Arbovirus Activity in Texas
2014 Surveillance Report

June 2015

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), western equine encephalitis virus (WEEV), and West Nile virus (WNV), many of which are endemic to the state. In 2014, human arbovirus infection in Texas was attributed to WNV (94%), CHIKV (4%), DENV (<1%), EEEV (<1%), and SLEV (<1%) (Table 1).

Table 1. Year-End Arbovirus Activity Summary, Texas, 2014

Virus	Mosquito	Avian	Equine	Human						TOTAL
				Fever	Neuroinvasive	Hemorrhagic Fever	Total (Human)	Deaths	Presumptive Viremic Blood Donors‡	
CHIKV	0			114	0		**114**	0		**114**
DENV	0			32	0	2	**34**	0		**34**
EEEV	0	0	5	0	0		**0**	0		**5**
SLEV	7	0		3	1		**4**	0		**11**
WNV	2032	77	25	126	253		**379**	6	59	**2513**
TOTAL	**2039**	**77**	**30**	**275**	**254**	**2**	**531**	**6**		**2677**

CHIKV – Chikungunya virus
DENV – Dengue virus
EEEV – Eastern equine encephalitis virus
SLEV – Saint Louis encephalitis virus
WNV - West Nile Virus
‡Presumptive viremic blood donors (PVDs) 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. 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.

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. Since then, autochthonous 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. The majority of these reported cases had travel to El Salvador, Puerto Rico, the Dominican Republic, or Haiti.

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. From 2003-2013, Texas reported 249 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 2014, Texas reported 34 cases of dengue: 32 dengue fever and 2 dengue hemorrhagic fever. Thirty-three of the reported cases were travel-associated and 1 had an unknown travel history.

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. 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 through 2013, Texas reported 49 equine cases of EEE (annual median = 2 cases, range: 0-29 cases). No EEEV-infected humans or mosquitoes were reported during this time. In 2014, 5 EEEV-infected horses were reported from Cass, Hardin, Jefferson, Newton, and Tyler counties.

