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Alcohol Use and Co-Use of Other Substances Among Pregnant Females Aged 12–44 Years — United States, 2015–2018

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Drinking alcohol during pregnancy can cause fetal alcohol spectrum disorders, including birth defects, behavioral disorders, and impaired cognitive development (*1*). Little is known about the co-use of other substances by females who drink during pregnancy. CDC used 2015–2018 data from the National Survey on Drug Use and Health (NSDUH) to estimate the overall and trimester-specific prevalence of self-reported drinking in the past 12 months, current drinking, and binge drinking, overall and by trimester, and the co-use of other substances among pregnant females aged 12–44 years. Past drinking (12 months) was reported by 64.7% of pregnant respondents. Current drinking (at least one drink in the past 30 days) was reported by 19.6% of respondents who were in their first trimester of pregnancy and 4.7% of respondents who were in their second or third trimester. Binge drinking (consuming four or more drinks on at least one occasion in the past 30 days) was reported by 10.5% of first trimester respondents and 1.4% of second or third trimester respondents. Overall, 38.2% of pregnant respondents who reported current drinking also reported current use of one or more other substances. The substances used most with alcohol were tobacco and marijuana. Self-reported drinking prevalence was substantially lower among second or third trimester respondents than among first trimester respondents. The American College of Obstetricians and Gynecologists (ACOG) recommends alcohol use and substance use disorders screening for all females seeking obstetric-gynecologic care and counseling patients that there is no known safe level of alcohol use during pregnancy (*2*).

NSDUH is a nationwide survey that uses multistage and area probability sampling to provide information on tobacco, alcohol, and drug use, and on mental health and other health-related issues, among U.S. civilian, noninstitutionalized persons aged ≥12 years. Surveys are conducted in respondents' homes and use computer-assisted interviewing methods. Female respondents report whether they are currently pregnant and the trimester of pregnancy at the time of the interview. Weighted response rates for 2015–2018 ranged from 66.6% to 69.3%.*

This report focuses on past 12 months drinking, current drinking and binge drinking among pregnant respondents.

*https://www.samhsa.gov/data/sites/default/files/NSDUH-MethodSummDefsHTML-2015/NSDUH-MethodSummDefsHTML-2015/NSDUH-MethodSummDefs-2015.htm.

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Drinking alcohol during pregnancy and binge drinking in any population are two measures of excessive drinking.[†] In addition, this report provides estimates of the prevalence of co-use of other substances among respondents who drank alcohol. Respondents who reported ever having an alcoholic beverage were asked how long it had been since they last drank an alcoholic beverage.

This report also examined past 12 months and past 30 days use of other substances, including tobacco (i.e., cigarettes, cigars, smokeless tobacco, and pipes), marijuana, opioids (prescription pain reliever misuse and heroin use), and "other substances," which included cocaine, hallucinogens, inhalants, methamphetamines, and the misuse[§] of sedatives, stimulants, and tranquilizers. Other substances were grouped as one category because of the small number of pregnant females who reported using them.

Data were weighted to adjust for nonresponse and to generate nationally representative estimates. Prevalence estimates and 95% confidence intervals (CIs) for past 12 months drinking, current drinking, and binge drinking were calculated overall and by sociodemographic and pregnancy characteristics (age, race/ethnicity, income, marital status, education, employment status, insurance status, county urban/rural status, and trimester of pregnancy). Prevalence estimates and 95% CIs for past 12 months and current drinking alone and with co-occurring substance use among pregnant respondents also were calculated. Analyses were conducted using SAS (version 9.4; SAS Institute) with SUDAAN (version 11.0; RTI International) to account for the complex sampling method used in NSDUH. This activity was reviewed by CDC and conducted consistent with CDC policies and procedures.[¶]

Among 99,618 female respondents aged 12–44 years, 3,006 (3%) reported a current pregnancy. Among pregnant respondents, past 12 months drinking, current drinking, and binge drinking prevalence estimates were 64.7%, 9.8%, and 4.5%, respectively (Table 1). Past 12 months drinking was reported by 76.1% of first trimester respondents and 59.8% of second or third trimester respondents; current drinking by 19.6% of first trimester respondents and 4.7% of second or third trimester respondents; and binge drinking by 10.5% of first trimester respondents and 1.4% of second or third trimester respondents ($p<0.001$ for all comparisons) (Table 1; Figure).

Among respondents who were pregnant and reported drinking in the past 12 months, 41.7% also reported using at least one other substance in the past 12 months. The most commonly reported substances were tobacco (30.3%), marijuana

[†] Excessive drinking by females includes binge drinking (four or more drinks per occasion), heavy drinking (more than one drink per day on average), any drinking by pregnant females, and drinking by females aged <21 years. https://health.gov/dietaryguidelines/2015/.

[§] Misuse includes 1) use without a prescription of the respondent's own medication; 2) use in greater amounts, more often, or longer than the respondent was told to take them; or 3) use in any other way a doctor did not direct the respondent to use them.

[¶] U.S. Department of Health and Human Services, Title 45 Code of Federal Regulations 46, Protection of Human Subjects.

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TABLE 1. Weighted prevalence of past 12 months and past 30 days drinking and past 30 days binge drinking in 3,006 pregnant females aged 12–44 years, by selected characteristics — National Survey on Drug Use and Health, United States, 2015–2018

Characteristic	% (95% CI)		
	Past 12 months drinking*	Past 30 days drinking*	Past 30 days binge drinking*
Overall	**64.7 (62.1–67.3)**	**9.8 (8.5–11.1)**	**4.5 (3.7–5.4)**
Age group (yrs)			
<18	39.0 (27.3–52.1)	—†	—†
18–25	61.2 (58.0–64.3)	9.9 (7.9–12.2)	6.0 (4.5–8.1)
26–34	68.2 (64.2–72.0)	9.4 (7.6–11.5)	3.9 (2.9–5.3)
≥35	63.1 (55.5–70.1)	11.1 (7.3–16.6)§	—†
Race/Ethnicity			
White, non-Hispanic	74.9 (71.4–78.0)	9.9 (8.2–11.8)	4.0 (3.0–5.3)
Black, non-Hispanic	56.7 (51.0–62.3)	13.7 (9.8–18.9)	7.0 (4.6–10.9)§
Hispanic	48.0 (42.2–53.7)	7.0 (4.5–10.7)§	—†
Other	52.9 (44.0–61.7)	8.4 (4.8–14.4)	—†
Income§			
<$20,000	50.5 (45.2–55.8)	9.7 (7.3–12.8)	6.3 (4.7–8.3)
$20,000–$74,999	61.6 (57.9–65.2)	8.7 (7.0–10.8)	3.9 (2.8–5.4)
≥$75,000	78.3 (74.0–82.1)	11.4 (9.2–14.0)	4.3 (3.0–6.0)
Marital status¶			
Married	66.2 (62.2–70.0)	9.0 (7.3–11.0)	3.1 (2.2–4.3)
Not married	63.6 (59.9–67.1)	11.0 (9.1–13.3)	6.5 (5.0–8.4)
Education¶			
≤High school	49.2 (45.3–53.0)	8.9 (6.9–11.4)	5.3 (3.8–7.6)
>High school	73.3 (70.0–76.3)	10.3 (8.8–12.0)	4.0 (3.1–5.2)
Employment¶			
Full time	76.3 (73.1–79.1)	11.6 (9.7–13.9)	4.6 (3.4–6.2)
Part time	62.5 (57.2–67.5)	8.7 (5.8–12.8)	3.4 (1.9–6.2)§
Unemployed/Other**	53.5 (49.3–57.7)	8.3 (6.4–10.6)	4.8 (3.4–6.6)
Insurance			
Medicaid	54.9 (51.3–58.5)	7.6 (6.0–9.5)	3.8 (2.8–5.0)
Private	73.9 (70.2–77.3)	10.6 (8.6–13.0)	4.0 (3.0–5.5)
Uninsured/Other††	53.2 (46.2–60.1)	13.5 (9.4–18.9)	9.5 (5.7–15.4)§
Urban/Rural§§			
Metropolitan	65.7 (61.6–69.5)	10.3 (8.4–12.7)	3.8 (2.7–5.4)
Micropolitan	64.5 (60.6–68.2)	9.3 (7.1–12.0)	4.9 (3.7–6.6)
Rural	61.0 (55.8–66.0)	8.3 (5.9–11.7)	6.3 (3.9–9.8)§
Trimester¶¶			
First	76.1 (72.7–79.3)	19.6 (16.8–22.7)	10.5 (8.5–13.0)
Second or third	59.8 (56.5–63.1)	4.7 (3.5–6.4)	1.4 (0.9–2.1)

Abbreviation: CI = confidence interval.
* Past 12 months use regardless of whether there was also past 30 days use; past 30 days drinking regardless of whether there was also past 30 days binge drinking; binge drinking = consuming four or more drinks on at least one occasion in the past 30 days.
† Estimates are not presented because the relative standard error was >30%.
§ Estimate might be unstable because the relative standard error is 20%–30%.
¶ The age group <18 years was omitted for income, marital status, education, and employment.
** Other = those not in the labor force.
†† Other insurance not otherwise specified.
§§ https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.
¶¶ Overall, 1.3% of females reported an unknown trimester of pregnancy and were not included in the table.

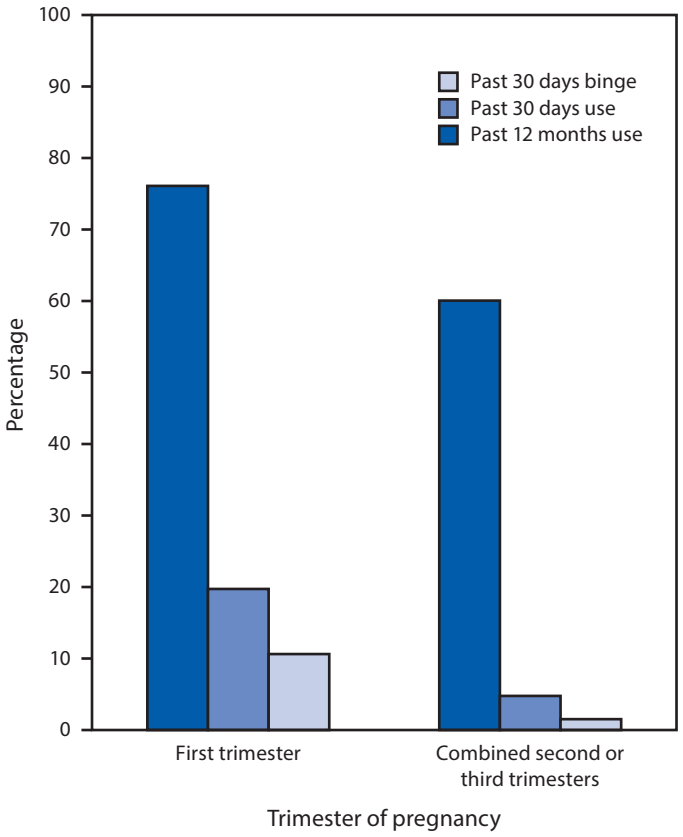
(21.9%), and opioids (7.0%) (Table 2). Among respondents who reported current drinking, 38.2% reported using at least one other substance, most commonly tobacco (28.1%) and marijuana (20.6%) (Table 2).

Overall, 19.6% of respondents who were pregnant reported past 12 months drinking and tobacco use, 14.2% reported past 12 months drinking and marijuana use, 4.5% reported past 12 months drinking and opioid use, 2.7% reported current drinking and tobacco use, and 2.0% reported current drinking and marijuana use.

Discussion

During 2015–2018, approximately half of all pregnant respondents who reported current drinking (drinking in the past 30 days) (9.8%) also reported binge drinking (4.5%). Among pregnant females who reported current drinking, 38.2% also reported current use of one or more other substances, including tobacco, marijuana, opioids, and other substances. The estimates of current drinking and binge drinking among pregnant females are consistent with recent

FIGURE. Weighted prevalence of past 12 months drinking, past 30 days drinking, and past 30 days binge drinking* among pregnant females† aged 12–44 years (N = 3,006), by trimester — National Survey on Drug Use and Health, United States, 2015–2018



* For females, binge drinking = four or more drinks per occasion.
† Overall, 1.3% of pregnant females reported an unknown trimester of pregnancy and were not included in the figure.

analyses using data from the 2015–2017 Behavioral Risk Factor Surveillance System, which reported current drinking and binge drinking estimates of 11.5% and 3.9%, respectively, among pregnant respondents aged 18–44 years (*3*). The current analysis adds to previous findings by including trimester-specific estimates showing higher self-reported drinking in first trimester respondents, suggesting that some respondents who drank before pregnancy might have quit by mid-to-late pregnancy, and by providing estimates indicating that co-use of other substances is common.

Few population-based reports consider co-use of other substances among pregnant females who drink alcohol. In this report, current drinking overall and in combination with one or more other substances were substantially lower than past 12 months drinking, suggesting that females decrease their use after they know they are pregnant. Alcohol exposure during pregnancy can adversely affect fetal development, resulting in behavioral disorders, impaired intellectual development, and

Summary

What is already known about this topic?

Drinking alcohol during pregnancy can cause miscarriage, stillbirth, and fetal alcohol spectrum disorders; however, approximately one in nine pregnant females report current drinking. Little is known about the co-use of other substances by females who drink during pregnancy.

What is added by this report?

Pregnant respondents in the first trimester reported higher current alcohol use than did respondents in the second or third trimester. Among first trimester respondents, 19.6% reported current alcohol use and 10.5% reported binge drinking; among second or third trimester respondents, current drinking and binge drinking were reported by 4.7% and 1.4%, respectively. Approximately 40% of pregnant females reporting current drinking also reported current use of other substances.

What are the implications for public health?

Co-use of other substances is common among females who drink alcohol during pregnancy. Screening and interventions for alcohol and other substances in pregnancy could improve the health of mothers and their children.

birth defects (*1*). It also has been associated with miscarriage and stillbirth (*4*). Although supporting data are sparse, alcohol exposure combined with exposure to other substances could worsen pregnancy outcomes. Prenatal exposure to substances included in this analysis has been associated with adverse health outcomes, including preterm birth, sudden infant death syndrome, and preterm-related death (exposure to tobacco) (*5*); low birth weight (tobacco, marijuana) (*5,6*); and altered fetal brain development (tobacco, marijuana) (*5–8*). A review of prenatal substance exposure and neuroimaging suggests that in utero exposure to substances other than alcohol, including marijuana, nicotine, cocaine, methamphetamine, opioids, or combinations of substances, is associated with long-term effects on cognition and with altered brain connectivity and white matter deficits (*9*).

