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Graduated Driver Licensing Night Driving Restrictions and Drivers Aged 16 or 17 Years Involved in Fatal Night Crashes — United States, 2009–2014

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Fatal crash risk is higher at night for all drivers, but especially for young, inexperienced drivers (*1*). To help address the increased crash risk for beginner teen drivers, 49 states and the District of Columbia include a night driving restriction (NDR) in their Graduated Driver Licensing (GDL) system. NDRs have been shown to reduce crashes among newly licensed teens, with higher reductions associated with NDRs starting at 10:00 p.m. or earlier (*2–3*). However, in 23 states and the District of Columbia, NDRs begin at 12:00 a.m. or later, times when most teen drivers subject to GDL are not driving. CDC analyzed 2009–2014 national and state-level data from the Fatality Analysis Reporting System (FARS) to determine the proportion of drivers aged 16 or 17 years involved in fatal crashes who crashed at night (9:00 p.m.–5:59 a.m.) and the proportion of these drivers who crashed before 12:00 a.m. Nationwide, among 6,104 drivers aged 16 or 17 years involved in fatal crashes during 2009–2014, 1,865 (31%) were involved in night crashes. Among drivers involved in night crashes, 1,054 (57%) crashed before 12:00 a.m. State-level analyses revealed an approximately twofold variation among states in both the proportions of drivers aged 16 or 17 years involved in fatal crashes that occurred at night and the proportions of night fatal crash involvements that occurred before 12:00 a.m. Because nearly all of the night driving trips taken by drivers aged 16 or 17 years end before 12:00 a.m., NDRs beginning at 12:00 a.m. or later provide minimal protection. States could consider updating their NDR coverage to include earlier nighttime hours. This descriptive report summarizes the characteristics of NDRs, estimates the extent to which drivers aged 16 or 17 years drive at night, and describes their involvement in fatal nighttime crashes during 2009–2014. The effects of NDRs on crashes were not evaluated because of the small state-level sample sizes during the 6-year study period.

NDRs are applied when teen drivers receive their GDL provisional license, which permits driving without an adult supervisor in the vehicle under prescribed conditions. NDRs specify the nighttime hours that a teen holding a GDL provisional license may not drive without an adult supervisor. As of January 2012, the District of Columbia and every state except Vermont had an NDR as a cornerstone of their GDL system.* GDL is designed to help young beginner drivers gain experience under lower-risk conditions. Two national evaluations conducted during 1986–2007 and 1996–2007 indicated

*Insurance Institute for Highway Safety. GDL laws history. Effective dates of GDL law components. 2015. Arlington, VA. http://www.iihs.org/iihs/topics/laws/graduatedlicenseintro.

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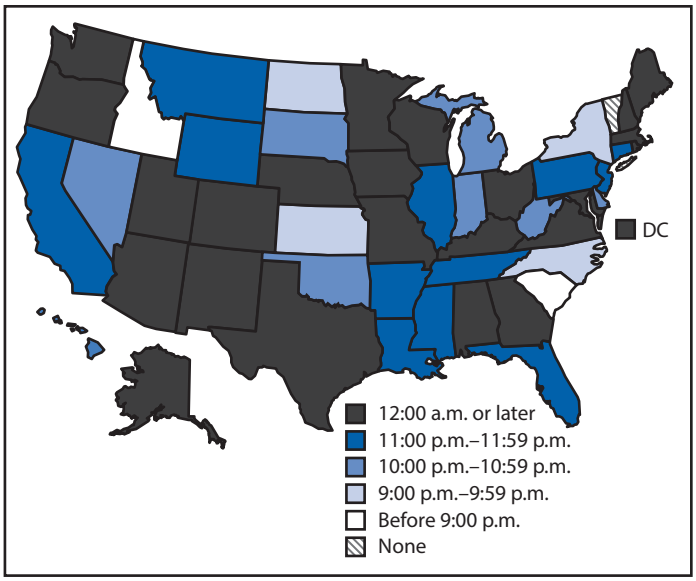
that NDRs reduced crashes among newly licensed teens, with higher reductions associated with NDRs starting at 10:00 p.m. or earlier (*2–3*). However, in 23 states and the District of Columbia, NDRs begin at 12:00 a.m. or later (Figure).

NDRs also vary in terms of the ages covered. The NDR remains in effect until either the driver reaches a designated age (e.g., 18 years, 0 months), until the provisional license has been held for a specified period (e.g., 6 or 12 months), or some combination of age and time since licensure (e.g., 6 months or aged 18 years, whichever comes first). In 15 states and the District of Columbia, graduation from the NDR is not possible until age 18 years. In the remaining 34 states with an NDR, graduation is possible before age 18 years.

For this study, the ages and hours covered by NDRs were obtained from the compendium of GDL laws maintained by the Insurance Institute for Highway Safety. National estimates of the proportion of trips taken by drivers aged 16 or 17 years by time of day were obtained from the 2009 National Highway Travel Survey (NHTS), the most recent survey.[†] Fatality data were obtained from FARS, a census of fatal traffic crashes maintained by the National Highway Traffic Safety Administration. FARS defines a fatal crash as one in which at least one vehicle occupant or nonoccupant (e.g., bicyclist or pedestrian) involved in a crash died within 30 days of the crash. Analyses were restricted to drivers of passenger vehicles (i.e., automobiles, sport utility vehicles, pickup trucks, and vans) aged 16 or 17 years. Records of 30 drivers were excluded because the time of the crash was unknown.

[†] U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey. http://nhts.ornl.gov.

FIGURE. Graduated driver licensing night driving restriction starting hours* — United States,[†] 2016



Source: Insurance Institute for Highway Safety (http://www.iihs.org/iihs/topics/laws/graduatedlicenseintro/mapyoungnighttimerestrictions?topicName=teenagers#map).

* Night driving restriction starting hours varied by day of the week for the District of Columbia, Illinois, and Mississippi; weekend starting hours are presented.

† Long Island does not allow teens with a New York provisional license (junior license) to drive unaccompanied, so there is no need for a night driving restriction.

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National and state-level FARS data from 2009–2014 were examined to determine the proportion of all drivers aged 16 or 17 years involved in fatal crashes (fatal crash involvement) that occurred at night (9:00 p.m.–5:59 a.m.) and the proportion of these drivers who crashed before 12:00 a.m. For the state-level analysis, six states that licensed drivers before age 16 years (Idaho, Montana, New Mexico, North Dakota, South Carolina, and South Dakota) were excluded because drivers could typically graduate from the NDR at age 16 years. Vermont, which does not have an NDR, also was excluded. State-level results were included for the states with ≥20 drivers in fatal crashes (N = 40) and ≥20 drivers in fatal night crashes (N = 30), respectively.

Nationwide, 1,865 (31%) of the 6,104 drivers aged 16 or 17 years involved in fatal crashes during 2009–2014 were involved in night crashes (27% of drivers aged 16 years and 33% of drivers aged 17 years). Among drivers involved in night crashes, 1,054 (57%) crashed before 12:00 a.m. (60% of drivers aged 16 years and 55% of drivers aged 17 years). According to the 2009 NHTS data, drivers aged 16 or 17 years took an estimated 3.4 billion trips, with 10% ending during 9:00 p.m.–11:59 p.m. and 0.8% ending during 12:00 a.m.–5:59 a.m.; 93% of night trips ended before 12:00 a.m. (Table 1).

Among the 40 included states, 20 had NDRs that began at 12:00 a.m. or later as of December 31, 2014 (Table 2). Seven states either implemented an NDR or updated their NDR early in the 6-year study period (Table 2). Five NDRs had mixed starting times, depending on day of week, month, age, or length of time a license had been held; details are available at the Insurance Institute for Highway Safety website (http://www.iihs.org). In 13 states, the youngest exit age was 18 years, and in the 27 remaining NDRs, exit ages ranged from 16 years, 6 months to 17 years, 11 months.

Across the 40 included states, the proportion of drivers aged 16 or 17 years involved in fatal crashes that occurred at night varied from 19% in Kentucky to 44% in New Hampshire (median = 31%) (Table 3). The proportion of drivers aged 16 or 17 years involved in night fatal crashes that occurred before 12:00 a.m. varied from 35% in Washington to 78% in Indiana (median = 56%) across the 30 included states.

Discussion

Approximately one third (31%) of U.S. drivers aged 16 or 17 years involved in fatal crashes during 2009–2014 crashed during the night hours of 9:00 p.m.–5:59 a.m., hours during which only about 11% of all trips made by these drivers occurred. These findings illustrate the increased risk for fatal crashes associated with nighttime versus daytime driving for newly licensed teens. The increased risk is attributed in part to teens' inexperience with driving in the dark and high-risk behaviors, such as speeding, driving after drinking alcohol, and carrying teen passengers (*4*–*6*).

Nearly all (93%) of the night trips taken by drivers aged 16 or 17 years ended before 12:00 a.m. However, 23 states and the District of Columbia currently have NDRs that begin at 12:00 a.m. or later. State-level analyses revealed an approximately twofold variation among states in both the proportions of all drivers aged 16 or 17 years involved in fatal crashes that occurred at night and the proportions of night fatal crash involvements that occurred before 12:00 a.m. These results illustrate the importance of each state examining and balancing the unique needs for both mobility and safety of their teen population, particularly related to nighttime travel.

The findings in this report are subject to at least four limitations. First, the NHTS was last conducted in 2009. Whether national driving patterns among teens aged 16 or 17 years have changed since then is unknown. Second, because of the sharp decline in fatal crash involvement by drivers aged 16 or 17 years in the past decade (*1*), 6 years of FARS data were needed to provide state-level sample sizes of ≥20 for most states. Data for the entire study period from Arkansas and Kansas, which implemented NDRs in 2009 and 2010, respectively, were included. Third, the FARS analysis included all drivers aged 16 or 17 years involved in fatal crashes without regard to whether or not they were subject to their state's NDR. Therefore, the reported fatal crash involvements should not be interpreted to indicate that teen drivers were noncompliant with their state's NDR. Finally, caution should be used in interpreting the differences in proportions of night fatal crash involvements among states. In addition to differences in NDR coverage and small state-level sample sizes, other factors that vary by state,

TABLE 1. Estimated annual number and proportion of trips taken by drivers aged 16 or 17 years, by time of day — United States, 2009

	Driver trips by end time*			
	6:00 a.m.–8:59 p.m.	9:00 p.m.–11:59 p.m.	12:00 a.m.–5:59 a.m.	Total
Age group (yrs)	No. (millions) (%)	No. (millions) (%)	No. (millions) (%)	No. (millions) (%)
16	1,047 (31)	102 (3)	8 (0.2)	**1,158 (34)**
17	2,012 (59)	230 (7)	17 (0.6)	**2,260 (66)**
Total	**3,060 (90)**	**332 (10)**	**24 (0.8)**	**3,417 (100)**

Source: National Household Travel Survey. http://nhts.ornl.gov.
* Some numbers and proportions do not add to their totals because of rounding.

TABLE 2. Distribution of characteristics of graduated driver licensing night driving restrictions — 40 states,* 2014

Night driving restriction characteristic†	No. of states
Starting hours§	
9:00 p.m.	3
10:00 p.m.	6
11:00 p.m.	10
11:30 p.m.	1
12:00 a.m.	15
12:30 a.m.	2
1:00 a.m.	3
Ending hours§	
4:00 a.m.	3
5:00 a.m.	28
6:00 a.m.	9
Youngest exit age group	
18 yrs, 0 mos	13
17 yrs, 11 mos	1
17 yrs, 0 mos	17
16 yrs , 9 mos	3
16 yrs , 6 mos	6

* Alaska, District of Columbia, Hawaii, and Rhode Island were excluded because they had <20 drivers aged 16 or 17 years involved in fatal crashes during 2009–2014; Idaho, Montana, New Mexico, North Dakota, South Carolina, and South Dakota were excluded because they permit licensure before age 16 years; Vermont was excluded because it did not have a night driving restriction.

