Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Weekly / Vol. 69 / No. 43

October 30, 2020

Dietary Supplement Use in Children and Adolescents Aged ≤19 Years — United States, 2017–2018

Bryan Stierman, MD[1,2]; Suruchi Mishra, PhD[1]; Jaime J. Gahche, PhD[3]; Nancy Potischman, PhD[3]; Craig M. Hales, MD[1]

Dietary supplement use is common among children and adolescents. During 2013–2014, approximately one third of children and adolescents (persons aged ≤19 years) in the United States were reported to use a dietary supplement in the past 30 days, and use varied by demographic characteristics (*1*,*2*). Dietary supplements can contribute substantially to overall nutrient intake, having the potential to both mitigate nutrient shortfalls as well as to lead to nutrient intake above recommended upper limits (*3*). However, because nutritional needs should generally be met through food consumption according to the 2015–2020 Dietary Guidelines for Americans, only a few dietary supplements are specifically recommended for use among children and adolescents and only under particular conditions (*4*). The most recently released data from the National Health and Nutrition Examination Survey (NHANES) during 2017–2018 were used to estimate the prevalence of use among U.S. children and adolescents of any dietary supplement, two or more dietary supplements, and specific dietary supplement product types. Trends were calculated for dietary supplement use from 2009–2010 to 2017–2018. During 2017–2018, 34.0% of children and adolescents used any dietary supplement in the past 30 days, with no significant change since 2009–2010. Use of two or more dietary supplements increased from 4.3% during 2009–2010 to 7.1% during 2017–2018. Multivitamin-mineral products were used by 23.8% of children and adolescents, making these the products most commonly used. Because dietary supplement use is common, surveillance of dietary supplement use, combined with nutrient intake from diet, will remain an important component of monitoring nutritional intake in children and adolescents to inform clinical practice and dietary recommendations.

NHANES is a cross-sectional survey designed to monitor the health and nutrition of the civilian noninstitutionalized resident U.S. population (https://www.cdc.gov/nchs/nhanes/index.htm). The survey was approved by the National Center for Health Statistics Research Ethics Review Board. Signed consent from parents/guardians or participants aged ≥18 years, as well as documented assent from minor participants aged 7–17 years,

INSIDE

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

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

were obtained. Information on dietary supplement use was obtained during an in-home interview. Participants aged ≥16 years and emancipated minors were interviewed directly. An adult proxy provided information for participants aged <16 years. Participants were asked to show product containers for all dietary supplements taken in the past 30 days. The interviewer recorded information from the product labels. The NHANES interview response rate for children and adolescents during 2017–2018 was 59.3%.

Age groups were categorized as <2, 2–5, 6–11, and 12–19 years. Self-reported race and Hispanic origin were divided into five categories: non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, Hispanic, and "other." The "other" category included non-Hispanic persons reporting other races or more than one race and was included in total estimates but not shown separately. Family income was categorized as ≤130%, >130% to ≤350%, and >350% of the federal poverty level (FPL) which accounts for inflation, family size, and geographic location. Highest educational attainment of the household head was divided into three categories: less than high school, high school graduate or equivalent or some college or an associate degree, and college graduate or above. All products were classified using mutually exclusive categories in the following order: 1) multivitamin-mineral products containing ≥3 vitamins and ≥1 mineral; 2) products containing primarily calcium with or without other ingredients; 3) products containing primarily omega-3 fatty acids with or without other ingredients; 4) products containing primarily probiotics with or without other ingredients; 5) products containing primarily fiber with or without other ingredients; 6) products containing primarily melatonin with or without other ingredients; 7) botanical products containing ≥1 botanical ingredient and no vitamins or minerals; 8) multivitamins containing ≥2 vitamins with no minerals; 9) amino acid products containing ≥1 amino acid; and 10) single nutrient supplements, categorized separately, such as single vitamins (e.g., vitamin D, vitamin C) and single minerals (e.g., iron). Results are presented for the product types most frequently used by children and adolescents, i.e., those with ≥1% prevalence of use.

Two participants with missing dietary supplement use data were excluded from analysis. All other 2017–2018 NHANES participants aged ≤19 years comprised the sample (n = 3,683). Analyses used 2-year interview weights and accounted for the survey's complex, multistage probability design. Standard errors for proportions were calculated using Taylor series linearization, and 95% confidence intervals were constructed using the Korn and Graubard method (*5*). Reliability of estimates was assessed using the National Center for Health Statistics Data Presentation Standards for Proportions (*6*). Differences in dietary supplement use by sex, age group, and race and Hispanic origin were evaluated using pairwise comparisons with univariate two-sided t-statistics. Trends across income and education of household head were tested using linear regression including categories as continuous variables. Recent

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

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

trends over the last 10 years from 2009–2010 to 2017–2018 were tested using orthogonal polynomial regression with 2-year NHANES cycles. Differences in product use by age group were tested using F-based second-order Rao-Scott tests. All reported differences are statistically significant ($p<0.05$). All analyses were performed using R (version 3.6.0; R Foundation for Statistical Computing), SAS (version 9.4; SAS Institute), and SUDAAN (version 11; RTI International).

During 2017–2018, overall prevalence of dietary supplement use among children and adolescents in the preceding 30 days was 34.0% (Table 1). Supplement use among females (37.3%) was higher than that among males (30.8%), and use prevalence was highest among those aged 2–5 years (43.3%) followed by those aged 6–11 years (37.5%), 12–19 years (29.7%), and <2 years (21.8%). Prevalence was higher among non-Hispanic Asian (41.1%) and non-Hispanic White children and adolescents (39.9%) compared with that among non-Hispanic Black (20.8%) and Hispanic (26.9%) children and adolescents. Dietary supplement use increased with increasing income and education of the head of household. Prevalence of use of two or more dietary supplements was 7.1% and varied by age, race and Hispanic origin, income, and education of the head of household.

Among persons aged 12–19 years, use of any dietary supplement increased significantly in a linear fashion from 2009–2010 (22.1%) to 2017–2018 (29.7%) (Figure). Use of two or more dietary supplements increased significantly from 2009–2010 to 2017–2018 among all children and adolescents (from 4.3% to 7.1%) as well as among those aged 2–5 years (from 6.8% to 8.3%) and 12–19 years (from 3.2% to 8.5%).

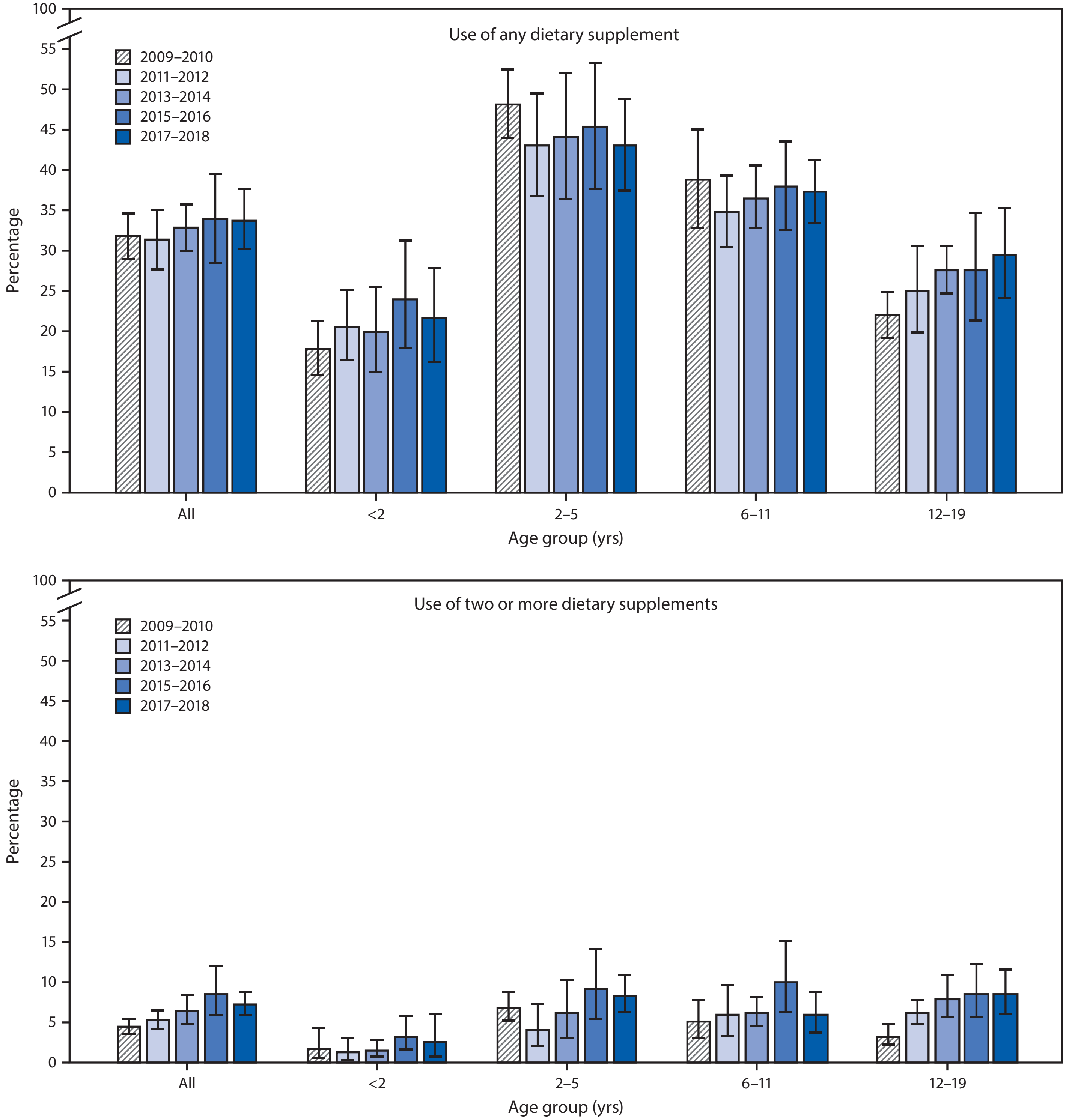
Multivitamin-minerals were the most used product type (23.8% of children and adolescents) (Table 2). Prevalence of use of single ingredient vitamin D (3.6%), single ingredient vitamin C (3.0%), probiotic (1.8%), melatonin (1.3%), omega-3 fatty acid (1.3%), botanical (1.1%), and multivitamin (1.0%) products all met or exceeded 1.0%. Multivitamin-mineral, single ingredient vitamin D, probiotic, and botanical product use differed by age group.

TABLE 1. Prevalence of any dietary supplement use and use of two or more dietary supplements in the past 30 days among children and adolescents (persons aged ≤19 years), by selected characteristics — United States, 2017–2018

Characteristic	No.	% (95% CI) Any dietary supplement	% (95% CI) ≥2 dietary supplements
Total	**3,683**	**34.0 (30.2–37.9)**	**7.1 (5.6–8.9)**
Sex			
Female	1,829	37.3 (33.7–41.0)	7.7 (5.9–9.8)
Male	1,854	30.8 (25.2–36.9)*	6.5 (4.5–9.2)
Age group (yrs)			
<2	591	21.8 (16.3–28.2)	2.4 (0.6–6.1)†
2–5	784	43.3 (37.6–49.2)§	8.3 (6.1–10.9)§
6–11	1,115	37.5 (33.5–41.6)§,¶	5.9 (3.6–8.9)
12–19	1,193	29.7 (24.1–35.7)§,¶,**	8.5 (5.9–11.6)§
Race, Hispanic origin			
White, non-Hispanic	1,214	39.9 (33.5–46.5)††,§§	8.6 (5.9–11.9)††
Black, non-Hispanic	816	20.8 (16.4–25.8)	1.8 (0.7–3.7)
Asian, non-Hispanic	357	41.1 (32.1–50.6)††,§§	9.3 (5.3–14.8)††
Hispanic	935	26.9 (20.9–33.6)	6.0 (3.6–9.2)††
Family income relative to poverty level			
≤130% of FPL	1,328	23.5 (16.6–31.7)	4.0 (1.9–7.2)†
>130% to ≤350% of FPL	1,209	34.5 (29.2–40.2)	7.0 (5.5–8.7)
>350% of FPL	706	45.9 (39.2–52.8)¶¶	11.1 (6.7–17.0)¶¶
Education of household head			
Less than high school graduation or equivalent	638	17.8 (11.9–25.0)	1.8 (0.6–4.2)
High school graduation or equivalent or some college or associate degree	2,030	33.7 (29.0–38.6)	6.9 (5.2–8.8)
College graduate or above	788	46.0 (39.3–52.9)***	10.8 (7.6–14.6)***

Abbreviations: CI = confidence interval; FPL = federal poverty level.
* Significantly different ($p<0.05$) from females.
† Estimate does not meet standards of reliability.
§ Significantly different ($p<0.05$) from age group <2 years.
¶ Significantly different ($p<0.05$) from age group 2–5 years.
** Significantly different ($p<0.05$) from age group 6–11 years.
†† Significantly different ($p<0.05$) from non-Hispanic Black children and adolescents.
§§ Significantly different ($p<0.05$) from Hispanic children and adolescents.
¶¶ Statistically significant linear trend ($p<0.05$) for household income.
*** Statistically significant linear trend ($p<0.05$) for education of household head.

FIGURE. Prevalence of use of any dietary supplement* and use of two or more dietary supplements*,† in the past 30 days among children and adolescents aged ≤19 years, by age group — United States, 2009–2010 to 2017–2018



* Statistically significant linear trend (p<0.05) for any dietary supplement use in age group 12–19 years and use of two or more dietary supplements in all ages and in age groups 2–5 and 12–19 years.
† Estimate does not meet standards of reliability for use of two or more supplements for age group <2 years in 2017–2018 and 2–5 years in 2011–2012.

TABLE 2. Prevalence of use of most frequently used dietary supplement product types in the past 30 days among children and adolescents (persons aged ≤19 years), by age group — United States, 2017–2018

Product type	Age group (years), % (95% CI)					P-value for difference by age*
	All (n = 3,683)	<2 (n = 591)	2–5 (n = 784)	6–11 (n = 1,115)	12–19 (n = 1,193)	
Multivitamin-mineral	23.8 (20.3–27.7)	11.0 (7.3–15.5)	34.6 (28.8–40.7)	29.5 (24.5–34.8)	17.3 (13.7–21.4)	<0.001
Single ingredient vitamin D supplement	3.6 (2.2–5.5)	5.4 (2.8–9.3)	1.7 (0.6–3.9)	1.8 (0.8–3.5)	5.4 (2.9–9.0)	<0.001
Single ingredient vitamin C supplement	3.0 (1.9–4.4)	1.1 (0.1–4.6)	2.0 (0.7–4.4)	2.4 (1.6–3.5)	4.2 (2.1–7.6)	0.083
Probiotic	1.8 (1.1–2.8)	1.9 (0.7–4.3)	3.7 (1.9–6.2)	2.0 (0.7–4.6)	0.8 (0.3–1.7)	0.020
Melatonin	1.3 (0.7–2.2)	0.0 (0.0–0.6)	1.4 (0.5–3.0)	1.3 (0.7–2.3)	1.5 (0.5–3.2)	0.435
Omega-3 fatty acid	1.3 (0.6–2.4)	0.5 (0.1–1.6)	1.4 (0.5–3.0)	1.2 (0.3–3.1)	1.4 (0.3–3.9)	0.707
Botanical	1.1 (0.6–1.9)	0.5 (0.1–1.8)	0.5 (0.1–1.3)	0.3 (0.0–0.9)	2.1 (0.8–4.6)	0.001
Multivitamin	1.0 (0.5–1.6)	1.2 (0.3–3.2)	0.8 (0.2–2.0)	0.6 (0.1–1.6)	1.3 (0.6–2.4)	0.361

Abbreviation: CI = confidence interval.
* p-values calculated using F-based second-order Rao-Scott test.

Discussion

During 2017–2018, approximately one third of children and adolescents used dietary supplements in the past 30 days. Prevalence among female children and adolescents exceeded that among males. Sex-differences in any dietary supplement use among all children and adolescents combined have not been reported previously; however, a 2013–2014 study found a large, non-significant difference in any dietary supplement use among adolescent females and males (*1*). As previously reported, dietary supplement use prevalence increased with income and education of household head (*2*). Patterns of dietary supplement use by age group and race and Hispanic origin also remained similar (*2*).

Use of two or more dietary supplements varied by age group, race and Hispanic origin, income, and education of household head and increased from 2009–2010 to 2017–2018. Few studies have examined use of multiple dietary supplements in children and adolescents. Dietary supplements may contain 100% or more of daily nutrient intake recommendations (*7*); therefore, use of two or more dietary supplements could lead to intakes above recommended upper limits if the products contain any of the same ingredients. Future studies could examine common combinations of dietary supplements used and their contribution to overall nutrient intake.

As with previous studies, multivitamin-minerals were the most frequently used dietary supplement products (*1*,*2*). Use of some product types varied by age. A recent study found that among U.S. children and adolescents who use dietary supplements, 18% took a dietary supplement under the recommendation of a health care provider (*2*). Few dietary supplement products are recommended for use among children and adolescents, and these are recommended only under specific circumstances. For example, the American Academy of Pediatrics (AAP) recommends that breastfeeding infants aged >4 months receive iron supplementation until introduction of iron-containing complementary foods and that all exclusively breastfed infants receive vitamin D supplementation (*8*,*9*).

Summary

What is already known about this topic?

Approximately one third of U.S. children and adolescents take dietary supplements; use varies by demographic characteristics.

What is added by this report?

The most recently released dietary supplement use estimates from the 2017–2018 National Health and Nutrition Examination Survey (NHANES) demonstrate that dietary supplement use remained stable and prevalent among U.S. children and adolescents aged ≤19 years (34.0%). Use of two or more dietary supplements differed by demographic characteristics and increased from 2009–2010 (4.3%) to 2017–2018 (7.1%).

What are the implications for public health practice?

NHANES will continue to measure dietary supplement use among children and adolescents to inform clinical practice and dietary recommendations.

Other circumstances warranting dietary supplement use in children or adolescents include restrictive diets, pregnancy, and various illnesses. The 2015–2020 Dietary Guidelines for Americans recommend that nutritional needs be met primarily through food consumption; however, it recognizes that dietary supplements might be useful in some cases to compensate for nutrients that would otherwise be underconsumed (*4*). Dietary supplement use might mitigate nutrient shortfalls but might also lead to intake above recommended upper limits for some nutrients (*3*). AAP recommends that pediatric health care providers inquire about dietary supplement use among patients (*10*).

The findings in this report are subject to at least two limitations. First, the low prevalence of use of two or more dietary supplements make these estimates less reliable among some subgroups. Second, the lack of universal definitions for dietary supplement product types limits comparisons across studies.

Dietary supplement use is fairly prevalent among U.S. children and adolescents and contributes to overall total nutrient intake. NHANES will continue to provide information on dietary supplement use among children and adolescents to help inform clinical practice and policy, such as the Dietary Guidelines for Americans.

Acknowledgment

Cynthia L. Ogden, PhD, National Center for Health Statistics, CDC.

Corresponding author: Bryan Stierman, bstierman@cdc.gov.

---

[1]Division of Health and Nutrition Examination Surveys, National Center for Health Statistics, CDC; [2]Epidemic Intelligence Service, CDC; [3]Office of Dietary Supplements, National Institutes of Health.

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

References

1. Qato DM, Alexander GC, Guadamuz JS, Lindau ST. Prevalence of dietary supplement use in US children and adolescents, 2003–2014. JAMA Pediatr 2018;172:780–2. https://doi.org/10.1001/jamapediatrics.2018.1008
2. Jun S, Cowan AE, Tooze JA, et al. Dietary supplement use among U.S. children by family income, food security level, and nutrition assistance program participation status in 2011–2014. Nutrients 2018;10:1212. https://doi.org/10.3390/nu10091212
3. Bailey RL, Fulgoni VL 3rd, Keast DR, Lentino CV, Dwyer JT. Do dietary supplements improve micronutrient sufficiency in children and adolescents? J Pediatr 2012;161:837–42. https://doi.org/10.1016/j.jpeds.2012.05.009
4. US Department of Health and Human Services; US Department of Agriculture. 2015–2020 Dietary Guidelines for Americans. 8th ed. Washington, DC; 2015. https://health.gov/dietaryguidelines/2015/guidelines/
5. Korn EL, Graubard BI. Confidence intervals for proportions with small expected number of positive counts estimated from survey data. Surv Methodol 1998;24:193–201.
6. Parker JD, Talih M, Malec DJ, et al. National Center for Health Statistics Data Presentation Standards for Proportions. Vital Health Stat 2 2017;(175):1–22.
7. Bailey RL, Gahche JJ, Lentino CV, et al. Dietary supplement use in the United States, 2003-2006. J Nutr 2011;141:261–6. https://doi.org/10.3945/jn.110.133025
8. Baker RD, Greer FR; Committee on Nutrition American Academy of Pediatrics. Diagnosis and prevention of iron deficiency and iron-deficiency anemia in infants and young children (0-3 years of age). Pediatrics 2010;126:1040–50. https://doi.org/10.1542/peds.2010-2576
9. Wagner CL, Greer FR; American Academy of Pediatrics Section on Breastfeeding; American Academy of Pediatrics Committee on Nutrition. Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. Pediatrics 2008;122:1142–52. https://doi.org/10.1542/peds.2008-1862
10. McClafferty H, Vohra S, Bailey M, et al. Pediatric integrative medicine. Pediatrics 2017;140:e20171961. https://doi.org/10.1542/peds.2017-1961

Progress Toward Global Eradication of Dracunculiasis, January 2019–June 2020

Donald R. Hopkins, MD[1]; Adam J. Weiss, MPH[1]; Sharon L. Roy, MD[2]; Sarah Yerian, MPH[1]; Sarah G.H. Sapp, PhD[2]

Dracunculiasis (Guinea worm disease) is caused by the parasite *Dracunculus medinensis* and is acquired by drinking water containing copepods (water fleas) infected with *D. medinensis* larvae. The worm typically emerges through the skin on a lower limb approximately 1 year after infection, resulting in pain and disability (*1*). There is no vaccine or medicine to treat the disease; eradication efforts rely on case containment* to prevent water contamination. Other interventions to prevent infection include health education, water filtration, chemical treatment of unsafe water with temephos (an organophosphate larvicide to kill copepods), and provision of safe drinking water (*1*,*2*). The worldwide eradication campaign began in 1980 at CDC *(1)*. In 1986, with an estimated 3.5 million cases† occurring each year in 20 African and Asian countries§ (*3*), the World Health Assembly (WHA) called for dracunculiasis elimination (*4*). The global Guinea Worm Eradication Program (GWEP), led by the Carter Center and supported by the World Health Organization (WHO), United Nations Children's Fund, CDC, and other partners, began assisting ministries of health in countries with dracunculiasis. This report, based on updated health ministry data (*4*), describes progress made during January 2019–June 2020 and updates previous reports (*2*,*4*,*5*). With only 54 human cases reported in 2019, 19 human cases reported during January 2019–June 2020, and only six countries currently affected by dracunculiasis (Angola, Chad, Ethiopia, Mali, South Sudan, and importations into Cameroon), the achievement of eradication is within reach, but it is challenged by civil unrest, insecurity, and lingering epidemiologic and zoologic concerns, including 2,000 reported animal cases in 2019 and 1,063 animal cases in 2020, mostly in dogs. All national GWEPs remain fully operational, with precautions taken to ensure safety of program staff members and community members in response to the coronavirus disease 2019 (COVID-19) pandemic.

In March 2019, the Carter Center hosted the annual GWEP Managers Meeting in Atlanta, Georgia, WHO's International Commission for the Certification of Dracunculiasis Eradication (ICCDE) met in Addis Ababa, Ethiopia, in April 2019, and WHO convened the annual Informal Meeting of Ministers of Health of endemic and formerly endemic dracunculiasis-affected countries during the WHA in Geneva, Switzerland, in May 2019. Because of the COVID-19 pandemic, The Carter Center hosted the annual GWEP Managers' Meeting and a meeting of Guinea worm researchers virtually in March 2020; WHO's ICCDE did not meet, and the Informal Meeting during the WHA did not occur during the first half of 2020. WHO has certified 199 countries, areas, and territories as free from human dracunculiasis, with only seven countries still lacking certification (*4*).

In 2019, Angola, Cameroon, Chad, and South Sudan reported 54 human cases; Angola, Chad, Ethiopia, and Mali reported 2,000 infected animals (mostly dogs), compared with 28 human cases and 1,102 animal infections reported in 2018 (Table 1). During January–June 2020, human cases were reported in Chad (nine), Ethiopia (seven), Mali (one), Cameroon (one), and Angola (one), with 1,063 infected animals reported, compared with 31 human cases and 1,365 infected animals reported during January–June 2019. During January–June 2020, CDC received 44 specimens from humans for morphologic or molecular identification, including 21 (41%) that were laboratory-confirmed as *D. medinensis*,¶ compared with 127 specimens received and 67 (53%) confirmed during all of 2019 (Table 2). During the first 6 months of 2020, CDC received 19 specimens from animals, five (26%) of which were confirmed *D. medinensis*, compared with 59 received and 33 (56%) confirmed during all of 2019. Two specimens from unknown host sources during 2019 were not *D. medinensis*. *D. medinensis* worms removed from animals are genetically and morphologically indistinguishable from those removed from humans (*6*).

* Transmission from a patient with dracunculiasis is considered contained only if all of the following conditions are met for each emerging worm: 1) the infected patient is identified ≤24 hours after worm emergence; 2) the patient has not entered any water source since the worm emerged; 3) a village volunteer or other health care provider has managed the patient properly; 4) the containment process, including verification of dracunculiasis, is validated by a Guinea Worm Eradication Program supervisor within 7 days of emergence of the worm; and 5) the approved chemical temephos (Abate) is used to treat known or potentially contaminated surface water. Proper patient management includes cleaning and bandaging the lesion until the worm has been fully removed manually and by providing health education to discourage the patient from contaminating any water source. If two or more emerging worms are present, transmission is not contained until the last worm is removed. Similar criteria are in place for the containment of animal infections.

† A dracunculiasis case is defined as an infection occurring in a person exhibiting a skin lesion or lesions with emergence of one or more worms laboratory-confirmed at CDC as *D. medinensis*. Because *D. medinensis* has a 10- to 14-month incubation period, each infected person is counted as having a case only once during a calendar year.

§ Initially 20 countries, but the former country of Sudan officially separated into two countries (Sudan and South Sudan) on July 9, 2011.

¶ Specimens are laboratory-confirmed as *D. medinensis* at CDC by morphologic examination under a microscope or polymerase chain reaction assay. Additional information about laboratory identification of parasites is available at https://www.cdc.gov/dpdx/dxassistance.html.

TABLE 1. Number of reported indigenous dracunculiasis cases, by country — worldwide, January 2018–June 2020

Country	No (% contained) Jan–Dec 2018 No. (% contained)	No (% contained) Jan–Dec 2019 No. (% contained)	% Change Jan–Dec 2018 to Jan–Dec 2019	No. (% contained) Jan–Jun 2019 No. (% contained)	No. (% contained) Jan–Jun 2020 No. (% contained)	% Change Jan–Jun 2019 to Jan–Jun 2020
Human cases						
Chad	17 (41)	48 (54)	188	29 (59)	9 (44)	-69
Ethiopia	0	0	0	0	7 (100)	NA
Mali*	0	0	0	0	1 (0)	NA
South Sudan	10 (30)	4 (50)	−60	0 (0)	0	NA
Angola	1 (0)	1 (0)	0	1 (0)	1 (0)	0
Cameroon	0	1 (0)†	0	1 (0)†	1 (0)§	0
Total	**28 (36)**	**54 (52)**	**93**	**31 (55)**	**19 (58)**	**−39**
Animal infections¶						
Chad	1,065 (75)	1,982 (76)	82	1,356 (78)	1,057 (87)	−22
Ethiopia	17 (41)	8 (25)	−53	6 (0)	3 (33)	−50
Mali	20 (80)	9 (67)	−55	2 (100)	0	−100
Angola	0	1 (0)	NA	1 (0)	0	−100
Cameroon	0	0	0	0	3 (0)	NA
Total	**1,102 (75)**	**2,000 (76)**	**77**	**1,365 (78)**	**1,063 (87)**	**−22**

Abbreviation: NA = not applicable.
* Civil unrest and insecurity since a coup d'état in April 2012 continued to constrain program operations in regions with endemic dracunculiasis (Gao, Kidal, Mopti, and Timbuktu) during 2019–June 2020.
† One case was reported from Cameroon in 2019 in a village approximately 1 mile (1.5 km) from the Chad-Cameroon border. This is believed to have been acquired in Chad.
§ One human case and three infected dogs detected in an area of Cameroon near the border with Chad in February–March 2020 might have also been infected in Chad.
¶ In Chad, primarily dogs, some cats; in Ethiopia, dogs, cats, and baboons; in Mali, dogs and cats; in Angola, one dog.

In affected countries, the national GWEP receives monthly case reports from supervised volunteers in each village under active surveillance** (Table 3). Villages where endemic transmission has ended (i.e., zero human cases or animal infections reported for ≥12 consecutive months) are kept under active surveillance for 2 additional years. WHO certifies a country as dracunculiasis-free after adequate nationwide surveillance for ≥3 consecutive years with no indigenous human cases or animal infections.††

Country Reports

Angola. Before 2018 no case of dracunculiasis was ever reported from Angola. After the discovery of a case in a human with no history of foreign travel in Cunene Province in April 2018, Angolan health authorities and WHO investigated nearby communities and began training local health professionals and community health workers about the disease (*4*) but found no other active cases. Another case was detected in January 2019 and a third in March 2020, both in Cunene Province in persons with no foreign travel. In April 2019, a dog with an emerging Guinea worm was found in the same district as were the first and third human cases. Angola offers a US$450 equivalent cash reward for reporting an infected human or animal. Provisional DNA analysis of Angola's Guinea worm specimens yielded no clear link to another *D. medinensis* population.

Chad. Chad reported 48 cases in 25 villages in 2019. During the first half of 2020, Chad reported nine human cases in seven villages (including four new villages), compared with 29 cases during January–June 2019 (Table 1). Twenty-two of the cases reported in 2019 were associated with one village in Salamat Region, representing Chad's first documented waterborne outbreak of dracunculiasis in humans since 2010. A Cameroonian woman whose village is approximately 1 mile (1.5 km) from the Chad-Cameroon border had a Guinea worm emerge in 2019; she was likely infected in Chad, as were one human and three dogs in the same area of Cameroon through June 2020.

During 2019, 1,935 domestic dogs and 47 domestic cat infections were reported, nearly twice the 1,040 dog and 25 cat infections reported in 2018. During January–June 2020, 24% fewer infected dogs and 56% more infected cats were reported than were during January–June 2019. The Carter Center is helping the Chad Ministry of Health implement active village-based surveillance in 2,219 at-risk villages (as of June 2020), compared with 2,211 villages in December 2019. The working hypothesis is that humans, dogs, and cats might become infected by eating inadequately cooked fish or other aquatic transport or paratenic hosts (hosts in which the larval

** Villages under active surveillance are those that have endemic dracunculiasis or are at high risk for importation. Active surveillance involves daily searches of households by village volunteers (supported by their supervisors) for persons or animals with signs of dracunculiasis. An imported human case or animal infection is one resulting from ingestion of contaminated water in a place other than the community where the case or infection is detected and reported. Since 2012, no internationally imported cases or infections have been reported.

†† An indigenous dracunculiasis human case or animal infection is defined as an infection consisting of a skin lesion or lesions with emergence of one or more Guinea worms in a person or animal who had no history of travel outside their residential locality during the preceding year.

TABLE 2. Characteristics of specimens from humans and animals received at CDC for laboratory diagnosis of *Dracunculus medinensis* — January 2019–June 2020

Specimens received at CDC	Jan–Dec 2019	Jan–Jun 2020
Specimens from humans		
No. received	127	44
No. (%) laboratory confirmed as *D. medinensis*	**67 (53)**	**21 (41)**
Country of origin, no. of specimens (no. of patients)		
Angola	1 (1)	1 (1)
Cameroon	1 (1)	1 (1)
Chad	50 (49)	9 (9)
Ethiopia	—	9 (7)
Mali	—	1 (1)
South Sudan	15 (4)	—
No. (%) ruled out as *D. medinensis*	**60 (47)**	**23 (59)**
No. (%) of other laboratory diagnoses		
Free-living nematode*	7 (12)	2 (9)
Onchocerca	3 (5)	1 (4)
Other parasitic nematode*	2 (3)[†]	3 (13)[†]
Sparganum	20 (33)	8 (35)
Tissue	8 (13)	2 (9)
Plant material	4 (7)	—
Other worms	1 (2)[§]	4 (17)[§]
Other	—	1 (4)[¶]
Unknown origin	15 (25)	2 (9)
Specimens from animals		
No. received	59	19
No. (%) laboratory confirmed as *D. medinensis*	**33 (56)**	**5 (26)**
Country/Species of origin, no. of specimens (no. of animals)		
Angola	3	—
Dog	3 (1)	—
Cameroon	—	3
Dog	—	3 (100)
Chad	16	—
Cat	2 (2)	—
Dog	14 (14)	—
Ethiopia	5	2
Baboon	1 (1)	2 (100)
Leopard	1 (1)	—
Dog	3 (3)	—
Mali	9	—
Cat	1 (1)	—
Dog	8 (8)	—
No. (%) ruled out as *D. medinensis*	**26 (44)**	**14 (74)**
No. (%) of other laboratory diagnoses		
Free-living nematode*	11 (42)	—
Other parasitic nematode*	12 (46)**	11 (78)**
Tissue	—	1 (7)
Other worms	1 (4)[††]	1 (7)[††]
Other	—	1 (7)[§§]
Unknown origin	2 (8)	0
Specimens from unknown sources		
No. received	2	—
No. (%) laboratory confirmed as *D. medinensis*	**0**	**—**
No. (%) ruled out as *D. medinensis*	**2 (100)**	**—**
No. (%) of other laboratory diagnoses		
Free-living nematode	2 (100)	—

* Free-living nematodes primarily included adult Mermithidae and other nematodes identified as belonging to nonparasitic taxa. Other parasitic nematodes included non-*Onchocerca* nematodes identified as belonging to parasitic taxa.

† Other parasitic nematodes submitted in association with human cases in 2019 included *Elaeophora* sp. (one) and a filarial nematode not identified to genus (one); during January–June 2020 submissions included *Dirofilaria* sp. (one), *Eustrongylides* sp. (one), and nematodes not identified further (two).

§ Other worms submitted in association with a human case in 2019 included a single tapeworm not identified further. Submissions in this category from human cases during January–June 2020 included an annelid (one); a horsehair (Gordian) worm (one); a specimen vial that contained two Acanthocephala not identified further and one *Toxocara*; and one nematode not able to be identified further (one).

¶ The other specimen submitted in association with a human case during January–June 2020 was a small (approximately 15 cm) blind snake (infraorder Scolecophidia).

** Other parasitic nematodes submitted in association with animal cases in 2019 included *Dirofilaria* sp. (one), *Eustrongylides* sp. (three), *Filaria* sp. (one), *Physaloptera* sp. (one), *Spirura* sp. (one), *Setaria* sp. (one), and filarial nematodes not identified to genus (three); during January–June 2020, submissions included *Protospirura* sp. (one), *Setaria* sp. (one), *Skrjabinodera* sp. (two), filarial nematodes not identified to genus (six), and a spirurid nematode not identified to genus (one).

†† Other worms submitted in association with an animal case included a *Taenia* sp. in 2019, and an Acanthocephala not identified further during January–June 2020.

§§ The other specimen submitted in association with an animal case during January–June 2020 was a small blind snake (infraorder Scolecophidia).

parasite does not develop) (*7*). Since June 2017, approximately 81% of households sampled monthly in at-risk communities were burying fish entrails as recommended; 77% and 87% of infected dogs were tethered (contained) in 2019 and during January–June 2020, respectively. Temephos application reached 68% of 422 villages with dog or human infections by December 2019 and 73% by April 2020. In December 2019, 65% of villages reporting infected dogs or humans had at least one source of copepod-free drinking water.

In areas under surveillance in Chad, 59% of residents surveyed in 2019 knew of the cash rewards for reporting a human (US$100 equivalent) or animal (US$20 equivalent) infection, and during January–June 2020, 86% knew of the rewards. Intensified surveillance generated 50,893 rumors (reports about a possible Guinea worm infection) regarding human or dog infections during January–June 2020 compared with 41,501 rumors during the same period in 2019; a person or dog with compatible signs or symptoms is suspected of having dracunculiasis, pending confirmation.

Ethiopia. Ethiopia reported no human case during 2018–2019 but reported seven during January–June 2020. The 2020 cases were in villagers exposed to a shared source of contaminated drinking water near Duli village in Gambella Region. During 2019, Ethiopia reported two infected dogs and six infected baboons, all in Gog district of Gambella Region, compared with 17 infected animals (11 dogs, five cats, and

TABLE 3. Reported human and animal dracunculiasis cases, surveillance, and status of local interventions in villages with endemic disease, by country—worldwide, 2019

	Country					
Human cases/Surveillance/Intervention status	**Chad***	**Ethiopia**	**Mali†**	**South Sudan**	**Angola**	**Total**
Reported human cases						
No. indigenous, 2019	49§	0	0	4	1	**54**
No. imported,¶ 2019	0	0	0	0	0	**0**
% Contained** in 2019	53	0	0	50	0	**52**
% Change in indigenous human cases in villages/localities under surveillance, same period 2018 and 2019	188	0	0	-60	0	**93**
Reported animal cases						
No. indigenous, 2019	1,935	8	6	0	1	**1,950**
No. imported,†† 2019	0	0	3	0	0	**3**
% Contained** in 2019	77	25	67	0	0	**77**
% Change in indigenous animal cases in villages/localities under surveillance, same period 2018 and 2019	82	-53	-55	0	NA	**77**
Villages under active surveillance, 2019						
No. of villages	2,211	189	2,802	2,675	0	**7,877**
% Reporting monthly	97	100	100	88	0	**96**
No. reporting ≥1 human case	25	0	0	10	1	**38**
No. reporting only imported†† human cases	0	0	0	0	0	**0**
No. reporting indigenous human cases	25	0	0	10	1	**38**
No. reporting ≥1 animal case	422	4	8	2	0	**436**
No. reporting only imported†† animal cases	0	0	2	0	0	**2**
No. reporting indigenous animal cases	422	4	6	2	0	**434**
Status of interventions in villages with endemic human dracunculiasis, 2019						
No. of villages with endemic human dracunculiasis, 2018–2019	34	0	0	12	2	**48**
% Reporting monthly§§	100	NA	NA	87	—	**92**
% Filters in all households§§	20	NA	NA	58	—	**29**
% Using temephos§§	61	NA	NA	75	—	**63**
% ≥1 source of safe water§§	50	NA	NA	67	100	**52**
% Provided health education§§	100	NA	NA	92	100	**94**
Status of interventions in villages with endemic animal dracunculiasis, 2019						
No. of villages with endemic animal dracunculiasis, 2018–2019	526	11	22	0	1	**560**
% Reporting monthly§§	100	100	100	NA	—	**100**
% Using temephos§§	69	100	100	NA	—	**70**
% Provided health education§§	100	100	100	NA	100	**100**

Abbreviation: NA = not applicable.

* Participants at the annual Chad Guinea Worm Eradication Program review meeting in November 2014 adopted "1+ case village" as a new description for villages in Chad affected by human cases of Guinea worm disease and/or dogs infected with Guinea worms and defined it as "a village with one or more indigenous and/or imported cases of Guinea worm infections in humans, dogs, and/or cats in the current calendar year and/or previous year."

† Civil unrest and insecurity since a coup in 2012 continued to constrain Guinea Worm Eradication Program operations (supervision, surveillance, and interventions) in Gao, Kidal, Mopti, Segou, and Timbuktu Regions.

§ Forty-eight cases were reported from Chad in 2019. One case was reported from Cameroon in 2019 in a village approximately 1 mile (1.5 km) from the Chad-Cameroon border. This is believed to have been acquired in Chad.

¶ Imported from another country.

** Transmission from a patient with dracunculiasis is contained only if all of the following conditions are met for each emerged worm: 1) the infected patient is identified ≤24 hours after worm emergence; 2) the patient has not entered any water source since the worm emerged; 3) a village volunteer or other healthcare provider has managed the patient properly, by cleaning and bandaging the lesion until the worm has been fully removed manually and by providing health education to discourage the patient from contaminating any water source (if two or more emerging worms are present, transmission is not contained until the last worm is removed); 4) the containment process, including verification of dracunculiasis, is validated by a Guinea Worm Eradication Program supervisor within 7 days of emergence of the worm; and 5) temephos is used to treat potentially contaminated surface water if any uncertainty about contamination of these sources of drinking water exists, or if a such a source of drinking water is known to have been contaminated.

†† Imported from another in-country disease-endemic village.

§§ The denominator is the number of endemic villages/localities where the program applied interventions during 2018–2019.

one baboon) in 2018. During January–June 2020, Ethiopia reported one infected dog and two infected baboons, all in Gog district, compared with six infected baboons in January–June 2019. Since 2017, The Carter Center has supported Ethiopian public health and wildlife authorities in a baboon and dog epidemiology project (*2*).

The Ethiopia Dracunculiasis Eradication Program has 189 villages under active surveillance. It applies temephos monthly to almost all water sources known to have been used by humans in the at-risk area of Gog district, and since 2018 it has supported villager-initiated, constant tethering of approximately 1,100 dogs and cats in villages where most infected animals were detected in recent years to prevent their exposure to water sources in adjacent forests where transmission is believed to occur (*2*). In 2018, Ethiopia increased its rewards for reporting a human dracunculiasis case to US$360 equivalent and for reporting and tethering an infected animal to US$40. In 2019, 74% and 96% of persons surveyed in active surveillance areas were aware of the rewards for reporting infected humans and animals, respectively.

Mali. In 2019, Mali reported no human dracunculiasis case for the fourth consecutive year; one case was reported during January–June 2020. During 2019, eight infected dogs and one infected cat were reported, compared with 18 dogs and two cats in 2018. During the first half of 2020, Mali reported no infected dog or cat, compared with two infected dogs during the first half of 2019. Six of the nine infected animals identified in 2019 were detected in Segou Region; three dogs were detected in adjacent Djenne district of Mopti Region. Segou Region is accessible to the program, but the dogs were bred and apparently became infected in areas of Mopti Region that have not been accessible to the program since 2012 because of insecurity; some dogs were later sold in Segou. The infected human in 2020 was detected in Segou Region. In 2019, Mali increased the number of villages under active surveillance to 2,802 from 903 at the end of 2018 and increased the cash reward to US$340 equivalent for reporting a case in a human; the reward remains at US$20 equivalent for reporting and tethering an infected animal. In areas under active surveillance, 77% of persons queried in 2019 and 86% in January–June 2020 were aware of the cash rewards for reporting an infected person or animal.

South Sudan. South Sudan reported four human cases in 2019, compared with 10 in 2018 and no human cases in January–June 2020 or in January–June 2019. Only one infected animal was reported in 2015, a dog in the same household as an infected person. Extreme population mobility of cattle herders and others is a special challenge in addition to sporadic insecurity. By December 2019, South Sudan's Guinea Worm Eradication Program had 2,675 villages under active surveillance. The cash reward for reporting a case of dracunculiasis is about US$400 equivalent. A 2019 survey of residents in villages not under active surveillance found that 73% of the respondents knew of the reward for reporting an infected person.

Discussion

Chad reported 3,096 (99%) of the world's 3,136 *D. medinensis* infections reported during January 2019–June 2020, 95% of which were in dogs. After a decade with no reported cases, Chad reported 10 indigenous human cases in 2010. Guinea worm infections in domestic dogs were reported for the first time in 2012, mostly from communities along the Chari River (*7*). Stopping transmission among dogs in Chad is now the biggest challenge faced by the eradication program. It is being addressed through innovative interventions and research supported by The Carter Center, WHO, and CDC and involves multiple research institutions with the purpose of better understanding the unusual epidemiology of dracunculiasis in the remaining countries with endemic transmission and assessing antihelminthic treatment of dogs (*8*). For example, collaboration with researchers from the University of Georgia (Athens, Georgia) has shown that fish can serve as transport hosts for *Dracunculus* spp. in the laboratory and that *D. medinensis* can use frogs as paratenic hosts; *Dracunculus* larvae have been recovered from multiple wild frogs in Chad (*9*,*10*). Common source waterborne dracunculiasis outbreaks in Chad in 2019 and Ethiopia in 2020 highlight the need for safe drinking water wherever this disease occurs.

Chad's ministry of health has offered a US$100 equivalent reward for reporting a confirmed human dracunculiasis case since 2010 and a reward of US$20 for reporting and tethering an infected dog since 2015. The rewards are given only after a case is confirmed; all reports must be corroborated by supervisors. In 2017, Chad launched a nationwide communication campaign to increase awareness about the rewards and how to prevent dracunculiasis in humans and dogs. Since 2013, Chad's GWEP has urged villagers to cook their fish well, bury fish entrails, and prevent animals from eating them. In 2014, village volunteers began persuading villagers to tether infected dogs until the worms emerged to prevent contamination of water. In March 2020, the program launched a new strategy to tether dogs proactively during the 4 months of peak dracunculiasis incidence in the 118 villages that reported five or more dracunculiasis infections in 2019. The program began applying temephos to cordoned sections of the extremely large lagoons at entry points used by infected humans or dogs in 2014, and it began applying temephos monthly to small ponds in villages with the most infected dogs in 2017.

The pattern of transmission to many dogs and few humans in Chad remains peculiar to that country. If the hypothesis is correct that the parasite's life cycle in Chad involves a transport or paratenic host (*10*), increased active surveillance, containment of infected dogs, application of temephos, and burial of fish entrails should reduce transmission. The dracunculiasis cases found in Cameroon in 2019 and 2020 highlight the risks for cases exported from Chad and the need for ongoing active surveillance in neighboring countries, especially Cameroon and the Central African Republic.

Finding three confirmed cases in humans and one infected dog in Angola during 2018–2020 suggests that the problem there is limited, but active surveillance throughout the at-risk areas is required to determine its full extent. If adequate security

Summary

What is already known about this topic?

Human dracunculiasis (Guinea worm disease) cases have decreased from an estimated 3.5 million in 1986 to 54 in 2019. Guinea worm infection in dogs has complicated eradication efforts.

What is added by this report?

During January–June 2020, the number of human dracunculiasis cases reported decreased to 19 in four countries (Angola, Chad, Ethiopia, and Mali) with one case in Cameroon in a patient possibly infected in Chad; South Sudan reported no human cases. In addition, 1,063 infected animals were reported

What are the implications for public health practice?

Infected dogs, especially in Chad, and impeded access because of civil unrest and insecurity in Mali and South Sudan remain challenges to interrupting transmission.

is maintained, South Sudan is poised to achieve zero-case status soon based on strong technical leadership, strong governmental political support, and no parallel animal infections.

In 2020, Mali reported its first human case in approximately 4 years, and Ethiopia reported its first human cases in approximately 2 years. Continued endemic transmission of Guinea worm infections among a few dogs and cats in Mali as well as baboons in Ethiopia appears to be geographically limited in each country. The ecologic study of baboons and proactive tethering of dogs in Gog district might help the program understand the dynamics of residual Guinea worm infections in Ethiopia. Insecurity decreased in some Guinea worm–affected areas of Mali in 2019 and 2020 but is still the main obstacle to stopping transmission in that country.

Corresponding author: Sharon L. Roy, str2@cdc.gov, 404-718-4698.

[1]The Carter Center, Atlanta, Georgia; [2]Division of Parasitic Diseases and Malaria, Center for Global Health, World Health Organization Collaborating Center for Dracunculiasis Eradication, CDC.

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

References

1. Ruiz-Tiben E, Hopkins DR. Dracunculiasis (Guinea worm disease) eradication. Adv Parasitol 2006;61:275–309. https://doi.org/10.1016/S0065-308X(05)61007-X
2. Hopkins DR, Weiss AJ, Roy SL, Zingeser J, Guagliardo SAJ. Progress toward global eradication of dracunculiasis—January 2018–June 2019. MMWR Morb Mortal Wkly Rep 2019;68:979–84. https://doi.org/10.15585/mmwr.mm6843a5
3. Watts SJ. Dracunculiasis in Africa in 1986: its geographic extent, incidence, and at-risk population. Am J Trop Med Hyg 1987;37:119–25. https://doi.org/10.4269/ajtmh.1987.37.119
4. World Health Organization. Dracunculiasis eradication: global surveillance summary, 2019. Geneva, Switzerland: World Health Organization; 2020. https://apps.who.int/iris/bitstream/handle/10665/332085/WER9520-eng-fre.pdf
5. Hopkins DR, Ruiz-Tiben E, Eberhard ML, et al. Dracunculiasis eradication: are we there yet? Am J Trop Med Hyg 2018;99:388–95. https://doi.org/10.4269/ajtmh.18-0204
6. Thiele EA, Eberhard ML, Cotton JA, et al. Population genetic analysis of Chadian Guinea worms reveals that human and non-human hosts share common parasite populations. PLoS Negl Trop Dis 2018;12:e0006747. https://doi.org/10.1371/journal.pntd.0006747
7. Eberhard ML, Ruiz-Tiben E, Hopkins DR, et al. The peculiar epidemiology of dracunculiasis in Chad. Am J Trop Med Hyg 2014;90:61–70. https://doi.org/10.4269/ajtmh.13-0554
8. World Health Organization. Meeting of the International Task Force for Disease Eradication, October 2017. Wkly Epidemiol Rec 2018;93:33–8.
9. Eberhard ML, Yabsley MJ, Zirimwabagabo H, et al. Possible role of fish and frogs as paratenic hosts of *Dracunculus medinensis*, Chad. Emerg Infect Dis 2016;22:1428–30. https://doi.org/10.3201/eid2208.160043
10. Cleveland CA, Eberhard ML, Thompson AT, et al. A search for tiny dragons (*Dracunculus medinensis* third-stage larvae) in aquatic animals in Chad, Africa. Sci Rep 2019;9:375. https://doi.org/10.1038/s41598-018-37567-7

COVID-19 in a Correctional Facility Employee Following Multiple Brief Exposures to Persons with COVID-19 — Vermont, July–August 2020

Julia C. Pringle, PhD[1,2]; Jillian Leikauskas, MPH[2]; Sue Ransom-Kelley[3]; Benjamin Webster[3]; Samuel Santos[3]; Heidi Fox, MSN[3]; Shannon Marcoux[3]; Patsy Kelso, PhD[2]; Natalie Kwit, DVM[2]

On October 21, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

On August 11, 2020, a confirmed case of coronavirus disease 2019 (COVID-19) in a male correctional facility employee (correctional officer) aged 20 years was reported to the Vermont Department of Health (VDH). On July 28, the correctional officer had multiple brief encounters with six incarcerated or detained persons (IDPs)* while their SARS-CoV-2 test results were pending. The six asymptomatic IDPs arrived from an out-of-state correctional facility on July 28 and were housed in a quarantine unit. In accordance with Vermont Department of Corrections (VDOC) policy for state prisons, nasopharyngeal swabs were collected from the six IDPs on their arrival date and tested for SARS-CoV-2, the virus that causes COVID-19, at the Vermont Department of Health Laboratory, using real-time reverse transcription–polymerase chain reaction (RT-PCR). On July 29, all six IDPs received positive test results. VDH and VDOC conducted a contact tracing investigation† and used video surveillance footage to determine that the correctional officer did not meet VDH's definition of close contact (i.e., being within 6 feet of infectious persons for ≥15 consecutive minutes)§,¶; therefore, he continued to work. At the end of his shift on August 4, he experienced loss of smell and taste, myalgia, runny nose, cough, shortness of breath, headache, loss of appetite, and gastrointestinal symptoms; beginning August 5, he stayed home from work. An August 5 nasopharyngeal specimen tested for SARS-CoV-2 by real-time RT-PCR at a commercial laboratory was reported as positive on August 11; the correctional officer identified two contacts outside of work, neither of whom developed COVID-19. On July 28, seven days preceding his illness onset, the correctional officer had multiple brief exposures to six IDPs who later tested positive for SARS-CoV-2; available data suggests that at least one of the asymptomatic IDPs transmitted SARS-CoV-2 during these brief encounters.

Subsequently, VDH and facility staff members reviewed July 28 quarantine unit video surveillance footage and standard correctional officer shift duty responsibilities to approximate the frequency and duration of interactions between the correctional officer and infectious IDPs during the work shift (Table). Although the correctional officer never spent 15 consecutive minutes within 6 feet of an IDP with COVID-19, numerous brief (approximately 1-minute) encounters that cumulatively exceeded 15 minutes did occur. During his 8-hour shift on July 28, the correctional officer was within 6 feet of an infectious IDP an estimated 22 times while the cell door was open, for an estimated 17 total minutes of cumulative exposure. IDPs wore microfiber cloth masks during most interactions with the correctional officer that occurred outside a cell; however, during several encounters in a cell doorway or in the recreation room, IDPs did not wear masks. During all interactions, the correctional officer wore a microfiber cloth mask, gown, and eye protection (goggles). The correctional officer wore gloves during most interactions. The correctional officer's cumulative exposure time is an informed estimate; additional interactions might have occurred that were missed during this investigation.

The correctional officer reported no other known close contact exposures to persons with COVID-19 outside work and no travel outside Vermont during the 14 days preceding illness onset. COVID-19 cumulative incidence in his county of residence and where the correctional facility is located was relatively low at the time of the investigation (20 cases per 100,000 persons), suggesting that his most likely exposures occurred in the correctional facility through multiple brief encounters (not initially considered to meet VDH's definition of close contact exposure) with IDPs who later received a positive SARS-CoV-2 test result.

Among seven employees with exposures to the infectious IDPs that did meet the VDH close contact definition, one person received a positive test result. Among thirteen employees (including the correctional officer) with exposures to the infectious IDPs that did not meet the VDH close contact definition

* For the purposes of this report, "IDP" refers to a person held in a prison.

† This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy: 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

§ https://www.cdc.gov/coronavirus/2019-ncov/php/public-health-recommendations.html.

¶ https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/appendix.html#contact.

TABLE. Description, frequency, and duration of close (within 6 ft) interactions between the ill correctional facility employee and six infectious incarcerated or detained persons (IDPs) while their SARS-CoV-2 test results were pending — Vermont, July 28, 2020*

Routine encounter	Description	Typical frequency	Typical duration	Cell door typically open?†	Estimated no. of exposures ≤6 ft from infectious persons and cumulative employee July 28 exposure time
Recreation room use	Employees open cell doors to allow IDPs to access recreation room one at a time. Observed opportunities for conversation between staff members and IDPs.	Once per 8-hour shift for each IDP	60 seconds	Yes	6 infectious persons x 1 encounter per shift = 6 encounters x 1 minute per encounter = 6 minutes
Collection of soiled linens and clothes	Employees collect soiled laundry and provide clean linens and clothing.	Clothes: twice weekly§; Linens: once weekly§	30–60 seconds	Yes	6 infectious persons x 1 encounter during ill employee's shift = 6 encounters x 45 seconds = 4.5 minutes
Showering or recreation	Employees open doors for IDPs to leave for showering or recreation.	Once daily for each IDP during second shift¶	30 seconds	Yes	6 infectious persons x 1 encounter per shift = 6 encounters x 30 seconds = 3 minutes
Health checks	Employees conduct health assessments of IDPs.	Once per 8-hour shift for each IDP	60 seconds	During approximately one third of the encounters	6 infectious persons x 1 encounter per shift x 1/3 of encounters with door open = 2 encounters x 1 minute per encounter = 2 minutes
Medication dispensing	Employees deliver medication to IDPs. Encounters occur through chutes in doors when possible.	As needed; approximately once per 8-hour shift for each IDP	30–60 seconds	During approximately one third of the encounters	6 infectious persons x 1 encounter per shift x 1/3 of encounters with door open = 2 encounters x 45 seconds per encounter = 1.5 minutes
Safety checks	Employees visually check on IDPs through door windows.	Every 15 minutes	<10 seconds	No	None
Meal delivery and pick-up	Meals are delivered through food chutes in cell doors; trays are picked up through the same chutes.	Once per 8-hour shift for each IDP	30 seconds	No	None
Total	—	—	—	—	**22 encounters; 17 minutes**

Abbreviation: COVID-19 = coronavirus disease 2019.
* Standard shift duties and surveillance footage from the quarantine unit were used to characterize routine opportunities for employees and IDPs to have close (within 6 ft) interactions. Observed encounters between the correctional officer and IDPs and typical encounter durations were used to estimate the ill employee's cumulative exposure time. One correctional staff member is assigned to the quarantine unit per shift and is responsible for performing the tasks described in the table.
† IDPs are not required to wear masks while inside cells. During health checks and medication dispensing interactions when cell doors were open but IDPs remained inside, IDPs did not wear masks despite being within 6 ft of employees without the door as a physical barrier.
§ These activities were observed during the course of the correctional officer's shift because these IDPs were new arrivals to the facility.
¶ Surveillance footage was used to estimate the number of encounters between the correctional officer and the six quarantined IDPs pending SARS-CoV-2 test results on July 28.

during contact tracing, only the correctional officer received a positive SARS-CoV-2 test result.

Data are limited to precisely define "close contact"; however, 15 minutes of close exposure is used as an operational definition for contact tracing investigations in many settings. Additional factors to consider when defining close contact include proximity, the duration of exposure, whether the infected person has symptoms, whether the infected person was likely to generate respiratory aerosols, and environmental factors such as adequacy of ventilation and crowding. A primary purpose of contact tracing is to identify persons with higher risk exposures and therefore higher probabilities of developing infection, which can guide decisions on quarantining and work restrictions. Although the initial assessment did not suggest that the officer had close contact exposures, detailed review of video footage identified that the cumulative duration of exposures exceeded 15 minutes. In correctional settings, frequent encounters of ≤6 feet between IDPs and facility staff members are necessary; public health officials should consider transmission-risk implications of cumulative exposure time within such settings.

Corresponding author: Julia C. Pringle, pgx1@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]Vermont Department of Health; [3]Vermont Department of Corrections.

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

Adoption of Strategies to Mitigate Transmission of COVID-19 During a Statewide Primary Election — Delaware, September 2020

Eva Leidman, MSPH[1]; Noemi B. Hall, PhD[1]; Amy E. Kirby, PhD[1]; Amanda G. Garcia-Williams, PhD[1]; Jose Aponte[1]; Jonathan S. Yoder, MPH[1]; Rick Hong, MD[2]; Anthony Albence, MA[3]; Fátima Coronado, MD[1]; Greta M. Massetti, PhD[1]

On October 23, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

Elections occurring during the coronavirus disease 2019 (COVID-19) pandemic have been affected by notable changes in the methods of voting, the number and type of polling locations, and in-person voting procedures (*1*). To mitigate transmission of COVID-19 at polling locations, jurisdictions have adopted changes to protocols and procedures, informed by CDC's interim guidance, developed in collaboration with the Election Assistance Commission (*2*). The driving principle for this guidance is that voting practices with lower infection risk will be those which reduce the number of voters who congregate indoors in polling locations by offering a variety of methods for voting and longer voting periods. The guidance for in-person voting includes considerations for election officials, poll workers, and voters to maintain healthy environments and operations. To assess knowledge and adoption of mitigation strategies, CDC collaborated with the Delaware Department of Health and Social Services and the Delaware State Election Commission on a survey of poll workers who served during the statewide primary election on September 15, 2020. Among 522 eligible poll workers, 93% correctly answered all three survey questions about COVID-19 transmission. Respondents noted that most voters and poll workers wore masks. However, masks were not always worn correctly (i.e., covering both the nose and mouth). Responses suggest that mitigation measures recommended for both poll workers and voters were widely adopted and feasible, but also highlighted gaps in infection prevention control efforts. Strengthening of measures intended to minimize the risk of poll workers acquiring COVID-19 from ill voters, such as additional training and necessary personal protective equipment (PPE), as well as support for alternative voting options for ill voters, are needed. Adherence to mitigation measures is important not only to protect voters but also to protect poll workers, many of whom are older adults, and thus at higher risk for severe COVID-19–associated illness. Enhanced attention to reducing congregation in polling locations, correct mask use, and providing safe voting options for ill voters are critical considerations to minimize risk to voters and poll workers. Evidence from the Delaware election supports the feasibility and acceptability of implementing current CDC guidance for election officials, poll workers, and voters for mitigating COVID-19 transmission at polling locations (*2*).

Among the 2,498 poll workers who served at one of the 434 polling locations operational during Delaware's primary election, 1,595 (64%) with valid e-mail addresses* were invited by their county elections office to complete a self-administered survey during September 23–26. Poll workers with e-mail addresses were eligible to participate if they worked on election day (September 15, 2020), were aged ≥18 years, and provided written consent to participate. Overall, 568 (36%) persons responded to the survey, among whom 522 (92%) were eligible to participate. Survey questions focused on direct observation of supply availability and polling location setup, training received, knowledge and attitudes about transmission and personal protection, and mitigation measures practiced by themselves, other poll workers, and voters. The survey was administered as a web-based Epi Info questionnaire.† Data were analyzed using R statistical software (version 3.5.0; The R Foundation) and SAS (version 9.4; SAS Institute). Differences in proportions were assessed using chi-squared tests, with p-values <0.05 considered statistically significant. Industry and occupation were coded using CDC's National Institute for Occupational Safety and Health Industry and Occupation Computerized Coding System.§ This activity was reviewed by the Delaware Department of Health and Social Services and CDC and was conducted consistent with applicable federal law and CDC policy.¶

The median age of respondents was 59 years (interquartile range = 52–69 years); 42% were aged >65 years (Table 1). The majority (57%) of respondents were male, 48% were non-Hispanic White, 42% were retired, nearly one third (32%) reported having one underlying medical condition associated with increased COVID-19 severity, and approximately one quarter (27%) reported having two or more such conditions (*3*).

Physical modifications to polling locations were reported by respondents, including spacing of voting booths ≥6 feet apart (88%), modifying polling location layout such that voters moved through the space in one direction (80%), and use of visual cues to remind voters to stay ≥6 feet apart (87%) (Table 2). Use of physical barriers, such as plexiglass shields, at registration desks and between

* E-mail addresses were considered valid if nonmissing, without obvious typographic errors, and did not return an automated error message.

† https://www.cdc.gov/epiinfo/index.html.

§ https://wwwn.cdc.gov/nioccs3.

¶ 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

TABLE 1. Self-reported characteristics of persons serving as poll workers during the statewide primary election — Delaware, September 15, 2020

Characteristic (no. with available information)	Respondents no. (%)
Total	**522**
Gender (522)	
Female	94 (18.0)
Male	298 (57.1)
Other/Unknown	130 (24.9)
Age group, yrs (522)	
Median age (interquartile range)	59 (52–69)
18–34	41 (7.9)
35–44	38 (7.3)
45–54	73 (14.0)
55–64	153 (29.3)
≥65	217 (41.6)
Race/Ethnicity (522)	
White, non-Hispanic	249 (47.7)
Black or African American, non-Hispanic	97 (18.6)
Other/Multiple races, non-Hispanic	9 (1.7)
Hispanic	7 (1.3)
Unknown	160 (30.7)
County of residence* (522)	
New Castle	238 (45.6)
Kent	125 (23.9)
Sussex	85 (16.3)
Unknown	74 (14.2)
Employment status (391)	
Retired	163 (41.7)
Employed full-time	147 (37.6)
Employed part-time	40 (10.2)
Unemployed	22 (5.6)
Self-employed	19 (4.9)
Industry† (190)	
Public administration	49 (25.7)
Health care and social assistance	29 (15.2)
Finance and Insurance	24 (12.6)
Occupation† (184)	
Office and administrative support	40 (21.7)
Management	21 (11.4)
Business and financial operations	21 (11.4)
Poll worker role§ (481)	
Registration desk	222 (46.2)
Greeter	127 (26.4)
Ballot processor	115 (23.9)
Underlying medical condition (403)	
Hypertension	129 (32.0)
Obesity	93 (23.1)
Asthma	44 (10.9)
Diabetes	36 (8.9)
One underlying medical condition¶	128 (31.8)
Two or more underlying medical conditions¶	110 (27.3)

* Delaware poll workers are eligible to serve in their county of residence.
† Three most common occupations and industries coded from free text using National Institute for Occupational Safety and Health Industry and Occupation Computerized Coding System.
§ Poll workers often had multiple roles such that categories are not mutually exclusive.
¶ Underlying medical conditions assessed included asthma; autoimmune condition (such as Type I diabetes); cardiovascular disease such as heart failure or coronary artery disease; chronic liver disease; chronic kidney disease; chronic lung disease such as chronic obstructive pulmonary disease; emphysema; chronic bronchitis; cystic fibrosis; diabetes mellitus; disability (related to the brain or nervous system, intellectual, physical, vision or hearing impairment); hypertension or high blood pressure; obesity (body mass index >30 kg/m^2); sickle cell disease; thalassemia; and weakened immune system or immunosuppressive condition (e.g., cancer, human immunodeficiency virus infection).

TABLE 2. Physical layout, environment, and supplies available at polling sites to mitigate COVID-19 transmission reported by poll workers during the statewide primary election — Delaware, September 15, 2020

Characteristic*	Respondents no./total no. (%)
Total	**522**
No. of unique polling locations represented†,§	**99**
Mitigation strategies	
Presence of physical barriers	
Between voter registration desk and voter check-in desks	21/462 (4.5)
Between voting booths	30/465 (6.5)
Polling site layout	
Layout to ensure voters move in one direction	367/457 (80.3)
Separate doors for entry and exit	204/454 (44.9)
Voting booths placed at least 6 feet apart	400/457 (87.5)
Signs/Markings	
Markings or decals on the floor to indicate 6 feet spacing	407/466 (87.3)
Mitigation signs in visible locations	297/465 (63.9)
Adequate availability of supplies	
Polling site supplies available to poll workers	
Hand sanitizer	394/421 (93.6)
Cleaning supplies	393/422 (93.1)
Ran out of hand sanitizer or cleaning supplies	59/418 (14.1)
Masks/Cloth face coverings	369/421 (87.6)
Polling site supplies available to voters	
Hand sanitizer	343/419 (81.9)
Ran out of hand sanitizer	32/413 (7.7)
Masks/Cloth face coverings	292/419 (69.7)

* Reported among persons with nonmissing response to each question.
† Poll location worked not identified by 394 survey respondents.
§ Total of 434 polling locations were operational for the September 15, 2020 primary.

voting booths was reported by 5% and 7% of respondents, respectively. Separate doors for entry and exit were reported by 45% of respondents. In response to questions about supplies to support safe hygiene behaviors, 94% of respondents reported that hand sanitizer was available for poll workers, 82% reported that hand sanitizer was available for voters, and 93% reported that cleaning supplies were available; however, 14% reported that their polling location ran out of hand sanitizer or cleaning supplies on election day. Availability of masks for poll workers at polling stations was reported by 88% of respondents and for voters by 70%.

Receipt of training specific to COVID-19 mitigation was reported by 80% of respondents (Table 3). The training content most commonly reported by respondents included guidance on hand hygiene, mask use, and procedures for poll workers with symptoms. Among those respondents who received training, only 30% reported receiving training specific to assisting voters with symptoms consistent with COVID-19 or with known COVID-19 infection. Despite differences in training

** Respondents were asked three true or false questions regarding whether 1) SARS-CoV-2 can spread through respiratory droplets, 2) SARS-CoV-2 can spread when in close contact with an infected person, and 3) SARS-CoV-2 can spread by touching a contaminated surface before touching one's face, eyes, or mouth.

TABLE 3. Knowledge and practice of recommended mitigation strategies reported by poll workers during the statewide primary election — Delaware, September 15, 2020

Characteristic*	Respondents no./total no. (%)
Total	**522**
Training, attitudes, and knowledge	
Received training specific to COVID-19 mitigation	
Yes, received specific training	395/492 (80.3)
Duration of training specific to COVID-19 mitigation	
<30 mins	121/395 (30.6)
30 mins to <2 hrs	94/395 (23.8)
≥2 hrs	131/395 (33.2)
Unspecified training duration	49/395 (12.4)
Training content	
Procedure if poll worker suspects themselves of having COVID-19	288/376 (76.6)
Hand hygiene	281/377 (74.5)
Use of masks among poll workers	375/378 (99.2)
Assistance of sick voters	112/376 (29.8)
All content assessed[†]	65/395 (16.5)
Knowledge and attitudes	
Answered correctly all questions on COVID-19 transmission[§]	379/408 (92.9)
Agreed or strongly agreed that they knew how to keep themselves safe from COVID-19 as a poll worker	438/465 (94.2)
Exposures and mitigation practices among poll workers	
Exposures	
Reported contact with >100 voters[¶]	337/468 (72.0)
Reported close contact with >100 voters[¶]	127/465 (27.3)
Reported contact or close contact with a sick voter	19/473 (4.0)
Wore a cloth or nonmedical mask while helping sick voter	15/19 (79.0)
Wore all recommended PPE while helping sick voter**	0/19
Mitigation practices observed among other poll workers	
Mask use by 80%–100% of poll workers	464/470 (98.7)
Never or very rarely observed masks worn incorrectly[††]	316/433 (73.0)
Frequently or very frequently observed hand washing or use of hand sanitizer	342/437 (78.3)
Frequently or very frequently observed cleaning of high touch surfaces or equipment	395/433 (91.2)
Mitigation practices observed among voters	
Mask use by 80%–100% of voters	461/469 (98.3)
Never or very rarely observed masks worn incorrectly[††]	242/451 (53.6)
Frequently or very frequently observed use of hand sanitizer	193/452 (42.7)
Frequently or very frequently observed maintenance of distance from other voters	403/441 (91.4)

Abbreviations: COVID-19 = coronavirus disease 2019; PPE = personal protective equipment.
* Reported among persons with nonmissing response to each question.
† Procedures if poll worker suspects they themselves have COVID-19, hand hygiene, mask use among poll workers and voters, use of other PPE, disinfecting high touch surfaces and equipment, maintaining physical distance, crowd management, assisting sick voters, and improving ventilation.
§ Knowledge score composed of three true or false questions on COVID-19 transmission that included asking whether SARS-CoV-2 can spread through respiratory droplets, when in close contact with an infected person, or from touching a contaminated surface before touching one's face, eyes, or mouth.
¶ Contacts defined as within 6 feet for any amount of time. Close contacts defined as within 6 feet for a total of 15 minutes or more. The number of contacts is based on poll worker self-report.
** Recommended PPE includes respiratory protection, face shields, gowns, and gloves.
†† "Incorrectly" refers to not covering the mouth and nose.

duration and content, 93% of respondents correctly answered all three survey questions about COVID-19 transmission,** and 94% agreed or strongly agreed that they knew how to keep themselves safe from COVID-19.

Personal prevention practices were reported to have been widely adopted by poll workers and voters. Nearly all respondents (99%) reported that masks were worn by most (i.e., 80%–100%) other poll workers. A similarly high proportion of respondents (98%) reported that masks were worn by most voters. A larger percentage of respondents (73%) reported very rarely or never observing incorrect mask use (i.e., not worn over both the nose and mouth) by other poll workers compared to 54% of respondents reporting very rarely or never observing incorrect mask use by voters. In addition, a larger percentage of respondents reported frequently or very frequently observing hand sanitizer use among poll workers (78%) than reported observing hand sanitizer use among voters (43%). As well, 91% of respondents reported frequently or very frequently having observed fellow poll workers cleaning high touch surfaces and equipment. Nearly all (91%) respondents reported frequently or very frequently observing voters maintaining ≥6 feet of distance from one another.

Nearly three quarters (72%) of respondents reported contact (within 6 feet) with >100 persons and 27% reported close contact (within 6 feet for ≥15 minutes) with >100 persons on election day. Only 19 (4%) of 522 respondents reported knowingly having had contact with a person identified as being ill (with or without a known COVID-19 diagnosis); 15 of those persons reported having worn a mask during contact with the ill voter, but none reported wearing all PPE (respiratory protection, face shields, gowns, and gloves) recommended in interim guidance (*2*).

As a proxy for total voters per polling location, experiences of respondents reporting contact with >100 persons were compared with those of respondents reporting fewer contacts for all analyses of mitigation strategies, training, knowledge and attitudes, and exposures. Among respondents indicating polling location worked (128), at least 99 unique sites (23% of all operational polling locations) were represented. Availability of separate doors for voter entry and exit was reported by 37% of respondents having contact with ≤100 persons, compared with 48% of those having >100 contacts (p = 0.02). Compared with respondents having contact with >100 persons, those having contact with ≤100 persons were more likely to report very rarely or never observing voters wearing masks incorrectly (63% versus 49%, p = 0.01). No other statistically significant differences were observed.

Discussion

The Delaware Department of Elections reported that 177,529 persons cast ballots during the 2020 primary election, nearly twice the number who voted during the 2016 primary (94,039) (*4*). Among all persons who cast ballots, 101,135 (57%) voters cast ballots in person on election day in 2020, compared with 89,280 (95%) voters in 2016 (*4*). Poll workers serving during the 2020 Delaware primary election included a large proportion of persons at increased risk for severe COVID-19–associated illness, with 42% aged >65 years and 59% having at least one underlying medical condition. The age distribution observed among survey respondents was similar to that of poll workers in Delaware during the 2016 general election, when 45% were aged >61 years (*5*). Population-based surveillance data suggest similar prevalences of underlying medical conditions among survey respondents and adults in the general population for most common conditions (*6*). Ongoing efforts to recruit younger poll workers might reduce the proportion of poll workers at risk for severe COVID-19–associated illness.

Reported infrastructure and mitigation practices generally aligned with CDC guidance for mitigating transmission of SARS-CoV-2, the virus that causes COVID-19. Most respondents reported availability of masks for poll workers as well as recommended supplies for hand hygiene and disinfection. Supplying masks for voters, although not explicitly recommended in interim guidance, might support adoption of personal prevention practices among voters. Similarity in observations related to most mitigation measures by respondents who had contact with a large number of persons and those who had contact with fewer persons at their polling locations suggests that these findings might be applicable in both smaller and larger polling locations.

This analysis identified areas where infection prevention measures could be improved in upcoming elections. The large number of close contacts (≤6 feet for ≥15 minutes) reported by poll workers underscores the potential for in-person voting locations to serve as mass gathering events, supporting current guidance related to the importance of absentee voting, extended polling location hours, and other voting options that reduce congregation of voters in polling locations. With respect to in-person voting, adoption of physical barriers and separate entrances and exits can support physical distancing; however, limited options in terms of polling locations and other physical or regulatory challenges might affect the ability to adopt some of these measures. Interim guidance recommends alternative voting options (e.g., curbside voting) and use of PPE when assisting a voter with symptoms or known infection (*2*); however, survey responses suggest that poll workers did not use recommended PPE in this setting and had limited training concerning its use. In settings with community spread, infection control measures should be followed, presuming that ill voters might have COVID-19. Ensuring that ill voters can vote while maintaining poll worker and voter safety will be essential to minimizing transmission without restricting voting rights. In April, Delaware began mandating mask use among persons aged >12 years, and in a July survey, approximately 79% of persons in all Delaware counties reported always wearing a mask in public when in close contact with other persons (*7*,*8*). Results from this survey indicate that the majority of both voters and poll workers wore masks at polling locations during the September primary. However, the substantial proportion of respondents who reported observing incorrect mask use by voters (i.e., masks not covering the nose and mouth) suggests that further messaging on proper mask use, including at polling locations, might be needed to strengthen the effectiveness of masks during upcoming elections.

The findings in this report are subject to at least four limitations. First, the final sample included 21% of all poll workers serving during the primary. Exclusion of persons without valid e-mail addresses and nonresponse among eligible poll workers might have biased the sample. Second, results from the Delaware primary might not be generalizable to other states or future elections; adoption of mitigation strategies could be affected by differences

Summary

What is already known about this topic?

CDC has published interim guidance for elections officials, poll workers, and voters for maintaining healthy environments and operations at polling stations to mitigate SARS-CoV-2 transmission.

What is added by this report?

Survey responses from Delaware's September 15, 2020 primary election poll workers demonstrate the feasibility of implementing CDC guidance, but highlight the large number of persons poll workers have close contact with as well as gaps in infection prevention, including ensuring correct mask use and providing training and personal protective equipment to poll workers assisting ill voters.

What are the implications for public health practice?

Enhanced attention to reducing congregation in polling locations, correct mask use, and enabling safe voting options for ill voters are critical considerations for elections to minimize risk for voters and poll workers.

in COVID-19 incidence, knowledge of COVID-19 transmission, voter turnout, and differences in voting practices by jurisdiction. Third, findings assessed only mitigation practices during in-person voting on election day, although findings would also be relevant to in-person early voting. Finally, these findings are based on poll worker reports rather than direct observation and might be subject to recall and social desirability biases.

Adherence to mitigation measures is important not only to protect voters but also to protect poll workers, many of whom are older adults. Evidence from the Delaware election supports the feasibility and acceptability of implementing current CDC guidance for election officials, poll workers, and voters for mitigating COVID-19 transmission at polling locations.

Acknowledgments

Erin Sauber-Schatz, Candis Hunter, Stacey Marovich, Pamela Schumacher, Jeff Purdin, Jennifer Cornell, Jose Montero, Peggy Honein, Christina McDonald, Akimi Smith, Jennifer Gondhi, Calethia Ray, Mohammed Lamtahri, Rajashekara Basavaraju, Karyl Rattay, Kim Ritter, Tabatha Offutt-Powell, Richard Pescatore.

Corresponding author: Eva Leidman, eleidman@cdc.gov.

[1]CDC COVID-19 Response Team; [2]Delaware Department of Health and Social Services; [3]Delaware State Election Commission.

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

References

1. Hinkle B. COVID-19: how's it changing elections? National Conference of State Legislatures LegisBrief, vol 28, no 22. Washington, DC: National Conference of State Legislatures; 2020. https://www.ncsl.org/research/elections-and-campaigns/covid-19-how-s-it-changing-elections.aspx
2. CDC. Coronavirus disease 2019 (COVID-19): community, work & school: considerations for election polling locations. Atlanta, GA: US Department of Health and Human Services, CDC; June 22, 2020. https://www.cdc.gov/coronavirus/2019-ncov/community/election-polling-locations.html
3. CDC. Coronavirus disease 2019 (COVID-19): people with certain medical conditions. Atlanta, GA: US Department of Health and Human Services, CDC; October 16, 2020. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html
4. Delaware Department of Elections. 2020 state primary election report: September 15th 2020 official results. Dover, DE: State of Delaware, Department of Elections; 2020. https://elections.delaware.gov/results/html/index.shtml?electionId=PR2020
5. US Election Assistance Commission. EAVS deep dive: poll workers and polling places. Silver Spring, MD: US Election Assistance Commission; 2017. https://www.eac.gov/documents/2017/11/15/eavs-deep-dive-poll-workers-and-polling-places
6. Razzaghi H, Wang Y, Lu H, et al. Estimated county-level prevalence of selected underlying medical conditions associated with increased risk for severe COVID-19 illness—United States, 2018. MMWR Morb Mortal Wkly Rep 2020;69:945–50. https://doi.org/10.15585/mmwr.mm6929a1
7. Delaware Division of Public Health. Guidance for face coverings. Dover, DE: State of Delaware, Division of Public Health; 2020. https://coronavirus.delaware.gov/guidance-for-face-coverings/
8. Katz J, Sanger-Katz M, Quealy K. A detailed map of who is wearing masks in the U.S. The New York Times. July 17, 2020. https://www.nytimes.com/interactive/2020/07/17/upshot/coronavirus-face-mask-map.html

COVID-19–Associated Hospitalizations Among Health Care Personnel — COVID-NET, 13 States, March 1–May 31, 2020

Anita K. Kambhampati, MPH[1]; Alissa C. O'Halloran, MSPH[1]; Michael Whitaker, MPH[1,2]; Shelley S. Magill, MD, PhD[3]; Nora Chea, MD[3]; Shua J. Chai, MD[4,5]; Pam Daily Kirley, MPH[4]; Rachel K. Herlihy, MD[6]; Breanna Kawasaki, MPH[6]; James Meek, MPH[7]; Kimberly Yousey-Hindes, MPH[7]; Evan J. Anderson, MD[8,9]; Kyle P. Openo, DrPH[8,9,10]; Maya L. Monroe, MPH[11]; Patricia A. Ryan, MS[11]; Sue Kim, MPH[12]; Libby Reeg[12]; Kathryn Como-Sabetti, MPH[13]; Richard Danila, PhD[13]; Sarah Shrum Davis, MPH[14]; Salina Torres, PhD[15]; Grant Barney, MPH[16]; Nancy L. Spina, MPH[16]; Nancy M. Bennett, MD[17]; Christina B. Felsen, MPH[17]; Laurie M. Billing, MPH[18]; Jessica Shiltz, MPH[18]; Melissa Sutton, MD[19]; Nicole West, MPH[19]; William Schaffner, MD[20]; H. Keipp Talbot, MD[20]; Ryan Chatelain, MPH[21]; Mary Hill, MPH[21]; Lynnette Brammer, MPH[1]; Alicia M. Fry, MD[1]; Aron J. Hall, DVM[1]; Jonathan M. Wortham, MD[1]; Shikha Garg, MD[1]; Lindsay Kim, MD[1]; COVID-NET Surveillance Team

On October 26, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

Health care personnel (HCP) can be exposed to SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), both within and outside the workplace, increasing their risk for infection. Among 6,760 adults hospitalized during March 1–May 31, 2020, for whom HCP status was determined by the COVID-19–Associated Hospitalization Surveillance Network (COVID-NET), 5.9% were HCP. Nursing-related occupations (36.3%) represented the largest proportion of HCP hospitalized with COVID-19. Median age of hospitalized HCP was 49 years, and 89.8% had at least one underlying medical condition, of which obesity was most commonly reported (72.5%). A substantial proportion of HCP with COVID-19 had indicators of severe disease: 27.5% were admitted to an intensive care unit (ICU), 15.8% required invasive mechanical ventilation, and 4.2% died during hospitalization. HCP can have severe COVID-19–associated illness, highlighting the need for continued infection prevention and control in health care settings as well as community mitigation efforts to reduce transmission.

COVID-NET conducts population-based surveillance for laboratory-confirmed COVID-19–associated hospitalizations among persons of all ages in 99 counties in 14 states (*1*). Hospitalized patients who are residents of the surveillance catchment area and have a positive SARS-CoV-2 molecular test result during their hospitalization or within 14 days before admission are included in COVID-NET. SARS-CoV-2 testing is performed at the discretion of health care providers or according to hospital testing policies. Trained surveillance officers conduct medical chart abstractions for COVID-19 patients using a standardized case report form, which includes HCP status. Data on HCP status collected by sites representing 98* counties in 13 states (California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Tennessee, and Utah) are included in this analysis. HCP were defined as persons working in health care settings, home health care services, or health care occupations within other settings (e.g., school nurses) who have potential for exposure to patients or infectious materials (*2*). HCP were stratified into two groups for analyses according to presumed level of patient contact (i.e., those generally expected and those generally not expected to have direct patient contact) based on reported occupation.†

* Counties represented in analysis: California (Alameda, Contra Costa, and San Francisco counties); Colorado (Adams, Arapahoe, Denver, Douglas, and Jefferson counties); Connecticut (Middlesex and New Haven counties); Georgia (Clayton, Cobb, DeKalb, Douglas, Fulton, Gwinnett, Newton, and Rockdale counties); Maryland (Allegany, Anne Arundel, Baltimore, Baltimore City, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Prince George's, Queen Anne's, St. Mary's, Somerset, Talbot, Washington, Wicomico, and Worcester counties); Michigan (Clinton, Eaton, Genesee, Ingham, and Washtenaw counties); Minnesota (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties); New Mexico (Bernalillo, Chaves, Doña Ana, Grant, Luna, San Juan, and Santa Fe counties); New York (Albany, Columbia, Genesee, Greene, Livingston, Monroe, Montgomery, Ontario, Orleans, Rensselaer, Saratoga, Schenectady, Schoharie, Wayne, and Yates counties); Ohio (Delaware, Fairfield, Franklin, Hocking, Licking, Madison, Morrow, Perry, Pickaway, and Union counties); Oregon (Clackamas, Multnomah, and Washington counties); Tennessee (Cheatham, Davidson, Dickson, Robertson, Rutherford, Sumner, Williamson, and Wilson counties); and Utah (Salt Lake County).

† HCP generally expected to have direct patient contact included nurse (115), CNA/nursing assistant/nurse aide (50), patient aide/care aide/caregiver/patient care assistant (25), home health personnel (17), phlebotomist/technician (16), social work/behavioral health/counseling (16), physician (15), physical therapist/occupational therapist/chiropractor (nine), dentist/dental hygienist (seven), emergency medical services personnel/paramedic (seven), medical assistant (six), nursing home/long-term care/assisted living staff members (three), respiratory therapist (three), and other (four). HCP generally not expected to have direct patient contact included human resources/administrative staff members (22), housekeeping/maintenance staff members (13), nursing home/long-term care/assisted living staff members, role unspecified (12), food service (seven), pharmacist/pharmacy staff members, role unspecified (six), environmental services (three), laboratory staff members, role unspecified (one), security (one), other (five), and unspecified (75). HCP categorized as "role unspecified" were those for whom only a location of work was indicated with no other detail about occupation; all such HCP were assumed generally not to have direct patient contact and were classified according to their location of work.

Because of high case counts, nine of 13 sites conducted in-depth medical chart abstractions for an age-stratified random sample of all reported COVID-19 patients hospitalized during March 1–May 31.[§] Six sites completed chart abstractions for all patients aged <50 years (including all pregnant patients), 20% of patients aged 50–64 years, and 10% of patients aged ≥65 years. Three sites completed abstractions for 10% of patients aged ≥18 years, in addition to all pregnant patients. The remaining four sites completed chart abstractions for all reported patients. As of September 12, chart abstractions were complete for 86% of sampled patients identified through COVID-NET. Descriptive statistics were calculated for all sampled HCP aged ≥18 years hospitalized with COVID-19 during March 1–May 31, 2020, for whom full chart abstraction was completed. Weights were applied to reflect the probability of being sampled for complete chart abstraction; weighted percentages and unweighted case counts are presented throughout this report. Analyses were conducted using SAS (version 9.4; SAS Institute), and 95% confidence intervals (CIs) were generated using the Taylor series linearization method in SUDAAN (version 11; RTI International). COVID-NET activities were determined by CDC to meet the requirements of public health surveillance.[¶] All sites participating in COVID-NET obtained approval from their respective state and local Institutional Review Boards, as applicable.

During March 1–May 31, 2020, COVID-NET received reports of 28,972 hospitalized adult patients, 8,515 of whom were sampled for complete chart abstraction (Figure 1). HCP status was documented for 6,760 sampled patients, 438 of whom were HCP, yielding a weighted estimate of 5.9% (95% CI = 5.1%–6.8%). The median age of HCP hospitalized with COVID-19 was 49 years (interquartile range [IQR] = 38–57 years), and 71.9% were female; 52.0% were non-Hispanic Black (Black), 27.4% were non-Hispanic White, and 8.6% were Hispanic or Latino persons (Table). More than two thirds (67.4%) of HCP hospitalized with COVID-19 worked in occupations in which they were generally expected to have direct patient contact; 36.3% of HCP hospitalized with COVID-19 worked in nursing-related occupations, including nurses (27.8%) and certified nursing assistants (CNAs) (8.5%). Patient aides and caregivers (6.6%) accounted for the next largest proportion of HCP hospitalized with COVID-19 (Figure 2).

Overall, 89.8% of HCP hospitalized with COVID-19 had documentation of at least one underlying condition (Table). The most commonly reported conditions included obesity (body mass index ≥30 kg per m^2) (72.5%), hypertension (40.6%), and diabetes (30.9%). Compared with HCP generally expected to have direct patient contact, those generally not expected to have direct patient contact had higher prevalences of obesity (80.9% versus 68.3%) and cardiovascular disease (excluding hypertension) (23.5% versus 8.4%). Among female HCP aged 18–49 years hospitalized with COVID-19, 9.6% were pregnant during hospitalization. Upon hospital admission, 96.6% of HCP reported COVID-19–associated signs and symptoms; shortness of breath (79.0%), cough (76.6%), and fever or chills (73.9%) were those most commonly reported.

The median length of hospitalization among HCP with COVID-19 was 4 days (IQR = 3–9 days). COVID-19 investigational treatments were administered to 48.2% of HCP hospitalized with COVID-19. Overall, 27.5% of HCP were admitted to an ICU for a median of 6 days (IQR = 3–20 days), and 15.8% required invasive mechanical ventilation. Pneumonia was a documented discharge diagnosis for 56.7% of HCP hospitalized with COVID-19 and acute respiratory failure for 42.9%. Sixteen (4.2%) HCP with COVID-19 died during hospitalization.

Discussion

During March 1–May 31, 2020, HCP accounted for approximately 6% of adults hospitalized with COVID-19 for whom HCP status was documented in COVID-NET. The median age of hospitalized HCP (49 years) was substantially lower than that previously reported for hospitalized adults (62 years) (*3*). More than two thirds (67.4%) of HCP hospitalized with COVID-19 were generally expected to have direct patient contact, and over one third (36.3%) were in nursing-related occupations. Similar to the proportion of underlying conditions among all hospitalized adults reported to COVID-NET during March–May,** approximately 90% of hospitalized HCP reported at least one underlying condition, with obesity being the most common and reported for over two thirds (72.5%) of patients. A high proportion of hospitalized HCP had indications of severe disease: approximately one in four were admitted to an ICU, and approximately 4% died. The proportion of HCP with these severe clinical outcomes was similar to that of adults aged 18–64 years hospitalized with COVID-19 during March–May.[††]

Findings from this analysis are comparable to those reported among HCP with COVID-19 in China, which found that nursing-related occupations accounted for the largest proportion of COVID-19 cases among HCP (*4*). COVID-NET does not specifically collect information on exposure history; however, nurses are frontline workers and might be at particular risk for exposure because of their frequent and close

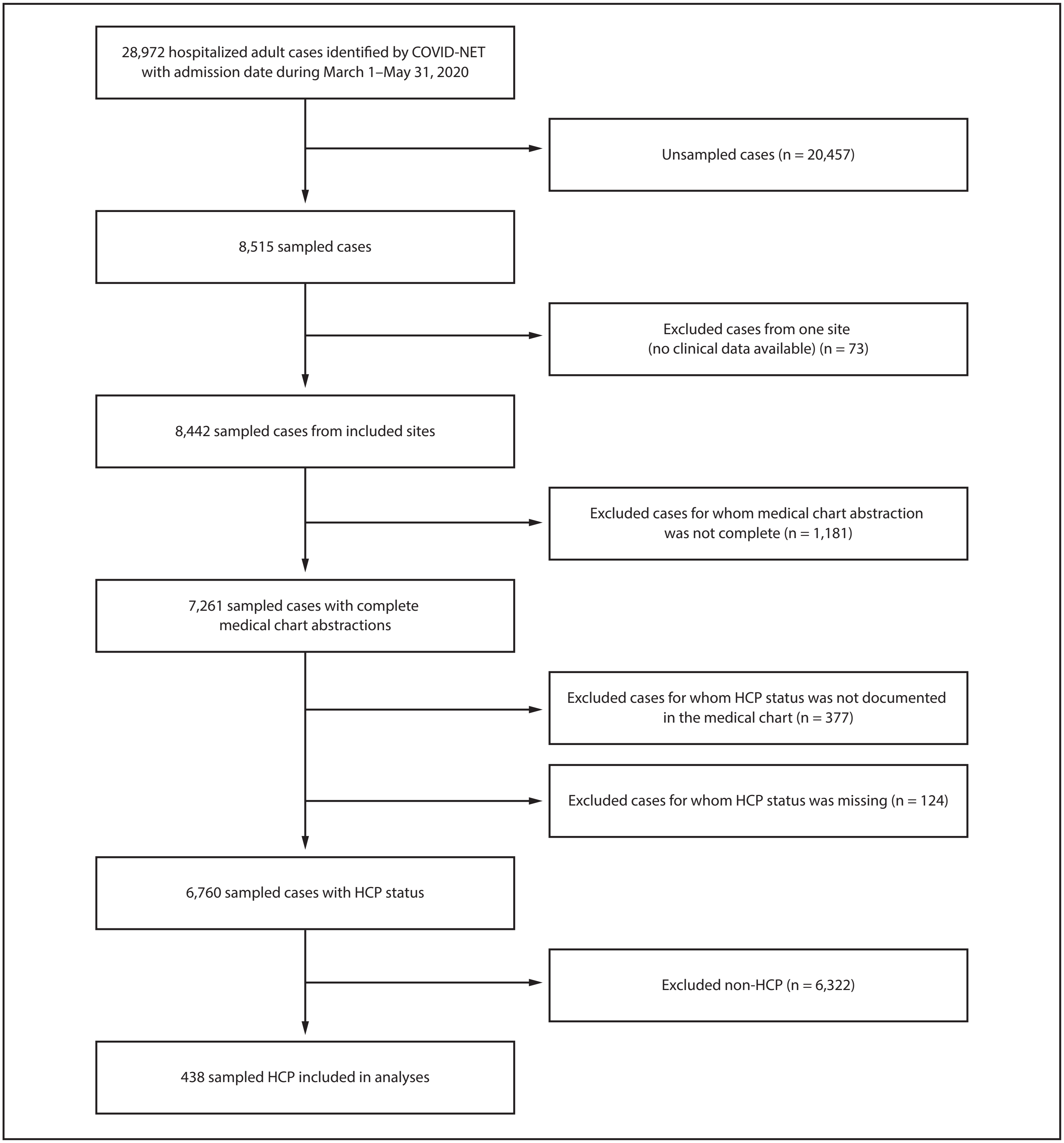
[§] https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/purpose-methods.html.

[¶] 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. **241(d); 5 U.S.C. **552a; 44 U.S.C. **3501 et seq.

** https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html.

[††] https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html.

FIGURE 1. Selection of cases for analysis of COVID-19–associated hospitalizations among health care personnel (HCP)* — COVID-NET, 13 states,† March 1–May 31, 2020



Abbreviations: COVID-19 = coronavirus disease 2019; COVID–NET = COVID–19–Associated Hospitalization Surveillance Network.
* All case counts are unweighted.
† Sites located in the following 13 states: California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Tennessee, and Utah.

TABLE. Demographic and clinical characteristics of health care personnel (HCP) with COVID-19-associated hospitalizations, overall and by type of patient contact* — COVID-NET, 13 states,† March 1–May 31, 2020

Characteristic	Overall (N = 438)		Direct patient contact (N = 293)		No direct patient contact (N = 145)	
	Unweighted no. (weighted %)	95% CI	Unweighted no. (weighted %)	95% CI	Unweighted no. (weighted %)	95% CI
Type of patient contact						
Direct patient contact	293 (67.4)	(59.9–74.1)	—	—	—	—
No direct patient contact	145 (32.6)	(25.9–40.1)	—	—	—	—
Age group (N = 438)						
18–49 yrs	278 (46.4)	(39.1–53.7)	183 (44.4)	(35.7–53.4)	95 (50.5)	(37.6–63.4)
50–64 yrs	139 (46.1)	(38.9–53.5)	99 (51.0)	(42.0–59.9)	40 (36.0)	(24.7–49.2)
≥65 yrs	21 (7.5)	(4.1–13.3)	11 (4.7)	(2.0–10.7)	10 (13.4)	(5.9–27.7)
Median age in years (IQR)	49 (38–57)	—	52 (38–57)	—	48 (37–57)	—
Race/Ethnicity (N = 438)						
White, non-Hispanic	142 (27.4)	(21.5–34.1)	104 (33.3)	(25.5–42.2)	38 (15.0)	(8.9–24.3)
Black, non-Hispanic	184 (52.0)	(44.5–59.5)	113 (44.7)	(35.6–54.1)	71 (67.3)	(55.2–77.4)
Hispanic or Latino	48 (8.6)	(5.3–13.8)	30 (9.8)	(5.3–17.3)	18 (6.3)	(3.4–11.3)
American Indian or Alaska Native, non-Hispanic	39 (6.8)	(4.2–10.8)	29 (6.8)	(4.0–11.5)	10 (6.7)	(2.5–16.9)
Asian or Pacific Islander, non-Hispanic	12 (3.2)	(1.5–6.6)	10 (4.4)	(2.0–9.6)	2 (0.6)	(0.1–2.3)
Multiple races	1 (0.1)	(0.0–0.7)	1 (0.1)	(0.0–1.0)	—	—
Unknown	12 (1.9)	(0.7–4.9)	6 (0.8)	(0.4–1.9)	6 (4.1)	(1.1–14.1)
Sex (N = 438)						
Male	131 (28.1)	(21.8–35.3)	88 (29.5)	(21.8–38.6)	43 (25.2)	(15.6–37.9)
Female	307 (71.9)	(64.7–78.2)	205 (70.5)	(61.4–78.2)	102 (74.8)	(62.1–84.4)
Underlying conditions (N = 438)						
Any underlying condition§	377 (89.8)	(85.0–93.2)	248 (87.8)	(81.0–92.4)	129 (94.0)	(88.5–97.0)
Obesity (n = 396)	270 (72.5)	(65.2–78.7)	177 (68.3)	(58.8–76.4)	93 (80.9)	(70.3–88.4)
Hypertension	158 (40.6)	(33.5–48.2)	103 (36.9)	(28.6–46.1)	55 (48.3)	(35.4–61.4)
Chronic metabolic disease	136 (36.7)	(29.6–44.3)	88 (32.6)	(24.6–41.9)	48 (45.1)	(32.3–58.5)
Diabetes	115 (30.9)	(24.3–38.3)	72 (24.7)	(17.8–33.3)	43 (43.6)	(31.0–57.2)
Chronic lung disease	125 (26.7)	(20.6–33.9)	88 (26.6)	(19.5–35.3)	37 (26.9)	(16.6–40.6)
Asthma	92 (18.3)	(13.3–24.7)	66 (17.4)	(11.9–24.8)	26 (20.2)	(11.1–33.9)
Cardiovascular disease¶	45 (13.3)	(8.7–19.9)	27 (8.4)	(4.8–14.4)	18 (23.5)	(13.0–38.6)
Pregnancy (n = 189)**	34 (9.6)	(6.5–14.0)	22 (9.5)	(5.8–15.2)	12 (9.7)	(4.9–18.4)
Immunocompromised condition	28 (7.0)	(4.1–11.8)	17 (6.7)	(3.5–12.5)	11 (7.7)	(2.9–19.0)
Signs and symptoms upon admission (N = 438)						
Any symptoms	411 (96.6)	(94.4–98.0)	276 (96.4)	(93.1–98.1)	135 (97.1)	(94.5–98.5)
Shortness of breath	339 (79.0)	(72.0–84.5)	226 (77.9)	(69.1–84.7)	113 (81.2)	(68.8–89.5)
Cough	324 (76.6)	(69.7–82.3)	218 (75.1)	(66.2–82.3)	106 (79.8)	(68.6–87.7)
Fever/Chills	323 (73.9)	(66.7–80.1)	220 (75.0)	(66.0–82.2)	103 (71.8)	(58.6–82.2)
Muscle aches/Myalgias	177 (35.9)	(29.2–43.3)	126 (38.4)	(30.0–47.5)	51 (30.9)	(20.4–43.8)
Nausea/Vomiting	145 (31.6)	(25.0–39.1)	99 (33.8)	(25.5–43.1)	46 (27.2)	(17.3–40.1)
Headache	123 (29.3)	(22.8–36.7)	79 (27.6)	(20.0–36.8)	44 (32.8)	(21.7–46.2)
Diarrhea	114 (24.8)	(19.1–31.4)	75 (27.7)	(20.4–36.5)	39 (18.6)	(11.9–28.0)
Chest pain	105 (23.9)	(18.0–31.0)	67 (25.6)	(18.2–34.8)	38 (20.5)	(12.3–32.2)
Congested/Runny nose	65 (14.6)	(10.2–20.5)	46 (14.5)	(9.4–21.8)	19 (14.8)	(7.6–26.8)
Sore throat	66 (14.2)	(9.7–20.3)	51 (17.1)	(11.1–25.4)	15 (8.1)	(3.6–17.2)
Abdominal pain	46 (12.4)	(8.1–18.6)	32 (13.3)	(7.9–21.3)	14 (10.8)	(4.9–21.9)
Anosmia/Decreased smell	40 (9.4)	(5.7–15.1)	26 (11.4)	(6.3–19.7)	14 (5.2)	(2.6–10.1)
Dysgeusia/Decreased taste	36 (6.8)	(4.0–11.6)	20 (5.7)	(2.6–12.1)	16 (9.2)	(4.4–18.3)
Wheezing	29 (5.7)	(3.2–10.1)	19 (4.6)	(2.1–9.6)	10 (8.2)	(3.3–18.9)
Hospital length of stay (median days, IQR)	4 (3–9)	—	4 (2–9)	—	5 (3–9)	—
Chest radiograph findings (N = 327)						
Infiltrate/Consolidation	288 (86.9)	(79.3–92.0)	201 (91.4)	(84.3–95.5)	87 (76.8)	(58.9–88.4)
Bronchopneumonia/Pneumonia	84 (32.0)	(24.1–41.0)	58 (35.1)	(25.3–46.3)	26 (24.9)	(13.9–40.5)
Pleural effusion	11 (6.3)	(3.0–13.1)	5 (2.6)	(0.8–7.6)	6 (14.8)	(5.8–33.0)
Chest CT/MRI findings (N = 94)						
Infiltrate/Consolidation	56 (61.2)	(45.4–75.0)	38 (53.5)	(34.9–71.1)	18 (77.0)	(47.4–92.6)
Ground glass opacities	57 (59.9)	(44.0–73.9)	40 (61.4)	(42.4–77.5)	17 (56.7)	(29.5–80.3)
Bronchopneumonia/Pneumonia	41 (46.5)	(31.5–62.2)	29 (41.0)	(24.1–60.2)	12 (57.9)	(31.7–80.4)
Pleural effusion	10 (9.3)	(3.4–23.2)	9 (10.7)	(3.3–29.8)	1 (6.4)	(0.9–34.7)

See table footnotes on the next page.

TABLE. (*Continued*) Demographic and clinical characteristics of health care personnel (HCP) with COVID-19-associated hospitalizations, overall and by type of patient contact* — COVID-NET, 13 states,† March 1–May 31, 2020

Characteristic	Overall (N = 438)		Direct patient contact (N = 293)		No direct patient contact (N = 145)	
	Unweighted no. (weighted %)	95% CI	Unweighted no. (weighted %)	95% CI	Unweighted no. (weighted %)	95% CI
COVID–19 investigational treatments (N = 438)††						
Received treatment	212 (48.2)	(40.8–55.8)	140 (47.5)	(38.5–56.7)	72 (49.8)	(36.8–62.8)
Hydroxychloroquine§§	152 (35.5)	(28.8–42.8)	96 (35.4)	(27.3–44.4)	56 (35.6)	(24.4–48.6)
Azithromycin¶¶	104 (25.9)	(19.8–32.9)	71 (25.6)	(18.6–34.2)	33 (26.3)	(16.2–39.8)
Remdesivir§§	54 (10.6)	(7.1–15.6)	43 (11.0)	(7.0–17.0)	11 (9.8)	(4.2–21.2)
Vitamins/minerals (i.e., vitamin C, zinc)	14 (8.9)	(5.0–15.6)	12 (10.4)	(5.4–19.0)	2 (6.0)	(1.5–20.8)
IL–6 inhibitors (i.e., tocilizumab, sarilumab)§§	46 (8.2)	(5.6–12.0)	24 (5.6)	(3.2–9.4)	22 (13.7)	(7.8–23.0)
Convalescent plasma	19 (5.1)	(2.5–10.0)	14 (5.4)	(2.4–11.4)	5 (4.5)	(1.0–17.7)
Protease inhibitors (i.e., atazanavir, lopinavir/ritonavir)***	8 (1.7)	(0.6–4.3)	4 (0.6)	(0.2–1.5)	4 (4.0)	(1.2–12.5)
Other†††	8 (1.7)	(0.6–4.2)	8 (2.5)	(0.9–6.2)	—	—
ICU admission (N = 438)	116 (27.5)	(21.3–34.7)	80 (29.6)	(21.9–38.6)	36 (23.2)	(14.2–35.6)
ICU length of stay (median days, IQR)	6 (3–20)	—	6 (4–19)	—	5 (3–21)	—
Interventions/Treatments (N = 438)§§§						
Invasive mechanical ventilation¶¶¶	65 (15.8)	(11.1–22.0)	44 (15.6)	(10.2–23.1)	21 (16.3)	(8.5–28.9)
BIPAP/CPAP¶¶¶	13 (2.4)	(1.2–5.0)	9 (3.1)	(1.3–7.0)	4 (1.2)	(0.4–3.1)
High flow nasal cannula¶¶¶	28 (5.2)	(2.8–9.6)	21 (6.8)	(3.4–13.2)	7 (2.0)	(0.9–4.3)
Systemic steroids	74 (17.7)	(12.6–24.1)	47 (16.9)	(11.1–24.9)	27 (19.2)	(10.9–31.7)
Vasopressor (n = 436)	60 (14.4)	(10.0–20.3)	41 (15.2)	(9.9–22.8)	19 (12.8)	(6.4–23.9)
Renal replacement therapy	13 (2.1)	(1.0–4.6)	9 (1.9)	(0.8–4.8)	4 (2.6)	(0.7–9.7)
Clinical discharge diagnoses (N = 438)						
Pneumonia (n = 437)	213 (56.7)	(49.3–63.8)	148 (56.8)	(47.7–65.4)	65 (56.5)	(43.5–68.7)
Acute respiratory failure	170 (42.9)	(35.6–50.6)	117 (45.9)	(36.8–55.2)	53 (36.8)	(25.1–50.2)
Sepsis (n = 437)	63 (13.2)	(9.0–18.8)	44 (14.9)	(9.6–22.4)	19 (9.6)	(4.4–19.6)
Acute renal failure (n = 437)	46 (9.7)	(6.4–14.3)	28 (7.7)	(4.6–12.5)	18 (13.7)	(7.1–24.8)
Acute respiratory distress syndrome (n = 437)	38 (9.0)	(5.5–14.4)	24 (7.8)	(4.3–13.7)	14 (11.5)	(4.9–24.3)
Deep vein thrombosis (n = 159)	6 (7.4)	(2.9–17.4)	4 (7.9)	(2.7–21.0)	2 (6.3)	(1.0–30.1)
Pulmonary embolism (n = 159)	6 (6.0)	(2.5–14.0)	5 (7.7)	(2.9–18.8)	1 (2.5)	(0.3–15.8)
Died during hospitalization (N = 438)	16 (4.2)	(2.2–7.7)	11 (4.1)	(1.9–8.6)	5 (4.3)	(1.4–12.5)

Abbreviations: BIPAP = bilevel positive airway pressure; CI = confidence interval; COVID–19 = coronavirus disease 2019; COVID–NET = COVID–19–Associated Hospitalization Surveillance Network; CPAP = continuous positive airway pressure; CT = computed tomography; ICU = intensive care unit; IQR = interquartile range; MRI = magnetic resonance imaging.

* Reported HCP were categorized as those generally expected and those generally not expected to have direct patient contact based on HCP type.

† Sites located in the following 13 states: California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Tennessee, and Utah.

§ Defined as any of the following: chronic lung disease, chronic metabolic disease, blood disorder/hemoglobinopathy, cardiovascular disease, neurologic disorder, immunocompromised condition, renal disease, gastrointestinal/liver disease, rheumatologic/autoimmune/inflammatory condition, obesity (body mass index ≥30 kg/m^2), and pregnancy.

¶ Excluding hypertension.

** Pregnancy was assessed among female patients aged 18–49 years; two pregnant patients were admitted to the ICU, and one required invasive mechanical ventilation.

†† Assessed as nonmutually exclusive treatment categories.

§§ Includes treatments administered as off–label, for compassionate use, or as part of randomized controlled trials (RCTs) for which the patient might have received treatment or a placebo: hydroxychloroquine (two), remdesivir (six), tocilizumab (one), and sarilumab (two).

¶¶ Given with at least one other COVID-19 investigational treatment.

*** Not given for human immunodeficiency virus infection.

††† Eight patients received at least one of the following treatments: RCT for baricitinib (three), dexamethasone (three), cyclosporine (one), RCT for losartan (one), and RCT for LY3127804 (one).

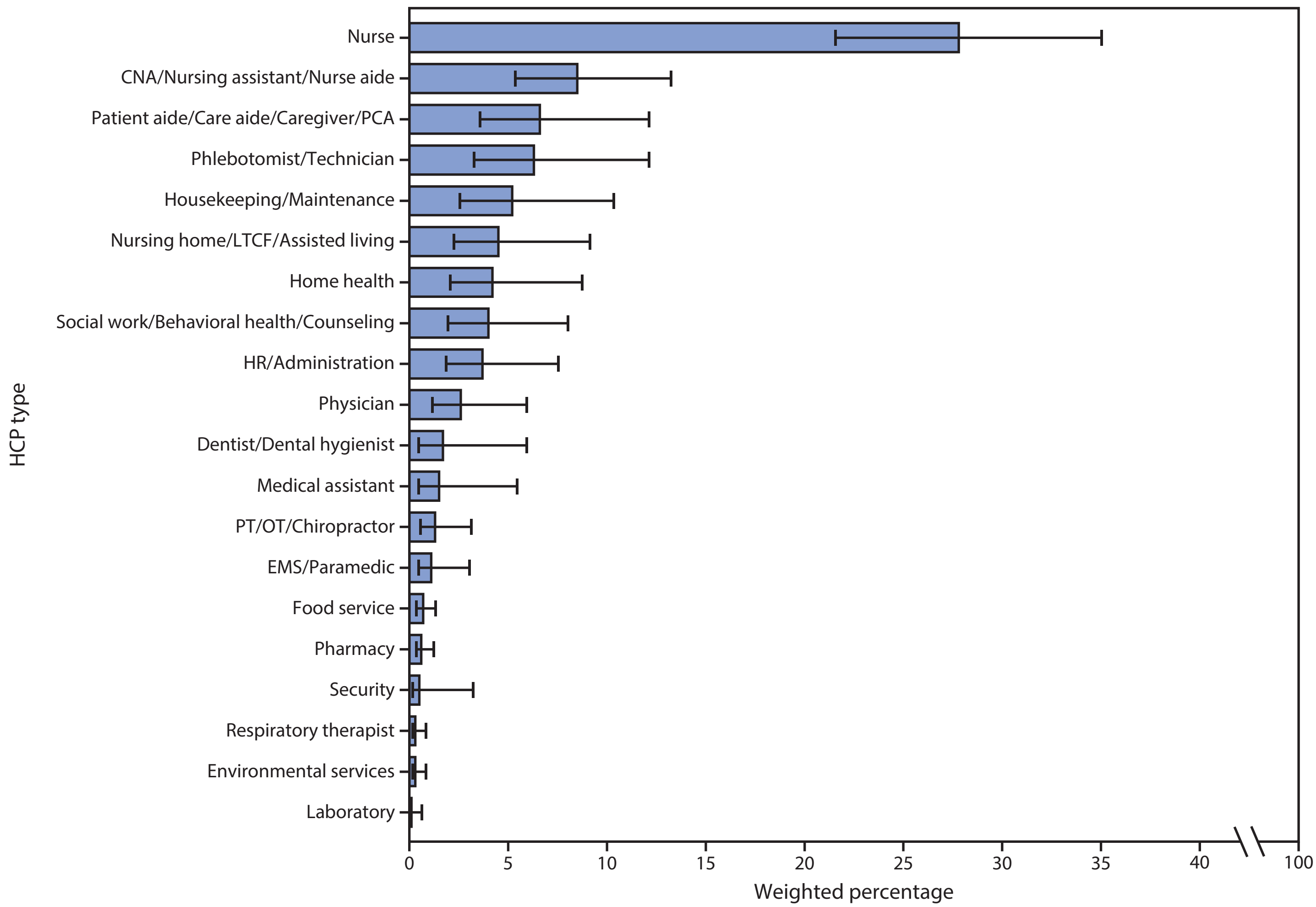
§§§ Five (1.9%) patients received extracorporeal membrane oxygenation, and two (0.2%) received intravenous immunoglobulin.

¶¶¶ Highest level of respiratory support for each patient that needed respiratory support.

patient contact, leading to extended cumulative exposure time. Nursing-related occupations also account for a large proportion of the U.S. health care workforce: in 2019, registered nurses alone represented approximately one third of health care practitioners (*5*). This has implications for the capacity of the health care system, specifically nursing staff members, to respond to increases in COVID-19 cases in the community.

To decrease the risk for SARS-CoV-2 transmission in health care facilities, CDC recommends that HCP use face masks (i.e., medical masks, such as surgical or procedure masks) at all times while they are in health care facilities, including patient-care areas, staff member rooms, and areas where other HCP might be present (*2*). In addition, in areas with moderate to substantial community transmission of SARS-CoV-2, CDC

FIGURE 2. Weighted percentage of personnel types*,† among reported health care personnel (HCP) with COVID-19–associated hospitalizations (N = 438) — COVID–NET, 13 states,§ March 1–May 31, 2020



Abbreviations: CNA = certified nursing assistant; COVID-19 = coronavirus disease 2019; COVID–NET = COVID–19–Associated Hospitalization Surveillance Network; EMS = emergency medical services; HR = human resources; LTCF = long-term care facility; OT = occupational therapist; PCA = patient care assistant; PT = physical therapist.

* HCP categorized as "unspecified" or "other" have not been included in the figure but are included in the denominator.

† Error bars represent 95% confidence intervals.

§ Sites located in the following 13 states: California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Tennessee, and Utah.

recommends that HCP wear eye protection for all patient care encounters. An N95-equivalent or higher-level respirator is recommended for aerosol-generating procedures and certain surgical procedures to provide optimal protection against potentially infectious respiratory secretions and aerosols (*2*).

Similar to the distribution of the U.S. health care workforce overall, a majority of hospitalized HCP in this report were female (*5*). However, compared with previously reported demographic characteristics of U.S. HCP with COVID-19, HCP identified by COVID-NET were older, and a larger proportion were Black (*6*). Given that COVID-NET conducts surveillance specifically for hospitalized patients, these differences might reflect the association between increased age and severe outcomes associated with SARS-CoV-2 infection as well as disproportionate effects among Black populations (*1*,*3*,*7*,*8*).

These results are consistent with previously reported data suggesting that underlying conditions, including obesity, diabetes, and cardiovascular disease, are risk factors for COVID-19–associated hospitalization and ICU admission (*3*,*9*,*10*). Among the approximately 90% of HCP in this analysis with at least one underlying condition, obesity was most commonly reported. A recent study found that obesity was highly associated with risk for death among COVID-19 patients who sought health care, even after adjusting for other obesity-related underlying conditions (*10*). The findings in this report highlight the need for prevention and management of obesity through evidence-based clinical care as well as policies, systems, and environmental changes to support HCP in healthy lifestyles to reduce their risk for poor COVID-19–related outcomes.§§

§§ https://www.cdc.gov/obesity/strategies/index.html.

Summary

What is already known about this topic?

Data on characteristics and outcomes of U.S. health care personnel (HCP) hospitalized with COVID-19 are limited.

What is added by this report?

Analysis of COVID-19 hospitalization data from 13 sites indicated that 6% of adults hospitalized with COVID-19 were HCP. Among HCP hospitalized with COVID-19, 36% were in nursing-related occupations, and 73% had obesity. Approximately 28% of these patients were admitted to an intensive care unit, 16% required invasive mechanical ventilation, and 4% died.

What are the implications for public health practice?

HCP can have severe COVID-19–associated illness, highlighting the need for continued infection prevention and control in health care settings as well as community mitigation efforts to reduce SARS-CoV-2 transmission.

The findings in this report are subject to at least five limitations. First, HCP status is determined through medical chart review, and although chart abstractions will be completed on all sampled cases, abstraction was pending at the time of analysis for approximately 14% of sampled cases hospitalized during March–May. Thus, the proportion of identified HCP among all adults hospitalized with COVID-19 from March–May might represent an overestimate or underestimate of HCP in this population. Second, because of small sample sizes for some variables, some estimates might be unstable, as evidenced by wider confidence intervals. Third, although COVID-NET collects HCP status, data on the degree, frequency, and duration of contact with patients are not collected. HCP were stratified by presumed level of patient contact, based on general understanding of health care professions; the level of patient contact for some HCP might have thus been misclassified. Fourth, COVID-NET does not collect data regarding exposure history. It is unknown whether HCP were exposed to SARS-CoV-2 in the workplace or community, highlighting the need for community prevention efforts as well as infection prevention and control measures in health care settings. Finally, laboratory confirmation is dependent on clinician-ordered testing and hospital testing policies for SARS-CoV-2; as a result, COVID-19–associated hospitalizations might have been underestimated.

Findings from this analysis of data from a multisite surveillance network highlight the prevalence of severe COVID-19–associated illness among HCP and potential for transmission of SARS-CoV-2 among HCP, which could decrease the workforce capacity of the health care system. HCP, regardless of any patient contact, should adhere strictly to recommended infection prevention and control guidance at all times in health care facilities to reduce transmission of SARS-CoV-2, including proper use of recommended personal protective equipment, hand hygiene, and physical distancing (*2*). Community mitigation and prevention efforts in households and congregate settings are also necessary to reduce overall SARS-CoV-2 transmission. Continued surveillance of hospitalized HCP is necessary to document the prevalence and characteristics of COVID-19 among this population. Further understanding of exposure risks for SARS-CoV-2 infection among HCP is important to inform additional prevention strategies for these essential workers.

Acknowledgments

Kimberly Gonzalez Barrera, Alexander Flood-Bryzman, Quynh Ho, Monica Napoles Serrano, California Emerging Infections Program; Sarah McLafferty, Colorado Department of Public Health and Environment; Emily Fawcett, Siyeh Gretzinger, Katelyn Lengacher, Jeremiah Williams, Emerging Infections Program, Georgia Department of Health, Atlanta Veterans Affairs Medical Center, Foundation for Atlanta Veterans Education and Research; Andy Weigel, Iowa Department of Public Health; Elisabeth Vaeth, Cindy Zerrlaut, Maryland Department of Health; Jim Collins, Sam Hawkins, Justin Henderson, Shannon Johnson, Val Tellez Nunez, Michigan Department of Health and Human Services; Austin Bell, Kayla Bilski, Emma Contestabile, Kristen Ehresmann, Claire Henrichsen, Emily Holodnick, Lisa Nguyen, Katherine Schleiss, Samantha Siebman, Minnesota Department of Health; Kerianne Engesser, Suzanne McGuire, Adam Rowe, New York State Department of Health; Virginia Cafferky, Kevin Popham, Savanah Russ, Rochester Emerging Infections Program, University of Rochester Medical Center; Kathy Billings, Katie Dyer, Anise Elie, Karen Leib, Terri McMinn, Danielle Ndi, Manideepthi Pemmaraju, John Ujwok, Vanderbilt University Medical Center; Ilene Risk, Salt Lake County Health Department, Keegan McCaffrey, Utah Department of Health; Mimi Huynh, Monica Schroeder, Council of State and Territorial Epidemiologists; Rainy Henry, Jennifer Milucky, Sonja Mali Nti-Berko, Robert W. Pinner, Alvin Shultz, CDC.

COVID-NET Surveillance Team

Nisha B. Alden, Colorado Department of Public Health and Environment; Kathy M. Angeles, New Mexico Emerging Infections Program; Mirasol Apostol, California Emerging Infections Program; David Blythe, Maryland Department of Health; Alicia Brooks, Maryland Department of Health; Susan Brooks, California Emerging Infections Program; Sophrena Bushey, Rochester Emerging Infections Program, University of Rochester Medical Center; Erica Bye, Minnesota Department of Health; Melissa Christian, New Mexico Emerging Infections Program; Ashley Coates, California Emerging Infections Program; Elizabeth Dufort, New York State Department of Health; Nancy Eisenberg, New Mexico Emerging Infections Program; Linda Frank, California Emerging Infections Program; Maria Gaitan, Rochester Emerging Infections Program, University of Rochester Medical Center; Andrea George, Salt Lake County Health

Department; Caroline Habrun, New Mexico Emerging Infections Program; Emily B. Hancock, New Mexico Emerging Infections Program; Brooke Heidenga, California Emerging Infections Program; Kareena Hundal, California Emerging Infections Program; Sarah A. Khanlian, New Mexico Emerging Infections Program; RaeAnne Kurtz, Rochester Emerging Infections Program, University of Rochester Medical Center; Ruth Lynfield, Minnesota Department of Health; Tiffanie Markus, Vanderbilt University Medical Center; Laine McCullough, Salt Lake County Health Department; Seth Meador, CDC; Alison Muse, New York State Department of Health; Joelle Nadle, California Emerging Infections Program; Meaghan Novi, New Mexico Emerging Infections Program; Jake Ortega, Salt Lake County Health Department; Ama Owusu-Dommey, Public Health Division, Oregon Health Authority; Rachel D. Park, Maryland Emerging Infections Program, The Johns Hopkins Bloomberg School of Public Health; Alexandra M. Piasecki, CDC, Cherokee Nation Assurance; Andrea Price, Salt Lake County Health Department; Sherry Quach, California Emerging Infections Program; Jeremy Roland, California Emerging Infections Program; Maria Rosales, California Emerging Infections Program; Yadira Salazar-Sanchez, New Mexico Emerging Infections Program; Melanie Spencer, Salt Lake County Health Department; Ashley Swain, Salt Lake County Health Department; Michelle W. Wilson, Maryland Emerging Infections Program, The Johns Hopkins Bloomberg School of Public Health.

Corresponding author: Anita K. Kambhampati, wyc4@cdc.gov.

[1]CDC COVID-NET Team; [2]Eagle Global Scientific, Atlanta, Georgia; [3]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [4]California Emerging Infections Program, Oakland, California; [5]Career Epidemiology Field Officer Program, CDC; [6]Colorado Department of Public Health and Environment; [7]Connecticut Emerging Infections Program, Yale School of Public Health, New Haven, Connecticut; [8]Departments of Pediatrics and Medicine, Emory University School of Medicine, Atlanta, Georgia; [9]Emerging Infections Program, Atlanta Veterans Affairs Medical Center, Atlanta, Georgia; [10]Foundation for Atlanta Veterans Education and Research, Decatur, Georgia; [11]Maryland Department of Health; [12]Michigan Department of Health and Human Services; [13]Minnesota Department of Health; [14]New Mexico Emerging Infections Program, University of New Mexico, Albuquerque, New Mexico; [15]New Mexico Department of Health; [16]New York State Department of Health; [17]University of Rochester School of Medicine and Dentistry, Rochester, New York; [18]Ohio Department of Health; [19]Public Health Division, Oregon Health Authority; [20]Vanderbilt University Medical Center, Nashville, Tennessee; [21]Salt Lake County Health Department, Salt Lake City, Utah.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Evan J. Anderson reports personal fees from AbbVie, Kentucky BioProcessing, Inc., Pfizer, and Sanofi Pasteur, grants from MedImmune, Regeneron, PaxVax, Pfizer, GSK, Merck, Novavax, Sanofi Pasteur, Micron, and Janssen, outside the submitted work; William Schaffner reports personal fees from VBI Vaccines outside the submitted work. No other potential conflicts of interest were disclosed.

References

1. Garg S, Kim L, Whitaker M, et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus disease 2019—COVID-NET, 14 states, March 1–30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:458–64. https://doi.org/10.15585/mmwr.mm6915e3
2. CDC. Coronavirus disease 2019 (COVID-19): interim infection prevention and control recommendations for healthcare personnel during the coronavirus disease 2019 (COVID-19) pandemic. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html
3. Kim L, Garg S, O'Halloran A, et al. Risk factors for intensive care unit admission and in-hospital mortality among hospitalized adults identified through the U.S. coronavirus disease 2019 (COVID-19)-associated hospitalization surveillance network (COVID-NET). Clin Infect Dis 2020. Epub July 16, 2020.
4. Lai X, Wang M, Qin C, et al. Coronavirus disease 2019 (COVID-2019) infection among health care workers and implications for prevention measures in a tertiary hospital in Wuhan, China. JAMA Netw Open 2020;3:e209666.
5. Bureau of Labor Statistics. Labor force statistics from the Current Population Survey. Washington, DC: US Department of Labor, Bureau of Labor Statistics; 2020. https://www.bls.gov/cps/cpsaat11.htm
6. CDC COVID-19 Response Team. Characteristics of health care personnel with COVID-19—United States, February 12–April 9, 2020. MMWR Morb Mortal Wkly Rep 2020;69:477–81.
7. Ko JY, Danielson ML, Town M, et al.; COVID-NET Surveillance Team. Risk factors for COVID-19–associated hospitalization: COVID-19–associated hospitalization surveillance network and behavioral risk factor surveillance system. Clin Infect Dis 2020. Epub September 18, 2020.
8. CDC COVID-19 Response Team. Severe outcomes among patients with coronavirus disease 2019 (COVID-19)—United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep 2020;69:343–6.
9. Chow N, Fleming-Dutra K, Gierke R, et al.; CDC COVID-19 Response Team. Preliminary estimates of the prevalence of selected underlying health conditions among patients with coronavirus disease 2019—United States, February 12–March 28, 2020. MMWR Morb Mortal Wkly Rep 2020;69:382–6. https://doi.org/10.15585/mmwr.mm6913e2
10. Tartof SY, Qian L, Hong V, et al. Obesity and mortality among patients diagnosed with COVID-19: results from an integrated health care organization. Ann Intern Med 2020. Epub August 12, 2020.

COVID-19 Mitigation Behaviors by Age Group — United States, April–June 2020

Helena J. Hutchins, MPH[1]; Brent Wolff, PhD[1]; Rebecca Leeb, PhD[1]; Jean Y. Ko, PhD[1]; Erika Odom, PhD[1]; Joe Willey, PhD[2]; Allison Friedman[1]; Rebecca H. Bitsko, PhD[3]

On October 27, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

CDC recommends a number of mitigation behaviors to prevent the spread of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19). Those behaviors include 1) covering the nose and mouth with a mask to protect others from possible infection when in public settings and when around persons who live outside of one's household or around ill household members; 2) maintaining at least 6 feet (2 meters) of distance from persons who live outside one's household, and keeping oneself distant from persons who are ill; and 3) washing hands often with soap and water for at least 20 seconds, or, if soap and water are not available, using hand sanitizer containing at least 60% alcohol (*1*). Age has been positively associated with mask use (*2*), although less is known about other recommended mitigation behaviors. Monitoring mitigation behaviors over the course of the pandemic can inform targeted communication and behavior modification strategies to slow the spread of COVID-19. The Data Foundation COVID Impact Survey collected nationally representative data on reported mitigation behaviors during April–June 2020 among adults in the United States aged ≥18 years (*3*). Reported use of face masks increased from 78% in April, to 83% in May, and reached 89% in June; however, other reported mitigation behaviors (e.g., hand washing, social distancing, and avoiding public or crowded places) declined marginally or remained unchanged. At each time point, the prevalence of reported mitigation behaviors was lowest among younger adults (aged 18–29 years) and highest among older adults (aged ≥60 years). Lower engagement in mitigation behaviors among younger adults might be one reason for the increased incidence of confirmed COVID-19 cases in this group, which have been shown to precede increases among those ≥60 years (*4*). These findings underscore the need to prioritize clear, targeted messaging and behavior modification interventions, especially for young adults, to encourage uptake and support maintenance of recommended mitigation behaviors to prevent the spread of COVID-19.

The COVID Impact Survey collected data to provide national estimates of health, economic, and social wellbeing of U.S. adults, using a national probability sample covering approximately 97% of the U.S. population of non-institutionalized adults with a home address (*3*). Surveys were conducted in three waves (April 20–26, May 4–10, and May 30–June 8), without significant resampling of persons across waves. Analyses included a total of 6,475 online or telephone surveys of adults aged ≥18 years.* The response rate among those invited to participate ranged from 19.7% to 26.1% across the three survey waves. Following data collection, an iterative raking process was used to adjust for nonresponse, noncoverage, and under- and oversampling (*5*). Demographic weighting variables provided in the dataset were obtained from the 2020 Current Population Survey; estimates reflect the U.S. household population of adults aged ≥18 years.† No personally identifying information was provided in the data file accessed by CDC.§

Respondents were asked, "Which of the following measures, if any, are you taking in response to the coronavirus?" Of the 19 response options, three mitigation behaviors aligning with CDC recommendations were assessed: 1) "wore a face mask," 2) "washed or sanitized hands," and 3) "kept six feet distance from those outside my household."¶ Three social mitigation behaviors aligning with CDC considerations and White House guidelines from March and April 2020 also were selected for analysis: 1) "avoided public or crowded places," 2) "cancelled or postponed social or recreational activities," and 3) "avoided some or all restaurants."**,††,§§ Pearson's Chi-squared test was

* The number of interviews conducted was 2,190 in April, 2,238 in May, and 2,047 in June 2020.

† https://www.census.gov/programs-surveys/cps.html.

§ The COVID-19 Impact Survey is conducted by NORC at the University of Chicago. The NORC Institutional Review Board (FWA00000142) reviewed and approved the study protocol to protect the rights and welfare of human subjects.

¶ Respondents could select all behaviors that applied. All 19 possible responses included 1) canceled a doctor appointment; 2) wore a face mask; 3) visited a doctor or hospital; 4) canceled or postponed work activities; 5) canceled or postponed school activities; 6) canceled or postponed dentist or other appointment; 7) canceled outside housekeepers or caregivers; 8) avoided some or all restaurants; 9) worked from home; 10) studied at home; 11) canceled or postponed pleasure, social, or recreational activities; 12) stockpiled food or water; 13) avoided public or crowded places; 14) prayed; 15) avoided contact with high-risk persons; 16) washed or sanitized hands; 17) kept six feet distance from those outside my household; 18) stayed home because I felt unwell; and 19) wiped packages entering my home.

** https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html.

†† https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/personal-social-activities.html.

§§ https://www.whitehouse.gov/wp-content/uploads/2020/03/03.16.20_coronavirus-guidance_8.5x11_315PM.pdf.

used to assess differences in reported behaviors (individual and cumulative) by age, within each survey wave and stratified by face mask use, based on a significance level of $\alpha = 0.05$. Logistic regression models were used to test statistical significance of time trends by assigning calendar week of data collection for each survey wave as a single linear predictor for individual and cumulative behavioral outcomes. All analyses were conducted in Stata ES (version 16.1, StataCorp.) with survey weights applied during analyses for nationally representative estimates.

Across survey waves, the majority of the weighted sample (range = 62%–65%) identified as Non-Hispanic or Latino White, and 50% identified as female; 14%–15% of respondents were aged 18–29 years. In April, 78% of adults aged ≥18 years reported wearing a mask; this increased to 83% in May and 89% in June (Table 1) ($p<0.001$). All other reported mitigation behaviors decreased from April 20–26 to early June ($p<0.05$), except avoiding some or all restaurants, which did not change significantly (Table 1) (Supplementary Figure 1: https://stacks.cdc.gov/view/cdc/95944). At each time point, >40% of all adults aged ≥18 years reported all six assessed mitigation behaviors (Table 2). Across all survey waves, reported prevalences of mitigation behaviors were highest among adults aged ≥60 years and lowest among those aged 18–29 years (Table 1) (Supplementary Figure 1: https://stacks.cdc.gov/view/cdc/95944). Age was also significantly associated with the cumulative number of reported mitigation behaviors across all survey waves, with young adults reporting engaging in fewer mitigation behaviors compared with older adults overall and at all time points (Table 2) (Figure).

Among adults who reported face mask use at each time point, a significantly higher percentage reported other mitigation behaviors compared with those who did not report mask use (Supplementary Figure 2: https://stacks.cdc.gov/view/cdc/95945). Among adults who did not report mask use, all other reported mitigation behaviors declined significantly from the April 20–26 wave to early June. Other mitigation behaviors also decreased over time among those who reported mask use, but to a much lesser extent, and only significantly for washing hands, maintaining a 6-foot distance, and cancelling or postponing social events. A higher percentage of adults who reported mask use also reported a higher cumulative number of other mitigation behaviors during the same period, compared with adults who did not report mask use (Figure). By early June, >45% of adults who did not report mask use reported one or fewer other mitigation behaviors (Figure). Overall, a significant positive association between age and the cumulative number of reported mitigation behaviors persisted over time among those who did and those who did not report mask use (Figure).

Discussion

This report provides four important insights into the practice of mitigation behaviors among U.S. adults to prevent the spread of SARS-CoV-2. First, the majority of U.S. adults reported engaging in most or all of the six mitigation behaviors assessed. Second, age was an important determinant of engagement in mitigation behaviors overall. A smaller percentage of adults aged <60 years, particularly those aged 18–29 years, reported engaging in the mitigation behaviors assessed compared with adults aged ≥60 years. Third, while reported use of face masks increased significantly across all age groups over time, other reported mitigation behaviors declined or did not change significantly across age groups. Finally, compared with adults who reported wearing a mask, those who did not report mask use also reported engaging in significantly fewer other mitigation behaviors during the same period, with significant declines in all other behaviors from April to June.

CDC recommends multiple, concurrent mitigation behaviors to most effectively reduce the spread of COVID-19 (*6*). Fewer reported mitigation behaviors among young adults might contribute to the high incidence of confirmed COVID-19 cases in this age group (*4*). Older adults might be more concerned about COVID-19, based on their higher risk for severe illness compared with that of younger adults (*7*). Young adults might also be less likely to engage in mitigation behaviors because of social, developmental, and practical factors (*8*,*9*). Across age groups, increases in mask use and decreases in other mitigation behaviors might reflect elevated promotion of mask use over time, along with the lifting of shelter-in-place orders and reopening of business, service, hospitality and other sectors.

Significant declines in self-reported mitigation behaviors among those not reporting mask use suggests that a minority of persons might be increasingly resistant to COVID-19 mitigation behaviors or unable to engage in mitigation behaviors because of the constraints introduced by their return to work, school, or other settings. Effectively promoting engagement in mitigation behaviors among young adults will require moving beyond education to addressing barriers to mitigation behaviors as the pandemic and the response evolve. Strategies might include engaging trusted leaders and social media influencers to improve social acceptability of mitigation behaviors, offering practical tips for engagement, and appealing to personal values. Strategies also might include addressing social and emotional challenges potentially associated with social distancing behaviors, and engaging communities, businesses, employers and institutes of higher education to ensure mitigation behaviors are both feasible and actively encouraged where young adults work, study, and engage in recreational activities. Similar

TABLE 1. Self-reported mitigation behaviors,* by adult age group — COVID Impact Survey, United States, April–June 2020†

Behavior/Characteristic	Wave 1 Apr (N = 2,190)		Wave 2 May (N = 2,238)		Wave 3 Jun (N = 2,047)	
	Yes (No.)	Weighted % (95% CI)	Yes (No.)	Weighted % (95% CI)	Yes (No.)	Weighted % (95% CI)
Wore a face mask§						
Total	**1,713**	**78.1 (76.1–80.1)**	**1,855**	**82.9 (81.3–84.4)**	**1,815**	**88.7 (87.2–90.0)**
Age group (yrs)						
18–29	195	69.6 (63.3–75.3)†	261	81.8 (77.2–85.7)	273	86.1 (81.9–89.5)†
30–44	506	74.7 (70.7–78.4)	542	83.1 (80.1–85.8)	538	86.4 (83.4–88.8)
45–59	419	79.8 (75.6–83.65)	431	80.7 (77.1–83.8)	406	88.3 (85.0–90.9)
≥60	593	83.7 (80.3–86.6)	621	84.7 (81.9–87.2)	598	92.4 (90.1–94.2)
Washed or sanitized hands§						
Total	**2,037**	**93.1 (91.8–94.2)**	**2,043**	**91.3 (90.1–92.4)**	**1,828**	**89.3 (87.9–90.6)**
Age (yrs)						
18–29	236	83.5 (77.9–87.8)†	281	88.1 (84.1–91.2)†	259	81.7 (77.1–85.6)†
30–44	615	91.6 (88.9–93.7)	577	88.5 (85.8–90.7)	540	86.7 (83.8–89.1)
45–59	499	95.0 (92.4–96.8)	497	93.1 (90.6–94.9)	429	93.3 (90.6–95.2)
≥60	687	96.5 (94.6–97.7)	688	93.9 (91.9–95.4)	600	92.7 (90.5–94.5)
Kept 6 feet distance§						
Total	**1,913**	**87.4 (85.7–88.9)**	**1,924**	**86.0 (84.5–87.4)**	**1,683**	**82.2 (80.5–83.8)**
Age group (yrs)						
18–29	202	71.7 (65.5–77.2)†	245	76.8 (71.9–81.1)†	225	71.0 (65.7–75.7)†
30–44	565	84.6 (81.2–87.5)	541	83.0 (79.9–85.7)	490	78.7 (75.3–81.7)
45–59	486	93.1 (90.3–95.1)	468	87.6 (84.6–90.2)	386	83.9 (80.3–87.0)
≥60	660	92.6 (90.0–94.5)	670	91.4 (89.2–93.2)	582	90.0 (87.4–92.0)
Cancelled/postponed pleasure, social, or recreational activities§						
Total	**1,554**	**69.8 (67.5–71.9)**	**1,514**	**67.8 (65.9–69.7)**	**1,291**	**63.1 (61.0–65.1)**
Age group (yrs)						
18–29	167	60.0 (53.4–66.3)†	208	65.2 (59.8–70.2)	185	58.4 (52.9–63.7)†
30–44	474	68.5 (64.2–72.4)	435	66.7 (63.0–70.2)	377	60.5 (56.6–64.3)
45–59	376	70.3 (65.5–74.6)	363	68.0 (63.9–71.8)	292	63.5 (59.0–67.8)
≥60	537	74.8 (70.9–78.3)	508	69.3 (65.9–72.5)	437	67.5 (63.8–71.0)
Avoided public or crowded places¶						
Total	**1,762**	**80.5 (78.5–82.4)**	**1,724**	**77.0 (75.2–78.7)**	**1,542**	**75.3 (73.4–77.2)**
Age group (yrs)						
18–29	204	74.2 (68.0–79.5)†	238	74.6 (69.5–79.1)†	213	67.2 (61.8–72.1)†
30–44	511	75.5 (71.5–79.1)	494	75.8 (72.3–78.9)	454	72.9 (69.2–76.2)
45–59	432	82.8 (78.7–86.2)	400	74.9 (71.1–78.4)	346	75.2 (70.1–79.0)
≥60	615	86.3 (83.1–89.0)	592	80.8 (77.8–83.5)	529	81.8 (78.6–84.6)
Avoided some or all restaurants						
Total	**1,574**	**71.9 (69.6–74.0)**	**1,578**	**70.5 (68.6–72.4)**	**1,446**	**70.6 (68.6–72.6)**
Age group (yrs)						
18–29	113	60.4 (53.8–66.6)†	217	68.0 (62.7–72.9)	201	63.4 (58.0–68.5)†
30–44	465	68.2 (64,0–72.2)	470	72.1 (68.5–75.4)	419	67.3 (63.5–70.8)
45–59	148	73.7 (69.2–77.8)	357	66.9 (62.8–70.7)	327	71.1 (66.8–75.1)
≥60	148	78.9 (75.3–82.2)	534	72.9 (69.5–76.0)	499	77.1 (73.7–80.2)

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019.
* Wore a face mask, washed or sanitized hands, kept 6 feet of distance, avoided public or crowded places, canceled or postponed pleasure, social, or recreational activities and avoided some or all restaurants.
† Chi-square p-value <0.05 for differences across age groups, by survey wave.
§ Test for trend for overall change over time: p-value <0.001.
¶ Test for trend for overall change over time for "avoided public or crowded places": p-value = 0.002.

targeted strategies can be used to promote use of recommended mitigation behaviors among all adults.

The findings in this report are subject to at least three limitations. First, survey questions did not ask about consistency, adequacy, or frequency of mitigation behaviors in alignment with public health recommendations and thus might overestimate the real prevalence of mitigation behaviors. For example, the survey item "wore a face mask" did not ask whether a mask

TABLE 2. Cumulative number of self-reported mitigation behaviors,* by adult age group† — COVID Impact Survey, United States, April–June 2020

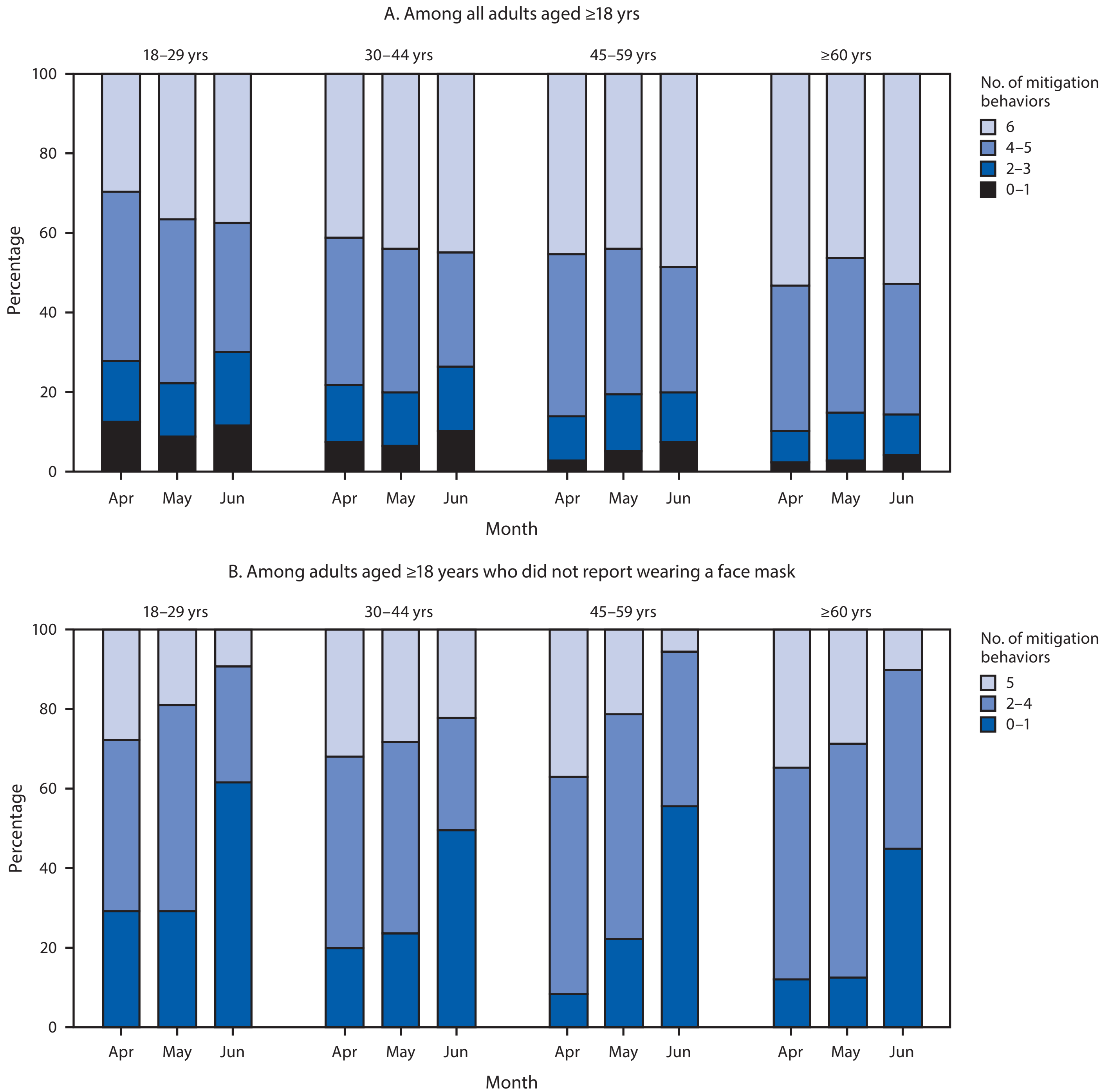
Characteristics	0–1 Mitigation behaviors No.	0–1 Mitigation behaviors Weighted % (95% CI)	2–3 Mitigation behaviors No.	2–3 Mitigation behaviors Weighted % (95% CI)	4–5 Mitigation behaviors No.	4–5 Mitigation behaviors Weighted % (95% CI)	All 6 Mitigation behaviors No.	All 6 Mitigation behaviors Weighted % (95% CI)
Combined survey waves (N = 6,475)§								
Total	**383**	**6.2 (5.6–6.8)**	**848**	**13.2 (12.4–14.1)**	**2,309**	**35.4 (34.2–36.6)**	**2,935**	**45.2 (44.0–46.5)**
Age group (yrs)								
18–29	97	10.5 (8.6–12.8)	153	15.7 (13.4–18.4)	350	38.1 (34.8–41.4)	318	35.7 (32.5–39.0)
30–44	148	7.9 (6.7–9.3)	288	15.0 (13.3–16.7)	662	33.3 (31.1–35.5)	849	43.9 (41.6–46.3)
45–59	76	5.5 (4.4–6.9)	190	12.8 (11.1–14.7)	556	35.6 (33.1–38.2)	696	46.1 (43.4–48.7)
≥60	62	3.1 (2.4–4.0)	217	10.7 (9.4–12.2)	741	36.0 (33.8–38.2)	1,072	50.2 (48.0–52.5)
Wave 1 Apr (N = 2,190)§								
Total	**109**	**5.3 (4.3–6.5)**	**265**	**11.6 (10.2–13.2)**	**827**	**38.6 (36.2–40.9)**	**989**	**44.5 (42.1–46.9)**
Age group (yrs)								
18–29	33	12.4 (8.6–17.6)	52	15.2 (11.2–20.2)	115	42.7 (36.4–49.3)	82	29.7 (24.1–36.1)
30–44	45	7.3 (5.3–10.0)	96	14.5 (11.7–17.9)	251	37.1 (33.0–41.5)	280	41.1 (36.8–45.5)
45–59	14	2.7 (1.5–4.7)	58	11.0 (8.3–14.5)	215	40.7 (36.0–45.7)	237	45.6 (40.7–50.5)
≥60	17	2.3 (1.4–4.0)	59	7.8 (5.8–10.3)	246	36.5 (32.5–40.7)	390	53.4 (49.2–57.6)
Wave 2 May (N = 2,238)¶								
Total	**115**	**5.1 (4.3–6.1)**	**299**	**13.4 (12.0–14.8)**	**842**	**37.6 (35.6–39.7)**	**982**	**43.9 (41.8–45.9)**
Age (yrs)								
18–29	28	8.8 (6.1–12.4)	42	13.2 (10.0–17.3)	132	41.4 (36.1–46.9)	117	36.7 (31.6–42.1)
30–44	41	6.3 (4.7–8.4)	90	13.8 (11.4–16.7)	233	35.7 (32.2–39.5)	288	44.2 (40.4–48.0)
45–59	27	5.1 (3.5–7.3)	76	14.2 (11.5–17.5)	195	36.5 (32.5–40.7)	236	44.2 (40.0–48.4)
≥60	19	2.6 (1.7–4.0)	91	12.4 (10.2–15.0)	282	38.5 (35.0–42.1)	341	46.5 (42.9–50.1)
Wave 3 Jun (N = 2,047)§								
Total	**159**	**7.8 (6.7–9.0)**	**284**	**13.9 (12.4–15.4)**	**640**	**31.3 (29.3–33.3)**	**964**	**47.1 (44.9–49.3)**
Age group (yrs)								
18–29	36	11.4 (8.3–15.3)	59	18.6 (14.7–23.3)	103	32.5 (27.6–37.8)	119	37.5 (32.4–43.0)
30–44	62	10.0 (7.8–12.6)	102	16.4 (13.7–19.5)	178	28.6 (25.2–32.3)	281	45.1 (41.2–49.0)
45–59	35	7.6 (5.5–10.4)	56	12.2 (9.5–15.5)	146	31.7 (27.7–36.1)	223	48.5 (43.9–53.1)
≥60	26	4.0 (2.8–5.8)	67	10.4 (8.2–13.0)	213	32.9 (29.4–36.6)	341	52.7 (48.9–56.5)

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019.
* Wore a face mask, washed or sanitized hands, kept 6 feet of distance, avoided public or crowded places, canceled or postponed pleasure, social, or recreational activities and avoided some or all restaurants.
† Test for trend for overall change in behavior over time p-value <0.001.
§ Chi-square p-value <0.01 for differences across age groups, by survey wave.
¶ Chi-squared p-value <0.05 for differences across age groups, by survey wave.

was worn over the nose and mouth in public settings and when around persons who are ill or those who live outside of one's household. Similarly, the survey item "washed or sanitized hands" did not specify frequency of handwashing or handwashing in situations associated with higher risk of exposure to SARS-CoV-2 (e.g., while in a public place) nor did it specify that hands were washed often with soap and water for at least 20 seconds or that sanitizer containing at least 60% alcohol was used. Second, the survey item "avoided some or all restaurants" did not specify type of restaurant service (e.g., curbside pick-up versus dining in), which might underestimate risk mitigation, as on-site dining has been associated with an increased risk for acquiring COVID-19 (*10*). Finally, all results depend on self-report and thus social desirability and recall bias might result in over- or underestimation of reported mitigation behaviors.

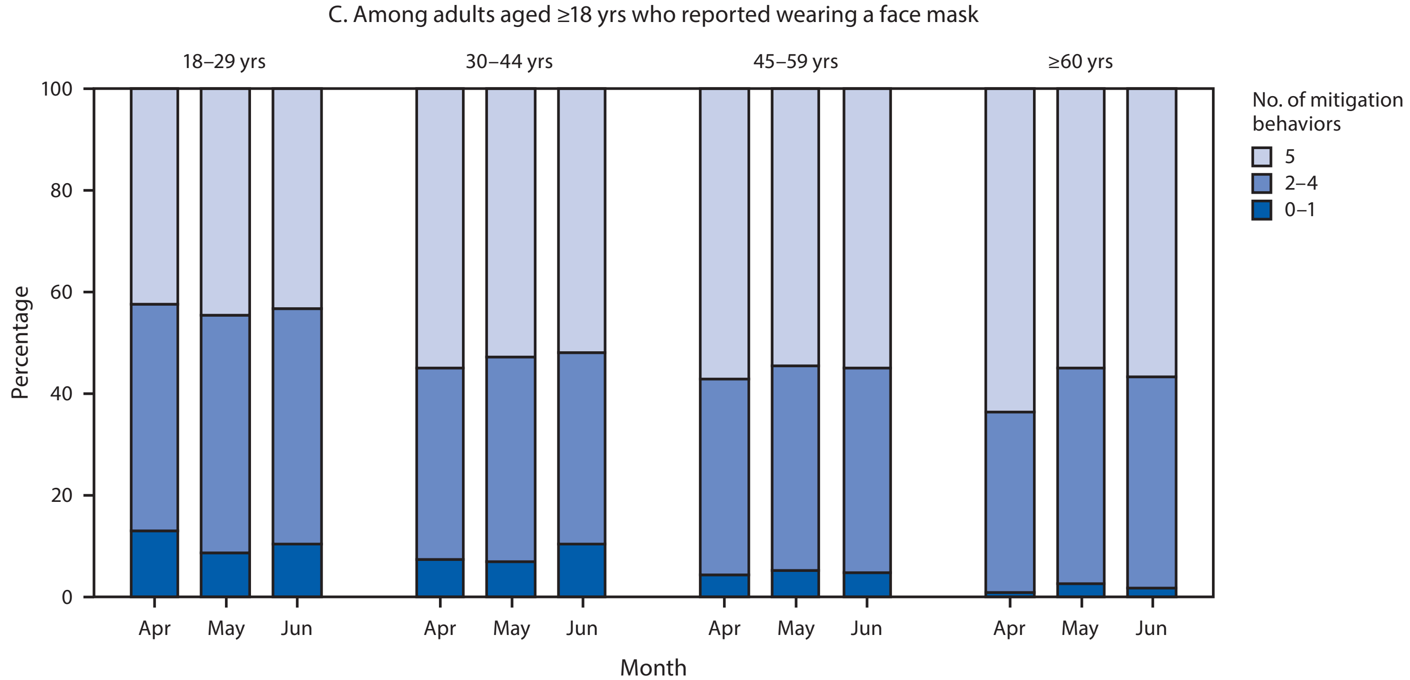
These findings suggest that lower engagement in social mitigation behaviors among younger adults might be one possible reason for the increased incidence of confirmed COVID-19 cases in this group, which began in June 2020 and preceded increases among persons aged ≥60 years by 4–15 days (*4*). Better understanding of barriers and motivators associated with participation in mitigation behaviors is needed to effectively employ strategies that promote engagement of younger adults and others who are not currently engaging in mitigation behaviors. Reaching these groups through targeted channels, trusted leaders, and influencers at national, state, and local levels has the potential to improve use and effectiveness of critical public health strategies to protect persons of all ages by preventing the spread of SARS-CoV-2.

FIGURE. Percentage distribution of cumulative number of reported mitigation behaviors,* by age group and reported face mask use — COVID Impact Survey, United States, April–June 2020†,§,¶,,††,§§**



See figure footnotes on the next page.

FIGURE. (*Continued*) Percentage distribution of cumulative number of reported mitigation behaviors,* by age group and reported face mask use — COVID Impact Survey, United States, April–June 2020†,§,¶,,††,§§**



Abbreviation: COVID-19 = coronavirus disease 2019.

* Wore a face mask; washed or sanitized hands; kept 6 feet of distance; avoided public or crowded places; canceled or postponed pleasure, social, or recreational activities; and avoided some or all restaurants.

† Weighted to be representative of noninstitutionalized U.S. adults; values <5% not shown.

§ Trend for overall change in behavior over time, p-value <0.001.

¶ Chi-squared p-value <0.001 for differences in cumulative number of mitigation behaviors reported across age groups, within all survey waves.

** Chi-squared p-value <0.05 for differences in cumulative number of mitigation behaviors reported across age groups, within April and June waves only

†† Not inclusive of the survey item "wore a face mask."

§§ Trend for overall change in behavior over time p-value <0.05 (among those who reported wearing a mask: p-value = 0.003).

Acknowledgment

Danielle Barradas, CDC.

Corresponding author: Helena Hutchins, pne8@cdc.gov.

[1]CDC COVID-19 Response Team; [2]Data Foundation, Washington, DC; [3]Division of Human Development and Disability, National Center on Birth Defects and Developmental Disabilities, CDC.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Joseph Willey reports grants from the David and Louise Packard Foundation and the Alfred P. Sloan Foundation (both partial funders of the COVID Impact Survey) during the conduct of the study. No other potential conflicts of interest were disclosed.

References

1. CDC. Coronavirus disease 2019 (COVID-19): how to protect yourself and others. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html
2. Fisher KA, Barile JP, Guerin RJ, et al. Factors associated with cloth face covering use among adults during the COVID-19 pandemic—United States, April and May 2020. MMWR Morb Mortal Wkly Rep 2020;69:933–7. https://doi.org/10.15585/mmwr.mm6928e3

Summary

What is already known about this topic?

Recommended mitigation behaviors to prevent the spread of COVID-19 include wearing masks, hand washing, social distancing, and staying home when ill.

What is added by this report?

Self-reported engagement in mitigation behaviors (mask wearing, handwashing, physical distancing, crowd and restaurant avoidance, and cancellation of social activities) differed significantly by adult age group. During April–June 2020, the prevalence of these behaviors was lowest among adults aged 18–29 years and highest among those aged >60 years. Whereas mask wearing increased over time, other reported mitigation behaviors decreased or remained unchanged.

What are the implications for public health practice?

Improved communication and policy priorities are needed to promote recommended COVID-19 mitigation behaviors, particularly among young adults.

3. Wozniak A, Willey J, Benz J, Hart N. COVID Impact Survey: Version 2 [dataset]. Chicago, IL: National Opinion Research Center, 2020. https://www.covid-impact.org/
4. Boehmer TK, DeVies J, Caruso E, et al. Changing age distribution of the COVID-19 pandemic—United States, May–August 2020. MMWR Morb Mortal Wkly Rep 2020;69:1404–9 10. https://doi.org/10.15585/mmwr.mm6939e1
5. Battaglia M, Izrael D, Hoaglin D, Frankel M. Practical considerations in raking survey data. Surv Pract 2009;2:1–10. https://doi.org/10.29115/SP-2009-0019
6. CDC. Implementation of Mitigation Strategies for Communities with Local COVID-19 Transmission. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/community/community-mitigation.html
7. Schaeffer K, Rainie L. Experiences with the COVID-19 outbreak can vary for Americans of different ages. Washington, DC: Pew Research Center; 2020. https://www.pewresearch.org/fact-tank/2020/06/16/experiences-with-the-covid-19-outbreak-can-vary-for-americans-of-different-ages/
8. The Harris Poll. COVID-19 Survey Wave 16, June 13–16, 2020. Rochester, NY: The Harris Poll; 2020. https://theharrispoll.com/wpcontent/uploads/2020/06/Wave-16_banner-1_no-BP.pdf
9. Johnson SB, Blum RW, Giedd JN. Adolescent maturity and the brain: the promise and pitfalls of neuroscience research in adolescent health policy. J Adolesc Health 2009;45:216–21. https://doi.org/10.1016/j.jadohealth.2009.05.016
10. Fisher KA, Tenforde MW, Feldstein LR, et al. Community and close contact exposures associated with COVID-19 among symptomatic adults ≥18 years in 11 outpatient health care facilities—United States, July 2020. MMWR Morb Mortal Wkly Rep 2020;69:1258–64. https://doi.org/10.15585/mmwr.mm6936a5

COVID-19 Outbreak Among a University's Men's and Women's Soccer Teams — Chicago, Illinois, July–August 2020

Richard A. Teran, PhD[1,2]; Isaac Ghinai, MBBS[1,2]; Stephanie Gretsch, MPH[2]; Tracy Cable, MD[3]; Stephanie R. Black, MD[2]; