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World TB Day — March 24, 2018

World TB Day is recognized each year on March 24, commemorating the date in 1882 when Dr. Robert Koch announced his discovery of *Mycobacterium tuberculosis*, the bacillus that causes tuberculosis (TB). World TB Day is an opportunity to raise awareness about TB and the measures needed to tackle this devastating disease. The U.S. theme for World TB Day 2018, "Wanted: leaders for a TB-free United States. We can make history. End TB" highlights the importance of engaging and empowering public health partners, clinicians, and communities in efforts to eliminate TB.

A study reported in this issue of *MMWR* found that in 2017, a provisional total of 9,093 TB cases were reported in the United States (rate of 2.8 cases per 100,000 persons) (*1*), a decrease from the 2016 case count and rate and the lowest rate and number of TB cases on record since reporting began in 1953. However, increased diagnosis and treatment of latent TB infection is important for eliminating TB in the United States (*2*).

CDC is working to eliminate TB in the United States by engaging new domestic and global partners, strengthening control of TB disease, and expanding testing and treatment of latent TB infection. Additional information about World TB Day and CDC's TB elimination activities is available online (https://www.cdc.gov/tb/worldtbday).

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Tuberculosis — United States, 2017

Rebekah J. Stewart, MSN, MPH[1]; Clarisse A. Tsang, MPH[1]; Robert H. Pratt[1]; Sandy F. Price[1]; Adam J. Langer, DVM[1]

In 2017, a total of 9,093 new cases of tuberculosis (TB) were provisionally* reported in the United States, representing an incidence rate of 2.8 cases per 100,000 population. The case count decreased by 1.8% from 2016 to 2017, and the rate declined by 2.5% over the same period. These decreases are consistent with the slight decline in TB seen over the past several years (*1*). This report summarizes provisional TB surveillance data reported to CDC's National Tuberculosis Surveillance System for 2017 and in the last decade. The rate

* This report is limited to National Tuberculosis Surveillance System case reports verified as of February 12, 2018. Updated data will be available in CDC's annual TB surveillance report later this year.

INSIDE

Continuing Education examination available at https://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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of TB among non–U.S.-born persons in 2017 was 15 times the rate among U.S.-born persons. Among non–U.S.-born persons, the highest TB rate among all racial/ethnic groups was among Asians (27.0 per 100,000 persons), followed by non-Hispanic blacks (blacks; 22.0). Among U.S.-born persons, most TB cases were reported among blacks (37.1%), followed by non-Hispanic whites (whites; 29.5%). Previous studies have shown that the majority of TB cases in the United States are attributed to reactivation of latent TB infection (LTBI) (*2*). Ongoing efforts to prevent TB transmission and disease in the United States remain important to continued progress toward TB elimination. Testing and treatment of populations most at risk for TB disease and LTBI, including persons born in countries with high TB prevalence and persons in high-risk congregate settings (*3*), are major components of this effort.

Health departments in the 50 states and the District of Columbia electronically report to CDC verified TB cases that meet the CDC and Council of State and Territorial Epidemiologists' surveillance case definition.[†] Reported data include the patient's country of birth, self-identified race and ethnicity (i.e., Hispanic or non-Hispanic), human immunodeficiency virus (HIV) status, drug-susceptibility test results, and information on risk factors, including homelessness[§] and residence in a congregate setting (i.e., long-term care or correctional facility). Persons of Hispanic ethnicity might be of any race; non-Hispanic persons are categorized as Asian, black, white, American Indian/Alaska Native, Native Hawaiian or other Pacific Islander, or of multiple races. A U.S.-born person is defined as a person who was eligible for U.S. citizenship at birth, regardless of the actual place of birth. CDC calculates overall national and state TB rates using U.S. Census Bureau population estimates and by racial/ethnic group and national origin using population denominators from the bureau's Current Population Survey.[¶] Yearly case counts and rates were compared overall and by origin of birth and race/ethnicity. Annual percent changes between years were calculated to compare differences in case counts and rates over time. Drug-susceptibility testing results were reported from

[†] Appendix A, page 137, Report of Verified Case of Tuberculosis (RVCT) Instruction Manual. https://www.cdc.gov/tb/programs/rvct/instructionmanual.pdf.

[§] Homelessness is defined as a lack of fixed, regular, and adequate nighttime residence at any time during the 12 months preceding TB diagnostic evaluation and a primary nighttime residence that is either a shelter, an institution that provides temporary residence for persons intended to be institutionalized, or a public place not designated for, or ordinarily used as, a regular sleeping accommodation for human beings. A homeless person may also be defined as a person without a home or in an unstable housing situation. Pages 85–86, Report of Verified Case of Tuberculosis (RVCT) Instruction Manual. https://www.cdc.gov/tb/programs/rvct/instructionmanual.pdf.

[¶] U.S. Census Bureau Population and Housing Unit Estimates Tables; https://www.census.gov/programs-surveys/popest/data/tables.html and Current Population Survey; https://www.census.gov/programs-surveys/cps.html.

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culture-confirmed cases in 2016, the most recent year for which complete TB drug-susceptibility data were available.

State-specific TB rates (cases per 100,000 persons) ranged from 0.3 in Montana to 8.1 in Hawaii (Table 1) with a median state TB rate of 1.8. As has been the case for the past decade, four states (California, Florida, New York, and Texas) reported half of the total TB cases in the United States in 2017. The annual percent change in rate in recent years has slowed from an average decline of 5.3% during 2010–2013 to an average decline of 2.0% during 2014–2017. In 2017, a total of 6,346 (69.8%) of U.S. TB cases occurred among non–U.S.-born persons, 2,698 (29.7%) cases occurred among U.S.-born persons, and 49 (0.5%) occurred among persons with no reported national origin. The TB rate among non–U.S.-born persons (14.6) was 15 times the rate among U.S.-born persons (1.0) (Figure). Although these rates represent decreases among both groups in 2017 compared with 2016, the rate among U.S.-born persons declined 7.0%, whereas that among non–U.S.-born persons declined 0.9%.

Among non–U.S.-born persons, the highest TB rate among all racial/ethnic groups occurred among Asians (27.0 per 100,000 persons), followed by blacks (22.0) (Table 2). As in previous years, in 2017, the top five countries of birth of non–U.S.-born persons with TB were Mexico (1,204; 19.0% of all non–U.S.-born persons with TB), Philippines (783; 12.3%), India (595; 9.4%), Vietnam (526; 8.3%), and China (400; 6.3%). Persons who received a diagnosis of TB ≥10 years after arriving in the United States accounted for 2,854 (45.0%) of all TB cases among non–U.S.-born persons.

TABLE 1. Tuberculosis (TB) case counts and incidence with annual percent changes, by U.S. Census division and state/district — 50 states and the District of Columbia, 2016 and 2017

	No. of reported TB cases*			TB incidence† per 100,000 persons		
Census division/State	**2016**	**2017**	**% change**	**2016**	**2017**	**% change§**
Division 1: New England						
Connecticut	52	63	21.2	1.4	1.8	21.1
Maine	23	14	-39.1	1.7	1.0	-39.4
Massachusetts	190	210	10.5	2.8	3.1	9.9
New Hampshire	15	19	26.7	1.1	1.4	25.9
Rhode Island	12	13	8.3	1.1	1.2	8.1
Vermont	6	3	-50.0	1.0	0.5	-50.0
Total	**298**	**322**	**8.1**	**2.0**	**2.2**	**7.7**
Division 2: Middle Atlantic						
New Jersey	294	278	-5.4	3.3	3.1	-5.7
New York	758	806	6.3	3.8	4.1	6.3
Pennsylvania	173	192	11.0	1.4	1.5	10.8
Total	**1,225**	**1,276**	**4.2**	**2.9**	**3.1**	**4.0**
Division 3: East North Central						
Illinois	341	337	-1.2	2.7	2.6	-0.9
Indiana	109	100	-8.3	1.6	1.5	-8.7
Michigan	133	132	-0.8	1.3	1.3	-1.0
Ohio	140	150	7.1	1.2	1.3	6.8
Wisconsin	40	50	25.0	0.7	0.9	24.5
Total	**763**	**769**	**0.8**	**1.6**	**1.6**	**0.6**
Division 4: West North Central						
Iowa	48	47	-2.1	1.5	1.5	-2.5
Kansas	39	29	-25.6	1.3	1.0	-25.8
Minnesota	168	178	6.0	3.0	3.2	5.0
Missouri	99	87	-12.1	1.6	1.4	-12.4
Nebraska	28	20	-28.6	1.5	1.0	-29.0
North Dakota	22	14	-36.4	2.9	1.9	-36.4
South Dakota	12	14	16.7	1.4	1.6	15.6
Total	**416**	**389**	**- 6.5**	**2.0**	**1.8**	**-7.0**
Division 5: South Atlantic						
Delaware	16	15	-6.3	1.7	1.6	-7.2
District of Columbia	25	36	44.0	3.7	5.2	42.0
Florida	639	549	-14.1	3.1	2.6	-15.4
Georgia	303	290	-4.3	2.9	2.8	-5.4
Maryland	221	208	-5.9	3.7	3.4	-6.3
North Carolina	219	213	-2.7	2.2	2.1	-3.8
South Carolina	102	101	-1.0	2.1	2.0	-2.3
Virginia	203	204	0.5	2.4	2.4	-0.2
West Virginia	14	16	14.3	0.8	0.9	15.1
Total	**1,742**	**1,632**	**-6.3**	**2.7**	**2.5**	**-7.3**

See table footnotes on next page.

TABLE 1. (*Continued*) Tuberculosis (TB) case counts and incidence with annual percent changes, by U.S. Census division and state/district — 50 states and the District of Columbia, 2016 and 2017

Census division/State	No. of reported TB cases*			TB incidence† per 100,000 persons		
	2016	2017	% change	2016	2017	% change§
Division 6: East South Central						
Alabama	112	120	7.1	2.3	2.5	6.8
Kentucky	91	65	-28.6	2.1	1.5	-28.9
Mississippi	61	53	-13.1	2.0	1.8	-13.1
Tennessee	103	128	24.3	1.5	1.9	23.0
Total	**367**	**366**	**-0.3**	**1.9**	**1.9**	**-0.8**
Division 7: West South Central						
Arkansas	91	85	-6.6	3.0	2.8	-7.1
Louisiana	127	141	11.0	2.7	3.0	11.1
Oklahoma	78	54	-30.8	2.0	1.4	-30.9
Texas	1,250	1,127	-9.8	4.5	4.0	-11.1
Total	**1,546**	**1,407**	**-9.0**	**3.9**	**3.5**	**-10.0**
Division 8: Mountain						
Arizona	188	188	0.0	2.7	2.7	-1.5
Colorado	64	84	31.3	1.2	1.5	29.4
Idaho	18	9	-50.0	1.1	0.5	-51.1
Montana	4	3	-25.0	0.4	0.3	-25.8
Nevada	55	80	45.5	1.9	2.7	42.6
New Mexico	39	37	-5.1	1.9	1.8	-5.2
Utah	20	29	45.0	0.7	0.9	42.3
Wyoming	1	2	100.0	0.2	0.3	101.9
Total	**389**	**432**	**11.1**	**1.6**	**1.8**	**9.5**
Division 9: Pacific						
Alaska	57	52	-8.8	7.7	7.0	-8.6
California	2,059	2,056	-0.1	5.2	5.2	-0.8
Hawaii	119	116	-2.5	8.3	8.1	-2.4
Oregon	70	69	-1.4	1.7	1.7	-2.8
Washington	205	207	1.0	2.8	2.8	-0.7
Total	**2,510**	**2,500**	**-0.4**	**4.8**	**4.7**	**-1.2**
United States	**9,256**	**9,093**	**-1.8**	**2.9**	**2.8**	**-2.5**

* Case counts based on data from the National Tuberculosis Surveillance System as of February 12, 2018.
† U.S. Census Bureau midyear population estimates provide the denominators used to calculate TB incidence.
§ Percentage change in incidence is calculated based on unrounded incidence for 2016 and 2017.

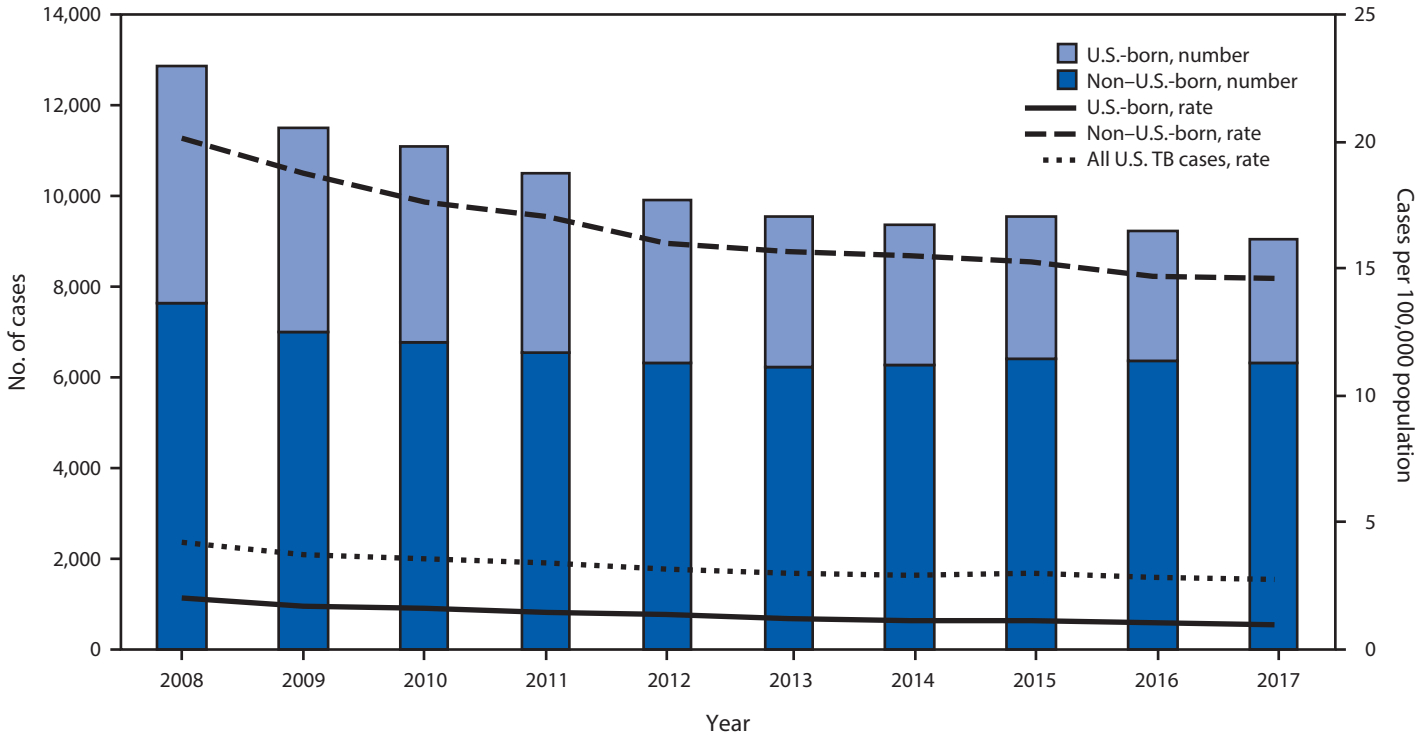
Among U.S.-born persons in 2017, a total of 1,001 (37.1%) TB cases were reported among blacks, and 797 (29.5%) among whites, representing a 55% decrease in case count for each group in the past decade. The highest TB rate among U.S.-born persons was reported among Native Hawaiians and other Pacific Islanders (6.5), followed by American Indians and Alaska Natives (3.7), blacks (2.8), Asians (2.0), Hispanics (1.5), and whites (0.4).

