viruses are maintained in a cycle between *Aedes triseriatus* and vertebrate hosts in forest habitats. In the U.S., approximately 80-100 reported cases of human neuroinvasive disease are caused by LACV each year (CDC). Most of the cases have been reported from mid-Atlantic and southeastern states. From 2002-2015, Texas reported 5 cases of human CAL neuroinvasive disease (range: 0-3 cases): 1 case of human CE neuroinvasive disease and 4 cases of human LACV neuroinvasive disease. In 2012, there was 1 LACV positive mosquito pool and 1 CAL positive mosquito pool reported in Orange County. Three cases of human LACV neuroinvasive disease were reported during 2012: 1 in Hardin County and 2 in Harris County. In 2015, there was 1 Keystone virus positive mosquito pool identified in Galveston county.

Chikungunya Virus

CHIKV 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 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 (CDC). Since then, locally acquired cases of chikungunya (CHIK) have been reported throughout the region, including the United States (U.S.). Prior to the emergence of CHIKV in the Americas in 2013, Texas reported fewer than 5 travel-associated CHIK cases. In contrast, in 2014, Texas reported 114 travel-associated cases. In 2015, Texas reported 54 travel-associated cases and one locally acquired CHIKV case. The majority of these travel-related cases reported travel to Mexico, Guatemala, and El Salvador.

Dengue Virus

DENV is a flavivirus that is maintained in a cycle between *Ae. aegypti* or *Ae. albopictus* mosquitoes and human hosts. It is re-emerging throughout 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 (CDC). From 2003-2014, Texas reported 283 cases of dengue (annual median = 16 cases, range: 1-95 cases). During this time, 27 cases of locally-acquired dengue were reported: 24 in Cameron County, 2 in Hidalgo County, and 1 in Willacy County. In 2015, Texas reported 32 cases of dengue: 30 dengue fever and 2 severe dengue. All of the reported cases were travel-associated.

Eastern Equine Encephalitis Virus

EEEV is an alphavirus maintained in a cycle between *Culiseta melanura* mosquitoes and avian hosts in freshwater swamps. *Cs. melanura* is not considered to be an important vector of EEEV to humans because it feeds almost exclusively on birds. Transmission to humans requires mosquito species capable of creating a "bridge" between infected birds and uninfected mammals, such as some *Aedes*, *Coquillettidia*, and *Culex* species. Eastern equine encephalitis (EEE) is a rare illness in humans and only a few cases are reported in the U.S. each year. Most cases of EEE have been reported from Florida, Georgia, Massachusetts, and New Jersey (CDC). The habitat in northeast Texas, bordering Louisiana, is suitable for EEEV transmission and EEEV-infected horses have been reported from this part of the state. From 2003-2014, Texas reported 54 equine cases of EEE (annual median = 2 cases, range: 0-29 cases). No EEEV-infected humans or mosquitoes were reported during this time. In 2015, 8 EEEV-infected horses were reported from Jasper, Liberty, Newton, and Orange counties. In addition, Galveston county reported 28 EEEV-positive sentinel chickens (Note: Galveston County is the only Texas county currently testing sentinel chickens for EEEV).

Saint Louis Encephalitis Virus

SLEV is a flavivirus maintained in a cycle between *Culex* species mosquitoes and birds. The geographic range of Saint Louis encephalitis virus (SLEV) extends from North to South America, but the majority of cases have occurred in the eastern and central U.S., where periodic epidemics have occurred since the 1930s (CDC). In Texas and states with milder climates, SLEV can circulate year round. From 2003-2014, Texas reported 38 cases of SLEV disease (annual median = 2 cases, range: 0-18 cases). In 2015, 4 SLEV-positive mosquito pools were identified in El Paso and Lubbock counties. In addition, Galveston county reported 1 SLEV-positive sentinel chicken (Note: Galveston County is the only Texas county currently testing sentinel chickens for SLEV).