Saint Louis Encephalitis Virus

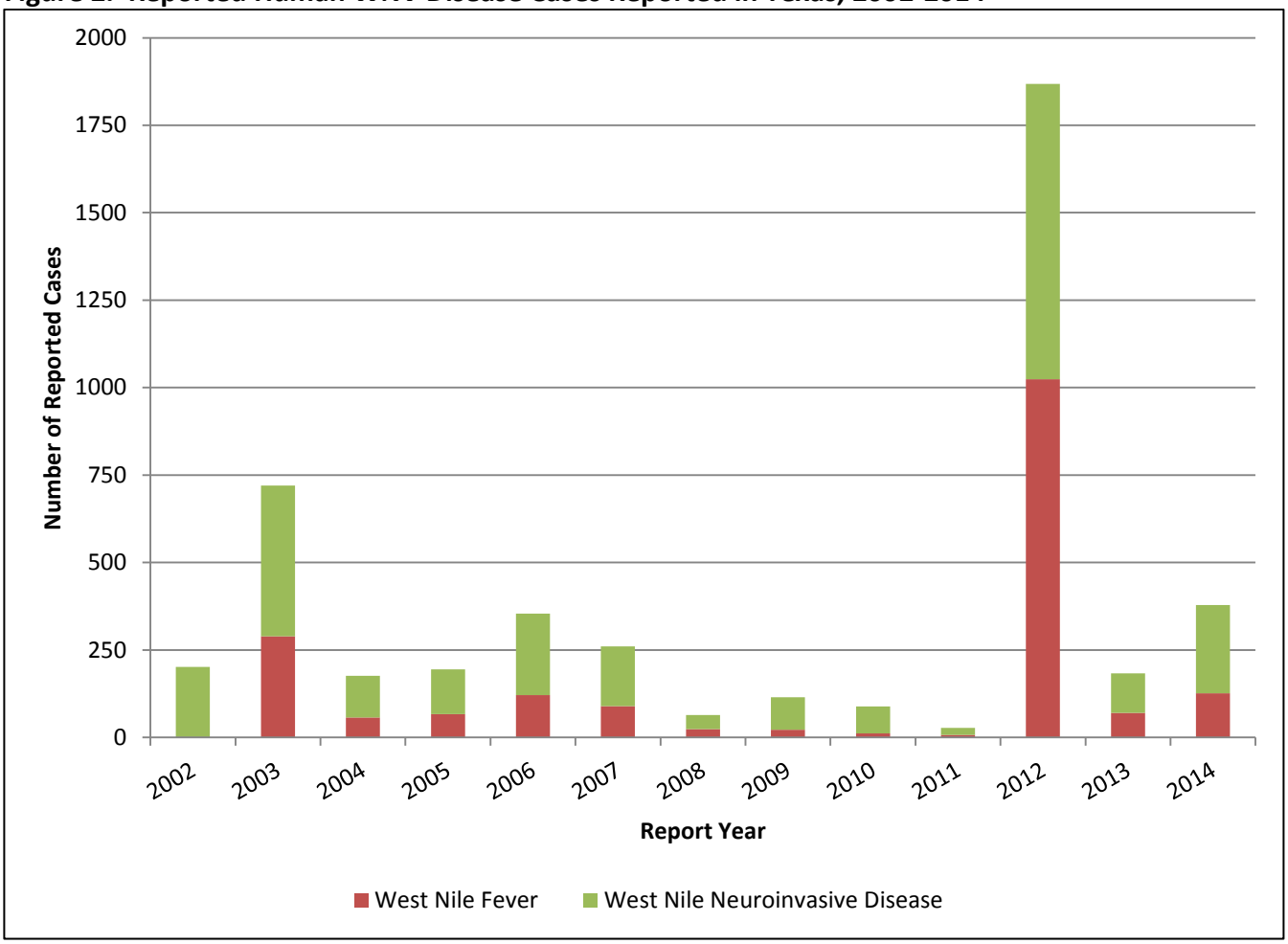
SLEV is a flavivirus maintained in a cycle between *Cx.* species mosquitoes and birds. The geographic range of Saint Louis encephalitis (SLE) extends from North to South America, but the majority of cases have occurred in the eastern and central U.S., where periodic epidemics have occurred since the 1930s. In Texas and states with milder climates, SLE can occur year round. From 2003-2013, Texas reported 34 cases of SLEV disease (annual median = 1 case, range: 0-18 cases). In 2014, 7 SLEV-positive mosquito pools were identified in El Paso, Jefferson, Harris and Hunt counties; and 3 human cases (3 uncomplicated fevers and 1 neuroinvasive disease case) were identified in Harris and Matagorda counties.

West Nile Virus

WNV is a flavivirus maintained in a cycle between mosquitoes (primarily *Cx.* 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.

