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National Black HIV/AIDS Awareness Day — February 7, 2020

National Black HIV/AIDS Awareness Day (NBHAAD) is observed each year on February 7 to highlight the continuing disproportionate impact of human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) on the U.S. black or African American (black) population. During 2018, blacks represented 13% of the U.S. population but accounted for 43% of all newly diagnosed HIV infections (*1*).

In February 2019, a new national initiative, Ending the HIV Epidemic: A Plan for America (EHE), was proposed. The plan calls for intensified efforts to diagnose, treat, prevent, and respond to HIV infections in the United States, with an overall goal of reducing new HIV infections by ≥90% by 2030 (*2*).

A study reported in this *MMWR* issue presents data on CDC-funded HIV testing and outcomes among blacks who were tested in jurisdictions that are the initial focus of EHE. In these jurisdictions during 2017, blacks accounted for 43.2% of CDC-funded tests and 49.1% of newly diagnosed HIV infections (*3*). CDC supports a range of efforts for reducing the risk for acquiring or transmitting HIV infection among blacks. Additional information is available at https://www.cdc.gov/hiv/group/racialethnic/africanamericans. Information about NBHAAD is available at https://www.cdc.gov/hiv/library/awareness/nbhaad.html.

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HIV Testing Outcomes Among Blacks or African Americans — 50 Local U.S. Jurisdictions Accounting for the Majority of New HIV Diagnoses and Seven States with Disproportionate Occurrences of HIV in Rural Areas, 2017

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Identifying persons with human immunodeficiency virus (HIV) infection who are unaware of their status and linking them to care are critical steps in achieving viral suppression and reducing the risk for transmitting HIV (*1*). In 2017, 43% of new diagnoses of HIV infection were among persons who self-identify as blacks or African Americans (blacks) (*2*), who represent 13% of the U.S. population (*3*). Fewer blacks, compared with whites, were linked to HIV medical care within 90 days of diagnosis, retained in care, or virally suppressed (*4*). Ending the HIV Epidemic (EHE) is an initiative intended to reduce new HIV infections by 90% from 2020 to 2030 (*5*). EHE's Phase 1 is focused on 50 jurisdictions* that accounted

* https://www.hiv.gov/federal-response/ending-the-hiv-epidemic/overview.

INSIDE

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

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for >50% of new diagnoses during 2016–2017 and seven states[†] with disproportionate HIV prevalence in rural areas (*5*). The purpose of this analysis was to examine HIV testing outcomes among blacks in high prevalence EHE jurisdictions, using CDC's 2017 National HIV Prevention Program Monitoring and Evaluation data. Blacks accounted for 43.2% of CDC-funded tests and 49.1% of new diagnoses of HIV infection. Seventy-nine percent of blacks with newly diagnosed HIV infection were linked to HIV medical care within 90 days (below the 2010 National HIV/AIDS Strategy goal of 85%), 71.4% interviewed for partner services, and 81.8% referred to prevention services. To achieve the goals of EHE, HIV prevention programs should focus on locally tailored evidence-based[§] testing strategies to enhance and overcome barriers for linkage to and retention in care and reduce onward HIV transmission and HIV-related disparities.

CDC analyzed 2017 HIV testing, linkage to care, and partner services data submitted to the National HIV Prevention Program Monitoring and Evaluation system by 61 CDC-funded health departments[¶] and 150 CDC-directly funded community-based organizations. Valid HIV tests were those with confirmed HIV-positive test results (discordant and indeterminate test results were excluded). Persons with new diagnoses were those whose HIV test results were positive during the current test and were not previously reported in the health department's HIV surveillance system or had reported not having had a previous HIV-positive test result. The percentage of positive tests (positivity) for new diagnoses was calculated by dividing the number of new HIV-positive tests by the number of valid tests. Data were stratified by age, gender, race/ethnicity, test setting, U.S. census region, and subpopulation (i.e., men who have sex with men [MSM], persons who inject drugs, heterosexual men, and heterosexual women).[**] In non–health care settings, data to identify subpopulations were required for all tests conducted; in health care settings data were required only for persons with HIV-positive test results. Subpopulation data included in the analysis were only from non–health care settings.[††] The following HIV testing outcomes were analyzed among blacks with newly diagnosed

[†] Seven states: Alabama, Arkansas, Kentucky, Mississippi, Missouri, Oklahoma, and South Carolina.

[§] https://effectiveinterventions.cdc.gov; https://www.cdc.gov/hiv/research/interventionresearch/compendium/lrc/index.html.

[¶] CDC-funded health departments include 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and the following eight metropolitan statistical areas or specified metropolitan divisions: Baltimore, Chicago, Fulton County (Atlanta), Houston, Los Angeles County, New York City, Philadelphia, and San Francisco.

[**] MSM includes males who reported male-to-male sexual contact; and males who reported both male-to-male sexual contact and injection drug use in the past 12 months. Persons who inject drugs include persons who reported injection drug use in the past 12 months. Heterosexual men includes males who only reported heterosexual contact with a female in the past 12 months. Heterosexual women includes females who only reported heterosexual contact with a male in the past 12 months.

[††] Non–health care settings include HIV testing sites; community setting (various, shelter/transitional housing, syringe services program, other); correctional facilities (non–health care); health department (field visit); and other non–health care.

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HIV infection: linkage to HIV medical care (e.g., attend first medical appointment) within 90 days of positive test result; interview for partner services (i.e., soliciting information from persons with HIV-positive test results regarding sex and drug-injecting partners to notify them of potential exposure and offer services); and referral to HIV prevention services (i.e., behavioral interventions and risk-reduction counseling). Percentages of HIV testing outcomes among blacks were calculated by dividing the number in which "yes" was indicated for the HIV testing outcomes (linked to care within 90 days, interviewed for partner services, and referred to prevention services) by the number of HIV-positive tests. Missing data were excluded from all outcome denominators. SAS (version 9.4; SAS Institute) was used to conduct all analyses.

During 2017, a total of 3,110,049 CDC-funded tests were conducted in the United States, including 1,954,741 (62.9%) in Phase-1 jurisdictions (Table 1). The highest percentages of HIV tests conducted in EHE Phase-1 jurisdictions were among persons aged 20–29 years (36.0%), males (52.3%), and those residing in the South Census region (57.0%). Blacks accounted for 43.2% (844,819) of tests conducted in Phase-1 jurisdictions, twice that of whites (21.6%; 421,656) or Hispanics/Latinos (22.4%; 437,635). Among all new HIV diagnoses, 68.9% (8,154 of 11,843) occurred in Phase-1 jurisdictions, and the highest percentages of new HIV diagnoses were among persons aged 20–29 years (42.9%), males (83.4%), blacks (49.1%), and persons residing in the South Census region (49.1%). The percentage of blacks with newly diagnosed HIV infection (0.5%) was equal to that of Hispanics/Latinos (0.5%) and nearly twice that of whites (0.3%) and Asians (0.3%).

In 2017 CDC-funded testing programs identified 11,427 persons with a previous diagnosis of HIV infection who were not known to be in care, 8,917 (78.0%) of whom were in Phase-1 jurisdictions. Persons with a previous diagnosis who were not known to be in care were predominately aged 20–29 years (30.2%) or 30–39 years (27.7%), male (78.1%), black (58.5%), and residents of the South Census region (62.0%). The number of blacks in Phase-1 jurisdictions with a previous diagnosis and not known to be in care (5,214; 58.5%) was more than three times that of whites (1,516; 17.0%) and Hispanics/Latinos (1,359; 15.2%).

Among the 844,819 blacks tested in Phase-1 jurisdictions in 2017, 37.7% (318,835) were persons aged 20–29 years; 49.7% were males; and 63.2% were persons residing in the South (Table 2). Of the 4,007 blacks who received a new diagnosis of HIV infection, the percentage positivity was highest among persons aged 20–29 years (0.6%), males (0.7%), and persons residing in the West Census region (0.7%). Among blacks who received a new diagnosis, 79.2% were linked to care within 90 days, 71.4% were interviewed for partner services, and 81.8% were referred to HIV prevention services. By region, linkage of blacks with newly diagnosed HIV infection to medical care within 90 days was lowest in the West (71.7%), whereas the lowest percentages of partner services interviews (58.9%) and referrals to HIV prevention services (70.2%) were in the Midwest. By subpopulation, the highest percentage of tests conducted in EHE jurisdictions were among MSM (27.4%) (Table 1), who also had the highest rates of HIV-positive test results (3.3%) among subpopulation blacks (Table 2).

Black MSM accounted for 15.0% (31,508 of 209,843) of tests and 64.9% (1,030 of 1,587) of new HIV diagnoses in non–health care settings. More than 70% of black MSM with newly diagnosed HIV infection were linked to HIV medical care (80.6%), interviewed for partner services (71.3%), or referred to HIV prevention services (84.2%) (Table 2).

Discussion

The goal of HIV testing programs is to identify persons with HIV infection who are unaware of their status and to link all persons with HIV-positive test results to services. In 2017, 62.9% of CDC-funded tests and 68.9% of new diagnoses of HIV infection were in Phase-1 jurisdictions, among whom blacks accounted for >40% of tests (40.4%) and new diagnoses (47.5%). Blacks also accounted for 58.5% of persons with a previous diagnosis not known to be in care. Compared with whites, a higher percentage of blacks in Phase-1 jurisdictions received a new diagnosis (49.1%) or had previously received a diagnosis and were not known to be in care (58.5%).