The findings in this report are subject to at least four limitations. First, data are self-reported and therefore subject to social desirability bias; respondents might underreport substance use because of social stigma and legal implications. Second, because NSDUH only ascertains past 12 months and past 30 days substance use in a cross-sectional sample, patterns across individual pregnancies are unknown. Estimates of any substance use during the length of an entire pregnancy would likely be higher than estimates of past 30 days use. Third, limited sample size necessitated the suppression of some prevalence estimates. Finally, some pregnancies might not have been recognized at the time of the interview, resulting in misclassification by pregnancy status. Alcohol use and other substance use presumably

TABLE 2. Weighted prevalence of substance use patterns (past 12 months and past 30 days) in pregnant females aged 12–44 years (N = 3,006*) who drank alcohol in the past 12 months (n = 1,851*) or the past 30 days (n = 282*) — National Survey on Drug Use and Health, United States, 2015–2018

Substance use pattern	% (95% CI)	
	Past 12 months drinking†	Past 30 days (current) drinking
All pregnant females (N = 3,006*)		
Any alcohol use	64.7 (62.1–67.3)	9.8 (8.5–11.1)
Alcohol use only	37.7 (35.7–39.7)	6.0 (5.0–7.2)
Alcohol and ≥1 additional substance	27.0 (25.1–29.0)	3.7 (2.9–4.7)
Other substances used§		
Tobacco¶	19.6 (18.0–21.3)	2.7 (2.1–3.6)
Marijuana	14.2 (12.3–16.3)	2.0 (1.4–2.8)
Opioids**	4.5 (3.5–5.8)	—††
Other††	6.2 (5.0–7.7)	—††
Pregnant females who drank in the past 12 months (n = 1,851*) or in the past 30 days (n = 282*)		
Alcohol use only	58.3 (56.0–60.6)	61.8 (53.9–69.2)
Alcohol and ≥1 additional substance	41.7 (39.4–44.0)	38.2 (30.8–46.1)
Other substances used§		
Tobacco¶	30.3 (28.0–32.8)	28.1 (21.7–35.6)
Marijuana	21.9 (19.0–25.0)	20.6 (14.5–28.3)
Opioids**	7.0 (5.5–8.9)	—††
Other§§	9.76 (7.8–11.8)	—††

Abbreviation: CI = confidence interval.
* Unweighted.
† Past 12 months use, regardless of whether there was also drinking in the past 30 days (current drinking).
§ Not mutually exclusive.
¶ Includes cigarettes, cigars, or smokeless tobacco.
** Includes prescription pain reliever misuse and heroin use.
†† Estimates are not presented because the relative standard error was >30%.
§§ Includes use of cocaine, hallucinogens, inhalants, methamphetamines, and the misuse of sedatives, stimulants, and tranquilizers.

are lower in recognized than in unrecognized pregnancies, resulting in underestimation of exposure levels.

The U.S. Preventive Services Task Force recommends alcohol screening and brief behavioral counseling in primary care settings for all adults aged ≥18 years (*10*). ACOG recommends alcohol use screening for all females seeking obstetric-gynecologic care and counseling patients that there is no known safe level of alcohol use during pregnancy (*2*). ACOG also recommends routine universal screening for substance use disorders with validated screening tools or through conversations with patients. Although ACOG does not have recommendations specific to polysubstance use, the findings of this report indicate that a substantial percentage of females who use alcohol during early pregnancy also use one or more other substances, especially tobacco or marijuana. Females could benefit from screening and interventions in pregnancy to reduce alcohol and polysubstance use and from referral for those in need of treatment. Successful reduction in substance exposures during pregnancy could improve the health of mothers and their children.

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COVID-19 Outbreak Among Employees at a Meat Processing Facility — South Dakota, March–April 2020

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On March 24, 2020, the South Dakota Department of Health (SDDOH) was notified of a case of coronavirus disease 2019 (COVID-19) in an employee at a meat processing facility (facility A) and initiated an investigation to isolate the employee and identify and quarantine contacts. On April 2, when 19 cases had been confirmed among facility A employees, enhanced testing for SARS-CoV-2, the virus that causes COVID-19, was implemented, so that any employee with a COVID-19–compatible sign or symptom (e.g., fever, cough, or shortness of breath) could receive a test from a local health care facility. By April 11, 369 COVID-19 cases had been confirmed among facility A employees; on April 12, facility A began a phased closure* and did not reopen during the period of investigation (March 16–April 25, 2020). At the request of SDDOH, a CDC team arrived on April 15 to assist with the investigation. During March 16–April 25, a total of 929 (25.6%) laboratory-confirmed COVID-19 cases were diagnosed among 3,635 facility A employees. At the outbreak's peak, an average of 67 cases per day occurred. An additional 210 (8.7%) cases were identified among 2,403 contacts of employees with diagnosed COVID-19. Overall, 48 COVID-19 patients were hospitalized, including 39 employees and nine contacts. Two employees died; no contacts died. Attack rates were highest among department-groups where employees tended to work in proximity (i.e., <6 feet [2 meters]) to one another on the production line. Cases among employees and their contacts declined to approximately 10 per day within 7 days of facility closure. SARS-CoV-2 can spread rapidly in meat processing facilities because of the close proximity of workstations and prolonged contact between employees (*1*,*2*). Facilities can reduce this risk by implementing a robust mitigation program, including engineering and administrative controls, consistent with published guidelines (*1*).

Investigation and Findings

Facility A, which employed 3,635 persons in 38 departments, harvests and processes animals during two shifts per day. A third shift sanitizes the facility. On March 24, SDDOH was notified that an employee had received a positive SARS-CoV-2 test result; SDDOH began an investigation that day. The employee worked in department A during the first shift. He had last worked on March 14, developed symptoms on March 16, and was tested on March 22. On March 19, a first-shift employee in department B became ill. The following day, two additional first-shift department A employees and one second-shift department C employee developed symptoms. On March 21, one first-shift department B employee developed symptoms, for a total of six COVID-19 cases among employees. During March 22–28, 18 employees from department B developed COVID-19 symptoms, resulting in the department's temporary closure on April 3; 15 cases in employees from nine other departments also occurred that week. On April 3, facility A also began screening all employees for fever, installing physical barriers on the production line, and amending the employee dress code to include optional masks, which were required as of April 13, 1 day after the phased closure of facility A began. By April 4, a total of 247 employees from 23 departments had developed COVID-19.

A COVID-19 case was defined as a positive SARS-CoV-2 reverse transcription–polymerase chain reaction test result in a person who had onset of COVID-19–compatible symptoms, or who was tested in the absence of symptoms, before April 26 (i.e., 14 days after phased closure began). Illness onset date was defined as the date COVID-19–compatible symptoms first appeared (or the specimen collection date, if no symptom onset date was documented). All reported cases were investigated by SDDOH to determine patient symptom onset date, identify and trace contacts, and describe patients' clinical course of illness. Lists with employee characteristics provided by facility A were used, along with SDDOH case investigation data, to identify cases associated with facility A and to calculate attack rates. Employees' contacts were identified through interviews conducted by SDDOH and were defined as persons who were within 6 feet (2 meters) of an employee who had a positive SARS-CoV-2 test result for at least 5 minutes during the employee's infectious period (i.e., from symptom onset to discontinuation of isolation). On April 1, the infectious period was expanded to include persons who had contact with persons with known COVID-19 during the 48 hours before symptom onset, in accordance with

*Beginning April 12, the facility did not slaughter any more animals. During April 12–14, the facility processed animals that had already been slaughtered, shipped finished product, and progressively closed departments. From April 15 onward, only staff members necessary for maintenance, cleaning, and sanitization of the facility, transportation of remaining product, and implementation of COVID-19 prevention activities reported to work.

changing CDC guidance. Employees who did not work during March 2–April 25 were excluded from analysis. Departments were aggregated into seven department-groups as determined by the facility's supervisory structure: Bacon, Conversion,[†] Cut, Harvest, Sausage, Smoke meat, and Other. Department-groups tended to consist of departments that performed similar functions under similar conditions and received COVID-19-related guidance and communication through similar channels. Attack rates were calculated by shift, department-group, and compensation status. A community resident was defined as a resident of one of the two counties that compose the city where facility A is located who was neither an employee of facility A nor a known contact of a facility A employee. SAS (version 9.4; SAS Institute) was used to conduct statistical analyses. This investigation was determined by CDC to be public health surveillance.[§]

During March 16–April 25, among 3,635 facility A employees, 929 (25.6%) met the COVID-19 case definition, including 895 (96.3%) who were symptomatic (Table 1) (Figure). During this period, facility A employees represented 920 (41.8%) of the 2,199 COVID-19 cases identified among community residents. Among 2,403 identified employee contacts, 210 (8.7%) had confirmed COVID-19 (illness onset range = March 30–April 25). The median employee age was 42 years (range = 18–81 years), and the median employee contact age was 29 years (range = 0–85 years). Among employees diagnosed with COVID-19, 34 (3.7%) were asymptomatic, as were six (2.9%) contacts and 53 (4.9%) community residents. Among those with symptoms, symptom onset date was not documented for 33 (3.7%) employees, 10 (4.9%) contacts, and 28 (2.7%) community residents. The earliest symptom onset date reported among community residents with diagnosed COVID-19 was February 24.

Among employees with COVID-19, 39 (4.2%) were hospitalized; the median age of hospitalized patients was 60 years (range = 28–73 years). As of June 14, 11 hospitalized patients had been discharged after a median length of stay of 6.5 days (range = 1–69 days). Nine (4.3%) contacts who developed COVID-19 were hospitalized; the median age of hospitalized contacts was 64 years (range = 23–79 years), and they were hospitalized for a median of 10 days (range = 1–15 days). As of June 14, two employees with COVID-19 had died.

The attack rate at facility A during March 16–April 25 was 25.6% (Table 2). The highest attack rates occurred in the Cut (30.2%), Conversion (30.1%), and Harvest (29.4%) department-groups. The first, second, and third shifts had similar attack rates. The attack rate among nonsalaried employees was 26.8% and among salaried employees was 14.8%. During the first 3 weeks of the outbreak, the overall attack rate increased approximately fivefold per week (week 1 = 0.2%, week 2 = 1.2%, and week 3 = 6.8%). During the fourth week of the outbreak, an average of 67 employee COVID-19 cases were occurring per day. Within 7 days of facility closure, cases among employees declined to approximately 10 per day.

Public Health Response

Beginning March 24, SDDOH investigated all cases among facility A employees and their contacts. Persons with confirmed COVID-19 were instructed to self-isolate. Contacts of patients were traced, instructed to quarantine, and actively monitored for signs and symptoms of COVID-19 using CDC's Text Illness Monitoring (TIM) system.[¶] Contacts who developed symptoms of COVID-19 were counseled and referred to a health care provider to be evaluated for SARS-CoV-2 testing.

Discussion

Outbreaks of COVID-19 have been described among employees in congregate settings (*3*–*5*). This large outbreak of COVID-19 among employees at a meat processing facility highlights the potential for rapid transmission of SARS-CoV-2 in these types of facilities. Factors that might have contributed to infection among employees at this facility include high employee density in work and common areas, prolonged close contact between employees over the course of a shift, and substantial SARS-CoV-2 transmission in the surrounding community (*6*).

The Cut, Conversion, and Harvest department-groups, in which numerous employees tended to work <6 feet (2 meters) from one another on the production line, experienced the highest attack rates. Salaried employees, who typically had workstations that could be adjusted to maintain distancing and did not work in close proximity to other employees on the production line, had a lower attack rate than did nonsalaried employees. These differences highlight the importance of engineering controls (e.g., physical barriers) and administrative controls (e.g., cohorting employees) in mitigating the risk for SARS-CoV-2 transmission in meat processing facilities (*1*). Consistent and correct use of masks can also prevent presymptomatic or asymptomatic employees with SARS-CoV-2 infection from transmitting the virus to others (*1*).

Although cases were confined to three departments during the first week of the outbreak, the number of affected

[†] Conversion is the process of further refining initial cuts of meat into finished fresh meat products.

[§] U.S. Department of Health and Human Services, Title 45 Code of Federal Regulations 46, Protection of Human Subjects. https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=83cd09e1c0f5c6937cd9d7513160fc3f&pitd=20180719&n=pt45.1.46&r=PART&ty=HTML.

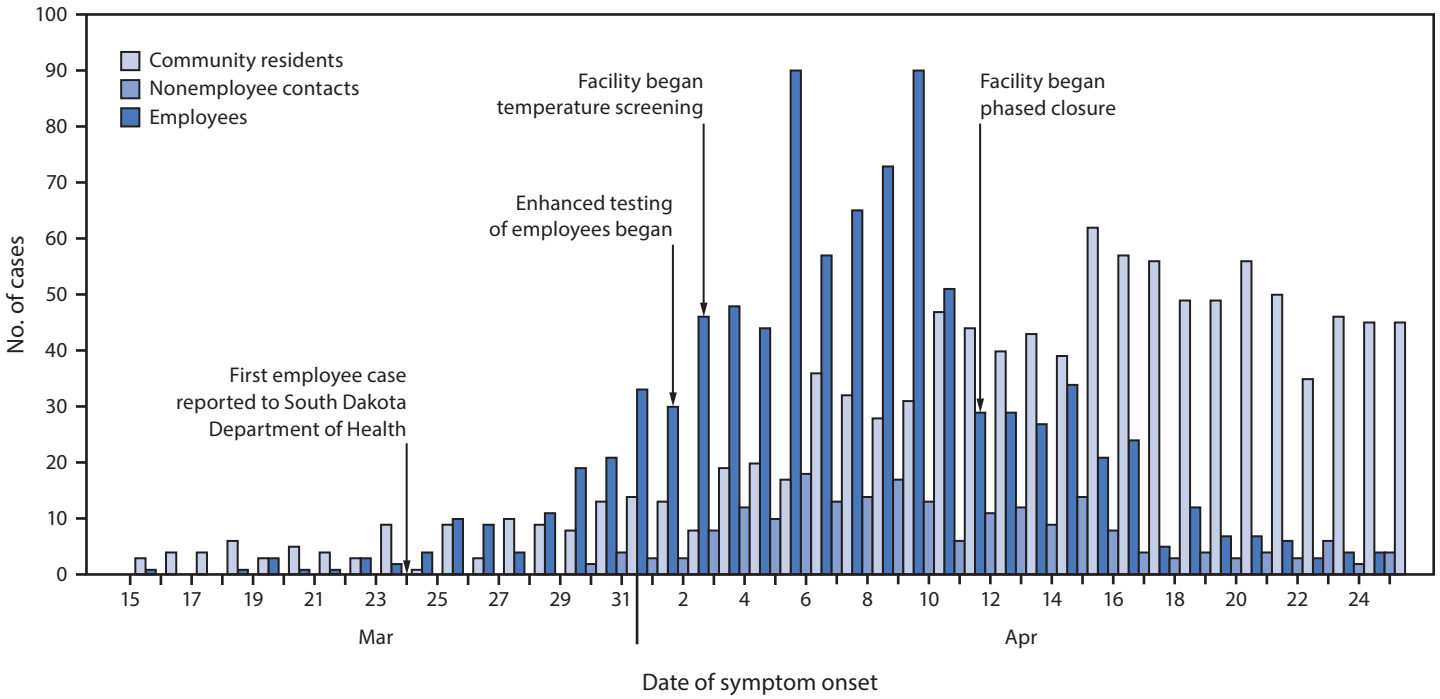
[¶] Public health departments can request access to the TIM system via this e-mail address: eocevent340@cdc.gov.

TABLE 1. Demographic* and clinical characteristics of COVID-19 patients among employees at a meat processing facility, their contacts, and community residents† — South Dakota, February 24–April 25, 2020

Characteristic	No. (%)		
	Employees (n = 929)	Contacts (n = 210)	Community residents (n = 1,086)
Demographic			
Sex			
Female	333 (35.8)	124 (59.1)	592 (54.5)
Male	596 (64.2)	86 (41.0)	494 (45.5)
Age, yrs, median (range)	42.0 (18–81)	29.0 (0–85)	40.0 (0–100)
Age group (yrs)			
<18	0 (—)	37 (17.6)	74 (6.8)
18–44	512 (55.1)	111 (52.9)	579 (53.3)
45–54	235 (25.3)	28 (13.3)	158 (14.6)
55–64	156 (16.8)	24 (11.4)	155 (14.3)
≥65	26 (2.8)	10 (4.8)	120 (11.1)
Clinical			
Symptomatic	895 (96.3)	204 (97.1)	1033 (95.1)
Hospitalized	39 (4.2)	9 (4.3)	130 (12.0)
ICU admission	14 (1.5)	3 (1.4)	22 (2.0)
Died	2 (0.2)	0 (—)	25 (2.3)

Abbreviations: COVID-19 = coronavirus disease 2019; ICU = intensive care unit.
* Race and ethnicity data were incomplete and are not presented.
† A resident of one of the two counties that compose the city where facility A is located who was neither an employee of facility A nor a contact of a facility A employee.

