Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 65 / No. 12
April 1, 2016

Campylobacter jejuni Infections Associated with Raw Milk Consumption — Utah, 2014

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In May 2014, the Utah Public Health Laboratory (UPHL) notified the Utah Department of Health (UDOH) of specimens from three patients infected with *Campylobacter jejuni* yielding indistinguishable pulsed-field gel electrophoresis (PFGE) patterns. All three patients had consumed raw (unpasteurized and nonhomogenized) milk from dairy A. In Utah, raw milk sales are legal from farm to consumer with a sales permit from the Utah Department of Agriculture and Food (UDAF). Raw milk dairies are required to submit monthly milk samples to UDAF for somatic cell and coliform counts, both of which are indicators of raw milk contamination. Before this cluster's identification, dairy A's routine test results were within acceptable levels (<400,000 somatic cells/mL and <10 coliform colony forming units/mL). Subsequent enhanced testing procedures recovered *C. jejuni*, a fastidious organism, in dairy A raw milk; the isolate matched the cluster pattern. UDAF suspended dairy A's raw milk permit during August 4–October 1, and reinstated the permit when follow-up cultures were negative. Additional cases of *C. jejuni* infection were identified in October, and UDAF permanently revoked dairy A's permit to sell raw milk on December 1. During May 9–November 6, 2014, a total of 99 cases of *C. jejuni* infection were identified. Routine somatic cell and coliform counts of raw milk do not ensure its safety. Consumers should be educated that raw milk might be unsafe even if it meets routine testing standards.

Outbreak Investigation

On May 21, 2014, UPHL notified UDOH of three laboratory-confirmed cases (in patients A, B, and C) of *C. jejuni* infection with indistinguishable *SmaI* PFGE patterns (DBRS16.0196). *Campylobacter* infection is a reportable disease in Utah, and all *Campylobacter* isolates undergo PFGE analysis (*1*). Patients A and B were a parent and child who had illness onset on May 10, and both were hospitalized. Patient A died 1 week later of multisystem organ failure, related, in part, to gastroenteritis and underlying medical conditions. Patient C's symptoms began on May 11. All three patients reported raw milk consumption from dairy A in Weber County, in northern Utah (Figure 1). Additional cases were identified during May and June; UDOH initiated an outbreak investigation on June 10. A confirmed case was defined as the onset of diarrheal illness caused by *C. jejuni* matching the cluster PFGE pattern or confirmed *Campylobacter* infection on or

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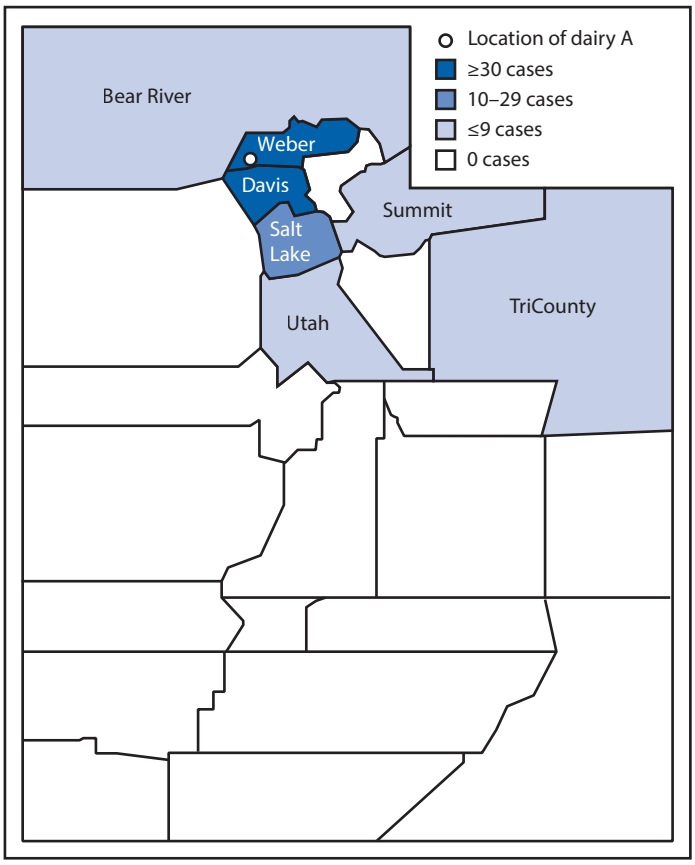
after May 1 in a person who had consumed dairy A raw milk 1–10 days before illness onset. A probable case was defined as the onset of diarrheal illness on or after May 1 in a person who had consumed raw milk from dairy A 1–10 days before illness onset, or who reported contact with a patient who met the confirmed case definition.

During May 9–November 6, a total of 99 cases (59 confirmed and 40 probable) of *C. jejuni* infection were identified through laboratory isolates and patient interviews (Figure 2). Eighty-five (86%) patients resided in three northern Utah counties (Weber, Davis, and Salt Lake) in the vicinity of dairy A; 34 cases were reported from Weber County, 33 from Davis County, and 18 from Salt Lake County. An additional 14 cases were reported from other northern Utah counties (Figure 1). Patients ranged in age from 1 to 74 years (median = 23 years); 44 patients were aged <18 years. Reported signs and symptoms were consistent with campylobacteriosis. All 99 patients reported diarrhea; among 84 patients with signs and symptoms available, the majority reported abdominal pain (65 patients) and fever (53). Although 15% of Utah residents and 17% of Weber County residents are Hispanic, a total of 31 cases (32%) occurred in Hispanics. Overall, 10 patients were hospitalized and one died (Table).

Exposure history was available for 98 patients. Among these patients, 53 reported drinking raw milk, including 52 who reported drinking raw milk from dairy A. Entries in dairy A's raw milk sales ledger during May 1–July 27 documented raw milk purchase by 38 (39%) identified patients, among whom

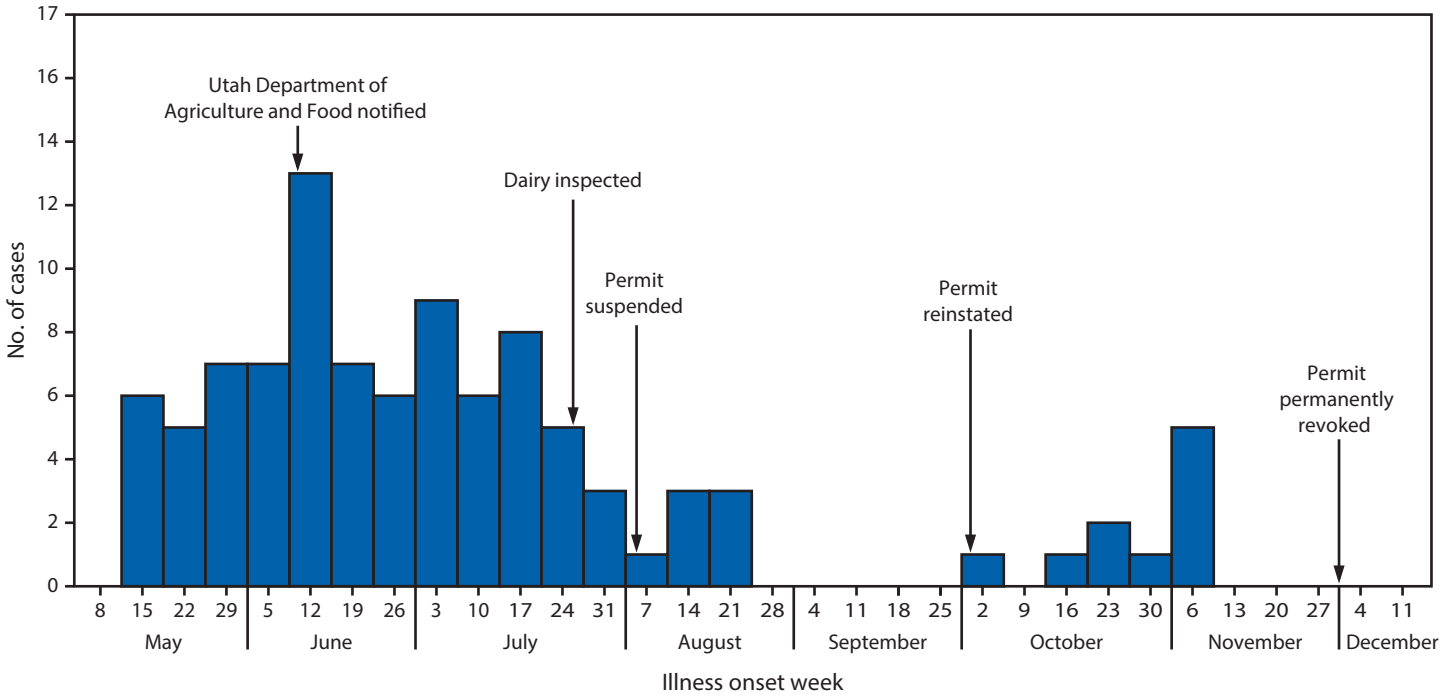
FIGURE 1. Location of dairy A and distribution of *Campylobacter jejuni* cases, by local health department district — Utah, May–November 2014



The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR Morb Mortal Wkly Rep 2016;65:[inclusive page numbers].

FIGURE 2. Week of illness onset among patients (N = 99) with probable and confirmed *Campylobacter jejuni* infection associated with consumption of raw milk from a dairy — Utah, May–November 2014



20 (53%) reported consuming raw milk from dairy A; an additional four (11%) patients reported raw milk consumption but could not recall the dairy's name. The remaining 14 (37%) patients who purchased raw milk from dairy A did not report consuming raw milk. Among 41 patients with no known raw milk consumption, 21 (51%) reported eating queso fresco, a Mexican-style cheese. Among the patients who reported eating queso fresco, 19 (90%) were Hispanic; however, no common source was identified.

UDAF inspectors visited dairy A on a routine inspection on June 1, before being notified about the outbreak, and on two subsequent outbreak-related inspections on June 12 and July 13. Dairy A passed these inspections with no critical violations noted. During June 1–July 13, three raw milk samples were collected and tested by UDAF for somatic cell and coliform counts. Because no pathogens were detected in the samples, the dairy continued selling raw milk.

Cases of *C. jejuni* infection continued to be identified, and on July 29, representatives from UDOH, UDAF, and UPHL conducted a collaborative investigation at dairy A. Following the Food and Drug Administration's Bacteriological Analytical Manual protocol (*2*), the raw milk bulk tank was agitated, and a UDAF inspector collected a 1-liter sample of raw milk. The sample was neutralized on-site to a pH of 7.5 by a UPHL microbiologist and sent to UPHL and UDAF laboratories for testing. The milk was cultured concurrently at UPHL and UDAF using the selective medium, sheep blood agar. Both UPHL and UDAF isolated *C. jejuni*; PFGE performed by UPHL identified the same pattern identified in specimens from the initial three patients. UDAF tested samples for somatic cell and coliform counts adhering to regulations set forth by the Utah Dairy Act; counts were within the acceptable range despite the positive culture (*3*). UPHL tested 56 human *Campylobacter* isolates related to the outbreak. The isolates were enriched in accordance with the Bacteriological Analytical Manual protocol for *Campylobacter* culture (*2*). As is routine in Utah, all samples were analyzed for serotype and *SmaI* PFGE. Fifty-five of 56 isolates produced indistinguishable PFGE patterns by *SmaI* (DBRS16.0196) and *KpnI* (DBRK02.0190). One sample was identified as *SmaI* PFGE pattern (DBRS16.2505); this pattern is 87% similar to the outbreak pattern, and the patient from whom the isolate was obtained reported having contact with a patient with confirmed *C. jejuni* infection and having consumed raw milk from dairy A.

Public Health Response

On August 4, after finding positive *C. jejuni* cultures, UDAF suspended dairy A's permit to sell raw milk. On August 26, UDOH and UDAF issued a joint press release to inform the public about the outbreak, educate Utah citizens about the dangers of raw milk consumption, and notify them of dairy A

TABLE. Demographic and clinical characteristics for 99 patients with *Campylobacter jejuni* infection associated with consumption of raw milk from a dairy — Utah, May–November 2014

Characteristic	No. (%)
Sex (n = 97)	
Male	57 (59)
Female	40 (41)
Hispanic ethnicity (n = 98)	
Non-Hispanic	67 (68)
Hispanic	31 (32)
Age group (yrs) (n = 99)	
0–5	11 (11)
6–18	29 (29)
≥19	48 (48)
Unknown	11 (11)
Signs and symptoms (n = 84*)	
Abdominal pain	65 (77)
Fever	53 (63)
Nausea	41 (49)
Vomiting	36 (43)
Bloody diarrhea†	35 (42)
Outcome (N = 99)	
Hospitalized	10 (10)
Died	1 (1)

* Patients for whom information was available.
† All 99 patients reported diarrhea.

raw milk as the outbreak source. The press release led to the identification of one additional probable case.

UDAF reinstated dairy A's permit to sell raw milk on October 1 after acceptable somatic cell and coliform counts and negative *Campylobacter* cultures were reported during retesting. However, during October 1–November 4, seven additional cases of *C. jejuni* infection were identified, and on December 1, UDAF permanently revoked dairy A's raw milk sales permit. No cases of *C. jejuni* infection were identified from November 4, 2014, through February 2015. However, after the outbreak investigation concluded and dairy A was no longer selling raw milk, a person with campylobacteriosis matching the outbreak pattern was identified on February 19, 2015. This person did not report drinking raw milk. No campylobacteriosis cases matching the outbreak pattern have been identified since February 19, 2015.

Discussion

An estimated 3% of the U.S. population drinks raw milk, and prefer it to pasteurized milk, in part, because of perceived health benefits of raw milk consumption (*4*,*5*). Raw milk can be contaminated with *Campylobacter* in different ways. *Campylobacter* is ubiquitous in the dairy environment. Fecal matter contamination, wild bird droppings, poorly sanitized milking equipment, contamination during repair of milking machines, and silent mastitis are among documented contamination routes reported during previous outbreaks (*6*–*9*). *Campylobacter* is a fragile organism and is notoriously difficult to culture from milk; documented outbreaks in which human cases of *Campylobacter* infection have been linked by PFGE to raw milk are rare. In this outbreak, immediate on-site pH neutralization and use of selective media enhanced recovery of *Campylobacter* from raw milk, and laboratory and epidemiologic evidence were both necessary to document ongoing illnesses from the milk, which led UDAF to permanently revoke dairy A's permit.

Routine testing of and standards for raw milk (somatic cell and coliform counts) do not ensure that the raw milk is free of pathogens (*8*). As required by Utah regulation, dairy A submitted raw milk samples to UDAF for bacterial and coliform counts every 4 weeks. These counts continually yielded acceptable results before and throughout the outbreak investigation. Previous studies have demonstrated a lack of correlation between bacterial counts and presence of pathogens in raw milk (*9*,*10*). Mandatory reporting, timely sample collection, pathogen testing, and on-site milk neutralization likely led to *C. jejuni* detection during this outbreak. Specific pathogen testing for raw milk, in addition to somatic cell and coliform counts, might more readily detect contaminated raw milk. PFGE patterns linking human isolates from *Campylobacter* cases with raw milk from dairy A provided evidence that led to implementation of control measures.

Summary

What is already known about this topic?

Raw milk can contain dangerous bacteria and is a common source of milkborne disease–related outbreaks. *Campylobacter jejuni* is a common raw milk contaminant and is notoriously difficult to isolate from food products, because of its fastidious growth requirements.

What is added by this report?

A total of 99 cases (59 confirmed and 40 probable) of campylobacteriosis, including 10 patients who were hospitalized, and one who died, occurred in an outbreak in northern Utah associated with a single raw milk dairy. The outbreak was documented by epidemiologic, environmental, and laboratory evidence. Despite routine testing of raw milk showing results within acceptable limits, the milk still contained dangerous bacteria.

What are the implications for public health practice?

Public health departments can consider adding ongoing education of the public regarding the risks from raw milk consumption and unreliability of some current safety testing. To limit outbreaks from raw milk consumption, more reliable routine tests are needed that do not rely solely on bacterial, coliform, and somatic cell counts. Case investigation and pulsed-field gel electrophoresis patterns from environmental samples can support an epidemiologic link and allow implementation of control measures.