This analysis found that HIV testing services supported by CDC funding are an important resource for identifying persons with new and previously diagnosed HIV infection who are not in care, especially in Phase-1 jurisdictions. Testing sites in Phase-1 jurisdictions are especially critical for blacks, who account for the largest numbers of persons tested, new diagnoses of HIV infection, and persons previously diagnosed not known to be in care. Factors such as stigma, comorbidities, and socioeconomic inequalities might increase blacks' risk for acquiring or transmitting HIV and limit access to quality health care, housing, and HIV prevention messaging (*3*). Delayed entry into HIV prevention and treatment, especially among blacks, leads to worse HIV care outcomes (e.g., delayed linkage to care and viral suppression) (*6*). Although 79.2% of blacks with newly diagnosed HIV infection in Phase-1 jurisdictions were linked to HIV medical care within 90 days, this percentage was below the 2010 National HIV/AIDS Strategy (NHAS) goal of 85% (*7*). This outcome suggests that the 2020 NHAS goals of 85% linkage within 30 days of diagnosis (*7*) and the EHE initiative to reduce new HIV infections by 90% by 2030 (*7*) might be challenging to achieve among blacks

TABLE 1. Human immunodeficiency virus (HIV) tests, new diagnoses, and previous diagnoses, by demographic characteristics and subpopulations — CDC-funded Phase-I Ending the HIV Epidemic (EHE) jurisdictions* and other CDC-funded testing sites, United States, 2017

	Valid CDC-funded HIV tests		New HIV diagnoses			Previous HIV diagnoses not currently in care	
Characteristic	CDC-funded tests No.	CDC-funded tests, EHE jurisdictions No. (Col %)	New diagnoses No.	New diagnoses, EHE jurisdictions No. (Col %)	New HIV positivity, EHE jurisdictions (%)	Previous diagnoses No.	Previous HIV diagnoses not known to be in care No. (Col %)
Age group (yrs)†							
13–19	218,293	123,447 (6.3)	434	279 (3.4)	0.2	180	142 (1.6)
20–29	1,175,736	704,303 (36.0)	5,221	3,494 (42.9)	0.5	3,345	2,696 (30.2)
30–39	762,944	479,073 (24.5)	3,249	2,322 (28.5)	0.5	3,204	2,467 (27.7)
40–49	416,566	276,244 (14.1)	1,484	1,033 (12.7)	0.4	2,134	1,674 (18.8)
≥50	501,096	355,855 (18.2)	1,411	993 (12.2)	0.3	2,550	1,926 (21.6)
Gender§							
Male	1,575,493	1,021,993 (52.3)	9,897	6,801 (83.4)	0.7	8,898	6,967 (78.1)
Female	1,498,393	906,192 (46.4)	1,701	1,168 (14.3)	0.1	2,288	1,744 (19.6)
Test setting							
Health care facility	2,388,928	1,502,673 (76.9)	7,280	4,863 (59.6)	0.3	8,352	6,754 (75.7)
Non–health care facility	712,278	451,247 (23.1)	4,539	3,290 (40.3)	0.7	3,05	2,159 (24.2)
U.S. Census region¶							
Northeast	471,609	266,101 (13.6)	1,707	1,216 (14.9)	0.5	1,421	1,015 (11.4)
Midwest	397,121	261,005 (13.4)	1,661	1,136 (13.9)	0.4	1,765	1,589 (17.8)
South	1,792,105	1,114,464 (57.0)	6,108	4,007 (49.1)	0.4	7,283	5,530 (62.0)
West	416,921	303,177 (15.5)	2,144	1,691 (20.7)	0.6	827	722 (8.1)
U.S. dependent areas	32,293	9,994 (0.5)	223	104 (1.3)	1.0	131	61 (0.7)
Race/Ethnicity**							
White	819,524	421,656 (21.6)	2,330	1,378 (16.9)	0.3	2,104	1,516 (17.0)
Black or African American	1,257,198	844,819 (43.2)	5,622	4,007 (49.1)	0.5	6,403	5,214 (58.5)
Hispanic or Latino	677,954	437,635 (22.4)	2,974	2,076 (25.5)	0.5	1,913	1,359 (15.2)
Asian	73,379	53,066 (2.7)	223	164 (2.0)	0.3	133	112 (1.3)
AI/AN	16,269	7,519 (0.4)	59	27 (0.3)	0.4	39	24 (0.3)
H/PI	6,509	4,176 (0.2)	15	13 (0.2)	0.3	14	12 (0.1)
Multirace	23,935	12,497 (0.6)	134	90 (1.1)	0.7	76	51 (0.6)
Subpopulation in non–health care setting††							
MSM	180,748	123,635 (27.4)	3,175	2,326 (70.7)	1.9	1,602	1,204 (55.8)
Transgender persons	7,763	5,377 (1.2)	109	89 (2.7)	1.7	70	55 (2.5)
Persons who inject drugs	38,190	17,142 (3.8)	145	98 (3.0)	0.6	121	68 (3.1)
Heterosexual men	173,259	100,521 (22.3)	443	305 (9.3)	0.3	424	265 (12.3)
Heterosexual women	182,852	108,053 (23.9)	376	262 (8.0)	0.2	350	248 (11.5)
Total	**3,110,049**	**1,954,741 (100.0)**	**11,843**	**8,154 (100.0)**	**0.4**	**11,427**	**8,917 (100.0)**

Abbreviations: AI/AN = American Indian or Alaska Native; Col = column; H/PI = Native Hawaiian or Pacific Islander; MSM = gay, bisexual, and other men who have sex with men.

* Fifty local jurisdictions accounting for >50% of new diagnoses during 2016–2017 and seven states with disproportionate occurrence of HIV in rural areas.

† For age, the numbers of records missing or invalid are as follows: in the columns "Valid CDC-funded HIV tests," 35,414 (1.1%) of all CDC-funded valid HIV tests and 15,819 (0.8%) of valid HIV tests in EHE jurisdictions; in the columns under "New HIV diagnoses," 44 (0.4%) of total new diagnoses and 33 (0.4%) of new diagnoses in EHE jurisdictions; in the columns under "Previous HIV diagnoses," 14 (0.1%) of total previous diagnoses and 12 (0.1%) of previous diagnoses in EHE jurisdictions.

§ For gender, the numbers of records reported as transgender, missing, or invalid are as follows: in the columns under "Valid CDC-funded HIV tests," 36,163 (1.2%) of all CDC-funded valid HIV tests and 26,556 (1.4%) of valid HIV tests in EHE jurisdictions; in the columns under "New HIV diagnoses," 245 (2.1%) of total new diagnoses and 185 (2.3%) of new diagnoses in EHE jurisdictions; in the columns under "Previous HIV diagnoses," 241 (2.1%) of total previous diagnoses and 206 (2.3%) of previous diagnoses in EHE jurisdictions.

¶ *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

** For race/ethnicity, the numbers of records missing or invalid are as follows: in the columns under "Valid CDC-funded HIV tests," 235,281 (7.6%) of all CDC-funded valid HIV tests and 173,373 (8.9%) of valid HIV tests in EHE jurisdictions; in the columns under "New HIV diagnoses," 486 (4.1%) of total new diagnoses and 399 (4.9%) of new diagnoses in EHE jurisdictions; in the columns under "Previous HIV diagnoses," 745 (6.5%) of total previous diagnoses and 629 (7.1%) of previous diagnoses in EHE jurisdictions.

†† MSM include males who reported male-to-male sexual contact as well as males who reported both male-to-male sexual contact and injection drug use in the past 12 months. Persons who inject drugs include persons who reported injection drug use in the past 12 months. Heterosexual males include males who only reported sexual contact with a female in the past 12 months. Heterosexual females include females who only reported sexual contact with a male in the past 12 months. Data on subpopulations were limited to those tested in non–health care settings. For subpopulation in non–health care settings, the numbers of records missing or invalid are as follows: in the columns under "Valid CDC-funded HIV tests," 129,466 (18.2%) of all CDC-funded valid HIV tests and 96,519 (21.4%) of valid HIV tests in EHE jurisdictions; in the columns under "New HIV diagnoses," 291 (6.4%) of total new diagnoses and 210 (6.4%) of new diagnoses in EHE jurisdictions; in the columns under "Previous HIV diagnoses," 483 (15.8%) of total previous diagnoses and 319 (14.8%) of previous diagnoses in EHE jurisdictions. Totals for subpopulation in non–health care settings are 712,278 for all CDC-funded HIV tests, 451,247 for CDC-funded tests in EHE jurisdictions, 4,539 for total new HIV diagnoses, 3,290 for new diagnoses in EHE jurisdictions, 3,050 for previously diagnosed, and 2,159 for previously diagnosed in EHE jurisdictions.