† Arkansas introduced a night driving restriction on July 30, 2009; Kansas introduced a night driving restriction on January 1, 2010; Indiana modified the start times from 11:00 p.m./1:00 a.m. to 10:00 p.m./11:00 p.m. effective July 1, 2009; Oklahoma modified the start time from 11:00 p.m. to 10:00 p.m. effective November 11, 2009; West Virginia modified the start time from 11:00 p.m. to 10:00 p.m. effective July 1, 2009; Michigan modified the start time from 12:00 a.m. to 10:00 p.m. effective March 30, 2011; New Jersey modified the start time from 12:00 a.m. to 11:00 p.m. effective May 1, 2010.

§ Five states had varying starting hours depending on day of the week (Illinois, Mississippi; weekend hours are presented), driver age (Florida), or length of time the driver has been licensed (Indiana, Ohio).

Summary

What is already known about this topic?

Driving at night increases the risk for fatal crashes all drivers, especially for young, inexperienced drivers. In recognition of this increased risk, 49 states and the District of Columbia include a night driving restriction (NDR) in their Graduated Driver Licensing (GDL) system. However, in 23 states and the District of Columbia, NDRs begin at 12:00 a.m. or later, times when most teen drivers subject to GDL are not driving.

What is added by this report?

Approximately one third (31%) of U.S. drivers aged 16 or 17 years involved in fatal crashes during 2009–2014 crashed during the night hours of 9:00 p.m.–5:59 a.m. Among drivers involved in night crashes, 57% crashed before 12:00 a.m. State-level analyses revealed an approximately twofold variation among states in both the proportions of all drivers aged 16 or 17 years involved in fatal crashes that occurred at night and the proportions of night fatal crash involvements that occurred before 12:00 a.m.

What are the implications for public health practice?

Because nearly all of the night driving trips taken by drivers aged 16 or 17 years end before 12:00 a.m., NDRs beginning at 12:00 a.m. or later provide minimal protection. As states examine strategies to further reduce total fatal crashes among newly licensed teen drivers, they could consider updating their NDR to include earlier nighttime hours. The study results illustrate the importance of each state examining and balancing the unique needs for both mobility and safety of their teen population, particularly related to nighttime travel.

such as rurality and alcohol-impaired driving, contribute to nighttime crash risk among teens.

Because approximately one third of fatal crash involvements by drivers aged 16 or 17 years occur at night, broader implementation of targeted strategies to reduce the risk for these night crashes seems warranted. Because nearly all of the night driving trips taken by drivers aged 16 or 17 years end before 12:00 a.m., NDRs beginning at 12:00 a.m. or later provide minimal protection. States could consider updating their NDR coverage to include earlier nighttime hours (*1–4,7–10*). Extending the exit age requirement to 18 years has been recommended (*8*), although its effectiveness has not been fully evaluated. GDL resources tailored for use by decision makers and practitioners are available online (*7–10*). In addition, communities could fully enforce laws known to reduce fatal crashes involving teen drivers, including primary seat belt laws and minimum legal drinking age laws.§

§ The Guide to Community Preventive Services. Motor vehicle-related injury prevention. http://www.thecommunityguide.org/mvoi/index.html.

TABLE 3. Night driving restrictions, the proportion of all drivers aged 16 or 17 years involved in fatal crashes that occur at night (9:00 p.m.–5:59 a.m.), and the proportion of drivers aged 16 or 17 years involved in night fatal crashes that occur before 12:00 a.m. — 40 states,* 2009–2014

State	Night driving restriction (NDR) hours	NDR earliest exit age (yrs)	Total no. drivers in fatal crashes†	No. of drivers in fatal crashes that occurred at night	Proportion of drivers in fatal crashes that occurred at night (%)	No. of drivers in night fatal crashes that occurred before 12:00 a.m.	Proportion of drivers in night fatal crashes that occurred before 12:00 a.m. (%)
Alabama	12:00 a.m.–6:00 a.m.	17	240	65	27	35	54
Arizona	12:00 a.m.–5:00 a.m.	16.5	125	39	31	22	56
Arkansas	11:00 p.m.–4:00 a.m.	18	94	26	28	14	54
California	11:00 p.m.–5:00 a.m.	17	299	105	35	56	53
Colorado	12:00 a.m.–5:00 a.m.	17	99	27	27	15	56
Connecticut	11:00 p.m.–5:00 a.m.	18	35	11	31	—§	—§
Delaware	10:00 p.m.–6:00 a.m.	17	21	8	38	—	—
Florida	11:00 p.m.–6:00 a.m. or 1:00 a.m.–5:00 a.m.**	18	351	114	32	56	49
Georgia	12:00 a.m.–5:00 a.m.	18	253	71	28	49	69
Illinois	10:00 or 11:00 p.m.–6:00 a.m.**	18	216	53	25	33	62
Indiana	10:00 or 11:00 p.m.–5:00 a.m.**	18	154	40	26	31	78
Iowa	12:30 a.m.–5:00 a.m.	17	80	27	34	11	41
Kansas	9:00 p.m.–5:00 a.m.	16.5	95	35	37	19	54
Kentucky	12:00 a.m.–6:00 a.m.	17	141	27	19	19	70
Louisiana	11:00 p.m.–5:00 a.m.	17	145	57	39	33	58
Maine	12:00 a.m.–5:00 a.m.	16.75	33	12	36	—	—
Maryland	12:00 a.m.–5:00 a.m.	18	69	24	35	13	54
Massachusetts	12:30 a.m.–5:00 a.m.	18	56	21	38	11	52
Michigan	10:00 p.m.–5:00 a.m.	17	212	71	33	39	55
Minnesota	12:00 a.m.–5:00 a.m.	16.5	104	23	22	14	61
Mississippi	10:00 or 11:30 p.m.–6:00 a.m.**	16.5	140	41	29	25	61
Missouri	1:00 a.m.–5:00 a.m.	17.9	218	72	33	42	58
Nebraska	12:00 a.m.–6:00 a.m.	17	64	16	25	—	—
Nevada	10:00 p.m.–5:00 a.m.	18	34	11	32	—	—
New Hampshire	1:00 a.m.–4:00 a.m.	18	27	12	44	—	—
New Jersey	11:00 p.m.–5:00 a.m.	18	86	28	33	17	61
New York	9:00 p.m.–5:00 a.m.	17	148	52	35	35	67
North Carolina	9:00 p.m.–5:00 a.m.	16.5	255	71	28	39	55
Ohio	12:00 a.m.–6:00 a.m. or 1:00 a.m.–5:00 a.m.**	18	223	60	27	34	57
Oklahoma	10:00 p.m.–5:00 a.m.	16.5	164	56	34	33	59
Oregon	12:00 a.m.–5:00 a.m.	17	51	12	24	—	—
Pennsylvania	11:00 p.m.–5:00 a.m.	17	213	69	32	39	57
Tennessee	11:00 p.m.–6:00 a.m.	17	192	50	26	34	76
Texas	12:00 a.m.–5:00 a.m.	18	551	181	33	99	55
Utah	12:00 a.m.–5:00 a.m.	17	63	12	19	—	—
Virginia	12:00 a.m.–4:00 a.m.	18	130	48	37	27	56
Washington	1:00 a.m.–5:00 a.m.	17	93	23	25	8	35
West Virginia	10:00 p.m.–5:00 a.m.	17	48	15	31	—	—
Wisconsin	12:00 a.m.–5:00 a.m.	16.75	124	41	33	21	51
Wyoming	11:00 p.m.–5:00 a.m.	16.75	24	7	29	—	—

* Alaska, District of Columbia, Hawaii, and Rhode Island were excluded because they had <20 drivers aged 16 or 17 years involved in fatal crashes during 2009–2014; Idaho, Montana, New Mexico, North Dakota, South Carolina, and South Dakota were excluded because they permit licensure before age 16 years; Vermont was excluded because it did not have a night driving restriction.

† Thirty records were excluded because the time of crash was unknown.

§ Numbers and proportions suppressed because night crashes <20.

** Five states had varying starting hours depending on day of the week (Illinois, Mississippi), driver age (Florida), or length of time the driver has been licensed (Indiana and Ohio).

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Mumps Outbreak at a University and Recommendation for a Third Dose of Measles-Mumps-Rubella Vaccine — Illinois, 2015–2016

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Mumps is an acute viral disease characterized by fever and swelling of the parotid or other salivary glands. On May 1, 2015, the Illinois Department of Public Health (IDPH) confirmed a mumps outbreak at the University of Illinois at Urbana-Champaign. IDPH and the Champaign-Urbana Public Health District (C-UPHD) conducted an investigation and identified 317 cases of mumps during April 2015–May 2016. Because of sustained transmission in a population with high 2-dose coverage with measles-mumps-rubella (MMR) vaccine, a third MMR dose was recommended by IDPH, C-UPHD, and the university's McKinley Health Center. No formal recommendation for or against the use of a third MMR dose has been issued by the Advisory Committee on Immunization Practices (ACIP) (*1*). However, CDC has provided guidelines for use of a third dose as a control measure during mumps outbreaks in settings in which persons are in close contact with one another, where transmission is sustained despite high 2-dose MMR coverage, and when traditional control measures fail to slow transmission (*2*).

On April 15, 2015, the university health center reported to C-UPHD a male aged 21 years with fever and parotitis beginning April 9. Mumps was suspected; however, confirmatory testing was not performed. During the following 2 weeks, five additional suspected cases of mumps were identified. Each patient received a diagnosis of parotitis without laboratory confirmation of mumps. All patients with suspected mumps had documentation of receipt of 2 doses of MMR vaccine. On May 1, 2015, a seventh suspected mumps case was confirmed by a positive real-time reverse transcription–polymerase chain reaction (rRT-PCR) test of a buccal swab conducted at the IDPH state laboratory. The six previous suspected cases were epidemiologically linked to the same academic program as the confirmed case, which enabled IDPH to establish the existence of a mumps outbreak at the university.

Confirmed, probable, and suspected cases were identified using the standard case definition for mumps (*3*). Patients were considered to be infectious from 2 days before until 5 days after the onset of parotitis. The exposure period was defined as 12–25 days before the onset of parotitis. Outbreak control measures recommended to the university health center by C-UPHD included standard and droplet precautions for patients in health care facilities and isolation of ill patients. Ill students were directed to return home or were provided alternative housing during their infectious period. Investigators identified contacts of mumps patients to verify receipt of 2 doses of MMR vaccine and recommended vaccination of susceptible close contacts if they were not fully vaccinated.* Susceptible close contacts who had a contraindication to vaccination or who refused vaccination were excluded from public settings for 14 days (from days 12–25 following exposure to a person with probable or confirmed mumps). University vaccination records were reviewed, and 2-dose MMR vaccination coverage was estimated at >97% among all students. On May 26, 2015, IDPH posted a notification on CDC's Epidemic Information Exchange (Epi-X) and issued a memorandum to health departments to request information on cases among persons who returned home from the university during the summer semester.