Zika Virus

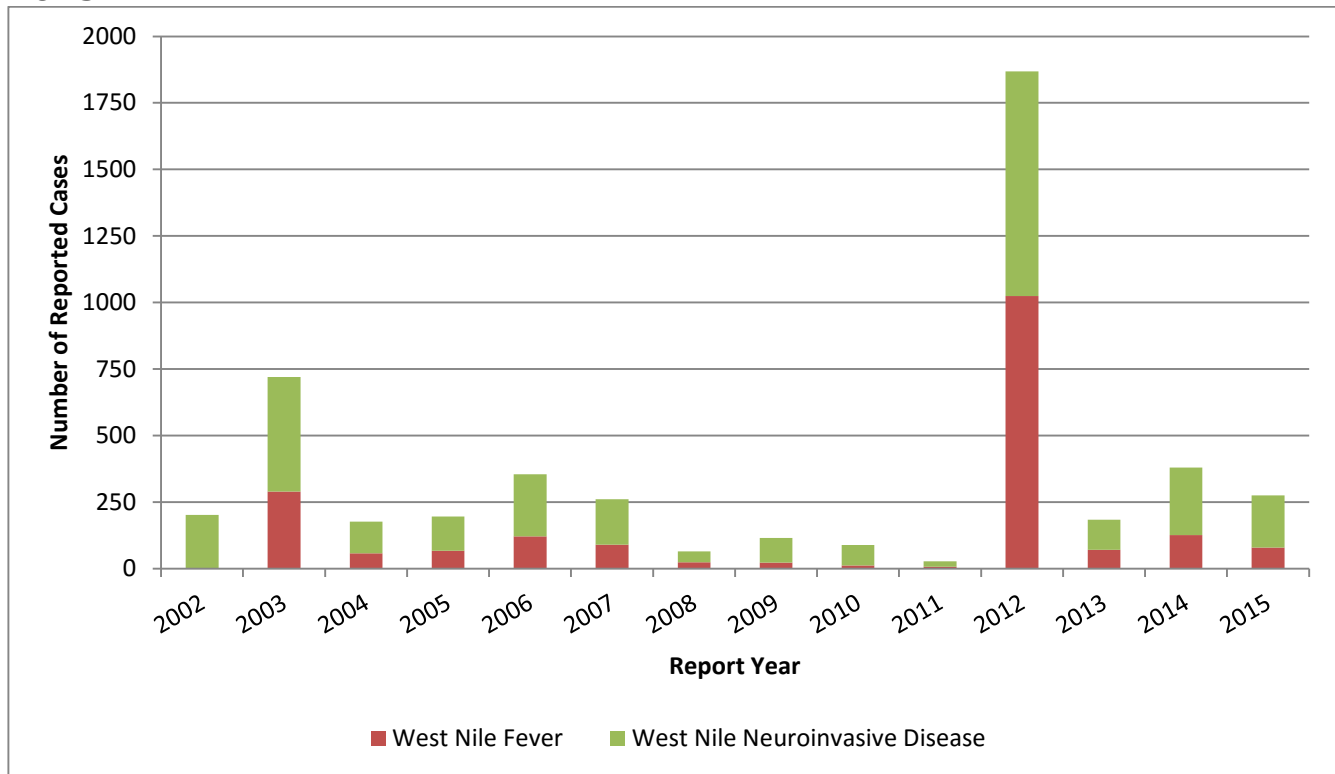
ZIKV is a flavivirus that is maintained in a cycle between *Aedes aegypti* or *Ae. albopictus* mosquitoes and human hosts. Zika virus was first discovered in 1947 and is named after the Zika Forest in Uganda. The first human cases of Zika were detected in the 1950s and since then, sporadic outbreaks of Zika have been reported in tropical Africa, Southeast Asia, and the Pacific Islands (CDC). In late 2015, the first local transmission of ZIKV in the Americas was reported in Brazil. Since then, locally acquired cases of Zika (ZIKV) have been reported throughout the region. Prior to the emergence of ZIKV in the Americas in 2015, Texas reported only 1 travel-associated Zika case. In 2015, Texas reported 8 travel-associated cases of ZIKV.