In 2017, 388 (4.3%) TB cases were reported among persons experiencing homelessness in the year preceding diagnosis, 148 (1.6%) among persons residing in a long-term care facility at the time of diagnosis, and 266 (3.0%) among persons confined in a correctional facility at the time of diagnosis. Although cases among U.S.-born persons accounted for <30% of total TB cases in the United States, they accounted for 61.1% among those reporting homelessness, 44.6% among those in long-term care facilities, and 39.5% among persons incarcerated at the time of diagnosis. HIV status was known for 86.3% of TB cases reported in 2017; among those cases, 5.6% had coinfection with HIV.

Drug susceptibility testing results were reported for 98.3% of culture-confirmed cases in 2016. Among all 9,256 cases reported in 2016, 97 (1.0%) were multidrug-resistant (MDR) TB, including 78 (80.4%) cases with primary MDR TB,** 18 (18.6%) with a prior history of TB, and one (1.0%) with an unknown history of previous TB diagnosis. Among the 97 MDR TB cases in 2016, 89 (91.8%) occurred among 6,355 non–U.S.-born persons, accounting for 1.4% of all TB cases among non–U.S.-born persons. One case of extensively drug-resistant†† TB was reported in a non–U.S.-born person.

** Primary multidrug-resistant tuberculosis (TB) is defined as a case of TB in a person with a *Mycobacterium tuberculosis* isolate with resistance to at least isoniazid and rifampin and who was not previously diagnosed with or treated for drug-susceptible TB disease.
†† Defined by the World Health Organization as a case of TB in a person with a *Mycobacterium tuberculosis* isolate with resistance to at least isoniazid and rifampin among first-line anti-TB drugs, resistance to any fluoroquinolone (e.g., ciprofloxacin or ofloxacin), and resistance to at least one second-line injectable drug (i.e., amikacin, capreomycin, or kanamycin).

FIGURE. Number of tuberculosis (TB) cases and rate, by national origin — United States, 2008–2017



Discussion

In 2017, the provisional TB case count and incidence were the lowest in the United States since national TB surveillance began in 1953 (*1*); however, the rate in 2017 (2.8 per 100,000) is still 28 times the U.S. elimination threshold of less than one case per million persons (*4*). Since 2014, the annual percentage change in rate compared with the preceding year has slowed to an average decline of 2.0%. To achieve TB elimination by 2100, a sustained annual decline of 3.9% is required.[§§] Previous studies have indicated that reactivation of LTBI, rather than recent transmission, is the primary driver of TB disease in the United States, accounting for >80% of all TB cases (*2*). Ongoing efforts to prevent TB transmission must be sustained, and efforts to detect and treat LTBI, especially among groups at high risk, must be increased.

An epidemiologic model found that substantial (i.e., quadruple) increases in LTBI testing and treatment completion would accelerate progress toward TB elimination (*4*). Several accepted treatment regimens are available for LTBI (*5*). Among these, CDC encourages the use of shorter, rifamycin-based regimens, such as 4 months of rifampin or 3 months of once-weekly rifapentine plus isoniazid, which have better treatment completion rates (*6*) and are less hepatotoxic (*7*,*8*) than a regimen of 9 months of isoniazid. Improved treatment completion, less toxicity, and shorter treatment regimens can reduce morbidity and accelerate TB elimination in the United States.

Distinct disparities exist between populations affected by TB. Highly affected and vulnerable populations include persons housed in congregate settings and persons from countries with high TB prevalences. The U.S. Preventive Services Task Force (USPSTF) recommends screening for LTBI in populations at increased risk, including persons born in countries with high TB prevalences, regardless of length of residence in the United States and age (*3*); this recommendation is consistent with a previously published report documenting an increasing proportion of TB diagnoses among non–U.S.-born persons living in the United States for ≥10 years (*9*). In addition to USPSTF screening recommendations, CDC also recommends treatment of LTBI to reduce the number of persons developing TB disease (*5*). Increased support of global TB elimination efforts would help to reduce global TB and LTBI prevalence, thereby indirectly reducing the incidence of reactivation TB in the United States among non–U.S.-born persons from higher-prevalence countries.

Spending time in congregate settings, such as homeless shelters, long-term care facilities, and correctional facilities, increases the risk for TB transmission. Most requests from state or local health departments for on-site CDC assistance

[§§] Sustained annual percent decline to reach TB elimination calculated as the yearly incidence reduction necessary to get from current rate to one case per million persons in 2100.

TABLE 2. Tuberculosis (TB) case counts and incidence,* by national origin and race/ethnicity — United States, 2014–2017†

U.S. population group	No. of cases (incidence)			
	2014	2015	2016	2017
U.S.-born§				
Hispanic	651 (1.8)	659 (1.8)	602 (1.6)	589 (1.5)
White, non-Hispanic	969 (0.5)	985 (0.5)	910 (0.5)	797 (0.4)
Black, non-Hispanic	1,185 (3.4)	1,141 (3.3)	1,067 (3.0)	1,001 (2.8)
Asian	139 (2.1)	139 (2.1)	146 (2.1)	136 (2.0)
American Indian/ Alaska Native	117 (5.2)	144 (7.0)	108 (5.0)	89 (3.7)
Native Hawaiian/ Pacific Islander	40 (6.0)	42 (6.1)	31 (4.3)	45 (6.5)
Multiple or unknown race/ethnicity	28 (—¶)	25 (—¶)	25 (—¶)	41 (—¶)
Total U.S.-born	3,129 (1.1)	3,135 (1.1)	2,889 (1.0)	2,698 (1.0)
Non–U.S.-born				
Hispanic	2,095 (11.2)	2,036 (10.4)	1,988 (10.0)	1,952 (9.9)
White, non-Hispanic	276 (3.6)	257 (3.4)	286 (3.8)	268 (3.5)
Black, non-Hispanic	829 (23.6)	855 (23.1)	908 (22.6)	892 (22.0)
Asian	2,945 (29.6)	3,156 (29.6)	3,055 (27.2)	3,087 (27.0)
American Indian/ Alaska Native	0 (0.0)	1 (1.9)	1 (2.9)	3 (4.3)
Native Hawaiian/ Pacific Islander	51 (22.8)	60 (18.6)	47 (13.0)	62 (21.0)
Multiple or unknown race/ethnicity	69 (—¶)	42 (—¶)	70 (—¶)	82 (—¶)
Total non–U.S.-born	6,265 (15.5)	6,407 (15.3)	6,355 (14.7)	6,346 (14.6)
Unknown national origin	5 (—¶)	6(—¶)	12 (—¶)	49 (—¶)
Overall total	**9,399 (2.9)**	**9,548 (3.0)**	**9,256 (2.9)**	**9,093 (2.8)**

* Incidence calculated per 100,000 persons.
† Case counts based on data from the National Tuberculosis Surveillance System as of February 12, 2018. The Current Population Survey (https://www.census.gov/programs-surveys/cps.html) provides the population denominators used to calculate TB incidence according to national origin and racial/ethnic group.
§ U.S.-born persons were born in the United States or U.S. territories (American Samoa, Commonwealth of the Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands) or born elsewhere to a U.S. citizen. Non–U.S.-born persons were born outside the United States (or the U.S. territories), and include those born in the sovereign freely associated states (Federated States of Micronesia, Republic of the Marshall Islands, and Republic of Palau) (unless one or both parents were U.S. citizens).
¶ Incidence was not calculated for these categories.

arise from TB outbreaks involving congregate settings serving vulnerable populations (*10*). The USPSTF recommends TB testing for persons who have lived in high-risk congregate settings, such as homeless shelters and correctional facilities (*3*). Control of transmission requires not only preventing disease through treatment of LTBI, but also strong infection control practices in settings with increased risk for transmission.

The findings in this report are subject to at least two limitations. First, this analysis is limited to reported provisional TB cases and case rates for 2017; final results will be available in the fall of 2018. Second, case rates are calculated using 2017 population estimates as denominators.

Summary

What is already known about this topic?

Since 1993, tuberculosis (TB) case counts and rates have declined in the United States. As the number of cases decreases overall, an increasing percentage of cases occurs among non–U.S.-born persons. Disparities also exist within racial, ethnic, and social groups among U.S.-born persons with TB.

What is added by this report?

In 2017, preliminary data indicate that 9,093 new TB cases were reported in the United States, a rate of 2.8 per 100,000 population. This is the lowest case count and rate on record, representing a decrease in case count of 1.8% from 2016 to 2017 and a 2.5% decrease in rate over the same period. The annual percent decline in rate in recent years has slowed to 2.0%. To achieve TB elimination by 2100, a sustained annual decline of 3.9% is required.

What are the implications for public health practice?

Control of active TB and a major effort to decrease latent TB infection are both necessary to reduce morbidity and achieve TB elimination in the United States. An important component of this strategy is the testing and treatment of populations most at risk for latent TB infection, persons born in countries with high TB prevalence, and persons in high-risk congregate settings.

Since 2015, TB case counts and rates in the United States have declined, in large part because of the work of local TB programs in detecting and treating persons with TB disease. Approximately 96% of persons with diagnosed TB disease in the United States complete therapy (*1*), thereby limiting the risk for further transmission and development of MDR TB. TB is preventable through LTBI testing and treatment and implementation of effective infection control measures; however, TB elimination goals in the United States will not be achieved without steadfast engagement among public health partners and sustained prevention and control programs. Public health priorities for TB elimination in the United States include developing comprehensive and innovative approaches to diagnosing, treating, and monitoring LTBI; continued engagement by the United States in global TB control efforts; and enhanced efforts to prevent TB transmission in the United States, particularly in congregate settings.

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Conflict of Interest

No conflicts of interest were reported.

[1]Division of Tuberculosis Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC.

Corresponding authors: Rebekah J. Stewart, rschicker@cdc.gov, 404-718-4580; Clarisse A. Tsang, ctsang@cdc.gov, 404-718-5360.

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Preliminary Incidence and Trends of Infections with Pathogens Transmitted Commonly Through Food — Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 2006–2017

Ellyn P. Marder, MPH[1]; Patricia M. Griffin, MD[1]; Paul R. Cieslak, MD[2]; John Dunn, DVM[3]; Sharon Hurd, MPH[4]; Rachel Jervis, MPH[5]; Sarah Lathrop, PhD[6]; Alison Muse, MPH[7]; Patricia Ryan, MS[8]; Kirk Smith, DVM[9]; Melissa Tobin-D'Angelo, MD[10]; Duc J. Vugia, MD[11]; Kristin G. Holt, DVM[12]; Beverly J. Wolpert, PhD[13]; Robert Tauxe, MD[1]; Aimee L. Geissler, PhD[1]

Despite ongoing food safety measures in the United States, foodborne illness continues to be a substantial health burden. The 10 U.S. sites of the Foodborne Diseases Active Surveillance Network (FoodNet)* monitor cases of laboratory-diagnosed infections caused by nine pathogens transmitted commonly through food. This report summarizes preliminary 2017 data and describes changes in incidence since 2006. In 2017, FoodNet reported 24,484 infections, 5,677 hospitalizations, and 122 deaths. Compared with 2014–2016, the 2017 incidence of infections with *Campylobacter*, *Listeria*, non-O157 Shiga toxin–producing *Escherichia coli* (STEC), *Yersinia*, *Vibrio*, and *Cyclospora* increased. The increased incidences of pathogens for which testing was previously limited might have resulted from the increased use and sensitivity of culture-independent diagnostic tests (CIDTs), which can improve incidence estimates (*1*). Compared with 2006–2008, the 2017 incidence of infections with *Salmonella* serotypes Typhimurium and Heidelberg decreased, and the incidence of serotypes Javiana, Infantis, and Thompson increased. New regulatory requirements that include enhanced testing of poultry products for *Salmonella*† might have contributed to the decreases. The incidence of STEC O157 infections during 2017 also decreased compared with 2006–2008, which parallels reductions in isolations from ground beef.§ The declines in two *Salmonella* serotypes and STEC O157 infections provide supportive evidence that targeted control measures are effective. The marked increases in infections caused by some *Salmonella* serotypes provide an opportunity to investigate food and non-food sources of infection and to design specific interventions.