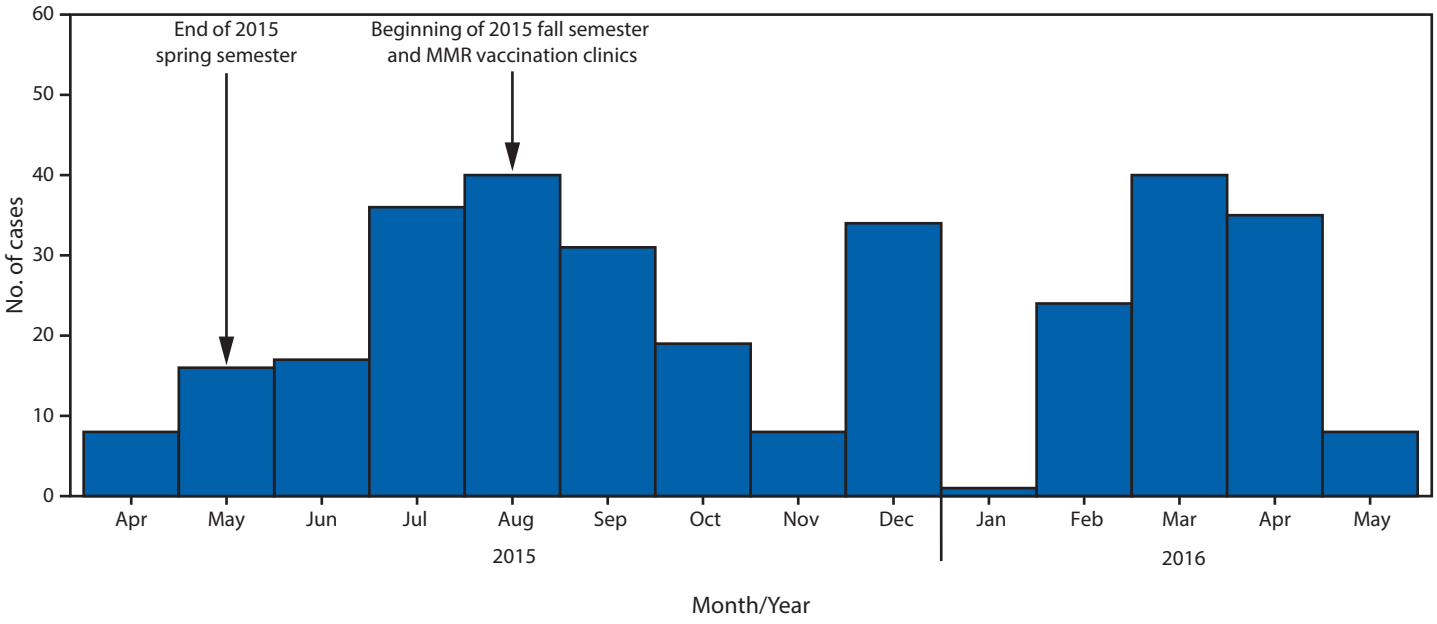
Despite high 2-dose MMR coverage and a reduced student population on campus, cases continued to occur during the summer semester (Figure). By July 31, a total of 70 cases had been reported. On August 4, IDPH, C-UPHD, and the university health center issued a recommendation for all students and staff members born during or after 1957† to receive an additional dose of MMR vaccine (*2*). Notifications were sent to students and their families, and an Epi-X notification was posted to inform state health agencies of the recommendation. An estimated 50,000 students and staff members were targeted for this intervention.

A total of 8,200 doses of MMR vaccine were administered at five vaccination clinics held on the university campus during August 6–27. An unknown number of additional vaccine doses were administered to students and staff members living off-campus during the summer, who were encouraged to received vaccine from a health care provider or pharmacy before returning to school. C-UPHD and the university health center administered an additional 3,300 doses throughout the

* Susceptible persons include all persons without evidence of immunity to mumps. Evidence of immunity includes 1) laboratory evidence of immunity to mumps; 2) documentation of receipt of 2 doses of MMR vaccine for school-aged children and adults at high risk (e.g., health care personnel, international travelers, or students at postsecondary educational institutions); 3) documentation of at least 1 dose of MMR vaccine for preschool-aged children and adults not at high risk; 4) birth before 1957; or 5) documentation of physician-diagnosed mumps.

† Because of widespread transmission of the mumps virus before the mumps vaccine was recommended for routine use, persons born before 1957 are likely to have been infected naturally and are presumed to be immune.

FIGURE. Number of confirmed and probable cases of mumps (N = 317) on the University of Illinois at Urbana-Champaign campus, by month of onset — Illinois, April 2015–May 2016



Abbreviation: MMR = measles, mumps, rubella.

fall and spring semesters. Persons vaccinated were monitored for 15 minutes after receiving the vaccine and were given a vaccine information statement. No serious vaccine-related adverse events were reported.

Investigators identified 317 probable and confirmed mumps cases with onset during April 9, 2015–May 27, 2016. One hundred (32%) cases were laboratory confirmed by rRT-PCR, and 217 (68%) were classified as probable. Cases occurred in persons who ranged in age from 16–55 years, with a median age of 20 years. Twenty-two (7%) patients were evaluated at the emergency department, and three (1%) were hospitalized (one to treat meningitis, one to rule out meningitis, and one for parotitis pain management). Two (1%) patients experienced orchitis, a recognized complication of mumps (*2*). No deaths were reported. Specimens from four cases were genotyped at the CDC Measles, Mumps, Rubella, and Herpesvirus Laboratory Branch; all were mumps genotype G. All cases were epidemiologically linked to the university; 278 (88%) cases occurred in students, three (1%) in staff members, and 36 (11%) in persons not affiliated with the university, but who had contact with university students or the campus. Several sub-clusters occurred within the larger outbreak in certain academic programs, athletic facilities, and community workplaces.

Among the 317 cases identified, at the time of parotitis onset, 50 (16%) mumps patients had received 3 doses of MMR vaccine, 232 (73%) had received 2 doses, 12 (4%) had received 1 dose, seven (2%) were unvaccinated, and 16 (5%) had unknown vaccination status. Forty-five (90%) of the 50 patients with a third dose received it during this outbreak, and five (10%) received it in prior years for reasons unrelated to this outbreak. Some of the 45 persons who received a third dose during this outbreak might have been exposed before vaccine-induced immunity was boosted. Eleven (24%) of the 45 patients had parotitis onset on the same day or within 2 weeks after receiving the third dose, six (13%) within 2–4 weeks, and 27 (60%) >4 weeks after. One (2%) patient received a third dose 3 days after parotitis onset.

Discussion

As in many previously described mumps outbreaks, this outbreak was characterized by sustained transmission, despite high 2-dose MMR vaccination coverage (*4–7*). Two doses of MMR vaccine are currently routinely recommended for the prevention of mumps; the first for children at 12–15 months of age and the second for children at 4–6 years of age (*2*). The median vaccine effectiveness against mumps has been estimated at 78% for 1 dose and 88% for 2 doses (*2*). However, 2-dose vaccine failure and possible waning of vaccine-induced immunity have been described in recent outbreaks, particularly in high-density, close-contact settings (*4–8*). Because outbreaks occur despite high 2-dose coverage, a third dose has been provided as a control measure to targeted populations during previous outbreaks (*4,5,7*).

No formal recommendation for a third MMR dose exists, but CDC has provided guidelines for public health agencies considering its use as a control measure during mumps outbreaks (*2*).

Factors that might trigger a recommendation include outbreaks among populations with 2-dose MMR vaccination coverage of >90%, intense exposure settings such as universities, evidence of sustained transmission for >2 weeks, and high attack rates (>5 cases per 1,000 population). Evidence of sustained disease transmission despite high 2-dose vaccination coverage among university students supported the decision to recommend a third MMR dose during this outbreak. The fourth criterion of high attack rates was not considered; because transmission occurred during spring, summer, and fall semesters when student enrollment varied widely, it was not possible to calculate an accurate attack rate because of frequent, large changes in the denominator.

In addition to meeting criteria in the CDC guidelines, two important aspects of this outbreak supported the recommendation for a third dose of MMR vaccine. First, this outbreak did not follow typical seasonal trends for mumps in Illinois, where incidence normally peaks during late winter and spring (Illinois Department of Public Health, unpublished data, 2016); evidence of sustained transmission extending into the summer months was concerning. During 2005–2014, the median number of mumps cases each year during June and July in Illinois was six statewide; in this outbreak, 53 cases occurred during these 2 months. This deviation from the 10-year median and continued transmission during the summer months was unexpected because of the reduction of high-density, close-contact settings on campus. Student enrollment declined from 41,497 in the 2015 spring semester to 11,684 in the summer, a reduction of 72%.

The second aspect that supported the recommendation was the anticipation of a large number of students returning for the 2015 fall semester, which would increase the population density on campus and provide opportunities for exposure. Many students would be returning to high-density congregate settings such as university housing, and large social events often occur early during the semester. An unknown number of susceptible persons would also be added to the population; although documentation of mumps vaccination (or other evidence of mumps immunity) is required by the university, the requirement is not enforced until students attempt to register for the subsequent semester.

The effectiveness of a third dose of MMR vaccine has not been established, but rationale exists for its use in outbreak settings. There is some evidence that a third dose induces an immune response, and in two outbreaks, attack rates declined after a third dose intervention (*4*,*5*,*9*,*10*). However, the decline in attack rate was not statistically significant in one outbreak; in both outbreaks, the intervention was given after the outbreaks had peaked, and other outbreaks occurring among similar populations showed declining attack rates without administration of a third dose of MMR vaccine (*8*). In addition, recommending an intervention that has limited evidence of effectiveness might result in unnecessary costs and introduce the potential for vaccine-related adverse events. Currently there is no formal recommendation for a third dose of MMR vaccine during mumps outbreaks; the decision to implement this intervention needs to be carefully considered. In light of the recent increased incidence of mumps, CDC is gathering additional data to assess use of a third dose of vaccine to inform decision-making during outbreak responses and potential changes in the recommendations.

Although evidence of its effectiveness is needed, a third dose of MMR vaccine may be considered as a control measure during mumps outbreaks occurring in settings in which persons are in close contact with one another, when transmission is sustained despite high 2-dose MMR coverage, and when traditional control measures fail to slow transmission. The final case in this outbreak occurred in May 2016, and the outbreak was declared over in July. Although transmission continued until May 2016, there was a decline in cases in the months immediately following August 2015, when the recommendation was made. Further evaluation is needed to determine if the reduction was a result of the recommendation for a third MMR dose.

Summary

What is already known on this topic?

Mumps outbreaks can occur in close-contact settings like universities, despite high 2-dose MMR vaccination coverage. A third dose of MMR vaccine has been used in previous mumps outbreaks, but its effectiveness is not established.

What is added by this report?

A large outbreak of mumps occurred at the University of Illinois at Urbana-Champaign during April 2015–May 2016; 89% of patients with mumps had received at least 2 doses of measles-mumps-rubella (MMR) vaccine, and a third dose was recommended as a control measure. The rationale for the recommendation of a third MMR dose included a consideration of seasonal trends and characteristics of the at-risk population. These were weighed against potential drawbacks, which included the potential for vaccine-related side effects, associated costs, and the lack of evidence of the effectiveness of a third MMR dose.

What are the implications for public health practice?

Both CDC guidelines and factors unique to the outbreak should be carefully considered by public health agencies before issuing a similar recommendation. Additional studies are needed to determine the effectiveness of a third MMR dose as a mumps outbreak control measure in certain populations.