FIGURE. Confirmed COVID-19 cases among employees at a meat processing facility (n = 929), their contacts (n = 210), and community residents* (n = 1,086) and facility mitigation strategies,† by date of illness onset§,¶ (N = 2,225) — South Dakota, February 24–April 25, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.
* A person who resided in one of the two counties that make up the city in which facility A is located who was neither an employee of facility A nor a contact of an employee.
† Beginning April 12, the facility did not slaughter any more animals. During April 12–14, the facility processed animals that had already been slaughtered, shipped finished product, and progressively closed departments. From April 15 onward, only staff members necessary for maintenance, cleaning, and sanitization of the facility, transportation of remaining product, and implementation of COVID-19 prevention activities reported to work.
§ The date COVID-19–compatible symptoms first appeared or, if no symptom onset date was documented during the investigation, specimen collection date. For asymptomatic persons, SARS-CoV-2 specimen collection date is reported.
¶ During February 24–March 14, 11 community residents had COVID-19 illness onset.

TABLE 2. COVID-19 cumulative attack rates among employees (N = 3,635) at a meat processing facility, by week of illness onset* — South Dakota, March 15–April 25, 2020

Employee division (no. with available information)	COVID-19 cases, no. (%)					
	March 15–21	March 15–28	March 15–April 4	March 15–April 11	March 15–April 18	March 15–April 25
Compensation						
Nonsalaried (3,372)	6 (0.2)	39 (1.2)	240 (7.1)	691 (20.5)	848 (25.1)	890 (26.4)
Salaried (263)	0 (0.0)	0 (0.0)	7 (2.7)	26 (9.9)	38 (14.4)	39 (14.8)
Total (3,635)	**6 (0.2)**	**39 (1.2)**	**247 (6.8)**	**717 (19.7)**	**886 (24.4)**	**929 (25.6)**
Department-group						
Cut (882)	0 (0.0)	4 (0.5)	64 (7.3)	211 (23.9)	251 (28.5)	266 (30.2)
Conversion† (575)	5 (0.9)	24 (4.2)	91 (15.8)	154 (26.8)	170 (29.6)	173 (30.1)
Harvest (428)	0 (0.0)	2 (0.5)	26 (6.1)	88 (20.6)	121 (28.3)	126 (29.4)
Smoke meat (357)	0 (0.0)	1 (0.3)	14 (3.9)	66 (18.5)	83 (23.2)	86 (24.1)
Bacon (234)	1 (0.4)	2 (0.9)	10 (4.3)	42 (17.9)	52 (22.2)	54 (23.1)
Sausage (151)	0 (0.0)	1 (0.7)	3 (2.0)	23 (15.2)	32 (21.2)	33 (21.9)
Other (745)	0 (0.0)	5 (0.7)	32 (4.4)	107 (14.4)	139 (18.7)	152 (20.4)
Total (3,372)	**6 (0.2)**	**39 (1.2)**	**240 (7.1)**	**691 (20.5)**	**848 (25.1)**	**890 (26.4)**
Shift						
First (1,744)	5 (0.3)	32 (1.8)	142 (8.1)	381 (21.8)	463 (26.5)	485 (27.8)
Second (1,459)	1 (0.1)	6 (0.4)	93 (6.4)	278 (19.1)	347 (23.8)	359 (24.6)
Third (167)	0 (0.0)	0 (0.0)	4 (2.4)	30 (18.0)	36 (21.6)	44 (26.3)
Total (3,370)	**6 (0.2)**	**38 (1.1)**	**239 (7.2)**	**691 (20.5)**	**846 (25.1)**	**888 (26.4)**

Abbreviation: COVID-19 = coronavirus disease 2019.
* COVID-19 illness onset was defined as the date COVID-19–compatible symptoms first appeared or, if no symptom onset date was documented during the investigation, specimen collection date. For asymptomatic cases, SARS-CoV-2 specimen collection date is reported.
† The process of further refining initial cuts of meat into finished fresh meat products.

departments increased rapidly. Contact between employees in common areas (e.g., cafeterias, locker rooms, and equipment-dispensing locations) might have facilitated spread among employees in different departments. Visual cues to maintain physical distancing and staggered shifts and break times might reduce risk for transmission among employees in these areas (*1*). Transmission among employees who work in different departments might have also occurred outside the facility (e.g., carpooling, cohabitating, and socializing outside work).

Employees working the first, second, and third shifts experienced similar attack rates, although employee density in the facility is lowest during the third shift, and sanitizing duties entail physical distancing and the use of personal protective equipment. Transmission among third shift employees might have occurred in common areas or outside the facility.

Although COVID-19 cases among employees declined to approximately 10 cases per day within 7 days of facility closure, some decrease was observed before closure. Implementation of control measures before closure of facility A might have contributed to this decrease. Employee testing decreased after facility closure, which also might have contributed to the apparent reduction in cases.

The findings in this report are subject to at least five limitations. First, during a period of limited availability of SARS-CoV-2 testing, the enhanced testing strategy begun on April 2 might have led to increased case detection among employees, compared with that among community members. Second, attack rates were calculated by department-group, shift, and compensation status; other characteristics that were not assessed might have contributed to risk for infection within the facility. Third, attack rates stratified by race and ethnicity are not reported because these data were incomplete. Fourth, unlike a recent study among meat processing employees (*7*), there was limited testing of asymptomatic persons in this study; therefore, the proportion of symptomatic infections reported here is likely an overrepresentation of the proportion of symptomatic SARS-CoV-2 infections in the population, and the number of cases identified is likely an underestimation of the number of SARS-CoV-2 infections in the population. Finally, the location of virus acquisition (e.g., facility versus community) for individual employees could not be determined.

These findings highlight the potential for rapid transmission of SARS-CoV-2 among employees in meat processing facilities. Employers should prioritize implementation of control measures consistent with published guidelines to mitigate the risk for occupational SARS-CoV-2 transmission (*1*,*2*). A robust mitigation program including engineering (e.g., modification of workstations to separate workers) and administrative (e.g., promoting social distancing when possible) controls should be implemented because no single control measure likely will eliminate transmission. Consistent and correct use of masks can prevent employees with COVID-19 from infecting others. Once a case is identified, prompt isolation of the infected employee and identification of contacts is necessary to reduce

Summary

What is already known about this topic?

Persons in congregate work settings are at increased risk for infection with respiratory pathogens, including SARS-CoV-2.

What is added by this report?

During March 16–April 25, 25.6% (929) of employees at a meat processing facility in South Dakota and 8.7% (210) of their contacts were diagnosed with COVID-19; two employees died. The highest attack rates occurred among employees who worked <6 feet (2 meters) from one another on the production line.

What are the implications for public health practice?

Implementing control measures before, or soon after, SARS-CoV-2 introduction into meat processing facilities, especially in areas where employees have prolonged, close contact with others, might substantially reduce the risk for SARS-CoV-2 spread within facilities.

spread within the facility and the community. If widespread transmission continues despite these measures, temporary facility closure might reduce transmission among employees and their contacts.

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Notes from the Field

Characteristics of Meat Processing Facility Workers with Confirmed SARS-CoV-2 Infection — Nebraska, April–May 2020

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Coronavirus disease 2019 (COVID-19) has been reported nationwide among meat processing facility workers (*1*). In late April 2020, through flyers and text messages, workers at a Nebraska meat processing facility were invited by the facility, in partnership with the Nebraska Department of Health and Human Services, to be tested for current SARS-CoV-2, the virus that causes COVID-19, at their worksite, free of charge. Specimens were analyzed using reverse transcription–polymerase chain reaction (RT-PCR) by a contracting laboratory. This investigation was determined by CDC to be public health surveillance.* Among 1,216 Nebraska-resident meat processing facility workers tested, 375 (31%) had positive results. During May 8–25, case investigators attempted to interview the 349 workers who had positive test results and available phone numbers; five refused, 99 were not reached after five attempts, and four did not report symptom status, leaving 241 (69%) of the attempted interviews for analysis.

Among the 241 interviewed workers, 57% were male, the median age was 41 years (range = 18–76 years), and 46% were Hispanic (Table). Approximately one third (78; 32%) of respondents reported no symptoms. Among the 163 symptomatic respondents, two were hospitalized, and no deaths were identified. Workers were queried about exposures during the 14 days before symptom onset (*2*) or before testing if they were asymptomatic. Close contact† with a visibly ill person (or person with diagnosed COVID-19) at work was reported by 70 (29%) workers; the most frequently reported close contact locations were production areas (74%) and cafeteria/break areas (51%). Among 167 persons who worked in the 14 days preceding symptom onset or testing, approximately half (46%) worked on the conveyor belt in harvesting (i.e., stunning, slaughtering, eviscerating, and halving), processing (i.e., cutting, preparing, and packaging), and rendering (i.e., converting waste animal materials into usable products), where they were in close proximity (<4 ft [<1.5 m]) to others. Most (88%) workers reported using a private vehicle rather than carpooling (11%) to get to work. Although most (87%) reported always having their temperature checked upon entry to work, fewer (41%) reported always being asked about symptoms. Nearly three quarters of workers (73%) reported having a flexible medical leave policy allowing for time off if needed. Approximately one half of workers reported living in a single-family home (53%), with a median household size of three persons (range = 1–13). Thirty of 235 (13%) workers reported close contact with a visibly ill person (or a person with diagnosed COVID-19) outside of work. Limitations of this analysis include the absence of a comparison group and that only persons who participated in testing, had positive test results, had contact information, answered the telephone, and agreed to be interviewed were included.

Reducing workplace exposures is crucial for preventing COVID-19 among meat processing facility workers. Despite broad availability of a flexible medical leave policy and fever screening, approximately one third of workers included in this investigation reported close contact with an ill person at work, which supports the need for symptom screening§ in addition to fever screening and ongoing access to testing. Fewer workers reported contact with an ill person outside work; risk factors such as crowded living conditions and shared transportation were reported infrequently. Approximately one third of workers with COVID-19 were asymptomatic, underscoring the limitations of relying on symptom or fever screening alone, particularly because asymptomatic persons with COVID-19 potentially contribute to transmission (*3*,*4*). That nearly one half of interviewed workers worked in close proximity to others highlights the need for physical barriers between workers, physical distancing throughout the facility (especially locations prone to crowding, such as production areas and cafeterias or break areas), and consistent and correct use of masks to reduce transmission in the workplace¶ in this critical industry (*5*,*6*).

* U.S. Department of Health and Human Services, Title 45 Code of Federal Regulations 46, Protection of Human Subjects. https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=83cd09e1c0f5c6937cd9d7513160fc3f&pitd=20180719&n=pt45.1.46&r=PART&ty=HTML.

† Close contact was defined as being within 6 feet (2 m) for ≥10 minutes in the 2 weeks preceding symptom onset or testing.

§ Symptom screening should include some of the wide range of symptoms that persons with COVID-19 have reported (e.g., fever, cough, shortness of breath, headache, fatigue, myalgia, loss of smell or taste, and sore throat). https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.

¶ https://www.unmc.edu/healthsecurity/education/programs/docs/Playbook.pdf.

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TABLE. Demographic, clinical, household, community and occupational characteristics of 241 meat processing facility workers with confirmed SARS-CoV-2 infection — Nebraska, April–May 2020

Characteristic (no. with available information)	No. (%)*
Sex (237)	
Male	136 (57)
Female	101 (43)
Age group, yrs (238)	
Median age, yrs (range)	41 (18–76)
18–29	41 (17)
30–39	70 (29)
40–49	44 (18)
50–59	55 (23)
≥60	28 (12)
Ethnicity (210)	
Hispanic	97 (46)
Non-Hispanic	113 (54)
Reported preferred language† (220)	
Spanish	75 (34)
English	56 (25)
Somali	54 (25)
Other	35 (16)
Underlying health conditions (238)	
None	195 (82)
Any§	43 (18)
Diabetes¶	21 (9)
Cardiovascular disease¶	15 (6)
Lung disease	8 (3)
Signs and symptoms associated with illness (241)	
None	78 (32)
Any	163 (68)
Headache	106 (44)
Fatigue	85 (35)
Measured or subjective fever	82 (34)
Myalgia	82 (34)
Lost taste or smell	77 (32)
Cough	59 (24)
Sore throat	57 (24)
Chills	52 (22)
Median illness duration, days (range)	11 (<1–31)
Outcome (241)	
Hospitalized	2 (1)
Died	0 (0)
Smoking habits (236)	
Never smoker	177 (75)
Former smoker	46 (19)
Current smoker	13 (6)
Occupational exposures	
Close contact** with ill person at work (241), no. (% of total)	70 (29)
Production areas, no. (% of 70)	52 (74)
Cafeteria/Break areas, no. (% of 70)	36 (51)
Locker room, no. (% of 70)	30 (43)
Entry/Exit, no. (% of 70)	28 (40)
Other, no. (% of 70)	12 (17)
Worked 2 wks before symptoms or test†† (237)	**167 (68)**
Occupational role§§ (167)	
Harvesting (stunning, slaughtering, eviscerating, halving)¶¶	27 (16)
Chilling	12 (7)
Processing (cutting, preparing and packaging meat products)¶¶	91 (54)
Rendering (converting waste animal materials into usable products)¶¶	3 (2)
Material handling	21 (13)
Administrative support/Other	16 (10)
Commute to work* (167)**	
Carpool	19 (11)
Private car	147 (88)
Other	5 (3)
Wore a face covering or mask at work (157)	
Always	142 (90)
Sometimes	8 (5)
Never	7 (4)
Aware of flexible leave policy (164)	
Yes	120 (73)
No	18 (11)
Don't know	26 (16)
Temperature checked at work entry (160)	
Always	139 (87)
Sometimes	9 (6)
Never	12 (8)
Symptoms checked at work entry (162)	
Always	66 (41)
Sometimes	17 (10)
Never	79 (49)
Household and community characteristics	
Household size, no. of persons including interviewed worker (228)	
Median (range)	3 (1–13)
1	38 (17)
2	63 (28)
3	46 (20)
4	36 (16)
5	22 (10)
≥6	23 (10)
Home type (233)	
Single-family home	124 (53)
Apartment	99 (42)
Mobile home or other	10 (4)
Household member works outside home (234)	
No one else worked outside home	119 (51)
Household member works outside home†††	115 (49)
Same facility, no. (% of 115)	83 (72)
Other food or manufacturing facility, no. (% of 115)	11 (10)
Health care, long-term care facility, school, or child care, no. (% of 115)	9 (8)
Other, no. (% of 115)	18 (16)
Household member ill or has positive test result for SARS-CoV-2 (236)	
Household member ill or has positive test result for SARS-CoV-2 before or after worker	63 (27)
Community exposures	
Close contact†† with ill person outside work, including ill household members (235)	30 (13)
Not sure about close contact with ill person outside work (235)	22 (9)
Used public or shared transportation (236)	12 (5)
Household member at school or child care facility (238)	3 (1)
Attended social gathering of >10 persons (234)	3 (1)

* Because of missing data, categories might not sum to total.
† Information on preferred language was included instead of race because more complete and detailed information was available for this diverse population. Other languages include Burmese, Cambodian, French, Karen, Lao, Malay, Oromo, Romanian, Tigrinya, and Vietnamese.
§ Other underlying conditions that were asked about and reported infrequently include: renal conditions, liver conditions, autoimmune disorders, neurologic disorders and other chronic conditions.
¶ Six workers reported underlying cardiovascular disease and diabetes.
** Close contact was defined as being within 6 ft (2 m) of an ill person for ≥10 minutes in the 2 weeks preceding symptom onset or testing.
†† No information is available on why the workers who did not go to work in the 14-day period were absent.
§§ Six workers had multiple occupational roles.
¶¶ Those working on the belt in harvesting, processing, and rendering were considered to work in proximity (<4 ft [<1.5 m]) to one another.
*** Four workers used multiple modes of transportation to get to work.
††† Six workers had two household members who worked outside the home in different industries. It is possible that multiple household members who worked in the same plant are included in this study.