FoodNet conducts active, population-based surveillance for laboratory-diagnosed infections caused by *Campylobacter, Cryptosporidium, Cyclospora, Listeria, Salmonella,* STEC, *Shigella, Vibrio,* and *Yersinia* in 10 sites that account for approximately 15% of the U.S. population (an estimated 49 million persons in 2016). FoodNet is a collaboration among CDC, 10 state health departments, the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS), and the Food and Drug Administration (FDA). Laboratory-diagnosed bacterial infections are defined as isolation of bacteria from a clinical specimen by culture or detection by a CIDT. CIDTs detect bacterial antigens, nucleic acid sequences, or, for STEC, Shiga toxin or Shiga toxin genes.¶ A CIDT-positive–only bacterial infection is a positive CIDT result without culture confirmation. *Listeria* cases are defined as isolation of *L. monocytogenes* or detection by a CIDT from a normally sterile site or from placental or fetal tissue in the instance of miscarriage or stillbirth. Laboratory-diagnosed parasitic infections are defined as detection of the parasite from a clinical specimen. Hospitalizations and deaths within 7 days of specimen collection are attributed to the infection. Surveillance for physician-diagnosed postdiarrheal hemolytic uremic syndrome (HUS) is conducted through a network of nephrologists and infection preventionists and hospital discharge data review. This report includes pediatric HUS cases identified during 2016, the most recent year for which data are available.

Incidence per 100,000 population was calculated by dividing the number of infections in 2017 by the U.S. Census estimates of the surveillance area population for 2016. Incidence measures include all laboratory-diagnosed infections reported. A negative binomial model with 95% confidence intervals (CIs) was used to estimate change in incidence during 2017 compared with that during 2014–2016 and 2006–2008. Because of large changes in testing practices since 2006, incidence comparisons with 2006–2008 used only culture-confirmed bacterial infections, and comparisons with 2014–2016 used culture-confirmed and CIDT-positive–only cases combined. For HUS, 2016 incidence was compared with that during 2013–2015.

* Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York https://www.cdc.gov/foodnet.

† https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/foodborne-illness-and-disease/salmonella/sap-two-year and https://www.fsis.usda.gov/wps/wcm/connect/fb8c866a-a9b7-4b0d-81c9-0f190c4a8d4d/2011-0012F.htm?MOD=AJPERES.

§ https://www.fsis.usda.gov/wps/portal/fsis/topics/data-collection-and-reports/microbiology/ec/e-coli-o157h7-year-to-date/ecoli-o157-raw-beef-testing-data-ytd.

¶ For Shiga toxin–producing *Escherichia coli*, only CIDT reports that were positive at a state public health laboratory were counted.

Cases of Infection, Incidence, and Trends

During 2017, FoodNet identified 24,484 cases of infection, 5,677 hospitalizations, and 122 deaths. The incidence of infection per 100,000 population was highest for *Campylobacter* (19.2) and *Salmonella* (16.0), followed by *Shigella* (4.3), STEC (4.2),** *Cryptosporidium* (3.7), *Yersinia* (1.0), *Vibrio* (0.7), *Listeria* (0.3), and *Cyclospora* (0.3) (Table 1). The percentage of CIDT-positive–only infections, including those that were culture-negative and those not tested by culture, were *Yersinia* (51%), *Campylobacter* (36%), *Shigella* (31%), *Vibrio* (29%), STEC (27%), *Salmonella* (9%), and *Listeria* (1%) (Figure). Compared with incidence during 2014–2016, the 2017 incidence was significantly higher for *Cyclospora* (489% increase), *Yersinia* (166% increase), *Vibrio* (54% increase), STEC (28% increase), *Listeria* (26% increase), and *Campylobacter* (10% increase) (Table 1). Bacterial infections diagnosed by CIDT increased 96% overall (range = 34%–700% per pathogen) in 2017 compared with those diagnosed during 2014–2016. Reflex culture†† was attempted on 71% of CIDT-positive specimens, ranging from 63% for *Campylobacter* to 100% for *Listeria* (Figure). Among specimens on which a reflex culture was performed, the percentage of positive cultures ranged from 38% for *Vibrio* to 90% for *Salmonella*.

Among 6,373 (89%) fully serotyped *Salmonella* isolates, the five most common were Enteritidis (incidence = 2.6 per 100,000), Typhimurium (1.4), Newport (1.3), Javiana (1.1), and the monophasic variant of Typhimurium, I 4,[5],12:i:- (0.9) (Table 2). Among the 13 most common serotypes, the incidence for Heidelberg in 2017 was 65% lower than during 2006–2008 and 38% lower than during 2014–2016 (Table 2). It was also significantly lower for Typhimurium for both periods (42% and 14%, respectively).

Among 1,473 STEC isolates tested for the O157 antigen, 413 (28%) were determined to be O157. Among the 766 non-O157 STEC isolates with serogroup determined, the most common were O26 (29%), O103 (26%), and O111 (18%). During 2017, the incidence of non-O157 STEC significantly increased 25% (95% CI = 9–44) compared with that during 2014–2016; incidence of STEC O157 was unchanged. However, compared with 2006–2008, the incidence of STEC O157 was significantly lower (35% decrease; 95% CI = 21–46).

FoodNet identified 57 cases of HUS in children (incidence = 0.51 per 100,000) during 2016; 35 (61%) occurred among children aged <5 years (incidence = 1.18 per 100,000). The incidence during 2016 compared with that during 2013–2015 was not significantly different among all children or those aged <5 years. The incidence among children aged <5 years significantly decreased 36% (95% CI = 8–55) in 2016 compared with 2006–2008.

TABLE 1. Incidence of bacterial and parasitic infections in 2017 and percentage change compared with 2014–2016 average annual incidence, by pathogen — FoodNet sites,* 2014–2017†

Pathogen	2017		2017 versus 2014–2016	
	No. of cases	Incidence rate§	% Change¶	(95% CI)
Bacteria				
Campylobacter	9,421	19.1	10	(2 to 18)
Salmonella	7,895	16.0	-5	(-11 to 1)
Shigella	2,132	4.3	-3	(-25 to 25)
Shiga toxin–producing *E. coli***	2,050	4.2	28	(9 to 50)
Yersinia	489	1.0	166	(113 to 234)
Vibrio	340	0.7	54	(26 to 87)
Listeria	158	0.3	26	(2 to 55)
Parasites				
Cryptosporidium	1,836	3.7	10	(-16 to 42)
Cyclospora	163	0.3	489	(253 to 883)

Abbreviations: CI = confidence interval; FoodNet = CDC's Foodborne Diseases Active Surveillance Network.

* Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York.

† Data for 2017 are preliminary.

§ Per 100,000 population.

¶ Percentage change reported as increase or decrease.

** For Shiga toxin–producing *E. coli*, all serogroups were combined because it is not possible to distinguish between serogroups using culture-independent diagnostic tests. Reports that were only Shiga toxin–positive from clinical laboratories and were Shiga toxin–negative at a public health laboratory were excluded (n=518). When these were included, the incidence rate was 5.2, which was a 57% increase (CI = 33% to 85%).

Discussion

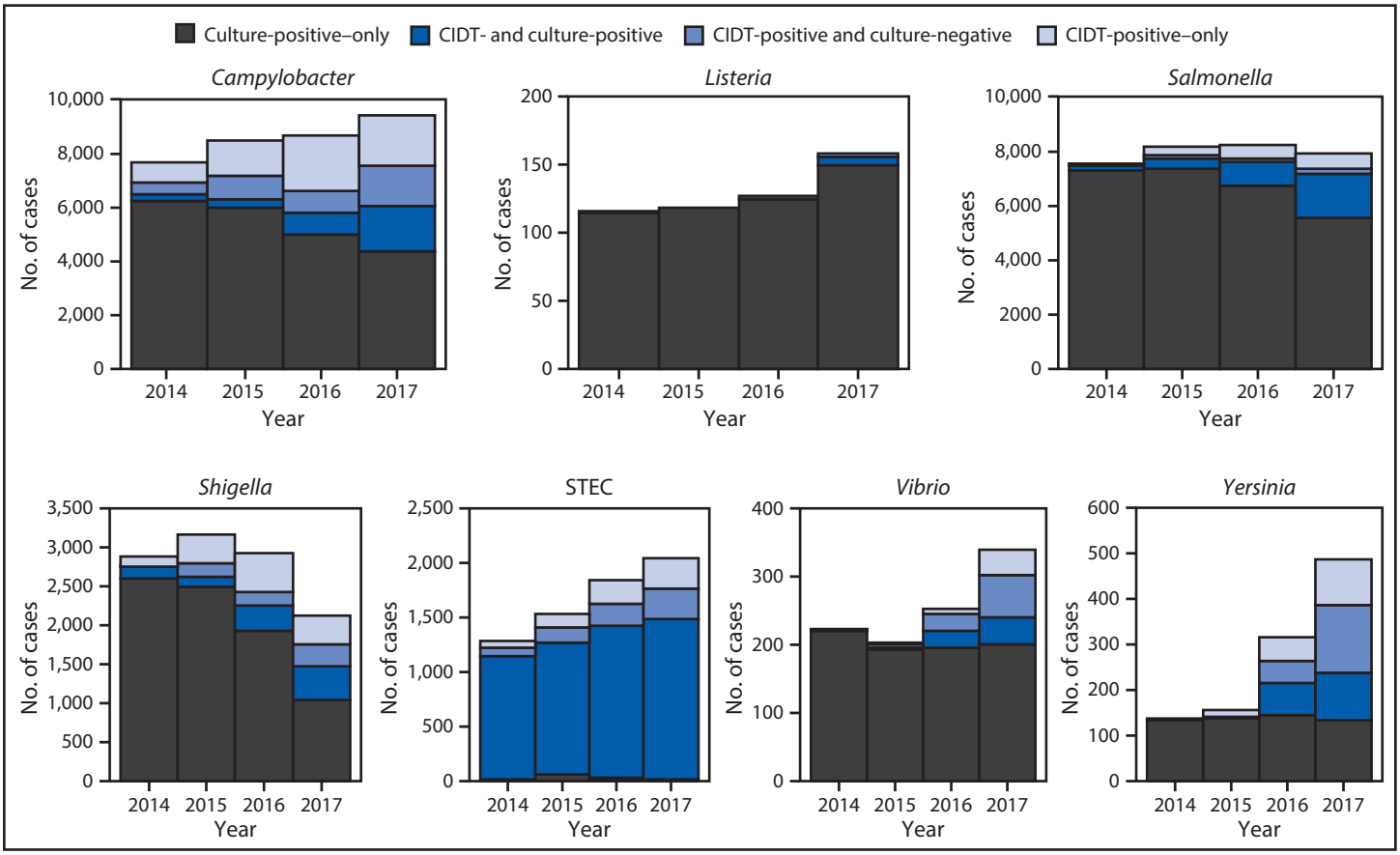
Clinical laboratories are steadily increasing the use of CIDTs, particularly DNA-based syndrome panels, to diagnose enteric pathogens (*2*). Previously, routine stool tests typically only included methods for identifying *Salmonella*, *Campylobacter*, *Shigella*, and STEC O157 (*3*). CIDTs benefit public health by identifying illnesses caused by pathogens not captured routinely by older methods, revealing more accurate incidence estimates for some pathogens. For example, most laboratories required a specific request to test for *Cyclospora*. Because use of panel tests has risen, routine tests more often include *Cyclospora* as well as *Yersinia*, *Vibrio*, and non-O157 STEC. The increased incidence of these infections in 2017 was most likely driven by the increased use of CIDTs.

Although the number of *Salmonella* infections with CIDT-positive results increased 176% during 2017 compared with 2014–2016, the overall percentage without culture confirmation remained relatively low (9%) because of the high frequency and success of reflex culture, which is necessary for subtyping. Infections caused by serotypes Typhimurium

** Excludes Shiga toxin-positive–only reports from clinical laboratories that were Shiga toxin–negative at a public health laboratory (n = 518).

†† Culturing of a specimen with a positive CIDT result.

FIGURE. Number of infections diagnosed by culture or culture-independent diagnostic tests, by pathogen, year, and culture status — FoodNet sites,* 2014–2017†,§



Abbreviations: CIDT = culture-independent diagnostic test; FoodNet = CDC's Foodborne Diseases Active Surveillance Network; STEC = Shiga toxin–producing *Escherichia coli*.

* Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York.

† Data for 2017 are preliminary.

§ For STEC, all serogroups were combined, as it is impossible to distinguish between serogroups using CIDTs. Shiga toxin-positive–only reports from clinical laboratories that were Shiga toxin–negative at a public health laboratory were excluded (n = 518).

(including I 4,[5],12:i:-) and Heidelberg have decreased considerably over the past 10 years. These declines mirror decreases in broiler chicken samples that yielded *Salmonella* and, specifically, serotype Heidelberg (USDA-FSIS, unpublished data). These declines might be partly because of industry measures to vaccinate poultry flocks against these serotypes (*4*) as well as implementation of measures by USDA-FSIS to decrease *Salmonella* in poultry and beef products.

Despite these decreases, the overall incidence of *Salmonella* has not substantially declined since 2014–2016, partly because infections with some serotypes have increased. In particular, infections caused by serotypes Javiana, Thompson, and Infantis each increased approximately 50% compared with 2006–2008. Like most serotypes, these have been linked to both food and other exposures, including animal contact (*5*). Thus, some of these infections are likely attributable to nonfood exposures. USDA-FSIS also noted an increase of >50% in the percentage of broiler chicken samples that yielded Infantis from 2006 to 2017 (USDA-FSIS, unpublished data).

The decreasing availability of STEC serogroup information, attributable to CIDTs, makes interpretation of trends difficult. However, the decreased incidence of HUS among young children during 2016 compared with that during 2006–2008 provides evidence that supports the finding of a decline in STEC O157 infections because most HUS cases are caused by STEC O157 (*6*). This decline also mirrors declines in STEC O157 in ground beef during the same period.