TABLE 2. Linkage to human immunodeficiency virus (HIV) medical care for blacks or African Americans (blacks) with newly diagnosed HIV infection — CDC-funded Phase-I Ending the HIV Epidemic (EHE) jurisdictions,* United States, 2017

Characteristic	No. (%)				
	CDC-funded tests among blacks in EHE jurisdictions	New diagnoses among blacks in EHE jurisdictions	Linked to HIV medical care within 90 days of diagnoses	Interviewed for partner services	Referred to HIV prevention services
Age group at test (yrs)†					
13–19	59,683	183 (0.3)	117 (84.2)	88 (71.0)	122 (84.7)
20–29	318,835	1,869 (0.6)	1,257 (81.3)	1,041 (74.6)	1,301 (83.2)
30–39	193,353	1,013 (0.5)	685 (78.8)	549 (70.7)	679 (81.1)
40–49	110,772	429 (0.4)	262 (74.4)	215 (70.0)	267 (78.1)
≥50	158,462	501 (0.3)	301 (74.5)	225 (62.0)	322 (80.7)
Gender§					
Male	419,746	3,124 (0.7)	2,039 (79.2)	1,660 (71.8)	2,124 (82.4)
Female	420,203	785 (0.2)	517 (78.6)	407 (69.8)	499 (79.6)
Test setting					
Health care facility	634,620	2,420 (0.4)	1,644 (80.2)	1,370 (72.7)	1,554 (81.7)
Non–health care facility	209,843	1,587 (0.8)	980 (77.6)	749 (69.2)	1,139 (82.0)
U.S. Census region¶					
Northeast	115,415	586 (0.5)	447 (86.3)	384 (83.8)	473 (83.9)
Midwest	139,838	675 (0.5)	430 (77.0)	331 (58.9)	448 (70.2)
South	534,304	2,378 (0.4)	1,539 (79.0)	1,200 (74.3)	1,570 (86.6)
West	55,260	368 (0.7)	208 (71.7)	204 (61.1)	202 (73.2)
U.S. dependent areas	2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Subpopulation in non–health care setting**					
MSM	31,508	1,030 (3.3)	664 (80.6)	484 (71.3)	763 (84.2)
Transgender	1,964	52 (2.6)	34 (79.1)	28 (73.7)	41 (85.4)
Persons who inject drugs	3,139	26 (0.8)	8 (42.1)	9 (47.4)	18 (72.0)
Heterosexual males	56,676	186 (0.3)	113 (74.8)	97 (65.1)	132 (80.0)
Heterosexual females	64,160	189 (0.3)	114 (75.0)	92 (74.8)	125 (77.6)
Total	**844,819**	**4,007 (0.5)**	**2,624 (79.2)**	**2,119 (71.4)**	**2,693 (81.8)**

Abbreviation: MSM = gay, bisexual, and other men who have sex with men.

* Fifty local jurisdictions accounting for >50% of new diagnoses during 2016–2017 and seven states with disproportionate occurrence of HIV in rural areas.

† For age, the numbers of records missing or invalid are as follows: in the column "CDC-funded tests among blacks in EHE jurisdictions," 3,714 (0.4%); in the column "New HIV diagnoses among blacks in EHE jurisdictions," 12 (0.3%); in the column "Linked to HIV medical care within 90 days of diagnoses," 2 (0.1%); in the column "Interviewed for partner services," 1 (0.05%); in the column "Referred to HIV prevention services," 2 (0.1%).

§ For gender, the numbers of records reported as transgender, missing, or invalid are as follows: in the column "CDC-funded tests among blacks in EHE jurisdictions," 4870 (0.6%); in the column "New HIV diagnoses among blacks in EHE jurisdictions," 98 (2.4%); in the column "Linked to HIV medical care within 90 days of diagnoses," 68 (2.6%); in the column "Interviewed for partner services," 52 (2.5%); in the column "Referred to HIV prevention services," 70 (2.6%).

¶ *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

** MSM include males who reported male-to-male sexual contact as well as males who reported both male-to-male sexual contact and injection drug use in the past 12 months. Persons who inject drugs include persons who reported injection drug use in the past 12 months. Heterosexual males include males who only reported heterosexual contact with a female in the past 12 months. Heterosexual females include females who only reported heterosexual contact with a male in the past 12 months. Data on behavioral risk factors used to define the subpopulation were limited to those tested in non–health care settings. For subpopulation in non–health care settings, the numbers of records missing or invalid are as follows: in the column "CDC-funded tests among blacks in EHE jurisdictions," 52,396 (25.0%); in the column "New HIV diagnoses among blacks in EHE jurisdictions," 104 (6.6%); in the column "Linked to HIV medical care within 90 Days of diagnoses," 47 (4.8%); in the column "Interviewed for partner services," 39 (5.2%); in the column "Referred to HIV prevention services," 60 (5.3%). Totals for subpopulation in non–health care settings are 209,843 for CDC-funded tests among blacks in EHE jurisdictions, 1,587 for new diagnoses among blacks in EHE jurisdictions, 980 for linked to HIV medical care within 90 days of diagnoses, 749 for interviewed for partner services, and 1,139 for referred to HIV prevention services.

without expanding current efforts and implementing novel testing strategies.

The findings in this report are subject to at least four limitations. First, the findings are based on data from CDC-funded tests, which are not representative of all U.S. HIV testing. Second, estimates of persons with newly diagnosed HIV infection rely on verification using CDC's HIV surveillance data or self-report, which could result in an overestimation of new diagnoses. Third, data on linkage to HIV medical care, interview for partner services, and referral to HIV prevention services exclude missing data from the denominator and likely overestimate the percentage of persons receiving services. Finally, data on subpopulations are collected for all tests in non–health care settings but only for HIV-positive tests in health care settings, resulting in underreporting of tests among subpopulations.

Summary

What is already known about this topic?

Ending the HIV Epidemic (EHE) jurisdictions are disproportionately affected by human immunodeficiency virus (HIV).

What is added by this report?

In 2017, blacks accounted for >40% of those tested and new diagnoses in EHE jurisdictions. Compared with whites, more blacks in EHE jurisdictions received a new diagnosis or were identified as a person with previously diagnosed HIV infection.

What are the implications for public health practice?

HIV prevention programs focused on locally tailored innovative testing, linkage, reengagement, and prophylaxis and treatment for blacks could help to achieve the national goals to end the HIV epidemic in the United States.

CDC-funded HIV testing programs are identifying new and previously diagnosed HIV infections in persons not known to be in care in Phase-1 jurisdictions, but challenges linking persons with new and previously diagnosed infections to care differ (*8*). Broader implementation of routine HIV screening and HIV-related services, most notably among black MSM, has critical public health implications. To achieve the goals of the EHE initiative, HIV prevention programs will need to focus on locally tailored evidence-based testing strategies to overcome barriers for and enhance linkage to and retention in care, provide prophylaxis and treatment, and reduce onward HIV transmission and HIV-related disparities.

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Syndromic Surveillance of Suicidal Ideation and Self-Directed Violence — United States, January 2017–December 2018

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Suicide is a growing public health problem in the United States, claiming approximately 47,000 lives in 2017 (*1*). However, deaths from suicide represent only a small part of a larger problem because each year millions of persons experience suicidal ideation and engage in suicidal and nonsuicidal self-directed violence, both risk factors for suicide (*2*). Emergency departments (EDs) are an important setting for monitoring these events in near real time (*3*–*5*). From 2001 to 2016, ED visit rates for nonfatal self-harm increased 42% among persons aged ≥10 years (*1*). Using data from CDC's National Syndromic Surveillance Program (NSSP), ED visits for suicidal ideation, self-directed violence, or both among persons aged ≥10 years during January 2017–December 2018 were examined by sex, age group, and U.S. region. During the 24-month period, the rate of ED visits for suicidal ideation, self-directed violence, or both increased 25.5% overall, with an average increase of 1.2% per month. Suicide prevention requires comprehensive and multisectoral approaches to addressing risk at personal, relationship, community, and societal levels. ED syndromic surveillance data can provide timely trend information and can support more targeted and prompt public health investigation and response. CDC's Preventing Suicide: A Technical Package of Policy, Programs, and Practices includes tailored suicide prevention strategies for health care settings (*6*).

CDC's NSSP BioSense Platform,* a national public health surveillance system, was used to identify ED visits for this study. At the time of this investigation,† NSSP included data from approximately 65% of visits at facilities categorized as EDs (i.e., urgent care and outpatient facilities were excluded) from 55 jurisdictions in 45 states.§ The Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) tool in the BioSense Platform was used to analyze ED visits. In collaboration with CDC, the NSSP Community of Practice Syndrome Definition Committee developed a definition to identify ED visits involving suicidal ideation, self-directed violence, or both, which combines clinical presentation and Boolean operators (e.g., hanging, laceration, or overdose attempt) and diagnosis codes associated with suicidal ideation, self-directed violence, or both.¶ The definition is designed to query patients' chief complaint history, discharge diagnosis, and admission reason code and description fields and includes common misspellings of suicide-related terms, while excluding visits in which a patient "denies suicidal ideation" or "is not suicidal." The syndrome definition used for this investigation does not differentiate between suicidal ideation and self-directed violence, nor the method of self-directed violence (*7*). The composite measure used in this investigation was the first syndrome definition ever developed by the NSSP Community of Practice Syndrome Definition Committee and CDC to capture ED visits broadly related to suicidal ideation, self-directed violence, or both. More specific syndrome definitions that separately assess ED visits related to suicidal ideation, self-directed violence, or specific mechanisms of self-directed violence are in development.

Monthly ED visits involving suicidal ideation, self-directed violence, or both per 100,000 ED visits among persons aged ≥10 years during January 2017–December 2018 were computed overall and stratified by sex, age group, and U.S. region.** Rates were calculated by dividing the number of ED visits related to suicidal ideation, self-directed violence, or

* NSSP's BioSense platform was established in 2003 as a national public health surveillance system for early detection and rapid assessment of bioterrorism-related events and has expanded to track infectious diseases and injuries. https://www.cdc.gov/nssp/biosense/index.html.

† Data are current as of February 8, 2019.

§ Availability and completeness of chief complaint text and discharge diagnosis codes of ED visits reported in NSSP, which can also vary across months and by U.S. Department of Health and Human Services (HHS) region, can affect the ability of the syndrome definition to detect ED visits related to suicidal ideation, self-directed violence, or both. During the study period, completeness of chief complaint text was 87.6%, and completeness of discharge diagnosis code data was 62.3%.

¶ *International Classification of Diseases, Tenth Revision, Clinical Modification; International Classification of Diseases, Ninth Revision, Clinical Modification*; and Systematized Nomenclature of Medicine Clinical Terms discharge diagnosis codes associated with suicidal ideation, self-directed violence, or both were included in the syndrome definition.

