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Barriers to Antiretroviral Therapy Adherence Among HIV-Positive Hispanic and Latino Men Who Have Sex with Men — United States, 2015–2019

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During 2018, estimated incidence of human immunodeficiency virus (HIV) infection among Hispanic and Latino (Hispanic/Latino) persons in the United States was four times that of non-Hispanic White persons (*1*). Hispanic/Latino men who have sex with men (MSM) accounted for 24% (138,023) of U.S. MSM living with diagnosed HIV infection at the end of 2018 (*1*). Antiretroviral therapy (ART) adherence is crucial for viral suppression, which improves health outcomes and prevents HIV transmission (*2*). Barriers to ART adherence among Hispanic/Latino MSM have been explored in limited contexts (*3*); however, nationally representative analyses are lacking. The Medical Monitoring Project reports nationally representative estimates of behavioral and clinical experiences of U.S. adults with diagnosed HIV infection. This analysis used Medical Monitoring Project data collected during 2015–2019 to examine ART adherence and reasons for missing ART doses among HIV-positive Hispanic/Latino MSM (1,673). On a three-item ART adherence scale with 100 being perfect adherence, 77.3% had a score of ≥85. Younger age, poverty, recent drug use, depression, and unmet needs for ancillary services were predictors of lower ART adherence. The most common reason for missing an ART dose was forgetting; 63.9% of persons who missed ≥1 dose reported more than one reason. Interventions that support ART adherence and access to ancillary services among Hispanic/Latino MSM might help improve clinical outcomes and reduce transmission.

The Medical Monitoring Project used a two-stage sampling method. During the first stage, 16 states and one territory were sampled from all U.S. states, the District of Columbia, and Puerto Rico. During the second stage, simple random samples of adults with diagnosed HIV infection were selected for each participating jurisdiction from the National HIV Surveillance System, a census of persons with diagnosed HIV infection in the United States. In-person or telephone interviews were conducted during the 2015–2018 data cycles,* in which self-reported sociodemographic characteristics, ART adherence, drug and alcohol use, and symptoms of depression† and anxiety§ were ascertained.

* Interviews are conducted during June–May for each annual cycle; this analysis combined 2015–2018 cycles. Response rates for participants ranged from 40% to 46% by cycle year.

† Symptoms of depression during the previous 2 weeks were assessed using the eight-item Patient Health Questionnaire.

§ Symptoms of anxiety during the previous 2 weeks were assessed using the Generalized Anxiety Disorder Scale.

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ART adherence during the 30 days before the interview was assessed using a three-item scale; responses were aggregated and transformed into a previously validated composite score (range = 0–100), which has high internal reliability and is consistent with electronic drug monitoring measures (*4*,*5*). Ancillary services¶ were defined as services that enable and support participants' retention in HIV care (*6*). Sustained viral suppression was defined as all viral load measurements in the previous 12 months documented as undetectable or <200 viral RNA copies/mL.** Reasons for most recent missed ART dose consisted of predefined options that respondents could select and were limited to the 2018 data cycle because of skip-pattern changes that limited comparability with earlier data cycles.

This analysis was limited to men who self-identified as Hispanic/Latino, regardless of race, who were currently taking ART and self-identified as MSM (i.e., gay or bisexual or who reported having had sex with one or more men during the previous 12 months) (1,673). Among HIV-positive Hispanic/Latino MSM, the three components of the ART adherence scale and the ART adherence scale score (dichotomized as ≥85 versus <85 on the basis of the distribution of scores), by selected characteristics, were examined by using weighted percentages with corresponding 95% confidence intervals (CIs). Characteristics associated with high ART adherence (score ≥85) were assessed by using a multivariable logistic regression model to describe adjusted prevalence ratios (aPRs) with predicted marginal means (*7*). Characteristics with bivariate associations with ART adherence (p<0.1) were eligible for possible inclusion in the model. Backward selection was used to determine final model selection, where eligible covariates with significant associations (p<0.05) were retained in the final model. Among persons who reported ever missing ≥1 ART dose (348 during the 2018 data cycle), reasons for most recent missed dose were described; participants could report more than one reason. Sustained viral suppression status was assessed, comparing those with higher adherence (i.e., adherence score ≥85) with those with lower adherence (i.e., adherence score <85), using a univariate prevalence ratio (PR). All analyses were weighted to adjust for individual nonresponse and poststratified to known population totals by age, race/ethnicity, and sex from the National HIV Surveillance System. Analyses were conducted using survey procedures in SAS software (version 9.4; SAS Institute) and SAS-callable SUDAAN (version 11.0.3; RTI International).

During 2015–2019, 57.4% of Hispanic/Latino MSM reported taking all ART doses during the previous month, 52.9% reported doing an excellent job taking their medications, and 69.2% reported always taking their medications as recommended (Table 1). ART adherence was high for 77.3%

¶ Ancillary services include HIV case management services, ART adherence counseling services, AIDS Drug Assistance Program services, patient navigation services, HIV peer-group support, dental services, drug or alcohol counseling or treatment, mental health services, transportation assistance, shelter/housing services, Supplemental Security Income, Social Security Disability Insurance, food assistance, meals or food services, interpreter services, or legal services.

** Persons with unknown viral load measurements were analyzed with those with detectable viral loads.

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Summary

What is already known about this topic?

Antiretroviral therapy (ART) adherence is crucial for viral suppression, a critical outcome for maintaining health in persons with HIV infection. Hispanic/Latino men who have sex with men (MSM) have disproportionately high HIV infection rates; their barriers to ART adherence have not been extensively explored.

What is added by this report?

ART adherence was lower among younger Hispanic/Latino MSM and those who experienced poverty or reported drug use, depression, or unmet ancillary service needs. The most common reason for missing ART doses was forgetting (63.1%); 63.9% who missed doses reported multiple reasons.

What are the implications for public health practice?

Expanding access to ancillary services among Hispanic/Latino MSM, particularly those experiencing barriers to ART adherence, might improve clinical outcomes.

(Table 2). Younger persons and those at or below the federal poverty threshold were less likely to report high ART adherence. Reported ART adherence was lower among persons who reported drug use in the previous year (67.2%) than among those who did not (81.9%), among persons who reported a recent history of depression (66.3%) than among those who did not (79.9%), and among persons who had unmet needs for ancillary services (71.6%) than among those without unmet needs (83.0%). Anxiety and history of homelessness were not associated with ART adherence after adjustment for other factors. Among persons who had ever missed ≥1 ART dose, the most commonly reported reasons for the most recent missed dose were forgetting to take medication (63.1%), a change in daily routine or travel (42.3%), and having fallen asleep early or overslept (33.6%) (Table 3). Approximately 64% of persons who missed ≥1 dose reported multiple reasons for missing ART. Sustained viral suppression was more common among persons with ART adherence scores ≥85 (75.3%) than among persons with lower scores (59.7%; PR = 0.61; 95% CI = 0.51–0.74).

TABLE 1. Adherence to antiretroviral therapy (ART) among Hispanic/Latino men who have sex with men currently taking ART (N = 1,673) — Medical Monitoring Project, United States, 2015–2019

Interview question	No.*	% (95% CI)†
How many days did you miss ≥1 dose of any of your HIV medicines?§		
0	943	57.4 (54.7–60.1)
1–2	489	29.2 (26.7–31.7)
3–5	151	8.5 (6.9–10.1)
6–10	52	3.0 (1.9–4.0)
≥11	36	2.0 (1.3–2.6)
How well did you do at taking your HIV medicines in the way you were supposed to?§		
Very poor	18	0.9 (0.5–1.3)
Poor	21	1.3 (0.6–2.0)
Fair	86	5.5 (4.0–7.0)
Good	207	11.6 (9.9–13.3)
Very good	472	27.8 (25.1–30.5)
Excellent	869	52.9 (49.9–55.9)
How often did you take your HIV medicines in the way you were supposed to?§		
Never	14	0.7 (0.3–1.1)
Rarely	—¶	—¶
Sometimes	36	2.0 (1.4–2.7)
Usually	79	5.0 (3.7–6.4)
Almost always	374	22.7 (20.1–25.3)
Always	1,163	69.2 (66.4–72.0)

Abbreviations: CI = confidence interval; HIV = human immunodeficiency virus.
* Numbers might not sum to total because of missing data, and percentages might not sum to 100 because of rounding.
† Percentages and corresponding CIs are weighted percentages.
§ Time frame for all questions is the 30 days before the interview.
¶ Value is excluded because coefficient of variation >0.30.

Discussion

Although high overall, self-reported ART adherence among HIV-positive Hispanic/Latino MSM was lower among younger persons, those living at or below poverty, and those who reported drug use, depression, and unmet needs for ancillary services. The most commonly reported reason for last missed ART dose was forgetting to take it; three in five persons reported multiple reasons. These results indicate possible avenues for interventions to help Hispanic/Latino MSM engage in care and remain ART-adherent.

Ancillary services (e.g., counseling for mental health and substance use disorders, financial support, and assistance with food and housing) might reduce barriers to ART adherence. Colocating these services with outpatient care (e.g., HIV patient-centered medical home model of the Ryan White HIV/AIDS Program)(*8*) can encourage engagement and retention in HIV care. In a study of ART adherence among African American and Hispanic/Latino MSM, younger participants reported better adherence when their care location also offered ancillary services to help them address other needs (*3*). Making these services more broadly available and easily accessible might remove barriers to ART adherence and improve health outcomes.

Approximately two thirds of persons who had missed ≥1 ART dose reported having forgotten to take it. Interventions that include reminders might help prevent these lapses. An analysis of systematic reviews of ART adherence interventions found that text messaging interventions were among the most successful for improving both self-reported adherence and viral load (*9*). Other interventions that have increased ART adherence include peer support and cognitive behavioral therapy. Interventions that include multiple strategies were more likely to increase ART adherence, although effects were often short-lived (*10*).

TABLE 2. Prevalence of medication adherence and association with selected sociodemographic characteristics among Hispanic/Latino men who have sex with men currently taking antiretroviral therapy (ART) (N = 1,673) — Medical Monitoring Project, United States, 2015–2019

		Adherence score ≥85†		Unadjusted		Adjusted	
Characteristic	Total no.*	No.*	% (95% CI)§	Prevalence ratio (95% CI)	P-value	Prevalence ratio (95% CI)	P-value
Sociodemographic variables							
Age group (yrs)							
18–29	**192**	126	65.7 (57.3–74.1)	0.79 (0.69–0.90)	<0.001	0.85 (0.76–0.96)	0.005
30–39	**398**	279	72.2 (66.9–77.5)	0.86 (0.79–0.94)		0.88 (0.80–0.96)	
40–49	**482**	372	77.8 (73.3–82.2)	0.93 (0.87–1.00)		0.94 (0.87–1.01)	
≥50	**598**	492	83.6 (80.4–86.7)	Reference		Reference	
Education level							
Less than high school	**207**	158	75.2 (68.3–82.2)	0.95 (0.86–1.05)	0.069	—¶	—
High school diploma or equivalent	**342**	242	72.6 (67.0–78.2)	0.92 (0.85–1.00)		—	—
More than high school	**1,120**	868	79.1 (76.3–81.8)	Reference		—	—
Household poverty level**							
Above threshold	**1,024**	801	79.7 (76.8–82.6)	Reference	0.002	Reference	0.024
At or below threshold	**535**	380	71.5 (66.8–76.2)	0.90 (0.83–0.96)		0.93 (0.87–0.99)	
Homeless††							
Yes	**124**	72	60.7 (50.9–70.5)	0.77 (0.66–0.91)	<0.001	—	—
No	**1,546**	1,197	78.5 (76.0–81.0)	Reference		—	—
Risk behaviors							
Binge drinking, previous 30 days§§							
Yes	**405**	289	74.0 (68.6–79.4)	0.94 (0.87–1.02)	0.142	—	—
No	**1,254**	974	78.4 (75.7–81.2)	Reference		—	—
Drug use, previous 12 mos							
Yes	**548**	349	67.2 (62.2–72.3)	0.82 (0.76–0.89)	<0.001	0.86 (0.80–0.93)	<0.001
No	**1,114**	916	81.9 (79.4–84.4)	Reference		Reference	
Clinical variables							
Time since HIV diagnosis (yrs)							
<5	**377**	279	72.3 (66.7–77.8)	0.91 (0.84–0.99)	0.058	—	—
5–9	**386**	290	77.4 (72.5–82.4)	0.98 (0.91–1.05)		—	—
≥10	**905**	698	79.2 (76.3–82.1)	Reference		—	—
Symptoms of depression, previous 2 wks¶¶							
Yes	**323**	206	66.3 (60.3–72.4)	0.83 (0.76–0.91)	<0.001	0.91 (0.83–1.00)	0.026
No	**1,335**	1,054	79.9 (77.3–82.5)	Reference		Reference	
Symptoms of generalized anxiety disorder, previous 2 wks***							
Yes	**349**	234	69.5 (63.2–75.8)	0.88 (0.80–0.96)	0.001	—	—
No	**1,315**	1,031	79.4 (76.9–81.9)	Reference		—	—
Attended Ryan White–funded facility for usual care							
Yes	**1,165**	878	76.5 (73.5–79.5)	0.96 (0.90–1.03)	0.266	—	—
No	**436**	341	79.7 (75.1–84.3)	Reference		—	—
Retained in care, previous 12 mos†††							
Yes	**1,462**	1,122	78.2 (75.8–80.7)	Reference	0.180	—	—
No	**153**	108	72.2 (63.1–81.3)	0.92 (0.81–1.05)		—	—
Health insurance type							
Any private insurance	**652**	519	80.3 (76.7–83.9)	Reference	0.130	—	—
Public insurance only	**764**	557	75.4 (71.7–79.1)	0.94 (0.88–1.00)		—	—
Uninsured or Ryan White HIV/AIDS Program coverage only	**239**	181	75.0 (68.8–81.2)	0.93 (0.85–1.03)		—	—
Had at least one unmet need for ancillary services, previous 12 mos§§§							
At least one unmet need	**832**	581	71.6 (67.7–75.5)	0.86 (0.81–0.92)	<0.001	0.89 (0.83–0.95)	0.001
Received or did not need services	**836**	687	83.0 (80.0–85.9)	Reference		Reference	
Received adherence support services							
Yes	**624**	474	77.7 (73.8–81.5)	Reference	0.851	—	—
No	**1,042**	794	77.2 (74.2–80.2)	0.99 (0.94–1.06)		—	—

Abbreviations: CI = confidence interval; HIV = human immunodeficiency virus.
* Numbers are unweighted.
† Adherence scale score is composite of three variables (number of missed days of ART, how often respondent took ART correctly, and how good of a job taking ART respondent reported) and ranges from 0 to 100, with 100 indicating perfect adherence.
§ Percentages and corresponding CIs are weighted percentages.
¶ Dash indicates that a value is not applicable.
** Poverty guidelines as defined by the U.S. Department of Health and Human Services.
†† Living on the street, in a shelter, in a single-room–occupancy hotel, or in a car.
§§ Binge drinking for men is defined as five or more alcoholic drinks in one sitting.
¶¶ Depression was assessed by using the eight-item Patient Health Questionnaire algorithm.
*** Anxiety was assessed by using the Generalized Anxiety Disorder Scale.
††† Retention in care was defined as documentation of two indications of outpatient HIV care, including a documented visit with an HIV provider, a documented $CD4^+$ or viral load test, or a documented resistance test or tropism assay, ≥90 days apart during the previous 12 months.
§§§ Ancillary services include HIV case management services, adherence counseling services, AIDS Drug Assistance Program services, patient navigation services, HIV peer group support, dental services, drug or alcohol counseling or treatment, mental health services, transportation assistance, shelter/housing services, Supplemental Security Income, Social Security Disability Insurance, food assistance, meals or food services, interpreter services, or legal services.

TABLE 3. Reason for most recent missed antiretroviral therapy (ART) dose* among Hispanic/Latino men who have sex with men (MSM) with diagnosed human immunodeficiency virus (HIV) infection currently taking ART and number who reported multiple reasons — Medical Monitoring Project, United States, 2018–2019†

Reason	No.§	% (95% CI)¶
Forgetting to take HIV medicines		
Yes	222	63.1 (55.7–70.5)
No	126	36.9 (29.5–44.3)
Change in daily routine or travel		
Yes	156	42.3 (36.8–47.9)
No	192	57.7 (52.1–63.2)
Fell asleep early or overslept		
Yes	121	33.6 (28.7–38.5)
No	227	66.4 (61.5–71.3)
Problem getting prescription or refill for HIV medicines		
Yes	63	18.8 (14.5–23.0)
No	285	81.2 (77.0–85.5)
Felt depressed or overwhelmed		
Yes	67	17.6 (13.7–21.6)
No	281	82.4 (78.4–86.3)
Did not feel like taking HIV medicines		
Yes	41	13.0 (8.9–17.1)
No	307	87.0 (82.9–91.1)
Drug or alcohol use		
Yes	41	11.8 (7.9–15.7)
No	307	88.2 (84.3–92.1)
Side effects from HIV medicines		
Yes	38	10.7 (7.4–14.0)
No	309	89.3 (86.0–92.6)
Problem paying for HIV medicines		
Yes	25	6.6 (3.4–9.8)
No	323	93.4 (90.2–96.6)
In the hospital or too sick to take HIV medicines		
Yes	16	4.5 (2.6–6.5)
No	332	95.5 (93.5–97.4)
Reported multiple reasons for missing ART		
Yes	223	63.9 (58.1–69.7)
No	125	36.1 (30.3–41.9)

Abbreviation: CI = confidence interval.
* Respondents could select multiple reasons for missing a dose.
† Data limited to 2018 cycle because of changes in skip-pattern preceding questions.
§ Numbers might not sum to total because of missing data, and percentages might not sum to 100 because of rounding.
¶ Percentages and corresponding CIs are weighted percentages.

In 2019, the U.S. Department of Health and Human Services proposed Ending the HIV Epidemic: A Plan for America (EHE) (*2*). Two of the four primary pillars of EHE are early HIV diagnosis and treatment of HIV infection to help persons achieve and maintain viral suppression to prevent morbidity and further transmission. CDC is working with state and local partners and other stakeholders to use interventions that support the four EHE pillars.[††] For example, Sin Buscar Excusas/No Excuses is a video-based intervention for Hispanic/Latino MSM that is intended to prevent transmission by increasing sexual safety, HIV testing, and HIV care.[§§] Another intervention, Helping Enhance Adherence to Antiretroviral Therapy (HEART), helps patients develop individualized adherence plans by using problem-solving activities to identify and address their ART adherence barriers. HEART also incorporates a patient-identified support partner to aid in meeting ART adherence goals.[¶¶]

The findings in this report are subject to at least three limitations. First, data ascertained through participant interviews, including information on ART adherence, were based on self-report and might be subject to social desirability or recall bias. Second, results were adjusted to minimize nonresponse bias on the basis of standard methodology; however, the possibility of residual nonresponse bias remains. Finally, reasons for missing ART doses might not be exhaustive.

