

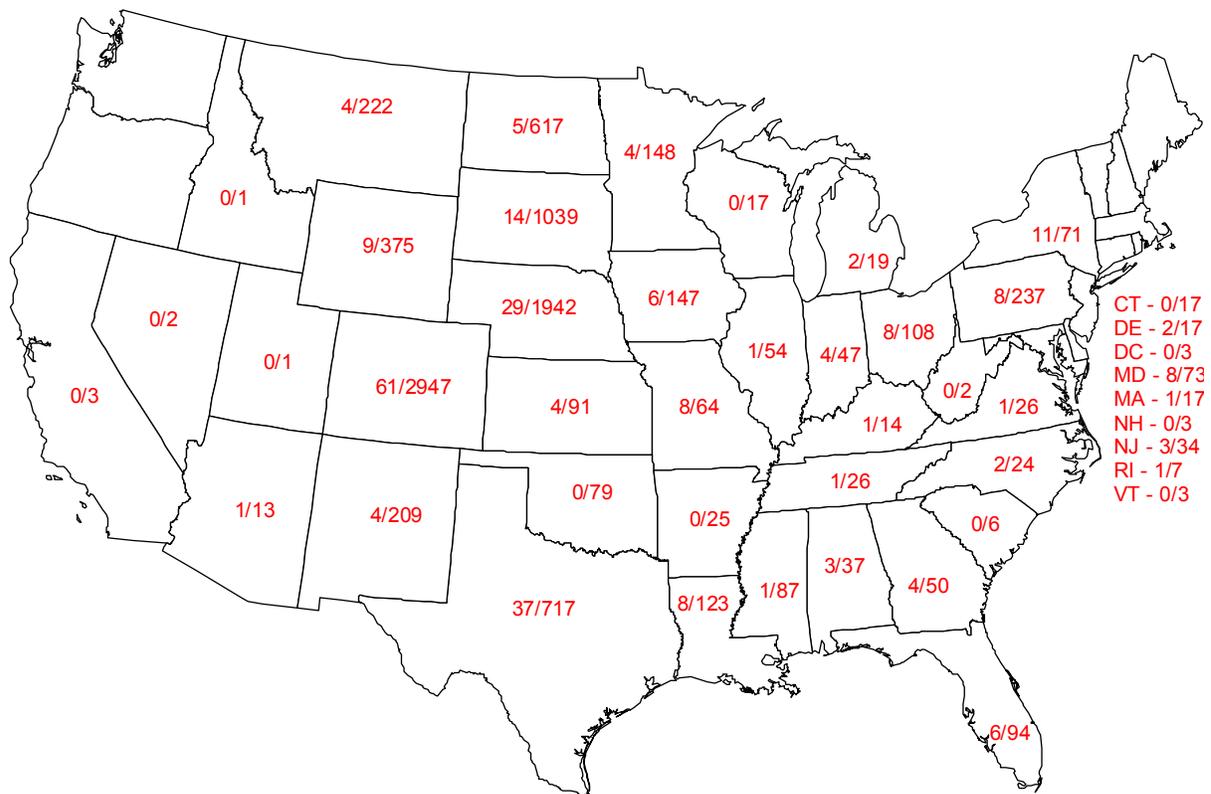
## West Nile Virus in South Dakota 2003

Lon Kightlinger, South Dakota Department of Health

West Nile virus (WNV) was first detected in the Western Hemisphere in 1999 in New York City. The virus spread west across the continent, reaching South Dakota in 2002. West Nile virus is now endemic in much of North America, including South Dakota, and continues to threaten our birds, our horses, and most importantly our people.

2003 was the fifth year of WNV transmission in North America and the second transmission season in South Dakota. The 2002 epidemic centered near the Mississippi and Ohio River valleys, whereas the 2003 epidemic was centered in Great Plains region. In 2003 North America experienced the largest ever recorded arboviral epidemic. South Dakota had the third most WNV cases and the highest incidence of neuroinvasive disease (NID) in the country.