** States listed are within the HHS regions that shared data with NSSP and had data available for the study period at the time of data analysis. In addition, some of the states listed do not provide data for the entire state. The *Northeast* region includes HHS Region 1 (Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), HHS Region 2 (New Jersey and New York), and HHS Region 3 (District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia); the *Southeast* region includes HHS Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee); the *Southwest* region includes HHS Region 6 (Arkansas, Louisiana, New Mexico, and Texas); the *Midwest* region includes HHS Region 5 (Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin) and HHS Region 7 (Iowa, Kansas, Missouri, and Nebraska); and the *West* region includes HHS Region 8 (Colorado, Montana, North Dakota, and Utah), HHS Region 9 (Arizona, California, and Nevada), and HHS Region 10 (Alaska, Idaho, Oregon, and Washington).

both by the total number of ED visits recorded in ESSENCE each month, multiplied by 100,000. Percentage changes in the monthly rate for ED visits for suicidal ideation, self-directed violence, or both overall and for each stratum were examined. Estimates of average monthly percentage change were calculated using Joinpoint regression with Joinpoint software (version 4.7.0.0; National Cancer Institute).†† P-values <0.05 were considered statistically significant.

During January 2017–December 2018, among approximately 163 million ED visits assessed in NSSP, a total of 2,123,614 involved suicidal ideation, self-directed violence, or both (1,300.6 per 100,000 ED visits). During the same period, the rate of ED visits involving suicidal ideation, self-directed violence, or both increased 25.5%, with an average increase of 1.2% per month (Table). Both sexes experienced significant increases during this period: the rate increased 22.7% for females and 27.6% for males (Table) (Figure 1). Among females, ED visit rates involving suicidal ideation, self-directed violence, or both significantly increased among those aged 10–19 years (33.7% increase), 40–59 years (17.6%), and ≥60 years (29.0%). Females aged 20–39 years did not experience a significant increase in ED visit rate for suicidal ideation, self-directed violence, or both. Among males, all age groups experienced significant increases in ED visit rates related to suicidal ideation, self-directed violence, or both during January 2017–December 2018, including those aged 10–19 years (62.3%), 20–39 years (29.1%), 40–59 years (20.4%), and ≥60 years (36.7%). For both females and males aged 10–19 years, a seasonal pattern in ED visits for suicidal ideation, self-directed violence, or both was observed, with the lowest proportion of visits occurring during summer months. Three of five U.S. regions experienced significant increases in these ED visit rates: the Midwest (33.8%), Northeast (16.0%), and West (13.3%) (Table) (Figure 2). Among females, rates of ED visits related to suicidal ideation, self-directed violence, or both significantly increased in the Midwest (28.7%), West (14.7%), and Northeast (13.6%). Among males, rates of ED visits related to suicidal ideation, self-directed violence, or both significantly increased in all U.S. regions except the Southwest (Midwest, 38.7%; Southeast, 33.5%; Northeast, 17.7%; and West, 11.1%). Rates were consistently highest in the West for both females and males.

Discussion

Syndromic surveillance data from NSSP indicate a significant 25.5% increase in the rate of ED visits involving suicidal ideation, self-directed violence, or both during January 2017–December 2018, with substantial increases occurring in younger age groups. Other studies have described increases in rates among younger age groups in earlier years (*1*,*8*), and the current trends suggest persistence of these increases into 2018. The large increase in ED visits related to suicidal ideation, self-directed violence, or both for females aged 10–19 years suggests that a previously documented increase might also be continuing. For example, research has shown that from 2009 to 2015, ED visits for self-inflicted injury increased 18.8% among females aged 10–14 years and 7.2% per year among females aged 15–19 years (*8*). Among the demographic groups examined, males aged 10–19 years experienced the largest significant increase during this period (62.3%), which diverges from earlier studies showing a stable trend for younger males from 2001 to 2015, according to data from the National Electronic Injury Surveillance System–All Injury Program (NEISS-AIP) (*1*,*8*). One potential reason for these differences might be that NEISS-AIP only measures a person's index visit, whereas NSSP records all ED visits from participating sites. Continued monitoring of trends in ED visits related to suicidal ideation, self-directed violence, or both using data from NSSP and other surveillance systems could help elucidate these differences by sex over time.

With respect to geographic variation, the largest increases in rates of ED visits related to suicidal ideation, self-directed violence, or both were observed among males in the Midwest (38.7%), males in the Southeast (33.5%), and females in the Midwest (28.7%), compared with other regions. However, rates were consistently highest in the West, as has been previously reported (*9*,*10*). The seasonal variation of youth ED visits involving suicidal ideation, self-directed violence, or both observed in the present study demonstrates the need for additional research examining the relationship between school-related factors and suicidal ideation, self-directed violence, or both and highlights opportunities for improved hospital capacity management during months with higher prevalence. Future research should assess geographic and temporal variations in suicide-related ED visits and the risk for dying by suicide after ED screening and presentation of suicidal thoughts or behaviors. Research examining variation in the impact of policies, socioeconomic risk factors, and access to lethal means across the United States on nonfatal suicide-related outcomes is needed (*6*).

The findings in this report are subject to at least five limitations. First, facility participation in NSSP can vary across months. To account for these changes, monthly trends in ED visits for suicidal ideation, self-directed violence, or both were assessed as a percentage of the total number of ED visits for each month. The monthly rates of ED visits for suicidal ideation, self-directed violence, or both calculated for this study served as a proxy indicator for changes in suicide risk but could

†† https://surveillance.cancer.gov/joinpoint.

TABLE. Changes in monthly rate* of ED visits related to suicidal ideation, self-directed violence, or both, by sex, age group, and U.S. region† — National Syndromic Surveillance Program, United States, January 2017–December 2018§

Characteristic	% Change			Average monthly % change (95% CI)
	From Jan 2017 to Dec 2017	From Jan 2018 to Dec 2018	From Jan 2017 to Dec 2018	
Age group (yrs)				
Both sexes				
Overall	8.2¶	13.7¶	25.5¶	**1.2 (1.0 to 1.5)¶**
10–19	17.2	17.9	43.4¶	1.7 (1.0 to 2.4)¶
20–39	10.7¶	13.7¶	28.5¶	1.2 (0.4 to 2.0)¶
40–59	5.6	15.2¶	19.7¶	0.9 (0.1 to 1.7)¶
≥60	11.0¶	23.3¶	33.4¶	1.3 (0.4 to 2.2)¶
Females				
Overall	5.6¶	11.2	22.7¶	**1.2 (0.9 to 1.5)¶**
10–19	11.6	14.3	33.7¶	1.4 (0.7 to 2.1)¶
20–39	8.4	12.5¶	27.1	1.1 (−0.1 to 2.4)
40–59	3.7	12.8¶	17.6¶	0.9 (0.2 to 1.5)¶
≥60	7.1	23.6¶	29.0¶	1.2 (0.1 to 2.4)¶
Males				
Overall	10.3¶	15.7¶	27.6¶	**1.2 (1.1 to 1.4)¶**
10–19	28.2¶	24.4	62.3¶	2.2 (1.5 to 2.9)¶
20–39	12.3¶	13.8¶	29.1¶	1.4 (0.7 to 2.0)¶
40–59	6.5¶	16.1¶	20.4¶	0.9 (0.4 to 1.5)¶
≥60	14.1¶	23.0¶	36.7¶	1.4 (0.6 to 2.2)¶
U.S. region†				
Both sexes				
Northeast	10.0¶	3.8	16.0¶	1.1 (0.8 to 1.3)¶
Southeast	8.2	25.8¶	30.2	1.5 (0.0 to 3.0)
Southwest	−7.9	13.8¶	9.6	0.6 (−0.8 to 2.0)
Midwest	10.0¶	15.7¶	33.8¶	1.3 (1.1 to 1.6)¶
West	0.1	7.3¶	13.3¶	0.5 (0.3 to 0.8)¶
Females				
Northeast	9.2	−0.1	13.6¶	1.0 (0.6 to 1.4)¶
Southeast	4.3	24.5¶	26.1	1.2 (−0.5 to 3.1)
Southwest	−12.0	10.1	5.0	0.4 (−1.3 to 2.1)
Midwest	4.3¶	14.5¶	28.7¶	1.3 (1.0 to 1.7)¶
West	1.0	5.2¶	14.7¶	0.5 (0.2 to 0.8)¶
Males				
Northeast	10.2¶	7.0¶	17.7¶	1.1 (0.9 to 1.3)¶
Southeast	11.4	26.7¶	33.5¶	1.6 (0.1 to 3.0)¶
Southwest	−3.7	16.6¶	13.6	0.6 (−0.5 to 1.7)
Midwest	15.5¶	16.6¶	38.7¶	1.3 (1.1 to 1.6)¶
West	−1.1	8.9¶	11.1¶	0.5 (0.2 to 0.9)¶

Abbreviations: CI = confidence interval; ED = emergency department.

* Per 100,000 visits. Calculated as number of ED visits related to suicidal ideation, self-directed violence, or both divided by the total number of ED visits for each month and multiplied by 100,000. Percentage change in rates were determined by subtracting the number during the previous month from the number during the current month, then dividing by the previous month's number multiplied by 100%.