West Nile Virus

WNV is a flavivirus maintained in a cycle between mosquitoes (primarily *Culex* species) and birds. WNV is found in Africa, India, Australia, the Middle East, Europe, and most recently, North America. 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 of the city. Since 1999, WNV infections in humans, birds, equines, other animals, and mosquitoes have been reported throughout the U.S.

The Texas Department of State Health Services (DSHS) has conducted surveillance for WNV since its arrival in Texas in 2002. The first big surge in the number of human cases of WNV disease occurred in 2003 with nearly 750 cases reported. In subsequent years, reported cases of human WNV disease decreased. 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 2). From 2002-2014, 4,632 cases of WNV disease were reported in Texas (annual median = 195 cases, range: 27-1868 cases).

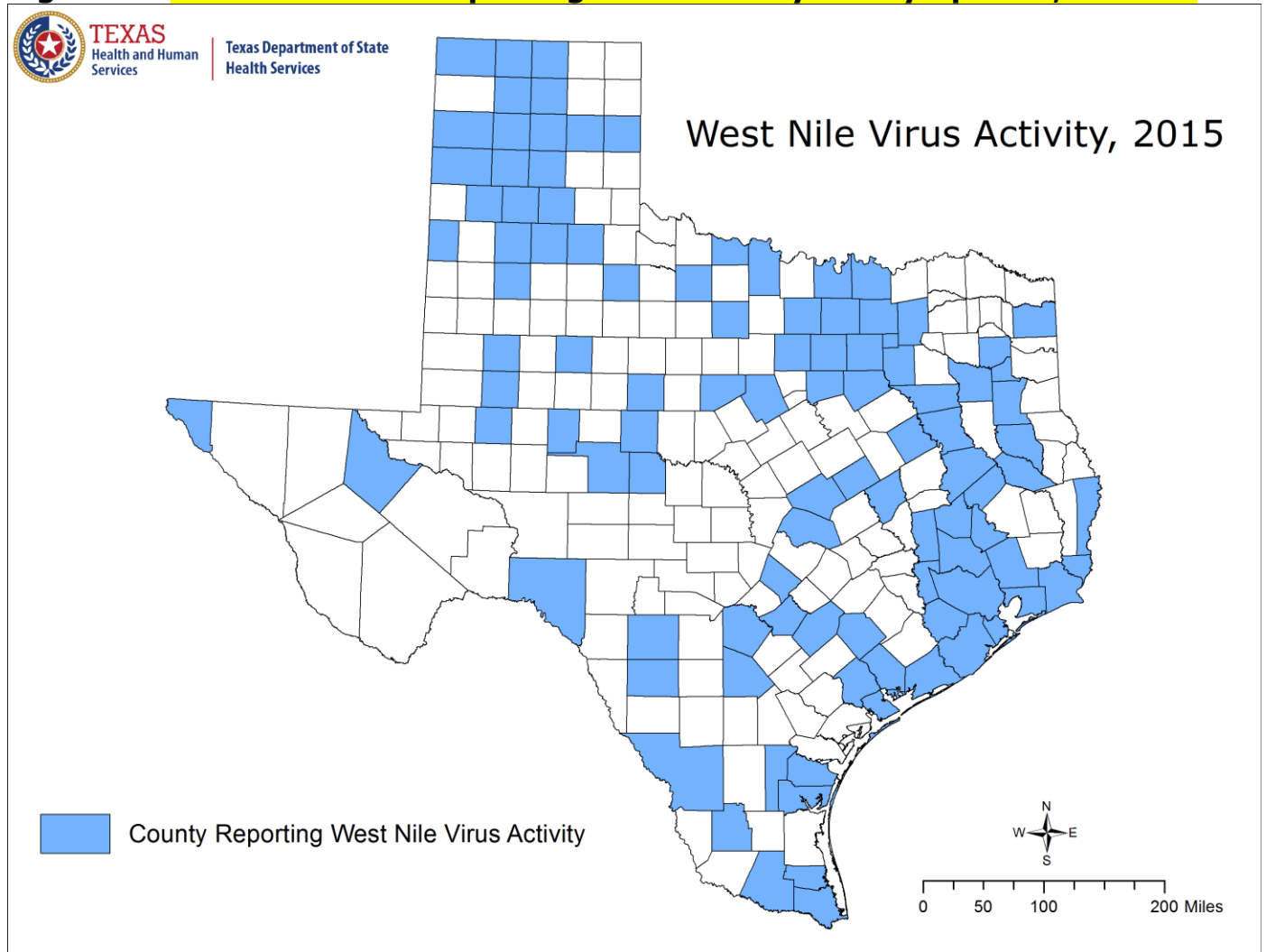
Figure 2. Reported Human WNV Disease Cases Reported in Texas, 2002-2015



In 2015, WNV infection was reported in 1,565 mosquito pools, 14 birds, 31 horses and 1 sentinel chicken. Jefferson county reported the highest number of WNV-infected horses. In humans, a total of 32 presumptive viremic blood donors (PVDs) were reported by blood collection agencies from 18 counties (7%). Additionally, 275 human WNV disease cases were reported (Table 2).

In 2015, some evidence of WNV activity (human, horse, bird, mosquito, or sentinel) was reported in 103 (41%) of the 254 Texas counties (Figure 3). Twenty-six counties (10%) reported WNV-positive mosquito pools, 78 (31%) reported human WNV disease cases, 25 (10%) reported WNV-infected horses, 1 county (<1%) reported WNV-positive birds (Note: Harris County is the only Texas County currently testing dead birds for WNV), and 1 county reported WNV-positive sentinel (Note: Galveston County is the only Texas County currently testing Sentinel chickens for WNV).

Figure 3. Texas Counties Reporting WNV Activity in Any Species, 2014**



**Counties showing no WNV Activity may be due to absence of an active surveillance program

Table 2. WNV Activity Reported by Species and County, Texas, 2015

County	WNV								County Total
	M	A	E	SC	H				
					WNF	WNND	PVD#	TOTAL	
Anderson						1	1	1	1
Angelina			1			5		5	6
Armstrong						2		2	2
Atascosa			1						1
Bailey					1			1	1
Baylor						4		4	4
Bell	1								1
Bexar	10				3	1	1	4	14
Brazoria	5								5
Briscoe					2			2	2
Calhoun						1		1	1
Cameron	1								1
Carson						1		1	1
Cass					1	1		2	2
Castro					2			2	2
Chambers			2						2
Clay						1		1	1
Collin	24				2	4	1	6	30
Concho						1		1	1
Cooke	7								7
Dallam							1		
Dallas	461				12	11	2	23	484
Dawson						1		1	1
Deaf Smith						1		1	1
Denton	54				5	5		10	64
Eastland						1		1	1
El Paso	16				2	14	1	16	32

County	WNV								County Total
	M	A	E	SC	H				
					WNF	WNND	PVD‡	TOTAL	
Ellis	3					2		2	5
Erath			1		1			1	2
Falls					1			1	1
Floyd					1	4	1	5	5
Fort Bend	13					1	1	1	14
Freestone			1			1		1	2
Galveston	2			1					3
Gonzales						1		1	1
Gray						1		1	1
Grayson	6								6
Gregg					1	2	1	3	3
Grimes					1			1	1
Guadalupe						1		1	1
Hale						1		1	1
Hansford					1			1	1
Harris	406	14	2		12	28	9	40	462
Hays	1					1		1	2
Henderson						1		1	1
Hidalgo						1		1	1
Houston			1						1
Hunt	8				1			1	9
Hutchinson			1						1
Jackson						1		1	1
Jefferson	3		3		2	2		4	10
Jim Hogg			1						1
Jim Wells						1		1	1
Johnson	22					3	1	3	25
Kaufman					1	1		2	2