Figure 1. West Nile human deaths/cases, United States, 2003.



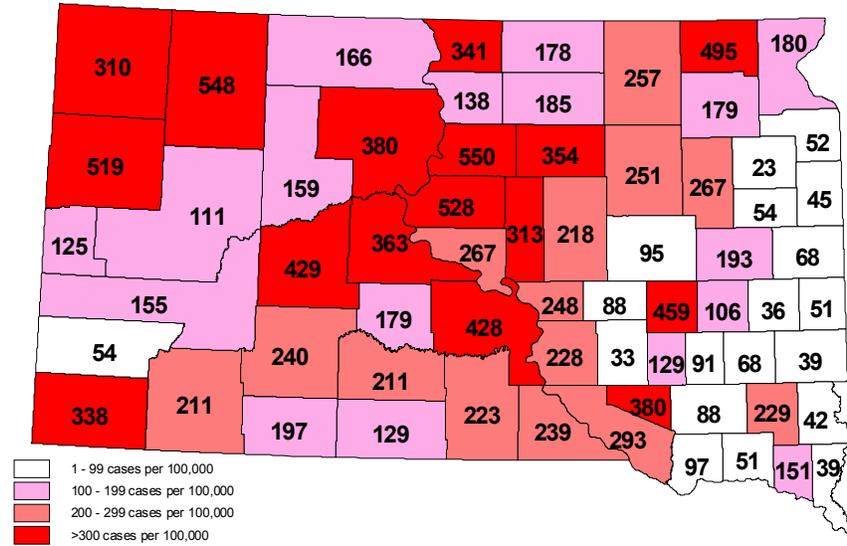
Nationally in 2003 there were 9868 human WNV cases disease reported, with 262 deaths. The WNV cases included 2863 NID cases (encephalitis or meningitis), 6829 with WNV fever, and 161 other diagnostic status. The national median age was 47 years for all cases (range 1 month to 99 years) and 77 years for WNV deaths (range 1 month to 97 years).

In South Dakota there were 1039 human cases of WNV disease and 2 cases of St Louis Encephalitis (SLE) reported in 2003 (Table 1). West Nile and SLE are both mosquito-borne Flavivirus that cause similar encephalitides. Of these cases 171 were diagnosed with neuro-invasive disease (NID 16%) and 870 had West Nile fever (84%), a milder form of the disease. There were 14 WNV-related deaths reported. In addition, 19 individuals also developed acute flaccid paralysis associated with WNV infection. There were 9 cases of

pregnancy associated with WNV infection reported and investigated. During the first year of transmission, 2002, there were 37 human WNV cases, including 14 cases of NID and 23 cases of WN Fever.

Human WNV disease was reported in every South Dakota county in 2003. Pennington County had the most cases, 139, and also had the most deaths, 4. The overall incidence of West Nile disease was 138 cases per 100,000 population. Figure 2 shows the incidence by county. Potter County had the highest incidence of WNV disease with 550 cases per 100,000 population; whereas, Codington County had the lowest incidence with 23 reported cases per 100,000. The high incidence counties were in the western and central part of the state. The overall statewide incidence of WNV NID was 23 cases per 100,000.

Figure 2. Incidence of human West Nile disease (cases reported per 100,000 population), South Dakota 2003.



The screening of donated blood has enhanced the safety of the blood supply and prevented many cases of WNV disease. Nationally, at least 818 WNV viremic donations were detected and removed from the blood supply. In South Dakota 60 viremic blood donations were detected and removed from the blood supply. The South Dakota Department of Health also investigated 4 events of viremic blood transfusions or blood recipients becoming ill with WNV symptoms following transfusion.

Overall, 53% of the WNV cases were male (551) and 47% were female (490), Table 2. Males accounted for a disproportionate number of NID cases (62%) and deaths (71%).