Consumers should be aware of dangers associated with consuming unpasteurized milk. Current raw milk testing standards do not readily detect contamination; thus, the safest alternative is to consume pasteurized milk.

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Acknowledgments

Cody Huft, Utah Department of Agriculture and Food; Steven L. Wright, Sushma Karna, Dairy Testing Laboratory, Laboratory Services Division, Utah Department of Agriculture and Food; state and local enteric disease investigators from Weber-Morgan, Davis County, Salt Lake County, Bear River, Tri-County, Summit County, and Utah County Health Departments.

References

1. Utah Department of Health. Health, disease control and prevention, epidemiology. Communicable disease rule; R386–702. Salt Lake City, UT: Utah Department of Health; 2016. http://www.rules.utah.gov/publicat/code/r386/r386-702.htm
2. Tan JM, Abeyta C, Tran T. Campylobacter. Bacteriological analytical manual. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2016. http://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm2006949.htm
3. Utah Department of Agriculture. Utah dairy act. 2010. Chapter 3. Salt Lake City, UT: Utah Department of Agriculture; 2013. http://le.utah.gov/xcode/Title4/Chapter3/C4-3_1800010118000101.pdf
4. CDC. Foodborne diseases active surveillance network (FoodNet) population survey atlas of exposures, 2006–2007. Atlanta, GA: US Department of Health and Human Services, CDC; 2011. http://www.cdc.gov/foodnet/PDFs/FNExpAtl03022011.pdf
5. Katafiasz AR, Bartlett P. Motivation for unpasteurized milk consumption in Michigan, 2011. Food Protection Trends 2012;32:124–8.
6. Schildt M, Savolainen S, Hänninen ML. Long-lasting *Campylobacter jejuni* contamination of milk associated with gastrointestinal illness in a farming family. Epidemiol Infect 2006;134:401–5. http://dx.doi.org/10.1017/S0950268805005029
7. Black RE, Levine MM, Clements ML, Hughes TP, Blaser MJ. Experimental *Campylobacter jejuni* infection in humans. J Infect Dis 1988;157:472–9. http://dx.doi.org/10.1093/infdis/157.3.472
8. Humphrey TJ, Beckett P. *Campylobacter jejuni* in dairy cows and raw milk. Epidemiol Infect 1987;98:263–9. http://dx.doi.org/10.1017/S0950268800062014
9. Heuvelink AE, van Heerwaarden C, Zwartkruis-Nahuis A, et al. Two outbreaks of campylobacteriosis associated with the consumption of raw cows' milk. Int J Food Microbiol 2009;134:70–4. http://dx.doi.org/10.1016/j.ijfoodmicro.2008.12.026
10. Bianchini V, Borella L, Benedetti V, et al. Prevalence in bulk tank milk and epidemiology of *Campylobacter jejuni* in dairy herds in northern Italy. Appl Environ Microbiol 2014;80:1832–7. http://dx.doi.org/10.1128/AEM.03784-13

Retail Deli Slicer Cleaning Frequency — Six Selected Sites, United States, 2012

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Listeria monocytogenes (*Listeria*) causes the third highest number of foodborne illness deaths (an estimated 255) in the United States annually, after nontyphoidal *Salmonella* species and *Toxoplasma gondii* (*1*). Deli meats are a major source of listeriosis illnesses (*2*,*3*), and meats sliced and packaged at retail delis are the major source of listeriosis illnesses attributed to deli meat (*4*). Mechanical slicers pose cross-contamination risks in delis and are an important source of *Listeria* cross-contamination (*5*,*6*). Reducing *Listeria* contamination of sliced meats in delis will likely reduce *Listeria* illnesses and outbreaks (*6*). Good slicer cleaning practices can reduce this foodborne illness risk (*7*). CDC's Environmental Health Specialists Network (EHS-Net) studied how often retail deli slicers were fully cleaned (disassembled, cleaned, and sanitized) at the Food and Drug Administration (FDA) Food Code–specified minimum frequency of every 4 hours and examined deli and staff characteristics related to slicer cleaning frequency (*8*). Interviews with staff members in 298 randomly-selected delis in six EHS-Net sites showed that approximately half of delis fully cleaned their slicers less often than FDA's specified minimum frequency. Chain-owned delis and delis with more customers, more slicers, required manager food safety training, food safety–knowledgeable workers, written slicer-cleaning policies, and food safety–certified managers fully cleaned their slicers more frequently than did other types of delis, according to deli managers or workers. States and localities should require deli manager training and certification, as specified in the FDA Food Code. They should also consider encouraging or requiring delis to have written slicer-cleaning policies. Retail food industry leaders can also implement these prevention efforts to reduce risk in their establishments. Because independent and smaller delis had lower frequencies of slicer cleaning, prevention efforts should focus on these types of delis.

The FDA Food Code is a model food code offered for adoption by state and local governmental jurisdictions that regulate retail food safety (i.e., states and localities). It contains science-based guidance to improve food safety in retail food service establishments. Although not all states and localities have adopted the latest version of the Food Code (2013), FDA and CDC strongly encourage its adoption at all levels of government.* The FDA Food Code states that food contact surfaces, including slicers, should be cleaned and sanitized at least every 4 hours (4–602.11[C]) (*8*), and that food contact surfaces should be disassembled before cleaning and sanitizing (4–202.11[A][5]) (*8*). U.S. Department of Agriculture (USDA) guidance also recommends slicer disassembly before cleaning and sanitizing (*6*). Knowledge about retail delis' cleaning practices is critical to developing effective interventions. EHS-Net, a collaborative program of CDC, FDA, USDA, and six EHS-Net–funded state and local health departments,† assessed how often deli slicers were fully cleaned (disassembled, cleaned, and sanitized) at the FDA–specified minimum frequency of every 4 hours. EHS-Net also assessed deli and staff characteristics related to slicer cleaning frequency.

Within each EHS-Net site, data collectors chose a convenient geographic area, based on reasonable travel distance, in which to survey delis by telephone to determine study eligibility and request study participation. A software program was then used to select a random sample of delis within in each of the site geographic areas. Delis eligible for the study had at least one slicer, prepared or served ready-to-eat foods (with a delay between purchase and consumption), and had staff members who could be interviewed in English. Data collectors assessed approximately 50 delis in each site. Data were collected during January–September 2012.

Data collectors interviewed deli managers about their characteristics, their deli's characteristics; and how often slicers were fully cleaned ("On average, how many times are food slicers fully cleaned [disassembled, cleaned, and sanitized] during a shift?"). Deli managers also completed a written, eight-item food safety knowledge survey. Data collectors interviewed food workers, away from the manager, about their characteristics and food safety knowledge, and how often each slicer was fully cleaned ("How often do you break down, clean, then sanitize this slicer?"). Simple and multiple logistic regression models were used to examine associations between deli, manager, and worker characteristics and slicer-cleaning frequencies. The cut-off for variable inclusion in the multiple regression models was $p \leq 0.10$.

Among 691 managers of eligible delis who were contacted, 298 (43%) agreed to be interviewed. In 294 (98.7%) participating delis, data collectors were also able to interview a worker. The majority of delis were chains (55.0%) and had 1–2 slicers (56.8%) (Table 1).

* *Introduction to the 2013 Food Code.* http://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM374510.pdf.

† California Department of Public Health, Minnesota State Department of Health, New York State Department of Health, New York City Department of Health and Mental Hygiene, State of Rhode Island Department of Health, and Tennessee State Department of Health.

TABLE 1. Reported slicer cleaning frequency, and deli, manager, and worker characteristics, obtained from manager interviews and surveys, and worker interviews*— six EHS-Net sites,† 2012

Reported slicer cleaning frequency (fully cleaned)§	No. (%)
Manager-reported (N = 297)	
Every 4 hours	147 (49.5)
Less frequently than every 4 hours	150 (50.5)
Worker-reported (N = 273)	
Every 4 hours	125 (45.8)
Less frequently than every 4 hours	148 (54.2)
Deli characteristic	
Ownership type (N = 298)	
Chain	164 (55.0)
Independent	134 (45.0)
Number of managers (N = 298)	
1	102 (34.2)
>1	196 (65.8)
Average number of workers per shift (N = 298)	
<2	106 (35.6)
≥2	192 (64.4)
Number of shifts in typical day (N = 298)	
1–2	150 (50.3)
≥3	148 (49.7)
Number of hours in typical shift (N = 298)	
<8	91 (30.5)
≥8	207 (69.5)
Number of customers on busiest day (N = 262)	
0–99	85 (32.4)
100–299	92 (35.1)
≥300	85 (32.5)
Number of slicers (N = 294)	
1–2	167 (56.8)
≥3	127 (43.2)
Maximum number of chubs sold daily (N = 274)	
<30	134 (48.9)
≥30	140 (51.1)
Manager food safety training required by deli (N = 295)	
Yes	220 (74.6)
No	75 (25.4)
Manager food safety certification required by deli (N = 291)¶	
Yes	145 (49.8)
No	146 (50.2)
Written policy for cleaning and sanitizing slicers (N = 296)	
Yes	194 (65.5)
No	102 (34.5)
Worker-rated difficulty of slicer cleaning (N = 293)	
Easy	216 (73.7)
More difficult**	77 (26.3)
Manager characteristic	
Experience in retail food industry (yrs) (N = 298)	
≤10	77 (25.8)
>10–15	50 (16.8)
>15	171 (57.4)
Experience as manager in current deli (yrs) (N = 298)	
≤5	156 (52.3)
>5	142 (47.7)
Ever food safety certified (N = 297)¶	
Yes	203 (68.4)
No	94 (31.6)
Currently food safety certified (N = 297)¶	
Yes	164 (55.2)
No	133 (44.8)
Food safety knowledge assessment (N = 298)	
<75% correct	97 (32.6)
≥75% correct	201 (67.4)
Worker characteristic	
Experience in retail food industry (yrs) (N = 293)	
≤10	163 (55.6)
>10–15	57 (19.5)
>15	73 (24.9)
Experience in current deli (yrs) (N = 294)	
≤5	190 (64.6)
>5	104 (35.4)
Food safety knowledge assessment (N = 294)	
<100% correct	157 (53.4)
100% correct	137 (46.6)

Abbreviation: EHS-Net = Environmental Health Specialists Network.
* Numbers vary because of missing data.
† California, Minnesota, New York, New York City, Rhode Island, and Tennessee.
§ Disassembled, cleaned, and sanitized.
¶ Certification defined as having taken and passed a food safety test and been issued a certificate.
** Somewhat easy, neither easy nor difficult to clean, somewhat difficult, or difficult.

Half of managers (49.5%) said that slicers were fully cleaned at least every 4 hours (Table 1). The remaining managers said that slicers were fully cleaned less frequently. Workers reported that 63.0% (393 of 624) of slicers were fully cleaned at least every 4 hours. Deli-level aggregation of these worker-reported data indicated that in 45.8% of delis, all slicers were fully cleaned at least every 4 hours (Table 1). In the remaining delis, at least one slicer was fully cleaned less frequently. Managers and workers agreed on cleaning frequency in 79.0% of delis (215 of 279, r = 0.587, p<0.001).

Simple regression models showed that the characteristics of deli chain ownership, a higher average number of workers per shift, more shifts per day, more customers served on the busiest day, more slicers, more chubs (plastic tubes of meat) sold daily, deli-required manager food safety training, a written policy on slicer cleaning, manager certification (current or ever), and manager and worker food safety knowledge were significantly associated with both managers and workers indicating that their slicers were fully cleaned at least every 4 hours (Table 2). Worker rating of deli slicers as easy to clean was significantly associated with managers indicating that slicers were fully cleaned at least every 4 hours. Deli-required manager food safety certification and more worker experience in the deli were significantly associated with workers indicating that slicers were fully cleaned at least every 4 hours.

TABLE 2. Simple logistic regression models of deli, manager, and worker characteristics associated with managers and workers reporting that slicers in their delis are fully cleaned* at the FDA–specified frequency (at least every 4 hours) — six EHS-Net Sites,† 2012

Characteristic	Comparison§	Managers reported that slicers are fully cleaned at least every 4 hours			Workers reported that slicers are fully cleaned at least every 4 hours		
		No.¶	OR (95% CI)	p-value for comparisons	No.¶	OR (95% CI)	p-value for comparisons
Deli characteristic							
Ownership type	Chain versus independent	293	4.41 (2.36, 8.25)	≤0.001	272	5.21 (2.50, 10.85)	<0.001
Number of managers	1 versus >1	293	0.74 (0.41, 1.33)	0.310	272	1.02 (0.53, 1.94)	0.960
Average number of workers per shift	≥2 versus <2	293	3.51 (1.85, 6.65)	0.003	272	3.48 (1.63, 7.40)	0.007
Number of shifts in a typical day	≥3 versus 1 or 2	293	2.92 (1.60, 5.32)	<0.001	272	2.63 (1.37, 5.02)	0.004
Number of hours in a typical shift	<8 versus ≥8	293	1.06 (0.59, 1.93)	0.841	293	1.52 (0.80, 2.87)	0.198
Number of customers on busiest day**	100–299 versus 0–99	257	5.84 (2.59, 13.21)	<0.001	236	8.71 (3.12, 24.33)	<0.001
	≥300 versus 0–99	257	5.05 (2.29, 11.13)	<0.001	236	6.75 (2.49, 18.26)	<0.001
Number of slicers	≥3 versus 1 or 2	293	3.23 (1.77, 5.91)	<0.001	272	4.47 (2.33, 8.55)	<0.001
Maximum number of chubs sold daily	≥30 versus <30	269	2.68 (1.47, 4.91)	0.001	250	3.66 (1.86, 7.20)	0.001
Manager food safety training required by deli	yes versus no	291	2.29 (1.08, 4.85)	0.032	270	4.55 (1.69, 12.46)	0.003
Manager food safety certification required by deli††	yes versus no	286	1.48 (0.81, 2.69)	0.200	270	2.82 (1.42, 5.59)	0.003
Written policy for slicer cleaning and sanitizing	yes versus no	291	4.46 (2.21, 9.01)	<0.001	271	6.02 (2.59, 14.00)	<0.001
Worker-rated difficulty of slicer cleaning	Easy versus more difficult§§	292	1.98 (1.02, 3.82)	0.043	271	1.54 (0.77, 3.10)	0.223
Manager characteristic							
Experience in retail food industry (yrs)¶¶	≤10 versus ≥15	293	0.88 (0.46, 1.69)	0.532	272	0.82 (0.39, 1.70)	0.600
	>10–15 versus ≥15	293	1.18 (0.54, 2.59)	0.554	272	1.00 (0.43, 2.33)	0.808
Experience as manager in current deli (yrs)	≤5 versus >5	293	1.51 (0.87, 2.63)	0.140	272	1.22 (0.67, 2.24)	0.517
Ever food safety certified	yes versus no	292	1.72 (0.90, 3.27)	0.099	271	2.29 (1.12, 4.72)	0.024
Currently food safety certified	yes versus no	292	2.06 (1.08, 3.93)	0.028	271	1.74 (0.97, 3.12)	0.063
Food safety knowledge assessment	≥75% correct versus <75% correct	293	3.28 (1.65, 6.53)	0.001	272	3.15 (1.42, 7.01)	0.005
Worker characteristic							
Experience in retail food industry (yrs)***	≤10 versus >15	293	1.47 (0.76, 2.88)	0.209	272	0.87 (0.41, 1.78)	0.287
	>10–15 versus >15	293	1.04 (0.45, 2.40)	0.675	272	1.48 (0.59, 3.69)	0.251
Experience in current deli (yrs)	≤5 versus >5	293	0.99 (0.56, 1.75)	0.962	272	0.51 (0.27, 0.97)	0.039
Food safety knowledge assessment	100% correct versus <100% correct	293	2.53 (1.41, 4.52)	0.002	272	1.93 (1.03, 3.62)	0.041

Abbreviations: CI = confidence interval; EHS-Net = Environmental Health Specialists Network; FDA = Food and Drug Administration; OR = odds ratio.
* Disassembled, cleaned, and sanitized.
† California, Minnesota, New York, New York City, Rhode Island, and Tennessee.
§ The reference level is the second category listed. Thus, the odds ratio is for the first category listed compared to the second category listed.
¶ Numbers vary because of missing data.
** P-values for the overall ORs: p = 0.001 and p<0.001 for the manager and worker models, respectively.
†† Certification defined as having taken and passed a food safety test and been issued a certificate.
§§ Somewhat easy, neither easy nor difficult to clean, somewhat difficult, or difficult.
¶¶ P-values for the overall ORs: p = 0.803 and p = 0.856 for the manager and worker models, respectively.
*** P-values for the overall ORs: p = 0.441 and p = 0.445 for the manager and worker models, respectively.