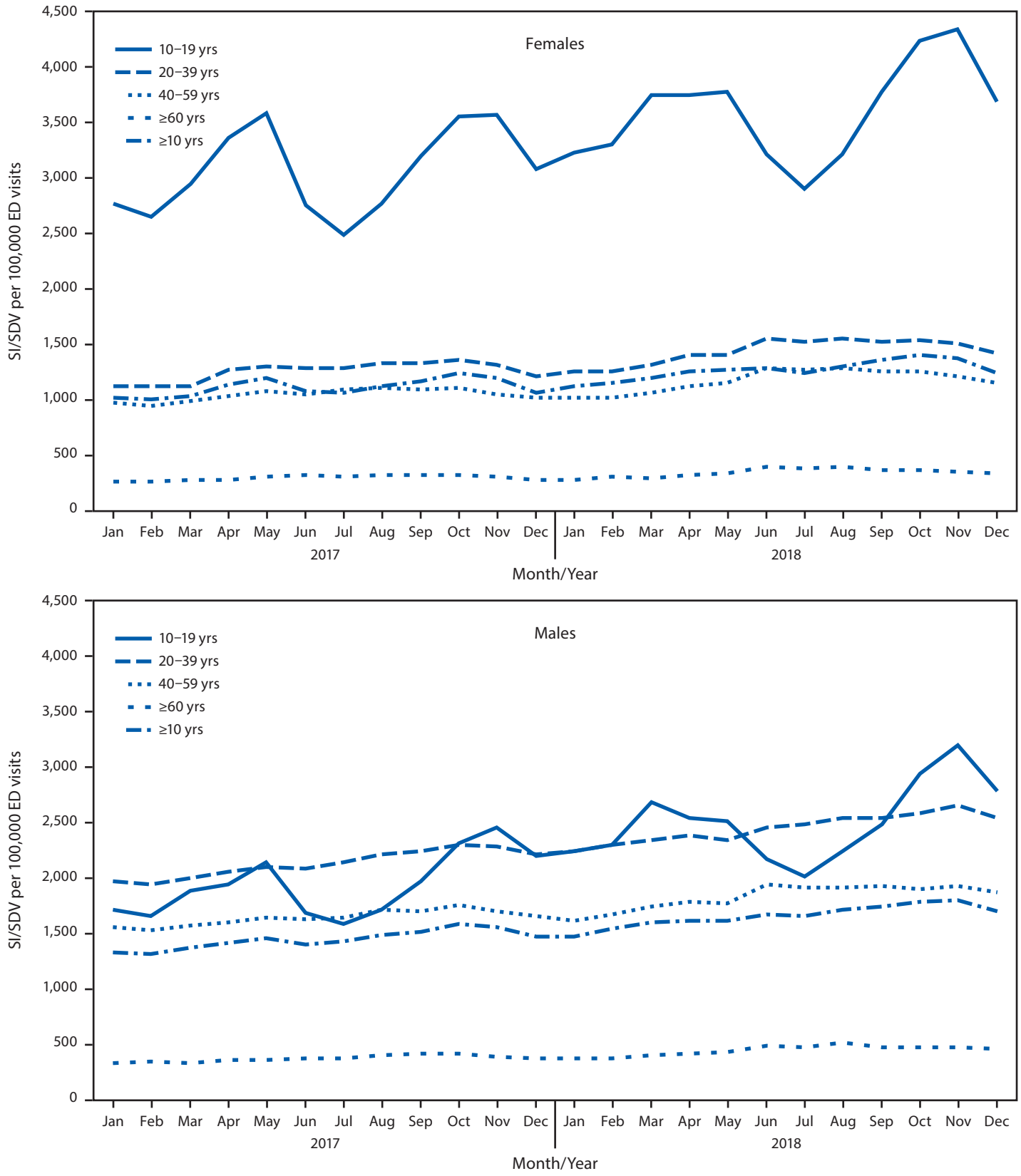
† The Northeast region includes U.S. Department of Health and Human Services (HHS) Region 1 (Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), HHS Region 2 (New Jersey and New York), and HHS Region 3 (District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia); the Southeast region includes HHS Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee); the Southwest region includes HHS Region 6 (Arkansas, Louisiana, New Mexico, and Texas); the Midwest region includes HHS Region 5 (Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin) and HHS Region 7 (Iowa, Kansas, Missouri, and Nebraska); and the West region includes HHS Region 8 (Colorado, Montana, North Dakota, and Utah), HHS Region 9 (Arizona, California, and Nevada), and HHS Region 10 (Alaska, Idaho, Oregon, and Washington).

§ Data are current as of February 8, 2019.

¶ Statistically significant (p<0.05).

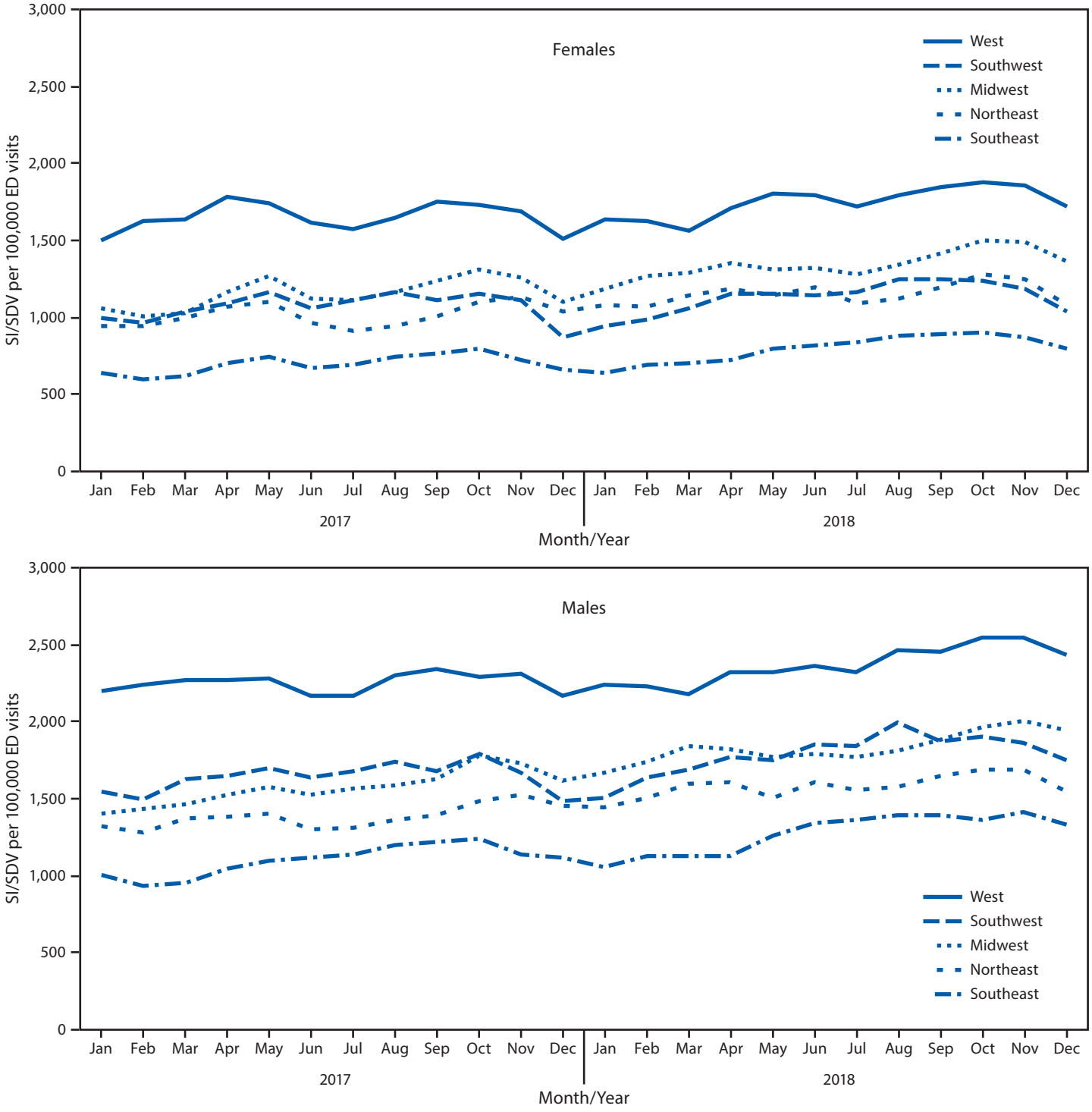
be influenced by changes in the denominator or characteristics of the populations served by participating facilities. Second, results are not generalizable to facilities not participating in NSSP. Data from NSSP facilities are also not nationally representative, nor representative of each U.S. region, and variations in ED visits related to suicidal ideation, self-directed violence, or both occurring nationally and by U.S. region could reflect differences in the participating facilities contributing data to the system. Third, the syndrome definition used in this study might under- or overestimate ED visits related to suicidal ideation, self-directed violence, or both because of differences in coding, reporting, and availability of chief complaint text

FIGURE 1. Monthly rate* of emergency department (ED) visits related to suicidal ideation (SI), self-directed violence (SDV), or both, by sex and age group — National Syndromic Surveillance Program, United States, January 2017–December 2018†



* Per 100,000 visits. Calculated as number of ED visits related to SI, SDV, or both, divided by the total number of ED visits for each month and multiplied by 100,000.
† Data are current as of February 8, 2019.

FIGURE 2. Monthly rate* of emergency department (ED) visits related to suicidal ideation (SI), self-directed violence (SDV), or both, by sex and region† — National Syndromic Surveillance Program, United States, January 2017–December 2018§



* Per 100,000 visits. Calculated as number of ED visits related to SI, SDV, or both, divided by the total number of ED visits for each month and multiplied by 100,000.

† *Northeast*: U.S. Department of Health and Human Services (HHS) Region 1 (Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), HHS Region 2 (New Jersey and New York), and HHS Region 3 (District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia); *Southeast*: HHS Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee); *Southwest*: HHS Region 6 (Arkansas, Louisiana, New Mexico, and Texas); *Midwest*: HHS Region 5 (Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin) and HHS Region 7 (Iowa, Kansas, Missouri, and Nebraska); *West*: HHS Region 8 (Colorado, Montana, North Dakota, and Utah), HHS Region 9 (Arizona, California, and Nevada), and HHS Region 10 (Alaska, Idaho, Oregon, and Washington).

§ Data are current as of February 8, 2019.

Summary

What is already known about this topic?

From 2001 to 2016, emergency department (ED) visit rates for nonfatal self-harm, which is associated with increased suicide risk, increased 42% among persons aged ≥10 years.

What is added by this report?

Analysis of CDC's National Syndromic Surveillance Program data showed that ED visit rates related to suicidal ideation, self-directed violence, or both increased 25.5% overall, with an average increase of 1.2% per month, nationwide during January 2017–December 2018.

What are the implications for public health practice?

ED syndromic surveillance data can provide timely suicidal ideation and self-directed violence trend information and can support more targeted and prompt public health investigation and response. CDC's Preventing Suicide: A Technical Package of Policy, Programs, and Practices includes tailored suicide prevention strategies for health care settings.

or discharge diagnosis data between jurisdictions or over time. The syndrome definition does not distinguish between incident and recurrent ED visits for suicidal ideation and self-directed violence, and it does not differentiate between suicidal ideation and self-directed violence. Therefore, the proportion of ED visits related to suicidal ideation, self-directed-violence, or the specific method of self-directed violence that contributed to the overall number of suicide-related ED visits in this investigation is unknown. Fourth, syndromic surveillance data used were transmitted to NSSP in near real time and are not considered finalized data sets. Thus, the reported findings should not be interpreted as exact case counts of suicidal ideation, self-directed violence, or both. Finally, without state or local context on the events, patterns, or behaviors of health systems and their patients, aggregating state and local syndromic surveillance data to the national or regional level might have less utility than would a methodology incorporating this local-level information into an early warning system for unusual patterns or potential clusters of nonfatal suicide-related outcomes (*3*–*5*).

Despite these limitations, these data identify important trends and variations across demographic and geographic groups and highlight the potential value of syndromic surveillance data to assist states and communities in detecting suicide-related events at more detailed geographic levels, thus facilitating more rapid and targeted public health prevention and response efforts. States and communities can also use resources such as CDC's Preventing Suicide: A Technical Package of Policy, Programs, and Practices to guide suicide prevention initiatives. The CDC technical package includes seven strategies designed to help states and communities implement comprehensive suicide prevention efforts: strengthening economic supports, strengthening access and delivery of suicide care, creating protective environments, promoting connectedness, teaching coping and problem-solving skills, identifying and supporting persons at risk, and lessening harms and preventing future risk (*6*).

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Anhydrous Ammonia Chemical Release — Lake County, Illinois, April 2019

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On April 25, 2019, a farm tractor towing two 2-ton ammonia tanks on a county road in Lake County, Illinois, experienced a mechanical failure that resulted in the release of anhydrous ammonia, a colorless, pungent, irritating gas that can cause severe respiratory and ocular damage (*1*). Approximately 80% of anhydrous ammonia produced in the United States is used as a fertilizer in agriculture (*1*). Eighty-three persons, including first responders, motorists, and neighborhood residents, were evaluated at area hospitals because of exposure to the gas. Two weeks after the release, the Agency for Toxic Substances and Disease Registry (ATSDR) and CDC's National Center for Environmental Health (NCEH) collaborated with the Lake County Health Department and the Illinois Department of Public Health on an investigation using ATSDR's Assessment of Chemical Exposures program to describe the release, review the emergency response, and determine health effects associated with the exposure. First responders, community residents, and hospital personnel reported communication challenges related to the nature of the gas release and effective protective measures. Among the 83 persons evaluated at six area hospitals for effects of the chemical release, 14 (17%) were hospitalized, including eight (10%) who were admitted to the intensive care unit (ICU), seven (8%) of whom required endotracheal intubation and mechanical ventilation; no deaths occurred. In addition, ICU health care providers experienced symptoms of secondary exposure. The National Institute for Occupational Safety and Health's Emergency Responder Health Monitoring and Surveillance Program has specific recommendations and tools to protect responders during all phases of a response (*2*). Hospitals also need to review institutional policies and procedures for chemical mass casualty events, including decontamination (*3*). Prompt and correct identification of hazardous material (hazmat) events, and clear communication among responding entities, including on-scene and hospital responders, is important to ensure effective response after a chemical release.

At 4:24 a.m. on April 25, 2019, a farm tractor experienced a mechanical failure that involved its two ammonia tanks while on a main two-lane county road, resulting in the release of at least 500 gallons (at least 1,893 L) of anhydrous ammonia (each tank had a capacity of 1,000 gallons [3,785 L], but neither was full at the time of the incident). Release of the ammonia created a large, low-lying plume of white gas, which, because of cool, humid air and calm winds, lingered in the area and surrounded nearby homes. Vehicles encountering the plume stalled (possibly caused by the effects on engines or electronics), and drivers and passengers were overcome by the gas, reporting an acrid smell and taste, throat irritation, coughing, difficulty breathing, and choking (Supplementary Figure, https://stacks.cdc.gov/view/cdc/84423). Overall, 129 fire personnel from 39 departments, 30 law enforcement officers from eight departments, and numerous dispatchers and 9-1-1 operators from multiple centers responded. Victims were rescued from cars and homes nearest to the release. A shelter-in-place order (to remain indoors, close all doors and windows, and shut off home heating, ventilation, and air conditioning systems) was issued to residents living within a 1-mile radius of the release and was transmitted by reverse 9-1-1, a system used to notify residents in emergency situations. The fire department applied a water spray to dilute the plume until the ammonia tanks were empty, which occurred at 7:23 a.m. The local fire department, the National Transportation Safety Board, and the U.S. Environmental Protection Agency investigated the release. The National Transportation Safety Board has released a preliminary report of their investigation (*4*).

Ten days after the release, on May 9, 2019, a team from ATSDR and CDC arrived in Illinois to assist the Lake County Health Department and the Illinois Department of Public Health with the Assessment of Chemical Exposures investigation, which uses a toolkit of modifiable surveys to conduct rapid assessments after large-scale toxic substance releases (*5*). This investigation included the following five components: 1) environmental evaluation of the size of the release; 2) abstraction of medical records to characterize the health effects of the release; 3) a survey of first responders who were in or near the plume; 4) a household survey of persons who lived in the four census blocks adjacent to the release; and 5) a survey of hospital emergency department (ED) personnel who treated patients.

Environmental Survey

To characterize the location and size of the chemical release, the locations of coniferous trees visibly damaged by the ammonia release were mapped as a proxy for the location of the anhydrous ammonia plume. Eighty-one damaged coniferous trees were identified in the release zone, including 59 (72%) with >10 ft (>3 m) of vertical damage. These data suggested that the ammonia plume likely covered at least 0.053 mi^2 (at least 0.137 km^2 [1,486,447 ft^2 (138,095 m^2)] and extended up

to 15 feet (up to 4.5 m) above the ground, especially in areas closer to the release site (Figure). Of note, the plume extended into the nearby golf course but could not be mapped because of the lack of coniferous trees on the course.

Medical Record Abstraction

At the time of the CDC/ATSDR investigation, medical charts were reviewed for 83 patients evaluated at EDs with complaints related to anhydrous ammonia exposure within 24 hours after the incident (Table 1). Forty-four (53%) patients were female; median age was 34 years (range = 1–79 years). Among 35 persons transported to the ED by emergency medical services (EMS), 15 (42%) were civilians exposed at home, seven (19%) were civilians exposed in their car, and 13 (39%) were first responders. Fourteen patients (including one first responder) were admitted to hospitals, including eight admitted to an ICU, seven of whom were intubated and required mechanical ventilation. Among the eight admitted to an ICU, the duration of their stay ranged from 1 to 7 days (total = 27 ICU days). No deaths occurred.