This report highlights barriers to ART adherence faced by Hispanic/Latino MSM with diagnosed HIV infection. Culturally tailored interventions aimed at improving adherence, particularly among Hispanic/Latino MSM who are younger, live in poverty, use drugs, and have unmet needs for ancillary services, might improve viral suppression, leading to better health outcomes and decreasing HIV transmission.

†† https://www.cdc.gov/hiv/effective-interventions/a-to-z.html.
§§ https://www.cdc.gov/hiv/effective-interventions/prevent/sin-buscar-excusas.
¶¶ https://www.cdc.gov/hiv/effective-interventions/treat/heart.

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Characteristics Associated with Adults Remembering to Wash Hands in Multiple Situations Before and During the COVID-19 Pandemic — United States, October 2019 and June 2020

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Washing hands often, especially during times when one is likely to acquire and spread pathogens,* is one important measure to help prevent the spread of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), as well as other pathogens spread by respiratory or fecal-oral transmission (*1*,*2*). Studies have reported moderate to high levels of self-reported handwashing among adults worldwide during the COVID-19 pandemic (*3*–*5*)[†]; however, little is known about how handwashing behavior among U.S. adults has changed since the start of the pandemic. For this study, survey data from October 2019 (prepandemic) and June 2020 (during pandemic) were compared to assess changes in adults' remembering to wash their hands in six situations.[§] Statistically significant increases in reported handwashing were seen in June 2020 compared with October 2019 in four of the six situations; the odds of remembering to wash hands was 2.3 times higher among respondents after coughing, sneezing, or blowing their nose, 2.0 times higher before eating at a restaurant, and 1.7 times higher before eating at home. Men, young adults aged 18–24 years, and non-Hispanic White (White) adults were less likely to remember to wash hands in multiple situations. Strategies to help persons remember to wash their hands frequently and at important times should be identified and implemented, especially among groups reporting low prevalence of remembering to wash their hands.

Data from ConsumerStyles fall and summer surveys conducted by Porter Novelli Public Services in October 2019 and June 2020 were analyzed for this study.[¶] These data are collected by Porter Novelli Public Services through Ipsos' Knowledge Panel, an online market research panel. This panel is designed to be representative of the noninstitutionalized U.S. population, and panel members are recruited randomly by mail through probability, address-based sampling. Respondents receive points for participating in the panel, which can be used to redeem cash and prizes. The samples from each year were weighted to match the U.S. population across eight characteristics: sex, age, annual household income, race/ethnicity, household size, education, U.S. Census division, and residence in a metropolitan area. Sampling weights were applied to all analyses.

The fall 2019 ConsumerStyles survey was completed by 3,624 participants during October 8–22, 2019, (77.5% response rate); the summer 2020 ConsumerStyles survey was completed by 4,053 participants during June 10–25, 2020, (62.7% response rate). The same handwashing question was asked in both surveys: "In which of these situations/settings are you most likely to remember to wash your hands?" with the following response options provided in a randomized order to each participant: 1) after using the bathroom at home; 2) after using the bathroom in public; 3) after coughing, sneezing, or blowing one's nose; 4) before eating at home; 5) before eating at a restaurant; and 6) before preparing food at home. Participants were asked to select all options for which they would be likely to remember to wash their hands and could choose as many of the six response options as were applicable. In addition to handwashing, collected data included information about demographic characteristics, household size, annual household income, employment status, and perceived health status. Differences in percentages from 2019 to 2020 were considered statistically significant when confidence intervals were not overlapping. Multivariable logistic regression was used to estimate odds ratios (ORs) for the association between remembering to wash hands and year, adjusting for sex, age group, race/ethnicity, health status, U.S. Census division, annual household income, work status, education, metro status, household size, and marital status. All analyses were performed using Stata (Version 15; Stata Corp LP).

The 2019 and 2020 populations were similar in composition across all demographic and socioeconomic characteristics. Respondents frequently reported remembering to wash hands before preparing food at home in 2019 (86.5%) and 2020 (85.7%) (Table 1), after using the bathroom at home (85.9% and 89.6%), and after using the bathroom in public (95.5% and 94.8%) (Table 2). Respondents less commonly reported remembering to wash hands before eating at home in 2019 (62.8%) and 2020 (74.4%), before eating at a restaurant (55.2% and 70.6%), and after coughing, sneezing, or blowing their nose (53.3% and 71.2%).

* https://www.cdc.gov/handwashing/when-how-handwashing.html.

† https://doi.org/10.1101/2020.04.01.20050039.

§ The six situations included the following: after using the bathroom at home; after using the bathroom in public; after coughing, sneezing, or blowing one's nose; before eating at home; before eating at a restaurant; and before preparing food at home.

¶ https://styles.porternovelli.com/consumer-youthstyles/.

In 2020, both men and women more frequently reported remembering to wash hands before eating at home and at a restaurant, and after coughing, sneezing, or blowing their nose than they did in 2019. When stratified by age group, a higher percentage of young adults (aged 18–24 years) in 2020 reported remembering to wash hands after having respiratory symptoms compared with 2019, and higher percentages of adults aged ≥25 years reported remembering to wash hands before eating at home and in a restaurant and after having respiratory symptoms in 2020 than did in 2019. In 2020, White participants more frequently reported remembering to wash hands before eating at home, before eating in a restaurant, after using the bathroom at home, and after having respiratory symptoms than they did in 2019. Non-Hispanic Black (Black) and Hispanic or Latino (Hispanic) participants more frequently reported remembering to wash hands after having respiratory symptoms in 2020 than they did in 2019.

Compared with 2019 responses, the odds of reporting remembering to wash hands before eating at home, before eating in a restaurant, after using the bathroom at home, and after coughing, sneezing, or blowing one's nose were significantly higher in 2020, after controlling for demographic and socioeconomic factors (aOR = 1.72, 2.01, 1.41, and 2.28, respectively) (Table 3). Regardless of year, men were significantly less likely than were women to remember to wash hands before eating at a restaurant, before preparing food, after using the bathroom at home, and after experiencing respiratory symptoms. In addition, young adults (aged 18–24 years) were less likely to remember to wash their hands before eating in a restaurant, before food preparation, and after having respiratory symptoms than were adults aged 45–74 years. Finally, compared with White participants, Black participants were more likely to remember to wash their hands before eating at home, before eating in a restaurant, after using the bathroom at home, and after experiencing respiratory symptoms. Hispanic participants were more likely than were White participants to remember to wash their hands before eating at home, before eating at a restaurant, and after experiencing respiratory symptoms, regardless of year.

Discussion

The findings in this report suggest that the percentage of U.S. adults who reported remembering to wash their hands in certain circumstances has increased during the COVID-19 pandemic compared with prepandemic levels. In June 2020, more U.S. adults reported remembering to wash their hands after coughing, sneezing, or blowing their nose, before eating in a restaurant, before eating at home, and after using the bathroom at home compared with responses in October 2019. The most substantial increases were in the percentages of those remembering to wash their hands after experiencing respiratory symptoms. Despite these increases, however, fewer than 75% of respondents reported remembering to wash their hands after having respiratory symptoms, before eating in a restaurant, and before eating at home. Efforts are needed to communicate the importance of handwashing during these specific situations as well as before food preparation and after using the bathroom.

In both 2019 (prepandemic) and 2020 (during the pandemic), higher percentages of older adults, women, Black persons, and Hispanic persons reported remembering to wash their hands in multiple situations than did young adults, men, and White adults. Because older adults, Black persons, and Hispanic persons have been disproportionately affected by COVID-19 (*6*), engagement in preventive behaviors by these persons is particularly important. The findings of this study are consistent with other studies conducted during the COVID-19 pandemic (*3*,*7*) and past respiratory pandemics (*8*) that have found an association between self-reported handwashing behavior and demographic factors such as sex and age. Although the current study did not explore the reasons for differences in remembering to wash hands among groups, previous work has indicated that older adults perceive personal risks of COVID-19 to be higher than do younger adults, and women have perceived themselves to be at higher risk of infection during respiratory pandemics than have men (*3*,*8*). Also, men and younger adults have less knowledge about symptoms and transmission compared with other groups (*7*), which might affect their handwashing behaviors.

The findings in this report are subject to at least six limitations. First, the cross-sectional design does not allow for assessment of whether the changes in reported remembering to wash hands was directly related to the pandemic or whether respondents might have been influenced by other factors, such as community hygiene promotion activities. However, the same question was asked using the same platform and data collection strategy, which facilitated comparisons over time. Second, the use of overlapping confidence intervals to determine whether the difference between years was statistically significant might result in false negatives, indicating that characteristics did not statistically differ from 2019 to 2020. This methodology is a very conservative approach intended to assess the relationship before estimating aORs. Third, despite weighting to make survey responses nationally representative, persons who agree to participate in online surveys could differ systematically from other members of the public. Fourth, the survey relied on self-report, which could be affected by recall bias or social desirability bias (*9*), resulting in falsely lowered or elevated percentages of those reporting remembering to wash their hands. Fifth, this survey did not assess whether participants had access to handwashing supplies, which might affect

TABLE 1. Percentage of respondents who reported remembering to wash their hands before eating at home, before eating at a restaurant, and before preparing food at home, before and during the COVID-19 pandemic, by selected characteristics — ConsumerStyles fall and summer surveys, United States, October 2019 and June 2020*

Characteristic	Weighted % (95% CI)					
	Before eating at home		Before eating at a restaurant		Before preparing food at home	
	2019	2020	2019	2020	2019	2020
Overall	**62.8 (60.9–64.6)**	**74.4 (72.7–76.1)**	**55.2 (53.3–57.1)**	**70.6 (68.9–72.4)**	**86.5 (85.2–87.8)**	**85.7 (84.3–87.1)**
Sex						
Women	63.9 (61.2–66.5)	75.3 (72.9–77.6)	56.5 (53.8–59.2)	73.2 (70.8–78.6)	89.9 (88.2–91.6)	89.6 (87.8–91.5)
Men	61.6 (59.0–64.2)	73.5 (71.1–75.9)	53.9 (51.2–56.6)	67.9 (65.4–70.5)	82.9 (80.9–84.9)	81.5 (79.3–83.7)
Age group (yrs)						
18–24	62.3 (53.9–70.7)	70.8 (61.8–78.6)	50.8 (42.2–59.5)	65.2 (56.3–74.0)	85.2 (79.1–91.3)	77.0 (69.1–84.9)
25–34	56.3 (51.5–61.2)	66.7 (62.3–71.2)	50.8 (46.0–55.7)	65.6 (61.1–70.1)	84.5 (81.0–88.0)	81.8 (78.1–85.5)
35–44	62.0 (57.6–66.4)	72.0 (68.3–75.7)	55.4 (50.8–60.0)	69.3 (65.5–73.1)	85.3 (82.2–88.4)	85.2 (82.2–88.2)
45–54	65.5 (61.4–69.7)	75.6 (71.9–79.2)	60.4 (56.1–64.7)	75.0 (71.4–78.6)	87.9 (85.1–90.8)	88.4 (85.7–91.1)
55–64	69.1 (65.9–72.3)	81.1 (78.4–83.8)	61.7 (58.3–65.1)	75.1 (72.1–78.2)	89.6 (87.3–91.8)	90.9 (88.8–92.9)
65–74	61.5 (57.6–65.3)	78.8 (75.5–82.0)	53.5 (49.5–57.5)	74.0 (70.6–77.5)	87.6 (84.9–90.4)	87.8 (85.2–90.3)
≥75	62.6 (57.3–68.0)	78.8 (73.7–84.0)	48.6 (43.0–54.2)	67.2 (61.2–72.7)	83.8 (79.6–88.0)	87.8 (83.5–92.0)
Race/Ethnicity						
White, NH	58.0 (55.8–60.1)	71.9 (69.9–73.9)	50.6 (48.4–52.8)	68.6 (66.5–70.7)	86.9 (85.5–88.3)	86.0 (84.4–87.5)
Black, NH	76.6 (71.1–82.1)	80.6 (75.5–85.8)	64.9 (58.7–71.2)	75.1 (69.7–80.4)	86.6 (81.9–91.2)	85.6 (80.9–90.4)
Other, NH	69.0 (61.3–76.7)	81.2 (75.1–87.4)	61.7 (53.7–69.8)	79.0 (72.7–85.2)	84.7 (79.0–90.4)	81.5 (74.5–88.4)
Hispanic or Latino	69.0 (63.7–74.4)	75.9 (71.1–80.6)	62.7 (57.1–68.3)	70.9 (65.8–76.0)	85.8 (81.6–90.0)	86.2 (82.1–90.2)
Multiracial, NH	58.7 (47.7–69.8)	84.8 (76.2–93.4)	63.6 (52.9–74.3)	78.0 (69.1–87.0)	85.9 (73.0–93.2)	91.1 (84.6–97.5)
Health status†						
Excellent	66.6 (60.8–72.3)	76.3 (71.3–81.3)	55.6 (49.3–61.9)	70.7 (65.1–76.3)	86.5 (82.3–90.6)	88.8 (85.3–92.4)
Very good	65.4 (62.5–68.3)	75.0 (72.4–77.7)	58.5 (55.5–61.5)	71.7 (68.9–74.4)	88.2 (86.2–90.2)	86.1 (83.8–88.4)
Good	60.6 (57.5–63.7)	75.2 (72.5–77.9)	53.2 (50.0–56.4)	71.3 (68.4–74.1)	86.1 (83.8–88.4)	84.7 (82.3–87.0)
Fair	56.7 (51.4–61.9)	70.6 (65.3–75.4)	52.7 (47.4–57.9)	67.1 (62.0–72.2)	83.7 (79.8–87.7)	86.3 (82.3–90.2)
Poor	66.4 (56.0–76.7)	69.6 (58.7–80.5)	49.6 (38.6–60.7)	69.6 (58.7–80.4)	82.8 (74.3–91.4)	80.9 (70.8–91.3)
U.S. Census division						
New England	49.5 (40.8–58.1)	73.9 (66.7–81.0)	45.3 (36.7–53.5)	73.4 (66.7–80.1)	87.2 (81.8–92.7)	88.7 (84.4–93.0)
Mid-Atlantic	65.6 (60.7–70.4)	73.4 (68.6–78.1)	57.4 (52.3–62.5)	69.8 (65.0–74.6)	87.9 (84.8–91.0)	87.8 (80.5–89.0)
East-North Central	55.0 (50.1–59.8)	75.0 (70.8–79.2)	44.7 (39.8–49.5)	69.4 (65.0–73.8)	83.2 (79.5–87.0)	84.7 (81.2–88.2)
West-North Central	56.3 (49.4–63.3)	62.1 (55.0–69.2)	51.2 (44.3–58.2)	66.6 (59.8–73.4)	83.5 (77.9–89.0)	83.0 (77.0–89.0)
South Atlantic	66.6 (62.7–70.6)	74.8 (71.0–78.5)	59.0 (54.9–63.2)	71.1 (67.2–75.0)	88.3 (85.6–91.0)	82.9 (79.3–86.4)
East-South Central	63.9 (56.1–71.6)	74.5 (66.9–82.1)	58.1 (49.9–66.3)	69.6 (61.3–77.9)	86.6 (80.9–92.2)	86.3 (79.9–92.6)
West-South Central	69.4 (63.9–75.0)	77.1 (72.4–81.7)	59.5 (53.6–65.3)	73.3 (68.3–78.4)	84.5 (80.0–89.0)	87.0 (83.2–90.8)
Mountain	59.6 (52.6–66.5)	71.5 (64.9–78.0)	54.5 (47.3–61.6)	68.6 (62.0–75.2)	87.4 (82.9–91.9)	88.5 (83.9–93.1)
Pacific	64.6 (59.9–69.3)	78.2 (74.2–82.2)	58.6 (53.7–63.4)	71.7 (67.3–76.1)	88.1 (84.9–91.4)	88.7 (85.3–92.0)
Annual household income (US$)						
<25,000	63.2 (57.8–68.5)	73.1 (67.7–78.4)	55.5 (50.0–61.0)	64.9 (59.3–70.6)	81.4 (76.9–85.9)	77.6 (72.3–83.0)
25,000–49,999	66.3 (62.0–70.6)	75.8 (71.6–79.9)	60.1 (55.5–64.7)	71.5 (67.1–76.0)	90.2 (87.9–92.6)	84.4 (80.7–88.2)
50,000–74,999	63.1 (58.6–67.5)	76.0 (72.0–80.1)	54.6 (50.0–59.3)	69.8 (65.5–74.0)	86.8 (83.8–89.8)	87.4 (84.2–90.5)
75,000–99,999	63.7 (58.9–68.5)	73.4 (69.0–77.8)	53.3 (48.3–58.4)	72.7 (68.2–77.3)	89.4 (86.3–92.6)	86.9 (83.5–90.2)
100,000–149,999	58.9 (54.7–63.1)	72.7 (69.0–76.4)	52.9 (48.6–57.2)	72.8 (69.3–76.3)	87.1 (84.2–89.9)	89.1 (86.5–91.6)
≥150,000	63.2 (58.0–68.4)	73.1 (68.6–77.7)	55.0 (49.6–60.4)	74.2 (69.7–78.8)	83.0 (78.6–87.3)	86.7 (83.0–90.4)
Work status§						
Working	62.3 (59.9–65.6)	73.7 (71.6–75.9)	55.6 (53.2–58.0)	70.8 (68.6–73.0)	86.2 (84.5–87.9)	85.8 (84.1–87.6)
Not working	63.3 (58.3–68.4)	71.1 (66.2–75.9)	55.4 (50.2–60.6)	68.8 (63.7–73.8)	88.1 (84.7–91.5)	82.6 (78.2–87.0)
Retired	63.9 (60.6–67.2)	79.6 (76.8–82.4)	53.7 (50.2–57.1)	71.7 (68.6–74.8)	85.9 (83.5–88.4)	88.1 (85.8–90.4)
Education						
Less than high school	64.0 (56.8–71.1)	72.9 (66.2–76.7)	53.7 (46.2–61.2)	65.9 (58.8–73.1)	85.0 (80.1–89.8)	79.9 (73.7–86.1)
High school	65.5 (62.0–69.0)	77.5 (74.4–80.5)	59.2 (55.6–62.8)	72.1 (68.8–75.4)	87.6 (85.2–90.0)	85.9 (83.2–88.6)
Some college	64.9 (61.6–68.3)	74.0 (70.7–77.3)	56.7 (53.1–60.2)	71.4 (68.0–74.8)	87.2 (84.6–89.8)	85.3 (82.4–88.1)
Bachelor's degree or higher	58.0 (55.1–60.9)	75.6 (70.1–75.1)	51.0 (48.0–53.9)	70.2 (67.7–72.7)	85.5 (83.4–87.6)	87.7 (85.9–89.5)
Metro status¶						
Non-metro	64.2 (59.3–69.0)	69.3 (64.4–74.2)	53.2 (48.0–58.3)	65.2 (60.0–70.4)	88.7 (85.5–91.8)	82.7 (78.4–86.9)
Metro	62.6 (60.6–64.5)	75.2 (73.4–77.0)	55.6 (53.5–57.6)	71.5 (69.6–73.3)	86.2 (84.7–87.6)	86.2 (84.7–87.7)

See table footnotes on the next page.