A multiple regression model showed that deli chain ownership, more customers served on the busiest day, and worker food safety knowledge were significantly associated with managers indicating that slicers were fully cleaned at least every 4 hours. A second multiple regression model showed that deli chain ownership, more customers served on the busiest day, more slicers, more chubs sold daily, deli-required manager food safety training, and more worker experience in the deli were significantly associated with workers indicating that slicers were fully cleaned at least every 4 hours. (Table 3).

Discussion

These analyses indicate that many delis have insufficient slicer-cleaning frequency, which could lead to cross-contamination of deli meats with *Listeria* and other pathogens. In at least half of delis studied, managers and workers reported that slicers were not fully cleaned at the FDA–specified minimum frequency of every 4 hours.

Multiple regression findings indicate that chain delis reported more frequent slicer cleaning than did independent delis, and delis with more slicers, serving more customers, and selling more

TABLE 3. Multiple logistic regression models* of deli, manager, and worker characteristics associated with managers and workers indicating that in their deli, slicers are fully cleaned† at the FDA–specified frequency (at least every four hours) — six EHS-Net sites,§ 2012

Characteristic	Comparison¶	OR (95% CI)	p-value for comparisons
Manager model (N = 257)			
Ownership type	Chain versus independent	2.78 (1.30, 5.96)	0.008
Number of customers on busiest day**	100–299 versus 0–99	4.32 (1.85, 10.11)	<0.001
	≥300 versus 0–99	2.71 (1.10, 6.70)	0.031
Worker food safety knowledge assessment	100% correct versus <100% correct	2.15 (1.11, 4.17)	0.023
Worker model (N = 222)			
Ownership type	Chain versus independent	4.65 (1.52, 14.25)	0.007
Number of customers on busiest day††	100–299 versus 0–99	3.42 (0.96, 12.16)	0.057
	≥300 versus 0–99	0.76 (0.18, 3.26)	0.713
Number of slicers	≥3 versus 1 or 2	2.42 (0.92, 6.39)	0.074
Maximum number of chubs sold daily	≥30 versus <30	2.36 (0.85, 6.54)	0.098
Manager food safety training required by deli	yes versus no	4.30 (0.93, 19.87)	0.062
Worker experience in current deli (yrs)	≤5 versus >5	0.45 (0.20, 1.04)	0.061

Abbreviations: CI = confidence interval; EHS-Net = Environmental Health Specialists Network; FDA = Food and Drug Administration; OR = odds ratio.

* Manager overall model (X^2 = 36.54, degrees of freedom (df) = 4, p<0.001) created using forward selection criteria of p≤0.10. Worker overall model (X^2 = 54.96, df = 7, p<0.001) created using forward selection criteria of p≤0.10. When employing a forward selection procedure, all predictors of interest (i.e., deli, manager, and worker characteristics in this study) are systematically individually tested to see which is most significant within the model. Once identified, this predictor is added to the model and the remaining predictors are retested. This procedure is repeated until all remaining predictors fail to meet the entrance criteria. Each final model presented above simultaneously included all variables shown in the table. Individual inclusion steps are not presented.

† Disassembled, cleaned, and sanitized.

§ California, Minnesota, New York, New York City, Rhode Island, and Tennessee.

¶ The reference level is the second category listed. Thus, the odds ratio is for the first category listed compared to the second category listed.

** P-value for the overall OR: p = 0.003.

†† P-value for the overall OR: p = 0.006.

chubs daily reported more frequent slicer cleaning than did delis with fewer slicers, serving fewer customers, or selling fewer chubs daily. These characteristics are likely indicators of deli size, and these data are consistent with other findings suggesting that both chain and larger establishments' food safety practices tend to be better than those of independent and smaller establishments (*9*,*10*). Compared with both independent and smaller delis, chain and larger delis might have more resources, more or better trained staff, or more standardized cleaning procedures.

The association of required manager food safety training and certification with more frequent reported slicer-cleaning is consistent with other findings indicating that training and certification are important in retail food safety (*9*,*10*), and highlights the important role that management can play in food safety. The finding that delis with workers with more food safety knowledge and experience had more frequent reported slicer cleaning suggests that workers also play an important role in food safety.

Simple logistic regression findings suggest other characteristics that might improve cleaning frequencies. Written slicer-cleaning policies and worker ratings of slicers as being easy to clean were both associated with more frequent reported cleaning, suggesting that workplace policies and slicer design can affect cleaning frequency. Finally, delis with a food safety–certified manager had better reported cleaning frequencies, again pointing to the importance of training and certification.

Because slicer-cleaning frequency and disassembly guidance are presented separately from each other in the FDA Food Code, some deli managers might be unaware that cleaning should include disassembly, and might clean and sanitize slicers without disassembling them. It is also possible that some slicers included in this study, especially newer ones, do not need to be disassembled to be fully cleaned.

The findings in this study are subject to at least three limitations. First, the interview data might be affected by social desirability bias, which might have resulted in overreporting of cleaning frequency. Second, because interviewed workers were selected by managers, and not at random, worker data might not represent all workers. Finally, because the data were collected from English-speaking staff members only, they might not reflect practices in delis with no English-speaking staff. It is also important to note that the data from this study do not allow causal inferences about relationships between characteristics and cleaning frequency nor do they link slicer cleaning frequency with foodborne illness.

States and localities should require deli manager training and certification, as specified in the FDA Food Code. They should also consider providing education on the topics of slicer-cleaning frequency and the importance of slicer disassembly, and encouraging or requiring delis to have written slicer-cleaning policies. Retail food industry leaders can also implement these prevention efforts to reduce risk in their food establishments. Because frequencies of slicer cleaning were lower at independent and smaller delis, prevention efforts should focus on these types of establishments.

Summary

What is already known about this topic?

Listeria monocytogenes (*Listeria*) causes the third highest number of foodborne illness deaths in the United States annually. *Listeria* contamination of sliced deli meats at retail locations contributes to *Listeria* illness and outbreaks. Mechanical slicers pose cross-contamination risks in retail delis and are an important source of *Listeria* cross-contamination. Good slicer cleaning practices can reduce this risk.

What is added by this report?

In approximately half of retail delis studied in six Environmental Health Specialists Network sites, slicers were fully disassembled, cleaned, and sanitized less frequently than the minimum 4 hours specified in the Food and Drug Administration (FDA) Food Code. Slicers were fully cleaned more frequently in chain delis, and in delis with more customers, more slicers, required manager food safety training, food safety–knowledgeable workers, written slicer cleaning policies, and food safety–certified managers than in delis in other categories.

What are the implications for public health practice?

To help ensure that deli slicers are cleaned at least every 4 hours as a foodborne illness prevention measure, states and localities should require deli manager training and certification, as specified in the FDA Food Code. They should also consider encouraging or requiring delis to have written slicer-cleaning policies. Retail food industry leaders can also implement these prevention efforts to reduce risk in their food establishments. Because independent and smaller delis show lower frequencies of slicer cleaning, prevention efforts should focus on these types of delis.

Acknowledgments

Participating deli managers and workers; EHS-Net site staff members; Food and Drug Administration (FDA), U.S. Department of Agriculture; Brenda Le, Carol Selman, CDC; Denita Williams, FDA.

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References

1. Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne illness acquired in the United States—major pathogens. Emerg Infect Dis 2011;17:7–15. http://dx.doi.org/10.3201/eid1701.P11101
2. Batz MB, Hoffmann S, Morris JG Jr. Ranking the disease burden of 14 pathogens in food sources in the United States using attribution data from outbreak investigations and expert elicitation. J Food Prot 2012;75:1278–91. http://dx.doi.org/10.4315/0362-028X.JFP-11-418
3. Cartwright EJ, Jackson KA, Johnson SD, Graves LM, Silk BJ, Mahon BE. Listeriosis outbreaks and associated food vehicles, United States, 1998–2008. Emerg Infect Dis 2013;19:1–9. http://dx.doi.org/10.3201/eid1901.120393
4. US Department of Agriculture. FSIS comparative risk assessment for *Listeria monocytogenes* in ready-to-eat meats and poultry deli meats. Washington, DC: US Department of Agriculture; 2010. http://www.fsis.usda.gov/wps/wcm/connect/c2ac97d0-399e-4c4a-a2bc-d338c2e201b3/Comparative_RA_Lm_Report_May2010.pdf?MOD=AJPERES
5. US Department of Agriculture. Interagency risk assessment: *Listeria monocytogenes* in retail delicatessens. Washington, DC: US Department of Agriculture; 2013. http://www.fsis.usda.gov/wps/wcm/connect/c0c6dfbc-ad83-47c1-bcb8-8db6583f762b/Lm-Retail-Technical-Report.pdf?MOD=AJPERES
6. US Department of Agriculture. FSIS best practices guidance for controlling *Listeria monocytogenes (Lm)* in retail delicatessens. Washington, DC: US Department of Agriculture; 2015. http://www.fsis.usda.gov/wps/wcm/connect/29d51258-0651-469b-99b8-e986baee8a54/Controlling-LM-Delicatessens.pdf?MOD=AJPERES
7. Hoelzer K, Pouillot R, Gallagher D, Silverman MB, Kause J, Dennis S. Estimation of *Listeria monocytogenes* transfer coefficients and efficacy of bacterial removal through cleaning and sanitation. Int J Food Microbiol 2012;157:267–77. http://dx.doi.org/10.1016/j.ijfoodmicro.2012.05.019
8. Food and Drug Administration. Food and Drug Administration Food Code. Chapter 4. equipment, utensils, and linens. Silver Springs, MD: US Department of Health and Human Services, Food and Drug Administration; 2013. http://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM374510.pdf
9. Bogard AK, Fuller CC, Radke V, Selman CA, Smith KE. Ground beef handling and cooking practices in restaurants in eight States. J Food Prot 2013;76:2132–40. http://dx.doi.org/10.4315/0362-028X.JFP-13-126
10. Brown LG. EHS-Net restaurant food safety studies: what have we learned? J Environ Health 2013;75:44–5.

Estimating Contraceptive Needs and Increasing Access to Contraception in Response to the Zika Virus Disease Outbreak — Puerto Rico, 2016

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

Zika virus is a flavivirus transmitted primarily by *Aedes* species mosquitoes. Increasing evidence links Zika virus infection during pregnancy to adverse pregnancy and birth outcomes, including pregnancy loss, intrauterine growth restriction, eye defects, congenital brain abnormalities, and other fetal abnormalities (*1*,*2*). The virus has also been determined to be sexually transmitted.* Because of the potential risks associated with Zika virus infection during pregnancy, CDC has recommended that health care providers discuss prevention of unintended pregnancy with women and couples who reside in areas of active Zika virus transmission and do not want to become pregnant.† However, limitations in access to contraception in some of these areas might affect the ability to prevent an unintended pregnancy. As of March 16, 2016, the highest number of Zika virus disease cases in the United States and U.S. territories were reported from Puerto Rico.§ The number of cases will likely rise with increasing mosquito activity in affected areas, resulting in increased risk for transmission to pregnant women. High rates of unintended and adolescent pregnancies in Puerto Rico suggest that, in the context of this outbreak, access to contraception might need to be improved (*3*,*4*). CDC estimates that 138,000 women of reproductive age (aged 15–44 years) in Puerto Rico do not desire pregnancy and are not using one of the most effective or moderately effective contraceptive methods,¶,** and therefore might experience an unintended pregnancy. CDC and other federal and local partners are seeking to expand access to contraception for these persons. Such efforts have the potential to increase contraceptive access and use, reduce unintended pregnancies, and lead to fewer adverse pregnancy and birth outcomes associated with Zika virus infection during pregnancy. The assessment of challenges and resources related to contraceptive access in Puerto Rico might be a useful model for other areas with active transmission of Zika virus.

CDC, the Puerto Rico Department of Health, and partners used a comprehensive approach, including key informant interviews and review of existing data, to gather information on contraception services in Puerto Rico, including information on rates of unintended pregnancy, contraceptive use, contraceptive access, and barriers to provision and use of contraception. Discussions were conducted with federal partners, including the Center for Medicare and Medicaid Services, the Office of Population Affairs, and the Health Resources and Services Administration (HRSA). Key stakeholders and family planning providers in Puerto Rico were also consulted, including the Puerto Rico Department of Health, the Puerto Rico Chapter of the American College of Obstetricians and Gynecologists (ACOG), Title X federal family planning grantees, and the Puerto Rico Health Insurance Administration.

Because current data regarding contraceptive use prevalence in Puerto Rico are not available, the number of women in Puerto Rico who desire effective contraception was estimated using several data sources. The estimated number of women of reproductive age (15–44 years) in 2014 was obtained from the U.S. Census Bureau.†† To determine the number of women of reproductive age who are not using one of the most effective or moderately effective contraceptive methods and who might therefore have an unintended pregnancy, a series of assumptions were made. Based on national results from the 2013 Youth Risk Behavior Surveillance System, 50% of women aged 15–19 years were assumed to be sexually experienced, and among these, 90% were assumed not to desire pregnancy and not to be using one of the most effective or moderately effective contraceptive methods.§§,¶¶ Among women aged 20–44 years, 65% were assumed to be sexually active, not infertile, not currently pregnant, and not currently desiring to become pregnant (*5*). The number of women aged 20–44 years who might have an unintended pregnancy was estimated by assuming that 65% were not sterilized (*6*), and

* http://www.cdc.gov/mmwr/volumes/65/wr/mm6508e2.htm.
† http://www.cdc.gov/mmwr/volumes/65/wr/mm6505e2.htm.
§ http://www.cdc.gov/zika/geo/united-states.html.
¶ http://www.cdc.gov/reproductivehealth/unintendedpregnancy/pdf/contraceptive_methods_508.pdf.
** Most effective = sterilization, intrauterine device, contraceptive implant; moderately effective = injectable contraceptive, oral contraceptive, contraceptive patch, or contraceptive vaginal ring.

†† http://www.census.gov.
§§ http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6304a1.htm.
¶¶ Estimated number of sexually active women aged 15–19 years who might have an unintended pregnancy = (no. women aged 15–19 years) x (50% sexually active) x (90% not desiring pregnancy, not infertile, not using effective contraception).

that among those, 33% are not using one of the most effective or moderately effective reversible contraceptive methods (*5*).***

To estimate the percentage distribution of desired contraceptive methods that might be needed in Puerto Rico, data from the Contraceptive CHOICE project, which was designed to remove the financial barriers to contraception, offer all methods and emphasize the most effective methods of birth control, and reduce unintended pregnancy in the St. Louis, Missouri area during 2007–2011,††† was used. In this project, women desiring reversible contraception were offered any Food and Drug Administration–approved contraceptive method at no cost along with counseling to promote the use of long-acting reversible contraceptive (LARC) methods (intrauterine devices [IUDs] and hormonal contraceptive implants), because these are the most effective reversible methods. Seventy-five percent of the general study population and 72% of adolescents aged 15–19 years chose a LARC method, resulting in decreases in adolescent and unintended pregnancy (*7*,*8*). Demonstration projects in Iowa and Colorado, also designed to increase use of LARC methods, have similarly resulted in increased use of LARCs and decreases in unintended pregnancy.§§§,¶¶¶ Assuming a distribution of desired methods similar to that observed in the CHOICE project (*7*,*8*), if barriers to access were removed, the total number of contraceptive products needed in Puerto Rico to supply all women of reproductive age who are currently not using one of the most effective or moderately effective contraceptive methods and who do not want to become pregnant was estimated.

Approximately 715,000 women aged 15–44 years reside in Puerto Rico, and there were approximately 34,000 births in 2014 (*3*). A 2008 hospital-based survey of postpartum women in Puerto Rico indicated that 65.5% of pregnancies were unintended in Puerto Rico, compared with 51% in a probability sample of the general U.S. population (the 50 U.S. states and the District of Columbia), according to the 2008 National Survey of Family Growth (*4*,*9*). In 2014, among women aged 15–19 years, the birth rate was almost twice as high (40/1,000) in Puerto Rico as in the U.S. overall (24/1,000) (*3*).

The most recent population-based estimates of contraceptive use in Puerto Rico, from a 2002 Behavioral Risk Factor Surveillance System survey, found that among women aged 18–44 years who used contraception, tubal ligation was the most frequently reported method, used by 46% of women, followed by oral contraceptives (19%), condoms (11%), calendar-based contraceptive methods (10%), vasectomy (6%), depot medroxyprogesterone acetate (DMPA) (3%), and IUDs (1%) (*6*). More recent information on services provided by La Asociación Puertorriqueña Pro Bienestar de la Familia (PROFAMILIA), a private non-profit organization that provides reproductive health care to a largely low income population in Puerto Rico, indicated that among approximately 44,000 women receiving contraceptive care in 2009, 80% received oral contraceptives, 8% received the transdermal contraceptive patch, 6% received condoms, 3% received DMPA, and <1% received an IUD (*4*).

Women access contraception at various sites in Puerto Rico, including community health clinics, private medical offices, university clinics, and Title X family planning clinics (Manuel Vargas, MD, MPH, Puerto Rico Department of Health; Claritsa Malave, MD, MPH, HRSA; personal communications, 2016). Despite the availability of these resources, barriers exist to providing optimal contraceptive coverage. Key stakeholders in Puerto Rico identified the need for increased contraceptive supplies, family planning delivery sites, training for providers on LARC insertion, education for women and men on effective contraception to reduce unintended pregnancy, and decreased financial and administrative barriers for providers and patients (Manual Vargas, MD, MPH, Puerto Rico Department of Health; Claritsa Malave, MD, MPH, HRSA; Nabal Bracero, MD, ACOG Puerto Rico Section; Ramon Sanchez, MD, MPH, Clinica Preven; Blanca Cuevas, MS, PROFAMILIA; personal communications, 2016). Coverage for all contraceptive methods by federal and private insurers is not universal in Puerto Rico. Certain contraceptive methods can be unaffordable for providers and patients, which has resulted in limited availability of more effective contraceptive options such as LARCs that have higher up-front costs (Manuel Vargas, MD, MPH, Puerto Rico Department of Health; personal communication, 2016). In addition, the cost of IUD and hormonal implant insertion might not be fully covered by public or private insurance, which might also deter women from seeking LARCs. Because of cost, these methods are often not available in physician offices or pharmacies, and therefore most women receive oral contraceptives, DMPA, or condoms. A lack of availability in hospitals has also led to missed opportunities for postpartum initiation of LARCs (Nabal Bracero, MD, MPH, ACOG Puerto Rico Section; personal communication, 2016). The number of health care providers who offer contraception, specifically IUDs and contraceptive implants, has been limited by lack of training and reimbursement (Nabal Bracero, MD, MPH, ACOG Puerto Rico Section; Manuel Vargas, MD, MPH, Puerto Rico Department of Health; personal communications, 2016).

*** Estimated number of sexually active women aged 20–44 years who might have an unintended pregnancy = (no. women aged 20–44 years) x (65% sexually active, not infertile, not currently pregnant, not desiring pregnancy) x (65% not sterilized) x (33% not using effective reversible contraception).

††† http://www.choiceproject.wustl.edu.

§§§ http://www.astho.org/Maternal-and-Child-Health/Long-Acting-Reversible-Contraception/Iowa-Initiative-Title-X-Issue-Brief/.

¶¶¶ https://www.colorado.gov/pacific/cdphe/reducing-unintended-pregnancy.

Women typically do not choose LARC methods because of this lack of availability, as well as a general lack of knowledge about these methods (Ramon Sanchez, MD, MPH, Clinica Preven; personal communication, 2016).

Among the 715,000 women of reproductive age in Puerto Rico, an estimated total of 138,000, or nearly 1 in 5 women, including 55,000 aged 15–19 years and 83,000 aged 20–44 years, do not want to become pregnant, are not using one of the most effective or moderately effective contraceptive methods, and could therefore have an unintended pregnancy. Applying the distribution of methods observed in the CHOICE project, there is an estimated unmet need for IUDs for 68,000 women, hormonal contraceptive implants for 33,000 women, DMPA for 11,000 women, oral contraceptives for 14,000 women, vaginal rings for 9,000 women, and contraceptive patches for 3,000 women (Table). The estimated needs for a year are 68,000 IUDs, 33,000 hormonal contraceptive implants, 44,000 DMPA doses, 168,000 oral contraceptive pill packs, 108,000 vaginal rings, and 36,000 contraceptive patches.

Discussion

Reducing the rate of unintended pregnancy is a public health priority because unintended pregnancies can be associated with delayed entry into prenatal care, decreased smoking cessation, and increased incidence of low birthweight (*10*), with attendant negative health consequences for mother and infant. Prevention of unintended pregnancies in the context of a Zika virus outbreak is especially important to reducing the likelihood of congenital infections. Removing barriers to contraception, such as cost, access, and lack of knowledge, can lead to increased use of the most effective contraceptive methods and reduced rates of unintended pregnancy, which would result in fewer adverse pregnancy and birth outcomes associated with Zika virus disease during pregnancy.

CDC and other partners have initiated multiple approaches to address some of these barriers. Current information on contraceptive use and unmet need is important, and efforts are underway to conduct reproductive health surveys in Puerto Rico to obtain this information. Approaches to increasing access to effective contraceptive methods at no or reduced cost are being explored. Education of providers is being conducted through outreach sessions designed to disseminate information about prevention of adverse outcomes associated with Zika virus infection during pregnancy. Training of providers on insertion of IUDs and contraceptive implants can be implemented using resources from professional organizations such as ACOG and the University of Puerto Rico. Ongoing education about effective use of contraception can be enhanced through health care providers, counselors in community health centers, home visiting nurses, and schools.

The findings in this report are subject to at least four limitations. First, no recent information was available regarding the proportion of women of reproductive age in Puerto Rico using specific contraceptive methods. Therefore, estimates of contraceptive need were derived from 2002 data, highlighting the urgent need for reproductive health surveys in Puerto Rico and other Zika-affected areas to better estimate unmet contraceptive need. Second, contraceptive preferences were extrapolated from the CHOICE project, and might not represent preferences in Puerto Rico or other populations, because of demographic and cultural differences. However, demonstration projects from other populations in the United States have similarly demonstrated high preference for LARC methods when common barriers, including cost, availability, and knowledge, were removed. Third, pregnancy intentions might change as a result of the Zika virus outbreak; therefore assumptions about pregnancy desires might not be accurate. Finally, most of the information on contraceptive access and barriers was obtained by nonsystematic personal communications with key leaders and stakeholders.

TABLE. Estimated contraception needs required to supply all women who desire to avoid pregnancy,* by contraceptive method — Puerto Rico, 2016

Contraceptive method	Age group (yrs)				Total no. of women	Total no. of contraceptives needed for 1 yr supply
	15–19		20–44			
	Percent distribution†	Approximate no. of women	Percent distribution§	Approximate no. of women		
Intrauterine devices	37	20,000	58	48,000	68,000	68,000
Contraceptive implants	35	19,000	17	14,000	33,000	33,000
Depot medroxyprogesterone acetate	9	5,000	7	6,000	11,000	44,000
Oral contraceptives	12	7,000	9	7,000	14,000	168,000
Contraceptive vaginal ring	5	3,000	7	6,000	9,000	108,000
Contraceptive patch	2	1,000	2	2,000	3,000	36,000
Total	**100**	**55,000**	**100**	**83,000**	**138,000**	**457,000**

* Includes women who are sexually active, fertile, and not sterilized nor using one of the most effective or moderately effective reversible contraceptive methods.
† Percent of contraceptive methods = distribution observed in CHOICE project for women aged 15–19 years (http://www.nejm.org/doi/pdf/10.1056/NEJMoa1400506).
§ Percent of contraceptive methods = distribution observed in CHOICE project for women aged 20–44 years (http://europepmc.org/articles/pmc4216614).

Summary

What is already known about this topic?

Zika virus infection during pregnancy has been linked to adverse pregnancy and birth outcomes, including pregnancy loss, intrauterine growth restriction, and congenital brain abnormalities. As of March 2016, Puerto Rico had the highest number of cases of Zika virus disease in the United States and its territories. Women residing in areas with active Zika virus transmission who do not desire pregnancy need access to effective and affordable contraception.

What is added by this report?

Approximately two thirds of pregnancies in Puerto Rico are unintended. An estimated 138,000 women of reproductive age (15–44 years) in Puerto Rico do not desire pregnancy and are not using an effective contraceptive method. Access to contraception is constrained by limited availability, especially of highly effective long-acting reversible contraceptives, high cost, incomplete insurance coverage, and lack of trained providers. To adequately prevent unintended pregnancies, there is an estimated need for IUDs for 68,000 women, contraceptive implants for 33,000 women, depot medroxyprogesterone acetate for 11,000 women, oral contraceptives for 14,000 women, vaginal rings for 9,000 women, and contraceptive patches for 3,000 women.

What are the implications for public health practice?

Removing barriers to contraception, such as cost, limited access, and lack of knowledge, could lead to increased use of highly effective contraceptive methods and reduced rates of unintended pregnancy, resulting in fewer adverse pregnancy and birth outcomes in the context of a Zika virus disease outbreak. This assessment of the resources and challenges in Puerto Rico related to contraceptive access might be a useful model for other areas with active transmission of Zika virus.

A collaborative and coordinated response is required from federal and local partners as well as other stakeholders, such as academic and professional organizations, private insurance companies, schools, and community leaders, to ensure access to contraception for women who desire to avoid pregnancy during the Zika outbreak in Puerto Rico and other affected areas. Increasing reimbursement and reducing costs for contraceptive services would support access. Efforts to increase opportunities for health care provider training on LARC insertion are needed. Education opportunities should be increased through health care providers, health educators, community leaders, schools, and other outreach mechanisms. This assessment of resources and challenges related to contraceptive access performed for Puerto Rico might be a useful model for other areas with active transmission of Zika virus.

Acknowledgments

Susan B. Moskosky, MS, Office of Population Affairs; Loretta Gavin, PhD, Office of Population Affairs; Michael J. Melendez, Centers for Medicare and Medicaid Services; Ivelisse M. Salce, Centers for Medicare and Medicaid Services; Michele Lawler, Health Resources and Services Administration.

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References

1. Brasil P, Pereira JP Jr, Raja Gabaglia C, et al. Zika virus infection in pregnant women in Rio de Janeiro—preliminary report. N Engl J Med 2016;NEJMoa1602412. Published online March 4, 2016. http://dx.doi.org/10.1056/NEJMoa1602412
2. Meaney-Delman D, Rasmussen SA, Staples JE, et al. Zika virus and pregnancy: what obstetric health care providers need to know. Obstet Gynecol 2016. Published online February 17, 2016.
3. Hamilton BE, Martin JA, Osterman MJ, Curtin SC, Matthews TJ. Births: final data for 2014. Natl Vital Stat Rep 2015;64:1–64. http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_12.pdf
4. Puerto Rico Title V Application, 2010–2011. https://mchdata.hrsa.gov/TVISReports/Documents/NeedsAssessments/2011/PR-NeedsAssessment.pdf
5. Daniels K, Daugherty J, Jones J, Mosher W. Current contraceptive use and variation by selected characteristics among women aged 15–44: United States, 2011–2013. Natl Health Stat Report 2015. http://www.cdc.gov/nchs/data/nhsr/nhsr086.pdf
6. Bensyl DM, Iuliano DA, Carter M, Santelli J, Gilbert BC. Contraceptive use—United States and territories, Behavioral Risk Factor Surveillance System, 2002. MMWR Surveill Summ 2005;54(No.SS-6).
7. Peipert JF, Madden T, Allsworth JE, Secura GM. Preventing unintended pregnancies by providing no-cost contraception. Obstet Gynecol 2012;120:1291–7.
8. Secura GM, Madden T, McNicholas C, et al. Provision of no-cost, long-acting contraception and teenage pregnancy. N Engl J Med 2014;371:1316–23. http://dx.doi.org/10.1056/NEJMoa1400506
9. Finer LB, Zolna MR. Shifts in intended and unintended pregnancies in the United States, 2001-2008. Am J Public Health 2014;104(Suppl 1):S43–8. http://dx.doi.org/10.2105/AJPH.2013.301416
10. Gipson JD, Koenig MA, Hindin MJ. The effects of unintended pregnancy on infant, child, and parental health: a review of the literature. Stud Fam Plann 2008;39:18–38. http://dx.doi.org/10.1111/j.1728-4465.2008.00148.x

Morbidity and Mortality Weekly Report

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

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

CDC has updated its interim guidance for U.S. health care providers caring for women of reproductive age with possible Zika virus exposure (*1*) to include recommendations on counseling women and men with possible Zika virus exposure who are interested in conceiving. This guidance is based on limited available data on persistence of Zika virus RNA in blood and semen (*2–5*). Women who have Zika virus disease* should wait at least 8 weeks after symptom onset to attempt conception, and men with Zika virus disease should wait at least 6 months after symptom onset to attempt conception. Women and men with possible exposure to Zika virus but without clinical illness consistent with Zika virus disease should wait at least 8 weeks after exposure to attempt conception. Possible exposure to Zika virus is defined as travel to or residence in an area of active Zika virus transmission (http://www.cdc.gov/zika/geo/active-countries.html), or sex (vaginal intercourse, anal intercourse, or fellatio) without a condom with a man who traveled to or resided in an area of active transmission. Women and men who reside in areas of active Zika virus transmission should talk with their health care provider about attempting conception. This guidance also provides updated recommendations on testing of pregnant women with possible Zika virus exposure. These recommendations will be updated when additional data become available.

The current Zika virus outbreak was identified in Brazil in May 2015, and knowledge about Zika virus infection, its potential adverse effects on pregnancy, and transmission is rapidly evolving. As of March 23, 2016, there were 39 countries and U.S. territories reporting active Zika virus transmission (*6*). Updates on areas with active Zika virus transmission are available online at http://wwwnc.cdc.gov/travel/notices.

Zika virus is primarily transmitted through the bite of infected *Aedes* species mosquitoes. However, Zika virus can also be sexually transmitted from a man infected with the virus to his sexual partners (*3,5,7–10*). Based on data from a previous outbreak, most persons infected with Zika virus are asymptomatic (*11*). Signs and symptoms, when present, are typically mild, with the most common being acute onset of fever, macular or papular rash, arthralgia, and conjunctivitis (*11*).

Increasing epidemiologic, clinical, laboratory, and pathologic evidence supports a link between Zika virus infection during pregnancy and adverse pregnancy and birth outcomes, including pregnancy loss, microcephaly, and brain and eye abnormalities (*12–16*). A critical knowledge gap for health care providers counseling women is the level of risk for adverse pregnancy and birth outcomes associated with Zika virus infection. That risk is currently unknown, but two recent studies might be informative. A retrospective analysis of the 2013–2014 Zika virus outbreak in French Polynesia identified eight fetuses and infants with microcephaly; using mathematical modeling, it was estimated that microcephaly affected approximately 1% of fetuses or infants born to women infected with Zika virus during the first trimester of pregnancy (*17*). In a recent study from Brazil, among 42 women with laboratory-confirmed Zika virus infection at any time during pregnancy who underwent prenatal ultrasonographic studies, 12 (29%) had abnormal findings; these included microcephaly, intracranial calcifications, other brain abnormalities, abnormal cerebral artery flow, intrauterine growth restriction, and fetal death (*16*). Further studies are underway to better estimate this risk, but it is important to recognize that microcephaly caused by viral destruction of brain tissue is likely to be part of a spectrum of neurological damage; the percentages in both studies may substantially underestimate the proportion of infants affected.