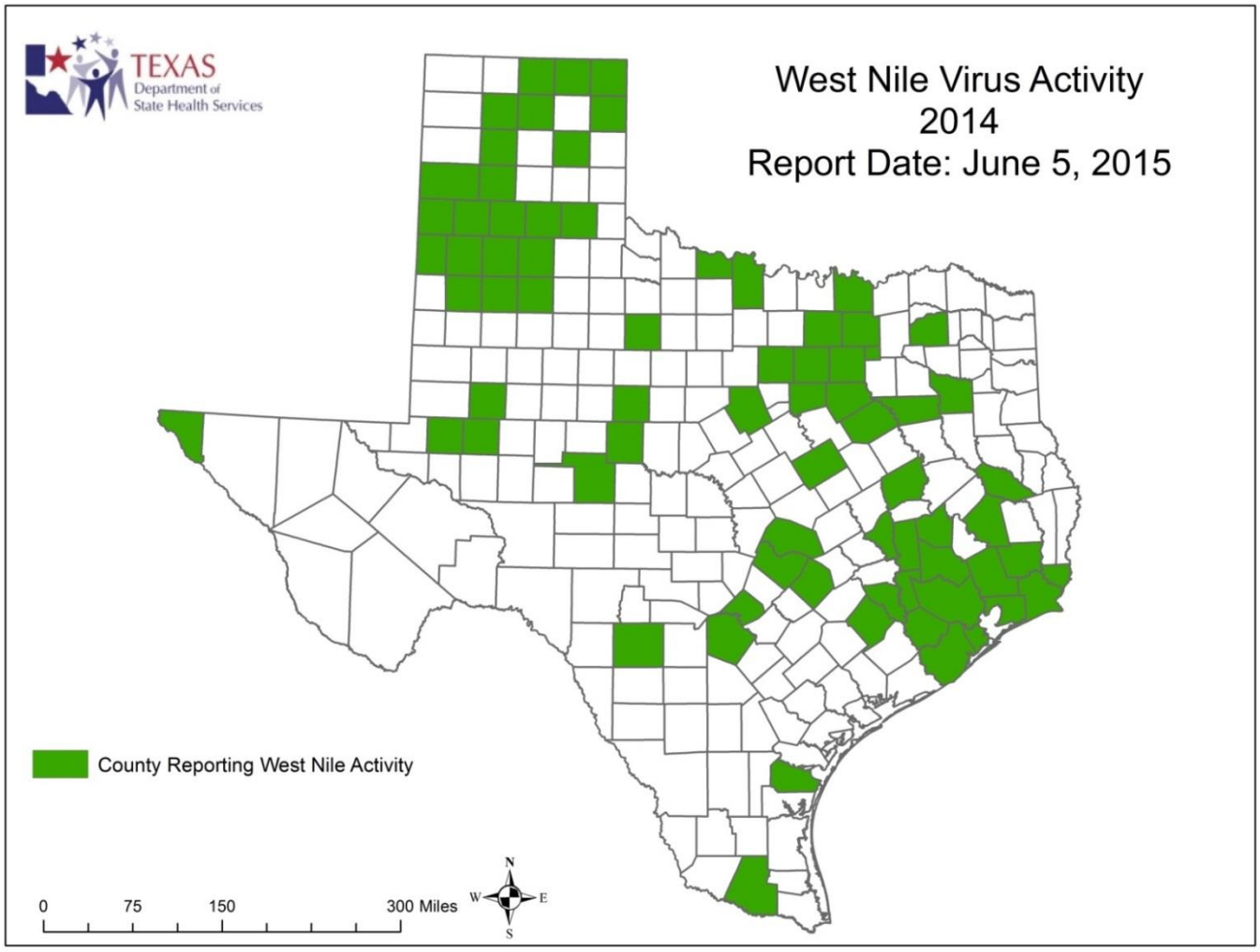
The Texas Department of State Health Services (DSHS) has conducted surveillance for WNV since its arrival in Texas in 2002. The first big surge in the number of human cases of WNV disease occurred in 2003 with nearly 750 cases reported. In subsequent years, reported cases of human WNV disease decreased. 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 2002-2013, 4,253 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, 2002-2014



In 2014, some evidence of WNV activity (human, horse, bird or mosquito) was reported in 74 (29%) of the 254 Texas counties (Figure 3). Twenty-one counties (8%) reported WNV-positive mosquito pools, 70 (28%) reported human WNV disease cases, 19 (7%) reported WNV-infected horses, and 1 county (<1%) reported WNV-positive birds (Harris County is the only Texas County currently testing dead birds 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

In 2014, WNV infection was reported in 2,032 mosquito pools, 77 birds and 25 horses. Gonzales and Waller counties reported the highest number of WNV-infected horses. In humans, a total of 59 presumptive viremic blood donors (PVDs) were reported by blood collection agencies from 24 counties (7%). Additionally, 379 human WNV disease cases were reported (Table 2).

Table 2. WNV Activity Reported by Species and County, Texas, 2014

COUNTY	M	A	E	H				TOTAL‡
				WNF	WNND	PVD‡	TOTAL‡	
Angelina					3	1	3	3
Austin					2		2	2
Bailey				1	1		2	2
Bastrop				1			1	1
Bell						1		
Bexar			1	2	4		6	7
Bowie						1		
Brazoria	17			4	4	1	8	25
Brazos	15			1	2		3	18
Briscoe				3	1		4	4
Caldwell			1					1
Castro				4	1	1	5	5
Chambers					2		2	2
Clay				1			1	1
Collin	3			1		1	1	4
Colorado				1			1	1
Comal					2		2	2
Crosby				1	1	2	2	2
Dallas	119			8	4	2	12	131
Deaf Smith				2	1		3	3
Denton	27			1	3	1	4	31
Eastland			1					1
Ector					2		2	2
El Paso	4		1	7	8		15	20
Ellis	3			1			1	4
Erath				1			1	1
Floyd				2	1		3	3
Fort Bend	14			2	2		4	18
Galveston	7			1	1	1	2	9
Gonzales			3				0	3
Gray					1		1	1
Grayson	16		1				0	17
Gregg							0	0
Grimes				1	2		3	3
Guadalupe							0	0
Hale				1	2		3	3
Hall				2			2	2
Hansford					1		1	1
Hardin				1		1	1	1

