Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 69 / No. 25
June 26, 2020

Characteristics of Women of Reproductive Age with Laboratory-Confirmed SARS-CoV-2 Infection by Pregnancy Status — United States, January 22–June 7, 2020

Sascha Ellington, PhD[1]; Penelope Strid, MPH[1]; Van T. Tong, MPH[1]; Kate Woodworth, MD[1]; Romeo R. Galang, MD[1]; Laura D. Zambrano, PhD[1]; John Nahabedian, MS[1]; Kayla Anderson, PhD[1]; Suzanne M. Gilboa, PhD[1]

As of June 16, 2020, the coronavirus disease 2019 (COVID-19) pandemic has resulted in 2,104,346 cases and 116,140 deaths in the United States.* During pregnancy, women experience immunologic and physiologic changes that could increase their risk for more severe illness from respiratory infections (*1*,*2*). To date, data to assess the prevalence and severity of COVID-19 among pregnant U.S. women and determine whether signs and symptoms differ among pregnant and nonpregnant women are limited. During January 22–June 7, as part of COVID-19 surveillance, CDC received reports of 326,335 women of reproductive age (15–44 years) who had positive test results for SARS-CoV-2, the virus that causes COVID-19. Data on pregnancy status were available for 91,412 (28.0%) women with laboratory-confirmed infections; among these, 8,207 (9.0%) were pregnant. Symptomatic pregnant and nonpregnant women with COVID-19 reported similar frequencies of cough (>50%) and shortness of breath (30%), but pregnant women less frequently reported headache, muscle aches, fever, chills, and diarrhea. Chronic lung disease, diabetes mellitus, and cardiovascular disease were more commonly reported among pregnant women than among nonpregnant women. Among women with COVID-19, approximately one third (31.5%) of pregnant women were reported to have been hospitalized compared with 5.8% of nonpregnant women. After adjusting for age, presence of underlying medical conditions, and race/ethnicity, pregnant women were significantly more likely to be admitted to the intensive care unit (ICU) (aRR = 1.5, 95% confidence interval [CI] = 1.2–1.8) and receive mechanical ventilation (aRR = 1.7, 95% CI = 1.2–2.4). Sixteen (0.2%) COVID-19–related deaths were reported among pregnant women aged 15–44 years, and 208 (0.2%) such deaths were reported among nonpregnant women (aRR = 0.9, 95% CI = 0.5–1.5). These findings suggest that among women of reproductive age with COVID-19, pregnant women are more likely to be hospitalized and at increased risk for ICU admission and receipt of mechanical ventilation

* https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html.

INSIDE

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

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

compared with nonpregnant women, but their risk for death is similar. To reduce occurrence of severe illness from COVID-19, pregnant women should be counseled about the potential risk for severe illness from COVID-19, and measures to prevent infection with SARS-CoV-2 should be emphasized for pregnant women and their families.

Data on laboratory-confirmed and probable COVID-19 cases[†] were electronically reported to CDC using a standardized case report form[§] or through the National Notifiable Diseases Surveillance System[¶] as part of COVID-19 surveillance efforts. Data are updated by health departments as additional information becomes available. This analysis includes cases reported during January 22–June 7 with data updated as of June 17, 2020. Included cases were limited to laboratory-confirmed infections with SARS-CoV-2 (confirmed by detection of SARS-CoV-2 RNA in a clinical specimen using a molecular amplification detection test) among women aged 15–44 years from 50 states, the District of Columbia, and New York City. Data collected included information on demographic characteristics, pregnancy status, underlying medical conditions, clinical signs and symptoms, and outcomes (including hospitalization, ICU admission, receipt of mechanical ventilation, and death). Outcomes with missing data were assumed not to have occurred (i.e., if data were missing on hospitalization, women were assumed to not have been hospitalized). Crude and adjusted risk ratios and 95% CIs for outcomes were calculated using modified Poisson regression. Risk ratios were adjusted for age (as a continuous variable), presence of underlying chronic conditions (yes/no), and race/ethnicity. All analyses were performed using SAS (version 9.4; SAS Institute).

During January 22–June 7, among 1,573,211 laboratory-confirmed cases of SARS-CoV-2 infection reported to CDC as part of national COVID-19 surveillance, a total of 326,335 (20.7%) occurred among women aged 15–44 years. Data on pregnancy status were available for 91,412 (28.0%) of these women; 8,207 (9.0%) were pregnant (Table 1). Approximately one quarter of all women aged 15–44 years were aged 15–24 years. A total of 54.4% of pregnant women and 38.2% of nonpregnant women were aged 25–34 years; 22.1% of pregnant women and 38.3% of nonpregnant women were aged 35–44 years. Information on race/ethnicity was available for 80.4% of pregnant women and 70.6% of nonpregnant women. Among pregnant women, 46.2% were Hispanic, 23.0% were non-Hispanic white (white), 22.1% were non-Hispanic black (black), and 3.8% were non-Hispanic Asian compared with 38.1%, 29.4%, 25.4%, and 3.2%, respectively, among nonpregnant women.

Symptom status was reported for 65.2% of pregnant women and 90.0% of nonpregnant women; among those with symptom status reported, 97.1% of pregnant and 96.9% nonpregnant women reported being symptomatic. Symptomatic pregnant and nonpregnant women also reported similar

[†] https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/.
[§] https://www.cdc.gov/coronavirus/2019-ncov/downloads/pui-form.pdf.
[¶] https://wwwn.cdc.gov/nndss/covid-19-response.html.

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

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR Morb Mortal Wkly Rep 2020;69:[inclusive page numbers].

TABLE 1. Demographic characteristics, symptoms, and underlying medical conditions among women aged 15–44 years with known pregnancy status and laboratory-confirmed SARS-CoV-2 infection (N = 91,412),* by pregnancy status — United States, January 22–June 7, 2020

Characteristic	No. (%)	
	Pregnant women (n = 8,207)	Nonpregnant women (n = 83,205)
Age group (yrs)		
15–24	1,921 (23.4)	19,557 (23.5)
25–34	4,469 (54.4)	31,818 (38.2)
35–44	1,817 (22.1)	31,830 (38.3)
Race/Ethnicity†		
Hispanic or Latino	3,048 (46.2)	22,394 (38.1)
Asian, non-Hispanic	254 (3.8)	1,869 (3.2)
Black, non-Hispanic	1,459 (22.1)	14,922 (25.4)
White, non-Hispanic	1,520 (23.0)	17,297 (29.4)
Multiple or other race, non-Hispanic§	321 (4.9)	2,299 (3.9)
Symptom status¶		
Symptomatic	5,199 (97.1)	72,549 (96.9)
Asymptomatic	156 (2.9)	2,328 (3.1)
Symptom reported**		
Cough	1,799 (51.8)	23,554 (53.7)
Fever††	1,190 (34.3)	18,474 (42.1)
Muscle aches	1,323 (38.1)	20,693 (47.2)
Chills	989 (28.5)	15,630 (35.6)
Headache	1,409 (40.6)	22,899 (52.2)
Shortness of breath	1,045 (30.1)	13,292 (30.3)
Sore throat	942 (27.1)	13,681 (31.2)
Diarrhea	497 (14.3)	10,113 (23.1)
Nausea or vomiting	682 (19.6)	6,795 (15.5)
Abdominal pain	350 (10.1)	5,139 (11.7)
Runny nose	326 (9.4)	4,540 (10.4)
New loss of taste or smell§§	587 (16.9)	7,262 (16.6)
Underlying medical condition		
Known underlying medical condition status¶¶	1,878 (22.9)	29,142 (35.0)
Diabetes mellitus	288 (15.3)	1,866 (6.4)
Chronic lung disease	409 (21.8)	3,006 (10.3)
Cardiovascular disease	262 (14.0)	2,082 (7.1)
Chronic renal disease	12 (0.6)	266 (0.9)
Chronic liver disease	8 (0.4)	141 (0.5)
Immunocompromised condition	66 (3.5)	811 (2.8)
Neurologic disorder, neurodevelopmental disorder, or intellectual disability	17 (0.9)	389 (1.3)
Other chronic disease	162 (8.6)	1,586 (5.4)

Abbreviation: COVID-19 = coronavirus disease 2019.

* Women with known pregnancy status, representing 28% of 326,335 total cases in women aged 15–44 years.

† Race/ethnicity was missing for 1,605 (20%) pregnant women and 24,424 (29%) nonpregnant women.

§ Other race includes American Indian or Alaska Native or Native Hawaiian or Other Pacific Islander.

¶ Data on symptom status were missing for 2,852 (35%) pregnant women and 8,328 (10%) nonpregnant women.

** Among symptomatic women (3,474 pregnant; 43,855 nonpregnant) with any of the following symptoms noted as present or absent on the CDC's Human Infection with 2019 Novel Coronavirus Case Report Form: fever (measured >100.4°F [38°C] or subjective), cough, shortness of breath, wheezing, difficulty breathing, chills, rigors, myalgia, rhinorrhea, sore throat, chest pain, nausea or vomiting, abdominal pain, headache, fatigue, diarrhea (three or more loose stools in a 24-hour period), new olfactory or taste disorder, or other symptom not otherwise specified on the form.

†† Patients were included if they had information for either measured or subjective fever variables and were considered to have a fever if "yes" was indicated for either variable.

§§ New olfactory and taste disorder has only been included on the CDC's Human Infection with 2019 Novel Coronavirus Case Report Form since May 5, 2020. Therefore, data might be underreported for this symptom.

¶¶ Status was classified as "known" if any of the following conditions were noted as present or absent on the CDC's Human Infection with 2019 Novel Coronavirus Case Report Form: diabetes mellitus, cardiovascular disease (including hypertension), severe obesity (body mass index ≥40 kg/m2), chronic renal disease, chronic liver disease, chronic lung disease, immunosuppressive condition, autoimmune condition, neurologic condition (including neurodevelopmental, intellectual, physical, visual, or hearing impairment), psychological/psychiatric condition, and other underlying medical condition not otherwise specified.

frequencies of cough (51.8% versus 53.7%) and shortness of breath (30.1% versus 30.3%). Pregnant women less frequently reported headache (40.6% versus 52.2%), muscle aches (38.1% versus 47.2%), fever (34.3% versus 42.1%), chills (28.5% versus 35.6%), and diarrhea (14.3% versus 23.1%) than did nonpregnant women.

Data were available on presence and absence of underlying chronic conditions for 22.9% of pregnant women and 35.0% of nonpregnant women. Chronic lung disease (21.8% pregnant; 10.3% nonpregnant), diabetes mellitus (15.3% pregnant; 6.4% nonpregnant), and cardiovascular disease (14.0% pregnant; 7.1% nonpregnant) were the most commonly reported

chronic conditions. Data were not available to distinguish whether chronic conditions were present before or associated with pregnancy (e.g., gestational diabetes or hypertensive disorders of pregnancy).

Hospitalization was reported by a substantially higher percentage of pregnant women (31.5%) than nonpregnant women (5.8%) (Table 2). Data were not available to distinguish hospitalization for COVID-19–related circumstances (e.g., worsening respiratory status) from hospital admission for pregnancy-related treatment or procedures (e.g., delivery). Pregnant women were admitted more frequently to the ICU (1.5%) than were nonpregnant women (0.9%). Similarly, 0.5% of pregnant women required mechanical ventilation compared with 0.3% of nonpregnant women. Sixteen deaths (0.2%) were reported among 8,207 pregnant women, and 208 (0.2%) were reported among 83,205 nonpregnant women. When stratified by age, all outcomes (hospitalization, ICU admission, receipt of mechanical ventilation, and death) were more frequently reported among women aged 35–44 years than among those aged 15–24 years, regardless of pregnancy status. When stratified by race/ethnicity, ICU admission was most frequently reported among pregnant women who were non-Hispanic Asian (3.5%) than among all pregnant women (1.5%) (Table 2).

After adjusting for age, presence of underlying conditions, and race/ethnicity, pregnant women were 5.4 times more likely to be hospitalized (95% CI = 5.1–5.6), 1.5 times more likely to be admitted to the ICU (95% CI = 1.2–1.8), and 1.7 times more likely to receive mechanical ventilation (95% CI = 1.2–2.4) (Table 2). No difference in the risk for death between pregnant and nonpregnant women was found (aRR = 0.9, 95% CI = 0.5–1.5).

Discussion

As of June 7, 2020, a total of 8,207 cases of COVID-19 in pregnant women were reported to CDC, representing approximately 9% of cases among women of reproductive age with data available on pregnancy status. This finding is similar to that of a recent analysis of hospitalized COVID-19 patients (*3*); however, given that approximately 5% of women aged 15–44 years are pregnant at a point in time,** this percentage is higher than expected. Although these findings could be related to the increased risk for illness, they also could be related to the high proportion of reproductive-aged women for whom data on pregnancy status was missing, if these women were more likely to not be pregnant. The higher-than-expected percentage of COVID-19 cases among women of reproductive age who were pregnant might also be attributable to increased screening and detection of SARS-CoV-2 infection in pregnant women compared with nonpregnant women or by more frequent health care encounters, which increase opportunities to receive SARS-CoV-2 testing. Several inpatient obstetric health care facilities have implemented universal screening and testing policies for pregnant women upon admission (*4–6*). During the study period, among pregnant women with laboratory-confirmed SARS-CoV-2 infection who reported race/ethnicity, 46% were Hispanic, 22% were black, and 23% were white; these proportions differ from those among women with reported race/ethnicity who gave birth in 2019: 24% were Hispanic, 15% were black, and 51% were white.†† Although data on race/ethnicity were missing for 20% of pregnant women in this study, these findings suggest that pregnant women who are Hispanic and black might be disproportionately affected by SARS-CoV-2 infection during pregnancy.

Among women with known symptom status, similar percentages of pregnant and nonpregnant women were symptomatic with COVID-19. However, data on symptom status were missing for approximately one third of pregnant women, compared with 10% of nonpregnant women; therefore, if those with missing symptom status are more likely to be asymptomatic, the percentage of pregnant women who are asymptomatic could be higher than the percentage of asymptomatic nonpregnant women. The percentages of pregnant women reporting fever, muscle aches, chills, headache, and diarrhea were lower than those reported among nonpregnant women, suggesting that signs and symptoms of COVID-19 might differ between pregnant and nonpregnant women. Diabetes mellitus, chronic lung disease, and cardiovascular disease were reported more frequently among pregnant women than among nonpregnant women. Additional information is needed to distinguish medical conditions that developed before pregnancy from those that developed during pregnancy and to determine whether this distinction affects clinical outcomes of COVID-19.

Whereas hospitalization occurred in a significantly higher proportion of pregnant women than nonpregnant women, data needed to distinguish hospitalization for COVID-19 from hospital admission for pregnancy-related conditions were not available. Further, differences in hospitalization by pregnancy status might reflect a lower threshold for admitting pregnant patients or for universal screening and testing policies that some hospitals have implemented for women admitted to the labor and delivery unit (*4–7*). In contrast, however, ICU admission and receipt of mechanical ventilation are distinct proxies for illness severity (*8*), and after adjusting for age, presence of underlying conditions, and race/ethnicity, the risks for both

** https://www.cdc.gov/reproductivehealth/emergency/docs/Geographic-Calculator-for-Pregnant-Women_508.xlsx.

†† https://www.cdc.gov/nchs/data/vsrr/vsrr-8-508.pdf.

TABLE 2. Hospitalizations, intensive care unit (ICU) admissions, receipt of mechanical ventilation, and deaths among women with known pregnancy status and laboratory-confirmed SARS-CoV-2 infection (N = 91,412), by pregnancy status, age group, and race/ethnicity, and relative risk for these outcomes comparing pregnant women to nonpregnant women aged 15–44 years — United States, January 22–June 7, 2020

Outcome*	No. (%)		Crude risk ratio (95% CI)	Adjusted risk ratio† (95% CI)
	Pregnant women (n = 8,207)	Nonpregnant women (n = 83,205)		
Hospitalization§			**5.4 (5.2–5.7)**	**5.4 (5.1–5.6)**
All	**2,587 (31.5)**	**4,840 (5.8)**		
Age group (yrs)				
15–24	562 (29.3)	639 (3.3)		
25–34	1,398 (31.3)	1,689 (5.3)		
35–44	627 (34.5)	2,512 (7.9)		
Race/Ethnicity¶				
Hispanic or Latino	968 (31.7)	1,473 (6.5)		
Asian, non-Hispanic	100 (39.4)	136 (7.3)		
Black, non-Hispanic	461 (31.6)	1,199 (8.0)		
White, non-Hispanic	492 (32.4)	803 (4.6)		
Multiple or other race, non-Hispanic**	136 (42.4)	194 (8.4)		
ICU admission††			**1.6 (1.3–1.9)**	**1.5 (1.2–1.8)**
All	**120 (1.5)**	**757 (0.9)**		
Age group (yrs)				
15–24	19 (1.0)	100 (0.5)		
25–34	53 (1.2)	251 (0.8)		
35–44	48 (2.6)	406 (1.3)		
Race/Ethnicity				
Hispanic or Latino	49 (1.6)	194 (0.9)		
Asian, non-Hispanic	9 (3.5)	25 (1.3)		
Black, non-Hispanic	28 (1.9)	194 (1.3)		
White, non-Hispanic	12 (0.8)	158 (0.9)		
Multiple or other race, non-Hispanic**	<5 (—§§)	40 (1.7)		
Hispanic or Latino	49 (1.6)	194 (0.9)		
Mechanical ventilation¶¶			**1.9 (1.4–2.6)**	**1.7 (1.2–2.4)**
All	**42 (0.5)**	**225 (0.3)**		
Age group (yrs)				
15–24	<5 (—§§)	22 (0.1)		
25–34	18 (0.4)	74 (0.2)		
35–44	21 (1.2)	129 (0.4)		
Race/Ethnicity				
Hispanic or Latino	13 (0.4)	70 (0.3)		
Asian, non-Hispanic	<5 (—§§)	13 (0.7)		
Black, non-Hispanic	9 (0.6)	48 (0.3)		
White, non-Hispanic	<5 (—§§)	44 (0.3)		
Multiple or other race, non-Hispanic**	5 (1.6)	16 (0.7)		
Death* **			**0.8 (0.5–1.3)**	**0.9 (0.5–1.5)**
All	**16 (0.2)**	**208 (0.2)**		
Age group (yrs)				
15–24	<5 (—§§)	9 (0.0)		
25–34	7 (0.2)	58 (0.2)		
35–44	8 (0.4)	141 (0.4)		
Race/Ethnicity				
Hispanic or Latino	5 (0.2)	47 (0.2)		
Asian, non-Hispanic	<5 (—§§)	7 (0.4)		
Black, non-Hispanic	6 (0.4)	74 (0.5)		
White, non-Hispanic	<5 (—§§)	37 (0.2)		
Multiple or other race, non-Hispanic**	<5 (—§§)	8 (0.4)		

See table footnotes on page 774.

TABLE 2. (Continued) Hospitalizations, intensive care unit (ICU) admissions, receipt of mechanical ventilation, and deaths among women with known pregnancy status and laboratory-confirmed SARS-CoV-2 infection (N = 91,412), by pregnancy status, age group, and race/ethnicity, and relative risk for these outcomes comparing pregnant women to nonpregnant women aged 15–44 years — United States, January 22–June 7, 2020

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019.

* Percentages calculated among total in pregnancy status group with known hospitalization status, ICU admission status, mechanical ventilation status, or death.

† Adjusted for age as a continuous variable, dichotomous yes/no variable for presence of underlying conditions, and categorical race/ethnicity variable. Nonpregnant women are the referent group.

§ A total of 1,539 (18%) pregnant women and 9,744 (12%) nonpregnant women were missing information on hospitalization status and were assumed to have not been hospitalized.

¶ Race/ethnicity was missing for 1,605 (20%) pregnant women and 24,424 (29%) nonpregnant women.

** Other race includes American Indian or Alaska Native or Native Hawaiian or Other Pacific Islander.

†† A total of 6,079 (74%) pregnant women and 58,888 (71%) nonpregnant women were missing information for ICU admission and were assumed to have not been admitted to an ICU.

§§ Cell counts <5 are suppressed.

¶¶ A total of 6,351 (77%) pregnant women and 63,893 (77%) nonpregnant women were missing information for receipt of mechanical ventilation and were assumed to have not received mechanical ventilation.