County	WNV							County Total
	M	A	E	SC	H			
					WNF	WNND	PVD‡	
King			1					1
Kleberg						1		1
Lavaca			1					1
Liberty			2					2
Lubbock	11				3	9		12
Martin						1	1	1
Matagorda			1		1			1
Midland			1					1
Montgomery	61				9	7	2	16
Moore						2		2
Motley					1			1
Nacogdoches						1		1
Newton						1		1
Nueces	5							5
Oldham					1			1
Orange			1				1	1
Parker			1			2		2
Potter					2	4	2	6
Randall			1		1	8	4	9
Reeves							1	
Robertson			2					2
Rockwall	6							6
Runnels					2			2
Rusk						1		1
San Jacinto						1		1
Scurry					1	1		2
Sherman						1		1
Smith			1			3		3
Sterling			1					1

County	WNV								County Total
	M	A	E	SC	H				
					WNF	WNND	PVD‡	TOTAL	
Swisher						1		1	1
Tarrant	424				4	26		30	454
Taylor	1				1	1		2	3
Tom Green						1		1	1
Trinity			1						1
Upshur			1			1		1	2
Uvalde						1		1	1
Val Verde						1		1	1
Victoria			1			2		2	3
Walker						1		1	1
Waller			1			1		1	2
Webb						1		1	1
Wheeler						2		2	2
Wichita	12				1	2		3	15
Willacy						1		1	1
Williamson	2								2
Wise						1	1	1	1
Young						1		1	1
Zavala						1		1	1
Total Number of Reports	1565	14	31	1	79	196	32	275	1886

M - mosquito A-avian E-equine SC- sentinel chicken H- human

WNV - West Nile Virus, WNF - West Nile Fever, WNND - West Nile Neuroinvasive Disease

‡Presumptive viremic blood donors (PVDs) are not included in any of the "total columns"

Of the 275 human WNV disease cases reported in 2015, 196 (71%) had neuroinvasive disease (WNND) and 79 (29%) had fever (WNF) (Table 3). Of the cases with WNND, 112 (57%) presented with encephalitis, including meningoencephalitis, and 74 (38%) presented with meningitis only.

The median age at onset of illness was 58 years (range: 8-89 years) for all cases. Cases with WNND tended to be slightly older (median = 60 years, range: 8-89

years), while case patients with WNF were slightly younger (median = 52 years, range: 16-85 years). The majority (67%) of all WNV disease cases were non-Hispanic whites, followed by Hispanics (18%) (Table 3).