Table 2. WNV Activity Reported by Species and County, Texas, 2014 (continued)

COUNTY	M	A	E	H				TOTAL‡
				WNF	WNND	PVD‡	TOTAL‡	
Harris	1286	77		31	103	20	134	1497
Haskell				1			1	1
Hemphill				1			1	1
Henderson					1		1	1
Hidalgo			2		4	1	4	6
Hill						1		
Hockley			1		1		1	2
Hopkins				1			1	1
Hutchinson					1		1	1
Jefferson	1			1	1		2	3
Jim Wells						1		
Johnson	8							8
Lamb				1	1		2	2
Leon					1		1	1
Liberty			1		5		5	6
Limestone						1		
Lipscomb				1			1	1
Lubbock				3	4	1	7	7
Madison			1					1
Martin					1		1	1
McLennan					1		1	1
Medina			1					1
Midland					2		2	2
Montgomery	183		2	9	23	5	32	217
Moore			1		1		1	2
Navarro				1	1		2	2
Nueces	1				2		2	3
Ochiltree			1		1		1	2
Orange	1					1		1
Palo Pinto						1		
Parker			1	1			1	2
Parmer				2			2	2
Polk					1		1	1
Potter				4	6	4	10	10
Randall				6	12	4	18	18
Rockwall	1							1
Runnels					1		1	1
Smith					1		1	1
Swisher				2	1		3	3

Table 2. WNV Activity Reported by Species and County, Texas, 2014 (continued)

COUNTY	M	A	E	H				TOTAL‡
				WNF	WNND	PVD‡	TOTAL‡	
Tarrant	317			7	9	4	16	333
Taylor					1		1	1
Tom Green				1	3	2	4	4
Travis	6		1	2	4		6	13
Uvalde					2		2	2
Walker					2		2	2
Waller			3	1			1	4
Washington			1					1
Wichita	1		1		4		4	6
Williamson	2				1		1	3
Total Number of Reports	**2032**	**77**	**25**	**126**	**253**	**59**	**379**	**2513**

M-mosquito, A-avian, E-equine, 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.

