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West Nile Virus and Other Arboviral Diseases — United States, 2013

Nicole P. Lindsey, MS[1], Jennifer A. Lehman[1], J. Erin Staples, MD[1], Marc Fischer, MD[1] (Author affiliations at end of text)

Arthropod-borne viruses (arboviruses) are transmitted to humans primarily through the bites of infected mosquitoes and ticks. West Nile virus (WNV) is the leading cause of domestically acquired arboviral disease in the United States (*1*). However, several other arboviruses also cause sporadic cases and seasonal outbreaks of neuroinvasive disease (i.e., meningitis, encephalitis, and acute flaccid paralysis) (*1*). This report summarizes surveillance data reported to CDC in 2013 for WNV and other nationally notifiable arboviruses, excluding dengue. Forty-seven states and the District of Columbia reported 2,469 cases of WNV disease. Of these, 1,267 (51%) were classified as WNV neuroinvasive disease, for a national incidence of 0.40 per 100,000 population. After WNV, the next most commonly reported cause of arboviral disease was La Crosse virus (LACV) (85 cases), followed by Jamestown Canyon virus (JCV) (22), Powassan virus (POWV) (15), and eastern equine encephalitis virus (EEEV) (eight). WNV and other arboviruses continue to cause serious illness in substantial numbers of persons annually. Maintaining surveillance remains important to help direct and promote prevention activities.

In the United States, most arboviruses are maintained in transmission cycles between arthropods and vertebrate hosts (typically birds or small mammals). Humans usually become infected when bitten by infected mosquitoes or ticks. Person-to-person transmission occurs rarely through blood transfusion and organ transplantation. Most human arboviral infections are asymptomatic. Symptomatic infections most often manifest as a systemic febrile illness and, less commonly, as neuroinvasive disease. Most endemic arboviral diseases are nationally notifiable and are reported to CDC through the ArboNET surveillance system (*2,3*). In addition to collecting data on human disease cases, ArboNET collects data on viremic blood donors, veterinary disease cases, and infections in mosquitoes, dead birds, and sentinel animals. Using standard definitions, human cases with laboratory evidence of recent arboviral infection are classified as neuroinvasive disease or nonneuroinvasive disease (*2*). Because of the substantial associated morbidity, detection and reporting of neuroinvasive disease cases is assumed to be more consistent and complete than for nonneuroinvasive disease cases. Therefore, incidence rates were calculated for neuroinvasive disease cases using U.S. Census Bureau 2013 mid-year population estimates.

In 2013, CDC received reports of 2,605 cases of nationally notifiable arboviral diseases, including those caused by WNV (2,469 cases), LACV (85), JCV (22), POWV (15), EEEV (eight), unspecified California serogroup virus (five), and St. Louis encephalitis virus (SLEV) (one). Cases were reported from 830 (26%) of the 3,141 U.S. counties; no cases were reported from Alaska or Hawaii. Of the 2,605 arboviral disease cases, 1,383 (53%) were reported as neuroinvasive disease, for a national incidence of 0.44 per 100,000 population.

A total of 2,469 WNV disease cases, including 1,267 (51%) neuroinvasive cases, were reported from 725 counties in 47 states and the District of Columbia (Table 1). WNV disease cases peaked in early September; 90% of cases had illness

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onset during July–September. The median age of patients was 55 years (interquartile range [IQR] = 41–67 years); 1,425 (58%) were male. Overall, 1,494 (61%) patients were hospitalized, and 119 (5%) died. The median age of patients who died was 78 years (IQR = 67–83 years).

Of the 1,267 WNV neuroinvasive disease patients, 669 (53%) had encephalitis, 486 (38%) had meningitis, and 112 (9%) had acute flaccid paralysis. Among the 112 patients with acute flaccid paralysis, 85 (76%) also had encephalitis or meningitis. The national incidence of neuroinvasive WNV disease was 0.40 per 100,000 population (Table 2). States with the highest incidence rates included North Dakota (8.9 per 100,000), South Dakota (6.8), Nebraska (2.9), and Wyoming (2.8) (Figure). Six states reported approximately half (51%) of the WNV neuroinvasive disease cases: California (237 cases), Texas (113), Colorado (90), Illinois (86), North Dakota (64), and Oklahoma (60). Neuroinvasive WNV disease incidence increased with age, with the highest incidence among persons aged ≥70 years. Among patients with neuroinvasive disease, 111 (9%) died.

The 85 LACV disease cases were reported from 59 counties in 12 states; 77 (91%) were neuroinvasive (Table 1). Dates of illness onset for LACV disease cases ranged from June through October; 71 (84%) had onset during July–September. Forty-nine (58%) patients were male. The median age of patients was 7 years (IQR = 4–11 years); 76 (89%) were aged <18 years. LACV neuroinvasive disease incidence was highest in West Virginia (0.54 per 100,000), Tennessee (0.35), North Carolina (0.13), and Ohio (0.12) (Table 2). Those four states reported 60 (78%) LACV neuroinvasive disease cases. A total of 80 (94%) patients were hospitalized; two (2%) died.

Twenty-two JCV disease cases were reported from 20 counties in 10 states; 15 (68%) were neuroinvasive (Table 1). Eight states (Georgia, Idaho, Massachusetts, Minnesota, New Hampshire, Oregon, Pennsylvania, and Rhode Island) reported their first JCV disease cases. Dates of illness onset ranged from January through November, with 14 (64%) of the 22 cases occurring during July–September. The median age of patients was 46 years (IQR = 32–57 years); 17 (77%) were male. Twelve (55%) patients were hospitalized; none died. In addition to the LACV and JCV cases, five cases of California serogroup virus disease were reported for which the specific infecting virus was unknown.

Fifteen POWV disease cases were reported from 13 counties in seven states; 12 (80%) were neuroinvasive (Table 1). Three states (Massachusetts, New Hampshire, and New Jersey) reported their first POWV disease cases. Dates of illness onset ranged from May through November; five (33%) had onset during April–June, and six (40%) had onset during July–September. The median age of patients was 69 years (IQR = 45–75 years); 11 (73%) were male. Thirteen (87%) patients were hospitalized; two (13%) died.

Eight EEEV disease cases were reported from six states, including the first cases ever reported from Arkansas and Connecticut (Table 1). All eight were neuroinvasive. Dates of illness onset ranged from January through December. The

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TABLE 1. Number and percentage of reported cases of arboviral disease, by virus and selected characteristics — United States, 2013*

Characteristic	Virus									
	West Nile (n = 2,469)		La Crosse (n = 85)		Jamestown Canyon (n = 22)		Powassan (n = 15)		Eastern equine encephalitis (n = 8)	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Age group (yrs)										
<18	96	(4)	76	(89)	3	(14)	1	(7)	2	(25)
18–59	1,392	(56)	6	(7)	16	(73)	6	(40)	3	(38)
≥60	981	(40)	3	(4)	3	(14)	8	(53)	3	(38)
Sex										
Male	1,425	(58)	49	(58)	17	(77)	11	(73)	6	(75)
Female	1,044	(42)	36	(42)	5	(23)	4	(27)	2	(25)
Period of illness onset										
January–March	4	(<1)	0	(0)	1	(5)	0	(0)	2	(25)
April–June	49	(2)	9	(11)	5	(23)	5	(33)	1	(13)
July–September	2,223	(90)	71	(84)	14	(64)	6	(40)	2	(25)
October–December	193	(8)	5	(6)	2	(9)	4	(27)	3	(38)
Clinical syndrome										
Nonneuroinvasive	1,202	(49)	8	(9)	7	(32)	3	(20)	0	(0)
Neuroinvasive	1,267	(51)	77	(91)	15	(68)	12	(80)	8	(100)
Encephalitis	669	(27)	65	(76)	9	(41)	10	(67)	8	(100)
Meningitis	486	(20)	8	(9)	6	(27)	2	(13)	0	(0)
Acute flaccid paralysis†	112	(5)	4	(5)	0	(0)	0	(0)	0	(0)
Outcome										
Hospitalization	1,494	(61)	80	(94)	12	(55)	13	(87)	8	(100)
Death	119§	(5)	2	(2)	0	(0)	2	(13)	4	(50)

* Five unspecified California serogroup virus disease cases in addition to the La Crosse virus and Jamestown Canyon virus disease cases were reported.
† Of the 112 West Nile virus disease patients with acute flaccid paralysis, 85 (76%) also had encephalitis or meningitis. The four La Crosse virus disease patients with acute flaccid paralysis all also had encephalitis.
§ Of the 119 West Nile virus deaths, 111 (93%) occurred in patients with neuroinvasive disease and eight (7%) in patients with nonneuroinvasive disease.

median age of patients was 56 years (IQR = 33–74 years); six (75%) were male. All eight patients were hospitalized; four (50%) died. The median age of patients who died was 62 years (IQR = 33–86 years).

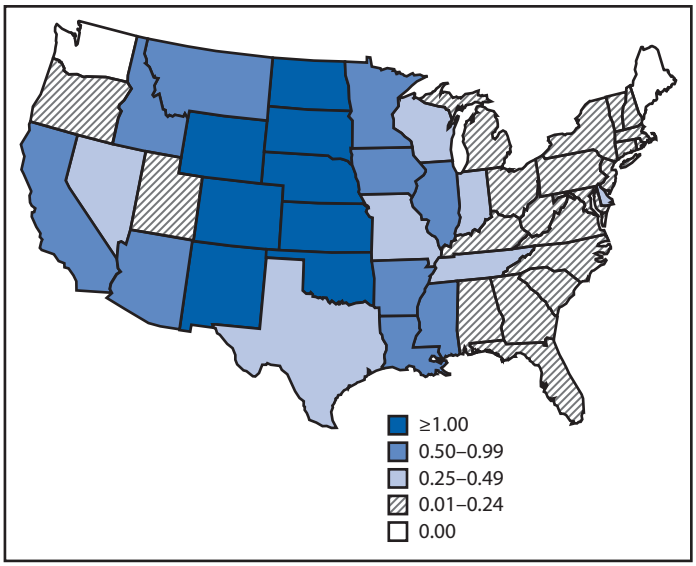
One SLEV neuroinvasive disease case was reported from Texas; the patient was hospitalized and survived.

Discussion

In 2013, WNV was the most common cause of neuroinvasive arboviral disease in the United States. However, LACV was the most common cause of neuroinvasive arboviral disease among children. More JCV cases were reported in 2013 than in any previous year and included the first cases reported from eight states. This increase is likely related to the initiation of routine immunoglobulin M testing for JCV at CDC in 2013 and suggests that the incidence of JCV infection in prior years might have been underestimated. EEEV disease, although rare, remained the most severe arboviral disease, with four deaths among eight patients. More than 90% of arboviral disease cases occurred during April–September, emphasizing the importance of focusing public health interventions during this period.

Reported numbers of arboviral disease cases vary from year to year. Weather (e.g., temperature and precipitation), zoonotic host and vector abundance, and human behavior (e.g., repellent use, outdoor activities, and use of air conditioning or screens in the home) are all factors that can influence when and where outbreaks occur. This complex ecology makes it difficult to predict how many cases of disease might occur in the future and where they will occur. Increased numbers of

FIGURE. Incidence* of reported cases of West Nile virus neuroinvasive disease, by state — United States, 2013



* Per 100,000 population, based on July 1, 2013 U.S. Census population estimates.

TABLE 2. Number and rate* of reported cases of arboviral neuroinvasive disease, by virus, U.S. Census region, and state — United States, 2013

	Virus									
	West Nile		La Crosse		Jamestown Canyon		Powassan		Eastern equine encephalitis	
U.S. Census region/State	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
United States	**1,267**	**0.40**	**77**	**0.02**	**15**	**<0.01**	**12**	**<0.01**	**8**	**<0.01**
New England	**11**	**0.08**	**—**	**—**	**3**	**0.02**	**3**	**0.02**	**2**	**0.01**
Connecticut	1	0.03	—	—	—	—	—	—	1	0.03
Maine	—	—	—	—	—	—	1	0.08	—	—
Massachusetts	7	0.10	—	—	1	0.01	1	0.01	1	0.01
New Hampshire	1	0.08	—	—	1	0.08	1	0.08	—	—
Rhode Island	1	0.10	—	—	1	0.10	—	—	—	—
Vermont	1	0.16	—	—	—	—	—	—	—	—
Middle Atlantic	**34**	**0.08**	**—**	**—**	**3**	**0.01**	**5**	**0.01**	**—**	**—**
New Jersey	10	0.11	—	—	—	—	1	0.01	—	—
New York	18	0.09	—	—	3	0.02	4	0.02	—	—
Pennsylvania	6	0.05	—	—	—	—	—	—	—	—
East North Central	**167**	**0.36**	**20**	**0.04**	**7**	**0.02**	**3**	**0.01**	**—**	**—**
Illinois	86	0.67	—	—	—	—	—	—	—	—
Indiana	19	0.29	1	0.02	—	—	—	—	—	—
Michigan	24	0.24	—	—	—	—	—	—	—	—
Ohio	21	0.18	14	0.12	—	—	—	—	—	—
Wisconsin	17	0.30	5	0.09	7	0.12	3	0.05	—	—
West North Central	**288**	**1.38**	**4**	**0.02**	**1**	**0.00**	**1**	**0.00**	**—**	**—**
Iowa	24	0.78	—	—	—	—	—	—	—	—
Kansas	34	1.17	—	—	—	—	—	—	—	—
Minnesota	31	0.57	4	0.07	1	0.02	1	0.02	—	—
Missouri	24	0.40	—	—	—	—	—	—	—	—
Nebraska	54	2.89	—	—	—	—	—	—	—	—
North Dakota	64	8.85	—	—	—	—	—	—	—	—
South Dakota	57	6.75	—	—	—	—	—	—	—	—
South Atlantic	**36**	**0.06**	**27**	**0.04**	**—**	**—**	**—**	**—**	**5**	**0.01**
Delaware	3	0.32	—	—	—	—	—	—	—	—
District of Columbia	—	—	—	—	—	—	—	—	—	—
Florida	5	0.03	—	—	—	—	—	—	3	0.02
Georgia	4	0.04	1	0.01	—	—	—	—	1	0.01
Maryland	11	0.19	—	—	—	—	—	—	—	—
North Carolina	3	0.03	13	0.13	—	—	—	—	1	0.01
South Carolina	3	0.06	1	0.02	—	—	—	—	—	—
Virginia	6	0.07	2	0.02	—	—	—	—	—	—
West Virginia	1	0.05	10	0.54	—	—	—	—	—	—

See table footnotes on page 525.

reported cases and the identification of cases in new locations might reflect actual changes in incidence and epidemiology or increased disease awareness.

The incidence of WNV neuroinvasive disease declined substantially in 2013 (incidence of 0.40 per 100,000 population) compared with 2012 (0.92 per 100,000 population), when a large multistate outbreak occurred, with incidence nearing the levels observed in 2002 and 2003 (*4*). However, the incidence in 2013 was similar to that during 2004–2007 (median = 0.43; range = 0.39–0.50) and was higher than that during 2008–2011 (median = 0.18; range: 0.13–0.23) (*3–5*). WNV activity remained focalized in 2013, with more than half of the neuroinvasive disease cases being reported from just six states.