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SARS-CoV-2 Transmission and Infection Among Attendees of an Overnight Camp — Georgia, June 2020

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On July 31, 2020, this report was posted as an MMWR Early Release on the MMWR website (https://www.cdc.gov/mmwr).

Limited data are available about transmission of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), among youths. During June 17–20, an overnight camp in Georgia (camp A) held orientation for 138 trainees and 120 staff members; staff members remained for the first camp session, scheduled during June 21–27, and were joined by 363 campers and three senior staff members on June 21. Camp A adhered to the measures in Georgia's Executive Order* that allowed overnight camps to operate beginning on May 31, including requiring all trainees, staff members, and campers to provide documentation of a negative viral SARS-CoV-2 test ≤12 days before arriving. Camp A adopted most† components of CDC's Suggestions for Youth and Summer Camps§ to minimize the risk for SARS-CoV-2 introduction and transmission. Measures not implemented were cloth masks for campers and opening windows and doors for increased ventilation in buildings. Cloth masks were required for staff members. Camp attendees were cohorted by cabin and engaged in a variety of indoor and outdoor activities, including daily vigorous singing and cheering. On June 23, a teenage staff member left camp A after developing chills the previous evening. The staff member was tested and reported a positive test result for SARS-CoV-2 the following day (June 24). Camp A officials began sending campers home on June 24 and closed the camp on June 27. On June 25, the Georgia Department of Public Health (DPH) was notified and initiated an investigation. DPH recommended that all attendees be tested and self-quarantine, and isolate if they had a positive test result.

A line list of all attendees was obtained and matched to laboratory results from the State Electronic Notifiable Disease Surveillance System¶ and data from DPH case investigations. A COVID-19 case associated with the camp A outbreak was defined as a positive viral SARS-CoV-2 test** in a camp A attendee from a specimen collected or reported to DPH from the first day at camp A (June 17 for staff members and trainees; June 21 for campers) through 14 days after leaving camp A (trainees left on June 21; staff members and campers left during June 24–June 27). Out-of-state attendees (27) were excluded from this preliminary analysis. Attack rates were calculated by dividing the number of persons with positive test results by the total number of Georgia attendees, including those who did not have testing results, because negative test results are not consistently reported in Georgia.

A total of 597 Georgia residents attended camp A. Median camper age was 12 years (range = 6–19 years), and 53% (182 of 346) were female. The median age of staff members and trainees was 17 years (range = 14–59 years), and 59% (148 of 251) were female. Test results were available for 344 (58%) attendees; among these, 260 (76%) were positive. The overall attack rate was 44% (260 of 597), 51% among those aged 6–10 years, 44% among those aged 11–17 years, and 33% among those aged 18–21 years (Table). Attack rates increased with increasing length of time spent at the camp, with staff members having the highest attack rate (56%). During June 21–27, occupancy of the 31 cabins averaged 15 persons per cabin (range = 1–26); median cabin attack rate was 50% (range = 22%–70%) among 28 cabins that had one or more cases. Among 136 cases with available symptom data, 36 (26%) patients reported no symptoms; among 100 (74%) who reported symptoms, those most commonly reported were subjective or documented fever (65%), headache (61%), and sore throat (46%).

The findings in this report are subject to at least three limitations. First, attack rates presented are likely an underestimate because cases might have been missed among persons not tested or whose test results were not reported. Second, given the increasing incidence of COVID-19 in Georgia in June and July, some cases might have resulted from transmission occurring before or after camp attendance.†† Finally, it was

*https://gov.georgia.gov/document/2020-executive-order/06112001/download.

† Notable adopted measures included cohorting of attendees by cabin (≤26 persons), staggering of cohorts for use of communal spaces, physical distancing outside of cabin cohorts, and enhanced cleaning and disinfection, especially of shared equipment and spaces.

§ https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/summer-camps.html.

¶ http://sendss.state.ga.us/.

** CDC defines a viral test as one that detects SARS-CoV-2 nucleic acids (e.g., polymerase chain reaction) or antigens. https://www.cdc.gov/coronavirus/2019-ncov/hcp/testing-overview.html.

†† https://dph.georgia.gov/covid-19-daily-status-report.

TABLE. SARS-CoV-2 attack rates*,† among attendees of an overnight camp, by selected characteristics — Georgia, June 2020

Characteristic	No.§	No. positive	Attack rate, %
Total	**597**	**260**	**44**
Sex			
Male	267	123	46
Female	330	137	42
Age group, yrs			
6–10	100	51	51
11–17	409	180	44
18–21	81	27	33
22–59	7	2	29
Type of attendee (dates attended camp)			
Trainee (June 17–21)	134	26	19
Staff member (June 17–27¶,**)	117	66	56
Camper (June 21–27¶)	346	168	49
Cabin size during camp†† (no. of persons/cabin)§§			
Small (1–3)	13	5	38
Medium (7–13)	75	29	39
Large (16–26)	375	200	53

Abbreviation: COVID-19 = coronavirus disease 2019.

* Although positive and negative test results for Georgia residents are reportable in the state of Georgia, negative results are not consistently reported. Attack rates were calculated by dividing the number of persons with a positive test result reported to the Georgia Department of Public Health (DPH) by the total number of Georgia attendees, including those who did not provide testing results.

† A COVID-19 case associated with the camp outbreak was defined as a positive viral SARS-CoV-2 test in an attendee from a specimen collected or reported to DPH from the first day at camp A (June 17 for staff members, including trainees; June 21 for campers) through 14 days after leaving camp A (trainees left on June 21; staff members and campers left during June 24–June 27).

§ Out-of-state attendees' (n = 27; 4%) test results were not reported to DPH and therefore were not included in this analysis.

¶ Camp departures began June 24 and were completed June 27.

** Three staff members arrived June 21.

†† Among camp attendees during June 21–27 (n = 463).

§§ No cabins included 4–6 or 14–15 persons.

not possible to assess individual adherence to COVID-19 prevention measures at camp A, including physical distancing between, and within, cabin cohorts and use of cloth masks, which were not required for campers.

These findings demonstrate that SARS-CoV-2 spread efficiently in a youth-centric overnight setting, resulting in high attack rates among persons in all age groups, despite efforts by camp officials to implement most recommended strategies to prevent transmission. Asymptomatic infection was common and potentially contributed to undetected transmission, as has been previously reported (*1*–*4*). This investigation adds to the body of evidence demonstrating that children of all ages are susceptible to SARS-CoV-2 infection (*1*–*3*) and, contrary to early reports (*5*,*6*), might play an important role in transmission (*7*,*8*). The multiple measures adopted by the camp were not sufficient to prevent an outbreak in the context of substantial community transmission. Relatively large cohorts sleeping in the same cabin and engaging in regular singing and cheering likely contributed to transmission (*9*). Use of cloth masks, which has been shown to reduce the risk for infection (*10*), was not universal. An ongoing investigation will further characterize specific exposures associated with infection, illness course, and any secondary transmission to household members. Physical distancing and consistent and correct use of cloth masks should be emphasized as important strategies for mitigating transmission in congregate settings.

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Characteristics and Outcomes of Contacts of COVID-19 Patients Monitored Using an Automated Symptom Monitoring Tool — Maine, May–June 2020

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SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), is spread from person to person (*1*–*3*). Quarantine of exposed persons (contacts) for 14 days following their exposure reduces transmission (*4*–*7*). Contact tracing provides an opportunity to identify contacts, inform them of quarantine recommendations, and monitor their symptoms to promptly identify secondary COVID-19 cases (*7*,*8*). On March 12, 2020, Maine Center for Disease Control and Prevention (Maine CDC) identified the first case of COVID-19 in the state. Because of resource constraints, including staffing, Maine CDC could not consistently monitor contacts, and automated technological solutions for monitoring contacts were explored. On May 14, 2020, Maine CDC began enrolling contacts of patients with reported COVID-19 into Sara Alert (MITRE Corporation, 2020),* an automated, web-based, symptom monitoring tool. After initial communication with Maine CDC staff members, enrolled contacts automatically received daily symptom questionnaires via their choice of e-mailed weblink, text message, texted weblink, or telephone call until completion of their quarantine. Epidemiologic investigations were conducted for enrollees who reported symptoms or received a positive SARS-CoV-2 test result. During May 14–June 26, Maine CDC enrolled 1,622 contacts of 614 COVID-19 patients; 190 (11.7%) eventually developed COVID-19, highlighting the importance of identifying, quarantining, and monitoring contacts of COVID-19 patients to limit spread. In Maine, symptom monitoring was not feasible without the use of an automated symptom monitoring tool. Using a tool that permitted enrollees to specify a method of symptom monitoring was well received, because the majority of persons monitored (96.4%) agreed to report using this system.

Public health investigators interviewed persons with COVID-19 upon report of the case to Maine CDC to collect information about their contacts, including date of last exposure. Contacts were defined as persons who were within 6 feet of an infectious person† for ≥15 minutes (≥30 minutes before May 29). Data were stored in the National Electronic Disease Surveillance Base System (NBS)§ and sent to Maine CDC's contact tracing team within 24 hours, along with contact data reported to Maine CDC by other jurisdictions and CDC's Division of Global Migration and Quarantine. The contact tracing team telephoned contacts to provide quarantine recommendations,¶ enroll them in Sara Alert, and instruct them to report symptoms daily via the Sara Alert questionnaire for the remainder of their quarantine. If contacts refused automated monitoring or could not be enrolled because of language barriers, they would be monitored using direct monitoring. Per the Council of State and Territorial Epidemiologists' case definition,** monitored signs and symptoms included cough, difficulty breathing, fever, chills, shaking with chills (rigors), muscle pain, headache, sore throat, and new loss of taste or smell. The contact tracing team attempted to directly monitor contacts who refused or were unable to be enrolled. Maine CDC staff members conducted case investigations for all enrollees who sought SARS-CoV-2 molecular testing and had a positive result (confirmed cases) irrespective of symptoms and those who did not have molecular testing but reported symptoms (probable cases). Staff members attempted to call or text enrollees who did not respond to the questionnaire within 24 hours. Enrollees who did not report symptoms during their quarantine period were automatically released from quarantine by a Sara Alert–issued notice. Data for contacts enrolled during May 14–June 26, 2020, were extracted from Sara Alert. Enrollee demographic characteristics and Sara Alert program preferences, selected by enrollees at the time of enrollment,

* https://www.saraalert.org.

† For symptomatic persons, this was defined as 2 days before symptom onset to at least 10 days following symptom onset. For asymptomatic persons, this was defined as 2 days before collection of a specimen that resulted in a positive test to 10 days following specimen collection date.

§ Maine's National Electronic Disease Surveillance Base System is a local installation and configuration of CDC's National Electronic Disease Surveillance Base System. https://www.cdc.gov/nbs/overview/index.html.

¶ https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/quarantine.html.

** https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/.

were analyzed, and the number of persons enrolled per household were calculated based on self-reported address.

All persons enrolled in Sara Alert during the study period were matched to NBS records using date of birth and the first initial of their first and last names. NBS data were extracted on July 10 to allow contacts enrolled by June 26 to complete 14 days of quarantine. Data extracted from NBS included case status (confirmed or probable), hospitalization status, and outcome, including death. For most analyses, confirmed and probable cases were combined. SAS (version 9.3; SAS Institute) was used to conduct analyses. This activity was determined to meet the requirements of public health surveillance as defined in 45 CFR 46.102(l)(2).

During May 14–June 26, 2020, Maine enrolled 1,622 contacts (enrollees) of 614 COVID-19 patients in Sara Alert. The average number of enrollees per index patient was 2.9 (range = 0–31). Among enrollees, median age was 29 years (range = 0–93 years); 766 (50.3%) were female (Table 1). Race data were available for 1,240 (76.4%) enrollees, 732 (59.0%) of whom identified as white and 486 (39.2%) as black/African American. Ethnicity data were available for 1,020 (62.9%) enrollees, 42 (4.1%) of whom identified as Hispanic/Latino. Primary language was documented for 1,230 (75.8%) enrollees; 985 (80.1%) primarily spoke English, 86 (7.0%) French, and 81 (6.6%) Somali.

Overall, 475 (29.3%) of 1,622 enrollees were enrolled within 2 days of their last exposure to the patient (Table 2), including 153 (9.5%) enrolled the day of their last exposure, likely indicating ongoing exposure. Among enrollees, 1,564 (96.4%) agreed to be monitored using the automated symptom monitoring, whereas 58 (3.6%) required direct monitoring. Enrollees using automated symptom monitoring preferred text message (976; 60.2%), followed by texted weblink (342; 21.1%), telephone call (127; 7.8%), and e-mailed weblink (119; 7.3%). Most enrollees (870; 59.0%) preferred an evening contact time.

Among all enrollees, 231 (14.2%) reported symptoms or had a positive test result. Among these enrollees, 41 (17.7%) were determined not to have COVID-19, including 24 who received negative test results and 17 whose symptoms did not meet those specified by the case definition; these 41 enrollees were reenrolled in Sara Alert for the remainder of their quarantine. Among all enrollees, 190 (11.7%) met the COVID-19 case definition. Among these 190 persons, 127 (66.8%) were confirmed to have COVID-19, and 63 (33.2%) were considered to have probable cases (Table 3). Among all persons with probable and confirmed cases, median age was 32 years (range = 0–93 years); 99 (52.1%) were female. Race data were available for 186 (97.9%) patients, among whom 98 (52.7%) identified as white and 81 (43.5%) as black/African American. Ethnicity was available for 182 (95.8%) patients, six (3.3%) of whom identified as Hispanic/Latino. Exposure was self-reported for 165 (86.8%) patients; household exposure was most common (112; 67.9%). COVID-19 symptoms were reported for 136 (74.3%) patients. Four (2.1%) patients were hospitalized, and one (0.5%) died. During May 14–July 10, Maine reported 1,869 total COVID-19 cases[††]; thus, approximately 10% of Maine's COVID-19 patients were identified among Sara Alert enrollees.

TABLE 1. Characteristics of contacts* of confirmed or probable COVID-19† patients enrolled in an automated, web-based symptom monitoring tool (Sara Alert) — Maine, May 14–June 26, 2020

Characteristic	No. (%)
Total no. of persons enrolled	**1,622 (100)**
Age at enrollment, yrs, median (range)	29 (0–93)
Sex	
Female	766 (50.3)
Male	757 (49.7)
Not reported	99 (—)
Race	
American Indian/Alaska Native	5 (0.4)
Asian/Pacific Islander	17 (1.4)
Black/African American	486 (39.2)
White	732 (59.0)
Not reported	382 (—)
Ethnicity	
Hispanic or Latino	42 (4.1)
Not Hispanic or Latino	978 (95.9)
Not reported	602 (—)
Primary language	
American Sign Language	6 (0.5)
Arabic	8 (0.7)
English	985 (80.1)
French	86 (7.0)
Kirundi	8 (0.7)
Lingala	11 (0.9)
Portuguese	10 (0.8)
Somali	81 (6.6)
Spanish	19 (1.5)
Other	16 (1.4)
Not reported	392 (—)

See table footnotes on the next page.

Discussion

Contact tracing and symptom monitoring encourages exposed persons to quarantine while providing health departments an opportunity to promptly and proactively identify symptomatic persons, likely reducing SARS-CoV-2 transmission (*5*). Because contact tracing can be resource intensive, using an automated symptom monitoring tool can reduce needed resources (*9*). Contact tracing and the resulting postexposure quarantine and

[††] https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/airborne/coronavirus/data.shtml.