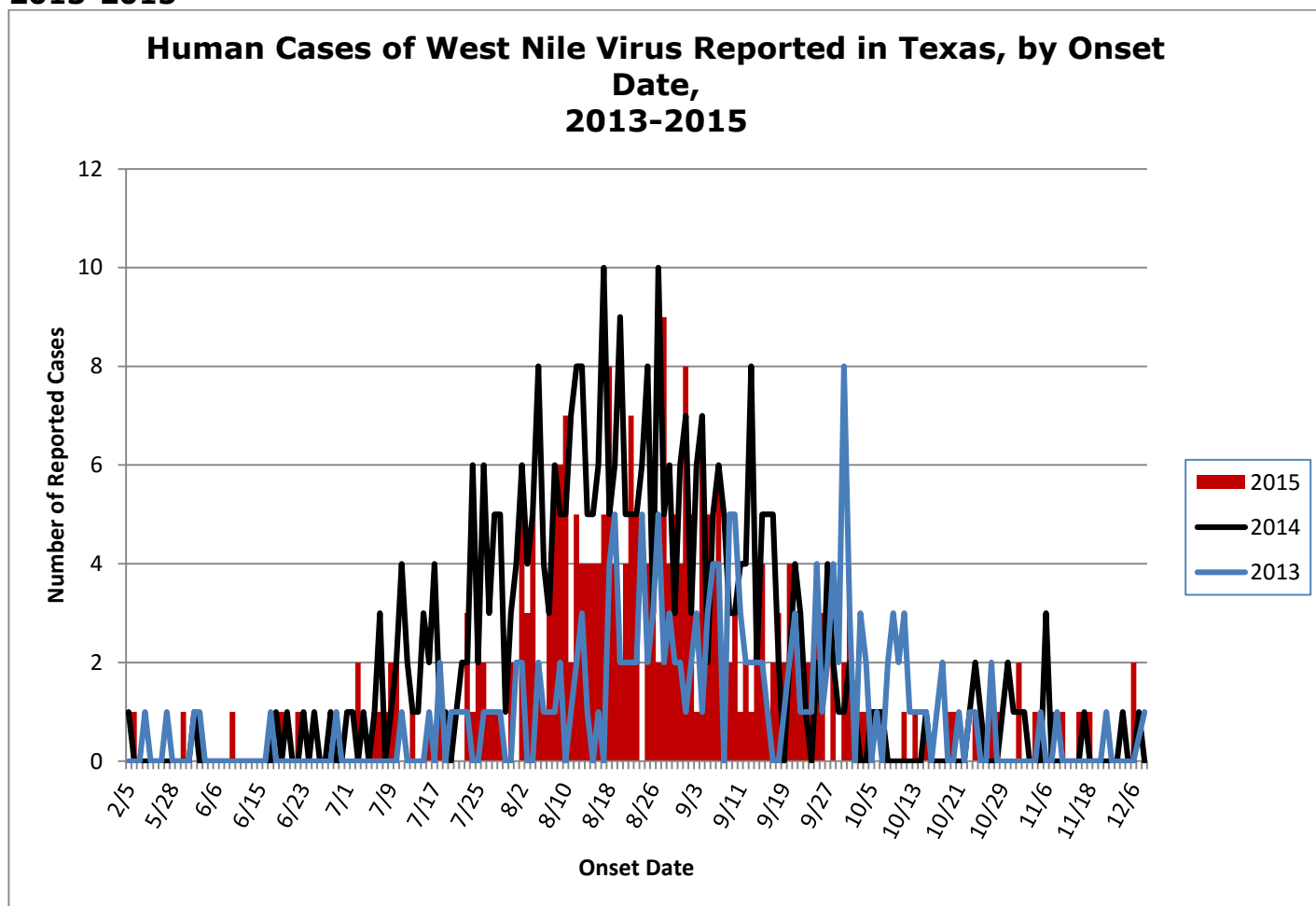
The most common symptoms reported by WNND cases were fever (93%), headache (67%), nausea or vomiting (64%), altered mental status (62%), and chills (53%). The most common symptoms reported by WNF cases were fever (95%), headache (76%), chills (75%), myalgia (63%), and nausea or vomiting (53%). The majority of WNND cases were hospitalized (97%), compared with only 25% of WNF cases. The median length of hospitalization for WNND and WNF cases were the same (6 days). There were 16 WNV-related deaths (8%) among reported cases of WNND in 2015. No WNV-related deaths were reported among WNF cases (Table 3).