The racial profile of South Dakota WNV cases shows 90% (932) white cases, 10% (107) Native American cases, and 0.2% (2) cases of other races, which reflects the race proportions of the state. Native Americans, however, had a disproportionate share severe morbidity and death with 18% of NID cases and 21% of deaths.

Figure 3. West Nile neuroinvasive disease incidence and death rate by age, South Dakota, 2003.

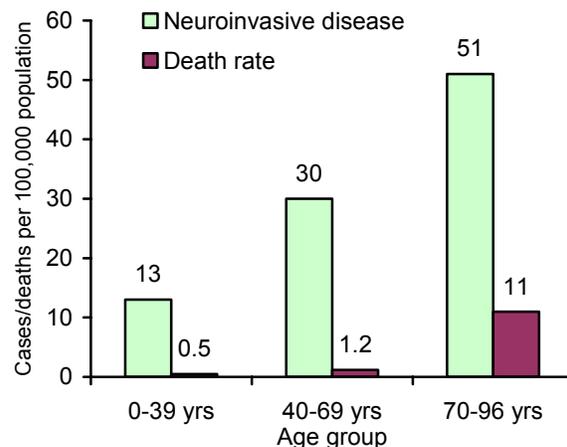


Table 1. West Nile human and animal reports, South Dakota, 2003.

County	Neuroinvasive disease	WN Fever	Total cases	Deaths	Blood donors	Birds	Horses	Other mammal
Aurora	0	1	1	0	0	1	0	0
Beadle	2	14	16	0	0	10	0	0
Bennett	2	5	7	1	0	2	1	0
Bon Homme	1	6	7	0	1	0	0	0
Brookings	4	15	19	0	0	10	2	0
Brown	6	84	90	1	8	4	3	0
Brule	2	10	12	0	0	0	1	0
Buffalo	2	3	5	0	0	0	0	0
Butte	7	40	47	0	4	2	4	0
Campbell	2	4	6	0	0	0	2	0
Charles Mix	2	25	27	0	1	0	0	0
Clark	2	9	11	0	1	0	1	dog
Clay	3	17	20	1	1	12	0	0
Codington	1	5	6	0	0	2	0	0
Corson	3	4	7	0	0	0	0	0
Custer	0	4	4	0	0	1	8	0
Davison	5	19	24	0	3	5	0	0
Day	1	10	11	0	0	4	0	0
Deuel	1	1	2	0	0	1	1	0
Dewey	5	18	23	0	0	0	0	0
Douglas	0	13	13	0	1	1	0	0
Edmunds	0	8	8	0	2	0	0	0
Fall River	7	18	25	1	0	1	10	0
Faulk	2	7	9	0	1	0	0	0
Grant	0	4	4	0	0	0	0	0
Gregory	0	11	11	0	0	0	1	0
Haakon	1	8	9	0	1	1	0	0
Hamlin	1	2	3	0	0	3	0	0
Hand	3	5	8	0	0	3	1	0
Hanson	1	2	3	0	0	0	1	0
Harding	3	1	4	0	0	0	0	0
Hughes*	3	41	44*	0	3	3	0	0
Hutchinson	2	5	7	1	4	1	0	0
Hyde	1	4	5	0	0	0	0	0
Jackson	0	6	6	0	0	0	7	0
Jerauld	2	0	2	0	2	1	0	0
Jones	0	2	2	0	0	0	1	0
Kingsbury	2	9	11	0	0	2	0	0
Lake	1	3	4	0	0	4	0	0
Lawrence	1	26	27	0	1	2	0	0
Lincoln	1	10	11	0	0	3	1	0
Lyman	2	15	17	0	0	1	1	0
Marshall	0	23	23	0	1	0	0	0
McCook	1	3	4	0	0	1	0	dog
McPherson	0	5	5	0	0	0	0	0
Meade	6	21	27	1	0	3	6	0
Mellette	2	3	5	0	0	0	0	0
Miner	0	3	3	0	0	4	0	0
Minnehaha	15	43	58	0	3	9	0	squirrel 2
Moody	0	1	1	0	0	3	0	0
Pennington	28	111	139	4	15	11	8	0
Perkins	1	17	18	0	0	0	1	0
Potter	3	11	14	0	1	0	0	0
Roberts	1	16	17	0	1	1	0	0
Sanborn	2	10	12	1	0	5	0	0
Shannon	11	16	27	2	0	0	1	0
Spink	4	14	18	0	0	0	0	0
Stanley*	0	10	10*	0	0	0	1	0
Sully	0	8	8	0	0	0	0	0
Todd	3	9	12	0	0	0	4	0
Tripp	3	11	14	0	0	0	1	0
Turner	2	18	20	0	1	8	0	0
Union	1	4	5	0	4	1	0	0
Walworth	2	6	8	0	0	0	0	0
Yankton	2	9	11	0	0	5	0	0
Ziebach	0	4	4	1	0	0	5	0
<b>TOTAL</b>	<b>171</b>	<b>870</b>	<b>1041</b>	<b>14</b>	<b>60</b>	<b>131</b>	<b>73</b>	<b>4</b>