TABLE 1. (*Continued*) Characteristics of contacts* of confirmed or probable COVID-19† patients enrolled in an automated, web-based symptom monitoring tool (Sara Alert) — Maine, May 14–June 26, 2020

Characteristic	No. (%)
County	
Androscoggin	421 (26.9)
Aroostook	39 (2.5)
Cumberland	713 (45.6)
Franklin	12 (0.8)
Hancock	2 (0.3)
Kennebec	60 (3.8)
Knox	1 (0.1)
Lincoln	8 (0.5)
Oxford	32 (2.1)
Penobscot	17 (1.1)
Sagadahoc	25 (1.6)
Somerset	9 (0.6)
Waldo	3 (0.2)
Washington	14 (0.9)
York	193 (12.4)
Out of state	10 (0.6)
Missing	59 (—)

Abbreviation: COVID-19 = coronavirus disease 2019.

* Defined as persons who were within 6 feet of an infectious person (symptomatic persons, 2 days before symptom onset to at least 10 days following symptom onset; asymptomatic persons, 2 days before collection of a specimen that resulted in a positive test to 10 days following specimen collection date) for ≥15 minutes (≥30 minutes before May 29).

† Probable cases had either clinical criteria or epidemiologic evidence of exposure (contact with a person with a confirmed or probable COVID-19 case or contact with a person with clinically compatible illness or linkage to a person with confirmed COVID-19), or met vital records criteria (a death certificate listing COVID-19 or SARS-CoV-2 as a cause of death or a significant condition contributing to death with no confirmatory laboratory testing performed for COVID-19). Confirmed cases had confirmatory laboratory evidence of SARS-CoV-2 infection. COVID-19 signs and symptoms included cough, difficulty breathing, fever, chills, shaking with chills (rigors), muscle pain, headache, sore throat, and new loss of taste or smell.

monitoring identified 190 (10%) of Maine's 1,869 reported COVID-19 cases during May 14–July 10.

These findings suggest that using a symptom monitoring tool with options to accommodate enrollees' preferences for monitoring method, time of day, and language, might be important for increasing enrollment and improving contact monitoring. Almost all (96.4%) monitored contacts chose automated over direct symptom monitoring. For most of this study period, Sara Alert provided messages in English only, with Spanish added June 10. Enrollees spoke a variety of languages, and French and Somali options were added after this study concluded.

Although the use of automated symptom monitoring tools might reduce staffing and resources needed to conduct active monitoring of contacts, there continues to be a considerable workload associated with contact enrollment, direct monitoring for nonparticipating contacts and follow-up of nonrespondents (*10*). Maine CDC dedicates approximately 500 person-hours each week to enrolling and monitoring contacts using Sara Alert. Substantial human resources will likely be required to operate any contact tracing and monitoring program. By identifying options that meet communication and accessibility needs of their specific populations, jurisdictions can maximize available resources. However, continued support for jurisdictions to build and maintain contact tracing capacity is needed.

TABLE 2. Enrollment details and monitoring preferences among contacts* of confirmed or probable COVID-19† patients enrolled in an automated, web-based symptom monitoring tool (Sara Alert) — Maine, May 14–June 26, 2020

Characteristic	No. (%)
Total	**1,622 (100)**
Interval from last exposure to enrollment (days)	
0	153 (9.5)
1	47 (2.9)
2	275 (17.1)
3	153 (9.5)
4	208 (12.9)
5	166 (10.3)
6	163 (10.1)
≥7	447 (27.7)
Missing date of last exposure	10 (—)
Preferred contact method	
E-mailed weblink	119 (7.3)
Text message	976 (60.2)
Texted weblink	342 (21.1)
Telephone call	127 (7.8)
Direct monitoring§	58 (3.6)
Preferred contact time	
Morning	479 (32.5)
Afternoon	126 (8.5)
Evening	870 (59.0)
Not recorded	147 (—)
No. of persons in household enrolled¶	
1	673 (70.6)
2	125 (13.1)
3	75 (7.9)
4	33 (3.5)
5	21 (2.2)
≥6	27 (2.7)

Abbreviation: COVID-19 = coronavirus disease 2019.

* Defined as persons who were within 6 feet of an infectious person (symptomatic persons, 2 days before symptom onset to at least 10 days following symptom onset; asymptomatic persons, 2 days before collection of a specimen that resulted in a positive test to 10 days following specimen collection date) for ≥15 minutes (≥30 minutes before May 29).

† Probable cases had either clinical criteria or epidemiologic evidence of exposure (contact with a person with a confirmed or probable COVID-19 case or contact with a person with clinically compatible illness or linkage to a person with confirmed COVID-19), or met vital records criteria (a death certificate listing COVID-19 or SARS-CoV-2 as a cause of death or a significant condition contributing to death with no confirmatory laboratory testing performed for COVID-19). Confirmed cases had confirmatory laboratory evidence of SARS-CoV-2 infection. COVID-19 signs and symptoms included cough, difficulty breathing, fever, chills, shaking with chills (rigors), muscle pain, headache, sore throat, and new loss of taste or smell.

§ Direct monitoring refers to contacts who did not want to be, or could not be, enrolled for automated monitoring. For these contacts, Maine CDC staff members called contacts daily until the end of their quarantine period.

¶ Based on address reported at time of enrollment.

TABLE 3. Characteristics of contacts* of confirmed or probable COVID-19† patients enrolled in an automated, web-based symptom monitoring tool (Sara Alert) who developed COVID-19 during quarantine—Maine, May 14–June 26, 2020

Characteristic	No. (%)§
Total persons with COVID-19	**190 (100)**
Case status	
Confirmed	127 (66.8)
Probable	63 (33.2)
Reported symptoms	
Yes	136 (74.3)
No	47 (25.7)
Missing	7 (—)
Age, yrs, median (range)	**32 (0–93)**
Sex	
Female	99 (52.1)
Male	91 (47.9)
Race	
Asian/Pacific Islander	3 (1.6)
Black/African American	81 (43.5)
White	98 (52.7)
Other	4 (2.2)
Unknown	4 (—)
Ethnicity	
Hispanic or Latino	6 (3.3)
Not Hispanic or Latino	176 (96.7)
Missing	8 (—)
Self-reported exposure settings¶	
Household	112 (67.9)
Community	29 (17.6)
Health care	26 (15.8)
Unknown	25 (—)
Hospitalized	
Yes	4 (2.1)
No	186 (97.9)
Died from COVID-19	
Yes	1 (0.5)
No	189 (99.5)

Abbreviation: COVID-19 = coronavirus disease 2019.

* Defined as persons who were within 6 feet of an infectious person (symptomatic persons, 2 days before symptom onset to at least 10 days following symptom onset; asymptomatic persons, 2 days before collection of a specimen that resulted in a positive test to 10 days following specimen collection date) for ≥15 minutes (≥30 minutes before May 29).

† Probable cases had either clinical criteria or epidemiologic evidence of exposure (contact with a person with a confirmed or probable COVID-19 case or contact with a person with clinically compatible illness or linkage to a person with confirmed COVID-19), or met vital records criteria (a death certificate listing COVID-19 or SARS-CoV-2 as a cause of death or a significant condition contributing to death with no confirmatory laboratory testing performed for COVID-19). Confirmed cases had confirmatory laboratory evidence of SARS-CoV-2 infection. COVID-19 signs and symptoms included cough, difficulty breathing, fever, chills, shaking with chills (rigors), muscle pain, headache, sore throat, and new loss of taste or smell.

§ Percentage calculated among enrollees with nonmissing information.

¶ Two contacts reported multiple exposure types.

The findings in this report are subject to at least four limitations. First, determining the overall number of contacts identified by all Maine cases was not possible. Contact records in NBS sometimes referenced locations rather than persons, some contacts had no working telephone number or accompanying e-mail address, and an untracked number of contacts refused monitoring, so were not enrolled. Thus, enrollees described in this analysis do not represent the total number of contacts of COVID-19 patients in Maine. Second, during the study period, Sara Alert data extracts did not distinguish between contacts lost to follow-up and those removed based on symptom reporting, making compliance difficult to ascertain. Third, enrollees were not required to be tested for SARS-CoV-2, therefore enrollees with asymptomatic COVID-19 who were not tested were not identified as cases. Finally, although each person was given guidance on quarantine recommendations, adherence was not assessed and is unknown.

Using digital tools in support of a comprehensive contact tracing strategy can make the contact tracing and monitoring process faster and more efficient, as well as provide epidemiologic and clinical data which might result in an improved understanding of COVID-19. Although most contacts in communication with Maine CDC opted to enroll in automated symptom monitoring, the contact tracing program, including contact identification, communication, and monitoring, continues to require resources, including staffing. Automated monitoring tools can augment traditional contact tracing; however, they cannot take the place of a large, trained public health workforce required for a comprehensive COVID-19 response.

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Summary

What is already known about this topic?

Identification and quarantine of contacts of COVID-19 patients can reduce SARS-CoV-2 transmission.

What is added by this report?

Maine found that using automated symptom monitoring as a part of the state's contact tracing program was well received, with the majority of monitored contacts (96.4%) agreeing to automated symptom monitoring. Automated symptom monitoring promptly identified COVID-19 diagnoses among monitored contacts. Among 1,622 persons enrolled into an automated symptom monitoring system, 190 (11.7%) developed COVID-19.

What are the implications for public health practice?

Prompt case investigation can rapidly identify contacts and recommend quarantine, reducing additional exposures and transmission. Automated tools, available in multiple languages and formats, might improve contact tracing programs and reduce resource needs, including staffing.

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Vital Signs: Clinical Characteristics of Patients with Confirmed Acute Flaccid Myelitis, United States, 2018

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On August 4, 2020, this report was posted as an MMWR Early Release on the MMWR website (https://www.cdc.gov/mmwr).

Abstract

Background: Acute flaccid myelitis (AFM) is a serious neurologic syndrome that affects mostly children and is characterized by the acute onset of limb weakness or paralysis. Since U.S. surveillance for AFM began in 2014, reported cases have peaked biennially. This report describes the clinical characteristics of AFM patients during 2018, the most recent peak year.

Methods: Medical records from persons meeting AFM clinical criterion (acute onset of flaccid limb weakness) were submitted to CDC. Patients with confirmed AFM met the clinical criterion and had magnetic resonance imaging indicating spinal cord lesions largely restricted to gray matter and spanning one or more vertebral segments. Symptoms, physical findings, test and imaging results, and hospitalization data were abstracted and described.

Results: Among 238 patients with confirmed AFM during 2018, median age was 5.3 years. Among the 238 patients, 205 (86%) had onset during August–November. Most (92%) had prodromal fever, respiratory illness, or both beginning a median of 6 days before weakness onset. In addition to weakness, common symptoms at clinical evaluation were gait difficulty (52%), neck or back pain (47%), fever (35%), and limb pain (34%). Among 211 who were outpatients when weakness began, most (76%) sought medical care within 1 day, and 64% first sought treatment at an emergency department. Overall, 98% of patients were hospitalized, 54% were admitted to an intensive care unit, and 23% required endotracheal intubation and mechanical ventilation.

Conclusion: Clinicians should suspect AFM in children with acute flaccid limb weakness, especially during August–November and when accompanied by neck or back pain and a recent history of febrile respiratory illness. Increasing awareness in frontline settings such as emergency departments should aid rapid recognition and hospitalization for AFM.

Introduction

Acute flaccid myelitis (AFM) is a serious neurologic syndrome that can cause paralysis, predominantly in previously healthy children. Similar to poliomyelitis-associated acute flaccid paralysis caused by poliovirus infection, AFM is a syndrome characterized by the acute onset of flaccid limb weakness accompanied by predominantly gray matter lesions in the spinal cord. AFM can progress rapidly over the course of hours or days, leading to permanent paralysis and the life-threatening complication of respiratory failure (*1*).

National surveillance for AFM was initiated in 2014, after California and Colorado reported clusters of AFM or acute limb weakness among previously healthy children, none of whom had laboratory or epidemiologic evidence of poliovirus infection (*2*,*3*). Since 2014, reported AFM cases have peaked in the late summer to early fall every 2 years in the United States (*4*). Although national case reporting for AFM did not begin until 2014, retrospective case investigations have documented sporadic cases before 2014 and increased numbers of cases during 2014, 2016, and 2018 (*5*,*6*). Together, these data suggest that the epidemiology of AFM shifted during or shortly before 2014, and likely reflect a new or emerging etiology.

Multiple viruses, including West Nile virus, adenovirus, and nonpolio enteroviruses, are known to cause AFM in a small percentage of infected persons (*7*–*10*). Pathogens are rarely recovered from the cerebrospinal fluid (CSF) of AFM patients, but enteroviruses are the most common pathogens detected in nonsterile site specimens, such as respiratory and stool specimens (*4*,*11*). Enterovirus D68 (EV-D68) is the most common enterovirus type identified among AFM patients; poliovirus has not been detected in any cases (*4*,*11*,*12*). In addition, recent data, including animal model studies and studies of enterovirus-binding antibodies in CSF, indicate that nonpolio enteroviruses, and EV-D68 in particular, are likely a primary cause of AFM in the United States since 2014 (*13*–*17*). However, other viruses that cause AFM might be contributing to the biennial peaks. A cluster of 11 AFM cases in Colorado associated with enterovirus A71 (EV-A71) contributed to the number of cases reported in 2018 (*18*,*19*).

Summary

What is already known about this topic?

Since U.S. surveillance for acute flaccid myelitis (AFM) began in 2014, reported cases have peaked biennially. Most cases occur in children during late summer and early fall.

What is added by this report?

Among 238 patients with confirmed AFM during 2018, most (92%) had prodromal fever, respiratory illness, or both. In addition to weakness, common symptoms were gait difficulty (52%), neck or back pain (47%), fever (35%), and limb pain (34%). Among 211 who were outpatients when weakness began, 64% sought treatment at an emergency department. Overall, 23% required endotracheal intubation and mechanical ventilation.

What are the implications for public health practice?

Clinicians should suspect AFM in children with acute flaccid limb weakness, especially when accompanied by neck or back pain and a recent history of febrile respiratory illness. Increasing awareness in frontline settings such as emergency departments should aid rapid recognition and hospitalization for AFM.

Based on the observed biennial pattern, another increase in AFM cases is anticipated to occur in the United States in late summer/early fall 2020 (https://www.cdc.gov/grand-rounds/pp/2020/20200703-acute-flaccid-myelitis.html). This report summarizes findings from review of medical records from patients with confirmed AFM in 2018, including cases known to be associated with EV-D68 and EV-A71, and describes the clinical characteristics of patients and settings and timing of seeking medical care for limb weakness. These data might facilitate rapid case recognition of AFM and prompt referral to care.

Methods

As part of national surveillance, health departments report cases meeting the clinical criterion for AFM (acute onset of flaccid limb weakness) to CDC, along with a patient summary form (completed by health departments) and relevant components of patient medical records when available, including admission and discharge notes, neurology and infectious disease consult notes, laboratory reports, and brain and spine magnetic resonance imaging (MRI) reports. A confirmed AFM case was defined as an illness meeting the clinical criterion with an MRI indicating a spinal cord lesion largely restricted to gray matter and spanning one or more vertebral segments. Confirmed cases were described by month of onset for August 2014–June 2020. In addition, data on the clinical evaluation and hospitalization for limb weakness, including prodromal and initial symptoms at evaluation, neurologic exam findings, laboratory results, MRI findings, and type of medical setting where the patient was evaluated, were abstracted from records of patients with confirmed AFM who had onset of limb weakness during 2018.

Neurologic exam findings were abstracted from the first neurology consultation note following onset of limb weakness or, if that was not available, from the first and most complete documented neurologic exam following the onset of weakness. MRI findings were abstracted from reports of the most abnormal brain and spine MRIs available.

Abstracted laboratory findings included results for enterovirus/rhinovirus (EV/RV)* detection and typing tests performed at external laboratories or CDC's AFM laboratory. CDC laboratory methods have been described previously (*4*). EV-D68 and EV-A71 cases were defined as a confirmed AFM case with a CSF, respiratory, stool, or serum specimen that tested positive for EV-D68 or EV-A71, respectively, at either an external laboratory or the CDC laboratory. Data on long-term patient outcomes were not available for this analysis.