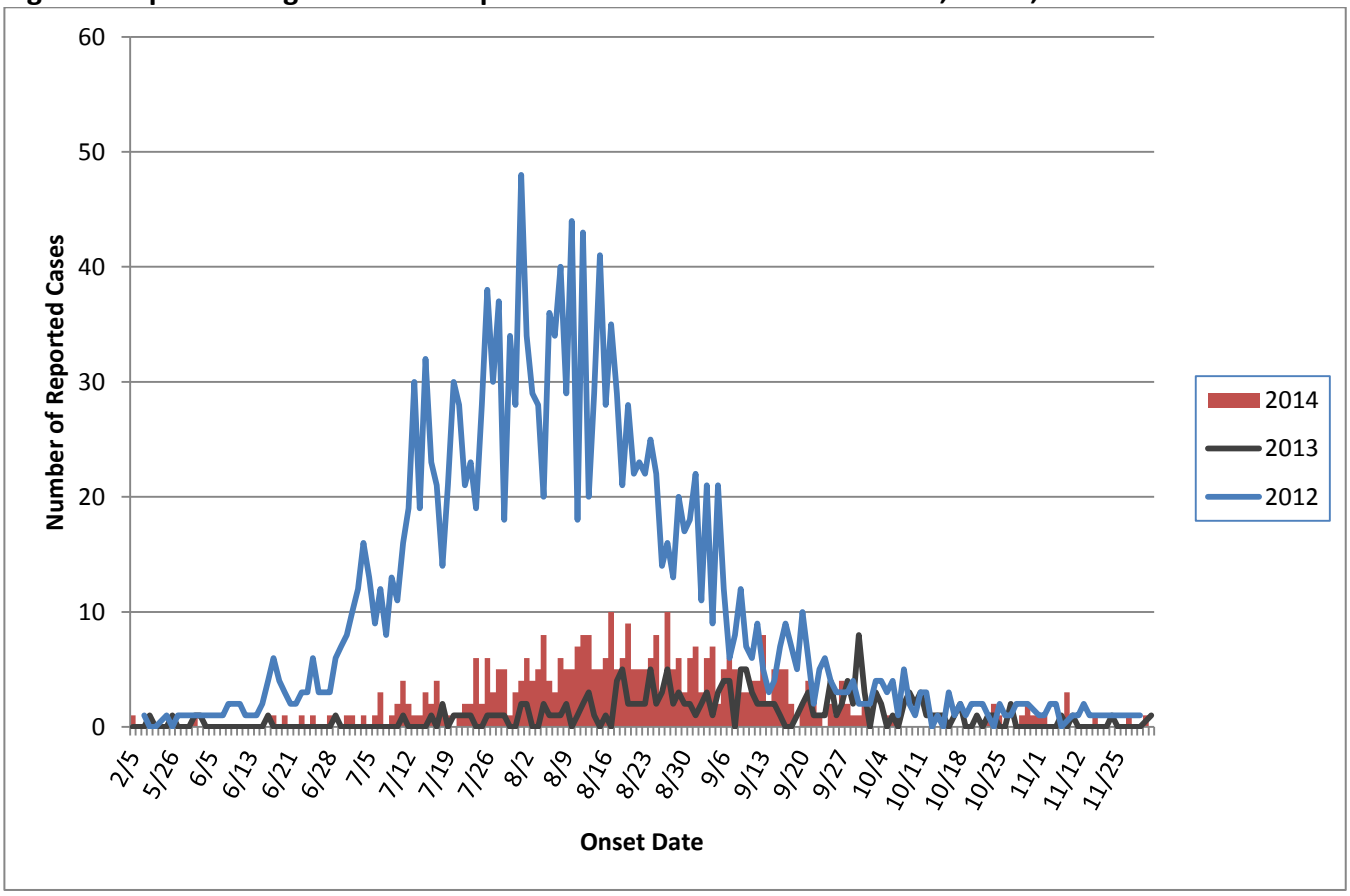
Of the 379 human WNV disease cases reported in 2014, 253 (67%) had neuroinvasive disease (WNND) and 126 (33%) had fever (WNF) (Table 3). Of the cases with WNND, 60% presented with encephalitis, including meningoencephalitis, and 40% presented with meningitis only. The median age at onset of illness was 57 years (range: 1-92 years) for all cases. There was no major difference in age between cases with WNND (median = 58 years, range: 5-92 years) and WNF (median = 55 years, range: 1-84 years). The majority (60%) of all WNV disease cases were non-Hispanic whites (Table 3), followed by Hispanics (20%). The most common symptoms reported by WNND cases were fever (96%), headache (68%), nausea or vomiting (62%), altered mental status (53%), and chills (53%). The most common symptoms reported by WNF cases were fever (90%), headache (80%), chills (72%), nausea or vomiting (54%), and myalgia (60%). The majority of WNND cases were hospitalized (97%), compared with only 24% of WNF cases. WNND cases also experienced a longer median length of hospital stay (6 days) compared to WNF cases (4 days). There were six WNV-related deaths (2%) reported in 2014, all of which were classified as WNND.

