



TEXAS
Health and Human
Services

Texas Department of State
Health Services

Arbovirus Activity in Texas 2017 Surveillance Report

June 2018

**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 reported in Texas may 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), West Nile virus (WNV), and Zika virus (ZIKV), many of which are endemic or enzootic in the state. In 2017, reported human arboviral disease cases were attributed to WNV (54%), ZIKV (22%), DENV (17%), and CHIKV (6%) (Table 1). Animal infections or disease caused by CAL, EEEV, SLEV, and WNV were also reported during 2017.

Table 1. Year-End Arbovirus Activity Summary, Texas, 2017

Arbovirus	Positive Mosquito Pools	Avian	Equine	Sentinel Chicken	Human						TOTAL
					Fever	Neuroinvasive	Severe	TOTAL (Human)	Deaths	PVD†	
CAL	1							0			1
CHIK					15			15			15
DEN					42		1	43			43
EEE			2	7				0			9
SLE	1			1				0			2
WN	1,041	3	19		48	87		135	6	14	1,198
Zika*								55		2	55
TOTAL	1,043	3	21	8	105	87	1	248	6	16	1,323

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

CHIK - Chikungunya

DEN - Dengue

EEE - Eastern equine encephalitis

SLE - Saint Louis encephalitis

WN - West Nile

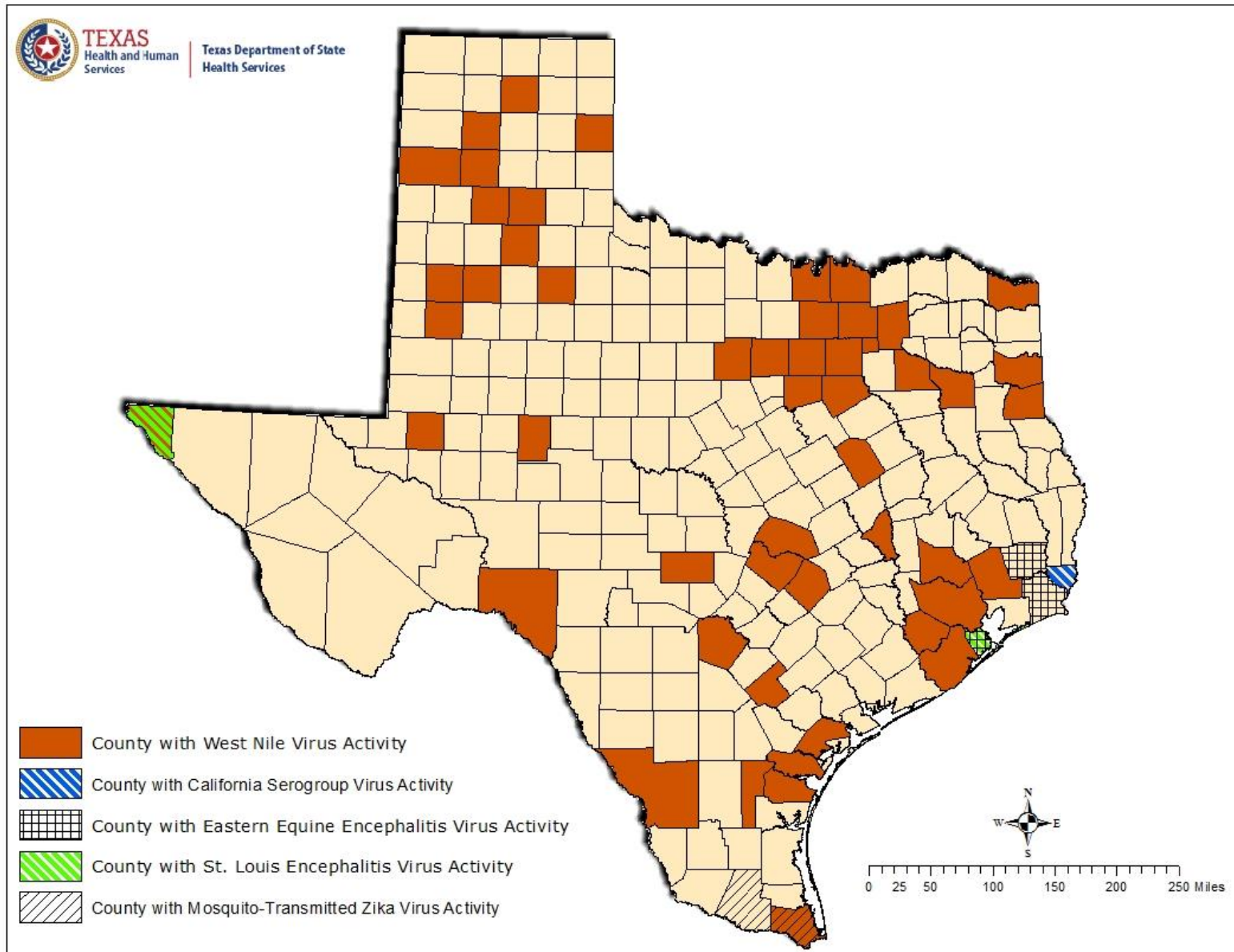
†PVD - Presumptive viremic blood donors are people who had no symptoms at the time of donating blood through a blood collection agency, but whose blood tested positive when screened for the presence of West Nile virus or Zika virus. Unless they meet the case reporting criteria, they are not counted as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

*Zika disease cases

California Serogroup Viruses

California serogroup viruses (CAL) 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 80-100 reported cases of human neuroinvasive disease are caused by LACV each year (CDC), mostly in mid-Atlantic and southeastern states. From 2002-2016, Texas reported a total of 5 cases of human CAL disease (range: 0-3 cases/year): 1 case of CEV neuroinvasive disease and 4 cases of LACV neuroinvasive disease. In 2017, one CEV-positive mosquito pool was identified in Orange County (Figure 1); no human cases of CAL disease were reported.