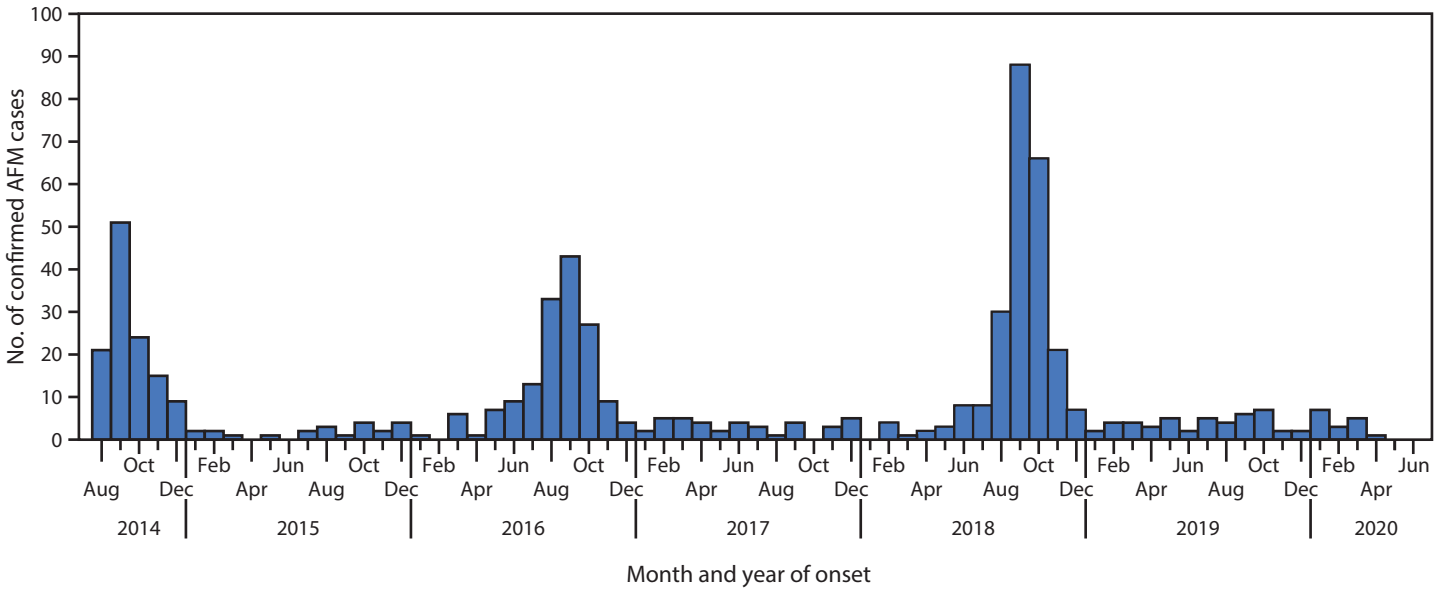
Results

Since surveillance for AFM began following the initial clusters reported in 2014, nationwide outbreaks have occurred in 2016 and 2018 (Figure). A total of 238 confirmed AFM cases with onset in 2018 were reported to CDC; among these, onset of limb weakness in 205 (86%) occurred during August–November, including 87 (37%) with onset during September (Figure). Among 219 (92%) patients receiving tests for EV/RV, 107 (49%) had at least one EV/RV-positive specimen (Table 1). A higher proportion of respiratory specimens were positive for EV/RV (48%), compared with other specimen sources (3% [serum] to 20% [stool]). EV-D68 was the most common virus type identified, and most EV-D68 (33 of 34) and EV-A71 (10 of 12) cases were identified from respiratory specimens.

The median age of patients with confirmed AFM was 5.3 years (range = 0.5–81.8 years), and 58% were male (Table 2). Patients were reported from 42 states throughout the country; 53% identified as white, 20% as Hispanic, and 9% as black. A prodromal illness preceding the onset of limb weakness was documented in most (97%) patients, with respiratory illness (80%) and fever (77%) the most commonly reported prodromal signs and symptoms. Many patients also had documented neck or back pain (46%) or headache (37%) preceding the onset of limb weakness. Among those who reported prodromal symptoms, the onset of respiratory illness generally occurred earlier than the onset of fever, headache, or neck or back pain.

* Enteroviruses and rhinoviruses are closely related picornaviruses. Most widely available polymerase chain reaction tests for enterovirus amplify a viral gene sequence that is highly conserved and is similar between enteroviruses and rhinoviruses. Therefore, these tests do not distinguish between enteroviruses or rhinoviruses, and additional testing is needed to differentiate between these groups of viruses.

FIGURE. Confirmed cases of acute flaccid myelitis (AFM) reported to CDC (N = 633), by month and year of onset — United States, August 1, 2014–June 30, 2020*,†



* As of July 24, 2020.
† Total cases reported each year: 2014 = 120; 2015 = 22; 2016 = 153; 2017 = 38; 2018 = 238; 2019 = 46; 2020 = 16.

At the time that patients were seen at a hospital for weakness, the most commonly documented symptoms were gait difficulty (52%), neck or back pain (47%), fever (35%), and pain in the affected limb or limbs (34%). Upper extremity weakness (64%) was more commonly noted on initial neurologic exam than was lower extremity weakness (36%). Only 13% of patients had documented sensory abnormalities; 21% had cranial nerve abnormalities, and 5% had altered mental status on exam.

All patients with confirmed AFM had, by definition, at least one abnormal spinal cord MRI indicating predominantly gray matter lesions. Based on medical records received at CDC, 227 (95%) patients had a brain MRI, 233 (98%) had a cervical spine MRI, 205 (86%) had a thoracic spine MRI, and 177 (74%) had a lumbosacral spine MRI performed. Among those receiving MRIs, cervical cord lesions were most commonly observed (219 of 233; 94%), followed by thoracic cord lesions (176 of 205; 86%). Although fewer patients had a lumbosacral spine MRI, conus lesions were seen in 40% (71 of 177) of those with MRIs. Brainstem lesions were observed in 44% (100 of 227) of those who received a brain MRI.

Most (233 of 238; 98%) patients were hospitalized (Table 3). Twenty-five patients (11%) were hospitalized at least 1 day before onset of limb weakness and developed weakness while inpatients, 206 (87%) were hospitalized on or after the day limb weakness began, and the date of onset for two patients was unclear. Overall, 54% of all patients were admitted to an intensive care unit, and 23% required intubation and mechanical ventilation. Steroids and intravenous immunoglobulin (IVIG) were the commonly administered treatments (Table 3).

Among the 211 patients who developed limb weakness as an outpatient (including five who were never hospitalized), most (134 of 211; 64%) initially sought treatment at an emergency department and 49 (23%) at a primary care provider. Most (160 of 211; 76%) sought medical care within 1 day of onset of limb weakness. Similarly, among patients hospitalized on the same day or after onset of weakness, most (134 of 206; 65%) were hospitalized within 1 day of onset.

When EV-D68 and EV-A71 cases were analyzed, patients with known EV-D68 infection were older (median age = 5.9 years) than were those with EV-A71 infection (median age = 1.6 years). In addition, patients with EV-D68 were reported from across the country, whereas 11 of 12 patients with EV-A71 were geographically and temporally clustered in Colorado (Table 2). All EV-D68 and EV-A71 cases had a prodromal illness before onset of limb weakness. Prodromal respiratory illness was more common among EV-D68 (97%) than among EV-A71 cases (58%). Prodromal rash was more common among EV-A71 (58%) than among EV-D68 cases (9%). The most common signs and symptoms accompanying limb weakness among EV-D68 cases were neck or back pain (59%), gait difficulty (56%), and fever (47%), whereas among EV-A71 cases, the most common signs and symptoms were fever (67%), ataxia (67%), gait difficulty (50%), and altered consciousness (50%). Abnormal findings on brain MRI were less common among EV-D68 than among EV-A71 cases, but a higher proportion of EV-D68 than EV-A71 cases were admitted to an intensive care unit and required intubation and mechanical ventilation (Table 3).

TABLE 1. Enterovirus/rhinovirus (EV/RV) polymerase chain reaction test results from respiratory, stool, cerebrospinal fluid (CSF), and serum specimens collected from patients with onset of confirmed acute flaccid myelitis (N = 238) — United States, 2018

Specimen source	No. of patients with specimens available (% of 238)	No. (%) positive	EV/RV type results (no.)
Any source*	219 (92)	107 (49)	EV-D68 (34) EV-A71 (12) Coxsackievirus A2 (1) Coxsackievirus A4 (1) Coxsackievirus A9 (1) Coxsackievirus A16 (1) Coxsackievirus B3 (1) Echovirus 11 (1) RV-A101 (2) RV-A24 (1) RV-A38 (1) RV-A54 (1) RV-A81 (1) RV-A85 (1) RV-B4 (1) RV-C54 (1) Other/Untyped EV/RV (46)
Respiratory	190 (80)	92 (48)	EV-D68 (33) EV-A71 (10) RV-A101 (2) RV-A24 (1) RV-A38 (1) RV-A54 (1) RV-A81 (1) RV-A85 (1) RV-B4 (1) RV-C54 (1) Other/Untyped EV/RV (40)
Stool	119 (50)	24 (20)	EV-D68 (3) EV-A71 (2) Coxsackievirus A2 (1) Coxsackievirus A4 (1) Coxsackievirus A9 (1) Coxsackievirus A16 (1) Coxsackievirus B3 (1) Echovirus 11 (1) Other/Untyped EV/RV (13)
CSF	187 (79)	9 (5)	EV-D68 (2) EV-A71 (1) Other/Untyped EV/RV (6)
Serum	90 (38)	3 (3)	EV-D68 (1) Echovirus 11 (1) Other/Untyped EV/RV (1)

* Some patients had multiple positive specimens.

Discussion

The findings in this report are consistent with, and build upon, previous reports describing patients with confirmed AFM during 2018 and earlier peak years (*4*,*11*,*12*,*19*). The current analysis supports previous reports documenting the frequent presence of respiratory symptoms, fever, or both before the onset of limb weakness and a predominance of upper limb involvement among AFM patients. In addition, prodromal neck or back pain or headache before onset of limb weakness were identified and described in the present cohort. Eleven percent of AFM patients were hospitalized at least 1 day before the onset of limb weakness, indicating that prodromal symptoms might be severe in some patients.

Evaluating a child with weakness and differentiating AFM from other causes of weakness can be challenging. In younger children especially, weakness might manifest as decreased use of a limb, which might mistakenly be attributed to musculoskeletal pain or injury. Gait difficulty, neck or back pain, fever, limb pain, and headache were often present when AFM patients sought care for limb weakness. The presence of these or any neurologic signs or symptoms in a child with acute limb weakness or decreased use of an extremity should heighten clinical suspicion of AFM, particularly in the setting of a recent respiratory or febrile illness.

TABLE 2. Demographic and clinical characteristics of patients with onset of confirmed acute flaccid myelitis (N = 238), by virus type — United States, 2018

Characteristic	No. (%)			
	EV-D68 (n = 34)	EV-A71 (n = 12)	Other (n = 192)*	Total (N = 238)
Demographic				
Median age, yrs	5.9	1.6	5.3	5.3
Range	1.4–56.9	0.9–32.7	0.5–81.8	0.5–81.8
IQR	3.7–7.9	1.1–2.1	3.4–8.3	3.3–8.2
Male sex	20 (59)	11 (92)	107 (56)	138 (58)
Geographic region				
South	16 (47)	0 (0)	64 (33)	80 (34)
Midwest	6 (18)	1 (8)	54 (28)	61 (26)
West	6 (18)	11 (92)	39 (20)	56 (24)
Northeast	6 (18)	0 (0)	35 (18)	41 (17)
Race/Ethnicity				
White	23 (68)	10 (83)	92 (48)	125 (53)
Hispanic	5 (15)	1 (8)	41 (21)	47 (20)
Black	2 (6)	0 (0)	19 (10)	21 (9)
Asian	1 (3)	0 (0)	7 (4)	8 (3)
Multiracial	0 (0)	0 (0)	4 (2)	4 (2)
Native Hawaiian/Pacific Islander	0 (0)	0 (0)	1 (1)	1 (0)
Unknown	3 (9)	1 (8)	28 (15)	32 (13)
Prodromal signs/symptoms in the 4 weeks before onset of limb weakness				
Any illness, no. (% of total)	34 (100)	12 (100)	184 (96)	230 (97)
Days before weakness onset (IQR)†	5 (4–7)	3 (2.5–6.5)	6 (3–9)	6 (3–9)
Any respiratory illness or fever, no. (% of total)	34 (100)	12 (100)	174 (91)	220 (92)
Days before weakness onset (IQR)†	5 (4–7)	3 (2–5)	6 (3–9)	6 (3–8)
Any respiratory illness, no. (% of total)	33 (97)	7 (58)	151 (79)	191 (80)
Days before weakness onset (IQR)†	5 (4–7)	3 (1–5)	6 (4–9)	6 (4–9)
Any fever, no. (% of total)	28 (82)	12 (100)	144 (75)	184 (77)
Days before weakness onset (IQR)†	3 (2–6)	3 (2–5)	3 (2–6)	3 (2–6)
Neck/back pain, no. (% of total)	18 (53)	4 (33)	88 (46)	110 (46)
Days before weakness onset (IQR)†	2 (1–3)	1.5 (0.5–4)	1 (1–3)	1.5 (1–3)
Headache, no. (% of total)	12 (35)	2 (17)	73 (38)	87 (37)
Days before weakness onset (IQR)†	3 (2–3)	2 (2–2)	2 (1–6)	2 (1–5.5)
Any gastrointestinal illness, no. (% of total)	9 (26)	6 (50)	38 (20)	53 (22)
Days before weakness onset (IQR)†	2 (1–4)	2.5 (2–3)	3 (2–4)	2 (2–4)
Rash, no. (% of total)	3 (9)	7 (58)	13 (7)	23 (10)
Days before weakness onset (IQR)†	4.5 (2–7)	4 (3–6)	9.5 (3–18.5)	4 (3–7)
Signs/Symptoms at evaluation				
Gait difficulty	19 (56)	6 (50)	99 (52)	124 (52)
Pain in neck or back	20 (59)	4 (33)	87 (45)	111 (47)
Fever	16 (47)	8 (67)	59 (31)	83 (35)
Pain in affected limb(s)	10 (29)	3 (25)	69 (36)	82 (34)
Headache	13 (38)	2 (17)	51 (27)	66 (28)
Neck weakness	7 (21)	1 (8)	31 (16)	39 (16)
Ataxia/Discoordination	6 (18)	8 (67)	24 (13)	38 (16)
Facial weakness	9 (26)	0 (0)	28 (15)	37 (16)
Dysphagia	6 (18)	2 (17)	23 (12)	31 (13)
Bladder retention/incontinence	2 (6)	3 (25)	23 (12)	28 (12)
Altered consciousness	2 (6)	6 (50)	18 (9)	26 (11)
Dysarthria	6 (18)	1 (8)	17 (9)	24 (10)
Numbness in affected limb(s)	2 (6)	1 (8)	13 (7)	16 (7)
Paresthesia in affected limb(s)	0 (0)	0 (0)	16 (8)	16 (7)
Bowel retention/incontinence	1 (3)	3 (25)	10 (5)	14 (6)
Diplopia	2 (6)	1 (8)	9 (5)	12 (5)
Ptosis	3 (9)	0 (0)	6 (3)	9 (4)
Seizures	2 (6)	1 (8)	3 (2)	6 (3)
Initial neurologic exam findings				
Decreased strength in upper limb(s)	22 (65)	4 (33)	127 (66)	153 (64)
Decreased strength in lower limb(s)	16 (47)	2 (17)	67 (35)	85 (36)
Any sensory abnormalities	5 (15)	0 (0)	25 (13)	30 (13)
Any cranial nerve abnormalities	12 (35)	2 (17)	37 (19)	51 (21)
Abnormal mental status	1 (3)	5 (42)	6 (3)	12 (5)

See table footnotes on next page.