CIDTs pose challenges to public health when reflex culture is not performed. Without isolates, public health laboratories are unable to subtype pathogens, determine antimicrobial susceptibility, and detect outbreaks. Reflex culture recovery rates vary, which could be attributed to false positives, low numbers of bacteria, storage or transport problems, or insensitive culture techniques (*7*,*8*). Furthermore, CIDTs vary in sensitivity and

TABLE 2. Incidence of infection of the top 13 *Salmonella* serotypes in 2017 compared with 2006–2008 and 2014–2016 average annual incidence, by pathogen — FoodNet sites,* 2006–2017†

	2017	2017 versus 2006–2008		2017 versus 2014–2016	
Serotype	Incidence rate§	% Change¶	(95% CI)	% Change¶	(95% CI)
Enteritidis	2.6	3	(-11 to 20)	-8	(-21 to 7)
Typhimurium**	1.4	-42	(-48 to -34)	-14	(-24 to -2)
Newport	1.3	-5	(-22 to 16)	-19	(-34 to -2)
Javiana	1.1	99	(57 to 153)	-7	(-26 to 17)
I 4,[5],12:i:-**	0.9	35	(-5 to 74)	1	(-22 to 29)
Muenchen	0.4	-13	(-35 to 14)	-4	(-28 to 27)
Infantis	0.3	60	(19 to 113)	-20	(-39 to 6)
Montevideo	0.3	-30	(-47 to -8)	24	(-7 to 66)
Braenderup	0.3	29	(-5 to 76)	25	(-8 to 70)
Saintpaul	0.3	-36	(-53 to -14)	-20	(-40 to 9)
Thompson	0.3	70	(22 to 138)	32	(-5 to 84)
I 13,23:b:-††	0.3	N/A	N/A	N/A	N/A
Heidelberg	0.2	-65	(-75 to -52)	-38	(-55 to -15)

Abbreviations: CI = confidence interval; FoodNet = CDC Foodborne Diseases Active Surveillance Network; N/A = not applicable.
* Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York.
† Data for 2017 are preliminary.
§ Per 100,000 population.
¶ Percentage change reported as increase or decrease.
** Percentage change (95% CI) for Typhimurium including monophasic variant (I, 4[5],12:i:-) compared with 2006–2008 and 2014–2016 was -26% (-34% to -17%) and -11% (-20% to 0%), respectively.
†† Comparisons could not be calculated for serotype I 13,23,b:I because of sparse data across the entire period.

specificity. Evaluations of panel tests have indicated high sensitivity and specificity, differing by test type and manufacturer. The Association of Public Health Laboratories recommends that clinical laboratories culture CIDT-positive specimens (*9*). The lack of isolates for 25% of bacterial infections in 2017 is cause for concern.

The findings in this report are subject to at least two limitations. First, the changing diagnostic landscape makes interpretation of incidence and trends difficult. In addition to actual increases in infection, increases in reported incidence might be due to some health care providers being more likely to order a CIDT because results are more quickly obtained than with traditional culture methods (*1*). Increases in incidence could also be due to increased use of DNA-based syndrome panel tests that diagnose pathogens not captured routinely by older methods. With improved sensitivity and specificity of DNA-based CIDTs, infections that previously would have remained undetected by culture methods might now be detected. Second, changes in incidence can reflect year-to-year variation rather than sustained trends.

Most foodborne illnesses can be prevented. New regulatory requirements aimed at reducing contamination of poultry meat might have contributed to decreases in incidence of infections caused by *Salmonella* serotypes Typhimurium and Heidelberg. Vaccination might also have contributed, but the extent of vaccination in poultry broiler flocks has not been reported. The declines in these and in STEC O157 infections provide supportive evidence that targeted control measures are effective. More control measures are needed and might be achieved with continued implementation of the FDA Food Safety Modernization Act,§§ new or revised meat and poultry performance standards, and enhanced training and guidance for industry and inspection personnel. In particular, measures targeting specific *Salmonella* serotypes, including vaccination of broiler poultry flocks, might result in a marked decrease in human illness, as has been seen in the United Kingdom (*10*).

§§ https://www.fda.gov/Food/GuidanceRegulation/FSMA/.

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Workgroup members, Foodborne Diseases Active Surveillance Network (FoodNet), Emerging Infections Program, CDC; Brittany Behm, Staci Dixon, Elizabeth Greene, Logan Ray, Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; Neal Golden, Steven Mamber, and Joanna Zablotsky Kufel, U.S. Department of Agriculture's Food Safety and Inspection Service.

Conflict of Interest

No conflicts of interest were reported.

[1]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]Oregon Health Authority; [3]Tennessee Department of Health; [4]Connecticut Department of Public Health; [5]Colorado Department of Public Health and Environment; [6]University of New Mexico, Albuquerque; [7]New York State Department of Health; [8]Maryland Department of Health; [9]Minnesota Department of Health; [10]Georgia Department of Public Health; [11]California Department of Public Health; [12]Food Safety and Inspection Service, U.S. Department of Agriculture, Atlanta, Georgia; [13]Center for Food Safety and Applied Nutrition, Food and Drug Administration, Silver Spring, Maryland.

Corresponding author: Ellyn Marder, emarder1@cdc.gov, 404-718-4722.

Summary

What is already known about this topic?

The incidence of infections transmitted commonly through food has remained largely unchanged for many years. Culture-independent diagnostic tests (CIDTs) are increasingly used by clinical laboratories to detect enteric infections. CIDTs benefit public health surveillance by identifying illnesses caused by pathogens not captured routinely by previous laboratory methods.

What is added by this report?

Decreases in incidence of infection of Shiga toxin–producing *Escherichia coli* (STEC) O157 and *Salmonella* serotypes Typhimurium and Heidelberg have been observed over the past 10 years. These declines parallel findings of decreased *Salmonella* contamination of poultry meat and decreased STEC O157 contamination of ground beef.

What are the implications for public health practice?

As use of CIDTs continues to increase, higher, more accurate incidence rates might be observed. However, without isolates, public health laboratories are unable to subtype pathogens, determine antimicrobial susceptibility, and detect outbreaks. Further prevention measures are needed to decrease the incidence of infection by pathogens transmitted commonly through food.

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Characteristics of and Precipitating Circumstances Surrounding Suicide Among Persons Aged 10–17 Years — Utah, 2011–2015

Francis B. Annor, PhD[1,2]; Marissa L. Zwald, PhD[1,3]; Amanda Wilkinson, PhD[1,4]; Mike Friedrichs, MS[5]; Anna Fondario, MPH[5]; Angela Dunn, MD[5]; Allyn Nakashima, MD[5]; Leah K. Gilbert, MD[2]; Asha Z. Ivey-Stephenson, PhD[2]

In 2015, suicide was the third leading cause of death among persons aged 10–17 years (*1*), and in Utah, the age-adjusted suicide rate was consistently higher than the national rate during the past decade (*2*). In January 2017, the Utah Department of Health (UDOH) invited CDC to assist with an epidemiologic investigation of suicides among youths aged 10–17 years during 2011–2015 to identify precipitating factors. CDC analyzed data from the Utah Violent Death Reporting System (UTVDRS), National Vital Statistics System, and additional information collected in the field. During 2011–2015 in Utah, 150 youths died by suicide. Approximately three fourths of decedents were male (77.4%) and aged 15–17 years (75.4%). During this period, the unadjusted suicide rate per 100,000 youths in Utah increased 136.2%, from 4.7 per 100,000 population (2011) to 11.1 (2015), whereas among youths nationwide, the rate increased 23.5%, from 3.4 to 4.1. Among suicide decedents with circumstances data available, more than two thirds (68.3%) had multiple precipitating circumstances, including mental health diagnosis (35.2%), depressed mood (31.0%), recent crisis (55.3%), and history of suicidal ideation or attempt (29.6%). CDC's technical package of policies, programs, and practices to prevent suicide supported by the best available evidence can be used as a suicide prevention resource (*3*).

UTVDRS is part of CDC's National Violent Death Reporting System,* which collects information on violent deaths, including suicides, from multiple sources, including death certificates, coroner and medical examiner reports, and law enforcement reports, to monitor trends, understand violent death characteristics and circumstances, and inform prevention efforts (*4*). Data from the National Vital Statistics System, accessed through CDC WONDER, provided national data for the comparison of suicide rates between Utah and U.S. youths aged 10–17 years during 2011–2015 (*2*). The crude suicide rate per 100,000 was estimated and descriptive analyses were performed to examine the demographic characteristics, precipitating circumstances, and toxicology results of decedents. Joinpoint regression was performed to test trends over time and to estimate annual percentage change. The additional data collected were obtained from medical examiner, law enforcement, autopsy, and toxicology reports, as well as obituary and online news articles. Previous research and initial reading of some of the narratives on youth suicide informed the collection of the additional data, which were considered potential precipitating circumstances for youth suicide, but which are not routinely collected by the UTVDRS, such as cutting and other self-harm behaviors. For this investigation, suicide was defined using the *International Classification of Diseases, Tenth Revision* (ICD-10) underlying cause of death codes X60–X84.

During 2011–2015, 150 youths aged 10–17 years died by suicide in Utah. More than three fourths of these decedents were male (77.4%), non-Hispanic white (81.3%), and aged 15–17 years (75.4%; average age = 15.3 years [standard deviation = 1.6]) (Table 1). The two most common methods of suicide were suffocation and firearm, which accounted for 46.0% and 45.3% of deaths, respectively. Among 148 suicide victims with information on location, 124 (83.8%) of the fatal injuries occurred at home.

TABLE 1. Suicides* among persons aged 10–17 years (N = 150), by selected characteristics — Utah, 2011–2015

Characteristic	No. (%)
Sex	
Male	116 (77.4)
Female	34 (22.6)
Race/Ethnicity	
White, non-Hispanic	122 (81.3)
Nonwhite†	28 (18.7)
Age group (yrs)	
10–14	37 (24.6)
15–17	113 (75.4)
Mean (SD, range)	15.3 (1.6, 10–17)
Mechanism	
Suffocation§	69 (46.0)
Firearm	68 (45.3)
Other¶	13 (8.7)
Location**	
Home††	124 (83.8)
Other§§	24 (16.2)

Abbreviation: SD = standard deviation.

* *International Classification of Diseases, Tenth Revision* underlying cause of death codes X60–X84.

† Included American Indian, Asian, Black, Hispanic, and Pacific Islander.

§ Includes hanging, strangulation, and deaths involving deprivation of oxygen attributable to inhalation of asphyxiant gases (e.g., helium, nitrogen, propane, argon, and butane).

¶ Includes poisoning, fall, drowning, and other transportation.

** Two decedents had missing information on location; therefore, N = 148.

†† House, apartment, rooming house, including driveway, porch, yard, and garage.

§§ Includes farm, natural area, motor vehicle, railroad tracks, office building, park/playground, and street/road.

* https://www.cdc.gov/violenceprevention/nvdrs/index.html.

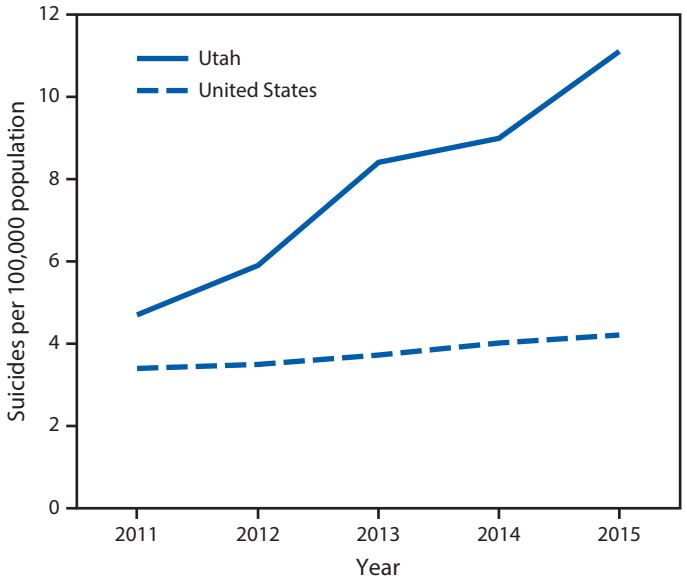
The unadjusted suicide rate among Utah youths aged 10–17 years increased an average of 22.8% per year during 2011–2015 (p<0.001), with a total increase of 136.2%, from 4.7 per 100,000 population in 2011 to 11.1 in 2015. Nationwide in the United States, the unadjusted suicide rate increased 6.0% per year during this period (p<0.001) (total increase of 23.5% [range for the census regions = -7.1% to 36.8%], from 3.4 per 100,000 in 2011 to 4.2 in 2015). The annual unadjusted suicide rate among Utah youths was higher than the U.S. rate for all years studied (Figure).

Among the 142 decedents for whom circumstance information was available, two or more precipitating circumstances were identified before death in 97 (68.3%). Fifty (35.2%) decedents with data had a diagnosed mental health problem, and 44 (31.0%), including 34 (23.9%) who had no mental health diagnosis, were described as being in a depressed mood at or near the time of death. (Table 2). Among the 50 decedents with a mental health diagnosis, 42 (84.0%) were in treatment at the time of death. A history of suicidal ideation, a previous suicide attempt, or both was reported for 42 (29.6%) decedents for whom circumstance information was available. A recent crisis, defined as an event occurring within 2 weeks of death that was indicated to have contributed to the death, was reportedly experienced by 83 (55.3%) decedents; these were most commonly family relationship problems (31, 21.8%) and intimate partner problems (15, 10.6%). Other crises included school problems and suicide of a friend or a family member. Among 131 (92.2%) decedents tested, 26 (19.8%) had one or more of the following drugs detected in their system at the time of death: alcohol, cocaine, amphetamines, marijuana, and opiates. Family conflicts that were the result of or that resulted in technology use restriction (i.e., limitations in the use of technological devices that resulted in family conflict or other family conflicts that resulted in restriction to the use of technological devices such as mobile phones, tablets, gaming systems, or laptops within 7 days before dying by suicide) were reported for 18 (12.7%) decedents. Thirty-four (23.9%) decedents disclosed their intent to die by suicide, 67 (47.2%) left a suicide note, and 30 (21.4%) had a history of cutting or had recently cut themselves.

Discussion

Reports from national data have highlighted increasing suicide rates among adolescents in recent years (*5*). This investigation indicated that the unadjusted suicide rate in Utah among persons aged 10–17 years more than doubled during 2011–2015, while the national rate increased 23.5%. The average annual increase of 22.8% observed in Utah youths was almost four times higher than the 6.0% increase observed in this age group nationwide. Whereas this investigation could not identify specific factors driving the increase in suicide among Utah youths, across multiple data sources, mental health, relationship problems, family conflicts, and experience of other forms of violence were common among Utah youths who died by suicide (https://health.utah.gov/wp-content/uploads/Final-Report-UtahEpiAid.pdf).

FIGURE. Unadjusted suicide rates among youths aged 10–17 years — Utah* and United States,† 2011–2015



Source: CDC Vital Statistics data accessed through CDC WONDER.
* Annual percentage change (APC) for Utah = 22.8% (p<0.001).
† APC for United States = 6.0% (p<0.001).

The prevalence of precipitating circumstances identified among suicide decedents aged 10–17 years and the proportion experiencing multiple precipitating circumstances are consistent with findings from previous investigations (*6*,*7*). Mental health problems, including depressed mood, were common among suicide decedents. Therefore, improving access to evidence-based mental health care for youths who do not have access might benefit suicide prevention efforts. Also, given that 84.0% of decedents with a mental health diagnosis were in treatment at the time of death, suicide prevention stakeholders and mental health professionals are encouraged to examine existing mental health treatment approaches and their timeliness to ensure they are consistent with the current evidence-based treatment approaches (*8*).

The data on recent crises and circumstances reported for suicide decedents suggest opportunities for prevention, in addition to strategies to promote mental health. For example, that approximately one in five decedents had experienced recent family relationship problems and one in 10 had experienced recent intimate partner problems suggest a lack of connectedness, a sense of belonging, trust, caring, and respect, which might erode safeguards that have been shown to buffer against suicidal

TABLE 2. Precipitating circumstances for suicide* among youths aged 10–17 years (N = 142†) — Utah, 2011–2015

Characteristic	No. (%)
Mental health diagnosis§	50 (35.2)
Mental health treatment among those with a diagnosis¶	42 (84.0)
Current depressed mood	44 (31.0)
History of suicidal thoughts/plans or suicide attempt	42 (29.6)
Suicidal thoughts	26 (18.3)
Suicide attempts	23 (16.2)
Family relationship problems	45 (31.7)
Dating partner problems	22 (15.7)
Recent crisis**	83 (55.3)
Family relationship problems††	31 (21.8)
Intimate partner problems††	15 (10.6)
School problem, suicide of friend/family, criminal legal problems††	19 (13.4)
Crisis not associated with a circumstance††	32 (22.5)
Disclosed intent§§	34 (23.9)
To friend¶¶	14 (63.6)
To parent/guardian	11 (50.0)
Left a suicide note	67 (47.2)
Positive toxicology results***	26 (19.8)
Family conflicts related to technology use restriction†††	18 (12.6)
Cutting or history of cutting§§§	30 (21.4)
More than two precipitating circumstances¶¶¶	97 (68.3)

* *International Classification of Diseases, Tenth Revision* underlying cause of death codes X60–X84.
† Decedents with known circumstances data and excludes missing. Unless otherwise noted, the denominator used to estimate the percentage = 142.
§ Disorders included diagnoses such as major depression, schizophrenia, and generalized anxiety disorder, as well as neurodevelopmental disorders (such as intellectual disability, autism, attention-deficit /hyperactivity disorder), eating disorders, personality disorders, and organic mental disorders.
¶ Denominator included only persons with diagnosed mental health problems.
** Refers to a current/acute event (within 2 weeks of death) that is reported in one of the source documents to have contributed to the death. The denominator = 150.
†† Crises are not mutually exclusive. A decedent might have experienced multiple crises, therefore percentage do not sum to 100%.
§§ For 22 of 34 decedents who disclosed their intent, information about person(s) to whom intent was disclosed was available.
¶¶ Included a friend, classmate, boy/girlfriend, ex-boy/girlfriend. Percentage do not sum to 100% because decedent might have disclosed intent to multiple persons.
*** Among 131 decedents tested for alcohol, cocaine, amphetamine, marijuana, and opiates.
††† Limitations in the use of technological devices that resulted in family conflict or other family conflicts that resulted in restriction to the use of technological devices such as mobile phones, tablets, gaming systems, or laptops within seven days before dying by suicide.
§§§ Denominator = 140.
¶¶¶ Estimated using the following circumstance information: Mental health diagnosis, current depressed mood, history of suicidal thoughts or plans, history of suicide attempts, family relationship problems, dating partner problems, recent crisis, and disclosure of intent to die by suicide.

behaviors (*9*). This loss of connectedness has been associated with social isolation and a sense of burdensomeness, both of which have been associated with suicidal behaviors in youths (*9*).

Approaches that promote connectedness and teach coping and problem-solving skills, such as peer norms programs, community engagement activities, social-emotional learning programs, and parenting skill and family relationship programs as part of a comprehensive approach, might help prevent suicide among youths in Utah (*3*). Approximately 12.6% of

Summary

What is already known about this topic?

Suicide is a major public health problem. It is the third leading cause of death among U.S. persons aged 10–17 years. In Utah, the rate of suicide among persons aged 10–17 years has increased since 2011 and is substantially higher than the national average.

What is added by this report?

Approximately two thirds of suicide decedents in Utah aged 10–17 years had multiple precipitating circumstances such as mental health problems, depressed mood, family relationship problems, dating partner problems, history of suicidal ideation or attempt, and experience of recent crisis that preceded their death. Approximately one in 10 decedents had experienced a family conflict that resulted in or that was a result of technology restriction before death.

What are the implications for public health practice?

Although the reasons for the high rate of youth suicide in Utah are not known, a multicomponent, comprehensive, and coordinated suicide prevention approach that addresses mental health issues, enhances connectedness, and targets multiple precipitating factors could benefit youths at risk for suicide in Utah.

decedents experienced family conflicts as a result of or that resulted in technology use restriction before death. Additional research is needed to understand the implications of this finding, including the extent to which it represents interruption to social support networks, distress over losing access to the device, confounding with the reason for punishment (e.g., poor grades), or other factors.

The findings in this report are subject to at least four limitations. First, because of the small sample size, group differences in trends (by sex and race/ethnicity) could not be examined. Second, information about mental health diagnosis and other circumstances were obtained from medical examiner reports and decedent family but not from medical records, which might have implications for over- or underestimating the true prevalence. Third, information on protective factors are not included in this report because of the nature of the source documents used and their focus on risk factors associated with death. Finally, death certificates might undercount suicide (*10*), and in Utah, the rate of death with undetermined intent is higher than the U.S. average (*2*). It is likely some of the undetermined intent deaths might be suicide; therefore, suicide rate in Utah might have been underestimated in this report.

During 2011–2015, approximately two thirds of youths aged 10–17 who died by suicide in Utah experienced multiple and diverse precipitating circumstances before death. A multicomponent, comprehensive, and coordinated suicide prevention approach that targets multiple precipitating circumstances is important for reducing and preventing suicide

in this population. CDC's technical package of policies, programs, and practices to prevent suicide supported by the best available evidence can be used as a suicide prevention resource (*3*). Strategies to strengthen access and delivery of suicide prevention care, promote connectedness, create protective environments, and teach coping and problem-solving skills as part of a comprehensive suicide prevention effort might benefit Utah youths (*3*).

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Cristy Sneddon, Hillary Campbell, Elizabeth Brutsch, Andrea Hood.

Conflict of Interest

No conflicts of interest were reported.

[1]Epidemic Intelligence Service, CDC; [2]Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; [3]Division of Health Nutrition Examination Surveys, National Center for Health Statistics, CDC, Washington, D.C.; [4]Child Health and Mortality Prevention Surveillance, Center for Global Health, CDC; [5]Utah Department of Health.

Corresponding author: Francis B. Annor, FAnnor@cdc.gov, 404-718-5527.

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Initial Public Health Laboratory Response After Hurricane Maria — Puerto Rico, 2017

Jeniffer Concepción-Acevedo[1]; Anita Patel[2]; Carolina Luna-Pinto[3]; Rafael González Peña[4]; Rosa Ivette Cuevas Ruiz[4]; Héctor Rivera Arbolay[4]; Mayra Toro[4]; Carmen Deseda[4]; Victor R. De Jesus[5]; Efrain Ribot[1]; Jennifer-Quiñones Gonzalez[5]; Gouthami Rao[1]; Alfonsina De Leon Salazar[5]; Marisela Ansbro[6]; Brunilís B. White[7,8]; Margaret C. Hardy[1,8]; Joaudimir Castro Georgi[5]; Rita Stinnett[8,9]; Alexandra M. Mercante[1]; David Lowe[8,10]; Haley Martin[1]; Angela Starks[11]; Beverly Metchock[11]; Stephanie Johnston[11]; Tracy Dalton[11]; Olga Joglar[11]; Cortney Stafford[11]; Monica Youngblood[11]; Katherine Klein[11]; Stephen Lindstrom[12]; LaShondra Berman[12]; Renee Galloway[10]; Ilana J. Schafer[10]; Henry Walke[10]; Robyn Stoddard[10]; Robin Connelly[13]; Elaine McCaffery[14]; Marie-Claire Rowlinson[15]; Stephen Soroka[16]; Darin T. Tranquillo[16]; Anne Gaynor[17]; Chris Mangal[17]; Kelly Wroblewski[17]; Atis Muehlenbachs[18]; Reynolds M. Salerno[19]; Matthew Lozier[20]; Brittany Sunshine[21]; Craig Shapiro[22]; Dale Rose[22]; Renee Funk[5]; Satish K. Pillai[20]; Eduardo O'Neill[18]

Hurricane Maria made landfall in Puerto Rico on September 20, 2017, causing major damage to infrastructure and severely limiting access to potable water, electric power, transportation, and communications. Public services that were affected included operations of the Puerto Rico Department of Health (PRDOH), which provides critical laboratory testing and surveillance for diseases and other health hazards. PRDOH requested assistance from CDC for the restoration of laboratory infrastructure, surveillance capacity, and diagnostic testing for selected priority diseases, including influenza, rabies, leptospirosis, salmonellosis, and tuberculosis. PRDOH, CDC, and the Association of Public Health Laboratories (APHL) collaborated to conduct rapid needs assessments and, with assistance from the CDC Foundation, implement a temporary transport system for shipping samples from Puerto Rico to the continental United States for surveillance and diagnostic and confirmatory testing. This report describes the initial laboratory emergency response and engagement efforts among federal, state, and nongovernmental partners to reestablish public health laboratory services severely affected by Hurricane Maria. The implementation of a sample transport system allowed Puerto Rico to reinitiate priority infectious disease surveillance and laboratory testing for patient and public health interventions, while awaiting the rebuilding and reinstatement of PRDOH laboratory services.

Hurricane Maria caused an estimated $90 billion in damage (*1*) and profoundly affected the island's 3.7 million inhabitants (*2*). The main PRDOH laboratory facility in San Juan and regional facilities located in Arecibo, Ponce, and Mayagüez municipalities were severely affected by the hurricane. PRDOH laboratories provide critical biologic and chemical laboratory testing activities certified under the Clinical Laboratory Improvement Amendments (CLIA). The destruction of the island's electrical power grid (Figure 1) compounded the situation and rendered the PRDOH laboratory system unable to test for infectious diseases or detect environmental hazards. PRDOH identified repair of the public health laboratories as a major priority during the posthurricane response and requested assistance from CDC with clinical testing as well as with structural and safety assessments to help guide the restoration process.

FIGURE 1. Disruption of electrical grid powering the Puerto Rico Department of Health laboratories caused by Hurricane Maria — San Juan, Puerto Rico, September 2017*

Photo/CDC

* The cables shown directly powered a section of the laboratory's facility and were knocked down by the storm.

Federal, state, and nongovernmental partners collaborated to support and provide technical assistance to public health response activities in Puerto Rico. CDC field assignees in Puerto Rico were engaged in the effort, and laboratory scientists from Atlanta were deployed to Puerto Rico to help restore laboratory capacity for priority pathogens in the short term and to assist in the full restoration of PRDOH's testing capacity in the long-term. As of February 2018, CDC had deployed 15 laboratory scientists to coordinate response and recovery activities and aid in the long-term restoration process. Partners collaborated to 1) conduct rapid laboratory needs assessments to understand the condition of laboratory facilities, prioritize activities to restore essential testing services, and determine long-term needs; 2) develop and implement a system for transporting samples from Puerto Rico to the continental United States for testing; and 3) establish an alternative, secure process for reporting testing results back to PRDOH. To coordinate sample shipments for testing at CDC or a state public health laboratory, the laboratory team partnered with APHL and the CDC Foundation, an independent nonprofit organization that supports CDC's health protection mission by mobilizing philanthropic and private sector resources.

On October 12, 2017, the first CDC laboratory team of two Spanish-speaking scientists was deployed to Puerto Rico; deployments continued, with teams rotating every 3 weeks. Deployed personnel had knowledge of laboratory facilities, testing operations, and CLIA requirements. Personnel with experience in laboratory management systems conducted laboratory assessments of the PRDOH facilities and recognized the urgent need to establish interim, alternative approaches to accomplish laboratory testing to guide surveillance and treatment management of priority diseases. The three core laboratory areas identified to have been affected by the hurricane were the electrical grid powering the facilities, the physical structure of laboratories, and equipment and reagents damaged by water leaks and power loss. Initial actions included requesting alternative power support through generators and procurement of equipment and reagents for each laboratory.