Figure 1. Texas Counties Reporting Arbovirus Activity* in Any Species, 2017



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

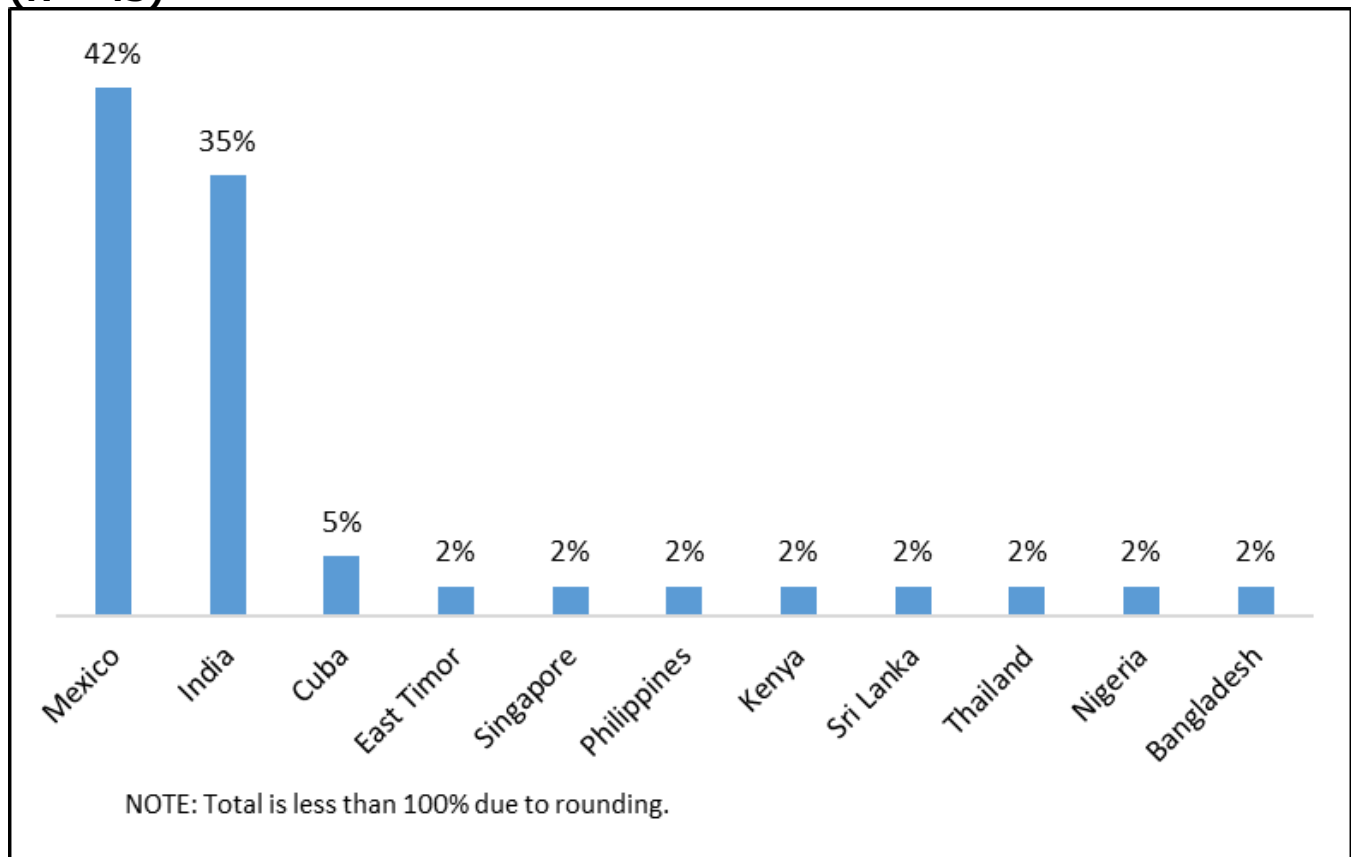
Chikungunya Virus

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 (CDC). 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 reported fewer than 5 travel-associated CHIK cases. In contrast, from 2014-2016, Texas reported a total of 188 travel-associated CHIK cases (range: 20-114 cases/year) and one locally-acquired case in Cameron County (2015). In 2017, Texas reported 15 travel-associated cases and no locally-acquired cases of CHIK. Reported cases traveled to India (67%), Bangladesh (20%), Mexico (7%), and Pakistan (7%).

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 re-emerging 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 (CDC). From 2003-2016, Texas reported a total of 360 cases of dengue (annual median = 20.5 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 2017, Texas reported 43 travel-associated cases of dengue: 40 dengue fever, 1 severe dengue, and 2 dengue-like illness. The majority of cases reported travel to Mexico (42%) and India (35%) (Figure 2). No locally-acquired dengue cases were reported in 2017.