TABLE 1. (*Continued*) Percentage of respondents who reported remembering to wash their hands before eating at home, before eating at a restaurant, and before preparing food at home, before and during the COVID-19 pandemic, by selected characteristics — ConsumerStyles fall and summer surveys, United States, October 2019 and June 2020*

	Weighted % (95% CI)					
	Before eating at home		Before eating at a restaurant		Before preparing food at home	
Characteristic	2019	2020	2019	2020	2019	2020
Household size						
1	59.9 (56.1–63.8)	75.7 (72.1–79.3)	53.6 (49.7–57.5)	69.0 (65.2–72.9)	84.7 (82.0–87.5)	81.5 (77.9–85.2)
2	61.0 (58.2–63.7)	74.5 (72.0–77.1)	54.7 (51.8–57.5)	70.6 (67.9–73.2)	56.9 (85.0–88.9)	87.0 (84.9–89.0)
3	62.0 (57.4–66.6)	74.7 (70.5–78.9)	51.9 (47.2–56.6)	70.0 (65.6–74.7)	86.2 (82.9–89.4)	84.6 (80.8–88.5)
4	63.1 (57.9–68.2)	72.0 (67.5–76.5)	58.3 (53.0–63.5)	73.6 (69.3–78.0)	88.0 (84.4–91.6)	88.4 (85.3–94.5)
≥5	70.4 (65.1–75.8)	75.2 (70.2–80.2)	58.9 (53.0–64.7)	69.7 (64.3–75.1)	86.0 (82.0–90.1)	85.1 (80.7–89.6)
Marital status						
Married/Living with partner	63.3 (61.2–65.4)	75.7 (73.9–77.6)	55.9 (53.7–58.1)	72.3 (70.4–74.2)	87.9 (86.4–89.3)	86.9 (85.4–88.5)
Single	61.9 (58.4–65.3)	72.2 (69.0–75.4)	54.1 (50.6–57.7)	67.9 (64.5–71.3)	84.3 (81.7–86.8)	83.7 (80.9–86.5)

Abbreviations: CI = confidence interval; NH = non-Hispanic.
* Surveys were conducted during October 8–22, 2019 (N = 3,624), and June 10–25, 2020 (N = 4,053).
† Health status was self-reported. Participants answered the question, "In general, would you say your health is…?" and were instructed to choose one answer.
§ Work status was defined as working (as a paid employee or self-employed); not working (looking for work, on temporary layoff from a job, disabled, or other); and not working, retired.
¶ Metro status was defined by U.S. Office of Management and Budget core-based statistical area.

TABLE 2. Percentage of respondents who reported remembering to wash their hands after using the bathroom at home, after using the bathroom in public and after coughing, sneezing or blowing their nose, before and during the COVID-19 pandemic, by selected characteristics — ConsumerStyles fall and summer surveys, United States, October 2019 and June 2020*

	Weighted % (95% CI)					
	After using the bathroom at home		After using the bathroom in public		After coughing, sneezing, or blowing nose	
Characteristic	2019	2020	2019	2020	2019	2020
Overall	**85.9 (84.6–87.2)**	**89.6 (88.5–90.8)**	**95.5 (94.6–96.3)**	**94.8 (93.8–95.8)**	**53.3 (51.4–55.2)**	**71.2 (69.5–72.9)**
Sex						
Women	88.8 (87.1–90.5)	91.4 (89.8–92.9)	96.5 (95.4–97.6)	94.9 (93.5–96.4)	59.7 (57.0–62.4)	76.6 (74.3–78.9)
Men	82.8 (80.7–84.8)	87.8 (86.1–89.6)	94.4 (93.1–95.7)	94.6 (93.3–95.9)	46.4 (43.7–49.1)	65.4 (62.9–68.0)
Age group (yrs)						
18–24	84.6 (78.5–90.8)	88.0 (82.0–94.0)	95.7 (92.1–99.3)	90.7 (85.2–96.2)	48.4 (39.7–57.1)	70.5 (62.0–78.9)
25–34	81.8 (78.1–85.5)	88.0 (84.9–91.0)	93.6 (91.1–96.2)	94.7 (92.4–97.1)	50.0 (45.1–54.9)	64.0 (59.5–68.6)
35–44	85.8 (82.8–88.8)	86.7 (83.9–89.6)	97.3 (95.7–98.8)	94.1 (91.8–96.4)	54.9 (50.3–59.4)	70.9 (67.2–74.7)
45–54	86.4 (43.5–89.3)	91.1 (88.7–93.5)	94.9 (92.9–96.8)	95.3 (93.4–97.2)	61.4 (57.1–65.7)	73.8 (70.2–77.4)
55–64	89.5 (87.5–91.6)	91.5 (89.7–93.4)	95.9 (94.3–97.4)	96.5 (95.2–97.9)	55.5 (52.0–59.1)	74.6 (71.6–77.6)
65–74	87.3 (84.8–89.9)	91.9 (89.8–94.0)	96.1 (94.5–97.6)	96.7 (95.2–98.2)	51.7 (47.7–55.7)	75.3 (72.0–78.7)
≥75	86.1 (82.2–89.9)	91.1 (87.7–94.4)	95.1 (92.7–97.4)	93.5 (89.6–97.1)	44.0 (38.4–49.6)	69.2 (63.7–74.7)
Race/Ethnicity						
White, NH	84.4 (82.8–85.9)	89.5 (88.1–90.8)	96.4 (95.6–97.1)	96.1 (95.2–97.1)	49.6 (47.4–51.8)	68.9 (66.8–70.9)
Black, NH	88.0 (83.6–92.5)	91.3 (87.9–94.8)	93.2 (89.6–96.9)	91.9 (88.4–95.4)	65.5 (59.4–71.6)	83.2 (78.8–87.5)
Other, NH	90.0 (85.0–95.1)	89.6 (85.2–94.0)	96.4 (93.5–99.3)	95.7 (92.6–98.8)	50.7 (42.4–59.1)	70.3 (63.1–77.4)
Hispanic or Latino	88.8 (85.1–92.5)	89.0 (85.4–92.7)	93.4 (90.5–96.3)	90.8 (87.3–94.4)	60.2 (54.6–65.9)	72.0 (67.0–77.0)
Multiracial, NH	82.9 (73.1–92.8)	90.6 (82.8–98.5)	92.7 (86.4–99.1)	99.4 (98.2–100.0)	49.2 (38.5–60.0)	73.5 (62.7–84.3)
Health status†						
Excellent	85.2 (81.0–89.3)	90.1 (86.4–93.9)	95.2 (92.7–97.7)	95.1 (92.1–98.1)	55.6 (49.3–61.9)	71.3 (66.0–76.7)
Very Good	87.8 (85.9–89.7)	89.8 (88.0–91.7)	97.2 (96.2–98.2)	96.2 (94.8–97.6)	55.6 (52.6–58.7)	72.1 (69.4–74.8)
Good	85.7 (83.3–88.0)	89.6 (87.7–91.6)	94.7 (93.1–96.3)	94.5 (92.9–96.1)	50.9 (47.7–54.2)	71.4 (68.6–74.3)
Fair	82.7 (78.6–86.7)	90.6 (87.7–93.5)	94.3 (91.5–97.1)	93.7 (90.9–96.5)	51.6 (46.3–56.8)	69.0 (63.3–73.5)
Poor	81.6 (72.5–90.6)	84.3 (76.4–92.3)	89.7 (82.3–97.0)	87.0 (78.6–95.4)	47.2 (36.2–58.2)	69.4 (58.8–80.1)
U.S. Census division						
New England	82.5 (76.0–88.9)	92.3 (88.4–96.3)	95.1 (91.8–98.3)	96.3 (93.9–98.7)	55.7 (47.0–64.4)	77.9 (71.2–84.6)
Mid-Atlantic	89.7 (86.5–93.0)	90.6 (87.4–93.7)	96.9 (95.3–98.5)	94.4 (91.7–97.1)	55.5 (50.3–60.8)	72.7 (68.0–77.4)
East-North Central	83.9 (80.4–87.4)	92.2 (89.8–94.7)	94.3 (91.9–96.8)	96.6 (94.7–98.5)	49.0 (44.1–53.9)	72.2 (67.9–76.4)
West-North Central	79.8 (74.1–85.5)	88.0 (83.5–92.5)	96.6 (93.9–99.4)	96.1 (93.5–98.6)	48.4 (41.4–55.4)	71.6 (65.4–77.8)
South Atlantic	86.0 (83.1–88.9)	88.7 (86.1–91.4)	97.1 (95.5–98.7)	94.4 (92.0–96.8)	56.2 (52.1–60.4)	73.2 (69.5–77.0)
East-South Central	87.0 (81.7–92.2)	82.4 (76.0–88.7)	96.1 (93.2–99.0)	91.5 (86.3–96.7)	60.0 (52.1–68.0)	61.9 (53.2–70.6)
West-South Central	85.7 (81.5–89.9)	89.4 (85.7–93.0)	91.2 (87.5–94.8)	94.3 (91.0–97.5)	55.1 (49.2–60.9)	72.0 (66.9–77.1)
Mountain	85.7 (80.6–90.1)	90.2 (85.8–94.5)	95.8 (92.9–98.7)	95.3 (92.0–98.7)	45.2 (38.1–52.4)	69.9 (63.5–76.2)
Pacific	87.5 (84.3–90.8)	89.7 (86.5–92.8)	95.7 (93.6–97.8)	94.2 (91.6–96.8)	52.8 (47.8–57.7)	67.2 (62.8–71.7)

See table footnotes on the next page.

TABLE 2. (*Continued*) Percentage of respondents who reported remembering to wash their hands after using the bathroom at home, after using the bathroom in public and after coughing, sneezing or blowing their nose, before and during the COVID-19 pandemic, by selected characteristics — ConsumerStyles fall and summer surveys, United States, October 2019 and June 2020*

	Weighted % (95% CI)					
	After using the bathroom at home		After using the bathroom in public		After coughing, sneezing, or blowing nose	
Characteristic	2019	2020	2019	2020	2019	2020
Annual household income (US$)						
<25,000	82.1 (77.7–86.5)	85.9 (81.7–90.0)	89.8 (86.3–93.4)	85.7 (81.1–90.3)	57.9 (52.5–63.4)	70.2 (64.6–75.8)
25,000–49,999	89.2 (86.5–91.8)	90.2 (87.4–93.0)	96.8 (95.4–98.2)	95.8 (93.6–98.1)	56.0 (51.3–60.6)	73.5 (69.3–77.7)
50,000–74,999	86.2 (83.2–89.2)	91.0 (88.5–93.5)	95.2 (93.1–97.2)	95.5 (93.4–97.5)	54.2 (49.6–58.9)	71.5 (67.3–75.7)
75,000–99,999	87.1 (83.8–90.4)	90.7 (87.8–93.7)	96.2 (94.5–97.9)	95.8 (93.9–97.7)	53.3 (48.3–58.3)	72.6 (68.1–77.1)
100,000–149,999	85.9 (82.9–88.8)	91.7 (88.4–93.0)	97.7 (96.5–98.9)	97.1 (95.7–98.5)	49.8 (45.6–54.1)	70.9 (67.3–74.5)
≥150,000	87.6 (80.5–88.6)	87.8 (84.3–91.2)	96.7 (94.5–99.0)	95.2 (92.5–97.9)	50.3 (44.9–55.8)	72.6 (68.2–77.1)
Work status§						
Working	85.2 (83.5–86.9)	89.3 (87.8–90.8)	95.9 (94.8–96.9)	95.1 (93.9–96.3)	53.2 (50.8–55.6)	70.7 (68.5–72.8)
Not working	86.4 (82.9–89.9)	88.0 (84.5–91.5)	94.8 (92.5–97.1)	93.0 (90.1–95.9)	56.4 (51.2–61.7)	70.7 (65.9–75.6)
Retired	87.7 (85.4–90.0)	92.2 (90.4–94.0)	94.9 (93.4–96.5)	95.4 (93.6–97.1)	50.3 (46.8–53.8)	73.5 (70.4–76.5)
Education						
Less than high school	85.9 (81.2–90.7)	88.0 (82.3–92.4)	90.5 (86.5–94.4)	87.8 (82.6–93.1)	58.2 (50.8–65.7)	71.6 (64.7–78.5)
High school	87.7 (85.3–90.1)	90.3 (88.1–92.5)	94.5 (92.8–96.3)	92.9 (90.8–95.0)	59.1 (55.5–62.7)	75.3 (72.1–78.4)
Some college	85.5 (82.8–88.1)	89.0 (86.6–91.3)	96.0 (94.5–97.5)	96.2 (94.7–97.7)	53.0 (49.4–56.6)	72.5 (69.1–78.8)
Bachelor's degree or higher	84.7 (82.6–86.7)	90.4 (88.8–91.9)	97.5 (96.6–98.4)	97.3 (96.4–98.3)	46.7 (43.8–49.7)	66.7 (64.1–69.3)
Metro status¶						
Non-metro	82.4 (78.5–86.2)	86.4 (82.7–90.0)	96.6 (95.0–98.3)	94.5 (91.5–97.4)	52.3 (47.2–57.4)	68.7 (63.6–73.7)
Metro	86.5 (85.4–87.9)	90.2 (88.9–91.4)	95.3 (94.4–96.2)	94.8 (93.8–95.9)	53.4 (51.4–55.5)	71.6 (69.8–73.4)
Household size						
1	84.4 (81.6–87.3)	87.0 (84.0–89.9)	94.3 (92.5–96.2)	92.9 (90.4–95.4)	51.1 (47.2–55.0)	69.5 (65.6–73.4)
2	85.1 (83.1–87.1)	89.7 (87.9–91.5)	96.2 (95.1–97.3)	95.5 (93.9–97.0)	51.3 (48.5–54.1)	71.2 (68.6–73.8)
3	86.3 (83.1–89.6)	90.2 (87.2–93.2)	93.4 (90.7–96.1)	94.6 (92.0–97.1)	54.4 (49.2–59.1)	72.6 (68.5–76.8)
4	85.7 (81.9–89.6)	90.6 (88.0–93.3)	95.4 (93.1–97.8)	96.1 (94.1–98.0)	54.8 (49.4–60.1)	71.9 (67.3–76.5)
≥5	88.8 (85.2–92.5)	90.3 (86.7–93.8)	97.6 (96.0–99.1)	94.0 (90.9–97.0)	56.6 (50.2–62.8)	70.5 (65.2–75.8)
Marital status						
Married/Living with partner	86.2 (84.7–87.7)	90.1 (88.8–91.4)	96.0 (95.0–96.9)	95.9 (94.9–96.9)	54.0 (51.8–56.2)	71.5 (69.6–73.5)
Single	85.4 (83.0–87.9)	88.9 (86.6–91.1)	94.7 (93.1–96.3)	93.0 (90.9–95.0)	52.1 (48.6–55.7)	70.7 (67.4–73.9)

Abbreviations: CI = confidence interval; NH = non-Hispanic.
* Surveys were conducted during October 8–22, 2019 (N = 3,624), and June 10–25, 2020 (N = 4,053).
† Health status was self-reported. Participants answered the question, "In general, would you say your health is…?" and were instructed to choose one answer.
§ Work status was defined as working (as a paid employee or self-employed); not working (looking for work, on temporary layoff from a job, disabled, or other); and not working, retired.
¶ Metro status was defined by U.S. Office of Management and Budget core-based statistical area.

TABLE 3. Odds of remembering to wash hands before and after six situations, by respondent characteristics — ConsumerStyles fall and summer surveys — United States, October 2019 and June 2020*

	aOR (95% CI)					
Characteristic	Before eating at home	Before eating at a restaurant	Before preparing food at home	After using the bathroom at home	After using the bathroom in public	After coughing, sneezing, or blowing nose
Overall, year						
2019	**Referent**	**Referent**	**Referent**	**Referent**	**Referent**	**Referent**
2020	**1.72 (1.56–1.89)**	**2.01 (1.84–2.20)**	**0.90 (0.78–1.03)**	**1.41 (1.24–1.60)**	**0.79 (0.63–0.98)**	**2.28 (2.08–2.50)**
Sex						
Women	Referent	Referent	Referent	Referent	Referent	Referent
Men	0.94 (0.82–1.06)	0.85 (0.75–0.96)	0.53 (0.44–0.63)	0.67 (0.56–0.80)	0.84 (0.62–1.13)	0.58 (0.51–0.66)
Age group (yrs)						
18–24	Referent	Referent	Referent	Referent	Referent	Referent
25–34	0.86 (0.61–1.19)	1.04 (0.75–1.43)	1.26 (0.83–1.92)	0.91 (0.58–1.42)	1.12 (0.56–2.26)	1.02 (0.74–1.42)
35–44	1.09 (0.78–1.52)	1.25 (0.90–1.72)	1.46 (0.95–2.25)	0.97 (0.62–1.54)	1.33 (0.64–2.76)	1.38 (0.99–1.93)
45–54	1.29 (0.92–1.81)	1.56 (1.13–2.16)	1.83 (1.19–2.83)	1.29 (0.81–2.04)	1.35 (0.65–2.81)	1.71 (1.23–2.38)
55–64	1.79 (1.29–2.50)	1.72 (1.25–2.38)	2.53 (1.63–3.94)	1.66 (1.05–2.62)	1.94 (0.90–4.21)	1.54 (1.11–2.13)
65–74	1.34 (0.93–1.92)	1.51 (1.06–2.13)	2.01 (1.23–2.37)	1.39 (0.85–2.26)	2.17 (0.95–4.96)	1.44 (1.01–2.05)
≥75	1.43 (0.95–2.14)	1.14 (0.78–1.67)	1.74 (1.02–2.95)	1.31 (0.76–2.25)	1.34 (0.55–3.27)	1.12 (0.76–1.65)

See table footnotes on the next page.