TABLE 2. (*Continued*) Demographic and clinical characteristics of patients with onset of confirmed acute flaccid myelitis (N = 238), by virus type — United States, 2018

Characteristic	No. (%)			
	EV-D68 (n = 34)	EV-A71 (n = 12)	Other (n = 192)*	Total (N = 238)
CSF microscopic examination§				
CSF pleocytosis	31/32 (97)	12/12 (100)	140/166 (84)	183/210 (87)
Median cells/mm^3	95	125	91.5	94
Range	9–499	17–685	6–814	6–814
IQR	36–170	67–480	42.5–157.5	43–163
MRI findings¶				
Supratentorial lesions	3/33 (9)	3/12 (25)	23/182 (13)	29/227 (13)
Brainstem lesions	15/33 (45)	11/12 (92)	74/182 (41)	100/227 (44)
Cerebellar lesions	1/33 (9)	9/12 (75)	38/182 (21)	50/227 (22)
Cervical cord lesions	33/34 (97)	12/12 (100)	174/187 (80)	219/233 (94)
Thoracic cord lesions	28/31 (90)	6/11 (55)	142/163 (87)	176/205 (86)
Conus lesions	16/25 (64)	2/5 (40)	2/5 (36)	71/177 (40)
Nerve root enhancement	5/33 (15)	6/12 (50)	38/182 (21)	49/227 (22)

Abbreviations: CSF = cerebrospinal fluid; EV = enterovirus; IQR = interquartile range; MRI = magnetic resonance imaging.

* Other category includes all patients who did not have a positive EV-D68 or EV-A71 test, including those who were never tested, those who had negative test results, and those who had positive test results for other viruses.

† Timing calculated among cases with the prodromal illness/symptom and documented dates of onset.

§ Among 210 cases with CSF results available. Median cells/mm^3 calculated among cases with CSF pleocytosis (>5 white blood cells per mm^3).

¶ Supratentorial, brainstem, and cerebellar lesions among 227 cases with brain MRI reports available. Cervical cord lesions among 233 cases with cervical spine reports available, thoracic cord lesions among 205 cases with thoracic spine reports available, and conus lesions among 177 cases with lumbosacral spine reports available. Nerve root enhancement among 227 cases with a contrast MRI of the spine.

These findings also indicate that clinical characteristics of AFM patients might differ by viral etiology. However, these results should be interpreted with caution because 11 of the 12 EV-A71 cases were reported from a single state (Colorado), potentially influencing the description of EV-A71 cases. In addition, these results could be affected by biased ascertainment of viral infection if cases with certain characteristics (e.g., severe respiratory symptoms) were more likely to be tested early in the course of illness, when testing is more likely to yield a pathogen (*4*,*11*). Some actual EV-D68 and EV-A71 cases likely did not have virus detected and were misclassified in the "other" category. However, these findings are consistent with other comparisons of EV-D68– and EV-A71–associated AFM cases, including those that compared cases within the same institution (*18*). Although there is considerable overlap in symptoms and findings associated with these two viruses, different viruses are likely associated with different AFM phenotypes.

Regardless of etiology, patients generally sought medical attention soon after onset of limb weakness; 76% of those with onset as an outpatient sought medical care within 1 day of onset of weakness, and most were initially evaluated in an emergency department. Because AFM can progress rapidly and lead to respiratory failure requiring intubation and mechanical ventilation, patients with suspected AFM should be immediately hospitalized and monitored for respiratory deterioration. Hospitalization also facilitates evaluation, including consultation with specialists and MRI of the brain and spine. Most patients were hospitalized within 1 day of onset of weakness, but 10% were not hospitalized until ≥4 days after onset of limb weakness, perhaps indicating delays in recognition and an opportunity for improvement.

The findings in the report are subject to at least two limitations. First, this study was restricted to cases reported to CDC, which likely underestimate the actual number of AFM cases owing to underascertainment of AFM and underreporting of cases to health departments. Second, the analysis was limited to medical record abstraction data and, in many cases, to data from the early course of hospitalization. Although data on long-term outcomes were not available for this analysis, these data are now being collected and will be the subject of future reports.

Despite these limitations, the data in this report further elucidate the clinical characteristics of AFM and should aid recognition of signs and symptoms, subsequent evaluation, and referral to care. Early recognition of AFM is important for clinical management and for specimen collection and detection of the underlying etiology. AFM should be suspected in any child with acute flaccid limb weakness. Onset during the months of August–November of peak years, history of recent febrile respiratory illness, and presence of neck or back pain or any neurologic symptom should raise suspicion for AFM.

Based on recent trends, another peak AFM year is anticipated in 2020. It is not known whether or how the COVID-19 pandemic and recommended social distancing measures will affect enterovirus circulation or trends in AFM. COVID-19's impact on the health care system and health care–seeking behaviors will likely present additional challenges to the recognition and

TABLE 3. Characteristics of hospitalization, treatment, and first medical encounter after onset of limb weakness among patients with confirmed acute flaccid myelitis (N = 238), by virus type — United States, 2018

Characteristic	No. (%)			
	EV-D68 (N = 34)	EV-A71 (N = 12)	Other (N = 192)*	Total (N = 238)
Hospitalization				
Hospitalized	34 (100)	12 (100)	187 (97)	233 (98)
Hospitalized ≥1 day before onset of limb weakness	7 (21)	4 (33)	14 (7)	25 (11)
Hospitalized on same day or after onset of limb weakness	27 (79)	8 (67)	171 (89)	206 (87)
Hospitalized, unknown timing	0 (—)	0 (—)	2 (1)	2 (1)
Timing from onset of weakness to hospitalization,† days				
Median interval from onset of weakness to hospitalization	1	0.5	1	1
Range	0–5	0–5	0–54	0–54
IQR	0–2	0–2.5	0–2	0–2
0–1	20/27 (74)	5/8 (63)	109/171 (64)	134/206 (65)
2–3	6/27 (22)	2/8 (25)	44/171 (26)	52/206 (25)
4–7	1/27 (4)	1/8 (13)	8/171 (5)	10/206 (5)
>7	0/27 (—)	0/8 (—)	10/171 (6)	10/206 (5)
Treatment received				
Steroids, no IVIG	8 (24)	1 (8)	46 (24)	55 (23)
IVIG, no steroids	9 (26)	8 (67)	37 (19)	54 (23)
Both steroids and IVIG	12 (35)	2 (17)	67 (35)	81 (34)
Plasma exchange	5 (15)	1 (8)	26 (14)	32 (13)
Admitted to ICU	25 (74)	5 (42)	99 (52)	129 (54)
Respiratory support	19 (56)	3 (25)	43 (22)	65 (27)
Mechanical ventilation	15 (44)	1 (8)	39 (20)	55 (23)
Location of first medical encounter after onset of weakness§				
Emergency department	17/27 (63)	2/8 (25)	115/176 (65)	134/211 (64)
Primary care provider	5/27 (19)	4/8 (50)	40/176 (23)	49/211 (23)
Urgent care provider	4/27 (15)	0/8 (—)	12/176 (7)	16/211 (8)
Unknown/missing/other	1/27 (4)	2/8 (25)	9/176 (5)	12/211 (6)
Timing from onset of limb weakness to first medical encounter,§ days				
Median interval from onset of weakness to first medical encounter¶	0	0	1	0
Range	0–3	0–1	0–15	0–15
IQR	0–1	0–0.5	0–1	0–1
0–1	19/27 (70)	8/8 (100)	133/176 (76)	160/211 (76)
2–3	5/27 (19)	0/8 (—)	29/176 (16)	34/211 (16)
4–7	0/27 (—)	0/8 (—)	4/176 (2)	4/211 (2)
>7	0/27 (—)	0/8 (—)	2/176 (1)	2/211 (1)
Unknown/Missing	3/27 (11)	0/8 (—)	8/176 (5)	11/211 (5)

Abbreviations: EV = enterovirus; ICU = intensive care unit; IQR = interquartile range; IVIG = intravenous immunoglobulin.

* Other category includes all patients who did not have positive EV-D68 or EV-A71 test results, including those who were never tested, those who had negative test results, and those who had positive test results for other viruses.

† Among the 206 patients (EV-D68 = 27; EV-A71 = 8; other = 171) who were hospitalized on or after the date of onset of limb weakness.

§ Among the 211 patients who had onset of limb weakness as an outpatient (206 patients who were hospitalized on or after the date of onset of limb weakness and five patients who were never hospitalized).

¶ Among 200 patients who had onset of limb weakness as an outpatient and known timing of onset of limb weakness and first medical encounter (211 patients minus the 11 with timing unknown).

evaluation of patients with AFM. Non-COVID-19 emergency department visits declined in 2020 (*20*), and the pandemic could possibly contribute to delays in care or to an increased proportion of clinical evaluations taking place via telephone or telemedicine. During this time, it will be critical for parents and clinicians to be aware of signs and symptoms suggestive of AFM and maintain vigilance for this condition during 2020.

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Increase in Antiretroviral Therapy Enrollment Among Persons with HIV Infection During the Lusaka HIV Treatment Surge — Lusaka Province, Zambia, January 2018–June 2019

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Within Zambia, a landlocked country in southern-central Africa, the highest prevalence of human immunodeficiency virus (HIV) infection is in Lusaka Province (population 3.2 million), where approximately 340,000 persons are estimated to be infected (*1*). The 2016 Zambia Population-based HIV Impact Assessment (ZAMPHIA) estimated the adult HIV prevalence in Lusaka Province to be 15.7%, with a 62.7% viral load suppression rate (HIV-1 RNA <1,000 copies/mL) (*2*). ZAMPHIA results highlighted remaining treatment gaps in Zambia overall and by subpopulation. In January 2018, Zambia launched the Lusaka Province HIV Treatment Surge (Surge project) to increase enrollment of persons with HIV infection onto antiretroviral therapy (ART). The Zambia Ministry of Health (MoH), CDC, and partners analyzed the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) Monitoring and Evaluation Reporting data set to assess the effectiveness of the first 18 months of the Surge project (January 2018–June 2019). During this period, approximately 100,000 persons with positive test results for HIV began ART. These new ART clients were more likely to be persons aged 15–24 years. In addition, the number of persons with documented viral load suppression doubled from 66,109 to 134,046. Lessons learned from the Surge project, including collaborative leadership, efforts to improve facility-level performance, and innovative strategies to disseminate successful practices, could increase HIV treatment rates in other high-prevalence settings.

Since 2004, the U.S. government, through PEPFAR, has partnered with the government of Zambia through the MoH and National HIV/AIDS/STI/TB Council (NAC) in coordinating a national HIV response. At the time of the launch of the Surge project (January 2018), PEPFAR was supporting approximately 750,000 Zambians receiving ART, and HIV incidence rates had decreased by approximately 40% from 2004 to 2018 (*1*). The ZAMPHIA results identified remaining challenges in Zambia overall and by subpopulation in achieving the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90/90/90 HIV treatment targets (90% of persons living with HIV infections know their diagnosis, 90% of those with diagnosed HIV infection on ART, and 90% of those on ART achieving viral suppression). For example, HIV treatment coverage nationally among persons aged 15–24 years was lower than that among adults aged ≥25 years. In response, the Zambia MoH, PEPFAR-Zambia, CDC-Zambia, and implementing partners started the Surge project in January 2018, with ongoing implementation coordinated via monthly reviews, quarterly leadership meetings, and joint facility site visits. Among 201 ART facilities in Lusaka Province, the Surge project prioritized 11 high-volume facilities that served 43% of persons with positive test results for HIV; each facility had annual, monthly, and weekly testing, treatment, and viral load targets. Best practices were disseminated to the other 190 ART facilities in the province through ad hoc trainings and staff member exchanges. The capacity of the HIV workforce was strengthened through HIV clinical mentors and Project Extension for Community Healthcare Outcomes (*3*), which links HIV treatment experts with distant HIV workforce staff members through video teleconference. Best practices identified from the literature and clinical practice were measured by site-level process indicators, including 1) HIV case finding via risk screening and elicitation of sexual partners from clients with a newly diagnosed HIV infection; 2) improvement in treatment initiation and retention by returning to care those clients who had missed appointments and by enrolling eligible clients into differentiated service delivery models (*4*); 3) increased documentation of viral load suppression using electronic medical record queries to identify clients with positive test results for HIV eligible for viral load testing; and 4) providing enhanced adherence counseling for clients who have not achieved viral load suppression. The Surge project emphasized routine data review and quality improvement (*5*) to identify and address gaps in HIV service delivery.

MOH, CDC, and partners routinely assessed the effectiveness of the Surge project by analyzing program data reported to PEPFAR by the 201 Lusaka Province ART facilities at the beginning of the project (January 2018) and after 18 months (June 2019). The PEPFAR Monitoring and Evaluation Report data set (*6*) contains aggregate program data and was analyzed

to ascertain the number of persons with positive test results for HIV receiving ART; data were disaggregated by sex and age. Viral load suppression rate, defined as the percentage of persons receiving ART who had a documented viral load result <1,000 copies/mL within the last 12 months among all those who were eligible for viral load testing, was assessed to determine the effectiveness of ART. Quarterly numbers of persons who newly initiated ART were analyzed, including data from the 2 years preceding the Surge project, for comparison.

In the final quarter of 2018, the Monitoring and Evaluation Report definition for persons with positive test results for HIV currently receiving ART was changed from any clinical or pharmacy visit within 90 days to any visit within 30 days. This change necessitated additional analysis of 34 public ART facilities in Lusaka Province supported by the Centre for Infectious Disease Research in Zambia (CIDRZ), which had deidentified individual electronic health records that were retrospectively queried using a consistent 30-day threshold to determine the number of persons with positive test results for HIV currently receiving ART. These 34 CIDRZ-supported facilities (17% of all HIV facilities in Lusaka Province) provided treatment for 57% of persons with positive test results for HIV receiving ART. Analyses were completed using SAS (version 9.4; SAS Institute); p-values <0.05 were considered statistically significant.

In January 2018, a total of 204,091 persons with positive test results for HIV were receiving ART in Lusaka Province (based on the 90-day threshold) (Table). By June 2019, after 18 months, 103,236 persons with positive test results for HIV had newly initiated ART. The number of persons with positive test results for HIV who newly initiated ART in Lusaka Province during the Surge project was higher in each quarter (15,752–19,003 per quarter) than in any single quarter during the preceding 2 calendar years (Figure 1).

Compared with the percentage of persons with positive test results for HIV who were receiving ART in January 2018, a significantly higher percentage of females aged 15–24 years, males aged 15–24 years, and men aged 25–49 years initiated ART during the Surge project (16% versus 6%, 4% versus 2%, and 29% versus 25%, respectively) (p<0.001, age- and sex-disaggregated). In June 2019, using the 30-day threshold, 248,002 clients with positive test results for HIV were receiving ART in Lusaka Province, a net increase of 43,911. The age and sex distribution of clients with positive test results for HIV receiving ART in January 2018 was similar to that in June 2019. The percentage of eligible persons who had a viral load test within the preceding 12 months increased from 37% in January 2018 to 65% in June 2019; approximately 90% of clients receiving ART who had a viral load test were virally suppressed at both time points (92% in January 2018 and 91% in June 2019).

Among the subset of 34 public ART facilities with electronic health records, the number of persons with positive test results for HIV currently receiving ART (using a 30-day threshold consistently) steadily increased from 119,239 in January 2018 to 141,164 in June 2019 (Figure 2).