*** A total of 3,819 (47%) pregnant women and 17,420 (21%) nonpregnant women were missing information on death and were assumed to have survived.

outcomes were significantly higher among pregnant women than among nonpregnant women. These findings are similar to those from a recent study in Sweden, which found that pregnant women with COVID-19 were five times more likely to be admitted to the ICU and four times more like to receive mechanical ventilation than were nonpregnant women (*9*). The risk for death was the same for pregnant and nonpregnant women. A recent meta-analysis of individual participant data among women of reproductive age found that for influenza, pregnancy was associated with a seven times higher risk for hospitalization, a lower risk for ICU admission, and no increased risk for death (*10*).

The findings in this report are subject to at least four limitations. First, pregnancy status was missing for three quarters of women of reproductive age with SARS-CoV-2 infection. Moreover, among COVID-19 cases in female patients with known pregnancy status, data on race/ethnicity, symptoms, underlying conditions, and outcomes were missing for a large proportion of cases. This circumstance could lead to overestimation or underestimation of some characteristics, if those with missing data were systematically different from those with available data. To avoid overestimating the risk for adverse outcomes, the absence of data on an outcome was assumed to indicate that the outcome did not occur, and those persons with missing information were included in the denominator. Second, additional time might be needed to ascertain and report outcomes such as ICU admission, mechanical ventilation, and death, and this analysis might underestimate the prevalence of these outcomes. Third, information on pregnancy trimester at the time of infection or whether the hospitalization was related to pregnancy conditions rather than for COVID-19 illness was not available and limits the interpretation of hospitalization data. Finally, routine case surveillance does not capture pregnancy or birth outcomes; thus, it remains unclear whether SARS-CoV-2 infection during pregnancy is associated with adverse pregnancy outcomes, such as pregnancy loss or preterm birth.

The findings in this report suggest that among adolescents and women aged 15–44 years with COVID-19, pregnancy is associated with increased risk for ICU admission and receipt of mechanical ventilation, but it is not associated with increased risk for mortality. This report also highlights the need for more complete data to fully understand the risk for severe illness resulting from SARS-CoV-2 infection in pregnant women. Further, collection of longitudinal data for pregnant women with SARS-CoV-2 infection, including information about pregnancy outcomes, is needed to understand the effects of SARS-CoV-2 infection on maternal and neonatal outcomes. To address these data gaps, CDC, in collaboration with health departments, has initiated COVID-19 pregnancy surveillance to report pregnancy-related information and outcomes among pregnant women with laboratory-confirmed SARS-CoV-2 infection. CDC will continue to provide updates on COVID-19 cases in pregnant women. Although additional data are needed to further understand these observed elevated risks, pregnant women should be made aware of their potential risk for severe illness from COVID-19. Pregnant women and their families should take measures to ensure their health and prevent the spread of SARS-CoV-2 infection. Specific actions pregnant women can take include not skipping prenatal care appointments, limiting interactions with other people as much as possible, taking precautions to prevent getting COVID-19 when interacting with others, having at least a 30-day supply of medicines, and talking to their health care provider about how to stay healthy during the COVID-19 pandemic.[§§] To reduce severe outcomes from COVID-19 among pregnant women, measures to prevent SARS-CoV-2 infection should be emphasized, and potential barriers to the ability to adhere to these measures need to be addressed.

[§§] https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/pregnancy-breastfeeding.html.

Summary

What is already known about this topic?

Limited information is available about SARS-CoV-2 infection in U.S. pregnant women.

What is added by this report?

Hispanic and non-Hispanic black pregnant women appear to be disproportionately affected by SARS-CoV-2 infection during pregnancy. Among reproductive-age women with SARS-CoV-2 infection, pregnancy was associated with hospitalization and increased risk for intensive care unit admission, and receipt of mechanical ventilation, but not with death.

What are the implications for public health practice?

Pregnant women might be at increased risk for severe COVID-19 illness. To reduce severe COVID-19–associated illness, pregnant women should be aware of their potential risk for severe COVID-19 illness. Prevention of COVID-19 should be emphasized for pregnant women and potential barriers to adherence to these measures need to be addressed.

Acknowledgments

State, local, and territorial health department personnel; U.S. clinical, public health, and emergency response staff members; CDC Epidemiology Studies Task Force Pregnancy and Infant Linked Outcomes Team; CDC Case Surveillance Task Force.

Corresponding author: Sascha Ellington, for the CDC COVID-19 Response Pregnancy and Infant Linked Outcomes Team, eocevent397@cdc.gov.

[1]CDC COVID-19 Emergency Response.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Ramsey PS, Ramin KD. Pneumonia in pregnancy. Obstet Gynecol Clin North Am 2001;28:553–69. https://doi.org/10.1016/S0889-8545(05)70217-5
2. Rasmussen SA, Kissin DM, Yeung LF, et al.; Pandemic Influenza and Pregnancy Working Group. Preparing for influenza after 2009 H1N1: special considerations for pregnant women and newborns. Am J Obstet Gynecol 2011;204(Suppl 1):S13–20. https://doi.org/10.1016/j.ajog.2011.01.048
3. Garg S, Kim L, Whitaker M, et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus disease 2019—COVID-NET, 14 states, March 1–30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:458–64. https://doi.org/10.15585/mmwr.mm6915e3
4. Breslin N, Baptiste C, Gyamfi-Bannerman C, et al. Coronavirus disease 2019 infection among asymptomatic and symptomatic pregnant women: two weeks of confirmed presentations to an affiliated pair of New York City hospitals. Am J Obstet Gynecol MFM 2020. Epub April 9, 2020. https://doi.org/10.1016/j.ajogmf.2020.100118
5. Campbell KH, Tornatore JM, Lawrence KE, et al. Prevalence of SARS-CoV-2 among patients admitted for childbirth in southern Connecticut. JAMA 2020. https://doi.org/10.1001/jama.2020.8904
6. Sutton D, Fuchs K, D'Alton M, Goffman D. Universal screening for SARS-CoV-2 in women admitted for delivery. N Engl J Med 2020;382:2163–4. https://doi.org/10.1056/NEJMc2009316
7. Creanga AA, Kamimoto L, Newsome K, et al. Seasonal and 2009 pandemic influenza A (H1N1) virus infection during pregnancy: a population-based study of hospitalized cases. Am J Obstet Gynecol 2011;204(Suppl 1):S38–45. https://doi.org/10.1016/j.ajog.2011.02.037
8. Kuklina EV, Meikle SF, Jamieson DJ, et al. Severe obstetric morbidity in the United States: 1998–2005. Obstet Gynecol 2009;113:293–9. https://doi.org/10.1097/AOG.0b013e3181954e5b
9. Collin J, Byström E, Carnahan A, Ahrne M. Public Health Agency of Sweden's brief report: pregnant and postpartum women with SARS-CoV-2 infection in intensive care in Sweden. Acta Obstet Gynecol Scand 2020. Epub May 9, 2020. https://doi.org/10.1111/aogs.13901
10. Mertz D, Lo CK, Lytvyn L, Ortiz JR, Loeb M; FluRisk-Investigators. Pregnancy as a risk factor for severe influenza infection: an individual participant data meta-analysis. BMC Infect Dis 2019;19:683. https://doi.org/10.1186/s12879-019-4318-3

HIV Testing Trends at Visits to Physician Offices, Community Health Centers, and Emergency Departments — United States, 2009–2017

Karen W. Hoover, MD[1]; Ya-Lin A. Huang, PhD[1]; Mary L. Tanner, MD[1]; Weiming Zhu, MD[1]; Naomie W. Gathua, MPH[2]; Marc A. Pitasi, MPH[1]; Elizabeth A. DiNenno, PhD[1]; Suma Nair, PhD[2]; Kevin P. Delaney, PhD[1]

In 2019, the U.S. Department of Health and Human Services launched the Ending the HIV Epidemic: A Plan for America (EHE) initiative to end the U.S. human immunodeficiency virus (HIV) epidemic by 2030. A critical component of the EHE initiative involves early diagnosis of HIV infection, along with prevention of new transmissions, treatment of infections, and response to HIV outbreaks (*1*). HIV testing is the first step in identifying persons with HIV infection who need to be engaged in treatment and care as well as persons with a negative HIV test result and who are at high risk for infection and can benefit from HIV preexposure prophylaxis (PrEP) and other prevention services. These opportunities are often missed for persons receiving clinical services in ambulatory care settings (*2*). Data from the 2009–2016 National Ambulatory Medical Care Survey (NAMCS) and 2009–2017 National Hospital Ambulatory Medical Care Survey (NHAMCS) were analyzed to estimate trends in HIV testing at visits by males and nonpregnant females to physician offices, community health centers (CHCs), and emergency departments (EDs) in the United States. HIV tests were performed at 0.63% of 516 million visits to physician offices, 2.65% of 37 million visits to CHCs, and 0.55% of 87 million visits to EDs. The percentage of visits with an HIV test did not increase at visits to physician offices during 2009–2016, increased at visits to CHC physicians during 2009–2014, and increased slightly at visits to EDs during 2009–2017. All adolescents and adults should have at least one HIV test in their lifetime (*3*). Strategies that reduce clinical barriers to HIV testing (e.g., clinical decision supports that use information in electronic health records [EHRs] to order an HIV test for persons who require one or standing orders for routine opt-out testing) are needed to increase HIV testing at ambulatory care visits.

The EHE initiative includes targets of diagnosing ≥95% of HIV infections and prescribing PrEP for ≥50% of persons with indications for PrEP by 2025 (*4*). During 2018, approximately 86% of persons with HIV infection were aware of their infection status, and an estimated 18% of persons with an indication for PrEP were prescribed PrEP (*4*). Routine opt-out HIV testing has been recommended by CDC since 2006 (*3*) and by the U.S. Preventive Services Task Force (USPSTF) as an A-graded preventive service since 2013, with the most recent update in 2019.* Since early 2014, a provision of the Patient Protection and Affordable Care Act has required that third-party health care payers cover HIV testing without a patient deductible or copayment because of the USPSTF A grade.†

The most recent data available from NAMCS and NHAMCS were analyzed to estimate the mean annual number of visits by males and nonpregnant females aged 13–64 years to physician offices, CHCs, and EDs, and the percentage of visits at which an HIV test was performed. NAMCS was based on a sample of visits to office-based physicians during 2009–2011 and 2016 and a state-based sampling design during 2012–2015.§ NAMCS included a separate sample of visits to CHCs that used a grantee-based sampling design during 2009–2011 and a delivery site design during 2012–2014. NHAMCS was based on a sample of visits to EDs. NAMCS used a three-stage probability design with samples drawn from primary sampling units (PSUs) (geographically defined areas), physician practices or CHCs within PSUs, and patient visits within practices. NHAMCS used a four-stage probability design with samples of PSUs, hospitals within PSUs, clinics within outpatient departments, and patient visits within clinics and emergency service areas. In NAMCS and NHAMCS, medical records from sampled visits were abstracted using a patient record form with checkboxes for important clinical services that were ordered or provided and for the type of visit, including HIV testing, other laboratory testing that required venipuncture, preventive care visits, nonurgent care visits, and diagnoses including HIV infection and pregnancy. Visits for persons with previously diagnosed HIV infection and pregnant women, who are routinely tested for HIV at least once during their pregnancy, were excluded from the analysis. The survey findings were weighted using estimation procedures that resulted in nationally representative estimates of clinical services provided at visits.¶ Estimates were stratified by patient demographic and visit characteristics, and 95% confidence intervals were calculated. The percentage of visits with an HIV test was estimated by year for physician offices for 2009–2016, physicians in CHCs for 2009–2014, and EDs for 2009–2017. The percentage of visits with an HIV test was also estimated for persons with private insurance and Medicaid for 2009–2012, 2013–2014, and 2015–2016 for physician

* https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/human-immunodeficiency-virus-hiv-infection-screening.

† https://www.healthcare.gov/law/full.

§ https://www.cdc.gov/nchs/ahcd/index.htm.

¶ https://www.cdc.gov/nchs/ahcd/ahcd_estimation_procedures.htm.

offices and EDs and 2009–2012 and 2013–2014 for CHCs; multiple years were combined to increase the statistical reliability of estimates. The categories for the type of payer were based on a hierarchy of private insurance, Medicaid, and other payer types. The statistical significance of temporal trends in HIV testing were assessed by using Cochran-Mantel-Haenszel tests. The statistical significance of differences in HIV testing between subgroups was assessed using Chi-squared tests. All analyses were performed by using SAS-callable SUDAAN (version 11.0.3; RTI International).

During the study periods, males and nonpregnant females made a mean annual 516 million visits to physician offices, 37 million visits to CHCs, and 87 million visits to EDs, with HIV testing performed at 0.63%, 2.65%, and 0.55% of those visits, respectively (Table). HIV testing rates were higher at visits made by persons aged 20–29 years to physician offices and to CHCs compared with visits made by younger or older persons. HIV testing was performed at a larger percentage of visits by non-Hispanic black/African American (black) and Hispanic/Latino (Hispanic) persons than at those by non-Hispanic white (white) persons in physician offices, CHCs, and EDs. HIV testing rates were higher at visits to physician offices, CHCs, and EDs located in metropolitan statistical areas (more urban areas), compared with those located in nonmetropolitan statistical areas (less urban areas). The percentage of visits with an HIV test performed did not increase in physician

TABLE. Mean number of annual visits by males and nonpregnant females aged 13–64 years to physician offices, community health centers, and emergency departments, and the percentage of those visits with a human immunodeficiency virus (HIV) test, by demographic and visit characteristics — United States, 2009–2017

	Physician offices		Community health centers		Emergency departments	
	2009–2016		2009–2014		2009–2017	
Characteristic	No. of visits*	HIV test, % (95% CI)	No. of visits*	HIV test, % (95% CI)	No. of visits*	HIV test, % (95% CI)
Total	**515,518,000**	**0.63 (0.45–0.87)**	**37,374,000**	**2.65 (2.29–3.07)**	**87,452,000**	**0.55 (0.45–0.66)**
Sex						
Female	305,086,000	0.62 (0.41–0.94)	24,349,000	2.56 (2.15–3.05)	48,378,000	0.54 (0.44–0.66)
Male	210,431,000	0.64 (0.49–0.84)	13,024,000	2.82 (2.40–3.33)	39,075,000	0.56 (0.45–0.69)
Age group, yrs						
13–19	48,606,000	0.56 (0.33–0.95)	4,029,000	2.45 (1.90–3.16)	10,695,000	0.53 (0.35–0.80)
20–29	57,179,000	1.71 (1.37–2.12)	5,764,000	5.08 (4.27–6.03)	21,311,000	0.62 (0.49–0.78)
30–39	77,948,000	1.02 (0.71–1.46)	6,725,000	3.65 (2.95–4.51)	17,751,000	0.60 (0.47–0.77)
40–49	110,264,000	0.67 (0.34–1.34)	7,864,000	2.26 (1.83–2.79)	16,371,000	0.53 (0.41–0.68)
50–64	221,520,000	0.21 (0.15–0.31)	12,992,000	1.36 (1.07–1.73)	21,324,000	0.45 (0.33–0.59)
Race/Ethnicity						
White	370,020,000	0.37 (0.30–0.45)	15,929,000	1.79 (1.49–2.13)	51,865,000	0.28 (0.22–0.36)
Black	57,345,000	1.51 (1.06–2.14)	6,116,000	4.30 (3.73–4.95)	20,888,000	1.07 (0.82–1.39)
Hispanic†	61,976,000	1.20 (0.70–2.04)	13,292,000	3.10 (2.39–4.00)	12,244,000	0.81 (0.62–1.07)
Other§	26,177,000	1.06 (0.42–2.65)	2,037,000	1.61 (0.99–2.61)	2,455,000	0.38 (0.20–0.72)
U.S. region						
Northeast	105,836,000	0.59 (0.43–0.81)	6,641,000	3.74 (3.00–4.66)	15,030,000	0.95 (0.64–1.40)
Midwest	102,923,000	0.38 (0.27–0.51)	6,266,000	2.00 (1.50–2.65)	20,583,000	0.49 (0.31–0.78)
South	192,637,000	0.80 (0.41–1.54)	8,900,000	2.91 (2.34–3.62)	33,848,000	0.53 (0.39–0.72)
West	114,122,000	0.61 (0.45–0.83)	15,567,000	2.31 (1.67–3.18)	17,992,000	0.30 (0.23–0.39)
Metropolitan statistical area (MSA)¶						
MSA	466,984,000	0.67 (0.47–0.94)	30,025,000	3.08 (2.63–3.59)	65,230,000	0.63 (0.51–0.78)
Non-MSA	48,534,000	0.28 (0.15–0.52)	7,348,000	0.93 (0.68–1.27)	12,724,000	0.11 (0.07–0.18)
Insurance type						
Private	347,585,000	0.61 (0.47–0.81)	6,612,000	2.15 (1.63–2.83)	29,199,000	0.42 (0.32–0.56)
Medicaid	51,315,000	0.79 (0.55–1.15)	14,591,000	2.95 (2.35–3.69)	24,027,000	0.67 (0.53–0.85)
Other**	90,670,000	0.32 (0.22–0.47)	13,626,000	2.63 (2.22–3.12)	26,594,000	0.48 (0.36–0.63)
Provider specialty						
Primary care††	263,192,000	1.09 (0.76–1.57)	18,599,000	2.47 (2.05–2.97)	—	—
Other	252,326,000	0.15 (0.11–0.22)	1,190,000	0.82 (0.32–2.06)	—	—
Nonphysician	—	—	17,585,000	2.97 (2.42–3.64)	—	—

Abbreviation: CI = confidence interval.

* Weighted nationally representative estimates.

† Hispanic/Latinos might be of any race.

§ Other races/ethnicities include Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native.

¶ Location of health care venue.

** Other insurance types include Medicare, workers compensation, self-pay, no charge/charity, and other. Insurance type was missing for 6.0% of visits to physician office, 7.3% of visits to community health centers, and 8.2% of visits to emergency departments in the analytic sample.

†† Primary care specialties include general and family practices, internal medicine, obstetrics and gynecology, and pediatrics.

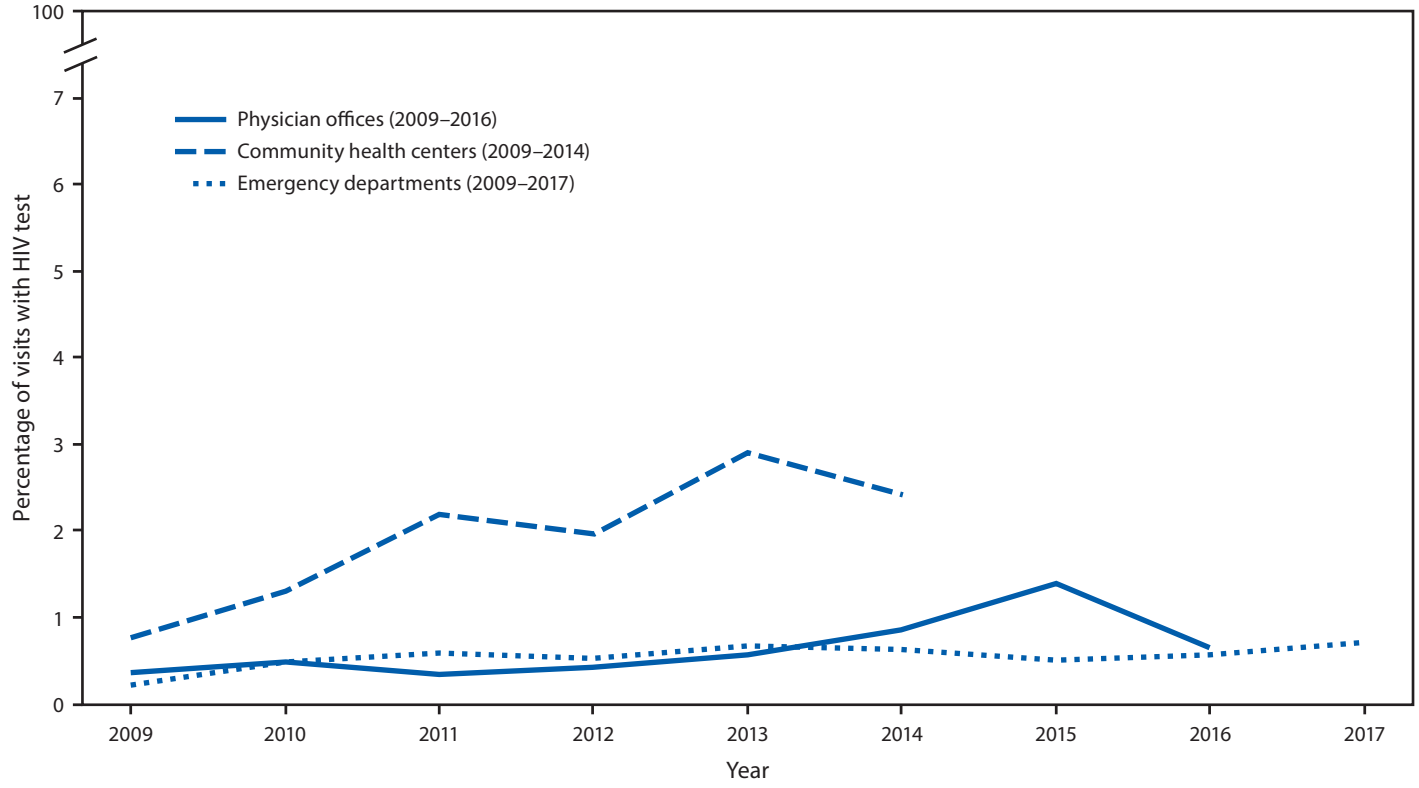
offices during 2009–2016 (p = 0.0534), increased markedly in CHCs from 0.76% in 2009 to 2.41% in 2014 (p<0.001), and increased slightly in EDs from 0.22% in 2009 to 0.72% in 2017 (p = 0.0378) (Figure 1). In 2015, the estimate of HIV testing at visits to physician offices had a relative standard error that was too large to produce a reliable estimate. However, this point was included in the statistical analysis of the time trend for HIV testing at visits to physician offices. HIV testing occurred at a significantly higher percentage of preventive visits to physician offices and CHCs, compared with other visit types (Figure 2). HIV testing also occurred at a significantly higher percentage of visits where venipuncture was performed in physician offices, CHCs, and EDs, compared with visits without venipuncture. HIV testing among persons with private insurance increased at visits to CHCs from 1.55% during 2009–2012 to 2.67% during 2013–2014 (p = 0.0482); among those with Medicaid, testing increased at physician office visits from 0.39% during 2009–2012 to 0.84% during 2013–2014 and to 1.35% during 2015–2016 (p = 0.0352), and at CHC visits from 1.86% during 2009–2012 to 3.05% during 2013–2014 (p = 0.0287). HIV testing did not increase among persons with private insurance at physician office visits or among persons with either private insurance or Medicaid at ED visits.

Discussion

Although several hundred million visits were made annually to physician offices, CHCs, and EDs by persons aged 13–64 years during 2009–2017, HIV testing occurred at <1% of visits to physician offices and <3% of visits to CHCs. Overall, HIV testing increased in CHCs, a venue that serves populations with some of the highest rates of undiagnosed HIV infection. The higher percentage of visits that included HIV testing in CHCs might be attributed to the Health Resource and Services Administration's (HRSA) efforts to increase HIV testing in primary care settings.[**,††] HRSA has collected data on HIV testing since 1999 and has included these data as a quality measure in the Universal Data System reporting requirements for federally qualified health centers and

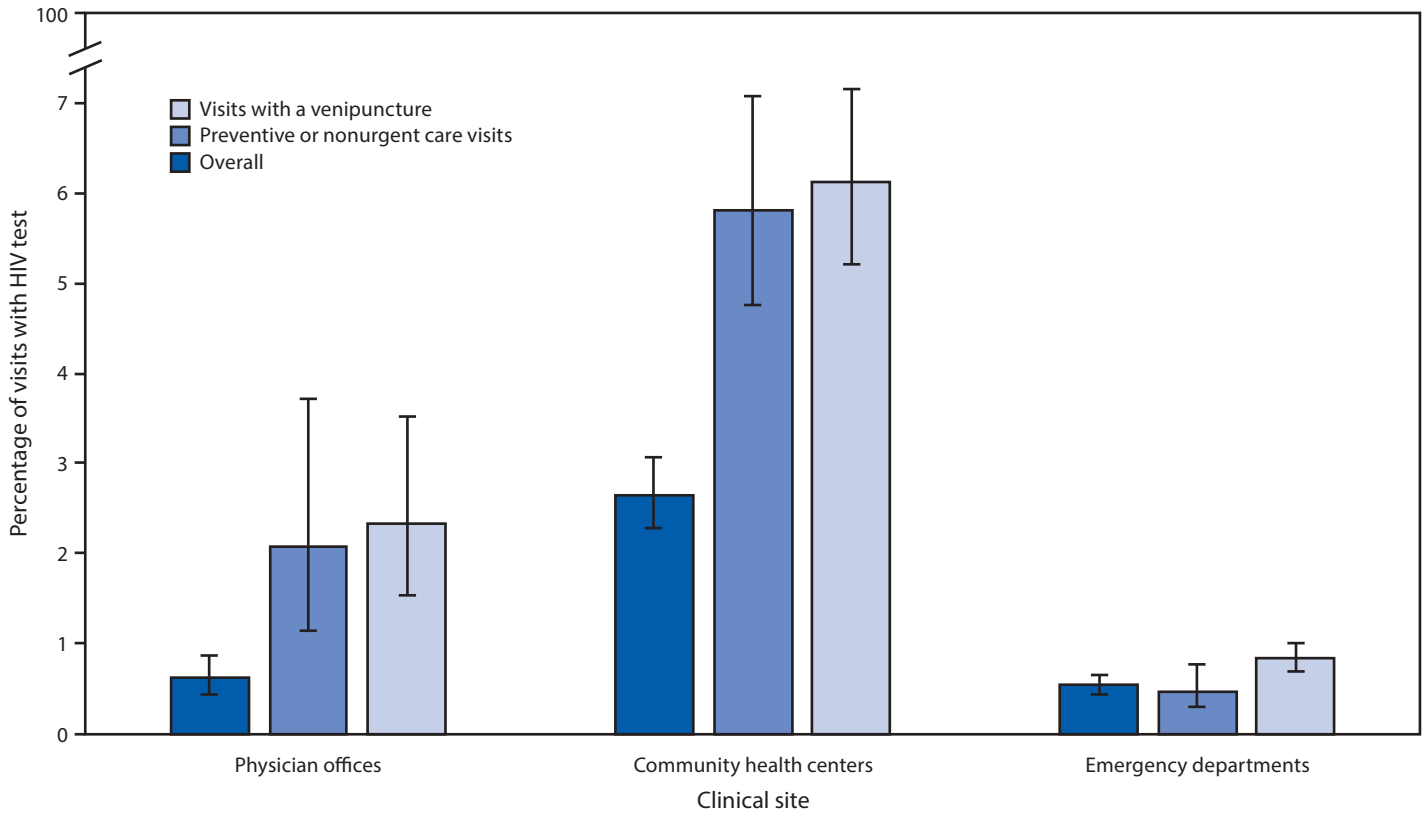
** https://bphc.hrsa.gov/qualityimprovement/clinicalquality/hiv-aids/pal201013.html.
†† https://bphc.hrsa.gov/qualityimprovement/clinicalquality/hiv-aids/pal201309.html.

FIGURE 1. Human immunodeficiency virus (HIV) testing at visits made by males and nonpregnant females to physician offices,* community health centers, and emergency departments — United States, 2009–2017



* The estimate for HIV testing at visits made to physician offices in 2015 was not statistically stable. The trend for HIV testing in community health centers includes only physicians.

FIGURE 2. Human immunodeficiency virus (HIV) testing performed at visits made by males and nonpregnant females to physician offices, community health centers, and emergency departments, by type of visit* and whether venipuncture was performed at the visit — United States, 2009–2017



* HIV testing was estimated for preventive visits made to physician offices and community health centers, and for nonurgent care visits made to emergency departments. Percentages shown with 95% confidence intervals.

look-alike health centers (community-based health centers that meet the requirements of the HRSA Health Center Program, but do not receive Health Center Program funding[§§]) since 2014.[¶¶] Some CHCs have also implemented clinical decision support algorithms for increasing HIV testing (*5*,*6*).

HIV testing did not increase in physician offices during 2014–2016, despite elimination of patient cost-sharing, possibly because testing barriers unrelated to cost have not been addressed (e.g., dependence on busy providers to order HIV tests). In this study, an HIV test was performed more often at visits for preventive care. Preventive visits provide an ideal opportunity for HIV risk assessment to identify persons who require annual or more frequent testing and PrEP. An HIV test was also performed more often at visits with venipuncture, a convenient opportunity for including an HIV test when blood is drawn for other tests. Young black and Hispanic males and persons who inject drugs and who are at increased risk for acquisition of HIV might not have frequent preventive visits but do have health care visits for other reasons (*7*). Other types of visits can provide an opportunity for an HIV test, and these opportunities for testing persons in populations with the highest risk for acquiring HIV should not be missed. A modeling study estimated that a threefold increase in HIV testing rates at ambulatory care visits by black and Hispanic men aged 18–39 years would result in near-universal test coverage by age 39 years (*8*). HIV testing is easily performed with a simple blood test. Clinical decision supports can be developed that use information in EHRs to order an HIV test for patients who need one (*9*) and standing orders can increase routine opt-out testing (*10*), thereby reducing clinical barriers to HIV testing and increasing it at ambulatory care visits.

The findings in this report are subject to at least four limitations. First, this study cannot estimate the number of persons tested each year, because the sampling unit was a visit rather than a person; some persons might have had an HIV test at more than one visit. Second, smaller sample sizes of NAMCS and NHAMCS in recent years prevented analyses by patient

[§§] https://www.hrsa.gov/opa/eligibility-and-registration/health-centers/fqhc-look-alikes/index.html.
[¶¶] https://bphc.hrsa.gov/datareporting/reporting/index.html.

Summary

What is already known about this topic?

CDC has recommended routine opt-out human immunodeficiency virus (HIV) testing since 2006, but the percentage of ambulatory care visits at which an HIV test is performed has remained low.

What is added by this report?

The percentage of visits with HIV testing increased in community health centers from 0.76% in 2009 to 2.41% in 2014 and in emergency departments from 0.22% in 2009 to 0.72% in 2017 but did not increase in physician offices during 2009–2016. HIV testing was performed at a higher percentage of visits for preventive care and visits with venipuncture.

What are the implications for public health practice?

To help end the HIV epidemic, health care systems can develop and implement clinical decision supports and training and accountability measures to increase HIV testing at ambulatory care visits especially in communities with high rates of HIV diagnoses.

and visit characteristics. Third, changes to the NAMCS and CHC sampling designs during the period of the study might have resulted in an underestimate or overestimate of HIV testing rates. Finally, recent data were not available, particularly CHC data that were only available through 2014; therefore, HIV testing in more recent years cannot be monitored for this important clinical venue.

Increasing HIV testing is a critical strategy for achieving the goals of the EHE initiative, and ambulatory health care encounters provide opportunities for increasing HIV testing that should not be missed. Jurisdictions participating in the first phase of the EHE initiative have the highest numbers of new HIV diagnoses and should be a focus of interventions to increase HIV testing. All persons should be routinely tested at least once during their lifetime and annually or more often if they are at increased risk for HIV infection because of sexual behavior or injection drug use, to identify those with HIV infection and link them to care, and to increase occasions for PrEP education and initiation. To end the HIV epidemic, testing of patients seeking care in ambulatory health care settings should be leveraged to increase the percentage of diagnosed infections and reduce HIV transmission.

Corresponding author: Karen W. Hoover, khoover@cdc.gov, 404-639-8534.

[1]Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC; [2]Bureau of Primary Health Care, Health Resources & Services Administration, Rockville, Maryland.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Fauci AS, Redfield RR, Sigounas G, Weahkee MD, Giroir BP. Ending the HIV epidemic: a plan for the United States. JAMA 2019;321:844–5. https://doi.org/10.1001/jama.2019.1343
2. Ham DC, Lecher S, Gvetadze R, Huang YA, Peters P, Hoover KW. HIV testing at visits to physicians' offices in the U.S., 2009–2012. Am J Prev Med 2017;53:634–45 10.1016/j.amepre.2017.08.006. https://doi.org/10.1016/j.amepre.2017.08.006
3. Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in healthcare settings. MMWR Recomm Rep 2006;55(No. RR-14).
4. Harris NS, Johnson AS, Huang YA, et al. Vital signs: status of human immunodeficiency virus testing, viral suppression, and HIV preexposure prophylaxis—United States, 2013–2018. MMWR Morb Mortal Wkly Rep 2019;68:1117–23. https://doi.org/10.15585/mmwr.mm6848e1
5. Crumby NS, Arrezola E, Brown EH, Brazzeal A, Sanchez TH. Experiences implementing a routine HIV screening program in two federally qualified health centers in the southern United States. Public Health Rep 2016;131(Suppl 1):21–9. https://doi.org/10.1177/00333549161310S104
6. Nunn A, Towey C, Chan PA, et al. Routine HIV screening in an urban community health center: results from a geographically focused implementation science program. Public Health Rep 2016;131(Suppl 1):30–40. https://doi.org/10.1177/00333549161310S105
7. Terlizzi EP, Connor EM, Zelaya CE, Ji AM, Bakos AD. Reported importance and access to health care providers who understand or share cultural characteristics with their patients among adults, by race and ethnicity. Natl Health Stat Report 2019;130:1–12.
8. Hoover KW, Rose CE, Peters PJ, editors. Estimating benchmarks for HIV testing at visits to U.S. ambulatory healthcare settings by men [Abstract 967]. Presented at the Conference on Retroviruses and Opportunistic Infections, Boston MA; February 22–25, 2016. https://www.croiconference.org/sessions/setting-benchmark-hiv-testing-visits-us-physician-offices
9. Rodriguez V, Lester D, Connelly-Flores A, Barsanti FA, Hernandez P. Integrating routine HIV screening in the New York City Community Health Center Collaborative. Public Health Rep 2016;131(Suppl 1):11–20. https://doi.org/10.1177/00333549161310S103
10. Arya M, Marren RE, Marek HG, Pasalar S, Hemmige V, Giordano TP. Success of supplementing national HIV testing recommendations with a local initiative in a large health care system in the U.S. South. J Acquir Immune Defic Syndr 2020;83:e6–9. https://doi.org/10.1097/QAI.0000000000002222

Outbreaks Associated with Untreated Recreational Water — California, Maine, and Minnesota, 2018–2019

Kayla L. Vanden Esschert, MPH[1,2]; Mia C. Mattioli, PhD[1]; Elizabeth D. Hilborn, DVM[3]; Virginia A. Roberts, MSPH[1]; Alexander T. Yu, MD[4]; Katherine Lamba, MPH[4]; Gena Arzaga, MPH[5]; Matthew Zahn, MD[5]; Zachary Marsh, MPH[1]; Stephen M. Combes, MS, MPH[6,7]; Emer S. Smith, MPH[6,7]; Trisha J. Robinson, MPH[8]; Stephanie R. Gretsch, MPH[8]; Joseph P. Laco, MSEH[9]; Mary E. Wikswo, MPH[10]; Allison D. Miller, MPH[1,11]; Danielle M. Tack, DVM[1]; Timothy J. Wade, PhD[3]; Michele C. Hlavsa, MPH[1]

Outbreaks associated with fresh or marine (i.e., untreated) recreational water can be caused by pathogens or chemicals, including toxins. Voluntary reporting of these outbreaks to CDC's National Outbreak Reporting System (NORS) began in 2009. NORS data for 2009–2017 are finalized, and data for 2018–2019 are provisional. During 2009–2019 (as of May 13, 2020), public health officials from 31 states voluntarily reported 119 untreated recreational water–associated outbreaks, resulting at least 5,240 cases; 103 of the outbreaks (87%) started during June–August. Among the 119 outbreaks, 88 (74%) had confirmed etiologies. The leading etiologies were enteric pathogens: norovirus (19 [22%] outbreaks; 1,858 cases); Shiga toxin–producing *Escherichia coli* (STEC) (19 [22%]; 240), *Cryptosporidium* (17 [19%]; 237), and *Shigella* (14 [16%]; 713). This report highlights three examples of outbreaks that occurred during 2018–2019, were caused by leading etiologies (*Shigella*, norovirus, or STEC), and demonstrate the wide geographic distribution of such outbreaks across the United States. Detection and investigation of untreated recreational water–associated outbreaks are challenging, and the sources of these outbreaks often are not identified. Tools for controlling and preventing transmission of enteric pathogens through untreated recreational water include epidemiologic investigations, regular monitoring of water quality (i.e., testing for fecal indicator bacteria), microbial source tracking, and health policy and communications (e.g., observing beach closure signs and not swimming while ill with diarrhea).

California

On July 22, 2019, the California Department of Public Health was notified of three cases of shigellosis in persons who reported playing in the Santa Ana River, a waterway spanning 100 miles through southern California. The department identified this exposure in other shigellosis cases and, in total, identified 24 cases with closely related isolates (within 0–2 alleles by core-genome multilocus sequence typing) of *Shigella sonnei*. Among 19 ill persons for whom epidemiologic data were available, 16 reported that during July 6–August 5 they played in a swim area in a shallow portion of the river where water quality was not regularly monitored. Two of the 16 ill persons also reported swallowing river water. No other common risk factors were identified. The median age of these 16 ill persons was 7 years (range = 1–20 years); seven were female. Two of 15 ill persons for whom clinical data were available were hospitalized; none died. Date of symptom onset ranged from July 6 through August 7. In response to the outbreak, local public health officials closed public access to the swim area during August 8–15. Surface water samples were collected upstream, downstream, and at the swim area and tested for *E. coli,* a bacterial indicator of fecal contamination. The concentration of *E. coli* ranged from 350 through 1,600 most probable number/100 mL at these sites.* Investigation into possible sources of fecal contamination upstream and at the swim area did not definitively identify an outbreak source. No additional cases were identified after public access to the swim area was reopened on August 15.

Maine

On July 6, 2018, the Maine Center for Disease Control and Prevention received a report that multiple persons were ill with gastrointestinal symptoms after visiting Woods Pond Beach in Bridgton, Maine. Town officials in Bridgton closed the public beach during July 6–10. The agency used social media to identify persons who visited the pond during July 1–6, interviewed 34 heads of household, and completed surveys for 148 household members. A total of 139 persons reported visiting the pond during this period, 97 (70%) of whom reported illness. Among these 97 ill persons, 41 (42%) were male; among the 95 ill persons for whom age data were available, the median age was 12 years (range = 1–73 years). The median incubation period was 38 hours (range = 8–139 hours); the median symptom duration, reported for 91 cases, was 24 hours (range = 3–96 hours). Vomiting was reported by 78 (80%) of 97 ill persons. Visitors who reported swallowing pond water or going under water (a potential marker for swallowing water) were approximately three times more likely to be ill than were those who did not (relative risk = 3.19; 95% confidence interval [CI] = 1.69–6.05). Two of the stool specimens collected from

* Most probable number is a method used to estimate the concentration of viable bacteria in water. All samples exceeded the Environmental Protection Agency (EPA)–recommended Beach Action Values of 190–235 colony forming units (CFU)/100mL for freshwater. Beach Action Values are EPA's suggested "do not exceed" value for beach advisory purposes.

four ill persons tested positive for norovirus genogroup I. Based on these test results and the reported symptomology, norovirus was thought to be the outbreak etiology. The source of water contamination was undetermined. No additional cases were reported after the beach reopened to swimmers on July 11.

Minnesota

On August 13, 2019, Minnesota Department of Health (MDH) epidemiologists identified three cases of STEC infection in persons who reported swimming at a public lake. Illness onset occurred during August 2–4. MDH notified park and recreation board officials of the cases on August 13 and advised them to close the lake to swimmers. MDH used social media to distribute a survey and identified 69 total cases, including four laboratory-confirmed STEC O145:H28 infections with closely related isolates (within 0–2 single nucleotide polymorphisms by whole genome sequencing). Dates of symptom onset ranged from July 18 through August 16. The median age of ill persons was 29 years (range = 1–65 years); 55 (80%) were female. Among the 24 (35%) ill persons who visited the beach only once, exposure dates ranged from July 16 through August 11. The two factors significantly associated with illness were swallowing lake water (odds ratio = 3.80; 95% CI = 1.17–12.38) and age ≤10 years (odds ratio = 2.90; 95% CI = 1.57–5.35). No hospitalizations or cases of hemolytic uremic syndrome were reported. The beach was monitored weekly for *E. coli* throughout the summer, but no test results exceeded Minnesota's recreational water criteria during April–October.† No evidence of a point source of fecal contamination was identified; however, 15 visitors and four lifeguards reported continuing to swim or work in the lake while ill. No additional cases were reported after the beach reopened to swimmers on September 5.

Discussion

Shigella, norovirus, STEC, and other enteric pathogens can be transmitted when persons ingest untreated recreational water contaminated with feces or vomit. Swimmers can contaminate water in untreated recreational water venues (e.g., lakes, oceans, and rivers) if they have a fecal or vomit incident in the water. Enteric pathogens can also be introduced into untreated recreational water venues by stormwater runoff and sewage system overflows and discharges. Other potential sources of fecal contamination and enteric pathogens include leaks from septic or municipal wastewater systems, dumped boating waste, and animal waste in or near swim areas.

Whereas the detection of *Shigella* and norovirus in untreated recreational water is indicative of human contamination, the detection of STEC does not necessarily indicate human contamination. Because *E. coli* and enterococci are part of the normal intestinal flora of humans and other animals, beach managers monitor levels of these bacteria as indicators of fecal contamination as recommended by the Environmental Protection Agency's 2012 recreational water quality criteria (*1*). Monitoring is conducted to detect changes in fecal contamination of water and not to indicate the presence of pathogens (*2–4*). For this reason, fecal indicator data alone cannot implicate the water as the route of outbreak exposure or identify the source of water contamination. This is particularly problematic for certain pathogenic strains of *E. coli*, such as *E. coli* O157:H7, which can persist in the sediment and be resuspended in the water but is not detected by most generic *E. coli* water tests.

In the outbreaks described in this report, the sources of contamination of the recreational waters were not definitively identified. Molecularly based microbial source tracking methods can be used to identify the host genus contributing to fecal contamination detected in water, which can inform more targeted environmental investigations and control measures (*5*). For example, identifying the host genus (e.g., horses) can help inform and optimize efforts to mitigate exposure (e.g., redesigning horse trails near untreated recreational water venues) to prevent outbreaks. Investigations into environmental influences include, but are not limited to, sanitary inspection of septic systems, identification of agricultural animal waste runoff or discharge, monitoring of wildlife activity in public areas, and identification of improper disposal of solid waste.

Multiple factors could hinder detection and investigation of outbreaks associated with untreated recreational water venues. First, persons often travel >100 miles to swim in lakes, oceans, and rivers (*6*). If swimmers become ill after returning to homes in multiple public health jurisdictions, identifying an outbreak can be difficult. Second, not all jurisdictions include questions about exposure to recreational water in their investigations of cases of illness caused by enteric pathogens. Third, issues with response activities (e.g., collection of water samples and decision-making about closures) might arise among agencies within the same jurisdiction (e.g., public health and natural resources agencies) or among jurisdictions if the outbreak source (i.e., untreated recreational water venue) is in multiple jurisdictions.

In addition to monitoring the level of fecal indicator bacteria at beaches, beach managers can promote healthy swimming by establishing policies that allow lifeguards to perform alternate duties that do not require them to enter the water if they are ill with diarrhea. This is equivalent to CDC recommendations for operators of public treated recreational water venues (e.g.,

† Minnesota recreational water criteria for freshwater call for a monthly geometric mean concentration of <126 CFU *E. coli*/100 mL water. For culturable *E. coli*, EPA criteria are a geometric mean concentration of 126 CFU/100mL and statistical threshold value of 410 CFU/100mL in freshwater.

Summary

What is already known about this topic?

Untreated recreational water–associated outbreaks can be caused by pathogens or chemicals, including toxins, in freshwater (e.g., lakes) or marine water (e.g., oceans).

What is added by this report?

This report highlights examples of untreated recreational water–associated outbreaks that occurred during 2018 or 2019, were caused by *Shigella* (California), norovirus (Maine), or Shiga toxin–producing *Escherichia coli* (Minnesota), the leading causes of such outbreaks, and demonstrate the wide geographic distribution of such outbreaks.

What are the implications for public health practice?

Swimmers should observe beach closure signs and water quality advisories, not swim in water made cloudier by heavy rain, not swim while ill with diarrhea, not swallow recreational water, and keep sand out of their mouths.

swimming pools)[§] (*7*). Creating a workplace environment where employees feel comfortable disclosing that they are ill with diarrhea without fearing potential loss of wages or even work is important to the success of such policies. Because of the multiple potential sources of fecal contamination, beach managers and public health officials should educate swimmers and parents of young swimmers about steps they can take to minimize risk of infection from enteric pathogens (https://www.cdc.gov/healthywater/swimming/oceans-lakes-rivers/visiting-oceans-lakes-rivers.html). These healthy swimming steps include observing beach closure signs or water quality advisories because of elevated levels of fecal indicator bacteria, not swimming in water made cloudier by heavy rain, not swimming while ill with diarrhea, not swallowing the water;,and keeping sand out of mouths. In addition, for the 2020 summer swim season, CDC has released coronavirus disease 2019 (COVID-19) prevention considerations for beach managers (https://www.cdc.gov/coronavirus/2019-ncov/community/parks-rec/public-beaches.html).

[§] CDC's 2018 Model Aquatic Health Code (https://www.cdc.gov/mahc/pdf/2018-MAHC-Code-Clean-508.pdf) element 6.3.4.7.1 states "Supervisors shall not permit employees who are ill with diarrhea to enter the water or perform in a qualified lifeguard role."

Acknowledgments

State and local health department waterborne disease coordinators, epidemiologists, microbiologists, and environmental health practitioners; Sarah A. Collier, Marissa K. Vigar, Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC.

Corresponding author: Michele C. Hlavsa, MHlavsa@cdc.gov, 404-718-4695.

[1]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee; [3]Environmental Protection Agency; Research Triangle Park, North Carolina; [4]California Department of Public Health; [5]Orange County Health Care Agency, Santa Ana, California; [6]Maine Center for Disease Control and Prevention; [7]University of Southern Maine, Portland, Maine; [8]Minnesota Department of Health; [9]Division of Environmental Health Science and Practice, National Center for Environmental Health, CDC; [10]Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC; [11]Eagle Medical Services, LLC, Atlanta, Georgia.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Environmental Protection Agency. Office of Water report 820-F-12–058: 2012 recreational water quality. Atlanta, GA: Environmental Protection Agency, Office of Water; 2012. https://www.epa.gov/sites/production/files/2015-10/documents/rwqc2012.pdf
2. Worley-Morse T, Mann M, Khunjar W, Olabode L, Gonzalez R. Evaluating the fate of bacterial indicators, viral indicators, and viruses in water resource recovery facilities. Water Environ Res 2019;91:830–42. https://doi.org/10.1002/wer.1096
3. Rose JB, Darbin H, Gerba CP. Correlations of the protozoa, *Cryptosporidium* and *Giardia*, with water quality variables in a watershed. Water Sci Technol 1988;20:271–6. https://doi.org/10.2166/wst.1988.0295
4. Korajkic A, McMinn BR, Harwood VJ. Relationships between microbial indicators and pathogens in recreational water wettings. Int J Environ Res Public Health 2018;15:2842. https://doi.org/10.3390/ijerph15122842
5. Harwood VJ, Staley C, Badgley BD, Borges K, Korajkic A. Microbial source tracking markers for detection of fecal contamination in environmental waters: relationships between pathogens and human health outcomes. FEMS Microbiol Rev 2014;38:1–40. https://doi.org/10.1111/1574-6976.12031
6. Collier SA, Wade TJ, Sams EA, Hlavsa MC, Dufour AP, Beach MJ. Swimming in the USA: beachgoer characteristics and health outcomes at US marine and freshwater beaches. J Water Health 2015;13:531–43. https://doi.org/10.2166/wh.2014.095
7. Cope JR, Prosser A, Nowicki S, et al. Preventing community-wide transmission of *Cryptosporidium*: a proactive public health response to a swimming pool–associated outbreak—Auglaize County, Ohio, USA. Epidemiol Infect 2015;143:3459–67. https://doi.org/10.1017/S0950268815000813

Progress Toward Polio Eradication — Worldwide, January 2018–March 2020

Anna N. Chard, PhD[1,2]; S. Deblina Datta, MD[2]; Graham Tallis, MBBS[3]; Cara C. Burns, PhD[4]; Steven G.F. Wassilak, MD[2]; John F. Vertefeuille, PhD[2]; Michel Zaffran, MEng[3]

Since the Global Polio Eradication Initiative (GPEI) was established in 1988, two of the three wild poliovirus (WPV) serotypes (types 2 and 3) have been eradicated.* Transmission of WPV type 1 (WPV1) remains uninterrupted only in Afghanistan and Pakistan. This report summarizes progress toward global polio eradication during January 1, 2018–March 31, 2020 and updates previous reports (*1*,*2*). In 2019, Afghanistan and Pakistan reported the highest number of WPV1 cases (176) since 2014. During January 1–March 31, 2020 (as of June 19), 54 WPV1 cases were reported, an approximate fourfold increase from 12 cases during the corresponding period in 2019. Paralytic poliomyelitis can also be caused by circulating vaccine-derived poliovirus (cVDPV), which emerges when attenuated oral poliovirus vaccine (OPV) virus reverts to neurovirulence following prolonged circulation in underimmunized populations (*3*). Since the global withdrawal of type 2-containing OPV (OPV2) in April 2016, cVDPV type 2 (cVDPV2) outbreaks have increased in number and geographic extent (*4*). During January 2018–March 2020, 21 countries reported 547 cVDPV2 cases. Complicating increased poliovirus transmission during 2020, the coronavirus disease 2019 (COVID-19) pandemic and mitigation efforts have resulted in suspension of immunization activities and disruptions to poliovirus surveillance. When the COVID-19 emergency subsides, enhanced support will be needed to resume polio eradication field activities.

Poliovirus Vaccination

Since May 2016, after trivalent OPV (tOPV, containing types 1, 2, and 3 Sabin strains) was withdrawn from use, only bivalent OPV (bOPV; containing types 1 and 3 Sabin strains) and injectable inactivated poliovirus vaccine (IPV, containing antigens for all three serotypes) have been used in routine immunization programs worldwide. In 2018,† estimated global coverage with at least 3 doses of poliovirus vaccine (Pol3) among infants aged <1 year received through routine immunization services was 89%, and with at least the recommended one full dose or two fractional doses of IPV (IPV1) was 72%. Regional, national, and subnational coverage estimates varied widely. In 2018, estimated national Pol3 coverage in Afghanistan was 73%, and IPV1 coverage was 66%; coverage in Pakistan was 75% for both Pol3 and IPV1 (*5*).

In 2018, approximately 1.2 billion bOPV, 32 million IPV, and 16 million monovalent OPV type 1 (mOPV1) doses were administered in 35 countries during 105 supplementary immunization activities (SIAs)§ supported by GPEI. In 2019, approximately 1 billion bOPV, 17 million IPV, and 36 million mOPV1 doses were administered in 34 countries during 90 SIAs. Since the global withdrawal of OPV2, the World Health Organization (WHO) Director-General must authorize release of monovalent OPV type 2 (mOPV2) for use in countries experiencing cVDPV2 outbreaks; in 2018, 100 million mOPV2 doses were used for outbreak response, 190 million in 2019, and 60 million in 2020 to date.

Poliovirus Surveillance

WPV and cVDPV transmission is primarily detected by surveillance for acute flaccid paralysis (AFP) among children aged <15 years and confirmed by stool specimen testing in WHO-accredited laboratories within the Global Polio Laboratory Network. AFP surveillance performance indicators¶ for 40 countries during 2018–2019 have recently been reported (*6*). Among the 22 countries reporting WPV or cVDPV cases in 2018 and 2019, 11 (Afghanistan, Benin, Burkina Faso, Burma [Myanmar],** Chad, Ethiopia, Ghana, Nigeria, Pakistan, Somalia, and Zambia) met threshold criteria for the two main indicators for adequate AFP surveillance nationally during both years; five countries (Central African Republic [CAR], the Democratic Republic of the Congo [DRC], Malaysia, Papua New Guinea, and the Philippines) did not meet criteria for adequate surveillance either year; and five countries (Angola, Indonesia, Mozambique, Niger, and Togo) met criteria for both surveillance indicators in 2018, but not in 2019. Indicators vary substantially at subnational levels; national level indicators often obscure subnational underperformance (*7*). Many countries with and without

*https://www.who.int/news-room/feature-stories/detail/two-out-of-three-wild-poliovirus-strains-eradicated.

† 2018 is the most recent year for which data are available.

§ SIAs are mass immunization campaigns intended to interrupt poliovirus circulation by immunizing every child aged <5 years with 2 OPV doses, regardless of previous immunization status.

¶ The two main indicators of adequate AFP surveillance are 1) an annual nonpolio AFP detection rate of ≥1 case per 100,000 population aged <15 years for countries in WHO regions certified as polio-free, or ≥2 cases per 100,000 population aged <15 years in all other countries and 2) collection of adequate stool specimens (two stool specimens collected >24 hours apart, within 14 days of paralysis onset, with arrival at the laboratory in good condition [cool and without leakage or desiccation]) from ≥80% of reported AFP cases.

** For this country, *MMWR* uses the U.S. State Department short-form name "Burma"; WHO uses "Myanmar."

recent poliovirus transmission supplement AFP surveillance with environmental surveillance (the testing of sewage for poliovirus), that allows more rapid and sensitive detection of poliovirus circulation where implemented. Persistent gaps in quality poliovirus surveillance are evident when genomic sequencing of isolates identifies polioviruses after long periods of undetected circulation. Continued strengthening of surveillance systems is necessary to confirm absence of poliovirus transmission.

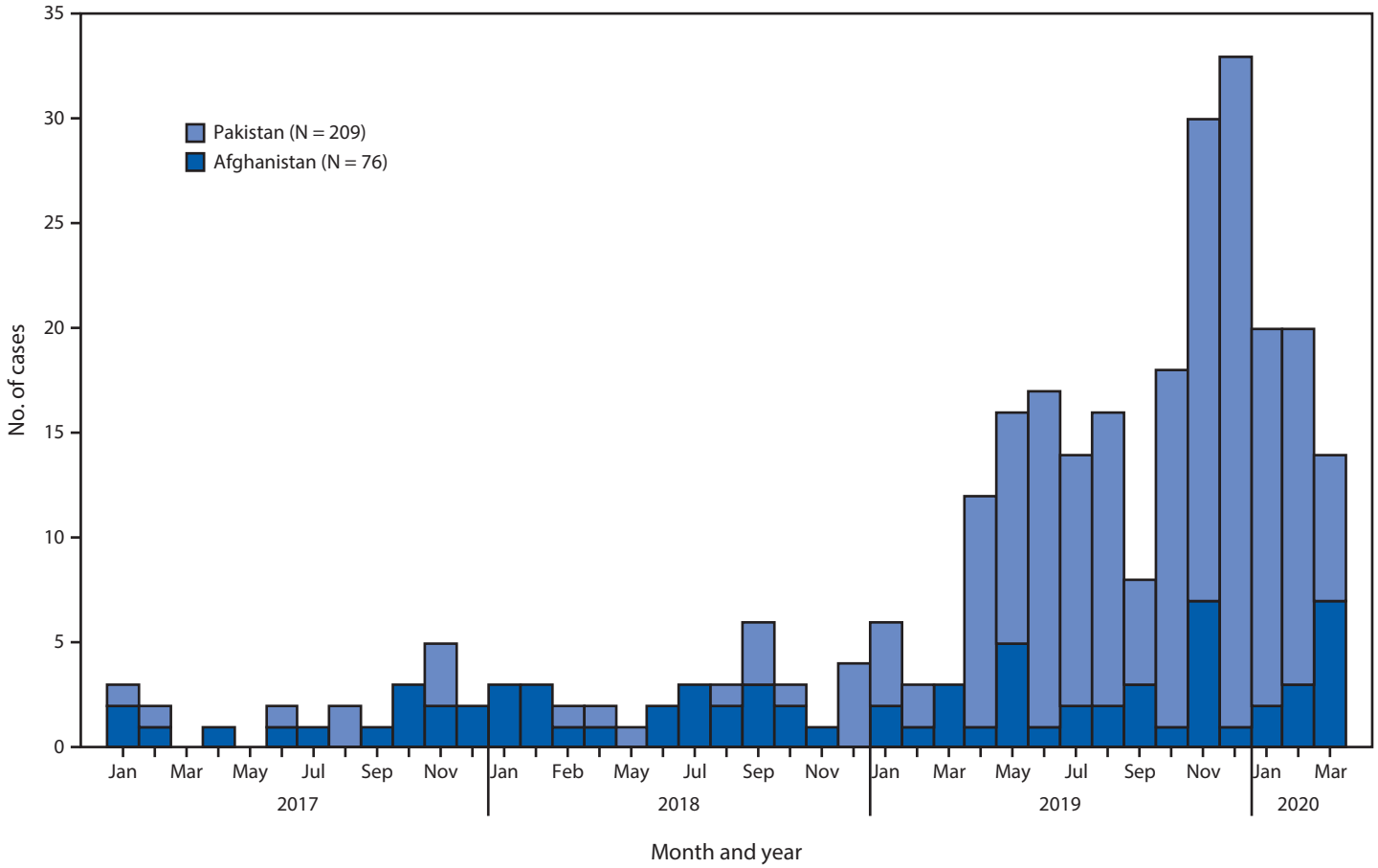
Reported Poliovirus Cases and Isolations

Countries reporting WPV cases and isolations. No WPV cases have been identified outside of Afghanistan, Nigeria, and Pakistan since 2015; the most recent reported onset of a WPV1 case in Nigeria was in September 2016. In 2018, 33 WPV1 cases were reported worldwide: 21 (64%) in Afghanistan and 12 (36%) in Pakistan (Figure) (Table 1).

Among 176 WPV1 cases reported during 2019, 29 (16%) were reported by Afghanistan, representing a 38% increase over the 21 cases reported in 2018. Cases were reported from 20 districts, a 43% increase from the 14 districts reporting cases during 2018. Among 54 WPV1 cases detected during January–March 2020, 12 (22%) cases were detected in 11 districts of 10 provinces in Afghanistan, compared with six cases reported in six districts of three provinces during the same period in 2019. In Afghanistan, WPV1 was detected in 83 (25%) of 336 sewage samples collected from 15 of 20 (75%) sites at regular intervals in 2018 and 56 (22%) of 259 samples from 12 of 21 (57%) sites in 2019 (Table 2).

Pakistan reported 147 (84%) of the 176 WPV1 cases in 2019, an elevenfold increase over the 12 cases reported in 2018; cases were reported in 43 districts, a sixfold increase over the six districts with confirmed cases in 2018. During January–March 2020, 42 (78%) WPV1 cases were detected in four provinces (Balochistan, Khyber Pakhtunkhwa, Punjab, and Sindh), a sixfold increase over the six cases in three provinces (Khyber Pakhtunkhwa, Punjab, and Sindh) reported during the corresponding period in 2019. In Pakistan, WPV1 was detected in 139 (20%) of 689 environmental surveillance samples from 37 of 58 (64%) sites in 2018 and 371 (47%) of 786 samples from 56 of 60 (93%) sites in 2019 (Table 2).

FIGURE. Number of cases of wild poliovirus, by country and month of onset — worldwide, January 2017–March 2020*



* Data are as of June 19, 2020.

WPV1 of Pakistan origin was detected in three environmental surveillance samples in Iran in early 2019.

Countries reporting cVDPV cases and isolations. During January 2018–March 2020, cVDPV transmission was confirmed in 26 countries. Five countries (Burma [Myanmar], Indonesia, Malaysia, Papua New Guinea, and the Philippines) reported four cVDPV type 1 emergences, with isolates from 39 AFP cases and 40 environmental surveillance samples. Twenty-three countries (Afghanistan, Angola, Benin, Burkina Faso, Cameroon, CAR, Chad, China, Côte d'Ivoire, DRC, Ethiopia, Ghana, Kenya, Malaysia, Mali, Mozambique, Niger, Nigeria, Pakistan, Philippines, Somalia, Togo, and Zambia) reported 49 cVDPV2 emergences, with isolates from 547 AFP cases in 21 countries and 354 environmental surveillance samples in 15 countries. Among these, the JIS-1 Nigeria emergence has spread to nine countries (*3*,*4*,*6*). Emergence of cVDPV type 3 was detected in Somalia during 2018–2019, involving isolates from seven AFP cases[††] and 11 environmental surveillance samples.

[††] One AFP case detected in Somalia was coinfected with cVDPV type 2 and type 3.

Discussion

WPV type 2 was certified as eradicated in 2015, and in October 2019, eradication of indigenous WPV type 3, last detected in 2012, was certified. Nigeria, the only country in the WHO African Region with indigenous WPV1 transmission after 2004, has had no evidence of circulation since September 2016; immunization coverage and surveillance in security-compromised northeast Nigeria have continued to improve. With no evidence of any WPV transmission since September 2016, the African Region meets the 3-year threshold without WPV detection required for certification and is eligible to be certified polio-free in 2020.[§§]

During January 2018–March 2020, however, transmission of both WPV1 and cVDPV2 markedly increased. Despite 4 years (2014–2017) of declines in reported WPV1 cases in Afghanistan and Pakistan, the high proportion of environmental surveillance samples with isolation of WPV1 during that time indicated persistent transmission in the historic polio

[§§] https://www.who.int/bulletin/volumes/82/1/24-30.pdf?ua=1.

TABLE 1. Number of poliovirus cases, by country — worldwide, January 1, 2018–March 31, 2020*

	Reporting period							
	2018		2019		Jan–Mar 2019		Jan–Mar 2020	
Country	WPV1	cVDPV	WPV1	cVDPV	WPV1	cVDPV	WPV1	cVDPV
Countries with endemic WPV1 transmission								
Afghanistan	21	0	29	0	6	0	12	2
Nigeria	0	34	0	18	0	8	0	1
Pakistan	12	0	147	22	6	0	42	44
Countries with reported cVDPV cases								
Angola	0	0	0	130	0	0	0	2
Benin	0	0	0	8	0	0	0	1
Burkina Faso	0	0	0	1	0	0	0	4
Burma (Myanmar)[†]	0	0	0	6	0	0	0	0
Cameroon	0	0	0	0	0	0	0	3
Central African Republic	0	0	0	21	0	0	0	1
Chad	0	0	0	10	0	0	0	13
China	0	0	0	1	0	0	0	0
Côte d'Ivoire	0	0	0	0	0	0	0	5
Democratic Republic of the Congo	0	20	0	88	0	2	0	5
Ethiopia	0	0	0	13	0	0	0	14
Ghana	0	0	0	18	0	0	0	11
Indonesia	0	1	0	0	0	0	0	0
Malaysia	0	0	0	3	0	0	0	1
Mali	0	0	0	0	0	0	0	1
Mozambique	0	1	0	0	0	0	0	0
Niger	0	10	0	1	0	0	0	4
Papua New Guinea	0	26	0	0	0	0	0	0
Philippines	0	0	0	15	0	0	0	1
Somalia	0	12[§]	0	3	0	1	0	0
Togo	0	0	0	8	0	0	0	7
Zambia	0	0	0	2	0	0	0	0

Abbreviations: cVDPV = circulating vaccine derived poliovirus; WPV1 = wild poliovirus type 1.
* Data are as of June 19, 2020.
† For this country, *MMWR* uses the U.S. State Department short-form name "Burma"; the World Health Organization uses "Myanmar."
§ One patient was coinfected with type 2 and type 3 cVDPV polioviruses.

TABLE 2. Number of circulating wild polioviruses (WPV) and circulating vaccine derived polioviruses (cVDPV) detected through environmental surveillance — worldwide, January 1, 2018–March 31, 2020*

Country	Jan 1–Dec 31, 2018		Jan 1–Dec 31, 2019		Jan 1–Mar 31, 2019		Jan 1–Mar 31, 2020	
	No. of samples	No. (%) of isolates	No. of samples	No. (%) of isolates	No. of samples	No. (%) of isolates	No. of samples	No. (%) of isolates
Countries with reported WPV1 cases (no. and % of isolates refer to WPV1)								
Afghanistan	336	83 (25)	259	56 (22)	69	22 (32)	88	9 (14)
Pakistan	689	139 (20)	786	371 (47)	179	86 (47)	201	123 (61)
Countries with reported cVDPV cases† (cVDPV type) (no. and % of isolates refer to cVDPVs)								
Afghanistan (2)	336	0 (—)	259	0 (—)	69	0 (—)	88	17 (19)
Angola (2)	106	0 (—)	106	17 (16)	24	0 (—)	13	0 (—)
Benin (2)	0	—	37	0 (—)	0	—	15	0 (—)
Burkina Faso (2)	50	0 (—)	52	0 (—)	12	0 (—)	18	0 (—)
Burma (Myanmar)§ (1)	59	0 (—)	12	0 (—)	9	0 (—)	6	0 (—)
Cameroon (2)	684	0 (—)	602	4 (1)	130	0 (—)	65	1 (2)
Central African Republic (2)	128	0 (—)	149	9 (6)	28	0 (—)	24	2 (8)
Chad (2)	151	0 (—)	198	10 (5)	46	0 (—)	30	3 (10)
China (2)	171	1 (1)	201	0 (—)	49	0 (—)	51	0 (—)
Cote d'Ivoire (2)	173	0 (—)	154	7 (5)	42	0 (—)	48	24 (50)
Democratic Republic of the Congo (2)	189	1 (1)	294	0 (—)	61	0 (—)	45	0 (—)
Ethiopia (2)	81	0 (—)	140	2 (1)	38	0 (—)	15	0 (—)
Ghana (2)	33	0 (—)	202	17 (9)	46	0 (—)	52	16 (31)
Indonesia (1)	117	0 (—)	174	0 (—)	45	0 (—)	31	0 (—)
Malaysia (1, 2)	0	—	60	15 (25)	10	0 (—)	177	11 (6)
Mali (2)	51	0 (—)	48	0 (—)	12	0 (—)	12	0 (—)
Mozambique (2)	90	0 (—)	76	0 (—)	15	0 (—)	15	0 (—)
Niger (2)	221	0 (—)	293	0 (—)	66	0 (—)	59	0 (—)
Nigeria (2)	166	44 (27)	211	64 (30)	483	38 (8)	347	0 (—)
Pakistan (2)	689	0 (—)	786	39 (5)	179	0 (—)	201	13 (6)
Papua New Guinea (1)	17	7 (41)	75	0 (—)	23	0 (—)	0	—
Philippines (1, 2)	87	0 (—)	212	33 (16)	30	0 (—)	87	4 (5)
Somalia (2)	422	30 (7)	92	5 (5)	32	2 (6)	25	8 (32)
Togo (2)¶	0	—	0	—	0	—	0	—
Zambia (2)	130	0 (—)	256	0 (—)	65	0 (—)	14	0 (—)

Abbreviations: cVDPV = circulating vaccine derived poliovirus; WPV1 = wild poliovirus type 1.
* Data are as of June 19, 2020.
† cVDPV2 was isolated from environmental samples in Kenya (2018) and in Malaysia (2019–2020), but these isolations were not associated with cVDPV2 acute flaccid paralysis cases.
§ For this country, MMWR uses the U.S. State Department short-form name "Burma"; the World Health Organization uses "Myanmar."
¶ Country does not conduct environmental surveillance.

reservoirs. Both countries face ongoing challenges, including vaccine refusals, polio campaign fatigue, and reaching mobile populations (*8*,*9*). In Afghanistan, antigovernment elements banned house-to-house vaccination in most southern and southeastern provinces during May–December 2018, then permitted vaccination only at designated community sites during January–April 2019 (*9*). Vaccination campaigns were banned nationally from the end of April 2019 to the end of September 2019. In Pakistan, the proportion of WPV1-positive sewage samples increased in early 2018; the number of WPV1 cases began to rise in late 2018. In 2019, the Pakistan polio program underwent a management review and is modifying its approach to address longstanding community mistrust and vaccine hesitancy issues (*8*).

The frequency and geographic extent of cVDPV2 outbreaks also increased during the reporting period, primarily because of the limited timeliness, quality, or scope of mOPV2 outbreak response SIAs and the seeding of new emergences of cVDPV2 outside mOPV2 outbreak response areas. Since 2018, cVDPV2 outbreaks have affected three of six WHO regions; most of the 23 affected countries are in Africa but also include Afghanistan and Pakistan, where WPV1 is endemic. Preparations continue for use in late 2020 of a genetically stabilized novel OPV2 (nOPV2), which has a substantially lower risk of reversion to neurovirulence and seeding new VDPV2 emergences than does Sabin mOPV2 (*10*); nOPV2 will eventually replace mOPV2 in cVDPV2 outbreak response SIAs.

In March 2020, GPEI committed to using its extensive laboratory and surveillance network and thousands of trained frontline polio workers to fully support country preparedness and response to the global COVID-19 pandemic.¶¶ To comply with global guidance on physical distancing during the COVID-19 pandemic, WHO and other GPEI partners recommended

¶¶ http://polioeradication.org/news-post/call-to-action-to-support-covid-19-response/.

Summary

What is already known about this topic?

Wild poliovirus type 1 (WPV1) transmission continues in Afghanistan and Pakistan. Circulating vaccine-derived poliovirus (cVDPV) outbreaks occur in areas with low immunization coverage.

What is added by this report?

Although WPV1 incidence declined annually during 2015–2017, cases in Afghanistan and Pakistan have increased since 2018. The number and geographic spread of cVDPV type 2 (cVDPV2) outbreaks are increasing. The COVID-19 pandemic has resulted in suspension of immunization activities and disruption of poliovirus surveillance.

What are the implications for public health practice?

Substantial efforts to address programmatic challenges are essential to safely restore and scale-up polio field activities in 2020, including use of a stabilized type 2 oral poliovirus vaccine to prevent new cVDPV2 emergences.

postponing all outbreak response SIAs until at least June 2020, and all preventive SIAs until the second half of 2020, with resumption depending upon COVID-19 control status. Although routine immunization services have been disrupted in most countries during the pandemic, GPEI is working to strengthen immunization services for preventing outbreak-prone diseases, including poliomyelitis and measles. GPEI has prioritized the continuation of AFP and environmental surveillance activities to monitor the extent of poliovirus circulation during the coming months; however, disruptions are occurring in the detection and investigation of AFP cases and in the shipping and testing of stool and sewage samples. Despite these disruptions, new areas of circulation have been identified, and preparations are underway to respond in the near future.

To address the reasons for increased WPV1 transmission since 2018 and resume field activities deferred because of response to COVID-19, it will be important for both Afghanistan and Pakistan programs to revitalize community engagement to combat polio campaign fatigue and vaccine hesitancy, strengthen the provision of basic health services, and substantially improve the management and quality of immunization activities to reach chronically missed children. In Afghanistan, continued negotiations with local antigovernment elements to resume house-to-house vaccination campaigns is crucial to reaching population immunity necessary to interrupt virus transmission. In Pakistan, implementing the 2019 management review recommendations to improve program oversight, managerial processes, and operational effectiveness is critical to strengthening SIA implementation above performance to date in all WPV1 reservoirs; identifying and mitigating the underlying challenges in underperforming districts is essential to ultimately interrupt all WPV1 transmission. In addition, defining a broad strategy to more effectively reach underserved minorities, including Pashtun populations, will be essential. Resuming preventive and outbreak response SIAs that have been paused because of the COVID-19 pandemic is critical to ensuring continued progress toward polio eradication during 2020. In the interim, GPEI and affected countries are actively planning for the safe resumption and scale-up of polio field activities when and where the COVID-19 emergency allows.

Acknowledgments

Ministries of health of all countries; World Health Organization (WHO) Regional Office for the Eastern Mediterranean Region, Amman, Jordan; WHO Regional Office for Africa, Brazzaville, Congo; WHO Regional Office for Europe, Copenhagen, Denmark; WHO Regional Office for the Western Pacific, Manila, Philippines; WHO Regional Office for South-East Asia, New Delhi, India; Global Polio Laboratory Network, Geneva, Switzerland; Jane Iber, Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC.

Corresponding author: Anna N. Chard, mmn9@cdc.gov; 404-718-3594.

[1]Epidemic Intelligence Service, CDC; [2]Global Immunization Division, Center for Global Health, CDC; [3]Polio Eradication Department, World Health Organization, Geneva, Switzerland; [4]Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Greene SA, Ahmed J, Datta SD, et al. Progress toward polio eradication—worldwide, January 2017–March 2019. MMWR Morb Mortal Wkly Rep 2019;68:458–62. https://doi.org/10.15585/mmwr.mm6820a3
2. Khan F, Datta SD, Quddus A, et al. Progress toward polio eradication—worldwide, January 2016–March 2018. MMWR Morb Mortal Wkly Rep 2018;67:524–8. https://doi.org/10.15585/mmwr.mm6718a4
3. Jorba J, Diop OM, Iber J, et al. Update on vaccine-derived poliovirus outbreaks—worldwide, January 2018–June 2019. MMWR Morb Mortal Wkly Rep 2019;68:1024–8. https://doi.org/10.15585/mmwr.mm6845a4
4. Alleman MM, Jorba J, Greene SA, et al. Update on vaccine-derived poliovirus outbreaks—worldwide, July 2019–February 2020. MMWR Morb Mortal Wkly Rep 2020;69:489–95. https://doi.org/10.15585/mmwr.mm6916a1
5. World Health Organization. WHO/UNICEF estimates of national immunization coverage. Geneva, Switzerland: World Health Organization; 2019. https://www.who.int/immunization/monitoring_surveillance/routine/coverage/en/index4.html
6. Lickness JS, Gardner T, Diop OM, et al. Surveillance to track progress toward polio eradication—worldwide, 2018–2019. MMWR Morb Mortal Wkly Rep 2020;69:623–9. https://doi.org/10.15585/mmwr.mm6920a3
7. Patel JC, Diop OM, Gardner T, et al. Surveillance to track progress toward polio eradication—worldwide, 2017–2018. MMWR Morb Mortal Wkly Rep 2019;68:312–8. https://doi.org/10.15585/mmwr.mm6813a4
8. Hsu CH, Kader M, Mahamud A, et al. Progress toward poliomyelitis eradication—Pakistan, January 2018–September 2019. MMWR Morb Mortal Wkly Rep 2019;68:1029–33. https://doi.org/10.15585/mmwr.mm6845a5

9. Martinez M, Shukla H, Nikulin J, Mbaeyi C, Jorba J, Ehrhardt D. Progress toward poliomyelitis eradication—Afghanistan, January 2018–May 2019. MMWR Morb Mortal Wkly Rep 2019;68:729–33. https://doi.org/10.15585/mmwr.mm6833a4

10. Van Damme P, De Coster I, Bandyopadhyay AS, et al. The safety and immunogenicity of two novel live attenuated monovalent (serotype 2) oral poliovirus vaccines in healthy adults: a double-blind, single-centre phase 1 study. Lancet 2019;394:148–58. https://doi.org/10.1016/S0140-6736(19)31279-6

Characteristics Associated with Hospitalization Among Patients with COVID-19 — Metropolitan Atlanta, Georgia, March–April 2020

Marie E. Killerby, VetMB[1]; Ruth Link-Gelles, PhD[1]; Sarah C. Haight, MPH[1]; Caroline A. Schrodt, MD[1,2]; Lucinda England, MD[1,2]; Danica J. Gomes, MD[1,2]; Mays Shamout, MD[1,2]; Kristen Pettrone, MD[1,2]; Kevin O'Laughlin, MD[1,2]; Anne Kimball, MD[1,2]; Erin F. Blau, DNP[1,2]; Eleanor Burnett, MPH[1]; Chandresh N. Ladva, PhD[1]; Christine M. Szablewski, DVM[2,3]; Melissa Tobin-D'Angelo, MD[3]; Nadine Oosmanally, MSPH[3]; Cherie Drenzek, DVM[3]; David J. Murphy, MD, PhD[4]; James M. Blum, MD[4]; Julie Hollberg, MD[4]; Benjamin Lefkove, MD[5]; Frank W. Brown, MD[4,5]; Tom Shimabukuro, MD[1]; Claire M. Midgley, PhD[1]; Jacqueline E. Tate, PhD[1]; CDC COVID-19 Response Clinical Team

On June 17, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

The first reported U.S. case of coronavirus disease 2019 (COVID-19) was detected in January 2020 (*1*). As of June 15, 2020, approximately 2 million cases and 115,000 COVID-19–associated deaths have been reported in the United States.* Reports of U.S. patients hospitalized with SARS-CoV-2 infection (the virus that causes COVID-19) describe high proportions of older, male, and black persons (*2*–*4*). Similarly, when comparing hospitalized patients with catchment area populations or nonhospitalized COVID-19 patients, high proportions have underlying conditions, including diabetes mellitus, hypertension, obesity, cardiovascular disease, chronic kidney disease, or chronic respiratory disease (*3*,*4*). For this report, data were abstracted from the medical records of 220 hospitalized and 311 nonhospitalized patients aged ≥18 years with laboratory-confirmed COVID-19 from six acute care hospitals and associated outpatient clinics in metropolitan Atlanta, Georgia. Multivariable analyses were performed to identify patient characteristics associated with hospitalization. The following characteristics were independently associated with hospitalization: age ≥65 years (adjusted odds ratio [aOR] = 3.4), black race (aOR = 3.2), having diabetes mellitus (aOR = 3.1), lack of insurance (aOR = 2.8), male sex (aOR = 2.4), smoking (aOR = 2.3), and obesity (aOR = 1.9). Infection with SARS-CoV-2 can lead to severe outcomes, including death, and measures to protect persons from infection, such as staying at home, social distancing (*5*), and awareness and management of underlying conditions should be emphasized for those at highest risk for hospitalization with COVID-19. Measures that prevent the spread of infection to others, such as wearing cloth face coverings (*6*), should be used whenever possible to protect groups at high risk. Potential barriers to the ability to adhere to these measures need to be addressed.

Patients were selected from six acute care hospitals and associated outpatient clinics affiliated with a single academic health care system in metropolitan Atlanta. Hospitalized patients were selected sequentially from hospital-provided lists of patients aged ≥18 years who were hospitalized with laboratory-confirmed COVID-19 (defined as a positive real-time reverse transcription–polymerase chain reaction [RT-PCR] test result for SARS-CoV-2) during March 1–30. The 220 selected hospitalized patients were described previously (*2*); hospitalizations included stays for observation and deaths that occurred in an emergency department (ED). All 311 nonhospitalized patients (i.e., evaluated at outpatient clinics or an ED and not admitted) aged ≥18 years with laboratory-confirmed COVID-19 during March 1–April 7, were included, unless they stayed for observation or died in an ED. During April 8–May 1, trained personnel abstracted information from electronic medical records on patient demographics, occupation, underlying conditions, and symptoms using REDCap software (version 8.8.0; Vanderbilt University) (*7*). This investigation was determined by CDC to be public health surveillance and by the Georgia Department of Public Health as an institutional review board–exempt public health evaluation.

During March 1–April 7, 2020, the health care system operated a telephone triage line to manage incoming patients with COVID-19–compatible symptoms. Patients with signs of severe illness (e.g., severe shortness of breath, confusion, or hemoptysis) were directed to an ED. Other symptomatic persons could receive outpatient SARS-CoV-2 testing; however, testing was limited, and appointments were prioritized for health care personnel and persons considered to be at higher risk for severe COVID-19–associated illness (e.g., persons aged ≥65 years and those with underlying conditions, including diabetes mellitus, cardiovascular disease, and chronic respiratory disease).

For analyses, race was categorized as black or other race; obesity was defined as body mass index ≥30 kg/m^2; age was categorized as 18–44, 45–64, and ≥65 years; smoking was defined as being a current or former smoker; cardiovascular disease excluded hypertension alone; and chronic kidney disease included end stage renal disease. Health care personnel were classified as persons whose occupations included patient contact or possible exposure to infectious agents in a health care setting.† Univariable and multivariable logistic regressions were

* https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html.

† https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html.

Summary

What is already known about this topic?

Hospitalized COVID-19 patients are more commonly older, male, of black race, and have underlying conditions. Less is known about factors increasing risk for hospitalization.

What is added by this report?

Data for 220 hospitalized and 311 nonhospitalized COVID-19 patients from six metropolitan Atlanta hospitals and associated outpatient clinics found that older age, black race, diabetes, lack of insurance, male sex, smoking, and obesity were independently associated with hospitalization.

What are the implications for public health practice?

To reduce severe outcomes from COVID-19, measures to prevent infection with SARS-COV-2 should be emphasized for persons at highest risk for hospitalization with COVID-19. Potential barriers to the ability to adhere to these measures need to be addressed.

used to compare hospitalized with nonhospitalized patients; variables included age group, race, sex, smoking status, insurance status, obesity, hypertension, diabetes mellitus, cardiovascular disease, chronic respiratory disease, and chronic kidney disease. These variables were selected based upon risk factors for severe COVID-19 identified in other studies (*3*,*4*) rather than a defined statistical endpoint. Persons lacking a health care visit during which a medical history could be recorded (25) were excluded from analyses. Because of small sample sizes for some variables, Firth's correction was used to provide bias-reduction (*8*). Because information on race was missing for nearly one quarter (23%) of nonhospitalized patients, sensitivity analyses were performed. Multivariable analyses were repeated and any patient with missing race was reclassified, first as black, then as other race. This method of sensitivity analysis was used to avoid implicit assumptions about the nature of missing data. Data were analyzed using SAS statistical software (version 9.4; SAS Institute).

Compared with nonhospitalized patients (311), hospitalized patients (220) were older (median age = 61 years) and more frequently male (52%) and black (79%) (Table). Obesity, smoking, hypertension, diabetes mellitus, and chronic kidney disease were more prevalent among hospitalized patients than among nonhospitalized patients. Among those whose occupations were reported, nonhospitalized patients were more likely to be health care personnel (54%) than were hospitalized patients (4%). Fever or cough were commonly reported among both hospitalized and nonhospitalized patients, whereas shortness of breath was reported more often among hospitalized patients. Chills, headache, loss of smell or taste, or sore throat were reported more often among nonhospitalized patients.

After controlling for age, sex, race, obesity, smoking status, insurance status, hypertension, diabetes mellitus, cardiovascular disease, chronic respiratory disease, and chronic kidney disease, characteristics independently associated with hospitalization were age ≥65 years (aOR = 3.4, 95% confidence interval [CI] = 1.6–7.4); black race (aOR = 3.2, 95% CI = 1.8–5.8); having diabetes mellitus (aOR = 3.1, 95% CI = 1.7–5.9); lack of insurance (aOR = 2.8, 95% CI 1.1–7.3); male sex (aOR = 2.4, 95% CI = 1.4–4.1); smoking (aOR = 2.3, 95% CI = 1.2–4.5); and obesity (aOR = 1.9, 95% CI = 1.1–3.3) (Figure). When missing race was reclassified as black or other race in sensitivity analyses, associations with hospitalization did not appreciably change for any variables.

Discussion

Older age, as measured by age ≥65 years, was associated with hospitalization, consistent with previous findings (*3*,*4*). Hospitalized patients with COVID-19 were more likely to have diabetes mellitus and obesity than were nonhospitalized patients, suggesting a relationship between these underlying conditions and increased severity of illness. Diabetes mellitus has been determined to be associated with more severe illness in hospitalized patients with COVID-19 (*4*) and in persons with illness caused by Middle East respiratory syndrome coronavirus (*9*). Obesity has previously been reported to be overrepresented in hospitalized patients with COVID-19 (*3*) and associated with hospitalization (*4*). After controlling for other underlying conditions and patient characteristics, hypertension was no longer associated with hospitalization, suggesting that other underlying conditions or factors associated with hypertension might be partially responsible for the higher prevalence of hypertension in hospitalized COVID-19 patients.

The COVID-19 pandemic has highlighted persistent health disparities in the United States. In a previous investigation of hospitalized patients in Georgia, including the subset of hospitalized patients reported here, the proportion of patients who were black was higher than expected based on overall hospitalizations during the same period (*2*). Racial and ethnic minority groups are at higher risk for severe complications from COVID-19 because of the increased prevalence of diabetes, cardiovascular disease, and other underlying conditions among racial and ethnic minority groups.[§] Social determinants of health might also contribute to the disproportionate incidence of COVID-19 in racial and ethnic minority groups, including factors related to housing, economic stability, and work circumstances.[¶] In the United States, black workers are more likely than other workers to be frontline industry or essential

[§] https://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a2.htm.
[¶] https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health.

TABLE. Characteristics of hospitalized and nonhospitalized patients with COVID-19 treated at six acute care hospitals and associated outpatient clinics in metropolitan Atlanta, Georgia, March 1–April 7, 2020

Demographic characteristic	No. (%) of patients	
	Nonhospitalized (n = 311)	Hospitalized (n = 220)
Sex		
Male	114 (36.7)	114 (51.8)
Female	197 (63.3)	106 (48.2)
Age group (yrs)		
Median age, yrs (IQR)	45.0 (33.0–58.0)	61.0 (45.0–70.0)
18–44	151 (48.6)	54 (24.6)
45–64	120 (38.6)	76 (34.6)
≥65 years	40 (12.9)	90 (40.9)
Race		
White	90 (28.9)	29 (13.2)
Black	139 (44.7)	174 (79.1)
Other	10 (3.2)	7 (3.2)
Missing race	72 (23.2)	10 (4.6)
Ethnicity		
Hispanic	10 (3.2)	6 (2.7)
Non-Hispanic*	197 (63.3)	203 (92.3)
Missing ethnicity	104 (33.4)	11 (5.0)
Occupation		
Health care personnel†	168 (54.0)	8 (3.6)
Non-health care personnel	78 (25.1)	50 (22.7)
Missing occupation	65 (20.9)	162 (73.6)
Other characteristic		
Uninsured	20 (6.4)	22 (10.0)
Missing insurance status	6 (1.9)	3 (1.4)
Lives in a congregate living facility§	1 (0.3)	12 (5.5)
Pregnant	4 (1.3)	3 (1.4)
Past or current smoking	37 (11.9)	54 (24.6)
Missing smoking status	52 (16.7)	9 (4.1)
Underlying condition		
Obesity¶	104 (33.4)	123 (55.9)
Missing BMI	84 (27.0)	11 (5.0)
Cardiovascular disease	12 (3.9)	8 (3.6)
Hypertension	101 (32.5)	142 (64.6)
Diabetes mellitus	30 (9.7)	81 (36.8)
Type 1	2 (0.6)	2 (0.9)
Type 2	28 (9.0)	74 (33.6)
Chronic respiratory disease	56 (18.0)	45 (20.5)
Chronic kidney disease	7 (2.3)	38 (17.3)
Chronic kidney disease without dialysis	6 (1.9)	24 (10.9)
End stage renal disease	1 (0.3)	14 (6.4)
Any transplant	1 (0.3)	10 (4.6)
Liver disease	4 (1.3)	5 (2.3)
HIV infection	10 (3.2)	5 (2.3)
Cancer	28 (9.0)	6 (2.7)
Rheumatological disease	4 (1.3)	6 (2.7)
No. of underlying conditions**		
0	169 (54.3)	44 (20.0)
1	88 (28.3)	77 (35.0)
2	44 (14.2)	65 (29.6)
≥3	10 (3.2)	34 (15.5)
Symptoms at Initial evaluation		
Fever††	240 (77.2)	188 (85.5)
Cough	275 (88.4)	180 (81.8)
Shortness of breath (dyspnea)	135 (43.4)	149 (67.7)
Headache	171 (55.0)	35 (15.9)
Chills	178 (57.2)	58 (26.4)
Arthralgia	44 (14.2)	9 (4.1)
Myalgia	184 (59.2)	69 (31.4)
Sore throat	146 (47.0)	21 (9.6)
Loss of smell§§	130 (41.8)	4 (1.8)
Loss of taste	106 (34.1)	6 (2.7)
Gastrointestinal symptoms¶¶	137 (44.1)	88 (40.0)
Median interval between symptom onset and testing, days (IQR)	**4.0 (2.0–7.0)**	**6.0 (3.0–9.5)**

Abbreviations: BMI = body mass index; HIV = human immunodeficiency virus; IQR = interquartile range.

* Includes non-Hispanic white and other races/ethnicities.

† Includes any occupation with patient contact.

§ Includes nursing homes, assisted living facilities, shelters, and dormitories.

¶ BMI ≥30.0 kg/m^2.

** Includes cardiovascular disease, hypertension, diabetes, chronic respiratory disease, and chronic kidney disease.

†† Includes subjective or objective fever (≥100.4°F [38°C]).

§§ Loss of smell or taste was first widely reported on April 23, 2020; differences in the periods of investigations between hospitalized and nonhospitalized patients might be responsible for differences in proportions reported.

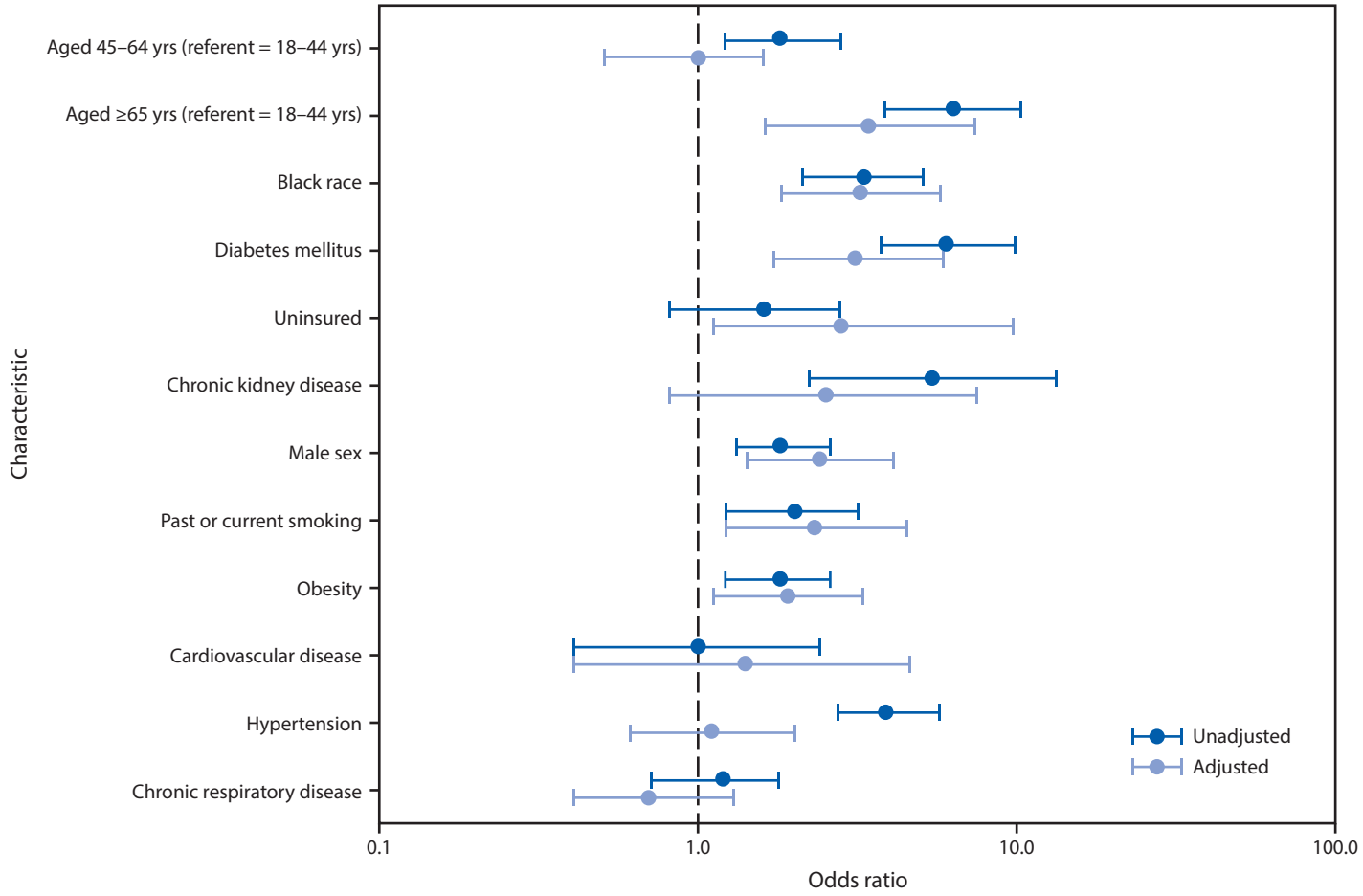
¶¶ Includes abdominal pain, diarrhea, nausea, or vomiting.

workers,** which increases their likelihood of infection with SARS-CoV-2 while performing their jobs. This and other social factors could contribute to the disproportionate diagnoses of COVID-19 among black persons in metropolitan Atlanta.

Black race has previously been associated with increased hospitalization among COVID-19 patients (*10*); however, race has not been associated with mortality among patients who were hospitalized (*2*,*10*). The independent association between black race and hospitalization in this investigation remained, even when the analysis controlled for other characteristics (including diagnosed underlying conditions), suggesting underlying conditions alone might not account for the higher rate of hospitalization among black persons. This might indicate that black persons are more likely to be hospitalized because of more severe illness, or it might indicate that black persons are less likely to be identified in the outpatient setting, potentially reflecting differences in health care access or utilization or other factors not identified through medical record review. Additional research is needed to more fully understand the association between black race and hospitalization. CDC and state and local partners are working to ensure completeness of race and ethnicity data and will continue to analyze and report on racial and ethnic disparities to further elucidate factors and health disparities associated with COVID-19 incidence and illness severity.

** https://www.epi.org/publication/black-workers-covid/.

FIGURE. Unadjusted and adjusted* odds ratios and 95% confidence intervals for hospitalizations in COVID-19 patients (n = 506†) evaluated at six acute care hospitals and associated outpatient clinics, by selected characteristics — metropolitan Atlanta, Georgia, March 1–April 7, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.
* Adjusted for age, sex, race, obesity, past or current smoking, insurance status, obesity, and other underlying conditions (hypertension, diabetes mellitus, cardiovascular disease, chronic respiratory disease, and chronic kidney disease).
† Complete case analysis was used for multivariable analyses; therefore, n = 368 for the multivariable model.

The findings in this report are subject to at least five limitations. First, although this investigation identified COVID-19 patients from a single health care system, hospitalized patients likely represent a broader population than nonhospitalized patients because those experiencing mild illness might have accessed outpatient services outside of this health care system or chosen not to seek care. Differences in these two populations caused by selection bias might therefore result in nonhospitalized patients differing beyond having milder illness than hospitalized patients. Thus, in this report, hospitalization status might not only represent severity of illness but also care seeking and potentially other confounding characteristics. Second, given that outpatient testing was prioritized for certain persons, older patients and those with underlying conditions might be overrepresented among outpatients receiving testing, resulting in underestimated odds ratios for hospitalization. In addition, overrepresentation of health care personnel in the outpatient setting could result in overestimation of odds ratios if health care personnel were disproportionately young or healthy. Third, outpatient visits did not always include a full medical history; thus, underlying conditions and other characteristics might be underreported. Fourth, data on age was stratified into groups, and because of sample size, smaller age group categories could not be explored. Finally, data on race, body mass index, and smoking status were missing for a substantial proportion of nonhospitalized patients. Data could not be disaggregated for other races or analyzed by ethnicity because of small sample sizes.

This investigation found that age ≥65 years, black race, and having diabetes mellitus were independently associated with hospitalization. Among the underlying conditions included in the multivariable analysis, diabetes mellitus was most strongly associated with hospitalization. The reported association

between black race and hospitalization, which remained even after controlling for diagnosed underlying conditions, suggests that underlying conditions alone might not account for the higher rate of hospitalization among black persons. Other factors that might explain higher rates of hospitalization include health care access, other social determinants of health, or the possibility of bias. Infection with SARS-CoV-2 can lead to severe outcomes, including death, and measures to protect persons from infection such as staying at home, social distancing (*5*), and awareness and management of underlying conditions should be emphasized for those at highest risk for hospitalization with COVID-19. To protect groups at high risk, measures that prevent the spread of infection to others, such as wearing cloth face coverings (*6*), should be used whenever possible. Potential barriers to the ability to adhere to these measures need to be addressed.

Acknowledgments

Stephanie R. Bialek, William Bornstein, Deron C. Burton, Mary E. Evans, Nathan W. Furukawa, Debra Houry, CDC COVID-19 Response Team; Kymmi Cooley; C. Hernandez-Romieu; Alfonso Mohleen Kang; Guru Patel; Jonathan Perkins; informatics and information technology staff members at collaborating hospitals; Atlanta health care personnel.

CDC COVID-19 Response Clinical Team

Sean D. Browning, CDC; Beau B. Bruce, CDC; Juliana da Silva, CDC; Jeremy A.W. Gold, CDC; Brendan R. Jackson, CDC; Sapna Bamrah Morris, CDC; Pavithra Natarajan, CDC; Robyn Neblett Fanfair, CDC; Priti R. Patel, CDC; Jessica Rogers-Brown, CDC; John Rossow, CDC; Karen K. Wong, CDC.

Corresponding author: Marie Killerby, MKillerby@cdc.gov, 404-626-7354.

[1]CDC COVID-19 Emergency Response Team; [2]Epidemic Intelligence Service, CDC; [3]Georgia Department of Public Health; [4]Emory University School of Medicine, Atlanta, Georgia; [5]Emory Decatur Hospital, Decatur, Georgia.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. James M. Blum reports personal fees from Clew Medical, outside the submitted work. No other potential conflicts of interest were disclosed.

References

1. Holshue ML, DeBolt C, Lindquist S, et al.; Washington State 2019-nCoV Case Investigation Team. First case of 2019 novel coronavirus in the United States. N Engl J Med 2020;382:929–36. https://doi.org/10.1056/NEJMoa2001191
2. Gold JAW, Wong KK, Szablewski CM, et al. Characteristics and clinical outcomes of adult patients hospitalized with COVID-19—Georgia, March 2020. MMWR Morb Mortal Wkly Rep 2020;69:545–50. https://doi.org/10.15585/mmwr.mm6918e1
3. Garg S, Kim L, Whitaker M, et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus disease 2019—COVID-NET, 14 states, March 1–30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:458–64. https://doi.org/10.15585/mmwr.mm6915e3
4. Petrilli CM, Jones SA, Yang J, et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. BMJ 2020. Epub May 22, 2020. https://doi.org/10.1136/bmj.m1966
5. CDC. Coronavirus disease 2019 (COVID-19): what you can do. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/what-you-can-do.html
6. CDC. Coronavirus disease 2019 (COVID-19): how to protect yourself & others. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html
7. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42:377–81. https://doi.org/10.1016/j.jbi.2008.08.010
8. Firth D. Bias reduction of maximum likelihood estimates. Biometrika 1993;80:27–38. https://doi.org/10.1093/biomet/80.1.27
9. Alanazi KH, Abedi GR, Midgley CM, et al. Diabetes mellitus, hypertension, and death among 32 patients with MERS-CoV infection, Saudi Arabia. Emerg Infect Dis 2020;26:166–8. https://doi.org/10.3201/eid2601.190952
10. Price-Haywood EG, Burton J, Fort D, Seoane L. Hospitalization and mortality among black patients and white patients with Covid-19. N Engl J Med 2020. Epub May 27, 2020. https://doi.org/10.1056/NEJMsa2011686

Potential Indirect Effects of the COVID-19 Pandemic on Use of Emergency Departments for Acute Life-Threatening Conditions — United States, January–May 2020

Samantha J. Lange, MPH[1,2]; Matthew D. Ritchey, DPT[1]; Alyson B. Goodman, MD[1,2]; Taylor Dias, MPH[3]; Evelyn Twentyman, MD[1]; Jennifer Fuld, PhD[2]; Laura A. Schieve, PhD[2]; Giuseppina Imperatore, MD, PhD[1]; Stephen R. Benoit, MD[1]; Aaron Kite-Powell, MS[2,3]; Zachary Stein, MPH[3]; Georgina Peacock, MD[2]; Nicole F. Dowling, PhD[1]; Peter A. Briss, MD[1]; Karen Hacker, MD[1]; Adi V. Gundlapalli, MD, PhD[2,3]; Quanhe Yang, PhD[1]

On June 22, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

On March 13, 2020, the United States declared a national emergency in response to the coronavirus disease 2019 (COVID-19) pandemic. Subsequently, states enacted stay-at-home orders to slow the spread of SARS-CoV-2, the virus that causes COVID-19, and reduce the burden on the U.S. health care system. CDC* and the Centers for Medicare & Medicaid Services (CMS)† recommended that health care systems prioritize urgent visits and delay elective care to mitigate the spread of COVID-19 in health care settings. By May 2020, national syndromic surveillance data found that emergency department (ED) visits had declined 42% during the early months of the pandemic (*1*). This report describes trends in ED visits for three acute life-threatening health conditions (myocardial infarction [MI, also known as heart attack], stroke, and hyperglycemic crisis), immediately before and after declaration of the COVID-19 pandemic as a national emergency. These conditions represent acute events that always necessitate immediate emergency care, even during a public health emergency such as the COVID-19 pandemic. In the 10 weeks following the emergency declaration (March 15–May 23, 2020), ED visits declined 23% for MI, 20% for stroke, and 10% for hyperglycemic crisis, compared with the preceding 10-week period (January 5–March 14, 2020). EDs play a critical role in diagnosing and treating life-threatening conditions that might result in serious disability or death. Persons experiencing signs or symptoms of serious illness, such as severe chest pain, sudden or partial loss of motor function, altered mental state, signs of extreme hyperglycemia, or other life-threatening issues, should seek immediate emergency care, regardless of the pandemic. Clear, frequent, highly visible communication from public health and health care professionals is needed to reinforce the importance of timely care for medical emergencies and to assure the public that EDs are implementing infection prevention and control guidelines that help ensure the safety of their patients and health care personnel.

CDC used data from its National Syndromic Surveillance Program (NSSP) to assess trends in ED visits from week 1, 2019 through week 21, 2020 for three life-threatening health conditions: MI, stroke, and hyperglycemic crisis. NSSP is a collaboration among CDC, federal partners, local and state health departments, and academic and private sector partners to collect, analyze, and share electronic patient encounter data received from emergency departments, urgent and ambulatory care centers, inpatient health care settings, and laboratories for public health action.§ NSSP includes ED visits from a subset of hospitals in 47 states (all but Hawaii, South Dakota, and Wyoming) and the District of Columbia, capturing approximately 73% of ED visits nationwide. These analyses were limited to EDs with consistent ≥90% completeness for patient discharge diagnosis to ensure data quality (1,670 EDs).¶ The three conditions were defined using the following *International Classification of Diseases, Tenth Revision* (ICD-10) codes: MI = I21–I22; stroke = I60–I61 (hemorrhagic stroke) or I63 (ischemic stroke); and hyperglycemic crisis = E10.1, E11.1, or E13.1 (diabetic ketoacidosis) or E11.0, E13.0, or E10.65 and E10.69 (hyperosmolar hyperglycemic syndrome). Weekly numbers of ED visits for each of the three conditions were compared for two 10-week periods: January 5–March 14, 2020 (weeks 2–11, prepandemic) and March 15–May 23, 2020 (weeks 12–21, early pandemic). The absolute differences and percentage change in number of visits from pre- to early pandemic periods were tabulated, overall and within age-sex strata. Analyses were conducted using SAS (version 9.4; SAS Institute).

Trends in number of ED visits for MI and stroke were relatively stable during the first half of 2019, increased slightly in the second half of 2019, and then stabilized during the first few weeks of 2020, remaining stable throughout the prepandemic period (Figure 1). The number of ED visits for MI and stroke declined sharply starting at week 10 (corresponding to the week beginning March 1, 2020) and reaching the lowest

* https://www.cdc.gov/coronavirus/2019-ncov/hcp/framework-non-COVID-care.html.
† https://www.cms.gov/files/document/cms-non-emergent-elective-medical-recommendations.pdf.
§ https://www.cdc.gov/nssp/index.html.
¶ During weeks 2–21, 2020, an average of 3,504 EDs reported to NSSP. On average, 1,670 EDs (48%) had consistent (≥90%) completeness on patient discharge diagnosis data during this period.

level during weeks 13–14 (weeks beginning March 22 for MI and March 29 for stroke), coinciding with the early weeks after the declaration of the COVID-19 national emergency. Since the nadir, ED visits for MI and stroke have gradually increased but remain below prepandemic levels. Compared with the prepandemic period, the number of ED visits during the early pandemic period was 23% lower for MI and 20% lower for stroke (Table). The number of ED visits for hyperglycemic crisis followed similar, albeit less pronounced, trends to those observed for MI and stroke; the number of ED visits for hyperglycemic crisis was 10% lower during the early pandemic than during the prepandemic period, with the lowest level occurring at week 14. The reduction in visits for all three conditions during the early pandemic was similar in males and females.

The relative decline in the number of ED visits between the prepandemic and early pandemic periods was similar across age groups for MI and stroke, whereas the decline in ED visits for hyperglycemic crisis tended to be larger among younger age groups, particularly for females (Table). The absolute decrease in ED visits for MI was largest among persons aged 65–74 years for both men (2,114-visit decrease) and women (1,459) (Figure 2). The absolute decrease in ED visits for stroke was largest among men aged 65–74 years (1,406-visit decrease) and women aged 75–84 years (1,642). The absolute decrease in ED visits for hyperglycemic crisis was largest in younger adults aged 18–44 years (419-visit decrease for men, 775 for women).

Discussion

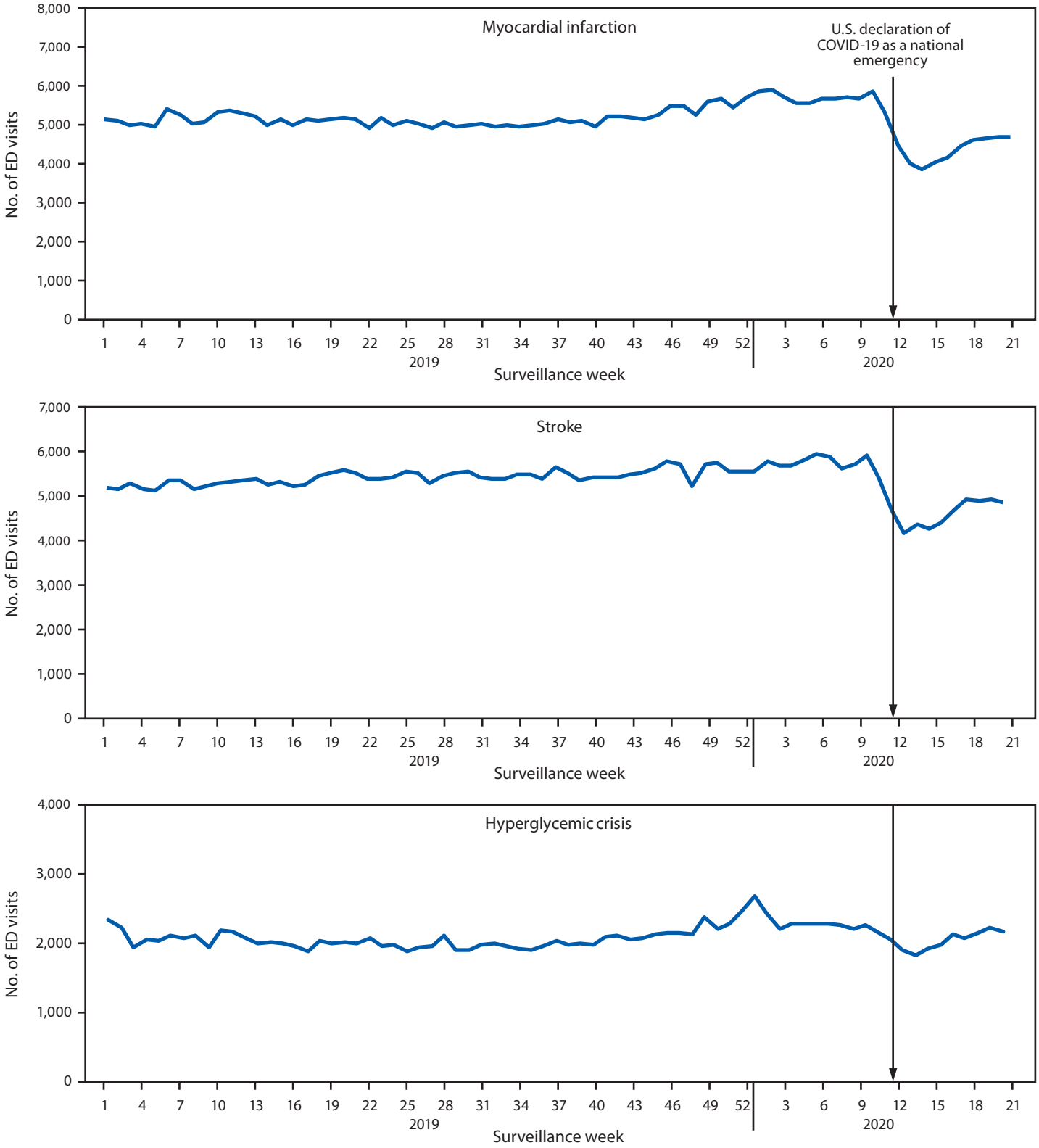
In the weeks following the declaration of COVID-19 as a national emergency on March 13, 2020, NSSP identified substantial reductions in numbers of ED visits by males and females in all age groups for three potentially life-threatening conditions: MI (23% decrease), stroke (20%), and hyperglycemic crisis (10%). These estimates are consistent with, but smaller in relative magnitude than, the 42% overall decline in ED visits observed during the early pandemic period (*1*). The largest absolute differences were observed in adults aged ≥65 years for MI and stroke, and adults aged 18–44 years and persons aged <18 years for hyperglycemic crisis. The substantial reduction in ED visits for these life-threatening conditions might be explained by many pandemic-related factors including fear of exposure to COVID-19, unintended consequences of public health recommendations to minimize nonurgent health care, stay-at-home orders, or other reasons. A short-term decline of this magnitude in the incidence of these conditions is biologically implausible for MI and stroke, especially for older adults, and unlikely for hyperglycemic crisis, and the finding suggests that patients with these conditions either could not access care or were delaying or avoiding seeking care during the early pandemic period. There have been reports of excess mortality during the COVID-19 pandemic wherein deaths not associated with confirmed or probable COVID-19 might have been directly or indirectly attributed to the pandemic.** The striking decline in ED visits for acute life-threatening conditions might partially explain observed excess mortality not associated with COVID-19.

Previous studies have also reported significant reductions in hospital admissions for MI and stroke during the COVID-19 pandemic (*2*–*7*). For example, a study of nine high-volume U.S. cardiac catheterization laboratories found a 38% decrease in activations for heart attacks during March 2020 compared with the 14 months before the pandemic (*2*). Further, large hospital systems in California, Massachusetts, and New York City have reported 43%–50% reductions in admissions for MI and other acute cardiovascular conditions during the pandemic (*3*–*5*), and neuroimaging data from approximately 850 U.S. hospitals indicate a 39% reduction in the number of patients who were evaluated for signs of stroke (*7*). Decreases in ED visits for hyperglycemic crisis might be less striking because patient recognition of this crisis is typically augmented by home glucose monitoring and not reliant upon symptoms alone, as is the case for MI and stroke. The decrease in visits for hyperglycemic crisis merits further study because there are few published reports on this topic.

MI, stroke, and hyperglycemic crisis are common life-threatening conditions that require urgent attention to reduce associated morbidity and mortality. Heart disease is the leading cause of death, and stroke is the fifth leading cause of death in the United States††: someone in the United States has a heart attack every 40 seconds,§§ and approximately 795,000 persons have a stroke annually.¶¶ Diabetes affects 34 million Americans,*** and uncontrolled hyperglycemia (high blood glucose), can lead to diabetic ketoacidosis or a hyperosmolar hyperglycemic state, life-threatening but preventable metabolic complications of diabetes (*8*). It is important for all persons to know the warning signs of MI, stroke, and hyperglycemic

** https://www.cdc.gov/mmwr/volumes/69/wr/mm6919e5.htm.
†† https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm.
§§ https://www.cdc.gov/heartdisease/facts.htm.
¶¶ https://www.cdc.gov/stroke/facts.htm.
*** https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf.

FIGURE 1. Number of emergency department (ED) visits for myocardial infarction, stroke, and hyperglycemic crisis* — National Syndromic Surveillance Program, United States, week 1, 2019–week 21, 2020†



Abbreviation: COVID-19 = coronavirus disease 2019.
* Includes diabetic ketoacidosis and hyperosmolar hyperglycemic syndrome.
† Week 1, 2019 (week ending January 5, 2019) to week 21, 2020 (week ending May 23, 2020).

TABLE. Number of emergency department visits and percentage change for myocardial infarction, stroke, and hyperglycemic crisis immediately before and during the early COVID-19 pandemic, by sex and age group — National Syndromic Surveillance Program, United States, 2020

	Myocardial infarction			Stroke			Hyperglycemic crisis		
Sex/Age	Prepandemic*	Early pandemic†	% Change	Prepandemic	Early pandemic	% Change	Prepandemic	Early pandemic	% Change
Total	**56,565**	**43,545**	**−23**	**57,490**	**46,066**	**−20**	**22,766**	**20,561**	**−10**
Males	33,263	26,176	−21	28,729	23,715	−17	11,842	11,070	−7
Age group (yrs)									
<18	10	5	−50	169	180	7	895	779	−13
18–44	2,101	1,805	−14	1,984	1,765	−11	5,236	4,817	−8
45–54	4,510	3,669	−19	3,256	2,665	−18	2,025	1,958	−3
55–64	8,228	6,780	−18	6,488	5,518	−15	1,887	1,854	−2
65–74	8,965	6,851	−24	7,532	6,126	−19	1,120	1,042	−7
75–84	6,218	4,736	−24	6,083	4,998	−18	526	490	−7
≥85	3,231	2,330	−28	3,217	2,463	−23	153	130	−15
Females	23,017	17,128	−26	28,666	22,260	−22	10,888	9,469	−13
Age group (yrs)									
<18	8	0	−100	137	100	−27	902	685	−24
18–44	1,168	882	−24	1,787	1,428	−20	4,775	4,000	−16
45–54	2,131	1,632	−23	2,625	2,050	−22	1,613	1,503	−7
55–64	4,396	3,372	−23	4,683	3,850	−18	1,689	1,509	−11
65–74	5,782	4,323	−25	6,625	5,056	−24	1,173	1,038	−12
75–84	5,379	3,924	−27	7,006	5,364	−23	536	540	1
≥85	4,153	2,995	−28	5,803	4,412	−24	200	194	−3
Sex unknown	285	241	−15	95	91	−4	36	22	−39

Abbreviation: COVID-19 = coronavirus disease 2019.
* Prepandemic (weeks 2–11) corresponds to January 5–March 14, 2020.
† Early pandemic (weeks 12–21) corresponds to March 15–May 23, 2020.

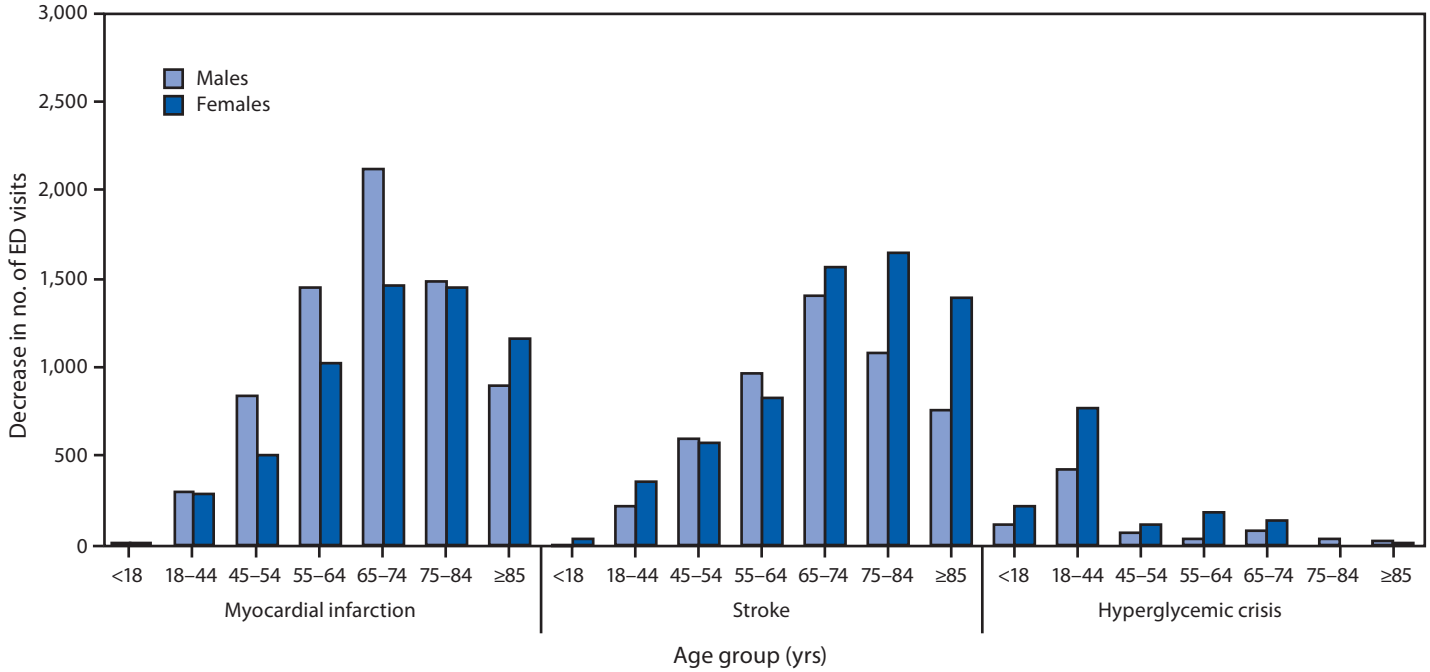
crisis††† and understand that immediate medical attention for these acute issues can prevent serious heart or brain damage, metabolic complications of diabetes, or death. The sooner emergency care begins, the better are the chances for survival. Even in the face of the COVID-19 pandemic, emergency care can and should be accessed and provided without delay.

The findings in this report are subject to at least five limitations. First, NSSP coverage is not uniform across or within states, and hospitals reporting to NSSP change over time; however, NSSP captures approximately 73% of the ED data analyzable at the national level. Second, conditions were defined using ICD-10 diagnosis codes. Differences in coding practices might exist; however, coding for common conditions, especially the life-threatening conditions described in this report, is likely consistent (*9*,*10*). Third, NSSP does not capture mortality data, and it is not known whether patients with MI or stroke sought treatment elsewhere or died at home. Fourth, despite allowing 2 weeks from the end of week 21 before analyzing the data, the findings from the final weeks might be slightly underestimated because of delayed reporting. Finally, seasonal effects in trends in ED visits might exist; however, a proximal comparison period was best for this analysis to minimize other factors that might have affected trends in disease incidence or health care–seeking behavior between years. Despite these limitations, this study also has important strengths. NSSP is a national surveillance system with automated electronic reporting and the ability to detect and monitor health events in near real time, and this analysis was restricted to hospitals with consistent reporting on patients' diagnoses at discharge to minimize effects of differential reporting.

At least one in five expected U.S. ED visits for MI or stroke and one in 10 ED visits for hyperglycemic crisis did not occur during the initial months of the COVID-19 pandemic. Patients might have delayed or avoided seeking care because of fear of COVID-19, unintended consequences of recommendations to stay at home, or other reasons. EDs play a critical role in treating acute conditions that might result in permanent disability or death. Persons experiencing severe chest pain, sudden or partial loss of motor function, altered mental status, signs of extreme hyperglycemia, or other life-threatening issues, should call 9-1-1, irrespective of the COVID-19 pandemic.

††† The five major symptoms of MI, or heart attack, are chest pain or discomfort; feeling weak, light-headed, or faint; pain or discomfort in the jaw, neck, or back; pain or discomfort in one or both arms or shoulders; and shortness of breath. The F.A.S.T acronym is a mnemonic that might help determine whether someone is having a stroke: F = Face: When the person smiles, does one side of the face droop? A = Arms: When the person tries to raise both arms, does one arm drift downward? S = Speech: When the person tries to repeat a simple phrase, is the speech slurred or strange? T = Time: If any of these signs are present, persons should call 9–1-1 right away. Signs of hyperglycemic crisis might include low blood pressure, lethargy, dehydration, a confused or altered mental state attributable to high blood glucose in a person with diabetes.

FIGURE 2. Absolute decreases in number of emergency department (ED) visits for myocardial infarction, stroke, and hyperglycemic crisis between COVID-19 prepandemic* and early pandemic periods,† by sex and age group§ — National Syndromic Surveillance Program, United States, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.
* Prepandemic (weeks 2–11) corresponds to January 5–March 14, 2020.
† Early pandemic (weeks 12–21) corresponds to March 15–May 23, 2020.
§ There was a slight absolute increase in ED visits for stroke among males aged 0–17 years and for hyperglycemic crisis among females aged 75–84 years.

Clear communication from public health and health care professionals is needed to reinforce the importance of timely emergency care for acute health conditions and to assure the public that EDs are implementing infection prevention and control guidelines[§§§] to ensure the safety of their patients and health care personnel.

[§§§] https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html.

Acknowledgments

National Syndromic Surveillance Program Community of Practice; Paula Yoon, Michael Coletta, William Mac Kenzie, Jennifer Adjemian, Kathleen Hartnett.

Corresponding author: Samantha Lange, nya7@cdc.gov.

[1]National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]CDC COVID-19 Emergency Response; [3]Center for Surveillance, Epidemiology, and Laboratory Services, CDC.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

Summary

What is already known about this topic?

National syndromic surveillance data suggest a decline in emergency department (ED) visits during the COVID-19 pandemic.

What is added by this report?

In the 10 weeks following declaration of the COVID-19 national emergency, ED visits declined 23% for heart attack, 20% for stroke, and 10% for hyperglycemic crisis.

What are the implications for public health practice?

Persons experiencing chest pain, loss of motor function, altered mental status, or other life-threatening issues should seek immediate emergency care, regardless of the pandemic. Communication from public health and health care professionals should reinforce the importance of timely care for acute health conditions and assure the public that EDs are implementing infection prevention and control guidelines to ensure the safety of patients and health care personnel.

References

1. Hartnett KP, Kite-Powell A, DeVies J, et al. Impact of the COVID-19 pandemic on emergency department visits—United States, January 1, 2019–May 30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:699–704. https://doi.org/10.15585/mmwr.mm6923e1
2. Garcia S, Albaghdadi MS, Meraj PM, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. J Am Coll Cardiol 2020;75:2871–2. https://doi.org/10.1016/j.jacc.2020.04.011
3. Solomon MD, McNulty EJ, Rana JS, et al. The COVID-19 pandemic and the incidence of acute myocardial infarction. N Eng J Med 2020. Epub May 19, 2020.
4. Bhatt AS, Moscone A, McElrath EE, et al. Declines in hospitalizations for acute cardiovascular conditions during the COVID-19 pandemic: a multicenter tertiary care experience. J Am Coll Cardiol 2020;20:35393–6.
5. Gogia S, Newton-Dame R, Boudourakis L, et al. COVID-19 X-curves: illness hidden, illness deferred. N Eng J Med Catalyst 2020. Epub May 29, 2020.
6. Metzler B, Siostrzonek P, Binder RK, Bauer A, Reinstadler SJ. Decline of acute coronary syndrome admissions in Austria since the outbreak of COVID-19: the pandemic response causes cardiac collateral damage. Eur Heart J 2020;41:1852–3. https://doi.org/10.1093/eurheartj/ehaa314
7. Kansagra AP, Goyal MS, Hamilton S, et al. Collateral effect of COVID-19 on stroke evaluation in the United States. N Eng J Med 2020. Epub May 8, 2020.
8. Benoit SR, Hora I, Pasquel FJ, Gregg EW, Albright AL, Imperatore G. Trends in emergency department visits and inpatient admissions for hyperglycemic crisis in adults with diabetes in the U.S., 2006–2015. Diabetes Care 2020;43:1057–64. https://doi.org/10.2337/dc19-2449
9. McCormick N, Lacaille D, Bhole V, Avina-Zubieta JA. Validity of myocardial infarction diagnoses in administrative databases: a systematic review. PLoS One 2014;9:e92286. https://doi.org/10.1371/journal.pone.0092286
10. McCormick N, Bhole V, Lacaille D, Avina-Zubieta JA. Validity of diagnostic codes for acute stroke in administrative databases: a systematic review. PLoS One 2015;10:e0135834. https://doi.org/10.1371/journal.pone.0135834

Notes from the Field

E-cigarette, or Vaping, Product Use–Associated Lung Injury Cases During the COVID-19 Response — California, 2020

Christina Armatas, MD[1]; Amy Heinzerling, MD[1,2]; Jason A. Wilken, PhD[1,3,4]

In April 2020, during the early coronavirus disease 2019 (COVID-19) pandemic, eight patients hospitalized with e-cigarette, or vaping, product use–associated lung injury (EVALI) were reported to the California Department of Public Health (CDPH). Patients resided in five counties and were aged 14–50 years (median = 17 years); seven were aged <21 years. All hospitalizations occurred in April 2020, a median of 4 days (range = 4–13 days) after symptom onset. Four patients were admitted to an intensive care unit; two required mechanical ventilation. Nucleic acid testing for SARS-CoV-2, the virus that causes COVID-19, was performed on all patients at the time of hospitalization; all tests yielded negative results. Seven patients were tested two or more times, and lower respiratory tract specimens were tested from the intubated and mechanically ventilated patients. Patients met California and CDC EVALI case definitions, including negative respiratory pathogen testing and chest imaging findings consistent with EVALI (Box).* Health care providers first documented suspicion for EVALI in their notes on hospital days 1–8 (median = day 3), after testing for SARS-CoV-2 returned negative results. Six patients reported vaping tetrahydrocannabinol (THC)-containing products, one reported vaping only nicotine-containing products, and one did not specify products vaped. Seven patients had positive test results for THC on urine drug screen; one patient not tested by urine drug screen reported vaping THC. No epidemiologic links were identified among the patients. Two patients reported obtaining their vaping products from friends; six patients were not asked or did not disclose vaping product source. Recreational cannabis use is legal in California for adults aged ≥21 years. Products might have been acquired from informal or unlicensed sources by patients aged <21 years who reported THC product use.

California identified 210 EVALI cases hospitalized during June 18, 2019–February 23, 2020,† and 65 of 87 (75%) interviewed patients reported using THC vaping products obtained from informal sources (*1*). EVALI hospitalizations peaked nationwide in September 2019.§ Because of substantial declines in EVALI cases following their peak in September 2019, CDC discontinued the collection of EVALI case reports in February 2020. However, states could continue to collect data on EVALI cases. Because CDPH received reports of only four EVALI cases in February 2020, CDPH asked local

BOX. Provisional California Department of Public Health confirmed e-cigarette, or vaping, product use–associated lung injury (EVALI) case definition*

- Respiratory illness requiring hospitalization and
- Using an e-cigarette (vaping) or dabbing in the 90 days before symptom onset† and
- Pulmonary infiltrate, such as opacities on plain film chest radiograph or ground-glass opacities on chest computed tomogram and
- Absence of respiratory infection on initial work-up: minimum criteria include the following negative tests: 1) SARS-CoV-2 nucleic acid test,§ and 2) respiratory viral polymerase chain reaction (PCR) panel, and 3) influenza PCR or rapid test, if local epidemiology supports testing, and 4) all other clinically indicated respiratory infectious disease testing (e.g., urine antigen for *Streptococcus pneumoniae* and *Legionella*, sputum culture if productive cough, bronchoalveolar lavage culture if done, blood culture, and human immunodeficiency virus–related opportunistic respiratory infections if appropriate) and
- No evidence in medical record of alternative plausible diagnoses (e.g., cardiac, rheumatologic, or neoplastic process).

* California has suspended use of the probable case definition, in which the patient has infection identified via culture or PCR but clinical team caring for patient believes this is not the sole cause of the underlying respiratory disease process; or patient has no evidence of pulmonary infection, but minimum criteria to rule out pulmonary infection not met (testing not performed).

† Includes using an electronic device (e.g., electronic nicotine delivery system [ENDS], electronic cigarette, e-cigarette, vaporizer, vape(s), vape pen, dab pen, or other) or dabbing to inhale substances (e.g., nicotine, marijuana, tetrahydrocannabinol (THC), THC concentrates, cannabidiol, synthetic cannabinoids, flavorings, or other substances).

§ For critically ill patients requiring mechanical ventilation, a minimum of two negative SARS-CoV-2 tests are required, and at least one of the two specimens must be from a lower respiratory tract sample or bronchoalveolar lavage.

* https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/health-departments/index.html.

† https://www.cdph.ca.gov/Programs/CCDPHP/Pages/EVALI-Weekly-Public-Report.aspx.

§ https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html.

jurisdictions to continue to report cases but discontinue active case interviews and follow-up at that time. The cases in April 2020 were the first reported to CDPH since February 2020 and the first since widespread transmission of SARS-CoV-2 was identified in California. It is unclear whether EVALI cases have continued to occur and were underreported or missed or whether these cases might represent the background incidence of EVALI as previously identified by CDC review of syndromic data (*2*). Because EVALI and COVID-19 signs and symptoms can be similar (e.g., cough, fever, and diarrhea),[¶] (*3*) health care providers should maintain clinical suspicion for EVALI during the COVID-19 pandemic.

In May 2020, CDPH issued a health alert provisionally updating California's EVALI case definition to require a negative SARS-CoV-2 nucleic acid test (Box) and suspending the probable case definition.[**] It is important that health care providers ask patients with symptoms consistent with EVALI, especially teenagers and young adults, about e-cigarette use, or vaping, during COVID-19 evaluations. CDPH urges everyone to refrain from using all e-cigarette, or vaping, products and recommends not using THC-containing products obtained from informal sources such as social contacts, online dealers, and unlicensed retailers.[††]

¶ https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.

** The CDC-Council of State and Territorial Epidemiologists case definition of EVALI has not been modified as of June 3 (https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/health-departments/index.html#primary-case-def).

†† https://www.cdph.ca.gov/Programs/CCDPHP/Pages/Vaping-Health-Advisory.aspx.

Corresponding author: Jason Wilken, jason.wilken@cdph.ca.gov.

[1]Center for Healthy Communities, California Department of Public Health, Richmond, California; [2]Epidemic Intelligence Service, CDC; [3]Career Epidemiology Field Officer Program, CDC; [4]U.S. Public Health Service, Rockville, Maryland.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Heinzerling A, Armatas C, Karmarkar E, et al. Severe lung injury associated with use of e-cigarette, or vaping, products—California, 2019. JAMA Intern Med 2020;180:1–9. https://doi.org/10.1001/jamainternmed.2020.0664
2. Hartnett KP, Kite-Powell A, Patel MT, et al. Syndromic surveillance for e-cigarette, or vaping, product use-associated lung injury. N Engl J Med 2020;382:766–72. https://doi.org/10.1056/NEJMsr1915313
3. CDC. Smoking & tobacco use. Outbreak of lung injury associated with e-cigarette use, or vaping. Frequently asked questions. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/faq/index.html

Notes from the Field

Measles Outbreak Associated with International Air Travel — California, March–April 2017

Lihan Lu, MSPH[1]; Efrosini Roland[1,2]; Eric Shearer, MPH[3]; Matthew Zahn, MD[3]; Maria Djuric[4]; Eric McDonald, MD[4]; Susan Redd, PhD[5]; Kara Tardivel, MD[1]

On March 14, 2017, the County of San Diego Health and Human Services Agency (COSD HHSA) notified CDC of a measles case in an adult airline passenger (patient A), with recent travel to Indonesia. The patient had developed rash and swollen eyes during a flight from Hong Kong to Los Angeles on March 8, followed by conjunctivitis and cough after arrival; the patient proceeded to an urgent care clinic, but a measles diagnosis was not considered. On March 9, patient A visited the clinic again, at which time measles was confirmed by polymerase chain reaction (PCR) testing on March 14. Patient A reported having received 1 dose of measles, mumps, and rubella (MMR) vaccine. CDC identified 22 contacts from the flight, involving seven U.S. states and two countries; potentially exposed flight crew were notified on March 15. COSD HHSA identified 483 community contacts, 81 of whom received self-quarantine recommendations because they lacked presumptive evidence of immunity.*

On March 28, COSD HHSA confirmed measles in patient B, an adult with unknown vaccination status, who had been exposed to patient A in the clinic waiting room during patient A's first visit on March 8. Serologic testing indicated that patient B was not immune to measles, and the patient had been instructed to self-quarantine until March 29. On March 24, patient B developed fever, cough, and sore throat and visited an urgent care clinic, informed the clinician of the measles exposure, but measles was not considered. The patient notified COSD HHSA when rash developed on March 25; measles was confirmed March 27 by PCR testing. Contact investigation of patient B identified 31 contacts, most linked to a home-based day care center where patient B resided, resulting in self-quarantine recommendations for six persons because they lacked presumptive evidence of immunity.

On March 31, the Orange County Health Care Agency (OCHCA) notified CDC of a measles case in patient C, a flight attendant who served patient A during the March 8 flight and reported having received 2 MMR doses. Patient C developed a mild cough on March 23 while working on a flight to the United States and developed subjective fever and a rash the next day. Patient C visited an urgent care clinic on March 25 and tested negative for measles immunoglobulin M; however, specimens collected March 30 by OCHCA and tested by PCR confirmed measles. The March 23 flight contact investigation included 164 passengers from 27 states and eight countries; OCHCA identified 12 community contacts, all of whom had documentation of immunity.

On April 3 and 10, OCHCA confirmed measles in two siblings. Patients D and E, aged 14 and 12 years, developed rash on April 2 and April 11, respectively. They resided in the same county as patient C, and neither had received measles-containing vaccine. Investigation at three community exposure sites identified 338 contacts and resulted in school exclusion of six students lacking documentation of immunity, including issuance of one quarantine order. Further investigations could not establish a link between patient C and patients D and E. Isolates from all five patients (A–E) were genotyped as D8 with an identical corresponding nucleotide sequence (N450) and were the only isolates identified in the United States during March–April 2017.

This travel-associated measles outbreak serves to remind travelers, airlines, clinicians, and the public that vaccine-eligible adult travelers lacking evidence of immunity should receive 2 MMR doses before traveling internationally (*1*). Clinicians should always consider measles when evaluating patients with febrile rash illness and international travel histories and in any patient reporting measles exposure, regardless of rash. Persons with recent known exposure to measles, regardless of vaccination history, should self-isolate at the first sign of illness and immediately contact their local public health authority.

Contact investigation during measles outbreaks is costly to the public health system and labor-intensive; this investigation identified approximately 1,000 contacts who required follow-up (*2*). The high communicability of measles continues to challenge identification of epidemiologic linkage during measles investigations. International travel, particularly to countries with endemic measles or measles outbreaks, presents a risk for exposure and subsequent introduction to U.S. communities (*3,4*). Measles cases in flight attendants, including the case from this outbreak, prompted CDC to issue new measles recommendations for airlines (*5*).

* Acceptable presumptive evidence of immunity to measles include at least one of the following: 1) written documentation of adequate vaccination (2 doses of measles-containing vaccine administered at least 28 days apart for school-aged children, adolescents, and adults at high risk, including international travelers; or 1 or more dose of measles-containing vaccine administered on or after first birthday for preschool-aged children and adults not at high risk), 2) laboratory confirmation of measles, 3) laboratory evidence of immunity, or 4) birth before 1957.

Acknowledgments

County of San Diego Health & Human Services Agency; Orange County Health Care Agency; California Department of Public Health; CDC Measles Virus Laboratory; CDC San Diego Quarantine Station; CDC Los Angeles Quarantine Station.

Corresponding author: Kara Tardivel, wjf3@cdc.gov, 310-215-2365.

[1]Division of Global Migration and Quarantine, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]Eagle Medical Services, Atlanta, Georgia; [3]Orange County Health Care Agency, California; [4]County of San Diego Health & Human Services Agency, California; [5]Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

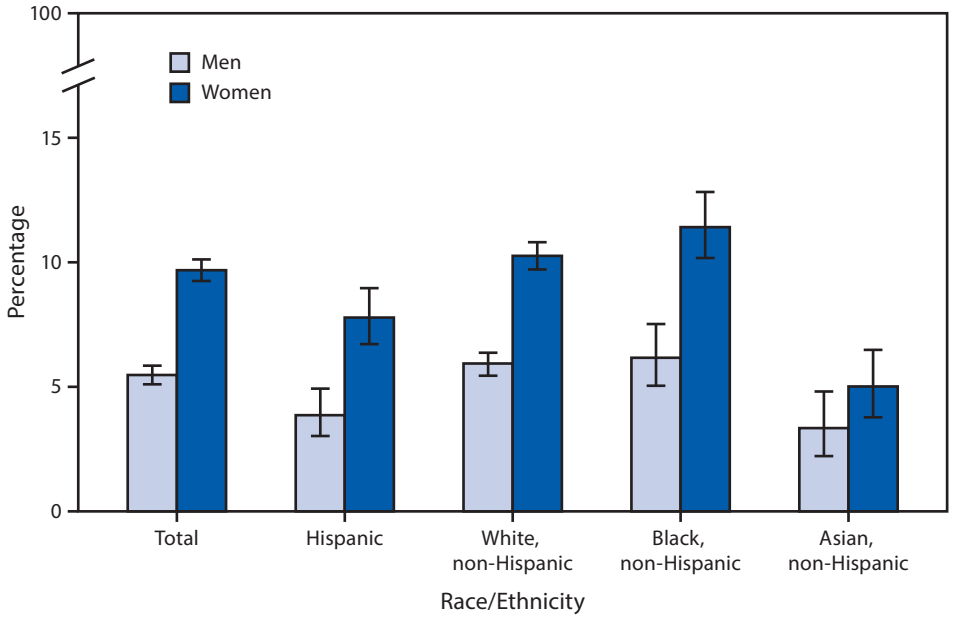
References

1. McLean HQ, Fiebelkorn AP, Temte JL, Wallace GS; CDC. Prevention of measles, rubella, congenital rubella syndrome, and mumps, 2013: summary recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2013;62(No. RR-4).
2. Collier MG, Cierzniewski A, Duszynski T, et al. Measles outbreak associated with international travel, Indiana, 2011. J Pediatric Infect Dis Soc 2013;2:110–8. https://doi.org/10.1093/jpids/pis132
3. Patel M, Lee AD, Redd SB, et al. Increase in measles cases—United States, January 1–April 26, 2019. MMWR Morb Mortal Wkly Rep 2019;68:402–4. https://doi.org/10.15585/mmwr.mm6817e1
4. Lee AD, Clemmons NS, Patel M, Gastañaduy PA. International importations of measles virus into the United States during the postelimination era, 2001–2016. J Infect Dis 2019;219:1616–23. https://doi.org/10.1093/infdis/jiy701
5. CDC. Recommendations for airlines to help reduce risk of measles transmission through air travel. Atlanta, GA: US Department of Health and Human Services, CDC; 2019. https://www.cdc.gov/quarantine/air/managing-sick-travelers/airline-recommendations.html

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Percentage* of Adults Aged ≥ 18 Years Who Currently Have Asthma,† by Sex and Race/Ethnicity§ — National Health Interview Survey, United States, 2017–2018¶



* Age-adjusted percentages are based on the 2000 U.S. Census standard population, using age groups 18–44, 45–64, 65–74, and ≥75 years, with 95% confidence intervals indicated by error bars.
† Adults who were ever told by a doctor or other health professional that they had asthma were asked "Do you still have asthma?"
§ Categories shown for non-Hispanic respondents are only for those who selected one racial group; respondents had the option to select more than one racial group. Hispanic respondents might be of any race or combination of races. Only selected groups are shown in the individual race/ethnicity bars, but total bar shows results for all adults aged ≥18 years.
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey Sample Adult component.

During 2017–2018, women aged ≥18 years were more likely than men (9.7% versus 5.5%) to currently have asthma. This pattern prevailed in each of the race/ethnicity groups: Hispanic adults (7.8% versus 3.9%); non-Hispanic white adults (10.3% versus 5.9%); non-Hispanic black adults (11.4% versus 6.2%); and non-Hispanic Asian adults (5.0% versus 3.3%). Non-Hispanic white and non-Hispanic black men were more likely to currently have asthma than were Hispanic and non-Hispanic Asian men. The same pattern existed among women.

Source: National Health Interview Survey, 2017–2018 data. http://www.cdc.gov/nchs/nhis.htm.

Reported by: Amy E. Cha, PhD, oty6@cdc.gov, 301-458-4236; Debra L. Blackwell, PhD.

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

Readers who have difficulty accessing this PDF file may access the HTML file at *https://www.cdc.gov/mmwr/index2020.html*. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Executive Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30329-4027 or to mmwrq@cdc.gov.

ISSN: 0149-2195 (Print)