TABLE 3. (*Continued*) Odds of remembering to wash hands before and after six situations, by respondent characteristics — ConsumerStyles fall and summer surveys — United States, October 2019 and June 2020*

	aOR (95% CI)					
Characteristic	**Before eating at home**	**Before eating at a restaurant**	**Before preparing food at home**	**After using the bathroom at home**	**After using the bathroom in public**	**After coughing, sneezing, or blowing nose**
Race/Ethnicity						
White, NH	Referent	Referent	Referent	Referent	Referent	Referent
Black, NH	2.00 (1.56–2.55)	1.60 (1.29–1.99)	1.05 (0.77–1.42)	1.39 (1.01–1.92)	0.61 (0.40–0.92)	2.00 (1.59–2.51)
Other, NH	1.64 (1.19–2.26)	1.60 (1.19–2.14)	0.63 (0.43–0.91)	1.26 (0.81–1.95)	0.73 (0.39–1.40)	1.11 (0.82–1.49)
Hispanic or Latino	1.34 (1.09–1.66)	1.32 (1.08–1.62)	0.96 (0.72–1.27)	1.20 (0.88–1.62)	0.59 (0.40–0.88)	1.39 (1.14–1.71)
Multiracial, NH	1.37 (0.92–2.03)	1.50 (1.04–2.18)	1.11 (0.61–2.03)	0.91 (0.50–1.64)	1.10 (0.41–2.94)	1.12 (0.78–1.60)
Health status†						
Excellent	Referent	Referent	Referent	Referent	Referent	Referent
Very good	0.90 (0.71–1.15)	1.01 (0.80–1.27)	0.86 (0.62–1.20)	1.07 (0.78–1.46)	1.33 (0.76–2.34)	0.92 (0.73–1.17)
Good	0.72 (0.57–0.92)	0.84 (0.67–1.07)	0.73 (0.52–1.02)	0.93 (0.67–1.29)	0.99 (0.57–1.73)	0.75 (0.59–0.96)
Fair	0.55 (0.41–0.72)	0.73 (0.56–0.97)	0.72 (0.49–1.05)	0.81 (0.55–1.18)	1.08 (0.82–2.01)	0.62 (0.47–0.82)
Poor	0.67 (0.44–1.04)	0.78 (0.51–1.20)	0.69 (0.39–1.22)	0.68 (0.38–1.22)	0.65 (0.29–1.48)	0.63 (0.41–0.96)
U.S. Census division						
New England	Referent	Referent	Referent	Referent	Referent	Referent
Mid-Atlantic	1.34 (0.97–1.85)	1.17 (0.85–1.61)	0.87 (0.56–1.39)	1.30 (0.81–2.10)	1.04 (0.53–2.06)	0.82 (0.59–1.14)
East-North Central	1.06 (0.77–1.44)	0.89 (0.66–1.21)	0.68 (0.44–1.05)	1.03 (0.67–1.60)	1.12 (0.59–2.14)	0.65 (0.48–0.90)
West-North Central	0.85 (0.60–1.21)	1.00 (0.71–1.41)	0.59 (0.36–0.98)	0.78 (0.48–1.26)	1.05 (0.49–2.25)	0.69 (0.49–0.99)
South Atlantic	1.31 (0.96–1.78)	1.22 (0.90–1.64)	0.78 (0.50–1.20)	0.94 (0.61–1.44)	1.15 (0.59–2.24)	0.75 (0.55–1.03)
East-South Central	1.25 (0.85–1.83)	1.19 (0.82–1.74)	0.88 (0.52–1.51)	0.77 (0.46–1.29)	0.79 (0.37–1.68)	0.65 (0.44–0.96)
West-South Central	1.50 (1.07–2.10)	1.24 (0.89–1.73)	0.83 (0.53–1.31)	0.93 (0.59–1.49)	0.83 (0.44–1.59)	0.70 (0.50–0.98)
Mountain	1.08 (0.75–1.53)	1.08 (0.76–1.53)	1.00 (0.61–1.65)	1.01 (0.61–1.68)	1.09 (0.52–2.31)	0.61 (0.42–0.87)
Pacific	1.31 (0.95–1.81)	1.16 (0.85–1.60)	1.11 (0.70–1.75)	1.11 (0.70–1.75)	1.11 (0.57–2.15)	0.66 (0.48–0.91)
Annual household income (US$)						
<25,000	Referent	Referent	Referent	Referent	Referent	Referent
25,000–49,999	1.09 (0.86–1.38)	1.23 (0.97–1.55)	1.75 (1.28–2.40)	1.63 (1.19–2.24)	3.74 (2.27–6.16)	1.01 (0.79–1.28)
50,000–74,999	1.00 (0.78–1.28)	1.02 (0.80–1.30)	1.62 (1.17–2.23)	1.41 (1.03–1.94)	2.22 (1.41–3.47)	0.93 (0.73–1.20)
75,000–99,999	0.92 (0.70–1.20)	1.02 (0.79–1.31)	1.77 (1.25–2.52)	1.43 (1.01–2.01)	2.53 (1.57–4.09)	0.95 (0.73–1.24)
100,000–149,999	0.84 (0.65–1.09)	1.02 (0.79–1.30)	1.67 (1.19–2.36)	1.36 (0.97–1.90)	3.13 (1.83–5.38)	0.88 (0.68–1.14)
≥150,000	0.91 (0.68–1.21)	1.10 (0.83–1.46)	1.27 (0.85–1.87)	1.08 (0.74–1.59)	1.85 (0.95–3.60)	0.94 (0.71–1.26)
Work status§						
Working	Referent	Referent	Referent	Referent	Referent	Referent
Not working	0.97 (0.79–1.18)	0.98 (0.84–1.19)	1.13 (0.85–1.51)	1.07 (0.81–1.41)	1.48 (0.96–2.29)	0.67 (0.79–1.18)
Retired	1.13 (0.93–1.37)	0.99 (0.82–1.19)	0.93 (0.70–1.75)	1.28 (0.97–1.69)	0.87 (0.55–1.38)	1.01 (0.84–1.21)
Education						
Less than high school	Referent	Referent	Referent	Referent	Referent	Referent
High school	1.20 (0.91–1.58)	1.27 (0.97–1.65)	1.23 (0.87–1.73)	1.18 (0.82–1.68)	1.45 (0.93–2.25)	1.06 (0.81–1.40)
Some college	1.09 (0.83–1.44)	1.19 (0.91–1.55)	1.19 (0.83–1.69)	1.01 (0.70–1.44)	2.35 (1.41–3.91)	0.88 (0.67–1.16)
Bachelor's degree or higher	0.91 (0.68–1.21)	1.00 (0.76–1.31)	1.22 (0.85–1.76)	1.03 (0.71–1.50)	2.94 (1.72–5.05)	0.70 (0.53–0.93)
Metro status¶						
Non-metro	Referent	Referent	Referent	Referent	Referent	Referent
Metro	0.98 (0.81–1.18)	1.11 (0.93–1.34)	0.91 (0.71–1.17)	1.19 (0.94–1.51)	0.74 (0.48–1.13)	1.06 (0.88–1.27)
Household size						
1	Referent	Referent	Referent	Referent	Referent	Referent
2	0.98 (0.81–1.17)	1.07 (0.90–1.28)	1.38 (1.07–1.78)	1.23 (0.95–1.60)	1.38 (0.91–2.09)	1.10 (0.91–1.32)
3	1.14 (0.92–1.42)	1.06 (0.85–1.31)	1.39 (1.03–1.88)	1.60 (1.17–2.18)	1.23 (0.75–2.00)	1.19 (0.95–1.48)
4	1.06 (0.83–1.36)	1.34 (1.05–1.71)	1.69 (1.19–2.41)	1.58 (1.12–2.24)	1.46 (0.82–2.62)	1.21 (0.95–1.55)
≥5	1.39 (1.07–1.82)	1.25 (0.97–1.61)	1.31 (0.92–1.87)	1.82 (1.24–2.67)	1.75 (0.93–3.28)	1.19 (0.92–1.54)
Marital status						
Married/Living with partner	Referent	Referent	Referent	Referent	Referent	Referent
Single	0.88 (0.74–1.03)	0.95 (0.81–1.10)	1.04 (0.83–1.30)	1.09 (0.87–1.36)	1.13 (0.78–1.65)	0.93 (0.79–1.10)

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; NH = non-Hispanic.

* Surveys were conducted during October 8–22, 2019 (N = 3,624), and June 10–25, 2020 (N = 4,053).

† Health status was self-reported. Participants answered the question, "In general, would you say your health is…?" and were instructed to choose one answer.

§ Work status was defined as working (as a paid employee or self-employed); not working (looking for work, on temporary layoff from a job, disabled, or other); and not working, retired.

¶ Metro status was defined by U.S. Office of Management and Budget core-based statistical area.

Summary

What is already known about this topic?

Hand hygiene is one important measure to prevent the spread of COVID-19 and other pathogens.

What is added by this report?

U.S. adult Internet survey respondents in June 2020 were more likely to remember to wash their hands after experiencing respiratory symptoms, before eating in a restaurant, and before eating at home than were October 2019 survey respondents. Despite improvements, <75% of survey respondents reported remembering to wash their hands in these situations in 2020.

What are the implications for public health practice?

Public health efforts should promote frequent handwashing for all, with attention to tailoring messaging to men, young adults, and non-Hispanic White adults. Particular focus should be placed on encouraging handwashing at important times such as before eating and after experiencing respiratory symptoms.

the ability to wash one's hands frequently. Finally, the survey question did not specify how handwashing was performed (e.g., with soap and water) and did not consider hand sanitizer use, which is a recommended method of hand hygiene if soap and water are unavailable.

These findings underscore the importance of promoting frequent handwashing during the ongoing COVID-19 pandemic, especially after coughing, sneezing, and blowing one's nose. Men, young adults, and White adults continue to be less likely to remember to wash their hands, despite improvements made from 2019 to 2020. Additional work is needed to identify strategies to remind and motivate persons to wash their hands, not only for the prevention of COVID-19, but also to reduce transmission of other infectious diseases transmitted via respiratory or fecal-oral routes. Strategies that have been used in the past to promote handwashing have included active and passive hygiene education, provision of handwashing supplies, environmental cues, and health communication (*2*). These types of efforts should be tailored to resonate with men, young adults, and White adults and continue to specify important times when persons should wash their hands, such as before eating and after coughing, sneezing, or blowing their nose.

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Case Series of Multisystem Inflammatory Syndrome in Adults Associated with SARS-CoV-2 Infection — United Kingdom and United States, March–August 2020

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During the course of the coronavirus disease 2019 (COVID-19) pandemic, reports of a new multisystem inflammatory syndrome in children (MIS-C) have been increasing in Europe and the United States (*1–3*). Clinical features in children have varied but predominantly include shock, cardiac dysfunction, abdominal pain, and elevated inflammatory markers, including C-reactive protein (CRP), ferritin, D-dimer, and interleukin-6 (*1*). Since June 2020, several case reports have described a similar syndrome in adults; this review describes in detail nine patients reported to CDC, seven from published case reports, and summarizes the findings in 11 patients described in three case series in peer-reviewed journals (*4–6*). These 27 patients had cardiovascular, gastrointestinal, dermatologic, and neurologic symptoms without severe respiratory illness and concurrently received positive test results for SARS-CoV-2, the virus that causes COVID-19, by polymerase chain reaction (PCR) or antibody assays indicating recent infection. Reports of these patients highlight the recognition of an illness referred to here as multisystem inflammatory syndrome in adults (MIS-A), the heterogeneity of clinical signs and symptoms, and the role for antibody testing in identifying similar cases among adults. Clinicians and health departments should consider MIS-A in adults with compatible signs and symptoms. These patients might not have positive SARS-CoV-2 PCR or antigen test results, and antibody testing might be needed to confirm previous SARS-CoV-2 infection. Because of the temporal association between MIS-A and SARS-CoV-2 infections interventions that prevent COVID-19 might prevent MIS-A. Further research is needed to understand the pathogenesis and long-term effects of this newly described condition.

Potential MIS-A patients were identified from several sources: reports from clinicians and health departments, published case reports, and published case series. Clinicians and health departments in the United States voluntarily reported adult patients with suspected MIS-A to CDC using the case report form* developed for MIS-C after a Health Advisory was published on May 14, 2020, calling for reporting of MIS-C cases. The case report form included information on patient demographics, underlying medical conditions, clinical findings, complications, laboratory test results including those from SARS-CoV-2 testing, imaging findings, treatments, and outcomes. Two clinician reviewers selected patients who fulfilled the working MIS-A case definition used in this report, which included the following five criteria: 1) a severe illness requiring hospitalization in a person aged ≥21 years; 2) a positive test result for current or previous SARS-CoV-2 infection (nucleic acid, antigen, or antibody) during admission or in the previous 12 weeks; 3) severe dysfunction of one or more extrapulmonary organ systems (e.g., hypotension or shock, cardiac dysfunction, arterial or venous thrombosis or thromboembolism, or acute liver injury); 4) laboratory evidence of severe inflammation (e.g., elevated CRP, ferritin, D-dimer, or interleukin-6); and 5) absence of severe respiratory illness (to exclude patients in which inflammation and organ dysfunction might be attributable simply to tissue hypoxia). Patients with mild respiratory symptoms who met these criteria were included. Patients were excluded if alternative diagnoses such as bacterial sepsis were identified.

To identify potential published cases, a literature search was performed on August 20, 2020, and 355 publications were identified.† Abstracts were screened by one reviewer to determine whether cases met the working MIS-A case definition; when no abstract was available, the full paper was examined. The references were reviewed to identify additional relevant articles. Data were obtained from published reports; authors were contacted to confirm published data and, when necessary, to provide data not included in the original articles.

* Multisystem Inflammatory Syndrome Associated with COVID-19 Case Report Form. https://www.cdc.gov/mis-c/pdfs/hcp/mis-c-form-fillable.pdf.

† Medline (OVID), Embase (OVID), CINAHL (EBSCOHost) and Cochrane Library were searched as primary sources, which were supplemented with searches in the following databases: Global Health, CAB abstracts, PsycInfo, Scopus, PubMed Central, Global Index Medicus, and several preprint databases. Each database was searched using the following terms: novel coronavirus/COVID-19 (multiple iterations) and severe inflammation/multisystem, cardiogenic shock/Kawasaki disease, and adult.

Case Reports

Demographic characteristics and underlying conditions. Cases in nine patients reported to CDC (Table 1) and seven published case reports (Table 2), originating from seven U.S. jurisdictions and the United Kingdom, met the working case definition. The 16 patients ranged in age from 21 to 50 years and included seven men and nine women. Five were reported as Hispanic, nine as African American, one as Asian, and one as a United Kingdom–born man of African ethnicity. Nine patients had no reported underlying medical conditions; six were obese, one had poorly controlled diabetes mellitus type 2 (hemoglobin A1C >9.0%), two had hypertension, and one had obstructive sleep apnea. Eight patients had documented respiratory illness before developing symptoms of MIS-A, and eight did not.

Initial signs and symptoms. Twelve of 16 patients had fever (≥100.4°F [38.0°C] for ≥24 hours or report of subjective fever lasting ≥24 hours) at the time of presentation. Six patients were initially evaluated for possible cardiac symptoms such as chest pain or palpitations; all 16 had evidence of cardiac effects, including electrocardiogram abnormalities such as arrhythmias, elevated troponin levels, or echocardiographic evidence of left or right ventricular dysfunction. Thirteen patients had gastrointestinal symptoms on admission; five had dermatologic manifestations on admission, including three with mucositis. Despite minimal respiratory symptoms, 10 patients had pulmonary ground glass opacities, and six had pleural effusions identified on chest imaging.

Inflammatory markers. All patients had markedly elevated laboratory markers of inflammation, including CRP (range of peak values = 84–580 mg/L; upper limit of normal [ULN] = 10 mg/L) and ferritin (196 to >100,000 ng/mL; ULN = 150 ng/mL for women, 300 ng/mL for men), as well as markers of coagulopathy including D-dimer (275–8691 ng/mL; ULN = 500 ng/mL). Ten patients had absolute lymphocyte counts lower than normal range (range of nadir values 120–2120 cells/μL; lower limit of normal = 1000 cells/μL).

SARS-CoV-2 test results. Ten patients received positive SARS-CoV-2 PCR test results at the time of initial assessment for MIS-A, seven of whom also had serologic evidence of infection (positive antibody test results) at that time. Six patients received negative SARS-CoV-2 PCR test results; of those, four had positive anti-SARS-CoV-2 antibody test results when first evaluated. Two patients had positive SARS-CoV-2 PCR test results 14 and 37 days before admission, negative PCR results at the time of admission, and no known antibody testing. Three additional patients had positive SARS-CoV-2 PCR test results 25–41 days before admission and continued positive PCR test results at the time of admission.

Treatment. Seven patients were treated with intravenous immunoglobulin, 10 with corticosteroids, and two with the interleukin-6 inhibitor, tocilizumab. Ten patients required intensive care; seven required inotropes or vasopressors, and one required mechanical circulatory support (extracorporeal membrane oxygenation followed by temporary left and right ventricular assist devices). Three patients required endotracheal intubation and mechanical ventilation, and two patients died.

Published Case Series

Three published case series were identified describing adult patients with manifestations consistent with MIS-A (*4*–*6*). One series describes seven previously healthy, young adult men aged 20–42 years who experienced mixed cardiogenic and vasoplegic shock and hyperinflammation along with high SARS-CoV-2 immunoglobulin G antibody titers indicating active or previous infection (*4*). Two of the patients identified as African American, two as Hispanic, two as Middle Eastern, and one as White. Four of the seven patients had negative PCR test results for SARS-CoV-2 at the time of admission, all had markedly elevated inflammatory markers and required inotropes or vasopressors, and three required intraaortic balloon pumps. All were treated with corticosteroids and therapeutic anticoagulation. All seven patients recovered and were discharged home after 7 to 18 days of hospitalization with improved cardiovascular function.

A second case series describes two patients aged 21 and 50 years who came to medical attention because of large-vessel strokes associated with positive SARS-CoV-2 tests (*5*). Information on race/ethnicity of these patients was not reported. These patients had elevated inflammatory markers and minimal respiratory symptoms, consistent with MIS-A. The authors proposed endothelial dysfunction and coagulopathy related to SARS-CoV-2 infection as potential etiologies. Incidence of large-vessel stroke among young adults during this same time the previous year was statistically significantly lower (*5*).

A third case series describes the pathologic findings of endothelialitis and complement deposition in the vessels of two patients with illness resembling MIS-A (cardiac dysfunction, abdominal signs and symptoms, and rash) associated with positive SARS-CoV-2 test results (*6*). Information on race/ethnicity of these patients was not reported. One of these two patients had no underlying medical conditions and recovered; the other had multiple underlying conditions at higher risk for severe COVID-19 and died hours after seeking care. Pathologic findings in this case series were similar to autopsy findings for those of patient 14 (Table 2).