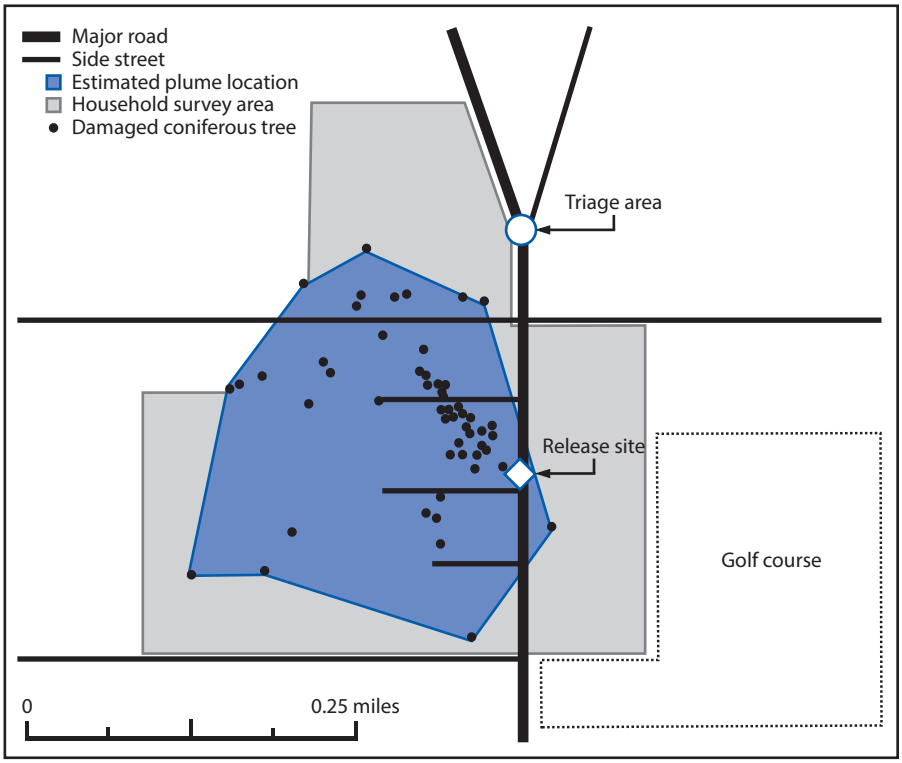
First Responder Survey

Thirty-eight first responders suspected of entering the plume were surveyed (Table 2); 18 (47%) reported entering the plume, five (13%) reported having been near the plume, 11 (29%) did not enter the plume, and the exposure status of four (11%) was unknown. Because dispatchers initially reported the incident as a car fire, some first responders arriving at the scene who were unaware of the chemical release were also overcome by the gas. Other responders who smelled ammonia and saw the white plume retreated several blocks to don a self-contained breathing apparatus before attempting rescues. Among the 18 first responders who entered the plume, nine experienced symptoms of illness within 24 hours of the release; the four most common symptoms, each reported by five responders, were cough, burning lungs, shortness of breath, and eye irritation. Thirteen first responders were transported by EMS to the hospital; many of these responders were evaluated as a precautionary measure. One first responder was hospitalized, requiring intubation, mechanical ventilation, and ICU care.

Household Survey

Forty-eight residents from 23 homes near the release site were surveyed; their median age was 53 years (range = 1–84 years), and 43 (90%) were aged >18 years (Table 2). Thirty-two (67%) surveyed residents were women, and 17 (35%) were Hispanic. Adult respondents reported initially receiving information about the release from first responders, relatives, friends, neighbors, and reverse 9-1-1. On the morning of the release, 33 (69%) residents remained at home until the shelter-in-place order was lifted, 11 (23%) evacuated from their homes by EMS or in their private vehicles, and four (8%) left home before the order was lifted to go to work or for other reasons. Twenty-one (44%) surveyed residents experienced symptoms of illness within 24 hours after the release; the four most common symptoms were cough (15), burning in the nose or throat (14), shortness of breath (12), and eye irritation (12). Fifteen (31%) surveyed residents reported having received medical care from hospitals, EMS, or other providers, including eight who had evacuated from their homes, two of whom required intubation, mechanical ventilation, and ICU care.

FIGURE. Anhydrous ammonia release site, estimated plume location based on damaged coniferous trees,* and area covered by the household survey for the assessment of chemical exposures — Lake County, Illinois, April 2019



* The plume extended into the nearby golf course but could not be mapped because of the lack of coniferous trees on the course.

TABLE 1. Characteristics of 83 patients exposed to anhydrous ammonia and treated at six hospitals within 24 hours — Lake County, Illinois, April 2019*

Characteristic	No. (%)
Exposure location	
Home	29 (35)†
Car	25 (30)§
Work	14 (17)¶
Unknown/Missing	15 (18)**
Hospital admissions	
Evaluated in ED and discharged	69 (83)††
Admitted to general medicine/observation	6 (7)
Admitted to ICU	8 (10)§§
Intubated/Mechanically ventilated in ICU	7 (8)§§
Sex	
Male	39 (47)
Female	44 (53)
Age (yrs), median (range)	34 (1–79)
Underlying condition	
Asthma	10 (12)
Hypertension	9 (11)
Tobacco use	10 (12)
Pregnant¶¶	3 (7)
Symptoms* **	
Shortness of breath	35 (42)
Cough	27 (33)
Upper airway pain	22 (27)
Headache	15 (18)
Dizziness	13 (16)
Chest tightness	10 (12)
Chest pain	8 (10)
Eye pain	8 (10)
Wheezing	7 (8)
Nausea	7 (8)
Pleuritic chest pain	5 (6)

Abbreviations: ED = emergency department; EMS = emergency medical services; ICU = intensive care unit.

* Based on medical chart abstraction data.
† Includes 15 patients (52%) transported by EMS.
§ Includes seven patients (28%) transported by EMS.
¶ Includes 12 patients (86%) transported by EMS.
** Includes one patient (7%) transported by EMS.
†† Includes 12 patients (17%) who were first responders.
§§ Includes one first responder.
¶¶ Percentage calculated among women.
*** Symptoms are not mutually exclusive. Patients might have had more than one symptom.

TABLE 2. Exposure location, hospital care, and symptoms experienced by firefighters, police officers, and hazardous materials (hazmat) first responders who entered the gas plume after anhydrous ammonia release and residents from 23 homes near the release site — First Responder and Household Surveys, Lake County, Illinois, April 2019

Characteristic	No. (%)
First responder survey (N = 38)	
First responder type	
Firefighter/EMS	22 (58)
Police officer	4 (11)
Hazmat	12 (32)
Exposure location	
Entered plume	18 (47)
Near plume	5 (13)
Did not enter plume	11 (29)
Unknown/Missing	4 (11)
Reported symptoms* after entering plume (n = 18)	
Yes	9 (50)
No	9 (50)
Hospital care (n = 13)	
Evaluated in ED and discharged	12 (32)
Admitted to general medicine/observation	0
Admitted to ICU	1 (2.6)
Intubated/Mechanically ventilated	1 (2.6)
Household survey (N = 48)	
Age group (yrs)	
Median (range)	53 (1–84)
1–18	5 (10)
>18	43 (90)
Sex	
Male	16 (33)
Female	32 (67)
Hispanic ethnicity	**17 (35)**
Response to shelter-in-place order	
Remained at home until order lifted	33 (69)
Evacuated by EMS or private vehicle	11 (23)
Left before order lifted	4 (8)
Symptom†/Treatment	
Experienced symptoms within 24 hours	21 (44)
Cough	15 (71)§
Burning nose/throat	14 (67)§
Shortness of breath	12 (57)§
Eye irritation	12 (57)§
Received medical care	15 (31)§
ICU admission, intubation/mechanical ventilation	2 (4)

Abbreviations: ED = emergency department; EMS = emergency medical services; ICU = intensive care unit.

* Symptoms included cough, burning lungs, shortness of breath, and eye irritation.
† Symptoms are not mutually exclusive. Patients might have had more than one symptom.
§ Percentage of those with symptoms.

Hospital Survey

ED administrators at the six hospitals that received patients from EMS during the incident (range = 1–33 patients per hospital) were surveyed. Three hospitals activated internal disaster response measures during the incident. Five reported receiving insufficient information from the scene, especially regarding the type of chemical exposure and the number of patients and their conditions. Because of limited information about the nature of the anhydrous ammonia exposure, initial calls by hospitals to the poison control center resulted in inadequate and incomplete recommendations, especially regarding decontamination. No patients had been decontaminated in the field. Three hospitals decontaminated patients at the hospital (clothing removal and soap/water shower). Two hospitals decontaminated patients upon arrival to the ED, and one hospital began to decontaminate admitted patients after five ICU staff members experienced symptoms of secondary exposure in the ICU from off-gassing* of anhydrous ammonia from victims' clothing.

* The evaporation of volatile organic compounds into the air from a contaminated source such as clothing.

Summary

What is already known about this topic?

Exposure to anhydrous ammonia gas can cause severe respiratory and ocular damage.

What is added by this report?

At least 500 gallons (1,893 L) of anhydrous ammonia gas was released from two tanks towed by a farm tractor in a residential area, resulting in evaluation of 83 persons at local emergency departments. Fourteen persons were hospitalized, including seven patients with respiratory failure.

What are the implications for public health practice?

Preparation for hazardous materials (hazmat) responses should ensure 1) timely and informative public communication, 2) effective communication among first responders, 3) accurate field information provided to health support personnel, and 4) regular hazmat exercises for all response and support personnel.

Discussion

Clear communication during a chemical release is essential to reduce exposures and harm. The timing of this event in the early morning when traffic was sparse and its location in a less populated area minimized morbidity among residents and motorists, and the actions of the first responders likely saved lives. However, multiple communication challenges during each part of the response hindered effective action to prevent exposures. Responders who initially arrived on scene were unaware it was a hazmat incident. Although some first responders did don the recommended personal protective equipment after smelling ammonia, half of those who entered the plume experienced symptoms, including one responder who required mechanical ventilation. Most hospitals reported receiving insufficient information about the chemical, type of exposure, and the number and triage category of inbound patients. After relaying this incomplete information to the poison control center, hospitals received inadequate decontamination recommendations, leading to secondary exposures of hospital personnel. After sharing findings from the Assessment of Chemical Exposures investigation, the poison control center reviewed communication flow protocols and reexamined ammonia guidelines to improve decontamination recommendations.

To improve future responses and reduce communication challenges, the assessment team recommended standardizing the 9-1-1 operator training for hazmat events; consolidating 9-1-1 systems or adopting shared computer-assisted dispatch systems; and implementing a comprehensive hazmat communication model to include multi-agency training that incorporated communication with hospitals. Although the probability of hazmat incidents of this magnitude is low, the incidents are of high consequence and threaten first responders and the public. Multi-agency hazmat trainings will improve communications, identify communication gaps, and clarify each agency and responder's role during a response. The National Institute for Occupational Safety and Health's Emergency Responder Health Monitoring and Surveillance Program has specific recommendations and tools to protect responders during all phases of a response (*2*). Hospitals also need to review institutional policies and procedures for chemical mass casualty events, including decontamination (*3*). Prompt and correct identification of hazmat events, and clear communication among responding entities, including on-scene and hospital responders, is important to ensure effective response after a chemical release.