To address the immediate need for laboratory testing during the months after the hurricane, CDC and APHL worked with PRDOH to identify 16 CDC and state public health laboratories that could assist with clinical testing for selected diseases identified by the territorial epidemiologist as important for the local population; staff members streamlined shipping logistics and coordinated sample transport with the CDC Foundation. PRDOH provided guidance to health care facilities regarding priority diseases and requested that samples be sent to PRDOH for testing in continental United States laboratories. However, interruptions in communication limited the receipt of samples from the most affected rural municipalities. Transportation by couriers from some hospitals and clinics alleviated the transport limitations, and samples that were received were then accessioned at PRDOH laboratories and shipped to the continental United States. This centralized system permitted coordination and tracking of samples and test results by PRDOH.

Challenges in establishing this system included shipping companies' inability to transport packages regularly to the continental United States. Affected carriers were unable to pick up packages directly from the PRDOH facility; these were transported to the shipping facility by deployed personnel, which resulted in delays. To ensure regular transport, sample shipments were delivered to the carrier facility Monday through Wednesday in the early morning. To replace water-damaged shipping containers, CDC sent containers to Puerto Rico with deployed personnel. APHL supplied additional shipping containers sent by carrier companies. When dry ice was available, it was picked up by deployed personnel from the only vendor operating under generator power on the island. The first package containing eight samples for tuberculosis testing using this transport system was sent to CDC on October 17, 2017 (Figure 2). As of January 27, 2018, PRDOH had shipped >1,700 samples using the transport system established by the laboratory team and partners, which resulted in the identification of nearly 350 cases of high-priority infectious diseases.

In the immediate aftermath of the hurricane, PRDOH laboratories were relying on a single generator to power basic critical laboratory equipment and fax communication as the primary method for reporting clinical results. Because of the lack of reliable power in all laboratories, a secure file transfer protocol (FTP) site hosted at CDC in Atlanta was established for data exchange, which facilitated upload of results from reporting laboratories and retrieval by PRDOH from a computer with Internet access. The addition of a secure FTP site provided testing laboratories with multiple options for reporting clinical results including fax, encrypted email, and a secure portal. Most public health laboratories in San Juan were back on the power grid on December 8, 2017. In mid-December 2017, the Hurricane Maria response in Puerto Rico transitioned from response to recovery phase.

Discussion

The establishment and implementation of a sample transport system allowed PRDOH to reestablish priority infectious disease testing and surveillance to guide patient and public health interventions, while awaiting the rebuilding and restoration of laboratory services. Alternative communication tools were critical for rapid reporting of high-priority infectious diseases. Laboratory assessments served as a basis for the development of a strategic framework for recovery efforts.

Laboratory recovery efforts will continue to focus on collaborating with PRDOH staff members to determine that 1) laboratory equipment receives and maintains required certification levels according to validation and quality assurance and quality control criteria, 2) the procurement of supplies, equipment, and other resources needed to restore clinical testing at PRDOH occurs, and 3) the identification of emerging needs is communicated and resolved.

With support from the CDC Foundation, deployed personnel continue to assist PRDOH staff members with sample transport logistics and are evaluating sample transport to test for additional pathogens until local testing can resume. CDC continues to provide laboratory support to PRDOH through expertise in quality systems, diagnostics, capacity building, laboratory risk assessments, and biosafety. These critical activities can serve as an example of successful federal, state, and nongovernmental partners' collaboration to reestablish priority sample testing and disease surveillance for the 3.7 million residents of Puerto Rico.

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Summary

What is already known about this topic?

Hurricane Maria devastated the U.S. territory of Puerto Rico in 2017, causing an estimated $90 billion in damage. As a result, the infrastructure and operations of the Puerto Rico Department of Health (PRDH) laboratories were severely disrupted, including diagnostic testing and disease surveillance for the island's 3.7 million inhabitants.

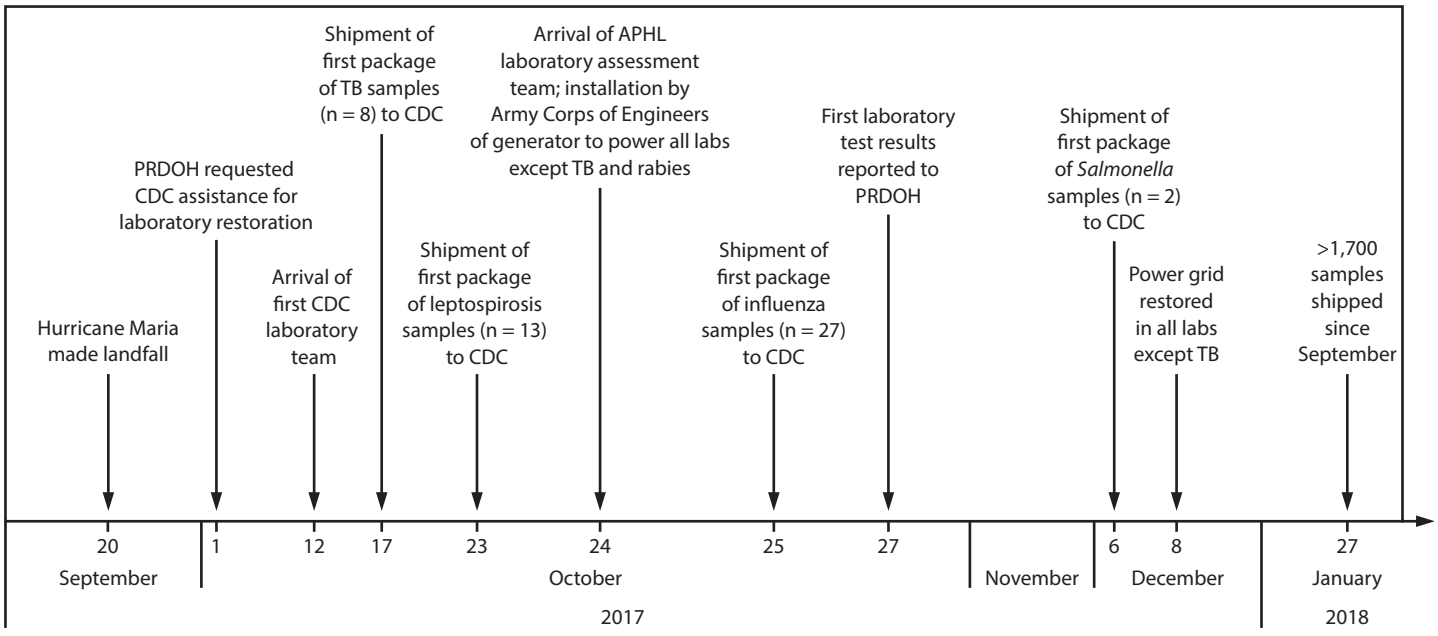
What is added by this report?

CDC and partners established a system for temporary alternative testing for selected priority diseases in laboratories in the continental United States. Implementation of a sample transport system and establishment of alternative reporting methods allowed PRDH to reinitiate diagnostic testing and laboratory surveillance and helped guide patient and public health interventions.

What are the implications for public health practice?

Reestablishment of PRDH's priority infectious disease testing and surveillance relied on collaboration and engagement among federal, state, and non-governmental partners, and the process can serve as a model for other jurisdictions facing public health emergencies. Incorporating practices described in this report in a preparedness plan might help in the rapid reestablishment of diagnostic testing and disease surveillance after a natural disaster.

FIGURE 2. Implementation of an alternative system for testing laboratory samples for priority infectious diseases and restoration of laboratory services after Hurricane Maria — San Juan, Puerto Rico, October 2017–January 2018



Abbreviations: APHL = Association of Public Health Laboratories; PRDOH = Puerto Rico Department of Health; TB = tuberculosis.

Conflict of Interest

No conflicts of interest were reported.

[1]Division of Foodborne and Waterborne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]Influenza Coordination Unit, National Center for Immunizations and Respiratory Diseases, CDC; [3]Office of the Director, Office for State, Tribal, Local and Territorial Support, CDC; [4]Puerto Rico Department of Health; [5]Division of Laboratory Sciences, National Center for Environmental Health, CDC; [6]Division of Select Agents and Toxins, Office of Public Health Preparedness and Response, CDC; [7]Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC; [8]Laboratory Leadership Service; [9]Division of Viral Diseases, National Center for Immunizations and Respiratory Diseases, CDC; [10]Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [11]Division of Tuberculosis Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC; [12]Influenza Division, National Center for Immunizations and Respiratory Diseases, CDC; [13]Georgia Public Health Laboratory; [14]Virginia Department of Health; [15]Florida Department of Health; [16]Office of the Director, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [17]Association of Public Health Laboratories, Silver Spring, Maryland; [18]Office of the Director, Office of Infectious Diseases, CDC; [19]Division of Laboratory Systems, Center for Surveillance, Epidemiology, and Laboratory Services, CDC; [20]Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [21]Division of Preparedness and Emerging Infections, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [22]Division of Emergency Operations, Office of Public Health Preparedness and Response, CDC.

Corresponding author: Eduardo O'Neill, eoneill@cdc.gov, 404-718-8844.

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Bleeding and Blood Disorders in Clients of Voluntary Medical Male Circumcision for HIV Prevention — Eastern and Southern Africa, 2015–2016

Lawrence E. Hinkle, MSPH[1]; Carlos Toledo, PhD[2]; Jonathan M. Grund, MA, MPH[2]; Vanessa R. Byams, MPH[3]; Naomi Bock, MD[2], Renee Ridzon, MD[4]; Caroline Cooney[5], Emmanuel Njeuhmeli, MD[6]; Anne G. Thomas, PhD[7]; Jacob Odhiambo, MBChB[8]; Elijah Odoyo-June, PhD[9]; Norah Talam, PhD[10]; Faustin Matchere, MPH[11]; Wezi Msungama, MPH[12]; Rose Nyirenda, MSc[13]; James Odek, MD[14]; Jotamo Come, MD[15]; Marcos Canda, MS[16]; Stanley Wei, MD[16]; Alfred Bere, PhD[17]; Collen Bonnecwe[18]; Isaac Ang'Ang'A Choge, PhD[19]; Enilda Martin, MD[19]; Dayanund Loykissoonlal[18]; Gissenge J.I. Lija, MD[20]; Erick Mlanga[21]; Daimon Simbeye, MD[22]; Stella Alamo, MD[23]; Geoffrey Kabuye, MD[23]; Joseph Lubwama, MD[23]; Nafuna Wamai, MD[23]; Omega Chituwo, MBChB[24]; George Sinyangwe, MD[25]; James Exnobert Zulu, MBChB[26]; Charles A. Ajayi, MD[27]; Shirish Balachandra, MD[28]; John Mandisarisa, PhD[28]; Sinokuthemba Xaba, MSc[29]; Stephanie M. Davis, MD[2]

Male circumcision reduces the risk for female-to-male human immunodeficiency virus (HIV) transmission by approximately 60% (*1*) and has become a key component of global HIV prevention programs in countries in Eastern and Southern Africa where HIV prevalence is high and circumcision coverage is low. Through September 2017, the President's Emergency Plan for AIDS Relief (PEPFAR) had supported 15.2 million voluntary medical male circumcisions (VMMCs) in 14 priority countries in Eastern and Southern Africa (*2*). Like any surgical intervention, VMMC carries a risk for complications or adverse events. Adverse events during circumcision of males aged ≥10 years occur in 0.5% to 8% of procedures, though the majority of adverse events are mild (*3*,*4*). To monitor safety and service quality, PEPFAR tracks and reports qualifying notifiable adverse events. Data reported from eight country VMMC programs during 2015–2016 revealed that bleeding resulting in hospitalization for ≥3 days was the most commonly reported qualifying adverse event. In several cases, the bleeding adverse event revealed a previously undiagnosed or undisclosed bleeding disorder. Bleeding adverse events in men with potential bleeding disorders are serious and can be fatal. Strategies to improve precircumcision screening and performance of circumcisions on clients at risk in settings where blood products are available are recommended to reduce the occurrence of these adverse events or mitigate their effects (*5*).

To ensure safety and quality of VMMC services and to inform policy updates, PEPFAR tracks qualifying notifiable adverse events* and investigates individual cases. The notification process started in July 2014 and initially only tracked fatal adverse events. Before 2015, two bleeding-related fatalities were reported, one attributable to suspected factor VIII deficiency and one to a hemorrhage of unknown cause. These deaths served, in part, as the impetus for broadening the adverse event notification process to include some nonfatal adverse events, including bleeding resulting in hospitalization for ≥3 days, in January 2015. When a qualifying notifiable adverse event occurs, the in-country office is notified and conducts an investigation including a review of the patient's medical chart for relevant clinical data. Ultimately, these investigations are reviewed by the Office of the Global AIDS Coordinator, U.S. Department of State, which tracks adverse events and the outcomes of investigations. This report summarizes bleeding adverse events associated with PEPFAR-supported VMMC programs in the eight countries (Kenya, Malawi, Mozambique, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe) that reported bleeding adverse events through the adverse event notification process during 2015–2016.

An estimated 4.58 million PEPFAR-supported VMMCs were performed in these eight countries during 2015–2016. A review of all VMMC-associated notifiable adverse events during this period identified 109 events, including 19 (17.4%) bleeding adverse events. These events accounted for the largest number of any reported PEPFAR VMMC program–associated adverse event resulting in ≥3 days of hospitalization.

In all 19 cases, the client received a conventional surgical circumcision. Among the clients who experienced a bleeding adverse event, the median age was 16 years (range = 10–59 years). One client had bleeding intraoperatively and was hospitalized immediately, 14 experienced bleeding within 3 days of circumcision (including two who had also had transient intraoperative bleeding), and four experienced bleeding at 7–10 days after the procedure. In two of the 19 cases, the client sought care at a clinic at least twice for bleeding and was sent home after basic interventions, before being hospitalized during a subsequent clinic visit. Among the 19 clients who experienced bleeding adverse events, eight received fresh frozen plasma, whole blood, or platelet transfusions. Because of limited availability, one client received a product type not originally chosen by the treating physician, and another had to wait a day for transfusion. Among the 13 cases for which the hospital stay was completed and documented, the average length of hospitalization was 14.7 days. Five clients experienced secondary infection requiring debridement, including one case of Fournier gangrene; all survived.