Figure 2. Reported Cases of Dengue by Country of Acquisition, Texas, 2017 (N = 43)

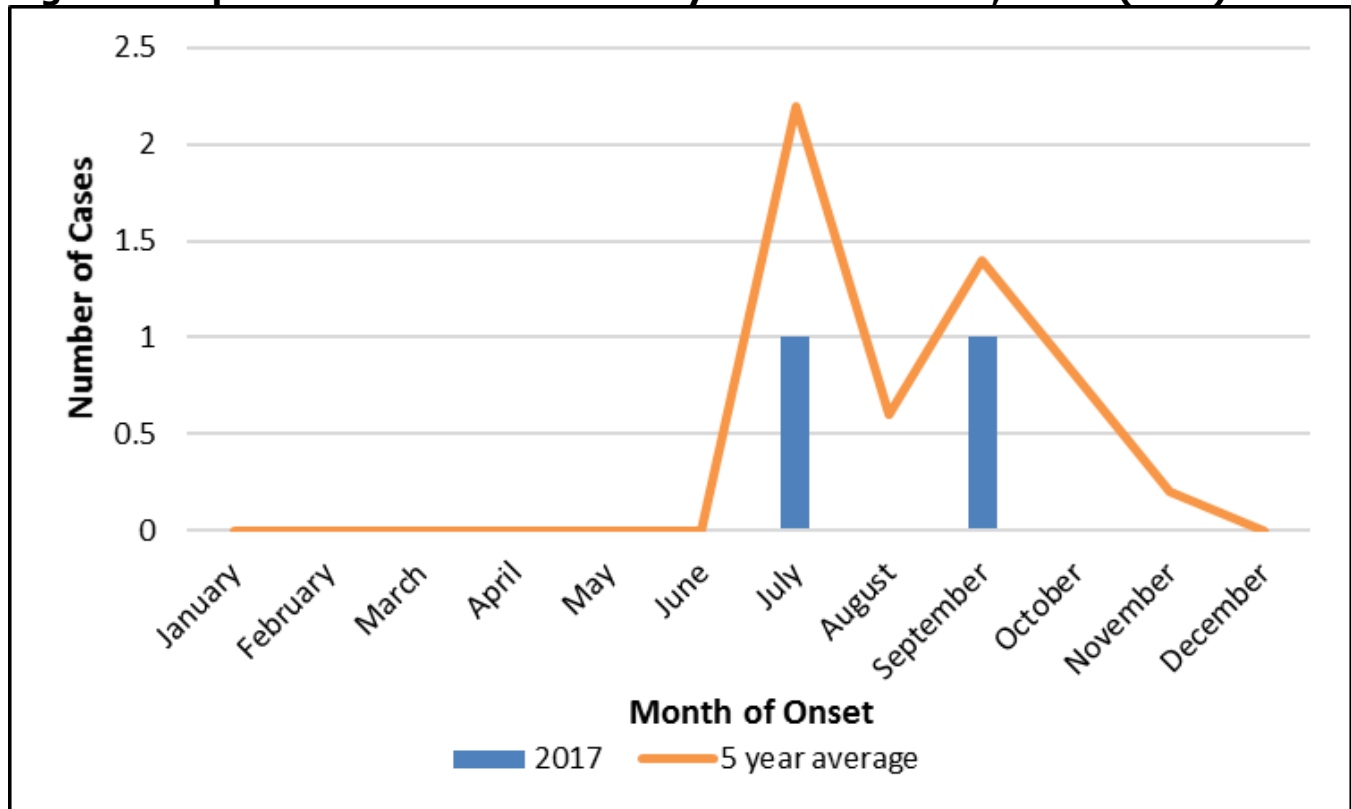


Eastern Equine Encephalitis Virus

Eastern equine encephalitis virus is an alphavirus maintained in a cycle between *Culiseta melanura* mosquitoes and avian hosts in freshwater swamps. *Culiseta 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). Portions of northeast Texas that border Louisiana contain habitat suitable for EEEV transmission and EEEV-infected horses have been reported from this part of the state. From 2003-2016, Texas reported 69 equine cases of EEE (annual median = 3 cases, range: 0-29 cases/year). No EEEV-infected humans or mosquitoes were reported during this time.

In 2017, two equine cases of EEE were reported from Hardin and Jefferson counties, with onsets of disease in July and September, respectively (Figure 3). In addition, Galveston County reported 7 EEEV antibody-positive sentinel chickens (Note: Galveston County is the only Texas county currently testing sentinel chickens for EEEV antibodies). No EEEV-infected humans or mosquitoes were reported in 2017.

Figure 3. Equine EEE Cases in Texas by Month of Onset, 2017 (N=2)



Saint Louis Encephalitis Virus

Saint Louis encephalitis virus is a flavivirus maintained in a cycle between *Culex* species mosquitoes and birds. The geographic range of 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 2003-2016, Texas reported 38 cases of SLE (annual median = 1 case, range: 0-18 cases/year). In 2017, one SLEV-positive mosquito pool was identified in El Paso County. In addition, Galveston County reported 1 SLEV antibody-positive sentinel chicken (Note: Galveston County is the only Texas county currently testing sentinel chickens for SLEV antibodies). No human cases of SLE were reported in 2017.

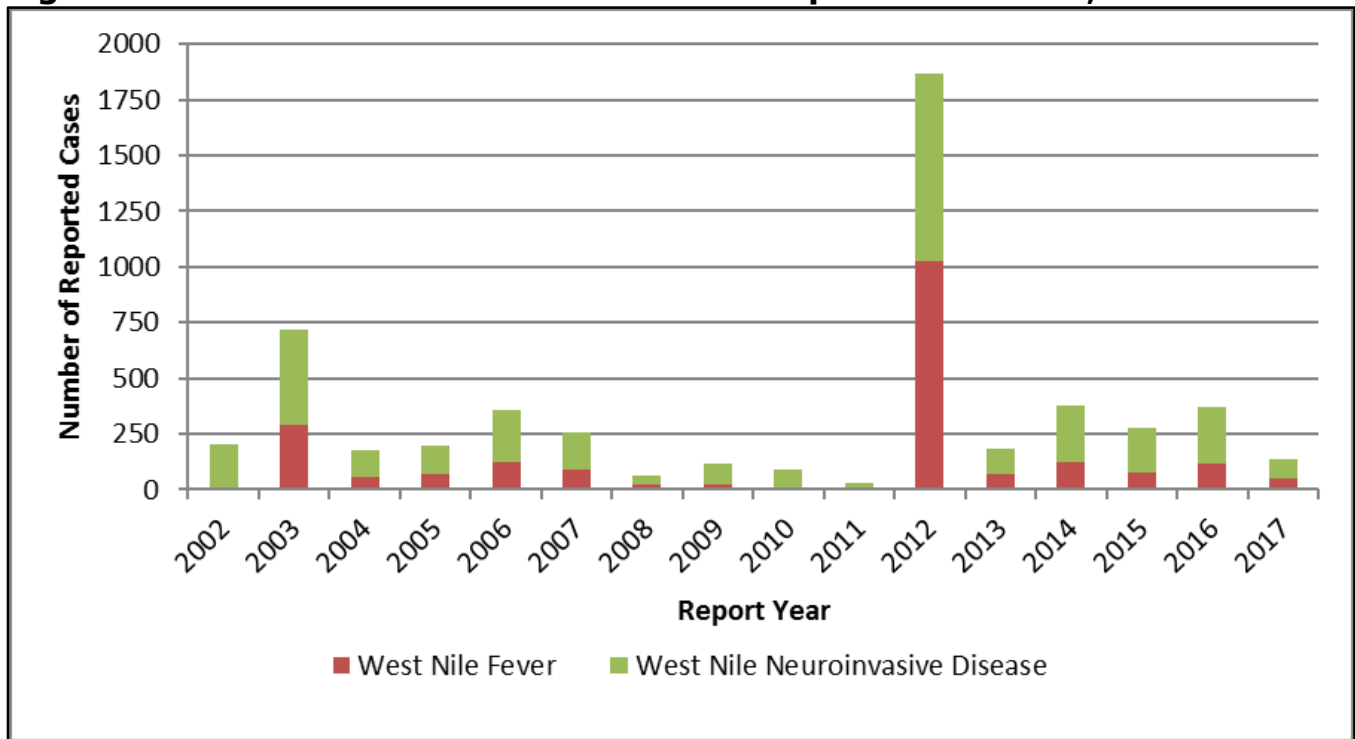
West Nile Virus

West Nile virus is a flavivirus maintained in a cycle between mosquitoes (primarily *Culex* species) and birds. WNV 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 2002-2016, a total of 5,277 human WNV disease cases were reported in Texas (annual median = 202 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 2017, 135 human WNV disease cases were reported: 87 (64%) WNND and 48 (36%) WNF. Additionally, there were 14 presumptive viremic blood donors (PVDs) reported by blood collection agencies.

Figure 4. Human West Nile Disease Cases Reported in Texas, 2002-2017



During 2017, evidence of WNV activity (human, horse, bird, mosquito, or sentinel chickens) was reported from 52 (20%) of the 254 counties in Texas (Figure 1). Twenty-one (8%) counties reported WNV-positive mosquito pools, 33 (13%) reported human WNV disease cases, 8 (3%) reported PVDs, 14 (6%) reported equine WNV disease cases, and one (~1%) county reported WNV-positive birds.

In 2017, WNV infection was reported in 1,041 mosquito pools, 3 dead birds, and 19 horses (Table 2). Randall County reported the highest number of equine WNV disease cases with 6 (32%). The majority (89%) of equine WNV disease cases had onsets of illness between August and October (Figure 5).

Table 2. WNV Activity Reported by Species and County, Texas, 2017

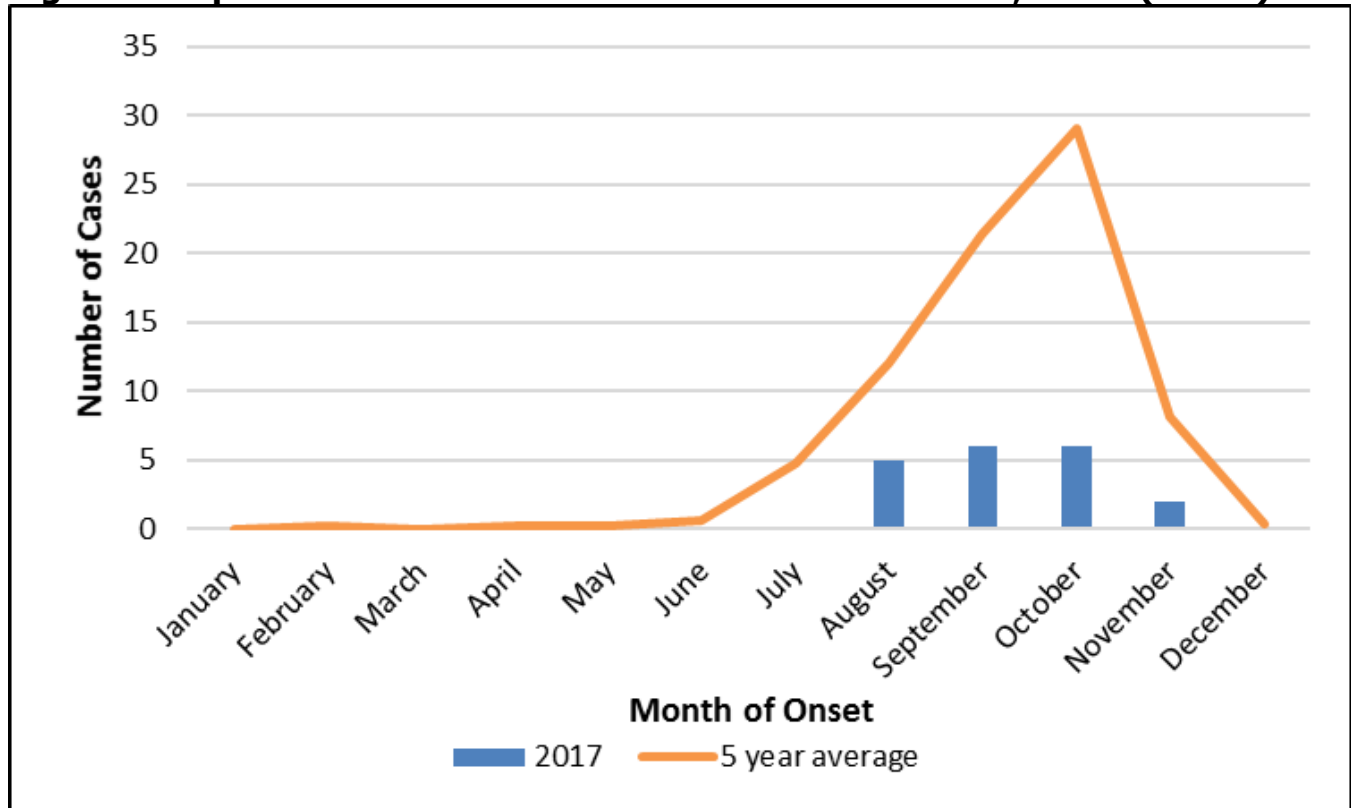
County	WNV							COUNTY TOTAL	
	M	A	E	SC	H				
					WNF	WNND	PVD±		TOTAL
Bastrop			1				0	1	
Bexar	2				1	3		4	6
Bowie						2		2	2
Brazoria	1							0	1
Brazos			1					0	1
Briscoe			1					0	1
Cameron	2							0	2
Collin	23				4	8	1	12	35
Cooke					1			1	1
Dallas	389				11	15	2	26	415
Deaf Smith					1			1	1
Denton	93				7	5		12	105
Dickens			1					0	1
Ector							1	0	0
El Paso	17				3	11	2	14	31
Ellis	8					1		1	9
Floyd							1	0	0
Fort Bend	2		1					0	3
Gillespie			1					0	1
Grayson	3							0	3
Harris	112	3	1		2	14	4	16	132
Harrison							2	0	0
Hockley						1		1	1
Hunt	4							0	4
Hutchinson						1		1	1
Jim Wells					1			1	1
Johnson	8				1			1	9
Karnes						1		1	1
Liberty			1					0	1
Limestone						1		1	1
Lubbock	5		1		2			2	8
Montgomery	21					2	1	2	23
Nueces	1				1			1	2
Palo Pinto			1					0	1
Panola					1			1	1
Parker			1					0	1
Potter						1		1	1
Randall			6		1			1	7
Refugio			1					0	1
Rockwall	5					1		1	6

Table 2 (continued)

County	WNV								COUNTY TOTAL	
	M	A	E	SC	H					
					WNF	WNND	PVD‡	TOTAL		
San Patricio						2			2	2
Smith						1			1	1
Sterling						1			1	1
Swisher						1			1	1
Tarrant	340				9	11			20	360
Terry			1						0	1
Travis	1								0	1
Val Verde					1				1	1
Van Zandt					1	1			2	2
Webb	1					1			1	2
Wheeler						1			1	1
Williamson	3					1			1	4
Total Number of Reports	1,041	3	19	0	48	87	14	135	1,198	1,198

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.

Figure 5. Equine West Nile Virus Disease Cases in Texas, 2017 (N=19)



Due to the importance of WNV in Texas, additional analysis of human disease data was performed. Of the reported cases of WNND, 46 (53%) presented with encephalitis, including meningoencephalitis, and 34 (39%) presented with meningitis only (Table 3). The median age at onset of illness was 55 years (range: 4-88 years) for all cases. Cases of WNND tended to be slightly older (median = 60 years, range: 12-88 years), while cases of WNF were younger (median = 48 years, range: 4-77 years). The majority (63%) of all WNV disease cases were in non-Hispanic whites, followed by Hispanics (23%).