Table 3. Characteristics of Reported Human WNV Disease Cases, Texas, 2014

Characteristic	WNND (N=253)		WNF (N= 126)	
	Number	%	Number	%
Gender				
Male	173	68	80	63
Female	80	32	46	37
Age (years)				
<1-9	3	1	1	1
10-19	7	3	6	5
20-29	20	8	5	4
30-39	18	7	12	10
40-49	27	11	24	19
50-59	61	24	33	26
60-69	52	21	30	24
70-79	42	17	14	11
80+	23	9	1	1
Race/Ethnicity				
Non-Hispanic White	135	53	91	72
Hispanic	62	25	14	11
Asian/Pacific Islander	1	0	3	2
Black	22	9	4	3
American Indian/Alaska Native	1	0	0	0
Unknown	32	13	14	11
Clinical Syndrome				
Encephalitis, including Meningoencephalitis	153	60	-	-
Meningitis	100	40	-	-
Uncomplicated Fever	-	-	126	100
Clinical Signs/Symptoms				
Fever	243	96	114	90
Chills	135	53	91	72
Headache	171	68	101	80
Rash	41	16	56	44
Nausea or Vomiting	157	62	68	54
Diarrhea	56	22	55	44
Myalgia	101	40	75	60
Arthralgia	68	27	56	44
Acute Flaccid Paralysis	16	6	-	-
Stiff Neck	98	39	37	29
Altered Mental Status	133	53	14	11
Seizures	19	8	1	<1
Ataxia	45	18	4	3
Coma	8	3	1	<1
Renal	39	15	10	8
Clinical Course				
Hospitalized	247	97	30	24
Median Length of Stay	6	-	4	-
Death	6	2	-	-

In 2014, dates of symptom onset for all human WNV disease cases ranged from February 5 to December 15 (Figure 4). The median date of onset in 2014 was August 20th, which is slightly earlier than the median onset in 2013 (September 6) and slightly later than the median onset in 2012 (August 7).

Figure 4. Epidemiologic Curve of Reported Human WNV Disease Cases, Texas, 2012-2014



In 2014, the statewide incidence of all human WNV disease cases was 1.4 cases per 100,000 population. The statewide incidence for WNND was 0.9 cases per 100,000 population (Table 4). Castro County (59.5 cases per 100,000 population) and Randall County (13.9 cases per 100,000 population) reported the highest overall WNV disease incidence rates. Randall County (9.3 cases per 100,000 population) and Liberty County (6.1 cases per 100,000 population) reported the highest WNND incidence rates.

Table 4. Reported Human WNV Disease Incidence Rates in Counties with 5 or More* Cases, 2014

County	Population**	WNF and WNND Cases	Incidence Rate (per 100,000)	Only WNND Cases	Incidence Rate (per 100,000)
Bexar	1,849,753	6	0.3	4	*
Brazoria	349,513	8	2.3	4	*
Castro	8,409	5	59.5	1	*
Dallas	2,469,643	12	0.5	4	*
El Paso	858,953	15	1.7	8	0.9
Harris	4,395,783	134	3.0	103	2.3
Liberty	81,955	5	6.1	5	6.1
Lubbock	292,108	7	2.4	4	*
Montgomery	531,746	32	6.0	23	4.3
Potter	126,130	10	7.9	6	4.8
Randall	129,313	18	13.9	12	9.3
Tarrant	1,931,335	16	0.8	9	0.5
Travis	1,119,544	6	0.5	4	*
All Texas Counties	27,194,258	379	1.4	253	0.9

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.

** 2014 population projections accessed 6/30/15, DSHS Center for Health Statistics http://soupfin.tdh.state.tx.us/

During 2014, DSHS Health Service Regions (HSRs) 1 (Texas Panhandle) and 6/5S (Houston metropolitan area) were disproportionally affected by WNV disease (Table 5). HSR 1 reported 8.4 cases per 100,000 population, and HSR 6/5S reported 2.8 cases per 100,000 population.

Table 5. Reported Human WNV Disease Cases and Incidence Rates in Texas by DSHS HSR, 2014

HSR	Population*	WNF and WNND Cases	Incidence Rate (per 100,000)
1	879,479	74	8.4
2/3	7,868,128	46	0.6
4/5N	1,555,379	7	0.5
6/5S	7,055,177	196	2.8
7	3,255,786	16	0.5
8	2,817,236	10	0.4
9/10	1,486,014	24	1.6
11	2,277,059	6	0.3
TOTAL	**27,194,258**	**379**	**1.4**

*2014 population projections accessed 6-30-15, DSHS Center for Health Statistics http://soupfin.tdh.state.tx.us/

Acknowledgements and data sources:

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