* Qualifying notifiable adverse events include complete or partial amputation of the glans or shaft of the penis, tetanus (fatal and nonfatal), any adverse event that results in permanent disability or deformity, any adverse event that results in hospital admission for ≥3 days, or any adverse event that results in death.

Among the 19 clients with a bleeding adverse event, seven received a diagnosis of a bleeding disorder or other hematologic abnormality, seven had an unconfirmed suspected bleeding disorder, and for five, no evidence was available that a bleeding disorder was considered (Table). Because availability of testing to confirm a bleeding disorder was limited, not all clients had a complete laboratory evaluation, and a diagnosis of a bleeding disorder was frequently based on clinical data only.

Discussion

Circumcision might be a male's first engagement with a medical procedure that challenges the coagulation cascade and potentially unmasks a bleeding disorder. Before undergoing VMMC, all clients are interviewed to ascertain a history of family or personal bleeding history (*6*), although the extent of screening varies. Seven of the 19 clients (or their guardians) did disclose a bleeding history but only after the adverse event had occurred. These clients might have concealed their history to receive the procedure or have been unaware of the relevance of their histories.

The two most common inherited bleeding disorders are hemophilia and von Willebrand disease (*7*), and data on prevalence of these bleeding disorders are limited in sub-Saharan Africa. In the 2015 World Federation of Hemophilia Annual Global Survey (*8*), the eight VMMC countries reporting hemophilia data (Ethiopia, Kenya, Lesotho, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe) reported a combined prevalence of approximately 1.05 cases per 100,000 population, 4.5-fold lower than the reported prevalence of 5.79 cases per 100,000 in the United States. This suggests possible underreporting, because U.S. data do not identify differences in incidence based on race or ethnicity. Among these eight countries, Ethiopia and Lesotho have not reported a bleeding adverse event; Malawi and Mozambique have reported bleeding adverse events but have no reported bleeding disorder data. Similarly, the four VMMC countries that report data on von Willebrand disease (Ethiopia, Kenya, South Africa, and Uganda) report a combined prevalence of 0.29 cases per 100,000 population, approximately 14-fold lower than the reported prevalence of 4.31 cases per 100,000 in the United States.

Recognizing that cases of postoperative bleeding in VMMC clients might be attributable to unreported or undiagnosed bleeding disorders has led CDC and PEPFAR to support development of tools to address this challenge, including a rapid verbal screening tool (*6*) designed for low-resource settings and an Adverse Event Action Guide addressing management of bleeding and indications for bleeding disorder workup (*5*). The screening tool is meant to screen for indications of any type of bleeding abnormality, including hemophilia and von Willebrand disease. When a potential client is known or suspected to have a bleeding disorder, he is counseled that male family members should also be considered to have a positive bleeding disorder screen when seeking VMMC. Likewise, if any member of a client's family is known to have any bleeding abnormalities, he is considered to have a positive screen. Mild or moderate bleeding disorders are not contraindications to VMMC, but in cases where clients are considered or suspected to have a bleeding disorder, the Adverse Event Action Guide advises that the procedure be conducted in a setting where blood products are available. Furthermore, bleeding disorders must be considered in clients with prolonged or recurring postoperative bleeding, even without a prior bleeding history (*5*).

The findings in this report are subject to at least four limitations. First, cases are limited to clients with external bleeding, not those with isolated hematoma, which might underestimate the prevalence of bleeding. Second, some bleeding adverse events might have resulted from other causes, such as unligated

TABLE. Bleeding disorders and diagnoses among men undergoing voluntary medical male circumcision with notifiable bleeding adverse events — eight Eastern and Southern African countries,* 2015–2016

Bleeding disorder (no. of clients)	Diagnosis	Supporting test results or interventions	No. of clients
Confirmed bleeding disorder or other hematologic abnormality (n = 7)	Hemophilia	Undisclosed prior diagnosis of hemophilia	1
	Hemophilia	Clinical response to Factor VIII administration	1
	Hemophilia	Severe Factor VIII deficiency	1
	Thrombocytopenia	Etiology unclear	1
	No clinical diagnoses	Prolonged clotting and bleeding times	1
	Unspecified bleeding dyscrasia†	Abnormal clotting profile	1
	Chronic myeloid leukemia	Diagnosis made based on results of complete blood count, client referred for Philadelphia Chromosome analysis	1
Unconfirmed suspected bleeding disorder (n = 7)	None	None	4
	None	Complete blood count (results normal)	1
	None	Bleeding time, clotting time (results not documented)	1
	None	Blood sample sent to hematologist (results unknown)	1
	None	Received or were considered for outpatient hematology referral	3
No evidence that bleeding disorder/ abnormality considered (n = 5)	None	Postoperative bleeding resulted in hospitalization for >3 days, but no documentation that a bleeding diagnosis was considered	5

* Kenya, Malawi, Mozambique, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.
† Referred to hematologist for follow-up.

Summary

What is already known about this topic?

Voluntary medical male circumcision (VMMC) is a key component of human immunodeficiency virus (HIV) infection prevention programs in 14 Eastern and Southern African countries. The President's Emergency Plan for AIDS Relief (PEPFAR) tracks notifiable adverse events in PEPFAR-supported programs to identify risks and improve practice.

What is added by this report?

A review of adverse event data reported to PEPFAR from VMMC programs in eight countries during 2015–2016 identified 19 cases of bleeding resulting in hospitalization of ≥3 days among 109 notifiable adverse events (17.4%); this was the most commonly reported adverse event. Among the 19 bleeding adverse events reported, seven occurred in clients who were later confirmed to have a bleeding disorder or nonspecific/other hematologic abnormality.

What are the implications for public health practice?

Efforts to improve precircumcision screening are intended to reduce the occurrence of bleeding adverse events by identifying clients who might have signs of a bleeding disorder. Clients considered or suspected to have minor bleeding disorders can be circumcised safely in settings where blood products are available.

bleeding vessels, rather than bleeding disorders. Third, the completeness of adverse event reporting, as well as clinical information, is not known. Finally, the VMMC clients do not represent a random sample of their countries' male populations, as clients must pass a health screen before circumcision, and not all males might choose to have VMMC. Data to analyze associations with surgeon experience or circumcision technique used are not available.

In resource-limited settings, health facilities might lack the capability to diagnose a bleeding disorder and might lack the blood products necessary for treatment. Preoperative screening and early adverse event recognition and patient transfer are critical, and the Adverse Event Action Guide recommends that VMMC providers who suspect bleeding disorders in clients with bleeding adverse events refer them for evaluation. Bleeding disorders in VMMC clients are uncommon but important, and both careful preoperative screening and a high index of suspicion in bleeding adverse events are necessary to ensure client safety.

Conflict of Interest

No conflicts of interest were reported.

[1]Public Health Institute/CDC Global Health Fellow; [2]Division of Global HIV and TB, CDC; [3]Division of Blood Disorders, CDC; [4]Independent Consultant, Boston, Massachusetts; [5]Office of the U.S. Global AIDS Coordinator, Washington, D.C.; [6]U.S. Agency for International Development, Washington, D.C.; [7]Naval Health Research Center, Department of Defense, San Diego, California; [8]National AIDS and STI Control Programme, Ministry of Health, Nairobi, Kenya; [9]Division of Global HIV and TB (Kenya), CDC; [10]U.S. Department of Defense, Kericho, Kenya; [11]U.S. Department of Defense, Lilongwe, Malawi; [12]Division of Global HIV and TB (Malawi), CDC; [13]Ministry of Health, Department of HIV & AIDS, Lilongwe, Malawi; [14]U.S. Agency for International Development, Lilongwe, Malawi; [15]Ministério da Saúde, Programa Nacional de Controlo De ITS, HIV/SIDA, Maputo, Mozambique; [16]Division of Global HIV and TB (Mozambique), CDC; [17]Division of Global HIV and TB (South Africa), CDC; [18]Department of Health, Pretoria, South Africa; [19]U.S. Agency for International Development, Pretoria, South Africa; [20]Ministry of Health, Community Development, Gender, Elderly and Children, Dar es Salaam, Tanzania; [21]U.S. Agency for International Development, Dar es Salaam, Tanzania; [22]Division of Global HIV and TB (Tanzania), CDC; [23]Division of Global HIV and TB (Uganda), CDC; [24]Division of Global HIV and TB (Zambia), CDC; [25]U.S. Agency for International Development, Lusaka, Zambia; [26]Ministry of Community Development, Mother and Child Health, Lusaka, Zambia; [27]U.S. Agency for International Development, Harare, Zimbabwe; [28]Division of Global HIV and TB (Zimbabwe), CDC; [29]Ministry of Health and Child Care, Harare, Zimbabwe.

Corresponding author: Lawrence E. Hinkle, LHinkleIV@cdc.gov.

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Fatal Yellow Fever in Travelers to Brazil, 2018

Davidson H. Hamer, MD[1,2]; Kristina Angelo, DO[3]; Eric Caumes, MD[4]; Perry J.J. van Genderen, MD, PhD[5]; Simin A. Florescu, MD, PhD[6]; Corneliu P. Popescu, MD[6]; Cecilia Perret, MD[7]; Angela McBride, BMBS[8]; Anna Checkley, MBChB, DPhil[8]; Jenny Ryan, MBBS[9]; Martin Cetron, MD[10]; Patricia Schlagenhauf, PhD[11]

On March 16, 2018, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

Yellow fever virus is a mosquito-borne flavivirus that causes yellow fever, an acute infectious disease that occurs in South America and sub-Saharan Africa. Most patients with yellow fever are asymptomatic, but among the 15% who develop severe illness, the case fatality rate is 20%–60%. Effective live-attenuated virus vaccines are available that protect against yellow fever (*1*). An outbreak of yellow fever began in Brazil in December 2016; since July 2017, cases in both humans and nonhuman primates have been reported from the states of São Paulo, Minas Gerais, and Rio de Janeiro, including cases occurring near large urban centers in these states (*2*). On January 16, 2018, the World Health Organization updated yellow fever vaccination recommendations for Brazil to include all persons traveling to or living in Espírito Santo, São Paulo, and Rio de Janeiro states, and certain cities in Bahia state, in addition to areas where vaccination had been recommended before the recent outbreak (*3*). Since January 2018, 10 travel-related cases of yellow fever, including four deaths, have been reported in international travelers returning from Brazil. None of the 10 travelers had received yellow fever vaccination.

Five of the 10 cases were reported by ProMED since January 15, including two from Argentina and three from Chile; two of the travelers from Chile died. In addition, during January 1–March 15, 2018, five confirmed cases of yellow fever in unvaccinated travelers returning from Brazil were reported by GeoSentinel (http://www.istm.org/geosentinel), the global clinician-based sentinel surveillance system for travel-related illness among international travelers and migrants (*4*). These five yellow fever cases represent the first such cases identified by GeoSentinel (Table), which was initiated in 1995 by the International Society of Travel Medicine with support from CDC and now consists of 70 specialized travel and tropical medicine clinical sites around the world. The first of the GeoSentinel-reported cases occurred in a Dutch man aged 46 years who traveled to São Paulo state for 3 weeks during December 2017–January 2018. The second case occurred in a French woman, aged 42 years, who traveled to Minas Gerais state in Brazil for 4 weeks during December 2017–January 2018. She received a diagnosis of yellow fever in Brazil and was examined at a GeoSentinel site after returning to France to convalesce. The third and fourth cases occurred in a Romanian man, aged 34 years, and a Swiss man, aged 44 years, each of whom visited Brazil for approximately 2 weeks in February 2018. The fifth case was in a German man, aged 33 years, who spent a week in Brazil in late February. The Swiss and German travelers died from their illness (Table).

Among the 10 international travelers reported with yellow fever acquired in Brazil, eight acquired the disease on Ilha Grande, a forested island off the Rio de Janeiro coast, where one human and one nonhuman primate yellow fever case were reported in early February 2018 (*5*); of the eight patients who acquired the disease on Ilha Grande, four died. Another travel-related case of yellow fever was reported recently outside of Brazil (*6*).

Yellow fever is a potentially fatal illness that is preventable by vaccination. Yellow fever vaccination is recommended for all eligible persons aged ≥9 months, traveling to many areas in Brazil, including the states of São Paulo and Rio de Janeiro (especially Ilha Grande). Unvaccinated travelers should avoid traveling to areas where vaccination is recommended (https://wwwnc.cdc.gov/travel/notices). Travelers planning to visit areas in Brazil or elsewhere where yellow fever transmission is occurring should receive yellow fever vaccine at least 10 days before travel and follow recommendations for avoiding mosquito bites (https://www.cdc.gov/yellowfever/prevention/index.html). The Food and Drug Administration–approved yellow fever vaccine, YF-VAX, is currently unavailable in the United States because of manufacturing difficulties (*7*). An alternative yellow fever vaccine, Stamaril, is available through a limited number of U.S. yellow fever vaccination clinics. U.S. travelers should therefore plan ahead to obtain Stamaril because it might take more time to access one of these clinics. Clinicians assessing returned travelers should be aware of yellow fever signs and symptoms and maintain vigilance regarding the possibility of yellow fever exposure in travelers returning from Brazil or other areas with ongoing transmission of yellow fever.