The findings in this report are subject to at least two limitations. First, ArboNET is a passive surveillance system that relies on clinicians to consider the diagnosis of an arboviral disease and obtain appropriate diagnostic tests, and on health-care providers and laboratories to report laboratory-confirmed cases to public health authorities. Second, testing and reporting are incomplete, leading to a substantial underestimate of the actual number of cases (*6*). For example, data from previous studies suggest there are 30–70 nonneuroinvasive disease cases for every reported case of WNV neuroinvasive disease (*7–9*). Extrapolating from the 1,267 WNV neuroinvasive disease cases reported, an estimated 38,000–88,500 nonneuroinvasive disease cases might have occurred in 2013. However, only 1,202 (1%–3%) were diagnosed and reported.

TABLE 2. (*Continued*) Number and rate* of reported cases of arboviral neuroinvasive disease, by virus, U.S. Census region, and state — United States, 2013

	Virus									
	West Nile		La Crosse		Jamestown Canyon		Powassan		Eastern equine encephalitis	
U.S. Census region/State	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
East South Central	**48**	**0.26**	**26**	**0.14**	—	—	—	—	—	—
Alabama	3	0.06	1	0.02	—	—	—	—	—	—
Kentucky	1	0.02	—	—	—	—	—	—	—	—
Mississippi	27	0.90	2	0.07	—	—	—	—	—	—
Tennessee	17	0.26	23	0.35	—	—	—	—	—	—
West South Central	**223**	**0.59**	—	—	—	—	—	—	**1**	**<0.01**
Arkansas	16	0.54	—	—	—	—	—	—	1	0.03
Louisiana	34	0.74	—	—	—	—	—	—	—	—
Oklahoma	60	1.56	—	—	—	—	—	—	—	—
Texas	113	0.43	—	—	—	—	—	—	—	—
Mountain	**216**	**0.94**	—	—	—	—	—	—	—	—
Arizona	50	0.75	—	—	—	—	—	—	—	—
Colorado	90	1.71	—	—	—	—	—	—	—	—
Idaho	14	0.87	—	—	—	—	—	—	—	—
Montana	10	1.00	—	—	—	—	—	—	—	—
Nevada	8	0.29	—	—	—	—	—	—	—	—
New Mexico	24	1.15	—	—	—	—	—	—	—	—
Utah	4	0.14	—	—	—	—	—	—	—	—
Wyoming	16	2.75	—	—	—	—	—	—	—	—
Pacific	**244**	**0.47**	—	—	**1**	**<0.01**	—	—	—	—
Alaska	—	—	—	—	—	—	—	—	—	—
California	237	0.62	—	—	—	—	—	—	—	—
Hawaii	—	—	—	—	—	—	—	—	—	—
Oregon	7	0.18	—	—	1	0.03	—	—	—	—
Washington	—	—	—	—	—	—	—	—	—	—

* Per 100,000 population, based on July 1, 2013 U.S. Census population estimates.

What is already known on this topic?

West Nile virus (WNV) is the leading cause of domestically acquired arboviral disease in the United States. However, several other arboviruses can cause sporadic cases and outbreaks of neuroinvasive disease, mainly in the summer.

What is added by this report?

In 2013, WNV was the most common cause of neuroinvasive arboviral disease in the United States (1,267 cases). However, La Crosse virus was the most common cause of neuroinvasive arboviral disease among children. More Jamestown Canyon virus disease cases (22) were reported in 2013 than in any previous year and included the first cases reported from eight states. Eastern equine encephalitis virus disease, although rare, remained the most severe arboviral disease, with a 50% case-fatality ratio.

What are the implications for public health practice?

WNV and other arboviruses continue to be a source of severe illness each year for substantial numbers of persons in the United States. Maintaining surveillance remains important to identify outbreaks and guide prevention efforts. Prevention efforts depend upon applying insecticides, reducing mosquito breeding grounds, use of repellents, and wearing protective clothing.

Arboviruses continue to cause substantial morbidity in the United States. However, cases occur sporadically, and the epidemiology varies by virus and geographic area. Surveillance is essential to identify outbreaks and guide prevention efforts aimed at reducing the incidence of these diseases. Health-care providers should consider arboviral infections in the differential diagnosis of cases of aseptic meningitis and encephalitis, obtain appropriate specimens for laboratory testing, and promptly report cases to public health authorities (*2*). Because human vaccines against domestic arboviruses are not available, prevention of arboviral disease depends on community and household efforts to reduce vector populations (e.g., applying insecticides and reducing mosquito breeding sites), personal protective measures to decrease exposure to mosquitoes and ticks (e.g., use of repellents and wearing protective clothing), and screening blood donors.

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[1]Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC (Corresponding author: Nicole Lindsey, nplindsey@cdc.gov, 970-221-6400)

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Use of MenACWY-CRM Vaccine in Children Aged 2 Through 23 Months at Increased Risk for Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices, 2013

Jessica R. MacNeil, MPH[1], Lorry Rubin, MD[2], Lucy McNamara, PhD[3], Elizabeth C. Briere, MD[1], Thomas A. Clark, MD[1], Amanda C. Cohn, MD[1] (Author affiliations at end of text)

During its October 2013 meeting, the Advisory Committee on Immunization Practices (ACIP) recommended use of a third meningococcal conjugate vaccine, MenACWY-CRM (Menveo, Novartis), as an additional option for vaccinating infants aged 2 through 23 months at increased risk for meningococcal disease. MenACWY-CRM is the first quadrivalent meningococcal conjugate vaccine licensed for use in children aged 2 through 8 months. MenACWY-D (Menactra, Sanofi Pasteur) is recommended for use in children aged 9 through 23 months who are at increased risk for meningococcal disease (*1*), and Hib-MenCY-TT (MenHibrix, GlaxoSmithKline) is recommended for use in children aged 6 weeks through 18 months at increased risk (Table) (*2*). This report summarizes information on MenACWY-CRM administration in infants and provides recommendations for vaccine use in infants aged 2 through 23 months who are at increased risk for meningococcal disease (*3*). Because the burden of meningococcal disease in infants is low in the United States and the majority of cases that do occur are caused by serogroup B, which is not included in any vaccine licensed in the United States, only those infants who are at increased risk for meningococcal disease are recommended to receive a meningococcal vaccine.

Recommendations for routine use of vaccines in children, adolescents and adults are developed by the Advisory Committee on Immunization Practices (ACIP). ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the Director of the Centers for Disease Control and Prevention (CDC) on use of vaccines and related agents for the control of vaccine-preventable diseases in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), and the American College of Obstetrics and Gynecology (ACOG). Recommendations for routine use of vaccines in adults are harmonized with recommendations of AAFP, ACOG, and the American College of Physicians (ACP). ACIP recommendations adopted by the CDC Director become agency guidelines on the date published in the Morbidity and Mortality Weekly Report (MMWR). *Additional information regarding ACIP is available at http://www.cdc.gov/vaccines/acip.*

Methods

In monthly teleconferences, the ACIP Meningococcal Vaccines Work Group reviewed safety and immunogenicity data from five phase 3 clinical trials of MenACWY-CRM use in infants aged 2 through 23 months (*4*–*8*). Data on the concomitant administration of MenACWY-CRM and 7-valent pneumococcal conjugate vaccine (PCV7) were discussed by both the Meningococcal and Pneumococcal ACIP work groups. The Meningococcal Vaccines Work Group also reviewed published peer-reviewed literature and unpublished data on disease epidemiology. Evidence of benefits, harms, values and preferences, and cost-effectiveness were reviewed in accordance with GRADE methods (*9*). A summary of the data reviewed and work group discussions were presented to ACIP, and recommendations for use of MenACWY-CRM in infants were approved by ACIP at its October 23–24, 2013 meeting.

Summary of Data Reviewed

MenACWY-CRM is a conjugate vaccine in which the capsular polysaccharides from *Neisseria meningitidis* serogroups A, C, W, and Y are conjugated to the diphtheria toxin mutant CRM197 (*10*). The vaccine provides protection against meningococcal serogroups A, C, W, and Y, but not against serogroup B.

Immunogenicity of MenACWY-CRM in infants aged 2 through 23 months was evaluated in four clinical trials (*4*–*7*). In all trials, enrolled subjects were randomized to receive either routine infant vaccinations and MenACWY-CRM, or routine infant vaccines alone. Human serum bactericidal antibody (hSBA) titers were used as a correlate of protection to assess vaccine immunogenicity; hSBA titers ≥1:8 were considered protective (*4,7*). Two open-label, multicenter trials assessed immunogenicity of a 4-dose MenACWY-CRM series, with doses at ages 2, 4, 6, and 12 months (*4,7*). A third trial assessed immunogenicity of a 4-dose series, with doses at ages 2, 4, 6, and 16 months, and a 3-dose series, with doses at ages 2, 6, and 12 months (*6*). A fourth randomized, open-label, multicenter trial assessed immunogenicity of a 2-dose MenACWY-CRM regimen, with doses at ages 7 through 9 months and 12 months (*5*). In the first three trials, hSBA titers were assessed 1 month after completion of the infant series (age 7 months)

TABLE. Summary of recommendations for meningococcal vaccination of children aged 2–23 months at increased risk for meningococcal disease — Advisory Committee on Immunization Practices, 2013

Vaccine	Age of primary vaccination	Booster doses*	Indicated for infants who:	Not indicated for:
MenACWY-CRM (Menveo)	2, 4, 6, and 12 months	• 1st booster 3 years after primary series • Additional boosters every 5 years	• Have complement component deficiencies • Have functional or anatomic asplenia (including sickle cell disease) • Are in the risk group for an outbreak for which vaccination is recommended • Are traveling to or residing in regions where meningitis is epidemic or hyperendemic	
MenACWY-D (Menactra)	9 and 12 months†	• 1st booster 3 years after primary series • Additional boosters every 5 years	• Have complement component deficiencies • Are in the risk group for an outbreak for which vaccination is recommended • Are traveling to or residing in regions where meningitis is epidemic or hyperendemic	• Infants with functional or anatomic asplenia (including sickle cell disease)§
Hib-MenCY-TT (MenHibrix)	2, 4, 6, and 12–15 months	• 1st booster (using MenACWY-CRM or MenACWY-D¶) 3 years after primary series	• Have complement component deficiencies	• Infants traveling internationally to regions where meningitis is epidemic or hyperendemic
		• Additional boosters (using MenACWY-CRM or MenACWY-D¶) every 5 years	• Have functional or anatomic asplenia (including sickle cell disease) • Are in the risk group for an outbreak for which vaccination is recommended	• Booster dose in children aged >18 months

* If the most recent dose was received before age 7 years, a booster dose should be administered 3 years later.
† For infants aged 9–23 months, 2 doses of MenACWY-D should be administered 12 weeks apart. For infants receiving the vaccine before travel, the second dose may be administered as soon as 8 weeks after the first dose (additional information at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6202a1.htm).
§ Because of high risk for invasive pneumococcal disease, children with functional or anatomic asplenia should not be immunized with MenACWY-D before age 2 years to prevent immune interference with 13-valent pneumococcal conjugate vaccine (PCV13).
¶ Hib-MenCY-TT should not be used for booster doses. A quadrivalent meningococcal vaccine (MenACWY-CRM or MenACWY-D) should be used for booster doses.

and 1 month after completion of the full series (age 13 or 17 months, depending on the dose regimen used) (*4,6,7*). In the fourth trial, hSBA titers were assessed 1 month after completion of the 2-dose series, at age 13 months.

In the first three trials, 1 month after completion of a 3-dose infant series, 67%–89% of subjects had protective hSBA titers for serogroup A, and 94%–98% had protective hSBA titers for serogroups C, W, and Y (*4,6,7*). In the first two trials, at age 13 months, 89%–94% of infants achieved protective hSBA antibody titers for serogroup A, and 95%–100% achieved protective hSBA antibody titers for the remaining serogroups (*4,7*); similar immune responses were observed at ages 13 and 17 months, respectively, among infants who received a 2-dose series (age 7 through 9 and 12 months) in the fourth trial or a 3-dose infant series with a 16-month toddler dose (*5,6,11*) in the third trial. Among infants receiving doses at ages 2, 6, and 12 months, 74% had protective hSBA titers for serogroup A, and at least 94% had protective hSBA titers for serogroups C, W, and Y at age 7 months; at least 94% had protective hSBA titers against all four serogroups at age 13 months (*6*). Preliminary results suggest that 2 years after a 4-dose MenACWY-CRM series (at ages 2, 4, 6, and 12 months) is completed, 34%–76% of children maintain protective hSBA titers for serogroups C, Y, and/or W (Novartis, unpublished data, 2013). However, protection against serogroup A wanes in almost all children by this time (Novartis, unpublished data, 2013).

Three trials evaluated concomitant administration of MenACWY-CRM and routine childhood vaccinations. Interference with immune responses to pneumococcal serotypes 6B (*4,7*) and 23F (*4*) was suggested after PCV7 coadministration with the 3-dose infant series of MenACWY-CRM compared with infants receiving PCV7 alone in two trials (*4,7,11*). However, after concomitant administration of PCV7 and the 12-month dose of MenACWY-CRM, no reduction in responses to pneumococcal serotype 6B or 23F was observed (*4,7,11*).

No interference with the immune response was observed for pertussis antigens based on geometric mean concentration ratios (*4–7*). Seroresponses to other pneumococcal serotypes and to antigens in other routine childhood vaccines (diphtheria-tetanus-acellular pertussis-inactivated poliovirus-*Haemophilus influenzae* type b combined vaccine [DTaP-IPV-Hib] [Pentacel, Sanofi Pasteur]); hepatitis B virus

vaccine; measles, mumps, and rubella vaccine; and measles, mumps, rubella, and varicella vaccine were not affected by MenACWY-CRM administration (*4,5,11*).

The work group also examined data from the five clinical trials evaluating adverse events in infants receiving MenACWY-CRM (*4–8,11*). Among approximately 5,000 subjects studied through 6-months postvaccination, local and systemic adverse events after administration of MenACWY-CRM and routine vaccinations were similar to those observed after routine vaccination alone (*4–8,11*); 11 serious adverse events were considered possibly related to MenACWY-CRM.* No deaths were considered related to MenACWY-CRM.

Recommendations

Vaccination with an age- and formulation-appropriate meningococcal conjugate vaccine is recommended for infants aged 2 through 23 months at increased risk for meningococcal disease. As described previously (*1–3*), infants at increased risk for meningococcal disease are:

- those with persistent complement component deficiencies (C3, C5–C9, properdin, factor D, and factor H),
- those with functional or anatomic asplenia (including sickle cell disease),
- healthy infants in communities with a meningococcal disease outbreak for which vaccination is recommended, and
- those traveling to or residing in areas where meningococcal disease is hyperendemic or epidemic.

Routine vaccination against meningococcal disease is not recommended for children aged 2 months through 10 years.

MenACWY-CRM may be used for protection against serogroups A, C, W, and Y in infants aged 2 through 23 months who are recommended for meningococcal vaccination because of an increased risk for meningococcal disease (Table). Infants are recommended to receive a 4-dose vaccination series, with doses at ages 2, 4, 6, and 12 months. Children initiating vaccination at ages 7 through 23 months are recommended to receive 2 doses of MenACWY-CRM, with the second dose administered at age ≥12 months and ≥3 months after the first dose. MenACWY-CRM is the only vaccine licensed for infants aged <9 months that includes protection against meningococcal serogroups A and W; therefore, infants aged <9 months traveling to or residing in areas with hyperendemic or epidemic meningococcal disease caused by these serogroups should receive MenACWY-CRM before travel. Hib-MenCY-TT does not provide protection against serogroups A and W and should not be used for protection in infants traveling to or residing in areas with hyperendemic or epidemic meningococcal disease. Recommendations for use of the other infant meningococcal vaccines, MenACWY-D and Hib-MenCY-TT, have been published previously and remain unchanged (Table) (*1–3*).

Because of differences in serogroup composition and licensure indication, the same vaccine product should be used for all doses in infants at increased risk for meningococcal disease. However, if the product used for prior doses is unknown or unavailable, the vaccination series can be completed with any age- and formulation-appropriate meningococcal vaccine. Although no data are available on interchangeability of meningococcal vaccines in infants, limited data from a postlicensure study in adolescents suggests safety and immunogenicity of MenACWY-CRM are not adversely affected by prior immunization with MenACWY-D (*12*).

In previous recommendations, children with functional or anatomic asplenia (including sickle cell disease) were recommended to receive 13-valent pneumococcal conjugate vaccine (PCV13) according to the normal schedule but to delay MenACWY-D vaccination until age 2 years because of immune interference (*1,3*). Because MenACWY-CRM does not demonstrate immune interference with PCV7 after the 12-month dose, it can be administered concomitantly with PCV13. ACIP recommends that infants aged 2 through 23 months with functional or anatomic asplenia either receive MenACWY-CRM or Hib-MenCY-TT or wait until age 2 years to receive MenACWY-D (Table).

For children at prolonged increased risk for meningococcal disease, ACIP recommends booster doses of conjugate meningococcal vaccine after completion of the primary series. As stated previously (*1*), if the most recent dose was received before age 7 years, a booster dose should be administered 3 years later. Additional boosters should be administered every 5 years thereafter.

*The administration of the investigational vaccine and an adverse event were considered reasonably related in time and the adverse event could be explained by causes other than exposure to the investigational vaccine. Reported adverse events included acute encephalomyelitis (one case), cellulitis (one), complex partial seizure (one), epilepsy (one), febrile seizure (three), fever (one), Kawasaki disease (three).

[1]Meningitis and Vaccine Preventable Diseases Branch, Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; [2]Advisory Committee on Immunization Practices Meningococcal Vaccines Work Group; [3]EIS officer, CDC (Corresponding author: Jessica R. MacNeil, jmacneil@cdc.gov)

Acknowledgments

Members of ACIP. Member roster for July 2013–June 2014 available at http://wwwdev.cdc.gov/vaccines/acip/committee/members-archive.html.

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Notes from the Field

Increase in Fentanyl-Related Overdose Deaths — Rhode Island, November 2013–March 2014

Melissa C. Mercado-Crespo, PhD[1], Steven A. Sumner, MD[1], M. Bridget Spelke[2], David E. Sugerman, MD[2], Christina Stanley, MD[3] (Author affiliations at end of text)

During November 2013–March 2014, twice as many all-intent drug overdose deaths were reported in Rhode Island as were reported during the same period in previous years. Most deaths were among injection-drug users, and a large percentage involved fentanyl, a synthetic opioid that is 50–100 times more potent than morphine (*1*). Clusters of fentanyl-related deaths have been reported recently in several states. From April 2005 to March 2007, time-limited active surveillance from CDC and the Drug Enforcement Administration identified 1,013 deaths caused by illicit fentanyl use in New Jersey; Maryland; Chicago, Illinois; Detroit, Michigan; and Philadelphia, Pennsylvania (*2*). Acetyl fentanyl, an illegally produced fentanyl analog, caused a cluster of overdose deaths in northern Rhode Island in 2013 (*3*).

The Rhode Island Department of Health (RIDOH) requested CDC's assistance in describing and determining risk factors for recent fentanyl-related overdose death cases. CDC abstracted records from RIDOH's Office of State Medical Examiners, Division of Vital Records, and Prescription Monitoring Program, with the assistance of local staff members. A fentanyl-related overdose death was defined as a death that occurred during November 2013–March 2014 in which fentanyl was listed as the official cause of death, a contributor to the cause of death, or in which toxicology reports identified fentanyl levels above the detection limit (≥2 ng/mL) by enzyme-linked immunosorbent assay.

Preliminary analyses show that fentanyl-related overdose deaths accounted for 52 (31.5%) of the 165 unintentional overdose deaths reported during November 2013–March 2014. Most decedents did not have active fentanyl prescriptions; the fentanyl appeared to originate from illicit sources and was not acetyl fentanyl–related. Although fentanyl-related overdose deaths were widespread in Rhode Island, most cases occurred in Providence and surrounding urban areas. CDC is currently conducting additional data analyses to determine whether the prescription monitoring program records or medical records of the decedents might help identify others at high risk for similar outcomes.

CDC collaborated with RIDOH to develop an emergency regulation that requires all Rhode Island emergency departments to report fatal and nonfatal opioid overdose cases within 48 hours to RIDOH. CDC recommended that RIDOH continue and expand its efforts to make naloxone, a prescription drug that helps reverse the effects of opioids, accessible for prior drug overdose patients and their families.