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Notes from the Field

Four Cases of Lyme Disease at an Outdoor Wilderness Camp — North Carolina, 2017 and 2019

Alexis M. Barbarin, PhD[1]; Steven W. Seagle, PhD[2]; Susan Creede[3]

On June 10, 2019, the North Carolina Division of Public Health was notified by the Buncombe County Health Department of three cases of Lyme disease among children aged 6–8 years. Lyme disease is a bacterial infection transmitted by the bite of an *Ixodes scapularis* tick that is infected most commonly with the bacterium *Borrelia burgdorferi*. An investigation conducted by Buncombe County communicable disease nurses determined that all three children were homeschooled and had attended a local, year-round, outdoor wilderness day camp. Each child had attended the camp at least 1 day a week over the course of the previous fall and spring. The camp site for the wilderness program is completely outdoors, with a canopy of hardwood forest providing much of the shelter. Further investigation identified an earlier camp participant who had received a diagnosis of Lyme disease in 2017 (Table).

North Carolina has historically had a low incidence of reported Lyme disease cases (*1*) but remains the southernmost border of the leading edge of Lyme disease in the United States (*2*). In North Carolina in 2017, 0.69 confirmed cases of Lyme disease per 100,000 residents were reported, a rate significantly lower than the 2017 national average of 9.1 confirmed cases per 100,000 residents (*3*).

On June 13, a North Carolina interagency assessment team traveled to the wilderness day camp to conduct entomologic surveillance for *Ixodes* ticks. Participants covered a total of 0.27 acres (1,077 m^2) of land while "flagging and dragging."* A total of 39 nymphal ticks were collected. Ticks were preserved in 95% ethanol and sent to CDC's Division of Vector-Borne Diseases in Fort Collins, Colorado, for pathogen testing. Of the 39 ticks collected, 37 (95%) were confirmed as *Ixodes scapularis*

* To sample the environment for ticks trying to locate a host, light-colored cloths with a wooden leading frame are dragged through grass or a leafy forest floor (dragging), and light colored cloths are used to brush uneven surfaces such as small bushes in wooded areas (flagging).

TABLE. Demographic information and clinical and laboratory evidence of Lyme disease in four attendees at a wilderness day camp — North Carolina, 2017 and 2019

Patient	Age (yrs)	Sex	Date of illness onset	Clinical evidence	Laboratory evidence	Tick exposure	Treatment	Case classification
A	8	Female	May 12, 2019	Brief, recurrent attacks of joint swelling Arthralgia Physician diagnosis of Lyme disease	Positive *Borrelia burgdorferi* IgG western blot Positive *B. burgdorferi* IgM western blot	Attended wilderness day camp Ticks removed	Doxycycline	Confirmed
B	6	Female	May 1, 2019	Erythema migrans rash Fever Headaches Arthralgia Loss of appetite Increased fatigue Physician diagnosis of Lyme disease	Negative *B. burgdorferi* IgG western blot Positive *B. burgdorferi* IgM western blot Positive Lyme disease antibody EIA, 1.77	Attended wilderness day camp Ticks removed	Doxycycline	Confirmed
C	7	Male	May 17, 2019	Small erythematous rash Fever Headaches Physician diagnosis of Lyme disease	Negative *B. burgdorferi* IgG western blot Positive *B. burgdorferi* IgM western blot Positive Lyme disease antibody EIA, 3.26	Attended wilderness day camp Ticks removed	Doxycycline	Probable*
D	9	Male	September 28, 2017	Erythema migrans rash Radiculoneuropathy Cranial neuritis (Bell's palsy) Arthralgia Physician diagnosis of Lyme disease	Positive *B. burgdorferi* IgG western blot Positive *B. burgdorferi* IgM western blot Positive Lyme disease antibody EIA, 11.08	Attended wilderness day camp	Doxycycline	Confirmed

Abbreviations: EIA = enzyme immunoassay; Ig = immunoglobulin.
* https://wwwn.cdc.gov/nndss/conditions/lyme-disease/case-definition/2017/.

ticks by molecular testing. Two ticks yielded poor DNA, and pathogen tests were ruled inconclusive. Six of the 35 ticks yielding DNA suitable for analysis tested positive for *B. burgdorferi* sensu stricto, the causative agent of Lyme disease. One of the six ticks was coinfected with *Borrelia miyamotoi*. All 35 ticks tested negative for *Anaplamsa phagocytophilum* and *Babesia microti* (two pathogens tested for when conducting *Ixodes* tick testing). Results indicated that nymphal ticks collected at the camp site had a *B. burgdorferi* infection prevalence of 17% (95% confidence interval = 8.1–32.7).

This was the first reported cluster of Lyme disease patients with a common exposure to be identified in North Carolina and the furthest south that *Borrelia*-infected ticks have been identified through North Carolina Division of Public Health entomologic surveillance efforts. Clinicians should be aware of the risk for transmission of Lyme disease in North Carolina and consider recommended diagnostic testing and treatment (*4*). To prevent exposure to *Borrelia* and other tickborne diseases, North Carolina Division of Public Health encourages everyone to wear personal protective clothing, to use EPA-approved repellents such as diethyltoluamide (DEET), and to conduct full-body examinations for ticks following outdoor activities in possible tick habitats. Prevention is the best defense against Lyme disease. Close collaboration between the North Carolina Division of Public Health and county health departments, along with clinician awareness, are essential for rapid identification of vector-borne disease expansion and appropriate treatment.

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Erratum

Vol. 68, No. 45

In the report "Evaluation of Bronchoalveolar Lavage Fluid from Patients in an Outbreak of E-cigarette, or Vaping, Product Use–Associated Lung Injury — 10 States, August–October 2019" names of the members of the Lung Injury Response Team and persons in Acknowledgments were omitted. The names are included below.

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Erratum

Vol. 68, No. 49

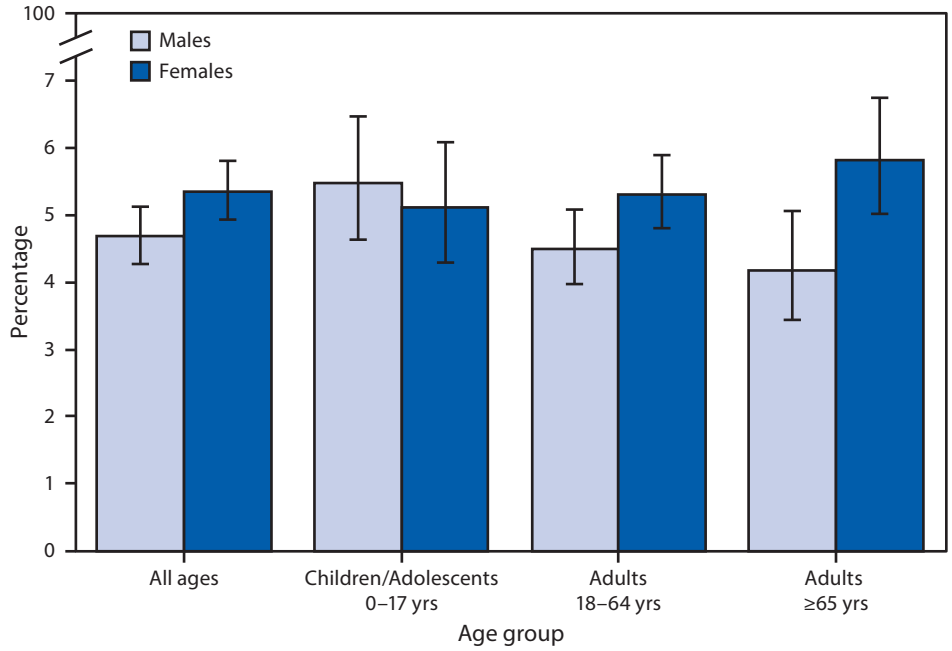
In the report "Update: Demographic, Product, and Substance-Use Characteristics of Hospitalized Patients in a Nationwide Outbreak of E-cigarette, or Vaping, Product Use–Associated Lung Injuries — United States, December 2019" on page 1444, there was an error in the Table.

In "TABLE. Demographic and e-cigarette, or vaping, product use characteristics among patients with hospitalized cases of e-cigarette, or vaping, product use–associated lung injury (EVALI) reported to CDC — United States, August–December 2019," in the last column, under "Any CBD-containing product use," in the first row below the row header "Combination of substance use," the values for "Both THC- and nicotine-containing product use" should have read **81/214 (38)**.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Persons Who Had a Stomach or Intestinal Illness That Started in the Past 2 Weeks,† by Sex and Age Group — National Health Interview Survey,§ 2018



* With 95% confidence intervals indicated by error bars.
† Based on a question in the Sample Child and Sample Adult Interview that asks "Did [you/your child] have a stomach or intestinal illness with vomiting or diarrhea that started during the last two weeks?"
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.

In 2018, 4.7% of males and 5.3% of females had a stomach illness that started in the past 2 weeks. Among children and adolescents aged 0–17 years, no difference was observed in the percentage of males and females who had a stomach illness that started in the past 2 weeks. However, among adults, women were more likely to have had a stomach illness than men. This held for those aged 18–64 years (5.3% of women compared with 4.5% of men) and those aged ≥65 years (5.8% versus 4.2%).

Source: National Health Interview Survey, 2018 data. https://www.cdc.gov/nchs/nhis.htm.

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The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit *MMWR* at *https://www.cdc.gov/mmwr/index.html*.

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