Table 3. Characteristics of Reported Human WNV Disease Cases, Texas, 2015

Characteristic	WNND (N=196)		WNF (N= 79)	
	Number	%	Number	%
Gender				
Male	130	66	46	58
Female	66	34	33	42
Age (years)				
<1-9	1	<1	-	-
10-19	4	2	3	4
20-29	11	6	-	-
30-39	12	6	17	22
40-49	21	11	15	19
50-59	47	24	18	23
60-69	50	26	14	18
70-79	34	17	7	9
80+	16	8	5	6
Race/Ethnicity				
Non-Hispanic White	123	63	61	77
Hispanic	41	21	8	10
Asian/Pacific Islander	2	1	3	4
Black	11	6	-	-
American Indian/Alaska Native	-	-	-	-
Unknown	19	10	7	9
Clinical Syndrome				
Encephalitis/Meningoencephalitis	112	57	-	-
Meningitis	74	38	-	-
Other Neuroinvasive Presentation	10	5	-	-
Uncomplicated Fever	-	-	79	100
Clinical Signs/Symptoms				
Fever	182	93	75	95
Chills	103	53	59	75
Headache	131	67	60	76
Rash	33	17	34	43
Nausea or Vomiting	126	64	42	53
Diarrhea	58	30	20	25
Myalgia	70	36	50	63
Arthralgia	46	23	33	42
Acute Flaccid Paralysis	11	6	-	-
Stiff Neck	73	37	20	25
Altered Mental Status	122	62	6	8
Seizures	18	9	-	-
Ataxia	48	24	3	4
Clinical Course				
Hospitalized	190	97	20	25
Median Length of Stay	6		6	
Death	16	8	-	-

In 2015, dates of symptom onset for all human WNV disease cases ranged from April 9th to December 6th (Figure 4). The median date of symptom onset in 2015 was August 26th, which is similar to the median symptom onset in 2014 (August 20th) and earlier than the median onset in 2013 (September 6).

Figure 4. Epidemiologic Curve of Reported Human WNV Disease Cases, Texas, 2013-2015



In 2015, the statewide incidence of all human WNV disease cases was 1.0 cases per 100,000 population. The statewide incidence for WNND was 0.7 cases per 100,000 population (Table 4). Floyd County (85.0 cases per 100,000 population) and Randall County (6.9 cases per 100,000 population) reported the highest overall WNV disease incidence rates. Randall County (6.1 cases per 100,000 population) and Angelina County (5.5 cases per 100,000 population) reported the highest WNND incidence rates.

During 2015, DSHS Health Service Region (HSR) 1 (Texas Panhandle) was disproportionately affected by WNV disease (Table 5). HSR 1 reported 6.0 cases per 100,000 population.

Table 4. Reported Human WNV Disease Incidence Rates in Counties with 5 or More* Cases, 2015

County	Population**	WNF and WNND Cases	Incidence Rate (per 100,000)	Only WNND Cases	Incidence Rate (per 100,000)
Angelina	90,373	5	5.5	5	5.5
Collin	923,201	6	0.7	4	*
Dallas	2,541,528	23	0.9	11	0.4
Denton	778,846	10	1.3	5	0.6
El Paso	837,353	16	1.9	14	1.7
Floyd	5,881	5	85.0	4	*
Harris	4,530,268	40	0.9	28	0.6
Lubbock	298,941	12	4.0	9	3.0
Montgomery	539,335	16	3.0	7	1.3
Potter	123,457	6	4.9	4	*
Randall	131,070	9	6.9	8	6.1
Tarrant	1,960,741	30	1.5	26	1.3
All Texas Counties	27,469,114	275	1.0	196	0.7

WNF - West Nile fever, WNND - West Nile neuroinvasive disease

*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.

**2015 population projections accessed 2/14/17, DSHS Center for Health Statistics

<http://soupfin.tdh.state.tx.us/>

Table 5. Reported Human WNV Disease Cases and Incidence Rates in Texas by DSHS HSR, 2015

HSR	Population*	WNF and WNND Cases	Incidence Rate (per 100,000)
1	872,421	52	6.0
2/3	7,953,721	97	1.2
4/5N	1,534,873	20	1.3
6/5S	7,213,320	64	0.9
7	3,291,066	4	0.1**
8	2,864,286	13	0.5
9/10	1,500,493	20	1.3
11	2,238,934	5	0.2
TOTAL	27,469,114	275	1.0

*2015 population projections accessed 2/14/17, DSHS Center for Health Statistics

<http://soupfin.tdh.state.tx.us/>

**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.

Resources:

CDC LaCrosse 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/>

Acknowledgements and data sources:

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