TABLE. Demographic characteristics and viral load suppression rates of persons with human immunodeficiency virus (HIV) infection who were currently receiving and who newly initiated antiretroviral therapy (ART),* at baseline (January 2018) and 18 months after initiation of the Lusaka Province HIV Treatment Surge (June 2019) — Lusaka Province, Zambia

Characteristic	No. (%)†		
	Receiving ART, January 2018§	Newly initiated on ART, January 2018–June 2019	Receiving ART, June 2019¶
Sex (age group, yrs)¶			
Total, all ages	**204,091 (100)**	**103,236 (100)**	**248,002 (100)**
Male and female (<15)	10,193 (5)	5,545 (5)	10,841 (4)
Total female (≥15)	**125,000 (61)**	**60,355 (58)**	**149,792 (60)**
Female (15–24)	11,342 (6)	16,192 (16)	14,544 (6)
Women (25–49)	96,736 (47)	40,935 (40)	114,469 (46)
Women (≥50)	16,922 (8)	3,228 (3)	20,779 (8)
Total male (≥15)	**68,898 (34)**	**37,336 (36)**	**87,369 (35)**
Male (15–24)	4,071 (2)	4,235 (4)	5,722 (2)
Men (25–49)	51,129 (25)	29,976 (29)	64,458 (26)
Men (≥50)	13,698 (7)	3,125 (3)	17,189 (7)
Viral load eligible**	**192,950 (95)**	—	**224,764 (91)**
Results documented	72,142 (37)	—	146,532 (65)
Suppressed (<1,000 copies/mL)	66,109 (92)	—	134,046 (91)

* At any of 201 Lusaka Province ART facilities.
† Column values might not sum to 100% because of rounding.
§ Receipt of medical or pharmacy services within the previous 90 days.
¶ Receipt of medical or pharmacy services within the previous 30 days.
** Receiving ART for at least 6 months.

FIGURE 1. Persons with human immunodeficiency virus (HIV) infection initiating antiretroviral therapy (ART), by quarter before (January 2016–December 2017) and during (January 2018–June 2019) the Lusaka Province HIV Treatment Surge — Lusaka Province, Zambia

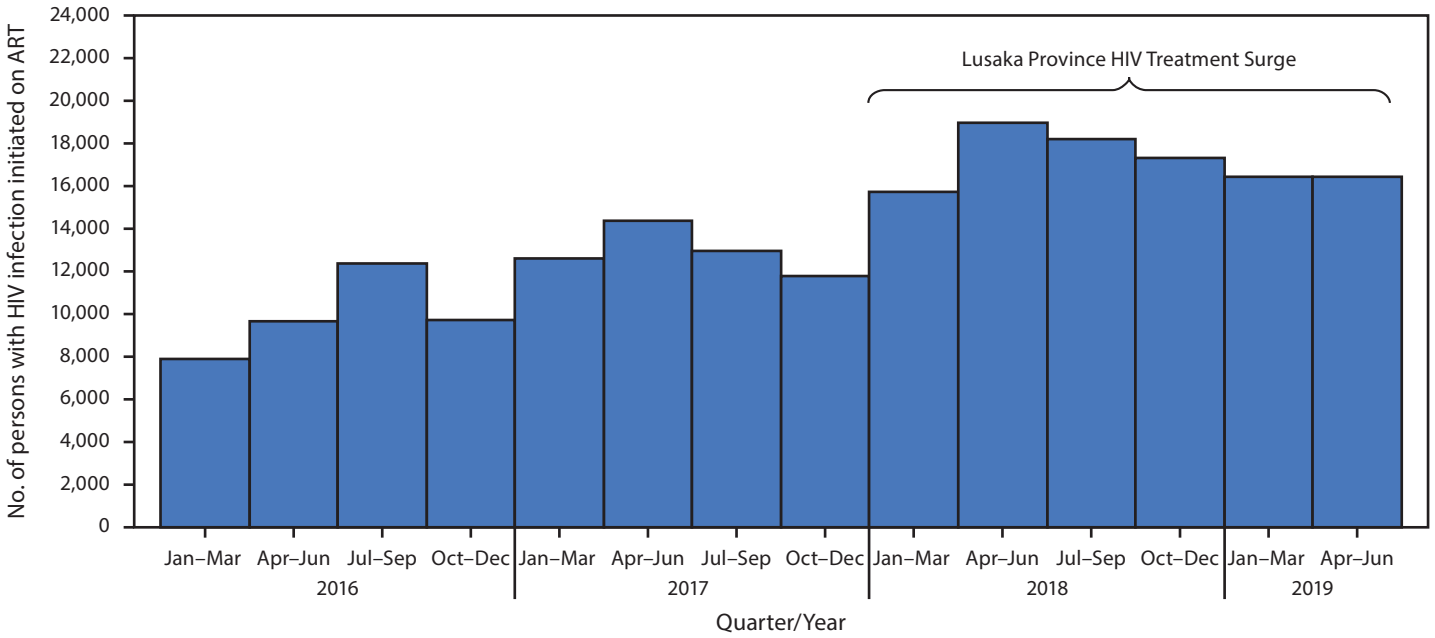
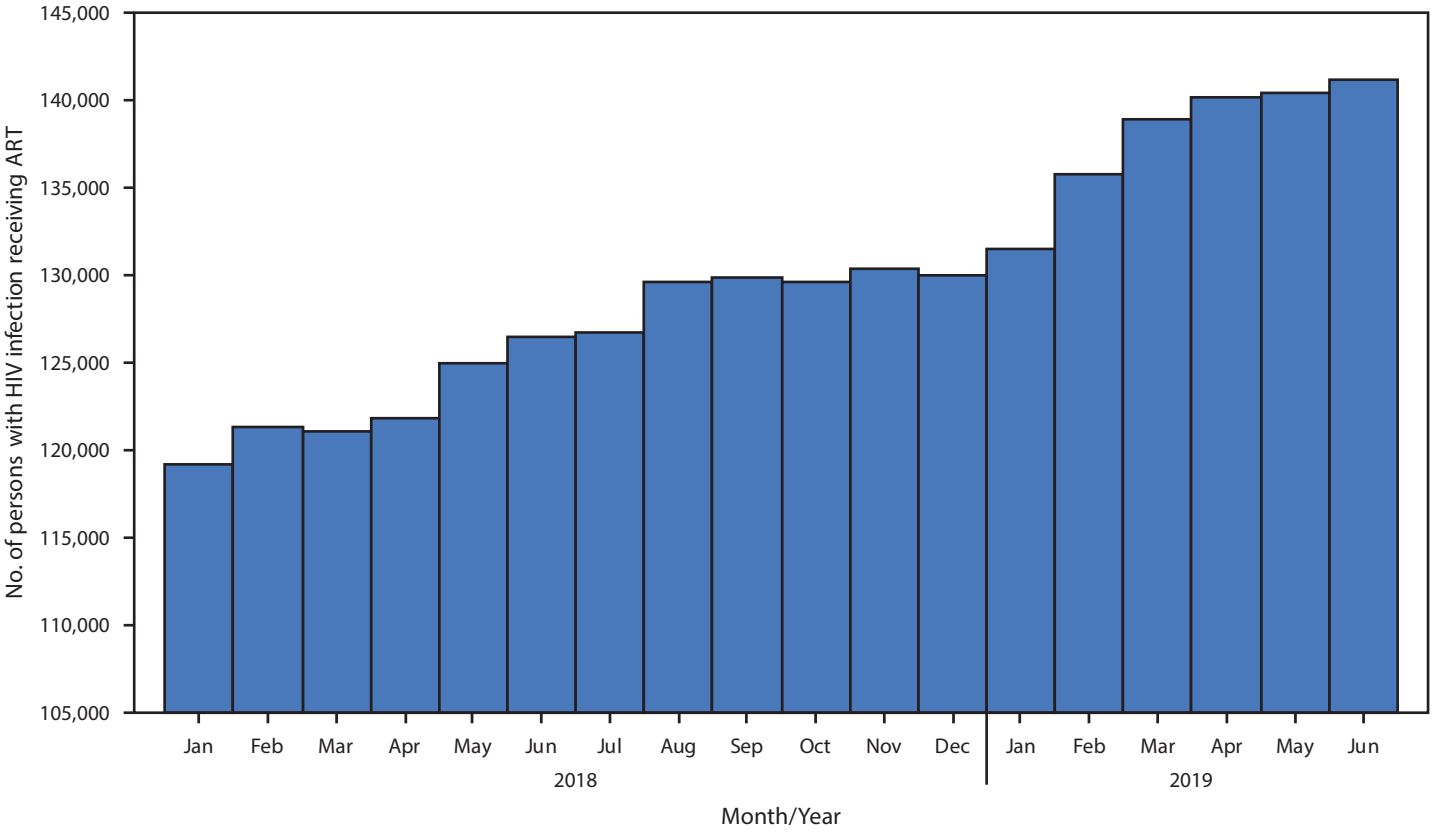


FIGURE 2. Persons with human immunodeficiency virus (HIV) infection receiving antiretroviral therapy (ART) during the Lusaka Province HIV Treatment Surge — 34 facilities with electronic health records, Lusaka Province, Zambia, January 2018–June 2019



Discussion

During the first 18 months of the Surge project (January 2018–June 2019), approximately 100,000 persons with positive test results for HIV newly initiated ART. These new ART clients were more likely to be persons aged 15–24 years, the group that the 2016 ZAMPHIA had documented to have the lowest ART coverage. After 18 months, the number of persons with positive test results for HIV receiving ART in Lusaka Province increased from 204,000 to 248,000 (increase of 22%), and the number of individuals with documented viral load suppression increased from 66,109 to 134,046 (increase of 100%). The increase in viral load testing within the previous 12 months among persons eligible to receive testing provides a more representative estimate of viral load suppression rates at the population level than was available before the Surge project, when only a small subset of clients with positive test results for HIV who were on treatment had viral load results. Clinically, the availability of viral load results helps identify clients with positive test results for HIV with viral load suppression who would benefit from decentralized HIV treatment and ART dispensation over multiple months and clients with positive test results for HIV with unsuppressed viral loads who would benefit from targeted enhanced adherence counseling, ART regimen switches, patient support interventions, and index testing services for partners with an elevated risk for HIV exposure.

The findings from this analysis provide guidance for the next steps for the Lusaka Surge project. The gap between the number of persons with positive test results for HIV who newly initiated ART and the net change in the number currently receiving ART suggests that ART retention is a notable challenge. In addition, preliminary investigations suggest that clients who are already receiving ART might be retesting and therefore be categorized as newly initiating ART even though they are already receiving treatment. In December 2018 and January 2019, among 612 patients at 12 of the largest ART facilities in Lusaka Province with newly diagnosed HIV infection, 24% were already virally suppressed at diagnosis (unpublished data, CDC-Zambia, 2019).

Despite the success in initiating persons aged 15–24 years on ART during the Surge project, the age distribution of patients currently receiving ART in June 2019 did not appreciably change during the project. These data suggest that retention is especially challenging for this age group, a finding consistent with analyses of global HIV programs, and attributed to a variety of factors, including stigma and discrimination, mobility, and self-perceived risk (*7*). Lessons learned from implementation of the Lusaka Surge project, such as the importance of frequent coordinated data review and site visits with important stakeholders, and a focus on continuous quality improvement, can be applied to improving ART retention.

Summary

What is already known about this topic?

Antiretroviral therapy (ART) coverage rates among persons living with human immunodeficiency virus (HIV) infection have increased in Zambia since 2004; however, remaining gaps in coverage and viral load suppression require new strategies to achieve treatment targets.

What is added by this report?

An 18-month analysis of a Lusaka Province, Zambia project to increase enrollment of persons with HIV infection into ART found that the number receiving ART in Lusaka Province increased from 204,000 to 248,000 (increase of 22%), and the number of persons with documented viral load suppression increased from 66,109 to 134,046, exceeding historical performance.

What are the implications for public health practice?

A strategy to improve HIV treatment programs based on stakeholder coordination, frequent site visits and data monitoring, and continual quality improvement resulted in demonstrable improvements in program indicators and could be replicated in other program areas and populations.

The findings in this report are subject to at least three limitations. First, HIV program data are subject to variability in reporting quality and completeness. However, this limitation is mitigated by the province-wide data quality assessment in 2017, which found high concordance between facility records and Monitoring and Evaluation Report reports, and ongoing data quality improvement efforts between CDC-Zambia, CIDRZ, and MoH. Second, the results presented here do not allow for population-level estimates of ART coverage, which are useful in assessing progress toward the 90/90/90 HIV treatment targets. In addition to ART facilities reporting to PEPFAR, private health facilities provide ART to an unknown number of clients with positive test results for HIV, which might lead to underestimation of ART coverage. Finally, estimates of HIV prevalence for Lusaka Province are subject to rapidly changing population migration and HIV risk behaviors. A second ZAMPHIA will be conducted in 2020 to inform these population-level estimates.

The Lusaka Surge project has demonstrated that collaborative leadership, political will, emphasis on improving facility-level performance, routine monitoring for accountability, and creative strategies to disseminate successful practices can increase HIV treatment rates in a high-prevalence setting. This approach can be used to target programmatic gaps that remain, including retention. With lessons learned from the Lusaka Surge project, Zambia has launched similar surges in other high-prevalence provinces with the objective of achieving 90/90/90 targets nationwide by 2020.

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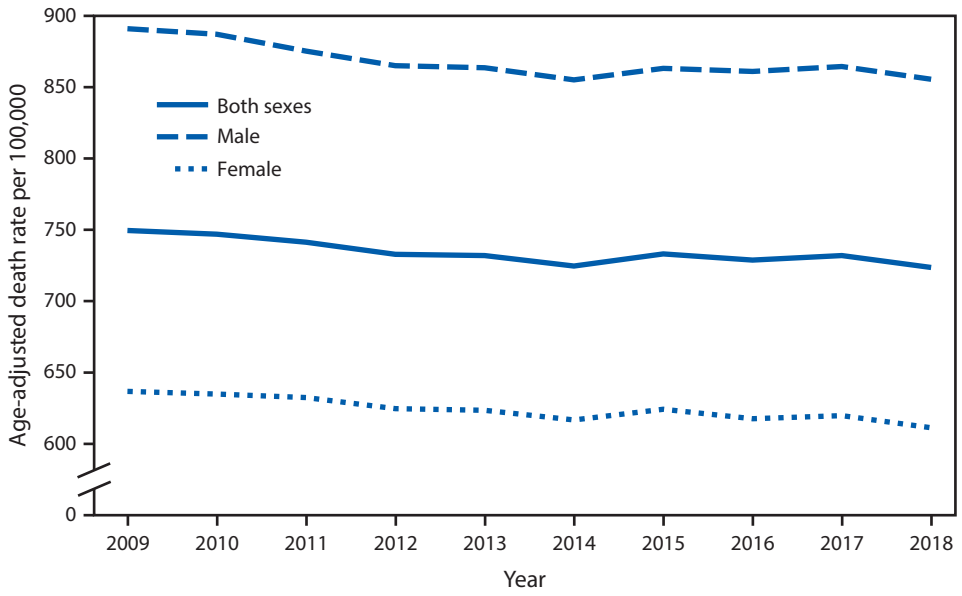
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates for Males, Females, and Both Sexes — United States, 2009–2018



During 2009–2018, the age-adjusted death rate in the United States generally declined, from 749.6 per 100,000 in 2009 to 723.6 in 2018. The death rate among males declined from 2009 (890.9) to 2014 (855.1), increased in 2015 (863.2), and then remained relatively flat until 2018 (855.5). Among females, the death rate declined steadily from 2009 (636.8) to 2018 (611.3). Throughout this period the death rate for males was higher than that for females.

Source: National Center for Health Statistics, National Vital Statistics System, mortality data. https://www.cdc.gov/nchs/nvss/deaths.htm.

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