[1]EIS officer, CDC; [2]Division of Unintentional Injury Prevention, National Center for Injury Prevention and Control, CDC; [3]Office of the State Medical Examiners, Rhode Island Department of Health (Corresponding author: Melissa C. Mercado-Crespo, mmercadocrespo@cdc.gov, 770-488-4713)

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Announcements

Recommendation Regarding Promoting Health Equity Through Full-Day Kindergarten — Community Preventive Services Task Force

The Community Preventive Services Task Force recently posted new information on its website: "Promoting Health Equity Through Education Programs and Policies: Full-Day Kindergarten Programs." The information is available at http://www.thecommunityguide.org/healthequity/education/fulldaykindergarten.html.

Established in 1996 by the U.S. Department of Health and Human Services, the task force is an independent, nonfederal, uncompensated panel of public health and prevention experts whose members are appointed by the Director of CDC. The task force provides information for a wide range of decision makers on programs, services, and policies aimed at improving population health. Although CDC provides administrative, research, and technical support for the task force, the recommendations developed are those of the task force and do not undergo review or approval by CDC.

Epidemic Intelligence Service Application Deadline — August 15, 2014

Applications are being accepted for CDC's July 2015–June 2017 Epidemic Intelligence Service (EIS) program. EIS is a 2-year, postgraduate program of service and on-the-job training for health professionals interested in the practice of epidemiology. Each year, EIS selects approximately 80 persons from applicants around the world and provides them with opportunities to gain hands-on experience in epidemiology at CDC or at state or local health departments. EIS officers, often called CDC's "disease detectives," have gone on to occupy leadership positions at CDC and other public health agencies nationally and internationally. However, the experience also is useful for health professionals who want to gain a population health perspective.

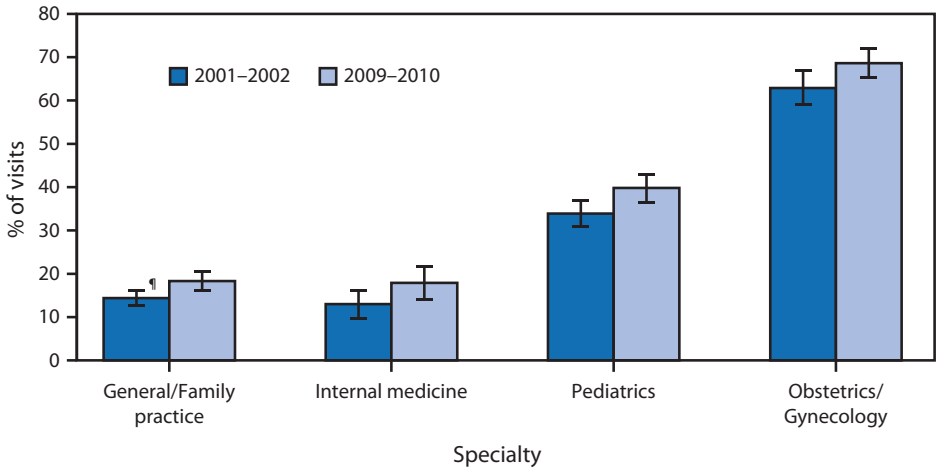
Persons with a strong interest in applied epidemiology who meet at least one of the following qualifications may apply to EIS: 1) a doctoral-level scientist with a degree in behavioral science, biostatistics, epidemiology, informatics, or nutrition; 2) a health professional such as a veterinarian, nurse (with a bachelor of science or master of science in nursing degree), or a dentist with a master of public health degree or the equivalent; or 3) a physician with at least 1 year of clinical training.

For most positions in the EIS class, U.S. citizenship or permanent residency and an active, unrestricted U.S. license to practice a clinical specialty are requirements. Non-U.S. citizens eligible for a J-1 visa may apply, but a limited number are selected. Information regarding the EIS online application and program details is available at http://www.cdc.gov/eis/applynow.html; by telephone (404-498-6110); or by e-mail (eis@cdc.gov).

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Physician Office Visits* for Which Preventive Care† Was the Major Reason for Visit, by Selected Specialties§ — National Ambulatory Medical Care Survey, United States, 2001–2002 and 2009–2010



* Percentages are 2-year annual averages. Visits to community health centers were excluded from this analysis.
† The National Ambulatory Medical Care Survey defines physician office visits for which preventive care was the major reason for visit as "General medical examinations and routine periodic examinations. Includes prenatal and postnatal care, annual physicals, well-child examinations, screening, and insurance examinations." Immunizations might or might not be administered during the visit.
§ Subspecialties of physician specialty categories listed were excluded.
¶ 95% confidence interval.

From 2001–2002 to 2009–2010, the percentage of physician office visits for which preventive care was the major reason for visit increased for the specialties of general/family practice, internal medicine, pediatrics, and obstetrics and gynecology. During 2009–2010, approximately two thirds of visits to obstetricians and gynecologists were for preventive care, including prenatal and postnatal care, and more than one third of visits to pediatricians were for preventive care.

Source: National Ambulatory Medical Care Survey 2001–2002 and 2009–2010. Available at http://www.cdc.gov/nchs/ahcd.htm.

Reported by: Michael Albert, MD, wmy1@cdc.gov, 301-458-4223; Linda F. McCaig, MPH.

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