The most common clinical signs and symptoms reported by WNND cases were fever (94%), severe malaise (67%), nausea or vomiting (64%), muscle weakness (64%), and headache (62%) (Table 3). The most common clinical signs and symptoms reported by WNF cases were fever (98%), headache (83%), chills (77%), severe malaise (63%), and nausea or vomiting (63%). The majority of WNND cases were hospitalized (95%), compared with only 23% of WNF cases. The median length of hospitalization for WNND cases was 8 days (range: 1-103 days) while the median length of hospitalization for WNF cases was 3 days (range: 2-15 days). There were 6 deaths attributed to WNV (7%) among reported cases of WNND in 2017. No WNV-related deaths were reported among WNF cases.

Table 3. Characteristics of Reported Human WNV Disease Cases, Texas, 2017

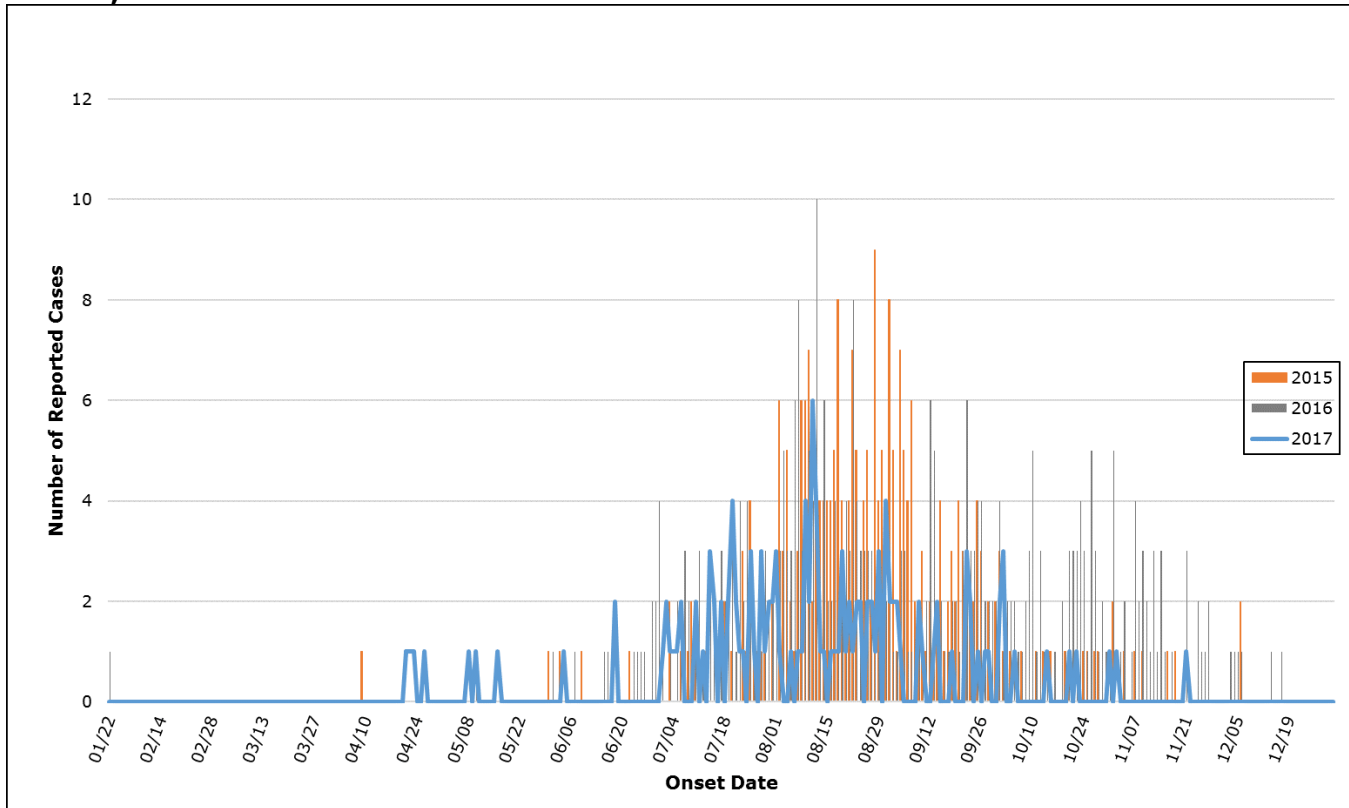
Characteristic	WNND (N=87)		WNF (N=48)	
	Number	%	Number	%
Gender				
Male	60	69	29	60
Female	27	31	19	40
Age Group at Onset (years)				
<1-9	-	-	1	2
10-19	3	3	3	6
20-29	4	5	2	4
30-39	6	7	10	21
40-49	13	15	11	23
50-59	17	20	10	21
60-69	21	24	6	13
70-79	16	18	5	10
80+	7	8	-	-
Race/Ethnicity				
Non-Hispanic White	52	60	33	69
Hispanic	25	29	6	12
Asian/Pacific Islander	-	-	1	2
Black	4	4	-	-
American Indian/Alaska Native	-	-	1	2
Unknown	6	7	7	15

Table 3 (continued)

Characteristic	WNND (N=87)		WNF (N=48)	
	Number	%	Number	%
Clinical Syndrome				
Encephalitis/Meningoencephalitis	46	53	-	-
Meningitis	34	39	-	-
Other Neuroinvasive Presentation	5	6	-	-
Acute Flaccid Paralysis	-	-	-	-
Guillain-Barré Syndrome	2	2	-	-
Uncomplicated Fever	-	-	48	100
Clinical Signs/Symptoms				
Fever	82	94	47	98
Severe Malaise	58	67	30	63
Nausea or Vomiting	56	64	30	63
Muscle Weakness	56	64	21	44
Headache	54	62	40	83
Chills	48	55	37	77
Altered Mental Status	45	52	2	4
Confusion	43	49	2	4
Stiff Neck	42	48	18	38
Anorexia	41	47	25	52
Clinical Signs/Symptoms				
CSF Pleocytosis	37	43	-	-
Myalgia	32	37	23	48
Arthralgia	25	29	25	52
Clinical Course				
Hospitalized	83	95	11	23
Median Length of Stay (Days)	8		3	
Death	6	7	-	-

In 2017, dates of symptom onset for all human WNV disease cases ranged from April 21st to November 21st (Figure 7). The median date of symptom onset in 2017 was August 11th, which is slightly earlier than the median symptom onset in 2016 (August 28th) and 2015 (August 26th).

Figure 7. Epidemiologic Curve of Reported Human WNV Disease Cases, Texas, 2015-2017



In 2017, the statewide incidence of all human WNV disease cases was 0.5 cases per 100,000 population. The statewide incidence for WNND was 0.3 cases per 100,000 population (Table 4). Overall, WNV disease incidence was highest in El Paso County (1.5 cases per 100,000 population) and Denton County (1.4 cases per 100,000 population). WNND incidence was highest in El Paso County (1.2 cases per 100,000 population) and Collin County (0.8 cases per 100,000 population). DSHS Public Health Regions (PHR) 1 and 9/10 reported the highest incidence of WNV disease (Table 5). Both HSR 1 and 9/10 reported 1.0 cases per 100,000 population.

Table 4. Reported Human WNV Disease Incidence Rates in Counties with 5 or More* Cases, 2017

County	Population**	WNF and WNND Cases	Incidence Rate (per 100,000)	Only WNND Cases	Incidence Rate (per 100,000)
El Paso	905,199	14	1.5	11	1.2
Denton	853,253	12	1.4	5	0.6
Collin	1,030,375	12	1.2	8	0.8
Dallas	2,551,173	26	1.0	15	0.6
Tarrant	2,029,946	20	1.0	11	0.5
Harris	4,638,417	16	0.3	14	0.3
All Texas Counties	28,853,424	135	0.5	87	0.3

* 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.

** 2017 population projections accessed 5/11/18, DSHS Center for Health Statistics <http://healthdata.dshs.texas.gov/>

Table 5. Reported Human WNV Disease Cases and Incidence Rates in Texas by DSHS Public Health Region (PHR), 2017

PHR	Population*	WNF and WNND Cases	Incidence Rate (per 100,000)
1	910,203	9	1.0
2/3	8,351,499	74	0.9
4/5N	1,605,264	6	0.4
6/5S	7,528,239	18	0.2
7	3,506,879	2	**
8	2,984,617	6	0.2
9/10	1,554,336	15	1.0
11	2,412,387	5	0.2
TOTAL	28,853,424	135	0.5

* 2017 population projections accessed 5/11/18, DSHS Center for Health Statistics <http://healthdata.dshs.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 (CDC). 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.

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. During 2016, Texas reported 8 locally-acquired cases of ZIKVD: 6 transmitted by mosquitoes and 2 sexually-transmitted cases.

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.

In 2017, Texas reported 55 ZIKVD cases: 5 (9%) locally-acquired cases transmitted by mosquitoes (Figure 1), 1 (2%) congenital disease case whose mother traveled during pregnancy, and 49 (89%) travel-associated cases. Two PVDs were reported by blood collection agencies. Cameron (25%), Harris (20%), Hidalgo (15%), and Bexar (7%) counties reported the most ZIKVD cases (Table 6).