TABLE 1. Demographics, clinical features, treatments, and outcomes of nine adults reported to CDC with multisystem inflammatory syndrome (MIS) associated with SARS-CoV-2 infection — United States, March–August 2020

Age (yrs), sex, race/ethnicity, location	Underlying medical conditions	Clinical signs and symptoms	Previous respiratory illness/ SARS-CoV-2 testing	SARS-CoV-2 testing at time of MIS-A admission	Laboratory studies (peak)*	Imaging/Other diagnostic studies	Treatments	Outcome and length of stay
Patient 1: 27, female, African American, Maine	None	Rigors, profuse diarrhea, diffuse rash x 5 days. Admitted with mixed shock (hypovolemic, vasoplegic, cardiogenic) and acute renal failure.	No/Testing unknown	PCR (-), Ab (+)	CRP 344 mg/L; D-dimer 2818 ng/mL; ferritin 1082 ng/mL; troponin I 0.43 ng/mL; ALT 37 IU/L; ALC nadir 420 cells/µL	TTE: mild to moderate global hypokinesis, left ventricular ejection fraction 45%, mildly dilated right ventricle, mild tricuspid regurgitation, pericardial effusion. CT chest: bilateral patchy ground-glass opacities, pleural effusion. CT abdomen/pelvis: abdominal free fluid.	Norepinephrine, vasopressin, midodrine, heparin, corticosteroids	Discharged after 13 days
Patient 2: 50, male, African American, Florida	None	Poor oral intake, chest pressure, palpitations, diaphoresis x 3 days. Hemodynamically unstable on admission.	No/Testing unknown	PCR (+), Ab (+)	CRP 84 mg/L; D-dimer 2310 ng/mL; ferritin 1919 ng/mL; troponin I 0.48 ng/mL; ALT 440 IU/L; ALC nadir 2500 cells/µL	EKG: atrial fibrillation/flutter with rapid ventricular response, ST segment changes. TTE: ejection fraction 25%–30% with global hypokinesis. CXR: small pleural effusions.	Remdesivir, corticosteroids	Discharged after 17 days
Patient 3: 46, male, African American, Florida	Obesity, chronic right lower extremity pain	Malaise, bilateral tinnitus, chest pain, and vomiting x 4 days. Hypotensive and mildly hypoxemic on admission.	Yes/Testing unknown	PCR (-), Ab (+)	CRP 217 mg/L; D-dimer 3790 ng/mL; ferritin >100,000 ng/mL; troponin I 2.5 ng/mL; IL-6 1412 pg/mL; ALT >10,000 IU/L; ALC nadir 400 cells/µL	EKG: ST-T segment changes. CT chest: dependent ground glass opacities. CT abdomen: hepatic steatosis.	Vasopressors, tocilizumab x 1, heparin	Deceased
Patient 4: 21, male, African American, Louisiana	Obesity	Fever, cough, nausea, vomiting, lymphadenopathy x 6 days.	No/Testing unknown	PCR (-), Ab (+)	CRP 318 mg/L; D-dimer 1760 ng/mL; ferritin 4400 ng/mL; troponin T 0.65 ng/mL; IL-6 7 pg/mL; ATL 279 IU/L; ALC nadir 700 cells/µL	TTE: severely decreased ejection fraction, mild mitral regurgitation, right ventricular dysfunction, coronary artery dilatation. CT chest: ground glass opacities and atelectasis.	ASA, corticosteroids, IVIG x 1	Discharged after 6 days
Patient 5: 33, male, African American, Georgia	Obesity, HTN, depression	Fever, chest pain, abdominal pain, diarrhea, dark urine x 4 days.	Yes/PCR (+) 41 days earlier	PCR (+), Ab (+)	CRP 182 mg/L; D-dimer 275 ng/mL; ferritin 375 ng/mL; troponin I 1.8 ng/mL; IL-6 74.3 pg/mL; ALT 30 IU/L; ALC nadir 2070 cells/µL	CT chest: atelectasis. CT abdomen/pelvis: normal. TTE: mitral and tricuspid regurgitation.	Anticoagulation	Discharged after 5 days
Patient 6: 22, female, African American, New York	None	Fever, chills, throat pain, odynophagia x 2 days.	No/Testing unknown	PCR (+), Ab (+)	CRP 355 mg/L; D-dimer 1882 ng/mL; ferritin 378 ng/mL; troponin T 0.06 ng/mL; IL-6 34.8 pg/mL; ALT 119 U/L; ALC nadir 360 cells/µL	CT neck: retropharyngeal and parapharyngeal edema. EKG: intermittent complete heart block with narrow junctional escape without hemodynamic compromise. TTE: ejection fraction 50%. CXR: dense bilateral lower lobe air-space disease.	Phenylephrine, anticoagulation, corticosteroids	Discharged after 19 days

See table footnotes on the next page.

Discussion

Findings indicate that adult patients of all ages with current or previous SARS-CoV-2 infection can develop a hyperinflammatory syndrome resembling MIS-C. Although hyperinflammation and extrapulmonary organ dysfunction have been described in hospitalized adults with severe COVID-19, these conditions are generally accompanied by respiratory failure (*7*). In contrast, the patients described here had minimal respiratory symptoms, hypoxemia, or radiographic abnormalities in accordance with the working case definition, which was meant to distinguish MIS-A from severe COVID-19; only eight of 16 patients had any documented respiratory symptoms before onset of MIS-A.

The pathophysiology of MIS in both children and adults is currently unknown. Eight of 27 (30%) adults described in this report and 45% of 440 children with MIS-C reported to CDC through July 29, 2020, (*1*) had negative PCR and positive SARS-CoV-2 antibody test results, suggesting MIS-A and MIS-C might represent postinfectious processes. However, in some patients, persistent infection outside the upper respiratory tract is possible; SARS-CoV-2 has been identified in

TABLE 1. (*Continued*) Demographics, clinical features, treatments, and outcomes of nine adults reported to CDC with multisystem inflammatory syndrome (MIS) associated with SARS-CoV-2 infection — United States, March–August 2020

Age (yrs), sex, race/ethnicity, location	Underlying medical conditions	Clinical signs and symptoms	Previous respiratory illness/ SARS-CoV-2 testing	SARS-CoV-2 testing at time of MIS-A admission	Laboratory studies (peak)*	Imaging/Other diagnostic studies	Treatments	Outcome and length of stay
Patient 7: 21, female, African American, New York	Obesity	Fever, fatigue, throat and neck pain, nausea, vomiting x 1 day.	Yes/PCR (+) 25 days earlier	PCR (+), Ab (+)	CRP 319 mg/L; D-dimer 713 ng/mL; ferritin 351 ng/mL; troponin T 0.04 ng/mL; IL-6 56.2 pg/mL; ALT 160 IU/L; ALC nadir 260 cells/μL	CT neck: bilateral supraclavicular and cervical lymphadenopathy with no discrete abscess or collection. CT chest: bilateral patchy ground-glass opacities, pleural effusion. TTE: mild to moderate diffuse left ventricular hypokinesis. Mild to moderate decreased left ventricular ejection fraction (40%). Small posterior pericardial effusion. Mild tricuspid and mitral valve regurgitation.	Dobutamine, heparin, ASA x1, corticosteroids x2	Discharged after 12 days
Patient 8: 47, female, African American, New York	None	Weakness, sore throat, shortness of breath, decreased exercise tolerance x 3 days.	Yes/Testing unknown	PCR (+), Ab testing not performed	CRP 485 mg/L; D-dimer 1365 ng/mL; ferritin 948 ng/mL; troponin T 0.24 ng/mL; ALT 45 U/L; ALC nadir 1980 cells/μL	EKG: first degree AV block and nonspecific T-wave abnormalities. TTE: borderline left ventricular ejection fraction (55%).	Heparin, convalescent plasma	Discharged after 8 days
Patient 9: 42, male, Asian, New York	Obesity	Fever, shortness of breath, cough, diarrhea, poor appetite, dysuria x 5 days.	Yes/PCR (+) 37 days earlier	PCR (-), Ab testing not performed	CRP 387 mg/L; D-dimer 3519 ng/mL; ferritin 7529 ng/mL; troponin T 0.60 ng/mL; ALT 66 U/L; ALC nadir 1740 cells/μL	TEE: mildly dilated left ventricle, moderately dilated right ventricle, moderate biventricular hypokinesis, moderately decreased left ventricular ejection fraction (35%). CXR: bilateral lower lobe opacities/ airspace disease.	Vasopressors, anticoagulation, corticosteroids	Discharged after 9 days

Abbreviations: Ab = antibody; ALC = absolute lymphocyte count; ALT = alanine aminotransferase; ASA = aspirin; CRP = C-reactive protein; CT = computed tomography; CXR = chest radiograph; EKG = electrocardiogram; HTN = hypertension; IL-6 = interleukin-6; IVIG = intravenous immunoglobulin; PCR = polymerase chain reaction; TEE = transesophageal echocardiogram; TTE = transthoracic echocardiogram.

* Normal ranges for laboratory studies: ALC 1000–4000 cells/μL; ALT 5–30 IU/L; CRP 0–10 mg/L; D-dimer <500 ng/mL; ferritin 12–300 ng/mL (men), 12–150 ng/mL (women); IL-6 ≤1.8 pg/mL; troponin I <0.03 ng/mL; troponin T < 0.1 ng/mL.

multiple organs including the heart, liver, brain, kidneys, and gastrointestinal tract (*7*). Additional proposed mechanisms for extrapulmonary dysfunction in COVID-19 include endothelial damage and thromboinflammation, dysregulated immune responses, and dysregulation of the renin-angiotensin-aldosterone system (*7*).

The interval between infection and development of MIS-A is unclear, adding to uncertainty regarding whether MIS-A represents a manifestation of acute infection or an entirely postacute phenomenon. In patients with COVID-19, dyspnea is typically experienced a median of 5–8 days and critical illness 10–12 days after onset of symptoms.[§] In patients who reported typical COVID-19 symptoms before MIS-A onset, MIS-A was experienced approximately 2–5 weeks later. However, eight MIS-A patients reported no preceding respiratory symptoms, making it difficult to estimate when initial infection occurred.

Given the high proportion of MIS-C patients with negative PCR testing, clinical guidelines recommend the use of both antibody and viral testing to assist with diagnosis (*8*–*10*). In patients with atypical or late manifestations of SARS-CoV-2 infection, including MIS-A, positive antibody results might be crucial to augment clinical recognition of this condition and guide treatment. In addition, the use of a panel of laboratory tests for inflammation, hypercoagulability, and organ damage (e.g., CRP, ferritin, D-dimer, cardiac enzymes, liver enzymes, and creatinine) might assist in the early identification and management of this COVID-19–associated condition.

All but one of the patients with MIS-A described in this report belonged to racial or ethnic minority groups. Long-standing health and social inequities have resulted in increased risk for infection and severe outcomes from COVID-19 in communities of color.[¶] MIS-C has also been reported disproportionately in these communities (*1*). Because patients described in this review represent a convenience sample from a small number of jurisdictions, conclusions cannot be made regarding the true burden or determinants of MIS-A in different groups; further research is needed.

§ https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html.

¶ https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html.

TABLE 2. Demographics, clinical features, treatments, and outcomes of seven adults reported in published literature with multisystem inflammatory syndrome (MIS) associated with SARS-CoV-2 infection — United Kingdom and United States, March–August 2020

Age (yrs), sex, race/ethnicity, location	Underlying medical conditions	Clinical signs/symptoms	Previous respiratory illness/ SARS-CoV-2 testing	SARS-CoV-2 testing at time of MIS-A admission	Laboratory studies (peak)*	Imaging/Other diagnostic studies	Treatments	Outcome and length of stay
Patient 10[†]: 36, female, Hispanic, New York	None	Fever, abdominal pain, vomiting, and diarrhea x 7 days; arthralgias and diffuse rash x 2 days. On admission, nonexudative conjunctivitis, mucositis, edema of bilateral hands and feet, palmar erythema, diffuse maculopapular rash, and cervical lymphadenopathy.	No/Not tested	PCR (+), Ab (+)	CRP 300 mg/L; D-dimer 652 ng/mL; ferritin 684 ng/mL; troponin I 0.07 ng/mL; ALT 116 IU/L; ALC nadir 900 cells/μL	TTE: moderate tricuspid regurgitation, pericardial effusion. CT chest: right pleural effusion. Ultrasound: gallbladder wall edema.	ASA, IVIG x1, corticosteroids	Discharged after 7 days
Patient 11[§]: 45, male, Hispanic, New York	None	Fever, sore throat, diarrhea, lower extremity pain, and diffuse rash x 6 days. On admission, hypotensive and tachycardic with nonexudative conjunctivitis, periorbital edema, mucositis, unilateral cervical lymphadenopathy, and diffuse exanthem.	No/Not tested	PCR (+), Ab testing not performed	CRP 547 mg/L; D-dimer 2977 ng/mL; ferritin 21,196 ng/mL; troponin 8.1 ng/mL; IL-6 117 pg/mL; ALT 133 IU/L; ALC nadir 700 cells/μL	EKG: ST elevations in anterolateral leads. TTE: ejection fraction 40% with global hypokinesis. CT head/neck: pre-septal edema. Slit lamp: uveitis.	Heparin, corticosteroids, IVIG x 2, Tocilizumab x 1	Discharged after 9 days
Patient 12[¶]: 44, female, Hispanic, Massachusetts	GERD, mild obstructive sleep apnea, depression	Chills, sore throat, cough, myalgias x 2 days (8 days before admission); followed by diarrhea and back pain x 3 days; followed by pleuritic chest pain and dyspnea. Admitted with profound cardiogenic shock.	Yes/Not tested	PCR (+), Ab testing not performed	CRP 141 mg/L; D-dimer 8691 ng/mL; ferritin 2564 ng/mL; hs-Trop T 1810 ng/L; IL-6 53.3 pg/mL; ALT 242 IU/L; ALC nadir 670 cells/μL	EKG: submillimeter ST-segment elevation in leads I/aVL, low QRS voltage. TTE: severely depressed left ventricular function, trace pericardial effusion. CT chest: mild ground glass opacities bilateral lung fields. CT abdomen/pelvis: small amount of ascites, periportal edema.	Norepinephrine, dobutamine, vasopressin, milrinone, IVIG x 5 days, ECMO to LVAD and RVAD.	Discharged to rehabilitation facility after 18 days; home 7 days later
Patient 13**: 21, male, African origin, United Kingdom	None	Fever, headache, and abdominal pain x 6 days; transient palmar rash. Hypotensive on admission with nonexudative conjunctivitis, mucositis, cervical lymphadenopathy.	No/Not tested	PCR (-), Ab (+)	CRP 338 mg/L; D-dimer 4260 ng/mL; ferritin 1249 ng/mL; troponin T 3.3 ng/mL; ALT 330 IU/L; ALC nadir 390 cells/μL	CT abdomen/pelvis: mesenteric adenopathy and ileitis. EKG: sinus tachycardia. CT chest: normal. TTE: normal. CT coronary angiogram: normal.	ASA, corticosteroids, IVIG x 1	Discharged after 8 days
Patient 14[††]: 31, female, African American, Louisiana	Obesity, HTN, diabetes mellitus type 2	Fever x 1 day, throbbing neck pain, nausea, vomiting.	Yes/PCR (+) 14 days before admission	PCR (-), Ab testing not performed	CRP 580 mg/L; D-dimer 453 ng/mL; ferritin 793 ng/mL; ALT 52 IU/L; ALC nadir 2120 cells/μL	Pathology: small-vessel cardiac vasculitis; new pulmonary thrombi in a background of otherwise reparative changes in the lungs. CT head/neck: bilateral enlarged parotid glands. CT chest: interval improvement of bibasilar ground-glass opacities with cervical and anterior mediastinal lymphadenopathy.	CPR	Deceased at admission (ventricular fibrillation)

See table footnotes on the next page.

The majority (24 of 27) of patients with MIS-A survived, similar to those with MIS-C, associated with receiving care in acute, often intensive, health care settings. Because of the potential therapies that might benefit these patients as described in these case reports, clinicians should consider MIS-A within a broader differential diagnosis when caring for adult patients with clinical and laboratory findings consistent with the working MIS-A case definition.

The findings in this report are subject to at least three limitations. First, cases described here were voluntarily reported or published and therefore are not representative of the true clinical spectrum or racial/ethnic distribution of this emerging

TABLE 2. (*Continued*) Demographics, clinical features, treatments, and outcomes of seven adults reported in published literature with multisystem inflammatory syndrome (MIS) associated with SARS-CoV-2 infection — United Kingdom and United States, March–August 2020

Age (yrs), sex, race/ethnicity, location	Underlying medical conditions	Clinical signs/symptoms	Previous respiratory illness/ SARS-CoV-2 testing	SARS-CoV-2 testing at time of MIS-A admission	Laboratory studies (peak)*	Imaging/Other diagnostic studies	Treatments	Outcome and length of stay
Patient 15[§§]: 25, female, Hispanic, Georgia	None	Fever, weakness, and shortness of breath x 7 days; followed by sore throat, mild cough, vomiting, and diarrhea. Hypotensive on admission with conjunctivitis, mucositis, cervical lymphadenopathy.	No/Not tested	PCR (+), Ab (+)	CRP 90 mg/L; D-dimer 1918 ng/mL; ferritin 798 ng/mL; troponin I 0.06 ng/mL; ALT 25 IU/L, ALC nadir 1150 cells/μL	TTE: moderate to severely reduced right-sided ventricular dysfunction, flattened interventricular septum in systole consistent with right ventricular pressure overload. EKG: right axis deviation. CT chest: scattered patchy ground glass opacities and peripheral consolidation, small bilateral pleural effusions with adjacent atelectasis; mild enlargement of the main pulmonary artery without pulmonary embolus. CT abdomen/ pelvis: mild peripancreatic fat stranding, nonspecific bilateral perinephric fat stranding.	ASA, IVIG x 2, vasopressors	Discharged after 5 days
Patient 16[¶¶]: 38, female, Hispanic, Texas	None	Fever, occipital headache, conjunctival injection, odynophagia, mucositis, glossitis shortness of breath, vomiting, polyarthralgia, and rash x 5 days.	Yes/PCR (+) 28 days earlier	PCR (+), Ab (+)	CRP 217 mg/L; D-dimer 1250 ng/mL; ferritin 196 ng/mL; troponin I <0.03 ng/mL; ALT 126 IU/L; ALC nadir 120 cells/μL	TTE: trace pericardial effusion, elevated pulmonary artery pressure (46–51 mmHg), normal left ventricular ejection fraction, no coronary artery abnormalities. CT chest/abdomen/pelvis: no pulmonary emboli, right upper lobe perihilar ground-glass opacities, septal and bronchial wall thickening, bilateral small-to-moderate pleural effusions.	ASA, corticosteroids, IVIG x 2	Discharged after 7 days

Abbreviations: Ab = antibody; ALC = absolute lymphocyte count; ALT = alanine aminotransferase; ASA = aspirin; CPR = cardiopulmonary resuscitation; CRP = C-reactive protein; CT = computed tomography; ECMO = extracorporeal membrane oxygenation; EKG = electrocardiogram; GERD = gastroesophageal reflux disease; hs-Trop T = high sensitivity troponin T; HTN = hypertension; IL-6 = interleukin-6; IVIG = intravenous immunoglobulin; LVAD = left ventricular assist device; PCR = polymerase chain reaction; RVAD = right ventricular assist device; TTE = transthoracic echocardiogram.

* Normal ranges for laboratory studies: ALC 1000–4000 cells/μL; ALT 5–30 IU/L; CRP 0–10 mg/L; D-dimer <500 ng/mL; Ferritin 12–300 ng/mL (men), 12–150 ng/mL (women); hs-Trop T 0–9 ng/L IL-6 ≤1.8 pg/mL; troponin I <0.03 ng/mL; troponin T < 0.1 ng/mL.

† https://www.sciencedirect.com/science/article/pii/S0735675720305428?via%3Dihub.

§ https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(20)31526-9.pdf.

¶ https://www.nejm.org/doi/10.1056/NEJMcpc2004975.

** https://www.sciencedirect.com/science/article/pii/S2665991320302344?via%3Dihub.

†† https://www.acpjournals.org/doi/10.7326/L20-0882.

§§ https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-020-05439-z.