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State and Regional Prevalence of Diagnosed Multiple Chronic Conditions Among Adults Aged ≥18 Years — United States, 2014

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The prevalence and care management of multiple (two or more) chronic conditions (MCC) are important public health concerns (*1*). Approximately 25% of U.S. adults have diagnoses of MCC (*2*). Care management of MCC presents a challenge to both patients and providers because of the substantial costs associated with treating more than one condition and the traditional care strategies that focus on single conditions as opposed to enhanced care coordination (*3*,*4*). Maintaining surveillance, targeting service delivery, and projecting resources are all important to meet this challenge, and these actions can be informed by identifying state and other regional variations in MCC prevalence (*5*,*6*). Data from the 2014 National Health Interview Survey (NHIS) were used to estimate prevalence of MCC (defined as two or more of 10 diagnosed chronic conditions) for each U.S. state and region by age and sex. Significant state and regional variation in MCC prevalence was found, with state-level estimates ranging from 19.0% in Colorado to 38.2% in Kentucky. MCC prevalence also varied by region, ranging from 21.4% in the Pacific region to 34.5% in the East South Central region. The prevalence of MCC was higher among women than among men within certain U.S. regions, and was higher in older persons in all regions. Such findings further the research and surveillance objectives stated in the U.S. Department of Health and Human Services (HHS) publication, *Multiple Chronic Conditions: A Strategic Framework* (*1*). Furthermore, geographic disparities in MCC prevalence can inform state-level surveillance programs and groups targeting service delivery or allocating resources for MCC prevention activities.

NHIS is a multistage health survey of the U.S. civilian, noninstitutionalized population conducted continuously throughout the year. Data on chronic conditions were collected in the NHIS Sample Adult Core questionnaire, in which a sample adult (the respondent) is randomly selected from among all adults aged ≥18 years in the family (a proxy respondent is used if a health condition precludes self-reporting by the sample adult). The final response rate for the 2014 NHIS Sample Adult Core questionnaire was 58.9% and included 36,697 adults.* Adults who reported a diagnosis of two or more of the following selected conditions were categorized as having MCC: arthritis, asthma, cancer, chronic obstructive pulmonary disease (COPD), coronary heart disease, diabetes, hepatitis, hypertension, stroke, or weak or failing kidneys.† These conditions were selected to ensure an approach to measuring MCC consistent with previous research using NHIS data (*2*), and have been included in a condition list developed by HHS (*7*). Estimates were generated for 50 U.S. states and the District of Columbia, and nine U.S. regions.§ Crude estimates are presented, as they are useful for projecting resource and service delivery needs among adults, an important focus in the HHS MCC strategic framework (*1*) and in ongoing research on MCC (*5*,*6*). In addition to overall estimates, regional prevalence estimates were also calculated by sex and age. All estimates meet National Center for Health Statistics standard of reliability,¶ and all state denominators had a nominal sample size of ≥250 persons, unless otherwise noted. For all estimates, sampling weights were used; analyses were conducted using SUDAAN 11.0 software to account for the complex sample design. Additional adjustments were

* Details on NHIS and its methodology are available at ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2014/srvydesc.pdf.

† Diagnosis of arthritis, cancer, coronary heart disease, diabetes, hepatitis, hypertension, and stroke was based on an affirmative response to the survey question "Have you ever been told by a doctor or other health professional that you had…[condition]?" Diagnosis of weak or failing kidneys was based on an affirmative response to the question "During the past 12 months, have you been told by a doctor or other health professional that you had…weak or failing kidneys?" Diagnosis of asthma was based on an affirmative response to each of the following two questions: "Have you ever been told by a doctor or other health professional that you had asthma?" and "Do you still have asthma?" Diagnosis of COPD, was based on an affirmative response to at least one of the following questions: "Have you ever been told by a doctor or other health professional that you had…emphysema?"; "Have you ever been told by a doctor or other health professional that you had…chronic obstructive pulmonary disease, also called COPD?"; or "During the past 12 months, have you been told by a doctor or other health professional that you had…chronic bronchitis?"

§ U.S. regions (and the states constituting them) include the following: *Pacific* (Alaska, California, Hawaii, Oregon, Washington); *Mountain* (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming); *West North Central* (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota); *East North Central* (Illinois, Indiana, Michigan, Ohio, Wisconsin); *West South Central* (Arkansas, Louisiana, Oklahoma, Texas); *East South Central* (Alabama, Kentucky, Mississippi, Tennessee); *New England* (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont); *Middle Atlantic* (Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania); and *South Atlantic* (Florida, Georgia, North Carolina, South Carolina, Virginia, West Virginia). These nine U.S. regions are based on divisions determined by the U.S. Census Bureau (http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf).

¶ National Center for Health Statistics standard for reliability is that an estimate have a relative standard error <30.0%, where the relative standard error is calculated by dividing the standard error of an estimate by the estimate itself, then multiplying by 100.

applied for the measures of variance accompanying all state-level estimates.** All presented differences were found to be significant using two-tailed significance tests ($p<0.05$). Two-tailed significance tests comparing state and regional prevalence to national prevalence were adjusted to account for dependent samples using procedures described elsewhere (*8*).

One in four (25.7%) U.S. adults had a diagnosis of MCC (Table 1), and a number of state prevalence estimates differed significantly from the national average. Prevalence estimates of MCC were higher than the national average in 10 states (Kentucky [38.2%], Alabama [35.8%], West Virginia [34.6%)], Mississippi [34.2%], Montana [33.2%], New Mexico [32.9%], Maine [30.9%], Michigan [30.3%], Ohio [29.6%], and Pennsylvania [29.6%]), and lower than the national average in six states (Colorado [19.0%], Alaska [19.6%], California [20.1%], Wyoming [20.3%], Minnesota [20.4%], and New York [21.3%]) and the District of Columbia (19.2%) (Table 1) (Figure).

Reported prevalence estimates of MCC in the East South Central (34.5%) and East North Central (28.4%) regions were higher than the national average (Table 2). Prevalence

** Taylor series linearization was used for estimation of standard errors for the 10 U.S. states with the largest sample sizes (California, Florida, Georgia, Illinois, Michigan, New York, North Carolina, Ohio, Pennsylvania, and Texas). For the remaining 40 U.S. states and the District of Columbia, the standard error was calculated by multiplying the square root of the average design effect based on the 10 states with the largest sample sizes and the standard error of the estimated percentages under a simple random sample. The 95% confidence intervals for each state were derived by multiplying this standard error with 1.96, and subtracting/adding this value to the estimated percentage.

FIGURE. Prevalence of diagnosed multiple chronic conditions among adults aged ≥18 years, by state — National Health Interview Survey, United States, 2014

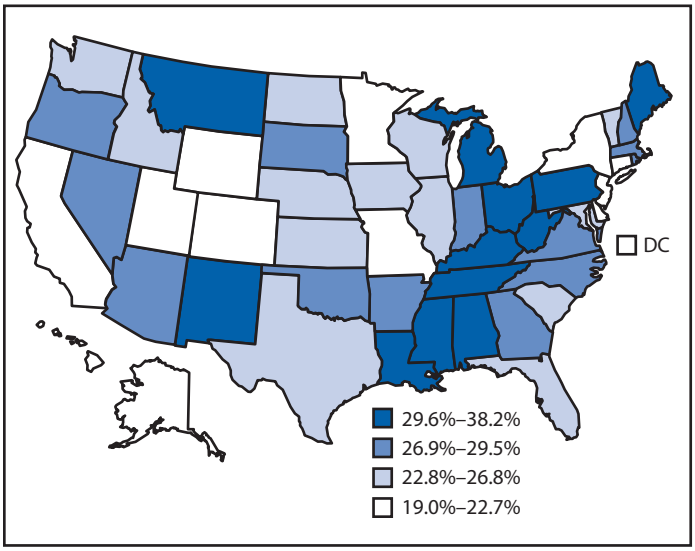

TABLE 1. Prevalence (highest to lowest) of diagnosed multiple chronic conditions* among adults aged ≥18 years, by state or district — National Health Interview Survey, United States, 2014

State/District	Adults with MMC % (95% CI)
Kentucky	38.2 (33.24–43.15)
Alabama	35.8 (29.93–41.69)
West Virginia	34.6 (29.44–39.75)
Mississippi	34.2 (28.95–39.42)
Montana	33.2 (27.40–38.93)
New Mexico	32.9 (27.87–37.98)
Maine	30.9 (26.11–35.64)
Tennessee	30.4 (25.31–35.54)
Michigan	30.3 (26.04–34.55)
Louisiana	29.8 (24.85–34.76)
Ohio	29.6 (26.18–32.97)
Pennsylvania	29.6 (25.97–33.26)
Oregon	29.5 (24.49–34.56)
Virginia	29.1 (24.67–33.56)
Oklahoma	28.9 (24.22–33.47)
Georgia	28.0 (24.92–31.15)
Massachusetts	28.0 (22.73–33.32)
Arizona	27.9 (22.84–32.91)
North Carolina	27.8 (23.84–31.65)
Arkansas	27.6 (22.36–32.87)
Indiana	27.6 (22.88–32.25)
Nevada	27.6 (22.77–32.34)
New Hampshire	27.6 (22.80–32.29)
South Dakota	27.2 (22.32–32.12)
Rhode Island	26.9 (21.47–32.25)
Illinois	26.8 (22.92–30.69)
Kansas	26.6 (22.19–30.90)
Iowa	26.5 (21.95–31.00)
Washington	26.4 (21.93–30.82)
Texas	25.6 (23.45–27.68)
Nebraska	25.5 (21.01–30.02)
North Dakota	25.5 (20.43–30.50)
Vermont	25.5 (19.86–31.15)
Wisconsin	25.4 (20.42–30.37)
Florida	24.4 (20.89–27.86)
South Carolina	23.5 (18.62–28.31)
Idaho	23.3 (18.42–28.07)
Maryland	22.8 (17.86–27.63)
Missouri	22.7 (17.90–27.43)
New Jersey	22.6 (18.31–26.90)
Utah	22.6 (18.33–26.84)
Connecticut	22.2 (17.12–27.31)
Delaware	21.8 (17.03–26.56)
Hawaii	21.8 (16.95–26.72)
New York	21.3 (18.64–23.93)
Minnesota	20.4 (16.02–24.69)
Wyoming	20.3 (15.84–24.77)
California	20.1 (18.44–21.69)
Alaska	19.6 (15.08–24.01)
District of Columbia	19.2 (15.00–23.35)
Colorado	19.0 (14.81–23.24)

Abbreviations: CI = confidence interval; MCC = multiple chronic conditions.

* Adults with diagnoses of MCC are persons who had been told by a health care professional that they had two or more of the following 10 conditions: arthritis; asthma (current); cancer; chronic obstructive pulmonary disease which includes emphysema (ever), chronic obstructive pulmonary disease (ever), or chronic bronchitis (past 12 months); coronary heart disease; diabetes; hepatitis (ever); hypertension; stroke; or weak/failing kidneys (past 12 months).