The risk for adverse pregnancy outcomes associated with maternal Zika virus infection around the time of conception is currently unknown. However, early reports suggest there might be adverse outcomes associated with Zika virus infection in early pregnancy: two women with Zika virus disease at <7 weeks' gestation both had pregnancy losses, with Zika virus RNA detected in products of conception, and another woman with clinical illness consistent with Zika virus disease at 7–8 weeks' gestation delivered a full-term infant with severe microcephaly (*15*). Other viral infections (e.g., cytomegalovirus, rubella, and parvovirus) that have occurred around

* 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. Persons who had possible Zika virus exposure and display one or more signs or symptoms consistent with Zika virus disease (acute onset of fever, rash, arthralgia, conjunctivitis) but did not have testing performed should follow recommendations for persons with Zika virus disease.

the time of conception have been associated with congenital infection and associated adverse pregnancy and birth outcomes (*18*–*22*); however, in these cases the exact timing of infection relative to timing of conception was often unknown.

Because currently available data are limited, providing preconception counseling following possible Zika virus exposure is challenging. Decisions about pregnancy timing are personal and complex, and discussions with patients should be individualized. CDC and state health departments have received numerous inquiries from health care providers requesting information on how best to counsel patients regarding timing of pregnancy following possible Zika virus exposure and diagnosis of Zika virus disease. CDC has developed updated interim guidance to address these concerns. This guidance is based on expert opinion, the limited available data on Zika virus, and knowledge about risks for other viral infections in the periconceptional period. CDC continues to evaluate all available evidence and to update recommendations as new information becomes available.

Preconception Counseling Recommendations For Women With Possible Exposure to Zika Virus Who Do Not Reside In an Area With Active Zika Virus Transmission

There is no evidence that Zika virus will cause congenital infection in pregnancies conceived after the resolution of maternal Zika viremia. Data on the incubation period for Zika virus disease and the duration of Zika viremia are limited. Evidence from case reports and experience from related flavivirus infections indicate that the incubation period for Zika virus disease is likely 3–14 days (*7*,*23*,*24*). After symptom onset, the duration of Zika viremia may range from a few days to 1 week (*24*–*26*); the longest duration of viremia in the published literature was 11 days (*4*).

Health care providers should provide preconception counseling to women with possible Zika virus exposure. Discussions should include information about the signs and symptoms of Zika virus disease and the potential adverse outcomes associated with Zika virus infection in pregnancy. Women with Zika virus disease should wait until at least 8 weeks after symptom onset before attempting conception. No data are available regarding the risk for congenital infection among pregnant women with asymptomatic infection. Based on the estimated upper limit of the incubation period for Zika virus disease (14 days) and approximate tripling of the longest published period of viremia after symptom onset (11 days), and given the limited data on duration of Zika viremia and the potential for individual immune system variability, asymptomatic women with possible Zika virus exposure should be advised to wait at least 8 weeks after the last date of exposure before attempting conception. Health care providers should provide information on available strategies to prevent unintended pregnancy, including use of the most effective contraceptive methods that can be used correctly and consistently (*27*). In addition, patients should be counseled that correct and consistent use of condoms reduces the risk for sexually transmitted infections.

Preconception Counseling Recommendations For Men With Possible Exposure to Zika Virus Who Do Not Reside In an Area With Active Zika Virus Transmission

Sexual transmission of Zika virus can occur, although data about the risk are limited. CDC has reported six laboratory-confirmed cases of sexually transmitted Zika virus disease (*9*,*28*). To date, all reported cases have involved sexual transmission from a man with symptoms, and have occurred within 3 weeks of symptom onset (*7*,*9*,*10*). Infectious Zika virus has been isolated from the semen of two men (one with hematospermia) at least 2 weeks after symptom onset (*5*) and possibly up to 10 weeks after symptom onset (*3*). A third report documented Zika virus RNA in semen 62 days after symptom onset (*2*). The duration and pattern of Zika virus persistence in semen is not known; further testing was not performed to document when replicative Zika virus or Zika virus RNA were no longer present in the men's semen.

Based on these data, men and their female partners should wait to attempt conception until the risk for sexual transmission is believed to be minimal. Men who have had a diagnosis of Zika virus disease should wait at least 6 months after symptom onset before attempting conception. This interval was recommended based on limited information regarding persistence of Zika virus in semen, and it allows for three times the longest period that Zika virus RNA has been detected in semen after symptom onset.

It is not known whether men with asymptomatic Zika virus infection can transmit the virus sexually. There have been no reported cases of sexual transmission from asymptomatic men. Although it has not been documented, it is biologically plausible that men who have been infected with Zika virus but display no symptoms of Zika virus disease might shed Zika virus in the semen. In the absence of data and to be consistent with other recommendations, men who have possible Zika virus exposure without clinical illness consistent with Zika virus disease should wait at least 8 weeks after possible exposure before attempting conception. If symptoms do not develop, the couple could consider attempting conception or waiting longer. Given the limited data, health care providers should discuss with couples the many factors that might influence a

decision about attempting conception, such as level of risk for Zika virus exposure and reproductive life plans.

Preconception Counseling Recommendations For Women and Their Partners Residing In Areas With Active Zika Virus Transmission

Health care providers caring for women and men residing in areas with active Zika virus transmission who have Zika virus disease should recommend they wait until the risk for viremia or viral shedding in semen is believed to be minimal to avoid potential adverse outcomes that have been linked with Zika virus infection in pregnancy. Women with Zika virus disease should wait at least 8 weeks from symptom onset before attempting conception; men with Zika virus disease should wait at least 6 months from symptom onset before attempting conception.

Women and men who reside in an area with active Zika virus transmission, but who do not have clinical illness consistent with Zika virus disease and who desire pregnancy should talk with their health care providers. Particularly in the context of Zika virus transmission, it is important for women and their partners to plan their pregnancies. As part of that planning process, women and their partners should discuss the risks for active Zika virus transmission with their health care providers, and providers should discuss their patients' reproductive life plans in the context of potential Zika virus exposure (Box). An assessment of the risk for Zika virus exposure includes evaluating the presence of mosquitoes in and around the home, protective measures practiced, and levels of active Zika virus transmission. Taking protective measures to avoid mosquito bites has been demonstrated to reduce the risk for mosquito-borne diseases (*29*,*30*); however, it might not be possible to eliminate the risk for Zika virus exposure during pregnancy. The expected duration of a Zika virus outbreak in any particular location is unknown. Health care providers should discuss factors that might influence timing of pregnancy, including fertility, age, reproductive history, medical history, and personal values and preferences. The decision about timing of pregnancy should be made by the woman or couple in consultation with a health care provider.

As part of counseling with health care providers, some women and their partners residing in areas of active Zika virus transmission might decide to delay pregnancy. Health care providers should discuss strategies to prevent unintended pregnancy, including use of the most effective contraceptive methods (*27*). In addition, patients should be counseled that correct and consistent use of condoms reduces the risk for sexually transmitted infections.

BOX. Recommendations for counseling persons in areas of active Zika virus transmission interested in attempting conception

Assess risk of Zika virus exposure

Environment

- Air conditioning, window screens in home
- Work environment
- Residence in area with high mosquito density
- Level of Zika viru transmission in the local area

Personal measures to prevent mosquito bites

- Protective clothing
- Use of EPA-registered insect repellent
- Emptying/removing standing water in containers

Personal measures to prevent sexual transmission

- Willingness to use condoms or abstain from sex throughout pregnancy

Discuss Zika virus infection in pregnancy

- Signs/symptoms of Zika virus disease
- Possible adverse consequences of Zika virus infection during pregnancy
- Unknown duration of epidemic

Explore reproductive life plan

- Fertility
- Age
- Reproductive history
- Medical history
- Personal values, preferences

Discuss risks/benefits of pregnancy at this time with woman and her partner

- If pregnancy not desired now, discuss contraceptive options

Recommendations For Testing of Persons Attempting Conception

Testing of serum for evidence of Zika virus infection should be performed in persons with possible exposure to Zika virus who have one or more of the following signs or symptoms within 2 weeks of possible exposure: acute onset of fever, rash, arthralgia, or conjunctivitis (*31*). Routine testing is not currently recommended for women or men who are attempting conception who have possible exposure to Zika virus but no clinical illness. The performance of the test in asymptomatic persons is unknown, and results might be difficult to interpret. It is not known whether a positive serologic test result in an asymptomatic man would indicate possible presence of Zika virus in semen, or if a negative serologic test result would preclude the presence of the virus in semen.

Reverse transcription-polymerase chain reaction (RT-PCR) testing of semen has not yet been validated. Intermittent shedding of other viruses in semen is recognized (*32*,*33*); however, the pattern of Zika virus shedding in semen is unknown. Further, the detection of Zika virus RNA in semen does not necessarily indicate the presence of infectious virus in semen. Because of these concerns, a positive or negative semen test result might not provide sufficient data to guide recommendations regarding attempting conception. Thus, testing of semen is not currently recommended. Studies are underway to better understand the performance of these tests, the persistence of Zika virus in semen, and how best to interpret the results.

Special Considerations For Women Undergoing Fertility Treatment

No instances of Zika virus transmission during fertility treatment have been documented, but transmission through donated gametes or embryos is theoretically possible, given that Zika virus can be present in semen, and sexual transmission has occurred (*2*,*7*–*9*). Zika virus is not likely to be destroyed in the cryopreservation process. Fertility treatment for sexually intimate couples using their own gametes and embryos should follow the timing recommendations for persons attempting conception, although recommendations might need to be adjusted depending on individual circumstances. The Food and Drug Administration (FDA) has developed guidance for donated tissues in the context of a Zika virus outbreak, including donated sperm, oocytes, and embryos (*34*); the guidance states that living donors will be deemed ineligible for anonymous donation if they have any of the following risk factors: medical diagnosis of Zika virus infection in the past 6 months; residence in or travel to an area with active Zika virus transmission within the past 6 months; or within the past 6 months had sex with a male partner who, during the 6 months before this sexual contact, received a diagnosis of or experienced an illness consistent with Zika virus disease, or had traveled to an area of active Zika virus transmission. FDA guidance applies to anonymous donors, but does not apply to sexually intimate couples. In accordance with previous FDA guidance, directed (or known) donors must undergo the same evaluation and eligibility determination as anonymous donors. However, gametes or embryos from directed donors who are ineligible may be used, per FDA guidance, if the tissue is properly labeled to indicate potential increased risk, all participating parties are aware of and willing to incur the risk, and physicians are aware of the status of gametes or embryos. Professional organizations recommend recipients be informed and counseled about potential risks before use of the donated tissue (*35*).

Updated Recommendations For Testing Pregnant Women With Possible Zika Virus Exposure

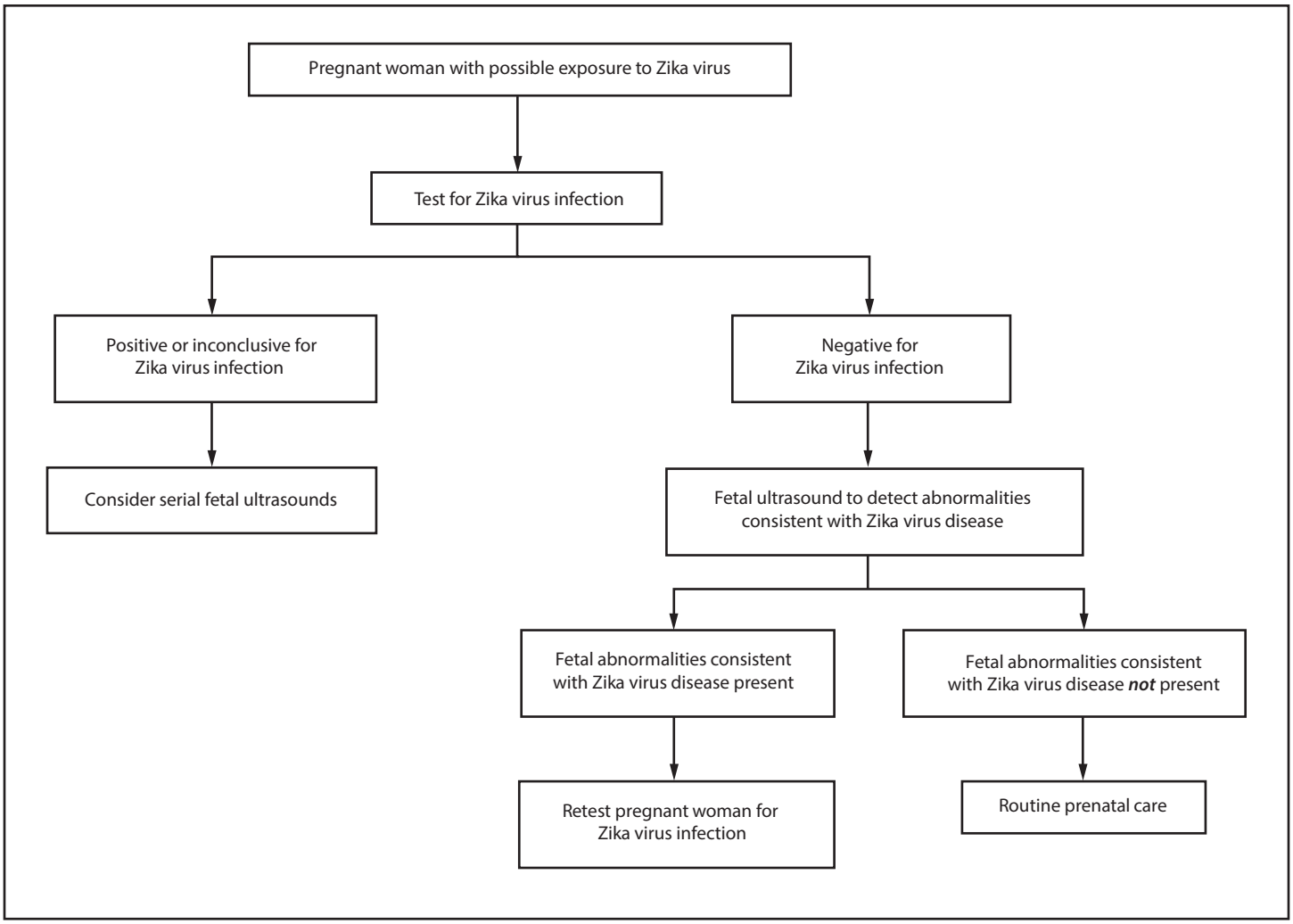
Pregnant women who had possible exposure to Zika virus who do not reside in an area with active transmission should be evaluated for Zika virus infection and tested in accordance with CDC Updated Interim Guidance (Figure 1). Similarly, pregnant women who reside in an area with active Zika virus transmission should be evaluated and tested in accordance with CDC interim guidance (Figure 2); a decision to implement testing of asymptomatic pregnant women should be made by local health officials based on information about levels of Zika virus transmission and laboratory capacity. A negative immunoglobulin M test result obtained 2–12 weeks after known exposure would suggest that a recent Zika virus infection did not occur and could obviate the need for serial ultrasounds.

Health care providers should assess their patients' travel histories. In certain circumstances, such as patients with frequent travel (e.g., daily or weekly) to areas of active Zika virus transmission, health care providers should follow CDC's interim guidance for pregnant women residing in areas with active Zika virus transmission (Figure 2). Health care providers who care for pregnant women who reside along the U.S.-Mexico border should assess their patients' travel histories, including frequency of cross-border travel, and destinations. Areas of active Zika virus transmission in Mexico not bordering the United States have been reported. There are currently no reports of active Zika virus transmission along the U.S.-Mexico border. However, if active transmission occurs, local health officials should determine when to implement testing of asymptomatic pregnant women based on information about levels of Zika virus transmission and laboratory capacity.

As previously recommended (*8*), men who travel to or reside in an area with active Zika virus transmission and have a pregnant partner should correctly and consistently use condoms or abstain from sex for the duration of pregnancy. This course is the best way to avoid even a minimal risk for sexual transmission of Zika virus, which could result in adverse fetal effects if contracted during pregnancy. Pregnant women who have had sex without a condom with a male partner with possible Zika virus exposure should be tested for evidence of Zika virus infection if the woman develops at least one sign or symptom of Zika virus disease or if her male partner has had diagnosed Zika virus disease or a clinical illness consistent with Zika virus disease.