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TABLE. Characteristics of five travelers to Brazil with yellow fever reported by GeoSentinel sites, January–March 2018*

Characteristic	Patient 1 (man)	Patient 2 (woman)	Patient 3 (man)	Patient 4 (man)	Patient 5 (man)
Age (yrs)	46	42	34	44	33
Nationality	Dutch	French	Romanian	Swiss	German
Reporting site	Netherlands	France	Romania	Switzerland	United Kingdom
Area (state) of presumed yellow fever acquisition	Mairiporã (São Paulo)	(Minas Gerais)	Ilha Grande (Rio de Janeiro)	Ilha Grande (Rio de Janeiro)	Ilha Grande (Rio de Janeiro)
Signs/Symptoms	Fever, headache, myalgia, nausea, vomiting, diarrhea	Fever	Fever, rash, myalgia, encephalopathy	Fever, petechial rash, arthralgia, vomiting, diarrhea	Fever, malaise, nausea, jaundice, hepatomegaly
Clinical/Laboratory findings	Hepatitis	Hepatitis, thrombocytopenia, neutropenia	Renal and hepatic failure	Renal and hepatic failure	Thrombocytopenia, renal and hepatic failure
Yellow fever diagnostic testing	Positive RT-PCR for YFV (urine, whole blood, plasma)	Positive RT-PCR (blood); positive IgM (initial diagnosis made in Brazil)	Positive PCR (serum, urine); YF IgM positive; IgG titers rising days 4–8	Positive PCR (blood)	Positive RT-PCR (serum, urine)
Yellow fever vaccination status	No	No	No	No	No
Outcome	Recovered	Recovered	Condition improving as of March 15, 2018	Died	Died

Abbreviations: IgG = Immunoglobulin G; IgM = Immunoglobulin M; PCR = polymerase chain reaction; RT-PCR = reverse transcription–PCR; YF = yellow fever; YFV = YF virus.
* In addition to the five patients reported by GeoSentinel sites, five additional cases of yellow fever have been reported by ProMED among persons who traveled to Brazil from Argentina (two) and Chile (three) since January 2018. Two of the patients from Chile died.

Eleni Nastouli, University College London Hospitals, London, United Kingdom; Andrew Simpson, Rare and Imported Pathogens Laboratory, Public Health England, Wiltshire, United Kingdom; Institute of Intensive Care and Division of Infectious Diseases, University Hospital Zurich, Switzerland; Alexandra Trkola, Institute of Medical Virology, University of Zurich, Switzerland; Laurent Kaiser, Virology Laboratory, University Hospital Geneva, Switzerland.

Conflict of Interest

No conflicts of interest were reported.

[1]Department of Global Health, Boston University School of Public Health, Massachusetts; [2]Section of Infectious Diseases, Department of Medicine, Boston Medical Center, Massachusetts, USA; [3]Travelers' Health Branch, Division of Global Migration and Quarantine, CDC; [4]Department of Infectious and Tropical Diseases, Groupe Hospitalier Pitié-Salpêtrière, Paris Sorbonne University, Paris, France; [5]Harbour Hospital, Rotterdam, Netherlands; [6]Carol Davila University of Medicine and Pharmacy, Victor Babes Clinical Hospital of Infectious and Tropical Diseases, Bucharest, Romania; [7]Pontificia Universidad Catolica de Chile School of Medicine, Santiago, Chile; [8]Hospital for Tropical Diseases, University College London Hospitals, London, United Kingdom; [9]Royal Free Hospital, London, United Kingdom; [10]Office of the Director, Division of Global Migration and Quarantine, CDC; [11]World Health Organization Collaborating Centre for Travellers' Health, Epidemiology, Biostatistics, and Prevention Institute, University of Zürich, Switzerland.

Corresponding author: Davidson H. Hamer; dhamer@bu.edu.

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Notes from the Field

Typhoid Fever Outbreak — Harare, Zimbabwe, October 2016–March 2017

William W. Davis, DrPH[1]; Prosper Chonzi, MBBS[2]; Kudzai P.E. Masunda, MBBS[2]; Lindsey M. Shields, DVM[1]; Innocent Mukeredzi, MS[2]; Portia Manangazira, MBBS[3]; Emmaculate Govore[2]; Rachael D. Aubert, PhD[4]; Haley Martin, PhD[4]; Elizabeth Gonese, PhD[5]; John B. Ochieng, PhD[6]; Bonaventure Juma, PhD[7]; Hammad Ali, MBBS, PhD[1]; Kristi Allen, MPH[5]; Beth A. Tippett Barr, DrPH[5]; Eric Mintz, MD[4]; Grace D. Appiah, MD[4]

In October 2016, the Harare City Health Department (HCHD) surveillance system recorded the beginning of an upward trend in typhoid cases. On December 27, 2016, after the typhoid fever–associated death of a student, the Ministry of Health and Child Care (MOHCC) in Zimbabwe declared an outbreak of typhoid fever. HCHD defined a suspected case in a resident of Harare City as an illness that began on or after October 6, 2016, with fever ≥100.4°F (38°C), body pains, headache, and abdominal pain. Patients with confirmed cases had blood or stool specimens positive for *Salmonella* Typhi.

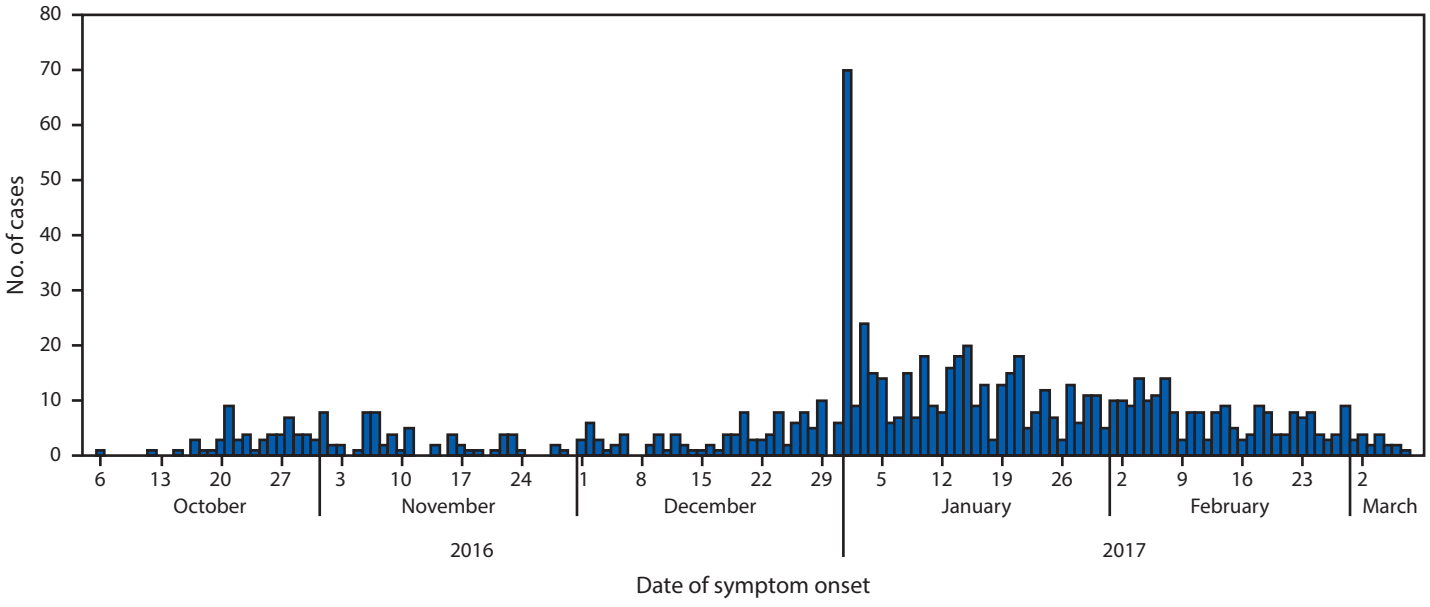
HCHD reported 860 cases with illness onset from October 6, 2016, through March 8, 2017, including 780 suspected cases, 80 confirmed cases, and four deaths (case fatality rate = 0.5%) (Figure). A spike in suspected cases on January 1 followed widespread media reports of the death of the student, but none of these cases were confirmed by lab testing. A total of 665 (77%) cases occurred in the high-density suburbs of Budiriro, Glen View, and Mbare; 24 (3%) patients were from outside Harare. Patients ranged in age from 1 month to 78 years (median age = 18 years); 48% were female.

Harare's Beatrice Road Infectious Disease Hospital tested isolates from blood and stool of 73 patients for antimicrobial susceptibility using the disk diffusion method. According to Clinical and Laboratory Standards Institute interpretive criteria (*1*), 45 (61%) were susceptible to ciprofloxacin, 10 (14%) indicated decreased ciprofloxacin susceptibility, and 18 (25%) were resistant. All but one of the 18 ciprofloxacin-resistant isolates were from patients who became ill after December 31, 2016, representing 39% of the 44 isolates from December 31, 2016, to March 8, 2017.

Assessments of affected suburbs identified 120 broken sewer lines and overcrowded apartment blocks with limited access to sanitary facilities. The area experienced frequent municipal water shortages because of an ongoing drought, and residents regularly relied on boreholes and shallow wells for drinking water (*2*). Of 32 boreholes in Mbare suburb, 18 (56%) were tested; 13 (72%) of those were contaminated with fecal coliform bacteria. Mapping indicated that cases were clustered around contaminated boreholes (*3*).

During January–July 2017, teams from HCHD, MOHCC, CDC, the World Health Organization (WHO), and UNICEF investigated risk factors for infection, monitored antibiotic resistance, and developed communications materials. WHO, UNICEF, and nongovernmental organizations complemented response efforts by HCHD and MOHCC by supporting

FIGURE. Suspected cases of typhoid fever (N = 860), by date of symptom onset — Harare, Zimbabwe, October 6, 2016–March 8, 2017



interventions, including repairing boreholes and fitting them with inline chlorinators; repairing sewer lines; and distributing water purification tablets, jerry cans, buckets, and soap. The number of incident cases declined after implementation of the interventions; however, a resurgence occurred in Mbare in October 2017 (*4*). HCHD is continuing to explore options for improved risk reduction and disease control. This outbreak serves as a reminder that diseases from contaminated water are an ongoing public health concern. World Water Day, sponsored by the United Nations and observed each year on March 22, is an opportunity to commit to the responsible management of water, sanitation, and hygiene resources to help reduce waterborne disease around the world.

Conflict of Interest

No conflicts of interest were reported.

[1]Epidemic Intelligence Service, CDC; [2]Harare City Health Department, Harare, Zimbabwe; [3]Ministry of Health and Child Care, Harare, Zimbabwe; [4]Division of Foodborne, Waterborne and Environmental Diseases, National Center for Emerging and Infectious Diseases, CDC; [5]Division of Global HIV and TB, Center for Global Health, CDC; [6]Kenya Medical Research Institute, Kisumu, Kenya; [7]Division of Global Health Protection, Center for Global Health, CDC.

Corresponding author: William W. Davis, wdavis@cdc.gov, 404-718-5503.

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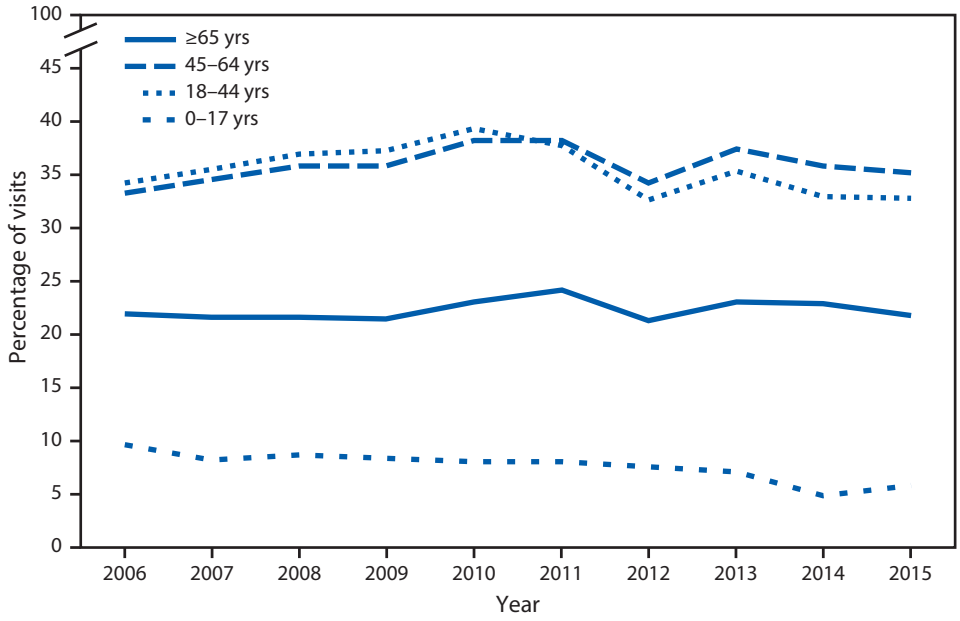
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Emergency Department Visits That Had an Opioid* Ordered or Prescribed, by Age Group — National Hospital Ambulatory Medical Care Survey, United States, 2006–2015†



* Defined as any natural opioid (e.g., codeine or morphine), semisynthetic opioid (e.g., hydrocodone, hydromorphone, or oxycodone), or synthetic opioid (e.g., fentanyl, methadone, or tramadol) analgesic (https://www.cdc.gov/drugoverdose/data/analysis.html). Heroin was not included because it is not approved for prescription in the United States. During 2006–2011, up to eight medications could be listed in the survey; therefore, analysis of data for the period 2012–2015 was also limited to eight medications.

† Based on a sample of visits to emergency departments in noninstitutional general and short-stay hospitals, exclusive of federal, military, and Veterans Administration hospitals, located in the 50 states and the District of Columbia.

During 2006–2010, the percentage of emergency department (ED) visits that had an opioid ordered or prescribed increased among visits involving persons aged 18–44 years (from 34.3% to 39.3%) and 45–64 years (from 33.2% to 38.3%). However, during 2010–2015, the percentage decreased among visits for those aged 18–44 years (32.7% in 2015) and 45–64 years (35.2% in 2015). Throughout 2006–2015, the percentage decreased among visits for persons aged 0–17 years (from 9.5% in 2006 to 5.7% in 2015), remained stable among visits for those aged ≥65 years, and was highest among visits for those aged 18–44 and 45–64 years.

Source: National Center for Health Statistics. National Hospital Ambulatory Medical Care Survey, 2006–2015. https://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm.

Reported by: Kari Yacisin, MD, kyacisin@cdc.gov, 301-458-4211; Kathleen S. O'Connor, MPH; Akintunde Akinseye.

For more information on this topic, CDC recommends the following link: https://www.cdc.gov/drugoverdose/prescribing/guideline.html.

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