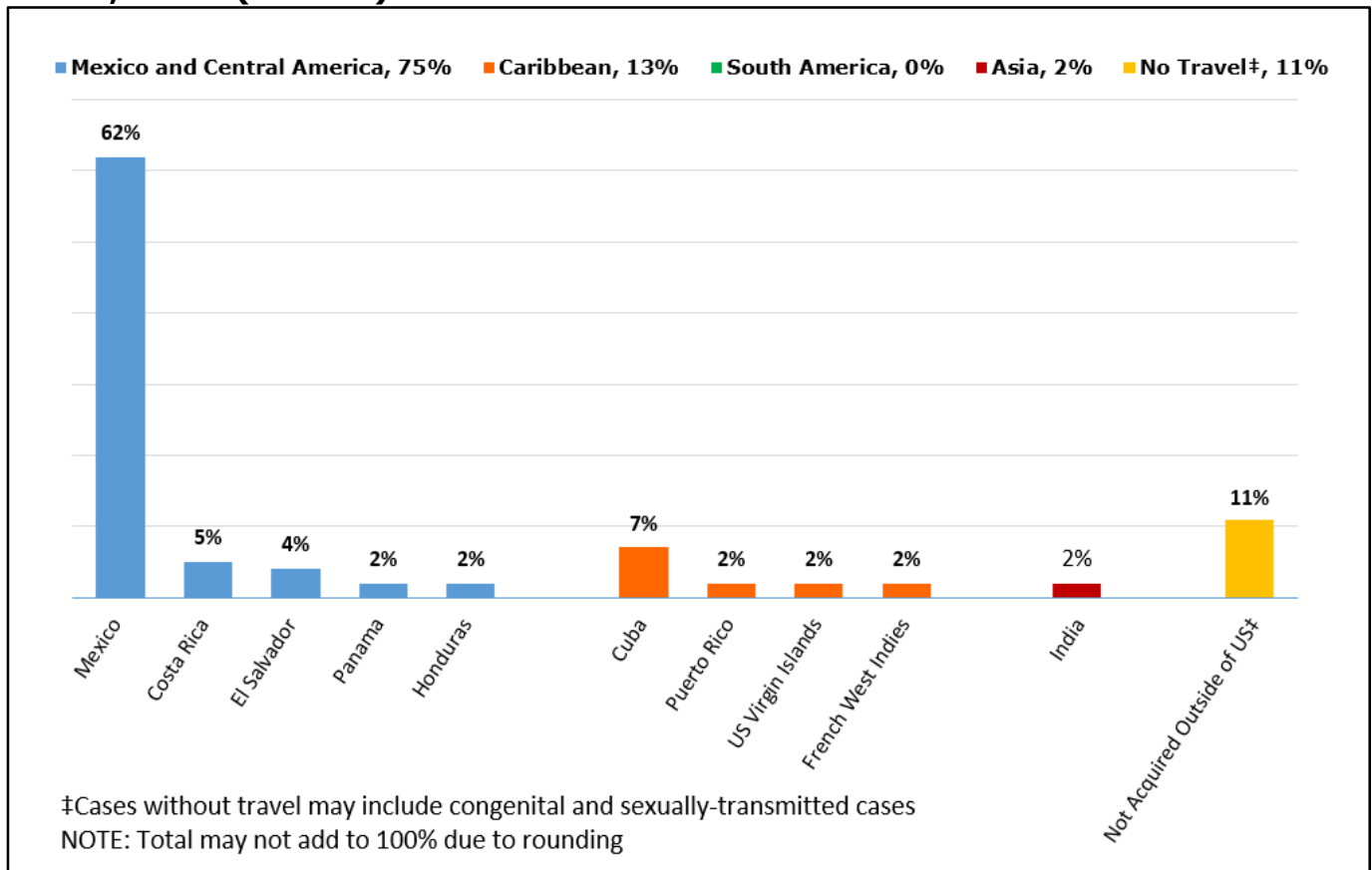
Table 6. Zika Disease Cases Reported by County, Texas, 2017

County	Number of Cases
Bexar	4
Brazoria	1
Brazos	1
Cameron	14†
Collin	3
Dallas	3
Denton	1
Harris	11
Hidalgo	8†
Kerr	1
Lubbock	1
Smith	2
Tarrant	1
Travis	1
Upshur	1
Webb	1
Williamson	1
Total	55

† Includes cases transmitted by mosquitoes in Texas: Cameron (1), Hidalgo (4).

In 2016, the majority of travel-associated ZIKVD cases reported travel to the Caribbean (43%) and Mexico (28%). In contrast, 62% of travel-associated ZIKVD cases in 2017 reported travel to Mexico (Figure 8).

Figure 8. Reported Cases of Zika Disease by Region and Country of Travel, Texas, 2017 (N = 55)



The median age at onset of illness was 25 years (range: 0-70 years) for all ZIKVD cases. The majority (78%) of all ZIKVD cases were Hispanics, followed by non-Hispanic whites (15%). Eighty-four percent of reported ZIKVD cases were females and 14% were males (Table 7).

Table 7. Demographic Characteristics of Reported Zika Disease Cases, Texas, 2017

Characteristic	Number	%
Gender		
Male	9	16
Female	46	84
Pregnancy Status (N = 46)		
Pregnant	23	50
Non-pregnant	23	50
Age Group at Onset (years)		
<1-9	3	5
10-19	13	24
20-29	17	31
30-39	4	7
40-49	5	9
50-59	7	13
60-69	5	9
70-79	1	2
80+	-	-
Race/Ethnicity		
Hispanic	43	78
Non-Hispanic White	8	15
Black	-	-
Asian/Pacific Islander	1	2
American Indian/Alaska Native	-	-
Unknown	3	5

Of the 55 ZIKVD cases reported, 62% reported as febrile illness, 36% reported other illness (rash, conjunctivitis and/or arthralgia with no fever, or a complication of pregnancy consistent with Zika), and 2% (one infant) reported congenital Zika manifestations. The most common clinical signs and symptoms reported by ZIKVD cases were rash (82%), fever (62%), arthralgia (62%), headache (51%), and conjunctivitis (45%). No ZIKVD-related hospitalizations were reported in 2017. In addition, there were no Zika-related deaths among reported cases in 2017 (Table 8).

Table 8. Clinical Characteristics of Reported Zika Disease Cases, Texas, 2017

Characteristic	Number	%
Clinical Syndrome		
Febrile Illness	34	62
Other	20	36
Congenital	1	2
Clinical Signs/Symptoms		
Rash	45	82
Fever	34	62
Arthralgia	34	62
Headache	28	51
Conjunctivitis	25	45
Chills	20	36
Myalgia	17	31
Severe Malaise	16	29
Muscle Weakness	14	25
Retro-orbital Pain	7	13
Vertigo	7	13
Nausea or Vomiting	6	11
Diarrhea	5	9
Zika-Associated Birth Defects	1	2
Clinical Course		
Hospitalized	-	-
Death	-	-

Resources:

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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