TABLE 2. Prevalence of diagnosed multiple chronic conditions* among adults aged ≥18 years, by region, sex, and age — National Health Interview Survey, United States, 2014

Region	Adults with diagnoses of MCC % (95% CI)					
		Sex		Age (yrs)		
	Total	Male	Female	18–44	45–64	≥65
United States	**25.7 (25.08–26.42)**	**24.1 (23.24–25.06)**	**27.2 (26.36–28.13)**	**7.3 (6.72–7.84)**	**32.1 (30.91–33.27)**	**61.6 (60.14–63.11)**
East North Central	**28.4 (26.53–30.35)**	25.3 (22.92–27.80)	31.4 (28.90–34.00)	9.1 (7.38–11.09)	34.5 (31.40–37.64)	65.8 (61.50–69.77)
East South Central	**34.5 (31.89–37.16)**	32.3 (28.50–36.35)	36.3 (33.14–39.63)	10.0 (7.82–12.77)	45.3 (40.21–50.42)	72.3 (67.15–76.84)
Middle Atlantic	**24.1 (22.43–25.85)**	24.1 (21.75–26.54)	24.1 (21.93–26.49)	6.5 (5.19–8.17)	27.0 (24.20–29.95)	58.1 (53.94–62.19)
Mountain	**24.9 (22.40–27.54)**	21.5 (18.78–24.59)	28.1 (24.75–31.64)	6.3 (5.02–8.01)	32.6 (28.44–37.01)	62.2 (57.24–66.86)
New England	**26.5 (23.95–29.14)**	23.6 (20.03–27.63)	29.0 (25.45–32.78)	6.4 (3.98–10.09)	29.1 (24.90–33.59)	59.6 (53.23–65.65)
Pacific	**21.4 (19.94–22.95)**	20.9 (18.92–23.04)	21.9 (19.91–24.02)	6.1 (5.05–7.26)	27.8 (25.10–30.62)	58.6 (54.59–62.47)
South Atlantic	**26.5 (24.79–28.37)**	24.8 (22.43–27.27)	28.1 (25.92–30.44)	7.8 (6.50–9.22)	31.8 (28.99–34.67)	60.8 (57.50–64.07)
West North Central	**23.4 (21.16–25.70)**	21.2 (18.46–24.21)	25.3 (22.54–28.26)	5.1 (3.64–7.17)	31.7 (28.48–35.18)	58.1 (53.26–62.70)
West South Central	**26.4 (24.73–28.17)**	25.8 (23.20–28.52)	27.0 (24.75–29.43)	7.7 (6.26–9.32)	36.3 (32.51–40.26)	63.1 (58.63–67.43)

Abbreviations: CI = confidence interval; MCC = multiple chronic conditions.

* Adults with diagnoses of MCC are persons who had been told by a health care professional that they had two or more of the following 10 conditions: arthritis; asthma (current); cancer; chronic obstructive pulmonary disease which includes emphysema (ever), chronic obstructive pulmonary disease (ever), or chronic bronchitis (past 12 months); coronary heart disease; diabetes; hepatitis (ever); hypertension; stroke; or weak/failing kidneys (past 12 months).

estimates in the Pacific (21.4%), West North Central (23.4%), and Middle Atlantic (24.1%) regions were lower than the national average.

Women had higher prevalence of MCC than did men at the national level (27.2% versus 24.1%), as well as in the Mountain (28.1% versus 21.5%), West North Central (25.3% versus 21.2%), East North Central (31.4% versus 25.3%), and New England (29.0% versus 23.6%) regions. Compared with the average prevalence of MCC among U.S. men overall (24.1%), MCC prevalence was higher among men in the East South Central region (32.3%), but lower among men who lived in the Pacific (20.9%), West North Central (21.2%), and Mountain (21.5%) regions. Among women, national prevalence of MCC was 27.2%, and was higher among women who lived in the East South Central (36.3%) and East North Central (31.4%) regions and lower among women who lived in the Pacific (21.9%) and Middle Atlantic (24.1%) regions.

By age group, overall prevalence of MCC was lowest among adults aged 18–44 years (7.3%), intermediate among persons aged 45–64 years (32.1%) and highest among persons aged ≥65 years (61.6%); this pattern was observed in all nine U.S. regions. In regions where prevalence of MCC was higher than the national average (East North Central and East South Central), the prevalence of MCC for each age group was also higher than the national average in each respective age group (Table 2). However, among regions with prevalence estimates of MCC lower than the national average (Pacific, Middle Atlantic, and West North Central), only the Pacific region prevalence was consistently lower than the national average when stratified by age.

Discussion

Approximately one in four U.S. adults had a diagnosis of MCC in 2014, which was similar to the prevalence previously reported for 2012 (*2*). This 2014 prevalence differed by region and by state. Ten states had prevalence estimates higher than the national average. Similar to previous research that found state-level differences among Medicare recipients (*5*), the findings reported here display differences among U.S. civilian, noninstitutionalized adults aged ≥18 years (regardless of insurance coverage type). Furthermore, a number of states with higher observed MCC prevalence estimates overlap geographically with states with high stroke mortality rates (the so-called "stroke belt," which includes all of Mississippi and parts of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia) (*9*), and the "diabetes belt" (which also includes all of Mississippi and parts of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia), where past research has noted high diabetes prevalence estimates (*10*). In addition to state-level differences, regional differences also existed. Examination of MCC by sex and age indicated that, for all regions, prevalence of MCC was higher among older persons; however, differences in MCC among men and women were region-specific.

The findings in this report are subject to at least six limitations. First, only 10 of the 20 conditions identified by HHS for inclusion in studies of MCC (*1*,*8*) were used for the measure of MCC in this study (NHIS data have not been collected regularly on the remaining 10 conditions). Second, no mental

Summary

What is already known on this topic?

One in four adults in the United States has multiple chronic conditions (MCC), defined as having two or more of 10 diagnosed chronic conditions. Care management of MCC presents challenges to both patients and physicians because of the substantial costs of treating more than one condition and the need to move beyond the traditional focus of care strategies on single conditions to coordinated care.

What is added by this report?

In 2014, 25.7% of U.S. adults had diagnoses of MCC. For 10 states, prevalence was higher than the national average. Adults living in the East North Central and East South Central regions had higher MCC prevalence estimates than the national average; prevalence estimates were lower among persons living in the Middle Atlantic, Pacific, and West North Central regions. Prevalence of MCC increased as age increased. Prevalence of MCC was higher among women than among men for the United States overall and in the East North Central, Mountain, New England, and West North Central regions.

What are the implications for public health practice?

Findings in this study further the research and surveillance objectives stated in the U.S. Department of Health and Human Services publication, *Multiple Chronic Conditions: A Strategic Framework*. Geographic disparities in MCC prevalence can inform state-level surveillance programs and groups targeting service delivery or allocating resources for MCC prevention activities.

health conditions were included. Thus, prevalence estimates presented might reflect a conservative estimate of MCC prevalence. Third, only physician-diagnosed chronic conditions were included; undiagnosed conditions are not collected by NHIS. Fourth, adults in long-term care or congregant facilities were not included in the NHIS sample design and therefore were excluded from this study. This limits the generalizability of results to the noninstitutionalized U.S. population. Fifth, crude estimates of MCC are presented for the U.S. states and the District of Columbia. This allowed for identification of states with higher prevalence of MCC, which might be useful in targeting service delivery and projecting resources (*5*,*6*); however, comparisons of these estimates with the national average do not account for different age distributions among the 50 states or District of Columbia. Finally, although survey weights are adjusted after data collection to ensure national generalizability, the 2014 NHIS Sample Adult Core response rate could signal nonresponse bias.

A stable national MCC prevalence indicates that diagnoses of MCC continue to be a public health issue. Through *Multiple Chronic Conditions: A Strategic Framework* (*1*), HHS has established objectives for addressing this issue. Similar to previous research that found geographic disparities in prevalence of MCC (*5*,*6*), this study provides state and regional estimates that can be used to understand which areas of the country have the highest adult prevalence of MCC.

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Update: Interim Guidance for Health Care Providers Caring for Pregnant Women with Possible Zika Virus Exposure — United States, July 2016

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CDC has updated its interim guidance for U.S. health care providers caring for pregnant women with possible Zika virus exposure, to include the emerging data indicating that Zika virus RNA can be detected for prolonged periods in some pregnant women. To increase the proportion of pregnant women with Zika virus infection who receive a definitive diagnosis, CDC recommends expanding real-time reverse transcription–polymerase chain reaction (rRT-PCR) testing. Possible exposures to Zika virus include travel to or residence in an area with active Zika virus transmission, or sex* with a partner who has traveled to or resides in an area with active Zika virus transmission without using condoms or other barrier methods to prevent infection.† Testing recommendations for pregnant women with possible Zika virus exposure who report clinical illness consistent with Zika virus disease§ (symptomatic pregnant women) are the same, regardless of their level of exposure (i.e., women with ongoing risk for possible exposure, including residence in or frequent travel to an area with active Zika virus transmission, as well as women living in areas without Zika virus transmission who travel to an area with active Zika virus transmission, or have unprotected sex with a partner who traveled to or resides in an area with active Zika virus transmission). Symptomatic pregnant women who are evaluated <2 weeks after symptom onset should receive serum and urine Zika virus rRT-PCR testing. Symptomatic pregnant women who are evaluated 2–12 weeks after symptom onset should first receive a Zika virus immunoglobulin (IgM) antibody test; if the IgM antibody test result is positive or equivocal, serum and urine rRT-PCR testing should be performed. Testing recommendations for pregnant women with possible Zika virus exposure who do not report clinical illness consistent with Zika virus disease (asymptomatic pregnant women) differ based on the circumstances of possible exposure. For asymptomatic pregnant women who live in areas without active Zika virus transmission and who are evaluated <2 weeks after last possible exposure, rRT-PCR testing should be performed. If the rRT-PCR result is negative, a Zika virus IgM antibody test should be performed 2–12 weeks after the exposure. Asymptomatic pregnant women who do not live in an area with active Zika virus transmission, who are first evaluated 2–12 weeks after their last possible exposure should first receive a Zika virus IgM antibody test; if the IgM antibody test result is positive or equivocal, serum and urine rRT-PCR should be performed. Asymptomatic pregnant women with ongoing risk for exposure to Zika virus should receive Zika virus IgM antibody testing as part of routine obstetric care during the first and second trimesters; immediate rRT-PCR testing should be performed when IgM antibody test results are positive or equivocal. This guidance also provides updated recommendations for the clinical management of pregnant women with confirmed or possible Zika virus infection. These recommendations will be updated when additional data become available.

Introduction

Zika virus continues to spread worldwide, and as of July 21, 2016, 50 countries and territories reported active Zika virus transmission (locations with mosquitoes transmitting Zika virus to persons in the area).¶ Although most persons with Zika virus infection are asymptomatic or have mild clinical disease, infection during pregnancy can cause congenital microcephaly and other brain defects (*1*). Zika virus has also been linked to other adverse pregnancy outcomes, including miscarriage and stillbirth (*1,2*). The U.S. Zika Pregnancy Registry (USZPR)** and the Puerto Rico Zika Active Pregnancy Surveillance System (ZAPPS)†† were established in collaboration with state, tribal, local, and territorial health departments to monitor pregnant women with confirmed or possible Zika virus infection to determine the risk for Zika virus infection during pregnancy and the spectrum of conditions associated with congenital Zika virus infection (*3*). As of July 14, 2016, a total of 400 women in the 50 U.S. states and the District of Columbia, and 378 women in

* Sex is specifically defined as vaginal sex (penis-to-vagina sex), anal sex (penis-to-anus sex), oral sex (mouth-to-penis sex or mouth-to-vagina sex), and the sharing of sex toys.

† Barrier methods include male or female condoms for vaginal or anal sex, male condoms for oral sex (mouth-to-penis), and male condoms cut to create a flat barrier or dental dams for oral sex (mouth-to-vagina).

§ Zika virus disease is defined as having at least one of the following signs or symptoms: acute onset of fever, rash, arthralgia, conjunctivitis, and laboratory confirmation of Zika virus infection.

¶ http://www.cdc.gov/zika/geo/active-countries.html.

** http://www.cdc.gov/zika/hc-providers/registry.html.

†† http://www.cdc.gov/zika/public-health-partners/zapss.html.

all U.S. territories (aggregated territories' data from the USZPR and ZAPSS) were determined to have laboratory evidence of confirmed or possible Zika virus infection during pregnancy.[§§]

Data from the USZPR and published case reports indicate that Zika virus RNA can persist in serum of some pregnant women longer than had been previously reported; the longest documented duration of Zika virus RNA detection in serum is 10 weeks after symptom onset (*4*–*7*). In addition, recent data indicate that Zika virus RNA might be detected in the serum or urine of some asymptomatic pregnant women (*7*). The frequency of this finding is unknown, but the detection of Zika virus RNA in serum or urine provides a definitive diagnosis of Zika virus infection. Preliminary data suggest that plaque reduction neutralization testing (PRNT) might not discriminate between Zika virus and other flavivirus infections, particularly in persons with previous flavivirus exposure (*8*), which complicates interpretation of serologic testing (IgM antibody test and PRNT). Given these challenges, expanded rRT-PCR testing might provide a definitive diagnosis for more pregnant women who are infected with Zika virus.

CDC has revised its interim guidance for U.S. health care providers caring for pregnant women with possible Zika virus exposure. The revised testing recommendations extend the timeframe for rRT-PCR testing of serum and include rRT-PCR testing for some asymptomatic pregnant women. CDC continues to evaluate all available evidence and will update recommendations as new information becomes available.

Updated Recommendations for Evaluating and Testing of Pregnant Women with Possible Zika Virus Exposure

All pregnant women in the United States and U.S. territories should be assessed for possible Zika virus exposure at each prenatal care visit. CDC recommends that pregnant women not travel to an area with active Zika virus transmission (*9*,*10*). Pregnant women who must travel to one of these areas should strictly follow steps to prevent mosquito bites during the trip.[¶¶] In addition, it is recommended that pregnant women with a sex partner who has traveled to or lives in an area with active Zika virus transmission use condoms or other barrier methods to prevent infection or abstain from sex for the duration of the pregnancy (*11*).

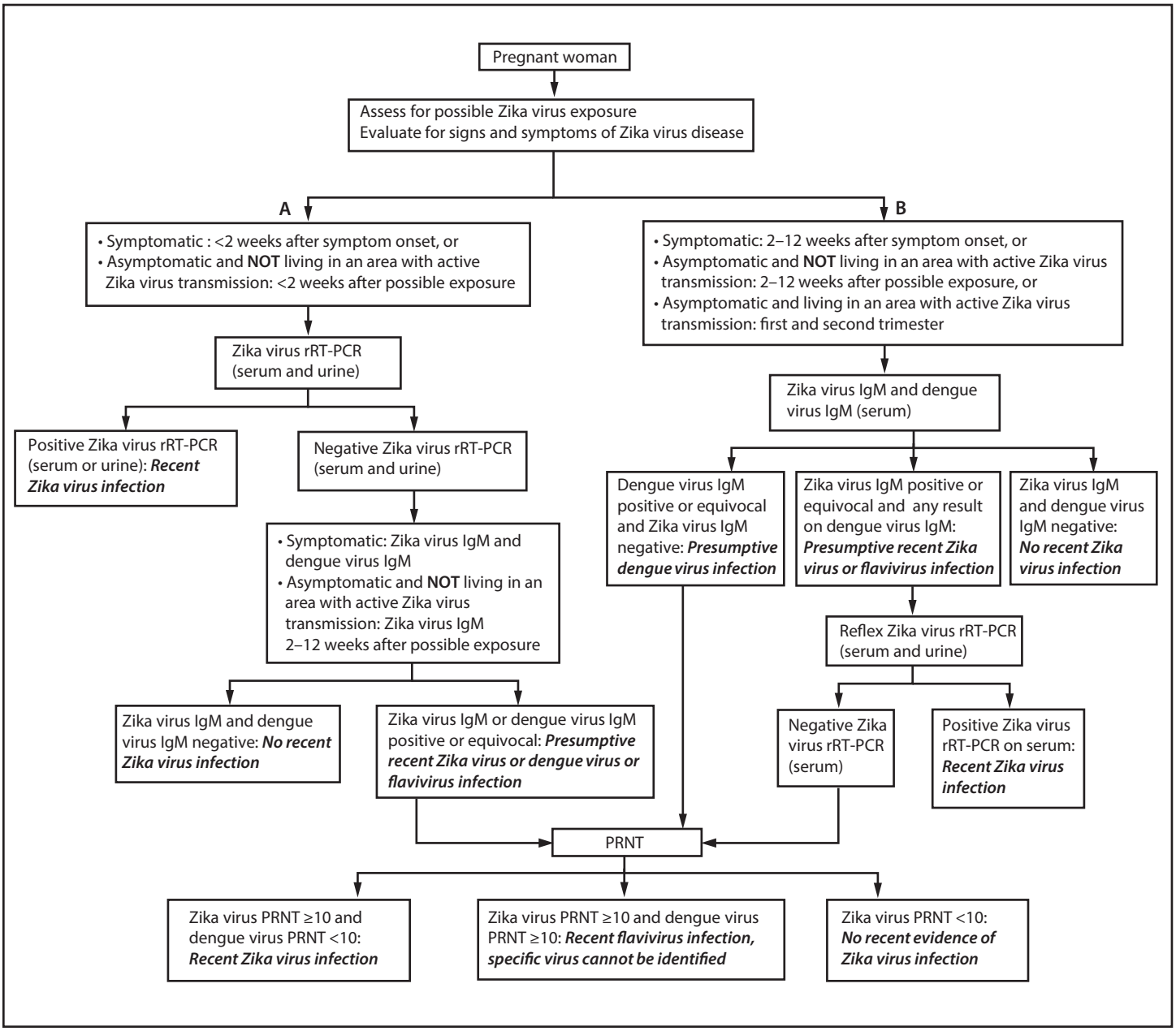
Symptomatic pregnant women. Pregnant women who report signs or symptoms consistent with Zika virus disease (acute onset of fever, rash, arthralgia, conjunctivitis) should be tested for Zika virus infection (Figure). The testing recommendations for symptomatic pregnant women are the same regardless of the circumstances of possible exposure; however, the type of testing recommended varies depending on the time of evaluation relative to symptom onset. Testing of serum and urine by rRT-PCR is recommended for pregnant women who seek care <2 weeks after symptom onset. This recommendation extends the previous recommendation for testing of serum from <1 week after symptom onset to <2 weeks (Figure). A positive rRT-PCR result confirms the diagnosis of recent maternal Zika virus infection. Symptomatic pregnant women with negative rRT-PCR results should receive both Zika virus IgM and dengue virus IgM antibody testing. If Zika virus rRT-PCR testing is requested from laboratories that do not have IgM antibody testing capacity or a process to forward specimens to another testing laboratory, storing of additional serum samples is recommended for IgM antibody testing in the event of a negative rRT-PCR result (*12*). If either the Zika virus or dengue virus IgM antibody test yields positive or equivocal results, PRNT should be performed on the same IgM-tested sample or a subsequently collected sample to rule out false-positive results (*8*).

Symptomatic pregnant women who seek care 2–12 weeks after symptom onset should first receive Zika virus and dengue virus IgM antibody testing (Figure). If the Zika virus IgM antibody testing yields positive or equivocal results, reflex rRT-PCR testing should be automatically performed on the same serum sample to determine whether Zika virus RNA is present. A positive rRT-PCR result confirms the diagnosis of recent maternal Zika virus infection. However, if the rRT-PCR result is negative, a positive or equivocal Zika virus IgM antibody test result should be followed by PRNT. Positive or equivocal dengue IgM antibody test results with a negative Zika virus IgM antibody test result should also be confirmed by PRNT. Interpretation of serologic results has been described (*8*).

Asymptomatic pregnant women. Testing recommendations for asymptomatic pregnant women with possible Zika virus exposure differ based on the circumstances of possible exposure (i.e., ongoing versus limited exposure) and the elapsed interval since the last possible Zika virus exposure (Figure). Asymptomatic pregnant women living in areas without active Zika virus transmission who are evaluated <2 weeks after possible Zika virus exposure should be offered serum and urine rRT-PCR testing (Figure). A positive rRT-PCR result confirms the diagnosis of recent maternal Zika virus infection. However, because viral RNA in serum and urine declines over time and depends on multiple factors, asymptomatic pregnant women with a negative rRT-PCR result require additional testing to exclude infection. These women should return 2–12 weeks after possible Zika virus exposure for Zika virus IgM antibody testing. A positive or equivocal IgM antibody test result should be confirmed by PRNT.

[§§] https://www.cdc.gov/zika/geo/pregwomen-uscases.html.
[¶¶] http://wwwnc.cdc.gov/travel/page/avoid-bug-bites.

FIGURE. Updated interim guidance: testing and interpretation recommendations*,†,§,¶ for a pregnant woman with possible exposure to Zika virus — United States (including U.S. territories)**



Abbreviations: IgM = immunoglobulin M; PRNT = plaque reduction neutralization test; rRT-PCR = real-time reverse transcription–polymerase chain reaction.

* A pregnant woman is considered symptomatic if one or more signs or symptoms (acute onset of fever, rash, arthralgia, or conjunctivitis) consistent with Zika virus disease is reported. A pregnant woman is considered asymptomatic if these symptoms are not reported.

† Testing includes Zika virus rRT-PCR on serum and urine samples, Zika virus and dengue virus IgM, and PRNT on serum samples. PRNT results that indicate recent flavivirus infection should be interpreted in the context of the currently circulating flaviviruses. Refer to the laboratory guidance for updated testing recommendations (http://www.cdc.gov/zika/laboratories/lab-guidance.html). Because of the overlap of symptoms in areas where other viral illness are endemic, evaluate for possible dengue or chikungunya virus infection.

§ Dengue virus IgM antibody testing is recommended only for symptomatic pregnant women.

¶ If Zika virus rRT-PCR testing is requested from laboratories without IgM antibody testing capacity or a process to forward specimens to another testing laboratory, storing of additional serum samples is recommended for IgM antibody testing in the event of an rRT-PCR negative result.

** Possible exposure to Zika virus includes travel to or residence in an area with active Zika virus transmission (http://wwwnc.cdc.gov/travel/notices/), or sex (vaginal sex (penis-to-vagina sex), anal sex (penis-to-anus sex), oral sex (mouth-to-penis sex or mouth-to-vagina sex), and the sharing of sex toys) without a barrier method to prevent infection (male or female condoms for vaginal or anal sex, male condoms for oral sex (mouth-to-penis), and male condoms cut to create a flat barrier or dental dams for oral sex (mouth-to-vagina) with a partner who traveled to, or lives in an area with active Zika virus transmission.

Asymptomatic pregnant women living in an area without active Zika virus transmission, who seek care 2–12 weeks after possible Zika virus exposure, should be offered Zika virus IgM antibody testing (Figure). If the Zika virus IgM antibody test yields positive or equivocal results, reflex rRT-PCR testing should be performed on the same sample. If the rRT-PCR result is negative, PRNT should be performed.

As recommended in previous guidance (*9*,*13*), IgM antibody testing is recommended as part of routine obstetric care during the first and second trimesters for asymptomatic pregnant women who have an ongoing risk for Zika virus exposure (i.e., residence in or frequent travel to an area with active Zika virus transmission) (Figure). Reflex rRT-PCR testing is recommended for women who have a positive or equivocal Zika virus IgM antibody test results because rRT-PCR testing provides the potential for a definitive diagnosis of Zika virus infection. Negative rRT-PCR results after a positive or equivocal Zika virus IgM antibody test result should be followed by PRNT. The decision to implement testing of asymptomatic pregnant women with ongoing risk for Zika virus exposure should be made by local health officials based on information about levels of Zika virus transmission and laboratory capacity.

Symptomatic and asymptomatic pregnant women who seek care >12 weeks after symptom onset or possible Zika virus exposure. For symptomatic and asymptomatic pregnant women with possible Zika virus exposure who seek care >12 weeks after symptom onset or possible exposure, IgM antibody testing might be considered. If fetal abnormalities are present, rRT-PCR testing should also be performed on maternal serum and urine. However, a negative IgM antibody test or rRT-PCR result >12 weeks after symptom onset or possible exposure does not rule out recent Zika virus infection because IgM antibody and viral RNA levels decline over time. Given the limitations of testing beyond 12 weeks after symptom onset or possible exposure, serial fetal ultrasounds should be considered.

Updated Recommendations for Prenatal Management of Pregnant Women with Laboratory Evidence of Confirmed or Possible Zika Virus Infection

Laboratory evidence of a confirmed recent Zika virus infection includes 1) detection of Zika virus or Zika virus RNA or antigen in any body fluid or tissue specimen or 2) positive or equivocal Zika virus or dengue virus IgM antibody test results on serum or cerebrospinal fluid with a positive (≥10) PRNT titer for Zika virus together with a negative (<10) PRNT titer for dengue virus (*8*). However, given that serology test results can be difficult to interpret, particularly in persons who were previously infected with or vaccinated against flaviviruses, and because the adverse outcomes caused by Zika virus infection during pregnancy are not fully described, pregnant women with laboratory evidence of recent flavivirus infection are considered to have possible Zika virus infection and should be monitored frequently (Table).

Pregnant women with confirmed or possible Zika virus infection should be managed in accordance with the updated CDC Interim Guidance (Table). In addition, pregnant women with presumptive recent Zika virus or flavivirus infection (i.e., positive or equivocal Zika virus or dengue virus IgM antibody test result that needs to be confirmed by PRNT) should also be managed in accordance with this updated guidance (Table) until final results are available. Serial fetal ultrasounds (every 3–4 weeks) should be considered to assess fetal anatomy, particularly neuroanatomy, and to monitor growth. Ultrasound findings that have been associated with congenital Zika virus syndrome include microcephaly, intracranial calcifications, ventriculomegaly, arthrogryposis, and abnormalities of the corpus callosum, cerebrum, cerebellum, and eyes (*1*,*14*). Consideration of amniocentesis should be individualized, because data about its usefulness in diagnosing congenital Zika virus infection are limited (*13*). The presence of Zika virus RNA in the amniotic fluid might indicate fetal infection (*5*,*15*); however, a negative result does not exclude congenital Zika virus infection (*13*). In addition, persistent detection of Zika virus RNA in serum has been reported during pregnancy (*7*). The clinical implications of prolonged detection of Zika virus RNA in serum are not known; however, repeat rRT-PCR testing has been performed in some cases (*5*,*7*).

Updated Recommendations for Postnatal Management of Pregnant Women with Laboratory Evidence of Confirmed or Possible Zika Virus Infection

Infants born to women with laboratory evidence of confirmed or possible Zika virus infection should be evaluated for congenital Zika virus infection in accordance with CDC interim guidance for health care providers caring for infants with possible Zika virus infection. (*16*). Zika virus testing is recommended for these infants regardless of the presence or absence of phenotypic abnormalities (*14*). Previous published guidance recommended that testing be performed on cord blood or infant serum; however, the use of cord blood to diagnose other congenital viral infections, such as HIV and syphilis, has sometimes yielded inaccurate results (*17*–*20*). Maternal blood can contaminate cord blood specimens leading to false-positive results, whereas Wharton's jelly in the umbilical cord can yield false-negative results (*19*,*20*). Cord blood samples

TABLE. Clinical management of a pregnant woman with suspected Zika virus infection

Interpretation of laboratory results*	Prenatal management	Postnatal management
Recent Zika virus infection Recent flavivirus infection; specific virus cannot be identified	Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth.† Decisions regarding amniocentesis should be individualized for each clinical circumstance.§	*Live births:* Cord blood and infant serum should be tested for Zika virus by rRT-PCR, and for Zika IgM and dengue virus IgM antibodies. If CSF is obtained for other reasons, it can also be tested. Zika virus rRT-PCR and IHC staining of umbilical cord and placenta are recommended.¶ *Fetal losses:* Zika virus rRT-PCR and IHC staining of fetal tissues is recommended.¶
Presumptive recent Zika virus infection** Presumptive recent flavivirus infection**	Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth.† Amniocentesis might be considered; decisions should be individualized for each clinical circumstance.	*Live births:* Cord blood and infant serum should be tested for Zika virus by rRT-PCR, and for Zika virus IgM and dengue virus IgM antibodies. If CSF is obtained for other reasons, it can also be tested. Zika virus rRT-PCR and IHC staining of umbilical cord and placenta should be considered.¶ *Fetal losses:* Zika virus rRT-PCR and IHC staining of fetal tissues should be considered.¶
Recent dengue virus infection	Clinical management in accordance with existing guidelines.††	
No evidence of Zika virus or dengue virus infection	Prenatal ultrasound to evaluate for fetal abnormalities consistent with congenital Zika virus syndrome.† *Fetal abnormalities present*: repeat Zika virus rRT-PCR and IgM test; base clinical management on corresponding laboratory results. *Fetal abnormalities absent*: base obstetric care on the ongoing risk for Zika virus exposure risk to the pregnant woman.	

Abbreviations: CSF = cerebrospinal fluid; IgM = immunoglobulin M; IHC = immunohistochemical; PRNT = plaque reduction neutralization test; rRT-PCR = real-time reverse transcription–polymerase chain reaction.

* Refer to the previously published guidance for testing interpretation (http://www.cdc.gov/mmwr/volumes/65/wr/mm6521e1.htm).

† Fetal abnormalities consistent with congenital Zika virus syndrome include microcephaly, intracranial calcifications, and brain and eye abnormalities.

§ Health care providers should discuss risks and benefits of amniocentesis with their patients. It is not known how sensitive or specific rRT-PCR testing of amniotic fluid is for congenital Zika virus infection, whether a positive result is predictive of a subsequent fetal abnormality, and if it is predictive, what proportion of infants born after infection will have abnormalities.

¶ Refer to pathology guidance for collection and submission of fetal tissues for Zika virus testing for detailed information on recommended specimen types (http://www.cdc.gov/zika/laboratories/test-specimens-tissues.html).

** rRT-PCR or PRNT should be performed for positive or equivocal IgM results as indicated. PRNT results that indicate recent flavivirus infection should be interpreted in the context of the currently circulating flaviviruses. Refer to the laboratory guidance for updated testing recommendations (http://www.cdc.gov/zika/laboratories/lab-guidance.html). Because of the overlap of symptoms and areas where other viral illnesses are endemic, evaluate for possible dengue or chikungunya virus infection.

†† http://apps.who.int/iris/bitstream/10665/44188/1/9789241547871_eng.pdf.

can also become clotted, which does not allow for appropriate serologic testing. Therefore, although collection and testing of cord blood for Zika virus testing can be performed, these results should be interpreted in conjunction with infant serum results. Pathology evaluation of fetal tissue specimens (e.g., placenta and umbilical cord)*** is another important diagnostic tool to establish the presence of maternal Zika virus infection and can provide a definitive diagnosis for pregnant women with Zika virus infection whose serology results indicate recent unspecified flavivirus infection. In addition, pathology findings might also be helpful in evaluating pregnant women who seek care >12 weeks after symptom onset or possible exposure; Zika virus RNA has been reported to persist in tissue specimens including placenta and fetal brain (*21*). A positive rRT-PCR or immunohistochemical staining on the placenta indicates the presence of maternal infection (*21*).

Pregnant women with laboratory evidence of confirmed or possible Zika virus infection who experience a fetal loss or stillbirth should be offered pathology testing for Zika virus infection; testing includes rRT-PCR and immunohistochemical staining of fixed tissue (*21*). This testing might provide insight into the etiology of the fetal loss, which could inform a woman's future pregnancy planning. Additional information is available at http://www.cdc.gov/zika.

*** http://www.cdc.gov/zika/laboratories/test-specimens-tissues.html.

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Update: Interim Guidance for Prevention of Sexual Transmission of Zika Virus — United States, July 2016

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On July 25, 2016, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Zika virus has been identified as a cause of congenital microcephaly and other serious brain defects (*1*). CDC issued interim guidance for the prevention of sexual transmission of Zika virus on February 5, 2016, with an initial update on April 1, 2016 (*2*). The following recommendations apply to all men and women who have traveled to or reside in areas with active Zika virus transmission* and their sex partners. The recommendations in this report replace those previously issued and are now updated to reduce the risk for sexual transmission of Zika virus from both men and women to their sex partners. This guidance defines potential sexual exposure to Zika virus as having had sex with a person who has traveled to or lives in an area with active Zika virus transmission when the sexual contact did not include a barrier to protect against infection. Such barriers include male or female condoms for vaginal or anal sex and other barriers for oral sex.† Sexual exposure includes vaginal sex, anal sex, oral sex, or other activities that might expose a sex partner to genital secretions.§ This guidance will be updated as more information becomes available.

As of July 20, 2016, 15 cases of Zika virus infection transmitted by sexual contact had been reported in the United States.¶ Sexually transmitted Zika virus infection has also been reported in other countries (*3*). In published reports, the longest interval after symptom onset that sexual transmission from a man might have occurred was 32–41 days (*4*). Using real-time reverse transcription–polymerase chain reaction (rRT-PCR), which detects viral RNA but is not necessarily a measure of infectivity, Zika virus RNA has been detected in semen up to 93 days after symptom onset (*5*). In addition, one report describes an asymptomatically infected man with Zika virus RNA detected by rRT-PCR in his semen 39 days following departure from a Zika virus-affected area and who might have sexually transmitted Zika virus to his partner (*6*). In most cases, serial semen specimens were not collected until Zika virus RNA was no longer detectable so that the precise duration and pattern of infectious Zika virus in semen remain unknown. Zika virus also has been transmitted from a symptomatically infected woman to a male sex partner (*7*), and Zika virus RNA has been detected in vaginal fluids 3 days after symptom onset and in cervical mucus up to 11 days after symptom onset (*8*). For sex partners of infected women, Zika virus might be transmitted through exposure to vaginal secretions or menstrual blood. Sexual transmission of infections, including those caused by other viruses, is reduced by consistent and correct use of barriers to protect against infection.

With this update, CDC is expanding its existing recommendations to cover all pregnant couples, which includes pregnant women with female sex partners. This guidance also describes what other couples (those who are not pregnant or planning to become pregnant) can do to reduce the risk for Zika virus transmission. CDC's recommendations for couples planning to become pregnant have been published separately (*9*).

Updated Recommendations

Recommendations for pregnant couples. Zika virus infection is of particular concern during pregnancy. Pregnant women with sex partners (male or female) who live in or who have traveled to an area with active Zika virus transmission should consistently and correctly use barriers against infection during sex or abstain from sex for the duration of the pregnancy. These recommendations reduce the risk for sexual transmission of Zika virus during pregnancy, which could have adverse fetal effects. Pregnant women should discuss with their health care provider their own and their sex partner's history of having been in areas with active Zika virus transmission and history of illness consistent with Zika virus disease**; providers can consult CDC's guidance for evaluation and testing of pregnant women (*10*).

Recommendations for couples who are not pregnant and are not planning to become pregnant. Several factors could influence a couple's level of concern about sexual transmission of Zika virus. The risk for acquiring mosquito-borne Zika virus infection in areas with active transmission depends on the duration and extent of exposure to infected mosquitoes and

* http://www.cdc.gov/zika/geo/index.html.

† Barrier methods to protect against infection include male or female condoms for vaginal or anal sex, male condoms for oral sex (mouth-to-penis), and male condoms cut to create a flat barrier or dental dams for oral sex (mouth-to-vagina).

§ For the purpose of these guidelines, sex is specifically defined as vaginal sex (penis-to vagina sex), anal sex (penis-to-anus sex), oral sex (mouth-to-penis sex or mouth-to-vagina sex), and the sharing of sex toys.