Pregnant women who do not reside in areas with active Zika virus transmission who have had possible Zika virus exposure during the 8 weeks before conception (6 weeks before the last menstrual period) can be offered serologic testing within 2–12 weeks of this exposure. As previously recommended, all

FIGURE 1. Updated interim guidance: testing algorithm*,†,§,¶ for a pregnant woman with possible Zika virus exposure not residing in an area with active Zika virus transmission**



* Testing is recommended for pregnant women with clinical illness consistent with Zika virus disease, including one or more of the following signs or symptoms: acute onset of fever, rash, arthralgia, or conjunctivitis during or within 2 weeks of travel or possible sexual exposure. Testing includes Zika virus reverse transcription-polymerase chain reaction (RT-PCR), and Zika virus immunoglobulin M (IgM) and neutralizing antibodies on serum specimens. More information is available at http://www.aphl.org/Materials/CDCMemo_Zika_Chik_Deng_Testing_011916.pdf. Because of the overlap of symptoms and areas where other viral illnesses are endemic, evaluate for possible dengue or chikungunya virus infection.

† Testing can be offered to pregnant women without clinical illness consistent with Zika virus disease. If performed, testing should include Zika virus IgM, and if IgM test result is positive or indeterminate, neutralizing antibodies on serum specimens. Testing should be performed 2–12 weeks after travel.

§ Laboratory evidence of maternal Zika virus infection: 1) Zika virus RNA detected by RT-PCR in any clinical specimen; or 2) positive Zika virus IgM with confirmatory neutralizing antibody titers that are ≥4-fold higher than dengue virus neutralizing antibody titers in serum. Testing is considered inconclusive if Zika virus neutralizing antibody titers are <4-fold higher than dengue virus neutralizing antibody titers.

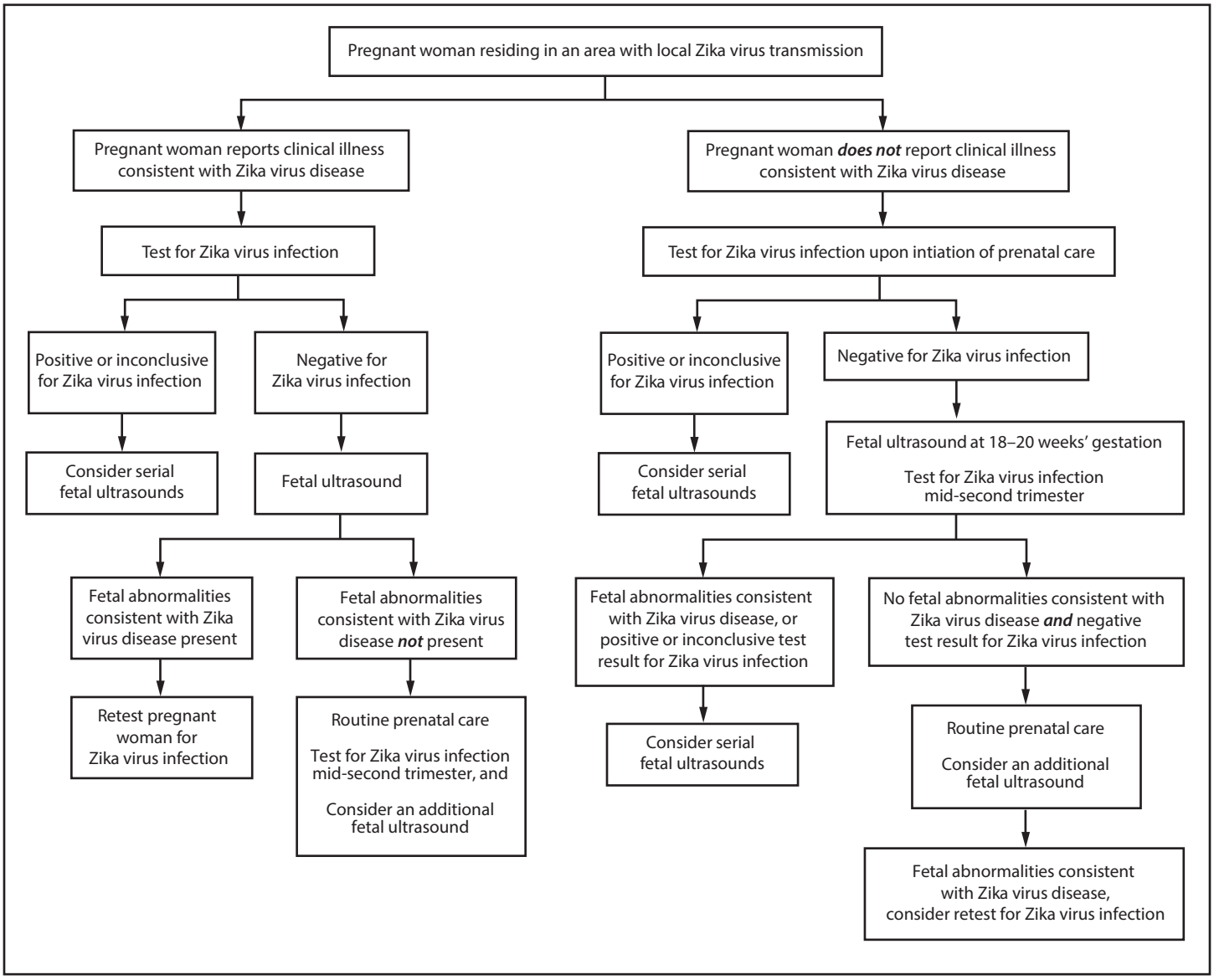
¶ Fetal abnormalities consistent with Zika virus disease include microcephaly, intracranial calcifications, and brain and eye abnormalities. Fetal ultrasounds might not detect abnormalities until late second or early third trimester of pregnancy.

** Possible exposure to Zika virus includes travel to an area with active Zika virus transmission (http://wwwnc.cdc.gov/travel/notices), or sex (vaginal intercourse, anal intercourse, or fellatio) without a condom with a man who traveled to, or resided in, an area with active Zika virus transmission. Testing is not currently recommended for pregnant women with possible sexual exposure to Zika virus if both partners are asymptomatic.

persons with possible exposure and clinical illness consistent with Zika virus disease should be tested for Zika virus infection.

An additional update to previously published guidance relates to amniocentesis. Consideration of amniocentesis should be individualized for each clinical circumstance; thus, amniocentesis has been removed from the updated testing algorithms (Figure 1) (Figure 2). Similar to evaluation of other congenital infections, amniocentesis may be considered in the evaluation of potential Zika virus infection. It is unknown how sensitive or specific RT-PCR testing of amniotic fluid is

FIGURE 2. Updated interim guidance: testing algorithm*,†,§,¶ for a pregnant women residing in an area with active Zika virus transmission, with or without clinical illness†† consistent with Zika virus disease**



* Tests for pregnant women with clinical illness consistent with Zika virus disease include Zika virus reverse transcription-polymerase chain reaction (RT-PCR), and Zika virus immunoglobulin M (IgM) and neutralizing antibodies on serum specimens. More information is available at http://www.aphl.org/Materials/CDCMemo_Zika_Chik_Deng_Testing_011916.pdf. Because of the overlap of symptoms and areas where other viral illnesses are endemic, evaluate for possible dengue or chikungunya virus infection. If chikungunya or dengue virus RNA is detected, treat in accordance with existing guidelines. Timely recognition and supportive treatment for dengue virus infections can substantially lower the risk of medical complications and death. Repeat Zika virus testing during pregnancy is warranted if clinical illness consistent with Zika virus disease develops later in pregnancy.

† Testing can be offered to pregnant women without clinical illness consistent with Zika virus disease. If performed, testing should include Zika virus IgM, and if IgM test result is positive or indeterminate, neutralizing antibodies on serum specimens. Results from serologic testing are challenging to interpret in areas where residents have had previous exposure to other flaviviruses (e.g., dengue, yellow fever) because of cross-reactivity with other flaviviruses.

§ Laboratory evidence of maternal Zika virus infection: 1) Zika virus RNA detected by RT-PCR in any clinical specimen; or 2) positive Zika virus IgM with confirmatory neutralizing antibody titers that are ≥4-fold higher than dengue virus neutralizing antibody titers in serum. Testing would be considered inconclusive if Zika virus neutralizing antibody titers are <4-fold higher than dengue virus neutralizing antibody titer.

¶ Fetal abnormalities consistent with Zika virus disease include microcephaly, intracranial calcifications, and brain and eye abnormalities. Fetal ultrasounds might not detect abnormalities until late second or early third trimester of pregnancy.

** http://wwwnc.cdc.gov/travel/notices/. Local health officials should determine when to implement testing of asymptomatic pregnant women based on information about levels of Zika virus transmission and laboratory capacity.

†† Clinical illness is consistent with Zika virus disease if one or more signs or symptoms (acute onset of fever, rash, arthralgia, or conjunctivitis) are present.

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 following infection will have abnormalities. The optimal time to perform amniocentesis to diagnose congenital Zika virus infection is not known; Zika virus RNA has been detected in amniotic fluid as early as 4 weeks after maternal symptom onset, and as early as 17 weeks' gestation (unpublished data). Health care providers should discuss the risks and benefits of amniocentesis with their patients.

The algorithms have also been updated to reflect accumulated data on ultrasonographic findings that might be consistent with Zika virus disease, including microcephaly, intracranial calcifications, and brain and eye abnormalities. This guidance will be updated as additional information becomes available (http://www.cdc.gov/zika/).

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References

1. Oduyebo T, Petersen EE, Rasmussen SA, et al. Update: interim guidelines for health care providers caring for pregnant women and women of reproductive age with possible Zika virus exposure—United States, 2016. MMWR Morb Mortal Wkly Rep 2016;65:122–7. http://dx.doi.org/10.15585/mmwr.mm6505e2
2. Atkinson B, Hearn P, Afrough B, et al. Detection of Zika virus in semen [letter]. Emerg Infect Dis. Published online May 2016. http://dx.doi.org/10.3201/eid2205.160107
3. Musso D, Roche C, Robin E, Nhan T, Teissier A, Cao-Lormeau VM. Potential sexual transmission of Zika virus. Emerg Infect Dis 2015;21:359–61. http://dx.doi.org/10.3201/eid2102.141363
4. Lanciotti RS, Kosoy OL, Laven JJ, et al. Genetic and serologic properties of Zika virus associated with an epidemic, Yap State, Micronesia, 2007. Emerg Infect Dis 2008;14:1232–9. http://dx.doi.org/10.3201/eid1408.080287
5. Mansuy JM, Dutertre M, Mengelle C, et al. Zika virus: high infectious viral load in semen, a new sexually transmitted pathogen? Lancet Infect Dis 2016;16:405. http://dx.doi.org/10.1016/S1473-3099(16)00138-9
6. CDC. All countries and territories with active Zika virus transmission. Atlanta, GA: US Department of Health and Human Services, CDC; 2016. http://www.cdc.gov/zika/geo/active-countries.html
7. Foy BD, Kobylinski KC, Chilson Foy JL, et al. Probable non-vector-borne transmission of Zika virus, Colorado, USA. Emerg Infect Dis 2011;17:880–2. http://dx.doi.org/10.3201/eid1705.101939
8. Oster AM, Brooks JT, Stryker JE, et al. Interim guidelines for prevention of sexual transmission of Zika virus—United States, 2016. MMWR Morb Mortal Wkly Rep 2016;65:120–1. http://dx.doi.org/10.15585/mmwr.mm6505e1
9. Hills SL, Russell K, Hennessey M, et al. Transmission of Zika virus through sexual contact with travelers to areas of ongoing transmission—continental United States, 2016. MMWR Morb Mortal Wkly Rep 2016;65:215–6. http://dx.doi.org/10.15585/mmwr.mm6508e2
10. Venturi G, Zammarchi L, Fortuna C, et al. An autochthonous case of Zika due to possible sexual transmission, Florence, Italy, 2014. Euro Surveill 2016;21:30148. http://dx.doi.org/10.2807/1560-7917.ES.2016.21.8.30148
11. Duffy MR, Chen T-H, Hancock WT, et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. N Engl J Med 2009;360:2536–43. http://dx.doi.org/10.1056/NEJMoa0805715
12. Calvet G, Aguiar RS, Melo AS, et al. Detection and sequencing of Zika virus from amniotic fluid of fetuses with microcephaly in Brazil: a case study. Lancet Infect Dis. Published online February 17, 2016. http://dx.doi.org/10.1016/S1473-3099(16)00095-5
13. Mlakar J, Korva M, Tul N, et al. Zika virus associated with micrcephaly. N Engl J Med 2016;374:951–8. http://dx.doi.org/10.1056/NEJMoa1600651.
14. Martines RB, Bhatnagar J, Keating MK, et al. Notes from the field: evidence of Zika virus infection in brain and placental tissues from two congenitally infected newborns and two fetal losses—Brazil, 2015. MMWR Morb Mortal Wkly Rep 2016;65:159–60. http://dx.doi.org/10.15585/mmwr.mm6506e1
15. Meaney-Delman D, Hills SL, Williams C, et al. Zika virus infection among US pregnant travelers—August 2015–February 2016. MMWR Morb Mortal Wkly Rep 2016;65:211–4. http://dx.doi.org/10.15585/mmwr.mm6508e1
16. Brasil P, Pereira JP Jr, Raja Gabaglia C, et al. Zika virus infection in pregnant women in Rio de Janeiro—preliminary report. N Engl J Med 2016. Published online March 4, 2016. http://dx.doi.org/10.1056/NEJMoa1602412
17. Cauchemez M, Dub T, Guillemette-Artur P, et al. Association between Zika virus and microcephaly in French Polynesia, 2013–2015: a retrospective study. Lancet. Published online March 15, 2016. http://dx.doi.org/10.1016/S0140-6736(16)00651-6
18. Enders G, Miller E, Nickerl-Pacher U, Cradock-Watson JE. Outcome of confirmed periconceptional maternal rubella. Lancet 1988;331:1445–7. http://dx.doi.org/10.1016/S0140-6736(88)92249-0
19. Daiminger A, Bäder U, Enders G. Pre- and periconceptional primary cytomegalovirus infection: risk of vertical transmission and congenital disease. BJOG 2005;112:166–72. http://dx.doi.org/10.1111/j.1471-0528.2004.00328.x
20. Picone O, Vauloup-Fellous C, Cordier AG, et al. A series of 238 cytomegalovirus primary infections during pregnancy: description and outcome. Prenat Diagn 2013;33:751–8. http://dx.doi.org/10.1002/pd.4118
21. Revello MG, Zavattoni M, Furione M, Lilleri D, Gorini G, Gerna G. Diagnosis and outcome of preconceptional and periconceptional primary human cytomegalovirus infections. J Infect Dis 2002;186:553–7. http://dx.doi.org/10.1086/341831
22. Nunoue T, Kusuhara K, Hara T. Human fetal infection with parvovirus B19: maternal infection time in gestation, viral persistence and fetal prognosis. Pediatr Infect Dis J 2002;21:1133–6. http://dx.doi.org/10.1097/00006454-200212000-00009
23. Rudolph KE, Lessler J, Moloney RM, Kmush B, Cummings DA. Incubation periods of mosquito-borne viral infections: a systematic review. Am J Trop Med Hyg 2014;90:882–91 http://dx.doi.org/10.4269/ajtmh.13-0403
24. Fonseca K, Meatherall B, Zarra D, et al. First case of Zika virus infection in a returning Canadian traveler. Am J Trop Med Hyg 2014;91:1035–8. http://dx.doi.org/10.4269/ajtmh.14-0151
25. Ioos S, Mallet HP, Leparc Goffart I, Gauthier V, Cardoso T, Herida M. Current Zika virus epidemiology and recent epidemics. Med Mal Infect 2014;44:302–7. http://dx.doi.org/10.1016/j.medmal.2014.04.008

26. Bearcroft WG. Zika virus infection experimentally induced in a human volunteer. Trans R Soc Trop Med Hyg 1956;50:438–41. http://dx.doi.org/10.1016/0035-9203(56)90090-6
27. CDC. Contraception. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. http://www.cdc.gov/reproductivehealth/unintendedpregnancy/contraception.htm
28. CDC. Zika virus disease in the United States, 2015–2016. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. http://www.cdc.gov/zika/
29. Nasci RS, Wirtz RA, Brogdon WG. Protection against mosquitoes, ticks, and other arthropods. In: CDC health information for international travel, 2016. New York, NY: Oxford University Press; 2015. http://wwwnc.cdc.gov/travel/yellowbook/2016/the-pre-travel-consultation/protection-against-mosquitoes-ticks-other-arthropods
30. Banks SD, Murray N, Wilder-Smith A, Logan JG. Insecticide-treated clothes for the control of vector-borne diseases: a review on effectiveness and safety. Med Vet Entomol 2014;28(Suppl 1):14–25. http://dx.doi.org/10.1111/mve.12068
31. CDC. Updated diagnostic testing for Zika, chikungunya, and dengue viruses in US Public Health Laboratories. Atlanta, GA: US Department of Health and Human Services, CDC; 2016.
32. Bujan L, Daudin M, Alvarez M, Massip P, Puel J, Pasquier C. Intermittent human immunodeficiency type 1 virus (HIV-1) shedding in semen and efficiency of sperm processing despite high seminal HIV-1 RNA levels. Fertil Steril 2002;78:1321–3. http://dx.doi.org/10.1016/S0015-0282(02)04344-3
33. Pasquier C, Bujan L, Daudin M, et al. Intermittent detection of hepatitis C virus (HCV) in semen from men with human immunodeficiency virus type 1 (HIV-1) and HCV. J Med Virol 2003;69:344–9. http://dx.doi.org/10.1002/jmv.10295
34. Food and Drug Administration. Donor screening recommendations to reduce the risk of transmission of Zika virus by human cells, tissues, and cellular and tissue-based products. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2016. http://www.fda.gov/downloads/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Guidances/Tissue/UCM488582.pdf
35. Practice Committee of American Society for Reproductive Medicine: Practice Committee of Society for Assisted Reproductive Technology. Recommendations for gamete and embryo donation: a committee opinion. Fertil Steril 2013;99:47–62e1. http://dx.doi.org/10.1016/j.fertnstert.2012.09.037

Morbidity and Mortality Weekly Report

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

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

CDC issued interim guidance for the prevention of sexual transmission of Zika virus on February 5, 2016 (*1*). The following recommendations apply to men who have traveled to or reside in areas with active Zika virus transmission* and their female or male sex partners. These recommendations replace the previously issued recommendations and are updated to include time intervals after travel to areas with active Zika virus transmission or after Zika virus infection for taking precautions to reduce the risk for sexual transmission. This guidance defines potential sexual exposure to Zika virus as any person who has had sex (i.e., vaginal intercourse, anal intercourse, or fellatio) without a condom with a man who has traveled to or resides in an area with active Zika virus transmission. This guidance will be updated as more information becomes available.

Zika virus can be sexually transmitted from a man to his sex partners. Zika virus infection is of particular concern during pregnancy. The first documented case of sexual transmission of Zika virus was in 2008 (*2*); transmission was from a man to a woman, and sexual contact occurred a few days before the man's symptom onset. The first case of sexual transmission associated with the current outbreak was reported in early February (Dallas County Health and Human Services, unpublished data, 2016). In late February 2016, CDC reported two additional confirmed cases of sexual transmission of Zika virus from men returning from areas with active Zika virus transmission to their sex partners in the United States; these transmissions occurred in early 2016 (*3*). As of March 18, 2016, CDC has reported three additional cases, for a total of six confirmed cases of sexual transmission in the United States associated with this outbreak.† Another recent report described a case of sexual transmission that occurred in Italy in 2014 (*4*). In addition, there have been two reports of replication-competent Zika virus isolated from semen at least 2 weeks after onset of illness; blood plasma specimens collected at the same time as the semen specimens tested negative for Zika virus by reverse transcription-–polymerase chain reaction (RT-PCR) (*5,6*). Semen collected from a third man with Zika virus infection had virus particles detectable by RT-PCR at 62 days after fever onset; RT-PCR of blood at that time was negative (*7*). Because serial semen specimens were not collected for these three cases, the duration of persistence of infectious Zika virus in semen remains unknown.

All reported cases of sexual transmission involved vaginal or anal sex with men during, shortly before onset of, or shortly after resolution of symptomatic illness consistent with Zika virus disease. It is not known whether infected men who never develop symptoms can transmit Zika virus to their sex partners. Sexual transmission of Zika virus from infected women to their sex partners has not been reported. Sexual transmission of many infections, including those caused by other viruses, is reduced by consistent and correct use of latex condoms.

Recommendations for Men and Their Pregnant Partners

Men who have traveled to or reside in an area with active Zika virus transmission and their pregnant sex partners should consistently and correctly use condoms during sex (i.e., vaginal intercourse, anal intercourse, or fellatio) or abstain from sex for the duration of the pregnancy. This course is the best way to avoid even a minimal risk of sexual transmission of Zika virus, which could have adverse fetal effects when contracted during pregnancy. Pregnant women should discuss their male sex partner's history of travel to areas with active Zika virus transmission and history of illness consistent with Zika virus disease§ with their health care provider; providers can consult CDC's guidance for evaluation and testing of pregnant women (*8*).

Updated Recommendations

Recommendations for men and their nonpregnant sex partners. Men and their nonpregnant sex partners (couples) who want to reduce the risk for sexual transmission of Zika virus should use condoms consistently and correctly during sex or abstain from sex. Based on expert opinion and limited but evolving information about the sexual transmission of Zika virus, the recommended duration of consistent condom use or abstinence from sex depends on whether men had confirmed infection or

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

clinical illness consistent with Zika virus disease and whether men are residing in an area with active transmission (Box). The rationale for selection of these timeframes is available elsewhere (*8*).

Several factors could influence a couple's level of concern about sexual transmission of Zika virus. The risk for acquiring mosquito-borne Zika virus in areas with active transmission depends on the duration and extent of exposure to infected mosquitoes and 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 (*9*). Transmission of Zika virus is of particular concern during pregnancy. Couples who do not desire pregnancy should use available strategies to prevent unintended pregnancy, including use of the most effective contraceptive methods that can be used correctly and consistently (*10*). In addition, couples should be advised that correct and consistent use of condoms reduces the risk for 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 genitourinary tract is limited. Therefore, neither serum nor semen testing of men for the purpose of assessing risk for sexual transmission is currently recommended.

Zika virus testing is recommended for persons who have had possible sexual exposure to Zika virus and develop signs or symptoms consistent with Zika virus disease.** A pregnant woman with possible sexual exposure to Zika virus should be tested if either she or her male partner developed symptoms consistent with Zika virus disease (*8*). CDC urges health care providers to report cases of suspected sexual transmission of Zika virus to local and state health departments.

¶ http://www.cdc.gov/zika/prevention.
** http://www.cdc.gov/zika/hc-providers/diagnostic.html.

Acknowledgments

Wafaa El-Sadr, Columbia University, New York, New York; Daniel R. Kuritzkes, Brigham and Women's Hospital, Boston, Massachusetts; Amesh Adalja, UPMC Center for Health Security and University of Pittsburgh School of Medicine, Pennsylvania; Jeffrey Duchin, Public Health-Seattle & King County, Washington; Trish Perl, Johns Hopkins School of Medicine and Bloomberg School of Public Health, Baltimore, Maryland.

BOX. Recommendations for prevention of sexual transmission of Zika virus for couples in which a man has traveled to or resides in an area with active Zika virus transmission

Couples in which a woman is pregnant

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

Other couples concerned about sexual transmission*

- Couples in which a man had confirmed Zika virus infection or clinical illness consistent with Zika virus disease should consider using condoms or abstaining from sex for at least 6 months after onset of illness.
- Couples in which a man traveled to an area with active Zika virus transmission but did not develop symptoms of Zika virus disease should consider using condoms or abstaining from sex for at least 8 weeks after departure from the area.
- Couples in which a man resides in an area with active Zika virus transmission but has not developed symptoms of Zika virus disease might consider using condoms 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 condoms, which also reduce the risk for sexually transmitted infections. Couples planning conception have a number of 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. Published online March 25, 2016.

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References

1. Oster AM, Brooks JT, Stryker JE, et al. Interim guidelines for prevention of sexual transmission of Zika virus—United States, 2016. MMWR Morb Mortal Wkly Rep 2016;65:120–1. http://dx.doi.org/10.15585/mmwr.mm6505e1
2. Foy BD, Kobylinski KC, Foy JLC, et al. Probable non-vector-borne transmission of Zika virus, Colorado, USA. Emerg Infect Dis 2011;17:880–2. http://dx.doi.org/10.3201/eid1705.101939
3. Hills SL, Russell K, Hennessey M, et al. Transmission of Zika virus through sexual contact with travelers to areas of ongoing transmission—continental United States, 2016. MMWR Morb Mortal Wkly Rep 2016;65:215–6. http://dx.doi.org/10.15585/mmwr.mm6508e2

4. Venturi G, Zammarchi L, Fortuna C, et al. An autochthonous case of Zika due to possible sexual transmission, Florence, Italy, 2014. Euro Surveill 2016;21:30148. http://dx.doi.org/10.2807/1560-7917.ES.2016.21.8.30148
5. Mansuy JM, Dutertre M, Mengelle C, et al. Zika virus: high infectious viral load in semen, a new sexually transmitted pathogen? Lancet Infect Dis 2016;S1473-3099(16)00138-9.
6. Musso D, Roche C, Robin E, Nhan T, Teissier A, Cao-Lormeau VM. Potential sexual transmission of Zika virus. Emerg Infect Dis 2015;21:359–61. http://dx.doi.org/10.3201/eid2102.141363
7. Atkinson B, Hearn P, Afrough B, et al. Detection of Zika virus in semen[Letter]. Emerg Infect Dis 2016. Published online March 2016. http://dx.doi.org/10.3201/eid2205.160107
8. 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. Published online March 25, 2016.
9. Duffy MR, Chen TH, Hancock WT, et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. N Engl J Med 2009;360:2536–43. http://dx.doi.org/10.1056/NEJMoa0805715
10. CDC. Contraception. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. http://www.cdc.gov/reproductivehealth/unintendedpregnancy/contraception.htm

Notes from the Field

Imported Cases of Malaria — Puerto Rico, July–October 2015

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On July 16 2015, the Puerto Rico Department of Health (PRDH) was notified of a case of malaria, diagnosed by a hospital parasitology laboratory in a student who had traveled to Punta Cana, Dominican Republic, during late June for a school-organized graduation trip. Malaria is a mosquito-borne parasitic infection, characterized by fever, shaking chills, headaches, muscle pains, nausea, general malaise, and vomiting (*1*). Malaria can be clinically difficult to distinguish from other acute febrile illnesses, and a definitive diagnosis requires demonstration of malaria parasites using microscopy or molecular diagnostic tests. The student's initial diagnosis on July 10 was suspected dengue virus infection. Puerto Rico eliminated local malaria transmission during the mid-1950s (*2*); however, reintroduction remains a risk because of the presence of a competent vector (*Anopheles albimanus*) and ease of travel to areas where the disease is endemic, including Hispaniola, the island shared by the Dominican Republic and Haiti, and the only island in the Caribbean with endemic malaria (*3*). During 2014, the Dominican Republic reported 496 confirmed malaria cases and four associated deaths; Haiti reported 17,662 confirmed cases and nine deaths (*4*). During 2000–2014, Puerto Rico reported a total of 35 imported malaria cases (range = 0–7 per year); three cases were imported from Hispaniola. During June–August 2015, eight confirmed malaria cases among travelers to the Dominican Republic were reported to CDC's National Malaria Surveillance System (CDC, unpublished data, 2015).

After the student's diagnosis of malaria, an epidemiologic investigation was undertaken by PRDH to identify additional cases among the 90 school trip participants. A suspected malaria case was defined as the occurrence of any symptoms consistent with malaria (i.e., fever, shaking chills, headaches, muscle pains, nausea, general malaise, and vomiting) occurring in a school trip participant ≥9 days after travel to the Dominican Republic. During interviews with participants, investigators learned that a second Puerto Rico school group (n = 44) had visited the same resort during the same time; thus, the investigation was expanded from 90 to 134 participants. To help find other suspected cases, PRDH released a health alert notice on July 17 to all health care providers in Puerto Rico; public health counterparts in the Dominican Republic were also informed.

Seven suspected cases were identified among school trip participants, and during July 16–August 21, health care providers in Puerto Rico sent 102 additional patient specimens to PRDH for evaluation by smear microscopy. Among the 109 total patient samples, 27 (25%) met the suspected case definition and were sent to CDC for testing by photo-induced electron transfer fluorogenic real-time polymerase chain reaction. *Plasmodium falciparum* malaria was diagnosed in five patients, including two from the first school group, two from the second school group, and one in an independent traveler from Puerto Rico (Table). Microsatellite loci evaluation indicated genetic similarity among isolates from the five patients as well as with previous malaria cases from Hispaniola. The five malaria patients were successfully treated. Two subsequent cases of *P. falciparum* malaria among self-organized travelers from Puerto Rico to Punta Cana were reported during September and October 2015.

This cluster of imported malaria cases highlights the importance of malaria surveillance in areas where the disease is not endemic to detect imported cases. Travelers should be informed

TABLE. Characteristics of patients with confirmed *Plasmodium falciparum* malaria who had traveled to the Dominican Republic — Puerto Rico, June–July, 2015

Patient no.	Age (yrs)	Sex	Travel dates to Dominican Republic	Travel type*	Date of symptom onset	Date first sought medical care	Date of hospital admission	Initial diagnosis suspected	Date reported to PRDH
1	18	Male	June 22–June 26	School trip 1	July 10	July 14	July 15	Dengue	July 16
2	17	Female	June 22–June 26	School trip 1	July 9	July 13	July 15	Dengue	July 17
3	18	Male	June 22–June 26	School trip 2	July 10	July 14	July 14	Viral syndrome	July 20
4	47	Male	June 22–June 27	Self-organized	July 8	July 13	July 13	Dengue	July 21
5	17	Female	June 22–June 26	School trip 2	July 11	July 13	July 14	Viral illness	July 20

Abbreviation: PRDH = Puerto Rico Department of Health.

* Epidemiologic investigation revealed cases resulting from two overlapping school trips to the same hotel in the Dominican Republic. An independent traveler staying at a different hotel in the region was also identified.

of risks before visiting locations where malaria is endemic and take recommended precautions, including avoiding exposure to mosquitoes, using mosquito repellent, and taking recommended chemoprophylaxis (http://www.cdc.gov/malaria/travelers/index.html). Physician awareness of malaria symptoms and patient travel histories is critical for timely diagnosis and effective patient care. Febrile travelers from areas where malaria is endemic should be promptly evaluated by thin and thick smear microscopy for malaria infection, and public and private health institutions should maintain the ability to test for and report confirmed cases of malaria to public health authorities.

Acknowledgments

Bernard Christiansen, Grupo HIMA San Pablo; Puerto Rico Department of Health regional epidemiologists and Public Health Laboratory personnel.

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References

1. CDC. Malaria. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. http://www.cdc.gov/malaria/
2. Miranda Franco R, Casta Vélez A. La erradicación de la malaria en Puerto Rico.[Spanish]. Rev Panam Salud Publica 1997;2:146–50. http://dx.doi.org/10.1590/S1020-49891997000800015
3. Herrera S, Ochoa-Orozco SA, González IJ, Peinado L, Quiñones ML, Arévalo-Herrera M. Prospects for malaria elimination in Mesoamerica and Hispaniola. PLoS Negl Trop Dis 2015;9:e0003700. http://dx.doi.org/10.1371/journal.pntd.0003700
4. World Health Organization. World Malaria Report, 2015. Geneva, Switzerland: World Health Organization; 2015. http://apps.who.int/iris/bitstream/10665/200018/1/9789241565158_eng.pdf?ua=1

Notes from the Field

Baseline Assessment of the Use of Ebola Rapid Diagnostic Tests — Forécariah, Guinea, October–November 2015

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The Ebola virus disease (Ebola) epidemic in West Africa began in Guinea in early 2014 (*1*). The reemergence of Ebola and risk of ongoing, undetected transmission continues because of the potential for sexual transmission and other as yet unknown transmission pathways (*2*). On March 17, 2016, two new cases of Ebola in Guinea were confirmed by the World Health Organization (*3*). This reemergence of Ebola in Guinea is the first since the original outbreak in the country was declared over on December 29, 2015. The prefecture of Forécariah, in western Guinea, was considerably affected by Ebola in 2015, with an incidence rate of 159 cases per 100,000 persons (*4*). Guinea also has a high prevalence of malaria; in a nationwide 2012 survey, malaria prevalence was reported to be 44% among healthy children aged ≤5 years (*5*). Malaria is an important reason for seeking health care (*6*); during 2014, 34% of outpatient consultations were related to malaria (*7*).

Malaria and Ebola share similar presenting symptoms, including fever, chills, body aches, nausea, and vomiting (*1*). Rapid diagnostic testing (RDT) for malaria and monitoring of febrile illnesses are currently recommended as part of the National Malaria Programme in Forécariah (*7*). In October 2015, in response to a surge of Ebola cases in cases in Forécariah, rapid diagnostic testing for Ebola (RDT-Ebola) was implemented by the National Ebola Coordination Cell to enhance surveillance efforts to detect new Ebola cases and ensure that Ebola cases are not clinically misdiagnosed as malaria. The RDT-Ebola used the OraQuick Ebola Rapid Antigen test, which for whole blood, has a manufacturer-reported sensitivity of 84% (95% confidence interval (CI) = 63.92–95.46) and a specificity of 98.0% (95% CI = 89.35–99.95) (http://www.fda.gov/downloads/MedicalDevices/Safety/EmergencySituations/UCM456912.pdf).

The Ebola and malaria RDTs have similar testing and sample collection procedures, which made the implementation plan straightforward and feasible. The CDC-Guinea RDT-Ebola testing protocol dictated that both RDT-Malaria and RDT-Ebola be conducted simultaneously for each patient with febrile illness who did not have an epidemiologic link to a patient with Ebola; patients with potential exposure to Ebola were sent to Ebola treatment centers (*8*). Because patients with known risk factors for Ebola were not tested with the RDT-Ebola tests, the same infection prevention control precautions as for malaria (i.e., use of gloves and gowns) were recommended.

To evaluate implementation of RDT-Ebola in Forécariah, 10 health centers (one in each of the 10 Forécariah subprefectures), two large hospitals within the prefecture, and three health posts located near the Sierra Leone border were selected as sentinel sites. Initial visits were conducted 1 month after the distribution of the RDT-Ebola test kits; by November 23, 2015, 13 of the 15 sentinel sites had been visited. Clinic registries were reviewed to establish a baseline for seven variables of interest, including the number of consultations for fever (reported and measured), the number of RDT-Malaria tests used, and the number of RDT-Ebola tests used (Table), and to collect information about lessons learned from this first large-scale RDT-Ebola implementation.

During October 1–November 23, 2015, at the 13 sentinel sites, among a total of 2,115 consultations 1,544 (73%) were for evaluation of febrile illness (subjective fever reported by patients and measured [≥100.4°F (≥38°C)] by a health care worker). Among these 1,544 consultations, a total of 1,553 RDT-malaria tests were reported to have been conducted (101% of patients tested) and 1,000 RDT-Ebola tests were conducted (65% of patients tested). Overall, 1,112 (72%) persons tested positive

TABLE. Implementation of RDT-Ebola program in 13 sentinel sites — Forécariah, Guinea, October 1–November 23, 2015

Variable	Sentinel site													
	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Consultations (no.)	89	41	327	138	206	507	25	140	274	100	88	67	113	**2,115**
Recorded fevers (no.)	68	21	276	88	169	426	18	30	148	76	65	60	99	**1,544**
Fevers >100.4°F (>38°C) (no.)	6	21	36	9	26	44	10	8	5	16	5	18	3	**207**
RDT-Ebola used (no.)	36	24	262	69	96	116	15	28	113	76	36	44	85	**1,000**
RDT-Malaria used (no.)	71	31	262	87	177	437	21	29	133	80	61	66	98	**1,553**
RDT-Malaria positive (no.)	51	25	137	66	131	334	18	17	105	62	45	38	83	**1,112**
Ratio of RDT-Ebola used to RDT-Malaria used	0.51	0.77	1.00	0.79	0.54	0.27	0.71	0.97	0.85	0.95	0.59	0.67	0.87	**0.64**
Consultations with recorded fever (%)	76.4	51.2	84.4	63.8	82.0	84.0	72.0	21.4	54.0	76.0	73.9	89.6	87.6	**73.0**
Positivity of malaria (%)	71.8	80.6	52.3	75.9	74.0	76.4	85.7	58.6	78.9	77.5	73.8	57.6	84.7	**71.6**

Abbreviations: RDT-Ebola = rapid diagnostic testing for Ebola; RDT-Malaria = rapid diagnostic testing for malaria.

for malaria by RDT (range of percentage of positive malaria tests among 13 sentinel sites = 52.3%–85.7%); none tested positive for Ebola by RDT-Ebola. The ratio of RDT-Ebola to RDT-Malaria tests used was 0.64 overall and ranged from 0.27 to 1.00 (Table). Reported barriers to RDT-Ebola use included inadequate stock of RDT-Ebola kits, lack of understanding of the CDC RDT-Ebola testing protocol, and patient refusal of RDT-Ebola testing, which might have contributed to the differences in the numbers of malaria and Ebola tests conducted.

Ongoing data collection from the sentinel sites can help to monitor the success of RDT-Ebola implementation, inform supply chain management, and identify and address barriers to RDT-Ebola use. RDT-Ebola implementation at the sentinel sites can also aid in screening for undetected Ebola cases to prevent establishment of new transmission chains.

Acknowledgments

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References

1. Dixon MG, Schafer IJ. Ebola viral disease outbreak—West Africa, 2014. MMWR Morb Mortal Wkly Rep 2014;63:548–51.
2. World Health Organization. Ebola situation report—16 December 2015. Geneva, Switzerland: World Health Organization; 2015. http://apps.who.int/ebola/current-situation/ebola-situation-report-16-december-2015
3. World Health Organization. Hundreds of contacts identified and monitored in new Ebola flare-up in Guinea. Update from the field: 22 March 2016. Geneva, Switzerland: World Health Organization; 2016. http://apps.who.int/csr/disease/ebola/guinea-flareup-update/en/index.html
4. World Health Organization. Ebola data and statistics. Geneva, Switzerland: World Health Organization; 2016. http://apps.who.int/gho/data/view.ebola-sitrep.ebola-summary-20160316?lang=en
5. Institut National de la Statistique Ministère du Plan, Conakry, Guinée. Enquête démographique et de santé et à indicateurs multiples (EDS-MICS) 2012. Calverton, MD: MEASURE DHS, ICF International; 2013. https://dhsprogram.com/pubs/pdf/FR280/FR280.pdf
6. Plucinski MM, Guilavogui T, Sidikiba S, et al. Effect of the Ebola-virus-disease epidemic on malaria case management in Guinea, 2014: a cross-sectional survey of health facilities. Lancet Infect Dis 2015;15:1017–23.
7. US Agency for International Development; Department of Health and Human Services; CDC; US Department of State. President's malaria initiative: Guinea. Malaria operational plan FY 2014. Washington, DC: US Agency for International Development; 2014. http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy14/guinea_mop_fy14.pdf?sfvrsn=10
8. Médecins Sans Frontières. Filovirus haemorrhagic fever guideline. Barcelona, Spain: Médecins Sans Frontières; 2008.

Announcements

STD Awareness Month — April 2016

According to data published by CDC in the 2014 Sexually Transmitted Diseases (STD) Surveillance Report (http://www.cdc.gov/std/stats14/surv-2014-print.pdf), cases of three nationally notifiable STDs (chlamydia, gonorrhea, and syphilis) have increased for the first time since 2006.

With approximately 1.4 million reported cases of chlamydia and a rate of 456.1 cases per 100,000 population, the rate of reported cases has increased 2.8 percent since 2013. Rates of primary and secondary (P&S) syphilis, the most infectious stages of syphilis, and gonorrhea, have both increased since 2013, by 15.1 percent and 5.1 percent, respectively. In 2014, there were 350,062 reported cases of gonorrhea (a rate of 110.7 per 100,000) and 19,999 reported cases of P&S syphilis (for a rate of 6.3 per 100,000).

STDs continue to affect young people, particularly women, most severely, but increasing rates among men, especially among gay, bisexual, and other men who have sex with men, contributed to the overall increases in 2014 for all three diseases.

April 2016 is CDC's annual STD Awareness Month, and the prevention theme for this year's campaign is Talk Test Treat. Individuals should begin a program of STD prevention by talking openly and honestly with their sexual partners and health care providers about their sexual history. Sexually transmitted infections might be asymptomatic; among sexually active persons, getting tested is one of the most important things they can do to protect their health. Health care providers can help their patients decide which tests are the most appropriate for them. Patients who test positive for an STD should work with their doctor to get the correct treatment, and ensure that the treatment works. Learning resources for patients, clinicians, and community members about STDs are available from CDC at http://www.cdc.gov/std/sam.

Sudden Death in the Young Case Registry

Approximately 3,500 infants die suddenly and unexpectedly each year in the United States (*1*). Less is known about the incidence in children because epidemiologic studies of these deaths in children are rare (*2*). The increased mortality risk in children with undetected heart conditions or epilepsy highlights the need for expanded surveillance to identify sudden unexpected death associated with these conditions (*3*,*4*).

In 2013, with support from the National Institutes of Health, CDC expanded its Sudden Unexpected Infant Death* Case Registry to develop the Sudden Death in the Young Case Registry (SDY-CR). The first registry helps states compile information on infant deaths that remain unexplained after investigation, whereas SDY-CR is an active surveillance system that targets both sudden cardiac deaths (SCD) and sudden unexpected deaths in epilepsy (SUDEP) among children and young adults. SDY-CR's goals are to 1) determine the incidence of SCD and SUDEP among infants, children, and adults aged ≤19 years, 2) collect clinical and demographic information about cases, 3) collect and store DNA samples in a biorepository for research, 3) examine preventable risk factors contributing to sudden unexpected death, and 4) inform prevention efforts.

Participating states and jurisdictions identify SDY-CR cases using existing child death review systems and protocols (*5*). SDY-CR also includes an advanced review team (e.g., cardiologists, neurologists, and forensic pathologists) who assist in categorizing sudden unexpected deaths in the young, using a standardized protocol. The National Institutes of Health will fund scientists who access SDY-CR data and samples to conduct research examining risk factors associated with SCD and SUDEP.

In 2016, seven states (Delaware, Georgia, Minnesota, New Hampshire, New Jersey, Nevada, and Tennessee) and three other jurisdictions (San Francisco; Tidewater, Virginia; and selected counties in Wisconsin) are participating in SDY-CR. Additional information about SDY-CR is available at http://www.nhlbi.nih.gov/news/spotlight/fact-sheet/frequently-asked-questions-about-sudden-death-young-case-registry.

* The death of an infant aged <1 year that occurs suddenly and unexpectedly, and whose cause of death is not immediately obvious before investigation.

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References

1. CDC. Sudden unexpected infant death and sudden infant death syndrome. Atlanta, GA: US Department of Health and Human Services, CDC; 2016. http://www.cdc.gov/sids/data.htm
2. Chugh SS, Reinier K, Balaji S, et al. Population-based analysis of sudden death in children: The Oregon Sudden Unexpected Death Study. Heart Rhythm 2009;6:1618–22. http://dx.doi.org/10.1016/j.hrthm.2009.07.046
3. Selassie AW, Wilson DA, Malek AM, et al. Premature deaths among children with epilepsy—South Carolina, 2000–2011. MMWR Morb Mortal Wkly Rep 2014;63:989–94.
4. Wong LC, Behr ER. Sudden unexplained death in infants and children: the role of undiagnosed inherited cardiac conditions. Europace 2014;16:1706–13. http://dx.doi.org/10.1093/europace/euu037
5. Covington TM. The US National Child Death review case reporting system. Inj Prev 2011;17(Suppl 1):i34–7. http://dx.doi.org/10.1136/ip.2010.031203

National Public Health Week — April 4–10, 2016

Every year since 1995, the American Public Health Association has led the observation of National Public Health Week in the United States during the first full week of April. The goal of National Public Health Week is to acknowledge contributions made by public health and to raise awareness of issues important to improving the nation's health. This year's observance focuses on building a nation of safe and healthy communities. Additional information about this year's observance is available at http://www.nphw.org.

In conjunction with this year's observance, CDC is partnering with the American Public Health Association to promote daily themes for National Public Health Week by sharing information on CDC topics that align with each day's theme. Additional information is available at http://www.cdc.gov/features/public-health-week/.

Erratum

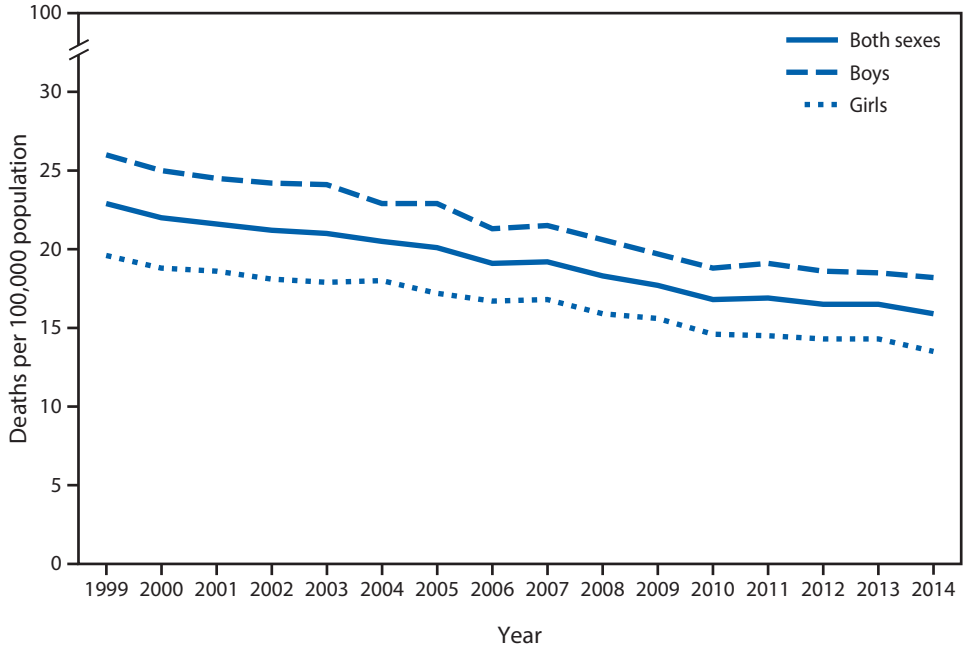
Vol. 65, No. 10

In the report, "Human Rabies — Missouri, 2014," on page 255, the second sentence of the first full paragraph should read as follows: "The rabies variant associated with this bat species occasionally infects other bats (e.g., *Tadarida braziliensis* [**Mexican free-tailed bat**]) as well as cats, foxes, and other species."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Death Rates* for Children and Adolescents Aged 1–14 Years, by Sex — United States, 1999–2014



*Deaths per 100,000 population.

In 2014, the crude death rate among children and adolescents aged 1–14 years was 15.9 per 100,000 population, a reduction of 30.6% from 22.9 per 100,000 population in 1999. During 1999–2014, the death rate decreased 30.0% for boys and 31.1% for girls; the death rate was higher for boys than girls throughout the period.

Source: CDC. Underlying cause of death 1999–2014. CDC WONDER. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. http://wonder.cdc.gov/.

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ISSN: 0149-2195 (Print)