\*Hughes and Stanley County each had 1 case of St. Louis Encephalitis

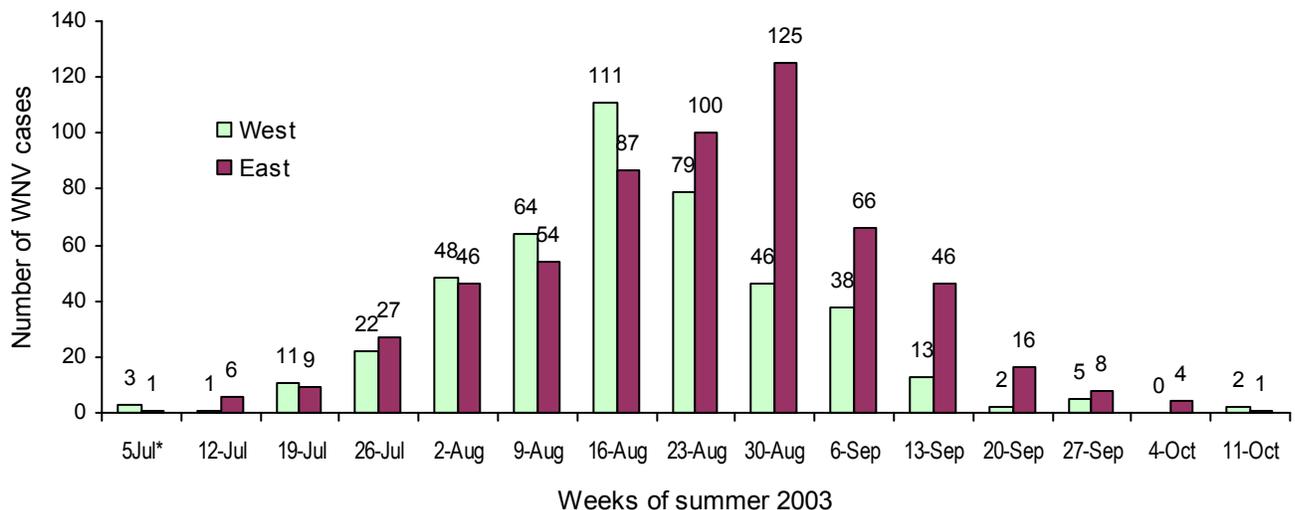
The median age of South Dakota cases was 44 years (range <1 month – 96 years). The median age increased with the NID case (50 years) and deaths (76 years). The risk of NID is highest in individuals over 50 years of age. The highest incidence of NID cases, 51 per 100,000, is among those 70 years and older (Figure 3). Of those cases over 70 years, 39% developed NID, whereas 14% of the younger cases developed NID (Table 2). The number and rate of WNV-associated death is also highest in those cases 70 years and older. Nine of the 14 WNV deaths (64%) occurred in this age group.

The first South Dakota WNV detection in 2003 was an antibody test on 8 May from a healthy, sentinel horse in Lincoln County. The initial bird detection of WNV was a crow from Hamlin County on 6 June, and the first mosquito detection was a pool of *Culiseta inornata* on 10 July from Hughes County. The first sick horse was diagnosed on 17 July in Jackson County.

The first South Dakotan to become ill was on 1 July, and the last person to become ill was on 10 October. This was a 101 day human WNV epidemic. The timeline graphic in Figure 4 shows the WNV human activity in eastern and western South Dakota in 2003. In the counties west of the Missouri River human WNV activity peaked during the week ending August 16th, while East River activity peaked 2 weeks later during the week ending August 30<sup>th</sup>.

Birds were collected and tested as leading surveillance indicators of WNV activity. Three-hundred-and-sixty-six birds were submitted in 2003, of which 131 tested WNV positive using PCR on brain tissue, 142 tested negative, and 85 were not tested due to decomposition or wrong species submission. The birds testing positive included 46 blue jays, 41 crows, 9 goshawks, 4 pelicans, 3 gyrfalcons, 3 prairie chickens, 3 red tail hawks, 3 sparrows, 2 mourning doves, 2 finches, 2 magpies, 2 owls, 1 cormorant, 1 crossbill, 1 duck, 1 goose, 1 robin, 1 woodpecker, and 5 birds of unknown species. Oral swab testing was run in parallel on crows and blue jays in 2003. West Nile positive birds were detected before human illness in 21 counties covering 62% of the state's population.

Figure 4. Human WNV cases by week of illness onset, Eastern and Western\* South Dakota, 2003.



\*Counties East or West of the Missouri River.

In 2003 there were 73 horse WNV cases reported from 25 South Dakota counties. There were also 2 dogs and 2 WNV positive squirrels reported in 2003. During the previous year, 2002, there were 690 horses with WNV reported, with detections in all 66 counties. During the 2002 equine epizootic 34% of non-vaccinated horses with WNV illness died (A.R. Jones et al., Dept of Veterinary Science, SD State University).

	Neuroinvasive disease cases	Fever cases	Total cases	Deaths (%)
<b>Total cases (%)</b>	171 (16%)	870 (84%)	<b>1041</b>	14
<b>GENDER</b>				
Males (%)	107 (19%)	444 (81%)	<b>551</b>	10 (71%)
Females (%)	64 (13%)	426 (87%)	<b>490</b>	4 (29%)
<b>AGE</b>				
0 - 39 years (%)	55 (14%)	348 (86%)	<b>403</b>	2 (14%)
40 - 69 years (%)	75 (14%)	457 (86%)	<b>532</b>	3 (21%)
70 - 99 years (%)	41 (39%)	65 (61%)	<b>106</b>	9 (64%)
<b>RACE</b>				
White (%)	141 (15%)	791 (85%)	<b>932</b>	11 (79%)
Native American (%)	30 (28%)	77 (72%)	<b>107</b>	3 (21%)
Other (%)	0 (0%)	2 (100%)	<b>2</b>	0

The principle route of human WNV infection is the bite of an infected mosquito. In 2003, 31 pools of mosquitoes tested PCR positive for WNV from 4 South Dakota counties. The mosquitoes testing WNV positive included the following species (% of positives) *Culex tarsalis* (65%), *Aedes vexans* (10%), *Ochlerotatus dorsalis* (6%), *Ochlerotatus fitchii* (6%), *Aedes cinereus* (3%), *Culex pipiens* (3%), *Culiseta inornata* (3%) and *Culex salinarius* (3%). *Culex tarsalis* is thought to be the critical bridge vector between infected birds and humans.

As summer 2004 approaches we are preparing again for WNV transmission in South Dakota. Communities should improve their mosquito control programs, horses should be vaccinated, citizens should submit dead birds for testing, eliminate places where mosquitoes can grow, and everyone should use personal protective measures.

Although there are limitations to West Nile surveillances, we are provided with useful information on monitoring and managing the epidemic. In 2004 surveillance for West Nile includes tracking ill human, blood donor, equine, bird and mosquito detections, as well as pilot sentinel chicken flocks. It is not known if the human cases of WNV disease will increase or decrease in 2004. Health care providers must appreciate that serologic testing for WNV becomes more complicated after the WNV infection becomes regionally endemic due to residual anti-WNV IgM that may be still detectable from last summer's infections.

During WNV season individuals with severe or unusual headaches should seek medical care as soon as possible. Physicians are encouraged to have a high index of suspicion for WNV disease. Free WNV testing is available at the South Dakota Public Health Laboratory for ill suspects. We do not encourage testing mildly ill patients or individuals who wish to know if they have an antibody titer. Serum or CSF should be submitted to the Public Health Laboratory. If you have any questions call the laboratory at 1-800-592-1861.

**PHYSICIANS:** Human WNV testing is available at the South Dakota Public Health Laboratory (SDPHL) using IgM and IgG EIA method. These tests specify WNV, and also detect other arboviral antibodies. Human testing is **FREE** at SDPHL for patients with symptoms suggestive of WNV disease. Testing is supported by a CDC Epidemiology-Laboratory Capacity Grant.

**Pregnancy:** Symptomatic women should be tested. Screening asymptomatic pregnant women for WNV is not recommended. If a woman has WNV disease during pregnancy the fetus and newborn should be evaluated. (See MMWR 53: 154-157 for guidelines).

## Submitting samples for WNV testing to the SDPHL

**SERUM:** 2-3 ml of serum on cool packs collected **8 days after onset** of symptoms. Acute serum collected too early after onset may produce false negative IgM results.

**CEREBROSPINAL FLUID:** collected as soon as patient experiences neuro-symptoms. Send 2-3 ml of CSF on cool packs. Do not freeze.

- Shipping address: **SDPHL, 615 East 4<sup>th</sup> Street, Pierre SD 57501**
- Courier service: **Call the lab at 1-800-592-1861**
- Questions? **Call the lab at 1-800-592-1861**

## West Nile Websites

South Dakota West Nile website [www.state.sd.us/doh/WestNile](http://www.state.sd.us/doh/WestNile)

South Dakota Mosquitoes <http://biomicro.sdstate.edu/Hildrethm/mosquito/>

CDC West Nile website: [www.cdc.gov/ncidod/dvbid/westnile/index.htm](http://www.cdc.gov/ncidod/dvbid/westnile/index.htm)

U.S. Department of Agriculture Animal and Plant Health Inspection Service  
[www.aphis.usda.gov/lpa/issues/wnv/wnv.html](http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html)

U.S. Geological Survey [www.nwhc.usgs.gov/research/west\\_nile/west\\_nile.html](http://www.nwhc.usgs.gov/research/west_nile/west_nile.html)

National Institutes of Health [www.nih.gov/news/westnile.htm](http://www.nih.gov/news/westnile.htm)

Food and Drug Administration [www.fda.gov/oc/opacom/hottopics/westnile.html](http://www.fda.gov/oc/opacom/hottopics/westnile.html)

Cornell University WNV Section [www.cfe.cornell.edu/erap/wnv](http://www.cfe.cornell.edu/erap/wnv)

National Library of Medicine [www.nlm.nih.gov/medlineplus/westnilevirus.html](http://www.nlm.nih.gov/medlineplus/westnilevirus.html)

National Pesticide Information Center Web Site <http://npic.orst.edu/wnv>

American Mosquito Control Association [www.mosquito.org/](http://www.mosquito.org/)

West Nile News [www.westnilefever.com/](http://www.westnilefever.com/)

**South Dakota Department of Health 1-800-592-1861**