¶ http://www.cdc.gov/zika/geo/united-states.html.

** Clinical illness consistent with Zika virus disease includes one or more of the following signs or symptoms: acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis.

the steps taken to prevent mosquito bites.[††] According to currently available information, most Zika virus infections appear to be asymptomatic, and when illness does occur, it is usually mild, with symptoms lasting from several days to a week; severe disease requiring hospitalization is uncommon (*11*).

Men and women who want to reduce the risk for sexual transmission of Zika virus should use barrier methods against infection consistently and correctly during sex or abstain from sex when one sex partner has traveled to or lives in an area with active Zika virus transmission. Based on expert opinion and on limited but evolving information about the sexual transmission of Zika virus, the recommended duration of consistent use of a barrier method against infection or abstinence from sex depends on whether the sex partner has confirmed infection or clinical illness consistent with Zika virus disease and whether the sex partner is male or female (Box). The rationale for these time frames has been published previously (*9*).

Couples who do not desire pregnancy should use available strategies to prevent unintended pregnancy and might consider multiple options, including (in addition to condoms, the only method that protects against both pregnancy and sexual transmission of Zika virus) use of the most effective contraceptive methods that can be used correctly and consistently (*9*,*12*). In addition, couples should be advised that correct and consistent use of barrier methods against infection, such as condoms, reduces the risk for other sexually transmitted infections.

Zika Virus Testing and Sexual Transmission

At present, Zika virus testing for the assessment of risk for sexual transmission is of uncertain value, because current understanding of the duration and pattern of shedding of Zika virus in the male and female genitourinary tract is limited. Therefore, testing of specimens to assess risk for sexual transmission is currently not recommended.

Zika virus testing is recommended for persons who have had possible sexual exposure to Zika virus and who develop signs or symptoms consistent with Zika virus disease.[§§] All pregnant women should be tested if they have had possible exposure to Zika virus, including sexual exposure (*9*,*10*). CDC urges health care providers to report to local and state health departments all cases of Zika virus disease, including those suspected to have occurred by sexual transmission.

[††] http://www.cdc.gov/zika/prevention.
[§§] http://www.cdc.gov/zika/hc-providers/diagnostic.html.

BOX. Recommendations for prevention of sexual transmission of Zika virus for couples in which one or both partners have traveled to or reside in an area with active Zika virus transmission

Couples in which a woman is pregnant

- Couples in which a woman is pregnant should use barrier methods against infection consistently and correctly or abstain from sex for the duration of the pregnancy.

Couples who are not pregnant and are not planning to become pregnant*

- Couples in which a partner had confirmed Zika virus infection or clinical illness consistent with Zika virus disease should consider using barrier methods against infection consistently and correctly or abstain from sex as follows:
  - Men with Zika virus infection for at least 6 months after onset of illness;
  - Women with Zika virus infection for at least 8 weeks after onset of illness.
- Couples in areas without active Zika transmission in which one partner traveled to or resides in an area with active Zika virus transmission but did not develop symptoms of Zika virus disease should consider using barrier methods against infection or abstaining from sex for at least 8 weeks after that partner departed the Zika-affected area.
- Couples who reside in an area with active Zika virus transmission might consider using barrier methods against infection or abstaining from sex while active transmission persists.

* Couples who do not desire pregnancy should use the most effective contraceptive methods that can be used correctly and consistently in addition to barrier methods to protect against infections, such as condoms, which reduce the risk for both sexual transmission of Zika and other sexually transmitted infections. Couples planning conception might have multiple factors to consider, which are discussed in more detail in the following: Petersen EE, Polen KN, Meaney-Delman D, et al. Update: interim guidance for health care providers caring for women of reproductive age with possible Zika virus exposure—United States, 2016. MMWR Morb Mortal Wkly Rep 2016;65:315–22.

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Notes from the Field

Kratom (*Mitragyna speciosa*) Exposures Reported to Poison Centers — United States, 2010–2015

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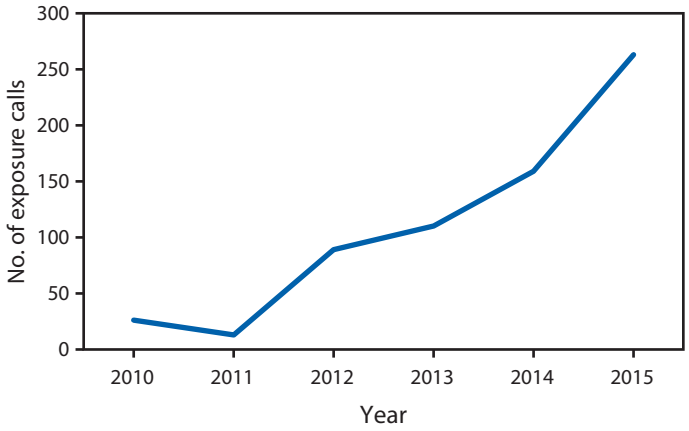
Kratom (*Mitragyna speciosa*) is a plant consumed throughout the world for its stimulant effects and as an opioid substitute (*1*). It is typically brewed into a tea, chewed, smoked, or ingested in capsules (*2*). It is also known as Thang, Kakuam, Thom, Ketum, and Biak (*3*). The Drug Enforcement Administration includes kratom on its Drugs of Concern list (substances that are not currently regulated by the Controlled Substances Act, but that pose risks to persons who abuse them), and the National Institute of Drug Abuse has identified kratom as an emerging drug of abuse (*3*,*4*). Published case reports have associated kratom exposure with psychosis, seizures, and deaths (*5*,*6*). Because deaths have been attributed to kratom in the United States (*7*), some jurisdictions have passed or are considering legislation to make kratom use a felony (*8*). CDC characterized kratom exposures that were reported to poison centers and uploaded to the National Poison Data System (NPDS) during January 2010–December 2015. The NPDS is a national database of information logged by the country's regional poison centers serving all 50 United States, the District of Columbia, and Puerto Rico and is maintained by the American Association of Poison Control Centers. NPDS case records are the result of call reports made by the public and health care providers.

During the study period, U.S. poison centers received 660 calls about reported exposure to kratom. The number of calls increased tenfold from 26 in 2010 to 263 in 2015 (Figure). Health care provider reports constituted 496 (75.2%) of calls. Among calls, 487 (73.8%) exposed persons reported intentional exposure, and 595 (90.2%) reported ingestion of the drug. Isolated kratom exposure (single exposure) was reported in 428 (64.8%) cases. Among calls reporting use of kratom in combination with other substances (multiple exposures), the most commonly reported other substances were ethanol, other botanicals, benzodiazepines, narcotics, and acetaminophen. Among 658 (99.7%) calls for which information on sex of the exposed person was available, 472 (71.7%) were male, and among 604 (91.5%) for which information on age was available, the median age was 28 years (range = 2 months–69 years).

Medical outcomes associated with kratom exposure were reported as minor (minimal signs or symptoms, which resolved rapidly with no residual disability) for 162 (24.5%) exposures, moderate (non-life threatening, with no residual disability, but requiring some form of treatment) for 275 (41.7%) exposures, and major (life-threatening signs or symptoms, with some residual disability) for 49 (7.4%) exposures. One death was reported in a person who was exposed to the medications paroxetine (an antidepressant) and lamotrigine (an anticonvulsant and mood stabilizer) in addition to kratom. For 173 (26.2%) exposure calls, no effects were reported, or poison center staff members were unable to follow up again regarding effects. Among exposed persons for whom information on signs and symptoms was available, reported signs and symptoms included tachycardia (n = 165, 25.0%), agitation or irritability (157, 23.8%), drowsiness (128, 19.4%), nausea (97, 14.7%), and hypertension (77, 11.7%). A chi-square test demonstrated a significant association between severity of outcome and multiple versus single exposures ($p<0.001$). Pairwise comparisons (adjusted by the stepdown Bonferroni procedure) indicated a higher likelihood of a report of a severe outcome among persons aged 21–30 years ($p = 0.04$), 31–40 years ($p = 0.02$), and >40 years ($p = 0.02$) compared with persons aged 0–10 years.

Kratom use appears to be increasing in the United States (*2*), and the reported medical outcomes and health effects suggest an emerging public health threat. Members of the public and health care providers should be aware that the use of kratom can lead to severe adverse effects, especially when consumed in combination with alcohol or other drugs.

FIGURE. Number of reported exposure calls to poison centers related to kratom use, by year — National Poison Data System, United States and Puerto Rico, January 2010–December 2015



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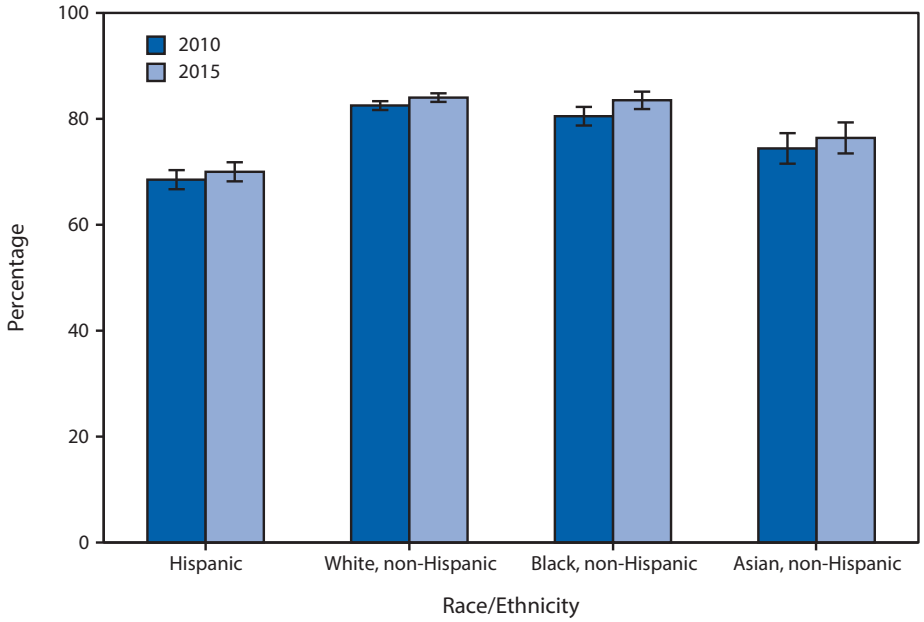
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged 18–64 Years Who Had Visited or Talked to a Health Care Professional in the Past 12 Months,† by Race/Ethnicity§ — National Health Interview Survey, 2010 and 2015¶



* With 95% confidence intervals indicated with error bars.
† Based on a question in the Sample Adult section that asked, "About how long has it been since you last saw or talked to a doctor or other health care professional about your own health? Include doctors seen while a patient in a hospital."
§ Categories shown are only for non-Hispanic respondents who selected one racial group; respondents had the option to select more than one racial group. Persons of Hispanic ethnicity might be of any race or combination of races.
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized, U.S. population and are derived from the National Health Interview Survey Sample Adult component.

From 2010 to 2015, there was an increase in the percentage of non-Hispanic white adults (from 82.5% to 84.0%) and non-Hispanic black adults (80.5% to 83.5%) aged 18–64 years who had seen or talked to a health care professional in the past 12 months. In 2010, non-Hispanic white adults aged 18–64 years were the most likely to have seen or talked to a health professional in the past 12 months, but there was no significant difference between non-Hispanic white and non-Hispanic black adults in 2015. In both 2010 and 2015, Hispanic adults aged 18–64 years were the least likely to have seen or talked to a health care professional in the past 12 months.

Source: National Health Interview Survey, 2010 and 2015. http://www.cdc.gov/nchs/nhis.htm.

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