¶¶ https://ard.bmj.com/content/early/2020/09/25/annrheumdis-2020-218959.

syndrome. Additional cases might not have been reported or published; others might have remained unrecognized because of absence of COVID-like symptoms, lack of antibody testing, or negative test results. Second, the working case definition excludes patients with severe respiratory dysfunction to distinguish MIS-A from severe COVID-19; however, the two conditions might overlap in some cases. Finally, the working case definition for this syndrome is potentially nonspecific, and some patients with other disease processes might have been misclassified as having MIS-A.

Clinicians and health departments should consider MIS-A in adults with signs and symptoms compatible with the current working MIS-A case definition. Antibody testing for SARS-CoV-2 might be needed to confirm previous COVID-19 infection in patients who do not have positive SARS-CoV-2 PCR or antigen test results. Findings in this convenience sample emphasize the importance of collecting race/ethnicity data on case reports at the jurisdictional level. As with children, it is important that multidisciplinary care be considered to ensure optimal treatment. In the process of learning more

Summary

What is already known about this topic?

Multisystem inflammatory syndrome in children (MIS-C) is a rare but severe complication of SARS-CoV-2 infection in children and adolescents. Since June 2020, several case reports and series have been published reporting a similar multisystem inflammatory syndrome in adults (MIS-A).

What is added by this report?

Cases reported to CDC and published case reports and series identify MIS-A in adults, who usually require intensive care and can have fatal outcomes. Antibody testing was required to identify SARS-CoV-2 infection in approximately one third of 27 cases.

What are the implications for public health practice?

Clinical suspicion and indicated SARS-CoV-2 testing, including antibody testing, might be needed to recognize and treat adults with MIS-A. Further research is needed to understand the pathogenesis and long-term effects of this condition. Ultimately, the recognition of MIS-A reinforces the need for prevention efforts to limit spread of SARS-CoV-2.

from MIS-A cases, the working case definition might need to be revised in order to systematically conduct a call for cases. Further research is needed to understand the pathogenesis and long-term effects of this newly described condition. Ultimately, the recognition of MIS-A reinforces the need for prevention efforts to limit spread of SARS-CoV-2.

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Adolescent with COVID-19 as the Source of an Outbreak at a 3-Week Family Gathering — Four States, June–July 2020

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There is increasing evidence that children and adolescents can efficiently transmit SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19) (*1–3*). During July–August 2020, four state health departments and CDC investigated a COVID-19 outbreak that occurred during a 3-week family gathering of five households in which an adolescent aged 13 years was the index and suspected primary patient; 11 subsequent cases occurred.

Both heads of each household were interviewed to assess demographic characteristics, exposures, symptoms, close contacts, and outcomes. Parents provided data for all children, adolescents, and young adults. Thirteen of the index patient's relatives sought viral testing; test results were reported by respondents, and all test results that were reported to be positive were verified in state reporting systems. For three children and adolescents who were not tested while symptomatic, a chemiluminescent immunoassay* detecting total antibody to SARS-CoV-2 was performed 28–46 days after symptom onset; results were positive for all three children and adolescents, including the index patient and her two brothers, indicating earlier infection. Likely exposure periods† and infectious periods§ were estimated from symptom onset dates. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.¶

While away from home, the index patient was exposed during a large COVID-19 outbreak in June 2020. Because of her exposure, she sought testing for SARS-CoV-2 after returning home. A rapid antigen test performed 4 days after exposure, when she was asymptomatic, was negative (Table) (Figure). She experienced nasal congestion 2 days later, her only symptom. That same day, she, her parents, and two brothers traveled to a gathering with 15 other relatives, which began the following day. Attendees belonged to five households in four states and ranged in age from 9 to 72 years. Fourteen relatives, including the index patient, stayed in a five-bedroom, two-bathroom house for 8–25 days. These relatives did not wear face masks or practice physical distancing. An additional six relatives (an aunt, an uncle, and four cousins) visited for 10 hours on day 3 and 3 hours on day 10, when six overnight attendees were potentially infectious, but maintained physical distance and remained outdoors; none wore face masks.

Among the 14 persons who stayed in the same house, 12 experienced symptoms** and were subsequently found to have COVID-19 based on Council of State and Territorial Epidemiologists definitions.†† Six cases were confirmed by reverse transcription–polymerase chain reaction (RT-PCR) testing, four persons were classified as having probable COVID-19 based on positive antigen testing or clinical and epidemiologic criteria, and two persons were classified as having suspected COVID-19 based on positive antibody testing, including the index patient (Table). The other two overnight attendees never experienced symptoms, including one who received a negative SARS-CoV-2 RT-PCR test result 4 days after the last exposure. One person with COVID-19 was hospitalized and another sought emergency department care for respiratory symptoms; both recovered. None of the six relatives who remained outdoors and maintained physical distance developed symptoms; four had negative RT-PCR test results 4 days after the last exposure, and two were not tested. Relatives with COVID-19 were advised by state investigators to self-isolate, and contacts were advised to self-quarantine.

Eight relatives reported activities outside the gathering during their exposure periods that might have increased their risks for exposure. However, only the index patient reported exposure to a person with confirmed COVID-19 or compatible symptoms outside the family. The index patient's high-risk exposure and symptom onset 3–19 days before that of any other person at the family gathering support the hypothesis that this adolescent's infection was the source

* https://www.fda.gov/media/136967/download.

† The likely exposure period was estimated to begin 14 days before symptom onset and end 2 days before symptom onset, which corresponds to the longest potential incubation period. https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html.

§ The infectious period was estimated to begin 2 days before symptom onset and end 10 days after symptom onset, according to CDC guidance. https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/investigating-covid-19-case.html.

¶ See e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

** Reported signs and symptoms included fatigue (seven patients), measured or subjective fever (six), chills (six), cough (six), loss of smell (five), loss of taste (five), congestion (five), headache (five), shortness of breath (four), myalgia (three), diarrhea (three), runny nose (two), sore throat (one), and nausea (one).

†† https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/08/05/.

TABLE. Confirmed, probable, and suspected COVID-19 cases* among overnight attendees and day visitors at a 3-week family gathering — four states, June–July 2020

Patient no.	Relationship to index patient (age, yrs)	Days attended gathering	Symptom onset† (days from start of gathering)	Laboratory testing (result), no. of days from symptom onset	Case status
Overnight attendee					
1	Index patient (13)	0–21	-1	Ag (-), -2; Ab (+), 46	Suspected
2	Brother (9)	0–21	2	Ab (+), 43	Suspected
3	Grandfather (72)	0–24	7	PCR (+), 7	Confirmed
4	Mother (42)	0–21	9	PCR (+), 4	Confirmed
5	Uncle (41)	2–5, 7–10	9	Ag (+), 4	Probable
6	Aunt (34)	2–5, 7–10	11	Ag (+), 2	Probable
7	Aunt (46)	0–24	11	PCR (+), 3	Confirmed
8	Uncle (46)	0–12	14	PCR (+), 2	Confirmed
9	Father (42)	0–21	17	PCR (+), 0	Confirmed
10	Grandmother (72)	0–24	17	PCR (+), 3	Confirmed
11	Brother (15)	0–21	17	Ab (+), 28	Probable§
12	Cousin (10)	0–24	18	Not tested	Probable§
—	Cousin (14)	0–12	N/A	PCR (-), N/A	Noncase
—	Cousin (16)	0–24	N/A	Not tested	Noncase
Day visitor					
—	Uncle (48)	3, 10	N/A	PCR (-), N/A	Noncase
—	Aunt (47)	3, 10	N/A	PCR (-), N/A	Noncase
—	Cousin (22)	3, 10	N/A	PCR (-), N/A	Noncase
—	Cousin (20)	3, 10	N/A	Not tested	Noncase
—	Cousin (18)	3, 10	N/A	Not tested	Noncase
—	Cousin (16)	3, 10	N/A	PCR (-), N/A	Noncase

Abbreviations: Ab = antibody; Ag = antigen; COVID-19 = coronavirus disease 2019; N/A = not applicable; PCR = polymerase chain reaction.
* Cases were classified as confirmed, probable, or suspected according to revised interim case definitions from the Council of State and Territorial Epidemiologists (https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/08/05/).
† Reported signs and symptoms included fatigue (seven patients), measured or subjective fever (six), chills (six), cough (six), loss of smell (five), loss of taste (five), congestion (five), headache (five), shortness of breath (four), myalgia (three), diarrhea (three), runny nose (two), sore throat (one), and nausea (one).
§ Based on clinical and epidemiologic criteria.

of the family outbreak (Figure). The adolescent's initial antigen test result was likely a false negative because it was performed before symptom onset; the only antigen test that had Food and Drug Administration Emergency Use Authorization at the time was intended for use within the first 5 days of symptoms.[§§]

This outbreak highlights several important issues. First, children and adolescents can serve as the source for COVID-19 outbreaks within families, even when their symptoms are mild (*2*). Better understanding of transmission by children and adolescents in different settings is needed to refine public health guidance. Second, this investigation provides evidence of the benefit of physical distancing as a mitigation strategy to prevent SARS-CoV-2 transmission. None of the six family members who maintained outdoor physical distance without face masks during two visits to the family gathering developed symptoms; the four who were tested for SARS-CoV-2 had negative test results. Third, rapid antigen tests generally have lower sensitivity (84.0%–97.6%) compared with RT-PCR testing; negative results should be confirmed with RT-PCR if used for persons with high pretest probability of infection, such as those with a known exposure (*4*). Fourth, regardless of negative test results, persons should self-quarantine for 14 days after a known exposure (*5*) or after travel when mandated by state, territorial, tribal, or local authorities (*6*). Finally, SARS-CoV-2 can spread efficiently during gatherings, especially with prolonged, close contact. Physical distancing, face mask use, and hand hygiene reduce transmission; gatherings should be avoided when physical distancing and face mask use are not possible (*7*).

§§ https://www.fda.gov/media/140299/download.

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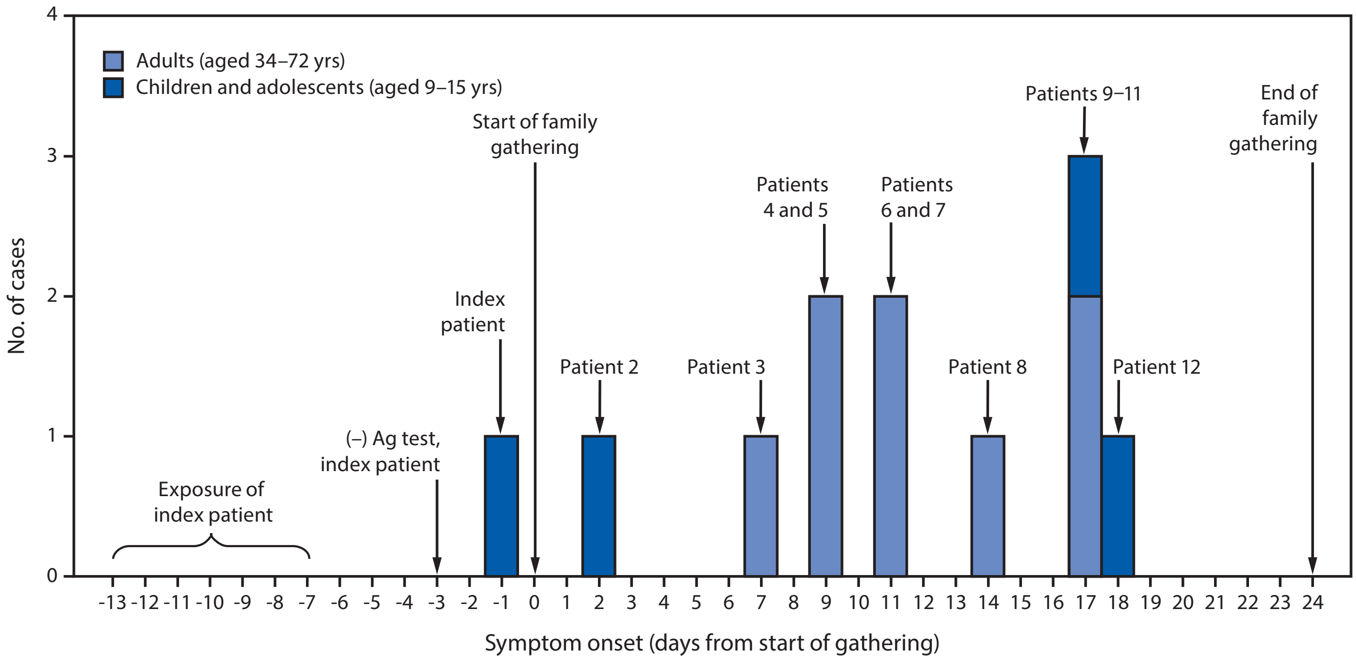
FIGURE. COVID-19 cases among children, adolescents, and adults who attended a 3-week family gathering* — four states, June–July 2020



Abbreviations: Ag = antigen; COVID-19 = coronavirus disease 2019.
* Patient numbers refer to those in the Table, where further details about each patient are provided.

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Trends in COVID-19 Incidence After Implementation of Mitigation Measures — Arizona, January 22–August 7, 2020

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Mitigating the spread of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), requires individual, community, and state public health actions to prevent person-to-person transmission. Community mitigation measures can help slow the spread of COVID-19; these measures include wearing masks, social distancing, reducing the number and size of large gatherings, pausing operation of businesses where maintaining social distancing is challenging, working from or staying at home, and implementing certain workplace and educational institution controls (*1–4*). The Arizona Department of Health Services' (ADHS) recommendations for mitigating exposure to SARS-CoV-2 were informed by continual monitoring of patient demographics, SARS-CoV-2 community spread, and the pandemic's impacts on hospitals. To assess the effect of mitigation strategies in Arizona, the numbers of daily COVID-19 cases and 7-day moving averages during January 22–August 7, 2020, relative to implementation of enhanced community mitigation measures, were examined. The average number of daily cases increased approximately 151%, from 808 on June 1, 2020 to 2,026 on June 15, 2020 (after stay-at-home order lifted), necessitating increased preventive measures. On June 17, local officials began implementing and enforcing mask wearing (via county and city mandates),* affecting approximately 85% of the state population. Statewide mitigation measures included limitation of public events; closures of bars, gyms, movie theaters, and water parks; reduced restaurant dine-in capacity; and voluntary resident action to stay at home and wear masks (when and where not mandated). The number of COVID-19 cases in Arizona peaked during June 29–July 2, stabilized during July 3–July 12, and further declined by approximately 75% during July 13–August 7. Widespread implementation and enforcement of sustained community mitigation measures informed by state and local officials' continual data monitoring and collaboration can help prevent transmission of SARS-CoV-2 and decrease the numbers of COVID-19 cases.

ADHS supports surveillance and investigation efforts of local public health departments, compiles surveillance and investigation information across counties, and provides infrastructure statewide to support infectious disease surveillance. Data on laboratory-confirmed and probable (*5*) COVID-19 cases (based on the Council of State and Territorial Epidemiologists case definitions)† were collected in the centralized Medical Electronic Disease Surveillance Intelligence System (MEDSIS),§ which is used by state, tribal, and county public health agencies to report human-based diseases in Arizona. Information was submitted to or entered into MEDSIS by health care providers, laboratories, local health departments, tribal entities, and ADHS. Multiple laboratory tests submitted for a single patient were combined into a single record. Specimen collection date was used for confirmed cases, and symptom onset date was used for probable cases.

Temporal trends were examined by comparing the number of daily COVID-19 cases (as of September 1)¶ and 7-day moving averages before, during, and after implementation of enhanced community mitigation measures, defined as the following: limitations on persons' time away from their place of residence except for essential activities; certain business closures and service limitations (e.g., occupancy limitations, curbside pickup, and delivery of goods); enhanced sanitation practices**; social distancing, employee mask wearing, and symptom screenings for all businesses operating a physical location; limitations on the occurrence and size of public events; and local mandates enforcing mask use. The 7-day moving average was calculated after the cumulative case count exceeded 20 cases and is presented to describe COVID-19 trends.

On March 11, 2020, Arizona declared a public health state of emergency to prepare for, prevent, respond to, and mitigate the spread of SARS-CoV-2. Additional guidance was provided to local officials, businesses, communities, and individual persons to implement social distancing and close schools statewide

* Mandates and ordinances varied and were county- and city-specific. Enforcement types included educating persons on the dangers of COVID-19 spread, issuing fines to persons and businesses who refused to comply with mandates, and loss of licenses for businesses not enforcing rules or mandates.

† https://cdn.ymaws.com/www.cste.org/resource/resmgr/ps/positionstatement2020/Interim-20-ID-02_COVID-19.pdf.

§ https://azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-services/index.php#medsis-faqs.

¶ https://www.azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-epidemiology/covid-19/dashboards/index.php.

** Based on guidance from ADHS, CDC, and the Department of Labor, and Occupational Safety and Health Administration to limit and mitigate the spread of COVID-19, including promoting healthy hygiene practices; and intensifying cleaning, disinfection and ventilation practices.

(March 15); postpone and limit large gatherings to fewer than 50 persons; recommend telework options; restrict access to congregate settings; require restaurants to provide dine-out options only; and close all bars, gyms, and movie theaters in counties with confirmed COVID-19 cases (March 19) (Table). Based on Arizona data and CDC guidance (*1*,*2*), ADHS also recommended limiting persons' time away from their place of residence except for essential activities (i.e., stay-at-home order, "Stay Home, Stay Healthy, Stay Connected")[††] (March 31).

During April 1–May 15, the 7-day moving average of daily cases ranged from 154 to 443 (Figure). During April 29–May 11, Arizona initiated a phased approach for retail shops and stores, cosmetologists, and barbers to reopen and operate, and for restaurants to resume dine-in services; the stay-at-home order ended May 15.

Average daily cases increased 151% from June 1 (808) to June 15 (2,026), necessitating an increased focus on preventive measures by businesses, communities, and individual persons. Updated guidance from state officials provided local governments the authority to implement mask policies (June 17) and enforcement measures tailored to local public health needs (local policies were applicable to approximately 85% of the total Arizona population). Before June 17, mask wearing had not been widely mandated or enforced. Arizona limited organized public events to fewer than 50 persons (with some exceptions); closed bars, gyms, movie theaters, and water parks and recreational tubing facilities (June 29); and limited restaurants' indoor dining to <50% capacity, with at least 6 feet of separation between patrons (July 9). The 7-day moving average of daily cases peaked during June 29–July 2 (range = 4,148–4,377), stabilized during July 3–12 (range = 3,609–4,160), and subsequently decreased 75% from July 13 (3,506) to August 7 (867). Mitigation measures put in place in June were extended through August to further limit transmission.

Discussion

Quantitative data on the effectiveness of community mitigation measures at suppressing the spread of COVID-19 are limited. The primary goal of implementing widespread enhanced mitigation measures in Arizona was to protect and save lives and maintain capacity in the health care system. A combination of voluntary and enforceable measures is more effective than any single measure (*6*). Mitigation measures mandated through public policy can effectively increase social distancing (*7*), and wearing masks has prevented transmission of SARS-CoV-2 (*8*). In Arizona, decreases in daily COVID-19

[††] https://www.azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-epidemiology/index.php#novel-coronavirus-admin-orders; https://azgovernor.gov/executive-orders.

TABLE. Public policies to implement and enforce COVID-19 community mitigation measures and dates of issue/reissue* — Arizona, March 11–August 7, 2020

Mitigation measure	Date of issue/reissue
Declaration of emergency	Mar 11
School closure (on-site learning)	Mar 15
Limits on senior living facilities visitation	Mar 19
Expanded availability and coverage for telemedicine for persons, pets, and animals	Mar 25, Apr 1
Deferred requirements to renew driver license	Mar 20
Stay-at-home order	Mar 30–May 15
Business/Service closures	
Bars	Mar 19, Jun 29, Jul 23
Movie theaters	Mar 19, Jun 29, Jul 23
Indoor gyms and fitness clubs	Mar 19, Jun 29, Jul 23
Restaurants, on-site dining	Mar 19
Pools	Mar 19
Water parks and recreational tubing facilities	Jun 29, Jul 23
Business/Service limits (requirements)	
All businesses operating a physical location (enhanced sanitation,[†] social distancing, employee mask wearing, symptom screenings)	Jun 17
Retail (limited capacity, social distancing, enhanced sanitation)	Apr 29
Barbers and cosmetologists (employee mask wearing, spaced appointments, enhanced sanitation)	May 4
Restaurants (social distancing, limited capacity, employee mask wearing, patron mask wearing [when not eating or drinking], employee screening, enhanced sanitation)	May 4, Jul 9
Public pools (e.g., at hotels; limited capacity)	Jun 29, Jul 23
Private pools in public areas (e.g., multihousing complexes; limited capacity)	Jun 29, Jul 23
Public events (<50 persons)	Mar 15, Jun 29, Jul 23
Wearing masks (mandatory)	
Local officials able to mandate and enforce wearing masks	Jun 17
Yuma County	Jun 18
Maricopa County	Jun 19
Pima County	Jun 19
Santa Cruz County	Jun 19
Coconino County	Jun 20
>40 other cities/tribal communities	Jun 17–25[§]

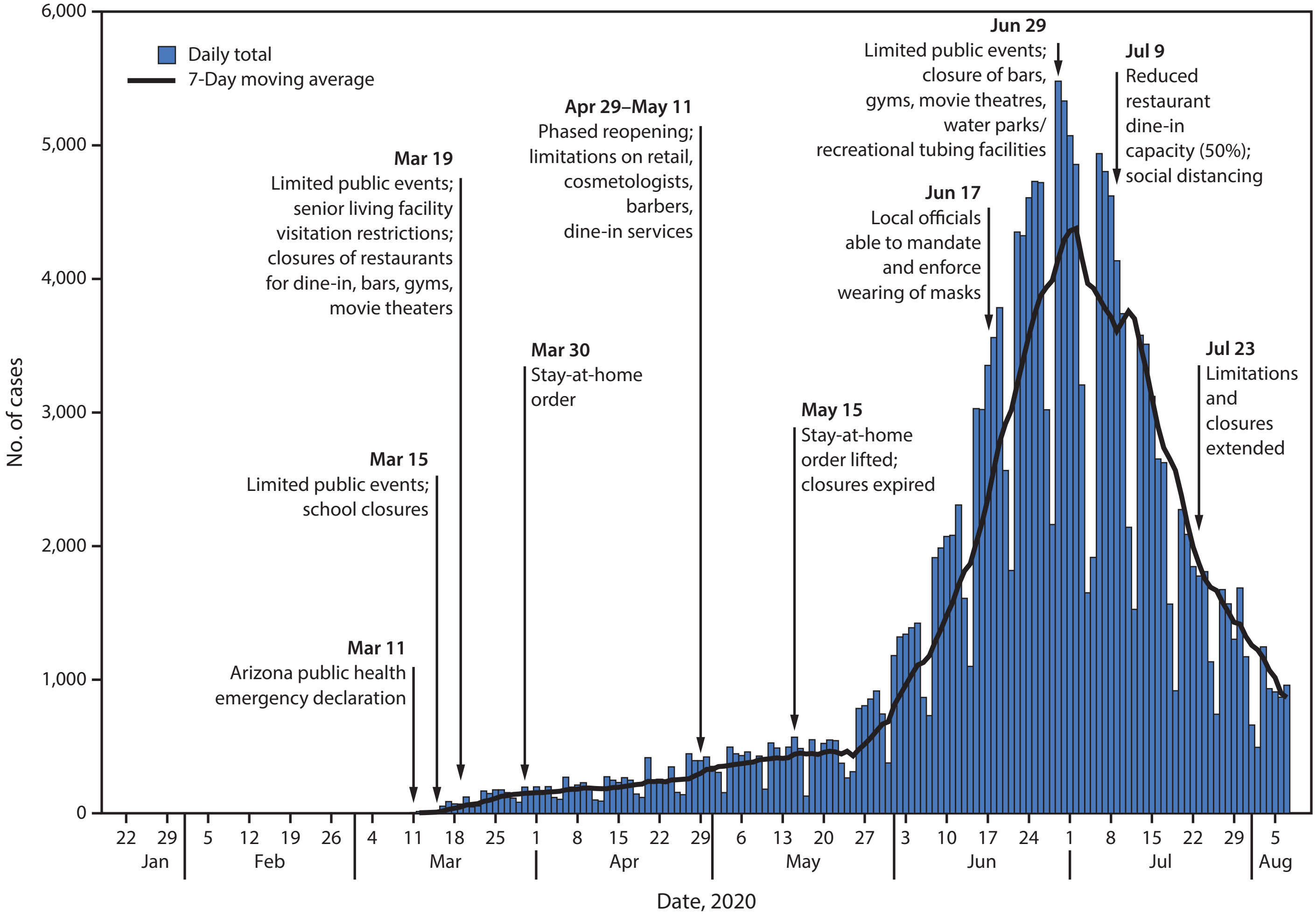
Abbreviation: COVID-19 = coronavirus disease 2019.

* Issue dates are the dates the issuing official signed the order implementing the mandatory mitigation measure. In some instances, mitigation measures were effective either immediately or within 1 to 3 days of issue. https://www.azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-epidemiology/index.php#novel-coronavirus-admin-orders; https://azgovernor.gov/executive-orders.

[†] Based on guidance from the Arizona Department of Health Services, CDC, Department of Labor, and Occupational Safety and Health Administration (OSHA) to limit and mitigate the spread of COVID-19 including promoting healthy hygiene practices; and intensifying cleaning, disinfection and ventilation practices.

[§] Other tribal communities with mask mandates (issued June 18–23) included Fort McDowell Yavapai Nation, Gila River Indian Community, Navajo Nation, Salt-River Pima-Maricopa Indian Community, Tohono O'Odham Nation. Other cities with mask mandates (issued June 17–25) included Avondale, Bisbee, Buckeye, Carefree, Casa Grande, Chandler, Clarkdale, Clifton, Coolidge, Cottonwood, Douglas, Flagstaff, Fountain Hills, Gila Bend, Gilbert, Glendale, Globe, Goodyear, Guadalupe, Jerome, Kingman, Litchfield Park, Mammoth, Mesa, Miami, Nogales, Oro Valley, Paradise Valley, Payson, Peoria, Phoenix, San Luis, Sedona, Scottsdale, Somerton, Superior, Surprise, Tempe, Tolleson, Tucson, Youngtown, Yuma. Several other tribal communities and cities encouraged but did not mandate wearing masks.

FIGURE. Selected community mitigation measures* and COVID-19 case counts† and 7-day moving averages§ — Arizona, January 22–August 7, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* Issue dates are the dates the issuing official signed the order implementing the mandatory mitigation measure. In some instances, mitigation measures were effective either immediately or within 1 to 3 days of issue. https://www.azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-epidemiology/index.php#novel-coronavirus-admin-orders; https://azgovernor.gov/executive-orders.

† As of September 1, 2020. Specimen collection date was used for confirmed cases, and symptom onset date was used for probable cases.

§ Plotting of 7-day moving average began when cumulative case count exceeded 20 cases.

cases were observed after widespread sustained community mitigation measures that promoted social distancing, limited large gatherings, paused operations of businesses where mask use and social distancing were difficult to maintain, mandated and enforced mask wearing, and promoted voluntary resident actions to stay at home and wear masks (when and where not mandated). The number of COVID-19 cases stabilized and began to decrease approximately 2 weeks after local officials began mandating mask wearing (throughout several counties and cities) and enhanced sanitation practices. Additional declines in case counts were associated with implementation of statewide limitations and closures sustained throughout July and extended into August.

The findings in this report are subject to at least four limitations. First, the relationship between mitigation measures and changes in case counts are temporal correlations and should not be interpreted to infer causality. Other factors that might have influenced the rate of change (e.g., travel restrictions, neighboring state mitigation measures, and individual choices to reduce movement before implementation of mandates) cannot be ruled out. Second, health centers run by tribal entities and federal health facilities (i.e., Indian Health Service, Veteran's Administration, and Department of Defense) in the state are requested but not required to comply with state reporting rules. Many of these health centers and federal health facilities complied with reporting, but the completeness of reporting by these entities is unknown. Third, adherence to

Summary

What is already known about this topic?

Community mitigation measures can help slow the spread of COVID-19.

What is added by this report?

The number of COVID-19 cases in Arizona stabilized and then decreased after sustained implementation and enforcement of statewide and locally enhanced mitigation measures, beginning approximately 2 weeks after implementation and enforcement of mask mandates and enhanced sanitations practices began on June 17; further decreases were observed during July 13–August 7, after statewide limitations and closures of certain services and businesses.

What are the implications for public health practice?

Widespread implementation and enforcement of sustained community mitigation measures, including mask wearing, informed by state and local officials' continual data monitoring and collaboration can help prevent transmission of SARS-CoV-2 and decrease the numbers of COVID-19 cases.

mitigation measures was not assessed, nor could the extent to which each individual measure affected the number of incident COVID-19 cases be established. Finally, Arizona might not be representative of other U.S. states, and community mitigation measures might have a different impact in more populous or densely populated states; thus, these findings are not necessarily generalizable to other settings.

Enhanced mitigation measures should be implemented by communities and persons to slow COVID-19 spread, particularly before a vaccine or therapeutic treatment becomes widely available. State, local, and tribal officials are best positioned to continually monitor data and collaborate to determine the level and types of enhanced mitigation required. Mitigation measures, including mask mandates, that are implemented and enforced statewide appear to have been effective in decreasing the spread of COVID-19 in Arizona.

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Progress Toward Poliomyelitis Eradication — Afghanistan, January 2019–July 2020

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Wild poliovirus type 1 (WPV1) transmission is ongoing only in Afghanistan and Pakistan (*1*). Following a decline in case numbers during 2013–2016, the number of cases in Afghanistan has increased each year during 2017–2020. This report describes polio eradication activities and progress toward polio eradication in Afghanistan during January 2019–July 2020 and updates previous reports (*2*,*3*). Since April 2018, insurgent groups have imposed bans on house-to-house vaccination. In September 2019, vaccination campaigns in areas under insurgency control were restarted only at health facilities. In addition, during March–June 2020, all campaigns were paused because of the coronavirus disease 2019 (COVID-19) pandemic. The number of WPV1 cases reported in Afghanistan increased from 21 in 2018 to 29 in 2019. During January–July 2020, 41 WPV1 cases were reported as of August 29, 2020 (compared with 15 during January–July 2019); in addition, 69 cases of circulating vaccine-derived poliovirus type 2 (cVDPV2), and one case of ambiguous vaccine-derived poliovirus type 2 (aVDPV2) (isolates with no evidence of person-to-person transmission or from persons with no known immunodeficiency) were detected. Dialogue with insurgency leaders through nongovernmental and international organizations is ongoing in an effort to recommence house-to-house campaigns, which are essential to stopping WPV1 transmission in Afghanistan. To increase community demand for polio vaccination, additional community health needs should be addressed, and polio vaccination should be integrated with humanitarian services.

Immunization Activities

In September 2015, wild poliovirus type 2 was declared to be globally eradicated, and a single dose of injectable inactivated poliovirus vaccine (IPV, containing inactivated vaccine virus types 1, 2, and 3) was introduced into the routine immunization program in Afghanistan. In April 2016, type 2 oral poliovirus vaccine (OPV) was withdrawn through a globally synchronized switch from trivalent OPV (tOPV, containing Sabin-strain types 1, 2, and 3) to bivalent OPV (bOPV, containing types 1 and 3.) The World Health Organization (WHO) and United Nations Children's Fund (UNICEF) estimated national routine vaccination coverage of children aged <12 months with the third dose of bOPV in Afghanistan was 73% in 2018 and 2019. Estimated 1-dose IPV coverage in 2019 was 66% (*4*). In 2019, 69% of children aged 6–23 months with nonpolio acute flaccid paralysis (NPAFP) nationwide had a history of receipt of 3 OPV doses (OPV3) through routine immunization services, a proxy indicator of OPV3 coverage. The proportion of children with NPAFP who never received OPV through routine or supplementary immunization activities (SIAs)* was 1% nationally in 2019, with higher percentages in the southern provinces of Kandahar (9%) and Uruzgan (25%), and the eastern province of Kunar (7%).

During January 2019–July 2020, where vaccination campaigns were allowed, 5 national immunization days (NIDs), 5 subnational immunization days (SNID), two WPV1 case response campaigns, and one cVDPV2 case response campaign SIAs targeted children aged <5 years for receipt of monovalent OPV type 1 (mOPV1, containing Sabin-strain type 1), bOPV, or monovalent OPV type 2 (mOPV2, containing Sabin-strain type 2), including NIDs targeted 9,999,227 children aged <5 years. During SIAs, IPV was administered to 554,211 (87%) children targeted in the districts at highest risk for poliovirus transmission.

To reach every child with OPV, the polio program conducts house-to-house SIAs whenever feasible. Children who are missed during campaigns are classified as inaccessible if they live in areas with security challenges to access or where campaigns are banned. Children are considered missed but accessible when they are not vaccinated because of campaign quality issues. SIAs were banned in all areas controlled by the insurgency in April 2018. Since September 2019, vaccination in these areas has only been permitted at health facilities or insurgency-approved fixed posts.

According to reported administrative data, 449,756 (4%) children aged <5 years in Afghanistan were inaccessible during the March 2019 NID. The number increased to 2,844,197 (28%) during the November 2019 NID and was 2,655,821 (27%) during the January 2020 NID. After a 5-month COVID-19–related pause in SIAs, a cVDPV2 response campaign with mOPV2 was conducted in July 2020 in the eastern region, where 107,768 (10%) of 1,101,740 targeted children were inaccessible. During these SIAs, the numbers of children reported as accessible but missed resulting from campaign quality failures were 399,969 (4%) in March 2019, 299,977 (2%) in November 2019 and January 2020, and 22,035 (2%) in July 2020.

* SIAs are mass house-to-house campaigns targeting children aged <5 years with OPV, regardless of their vaccination history.

Lot quality assurance sampling (LQAS)[†] surveys assess SIA quality in areas where permitted, with more accuracy than convenience-sampled, post-SIA monitoring surveys. Depending on the number of unvaccinated children among 60 children surveyed, SIAs in districts are marked either "passed" at a 90% threshold or "failed." The proportion of districts with failed LQAS SIAs was 29% in April 2019, 15% in November 2019, 24% in January 2020, and 40% in July 2020.

Children aged ≤10 years are also targeted for vaccination along major travel routes throughout Afghanistan, at transit points from inaccessible areas, and at border-crossing points with Iran and Pakistan. During January 2019–July 2020, 24,009,626 doses of bOPV were administered at transit points and 1,296,109 doses at border crossings. Starting in March 2019, documented annual bOPV vaccination was required for all persons entering Afghanistan from Pakistan, resulting in an additional 551,837 doses administered to persons aged >10 years.

Poliovirus Surveillance

Acute flaccid paralysis surveillance. Detection of two or more NPAFP cases per 100,000 persons aged <15 years indicates surveillance sufficiently sensitive to detect a poliovirus case; to assess the ability to detect poliovirus among those with acute flaccid paralysis (AFP), 80% of AFP cases should have adequate stool specimens collected.[§] The Afghanistan AFP surveillance network includes 2,501 health facilities and 38,140 community volunteers. In 2019, the national NPAFP rate was 18 per 100,000 persons aged <15 years with regional rates ranging from 12 to 26 (Table). The percentage of AFP cases with adequate specimens was 94% (regional range = 90%–98%).

Environmental surveillance. Supplementary poliovirus surveillance in Afghanistan is conducted through systematic sampling of sewage at 23 sites in 11 provinces and virologic testing. WPV1 was detected in 83 (25%) of 336 environmental surveillance (ES) specimens in 2018, 56 (23%) of 259 in 2019, and 26 (10%) of 249 in 2020 (as of August 29). All WPV1 ES detections in 2019 were in Helmand, Kandahar (southern region) and Nangarhar (eastern) provinces. To date in 2020, WPV1 ES detections were in these provinces plus Khost (southeastern) and Herat (western). In 2020, 56 of 249 (23%) ES specimens tested positive for cVDPV2 in Kandahar and Helmand (southern), Nangarhar and Kunar (eastern), Khost (southeastern), and Kabul (central) provinces.

Summary

What is already known about this topic?

Wild poliovirus circulation continues in Afghanistan.

What is added by this report?

After approximately 2 years of campaign bans by the insurgency coupled with the COVID-19 pandemic, wild poliovirus circulation has increased during 2019–2020, and a new vaccine-derived poliovirus type 2 outbreak began in 2020.

What are the implications for public health practice?

Polio vaccination must be incorporated more broadly into public health services in order to reach every child. New partners should be engaged in discussions with local leaders to facilitate the recommencement of nationwide house-to-house campaigns.

Epidemiology of Poliovirus Cases

During 2019, 29 WPV1 cases were reported from 20 districts in 10 provinces, compared with 21 WPV1 cases reported from 14 districts in six provinces in 2018. During January–July 2020, 41 WPV1 cases were reported from 30 districts in 12 provinces compared with 15 from 11 districts in four provinces during the same period in 2019 (Table) (Figure 1) (Figure 2). Among the 70 WPV1 cases reported during January 2019–July 2020, 54 (77%) were in children aged <36 months. Nineteen (27%) of the 70 patients had never received OPV through routine immunization or SIAs, 15 (21%) had received 1 or 2 doses, and 36 (51%) had received ≥3 doses each; 46 (66%) had never received OPV through routine immunization but had received ≥1 SIA doses.

Genomic sequence analysis of the region encoding capsid protein VP1 of poliovirus isolates identified evidence of multiple episodes of cross-border transmission between Afghanistan and Pakistan during 2018–2020, with sustained local transmission in both countries. During January 2019–July 2020, 13 (20%) of 66 WPV1 isolates from AFP patients and 17 (22%) of 77 WPV1 ES isolates in Afghanistan had closest genetic links to earlier WPV1 isolates from Pakistan; the remaining were most closely linked to patient and ES isolates within Afghanistan. During January 2018–July 2020, four WPV1 genetic clusters (≥95% sequence identity) were detected among AFP cases. Although transmission in eastern and southern provinces is

[†] Lot quality assurance sampling is a rapid method used to assess the quality of vaccination activities after SIAs in predefined areas such as health districts (referred to as "lots"), using a small sample size. Lot quality assurance sampling involves dividing the population into lots and ascertaining receipt of vaccination by randomly selected persons within each lot. If the number of unvaccinated persons in the sample exceeds a predetermined value, then the lot is classified as having an unsatisfactory level of vaccination coverage, and mop-up activities are recommended. If the threshold of ≥90% is met (Afghanistan program guidelines have recently increased the threshold from ≥80%), the area or district is classified as having passed, although mop-up activities might still be indicated in certain areas.

[§] Surveillance target is ≥80% of AFP cases with adequate stool specimens collected. Adequate stool specimens are defined as two stool specimens of sufficient quality for laboratory analysis, collected ≥24 hours apart, both within 14 days of paralysis onset, and arriving in good condition at a World Health Organization–accredited laboratory with reverse cold chain maintained, without leakage or desiccation, and with proper documentation.

TABLE. Acute flaccid paralysis (AFP) surveillance performance indicators and reported cases of wild poliovirus (WPV1) and vaccine-derived poliovirus type 2 (VDPV2) *, by region and period — Afghanistan, January 2019–July 2020†

Region of Afghanistan	AFP surveillance indicators (2019)			No. of WPV1 cases reported			No. of cVDPV2 cases reported			No. of aVDPV2 cases reported		
	No. AFP cases	NPAFP rate†	% AFP cases with adequate stool specimens§	2019 Jan–Jul	2019 Aug–Dec	2020 Jan–Jul	2019 Jan–Jul	2019 Aug–Dec	2020 Jan–Jul	2019 Jan–Jul	2019 Aug–Dec	2020 Jan–Jul
All regions	**3,768**	**18**	**94**	**15**	**14**	**41**	**0**	**0**	**69**	**0**	**0**	**1**
Badakhshan	74	12	91	0	0	1	0	0	1	0	0	0
Central	646	14	98	0	0	0	0	0	2	0	0	0
Eastern	552	26	95	1	1	2	0	0	62	0	0	1
Northeastern	497	21	94	0	1	0	0	0	0	0	0	0
Northern	387	15	92	0	0	1	0	0	0	0	0	0
Southeastern	372	18	97	0	2	0	0	0	2	0	0	0
Southern	632	17	90	14	6	30	0	0	1	0	0	0
Western	608	21	94	0	4	7	0	0	1	0	0	0

Abbreviations: aVDPV2 = ambiguous vaccine-derived poliovirus type 2; cVDPV2 = circulating vaccine-derived poliovirus type 2; NPAFP = nonpolio acute flaccid paralysis.
* aVDPVs are isolates with no evidence of person-to person transmission or from persons with no known immunodeficiency; cVDPVs are isolates for which there is evidence of person-to-person transmission in the community.
† Data current as of August 29, 2020.
§ Cases per 100,000 persons aged <15 years. The target for the nonpolio AFP rate indicator is ≥2 NPAFP cases per 100,000 persons aged <15 years.
¶ Surveillance target is that ≥80% of AFP cases have adequate stool specimens collected. Adequate stool specimens are defined as two stool specimens of sufficient quality for laboratory analysis, collected ≥24 hours apart, both within 14 days of paralysis onset, and arriving in good condition at a World Health Organization–accredited laboratory with reverse cold chain maintained, without leakage or desiccation, and with proper documentation.

largely from distinct genetic clusters, three WPV1 cases were identified in the south from clusters originally identified in the east. During January 2019–July 2020, 13 orphan WPV1 viruses isolated from ES or AFP cases (those with ≥1.5% divergence from their closest genetic match, i.e., ≤98.5% of a match) were detected, signaling gaps in AFP surveillance.

During January–July 2020, 69 cVDPV2 cases and one aVDPV2 case were reported from 34 districts in 10 provinces, 57 (81%) of which occurred in children aged <36 months, and 68 (97%) of which are genetically related to the PAK-GB-1 emergence first detected in Gilgit-Baltistan, Pakistan. The remaining two cases were classified as a new Afghanistan cVDPV2 emergence (AFG-NGR-1) first detected in Nangarhar province and an aVDPV2 with no genetic linkage to known polioviruses.

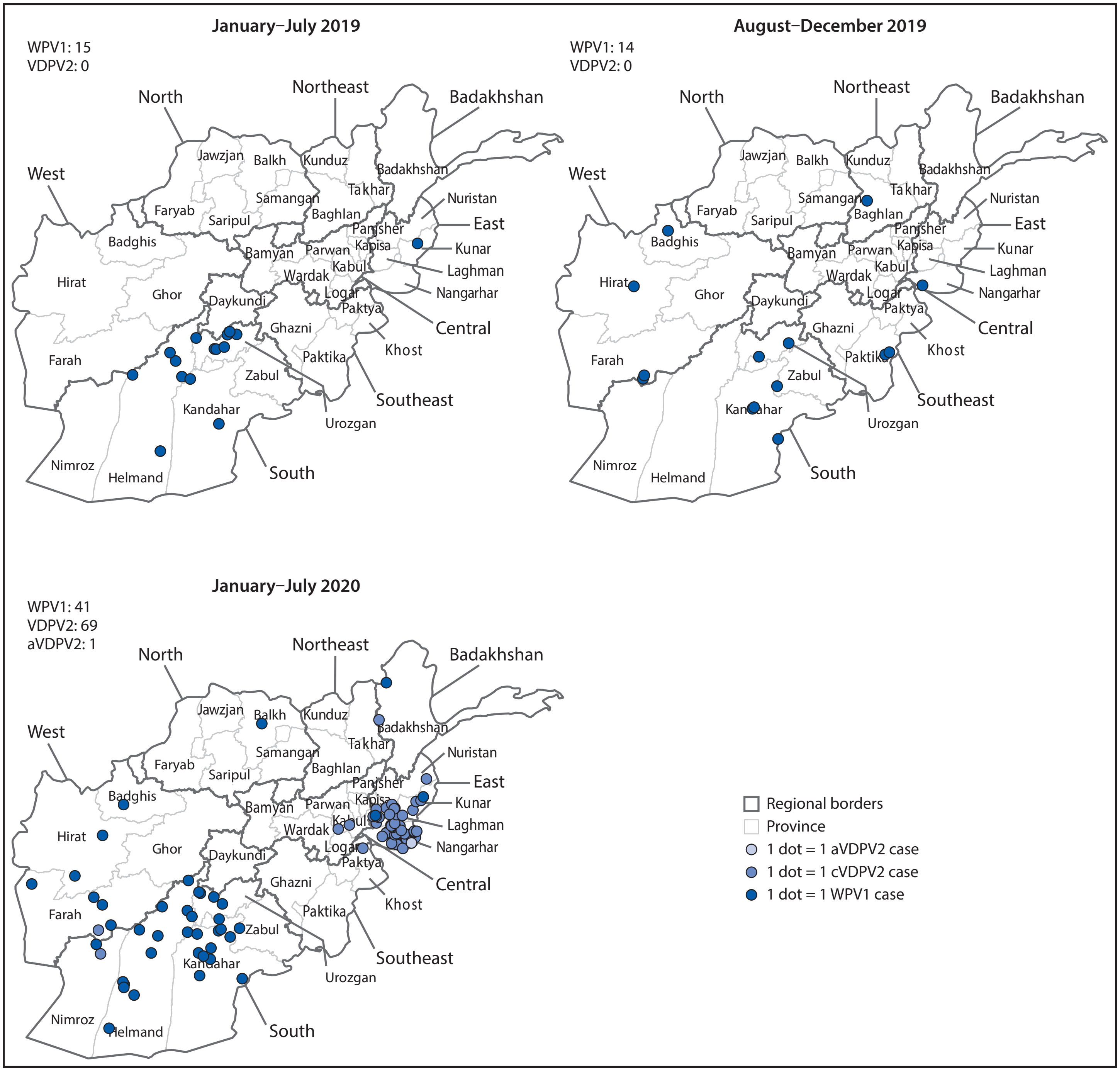
Discussion

On August 25, 2020, the WHO African Region was certified WPV-free, the fifth of six WHO regions to be certified, leaving only the Eastern Mediterranean Region with endemic WPV1 circulation in Afghanistan and Pakistan. Afghanistan has interrupted internal transmission of WPV1 for short periods in the past (*5*). Widespread bans on house-to-house vaccination in insurgency-held areas since April 2018 have resulted in increasing numbers of WPV1 cases. In 2020, COVID-19 pandemic mitigation efforts in Afghanistan halted SIAs for 5 months, compounding the existing access and SIA quality issues and resulting in increased numbers of susceptible children.

The cVDPV2 Pakistan outbreak that began in 2019 rapidly spread to Afghanistan and is growing. The polio program was able to resume mOPV2 outbreak response campaigns in July 2020; however, the lack of full access for house-to-house immunization will limit the effectiveness of these campaigns.

The primary barrier to interrupting poliovirus transmission in Afghanistan is the number of inaccessible children in insurgency-held areas. Dialogue with insurgency leaders through nongovernmental and international organizations to regain house-to-house access, which was successful in earlier years, needs enhanced efforts and new partners. In the interim, focus must be placed on finding and strengthening alternatives to SIAs for vaccinating children against polio. Before being aborted at the start of the COVID-19 pandemic, the country was in the process of rolling out integrated services to address widespread health demands beyond vaccination in polio-priority areas and to integrate OPV use into other health programs; provision of broad services should be fully implemented. With SIA resumption, partnering with other health sectors to offer multiantigen vaccination alongside other health services of high priority will increase community polio vaccination demand and coverage.

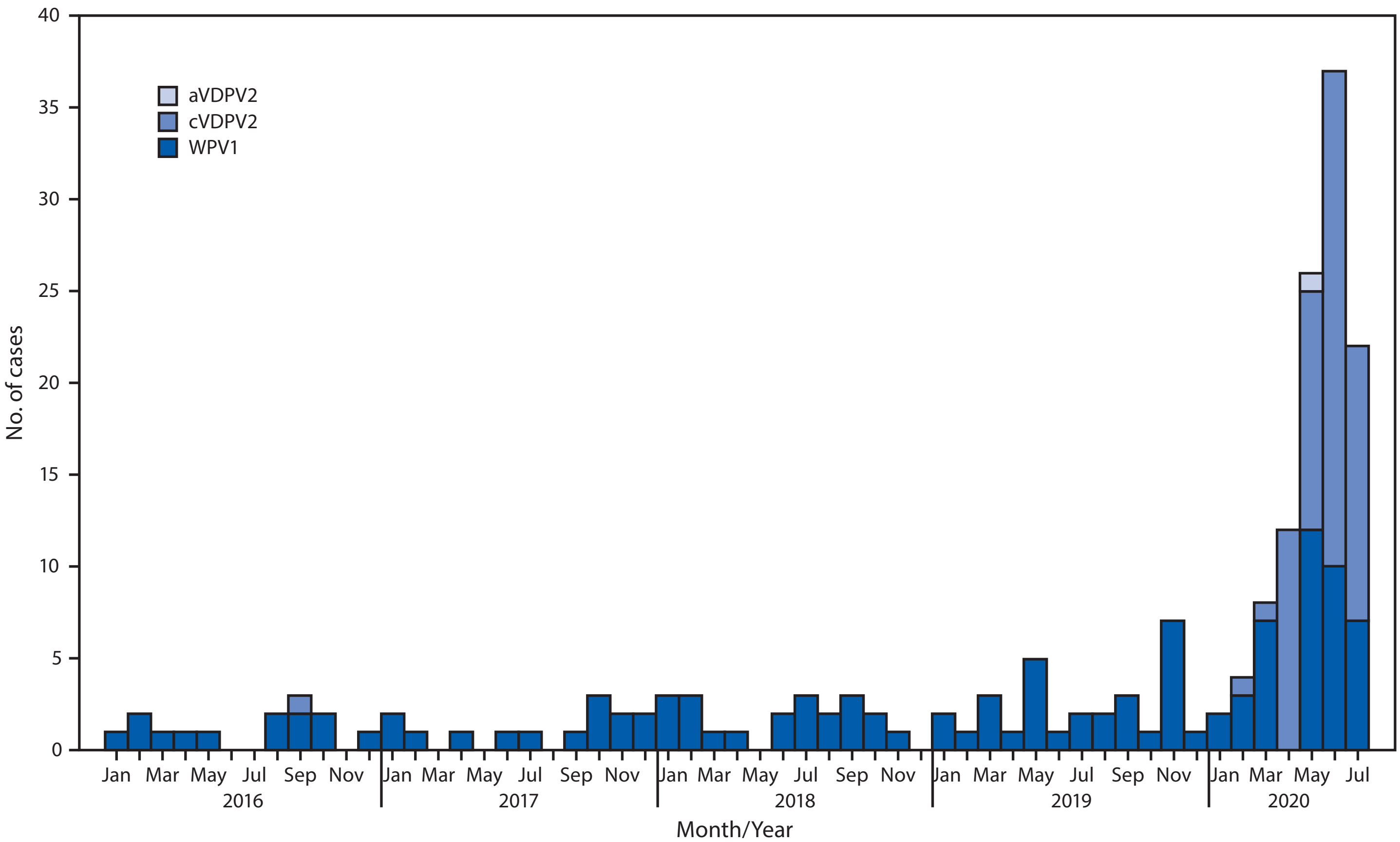
FIGURE 1. Cases of wild poliovirus type 1 (WPV1) and vaccine-derived poliovirus type 2 (VDPV2),* by province — Afghanistan, January 2019–July 2020



Abbreviations: aVDPV2 = ambiguous vaccine-derived poliovirus type 2; cVDPV2 = circulating vaccine-derived poliovirus type 2.

* aVDPVs are isolates with no evidence of person-to person transmission or from persons with no known immunodeficiency; cVDPVs are isolates for which there is evidence of person-to-person transmission in the community.

FIGURE 2. Number of wild poliovirus type 1 (WPV1) cases (n = 91) and vaccine-derived poliovirus type 2 (VDPV2)* cases (n = 71) — Afghanistan, January 2016–July 2020†



Abbreviations: aVDPV2 = ambiguous vaccine-derived poliovirus type 2; cVDPV2 = circulating vaccine-derived poliovirus type 2.

* aVDPVs are isolates with no evidence of person-to person transmission or from persons with no known immunodeficiency; cVDPVs are isolates for which there is evidence of person-to-person transmission in the community.

† Data as of August 29, 2020.

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Erratum

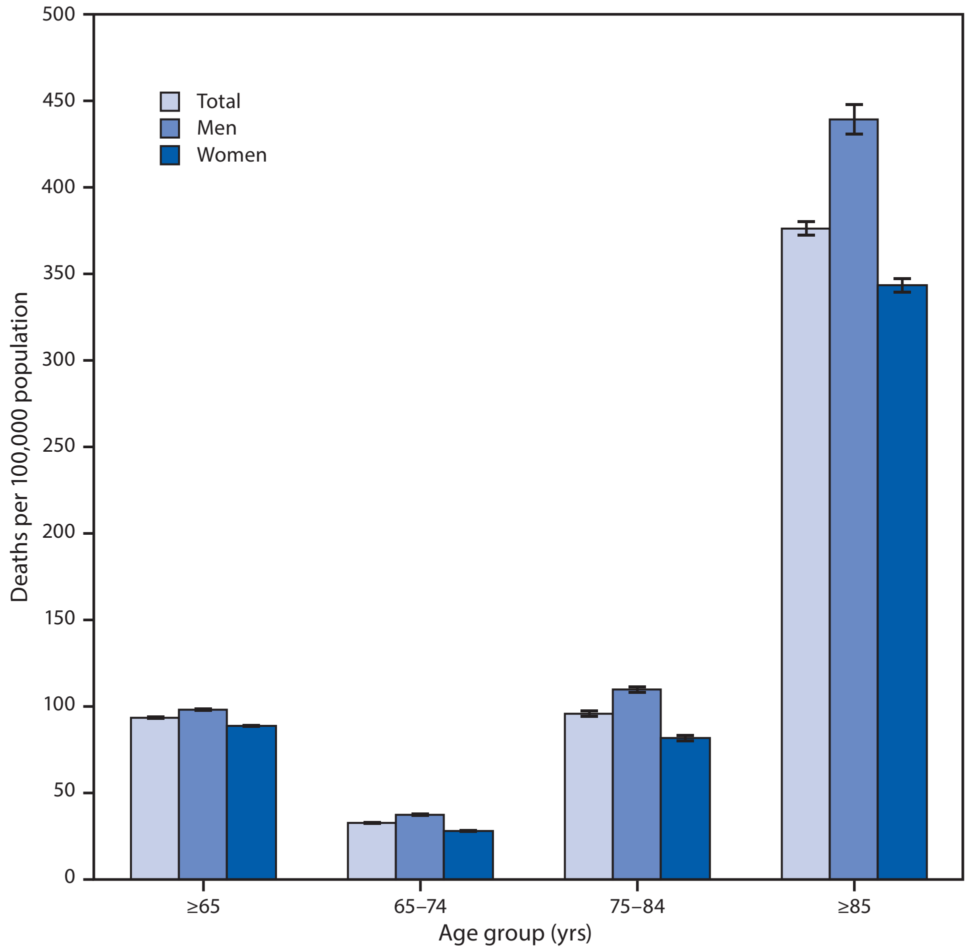
Vol. 69, No. Suppl. 1

In the *MMWR Supplement* report "Tobacco Product Use Among High School Students — Youth Risk Behavior Survey, United States, 2019," errors occurred on page 58. In the second column, the first sentence of the second full paragraph should have read "In 2019, among the 32.7% of current electronic vapor product users, 32.6% were frequent users; among the **6.0%** current cigarette smokers, 22.2% were frequent users; among the **5.7%** current cigar smokers, 18.4% were frequent users; and among the **3.8%** current smokeless tobacco product users, 28.5% were frequent users."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Death Rates* from Influenza and Pneumonia† Among Persons Aged ≥65 Years, by Sex and Age Group — National Vital Statistics System, United States, 2018



* With 95% confidence intervals shown with error bars. Rates are per 100,000 population in each age group.
† Deaths attributed to influenza and pneumonia were identified using the *International Classification of Diseases, Tenth Revision* underlying cause of death codes J09–J18.

In 2018, the death rate from influenza and pneumonia among persons aged ≥65 years was 93.2 deaths per 100,000 population. Death rates increased with age from 31.7 deaths per 100,000 population among adults aged 65–74 years, to 94.2 among adults aged 75–84 years, to 377.6 among those aged ≥85 years. Rates increased with age for both men and women, and in each age group the death rates were higher for men than for women.

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

Reported by: Ellen A. Kramarow, PhD, ekramarow@cdc.gov, 301-458-4325; Julie D. Weeks, PhD.

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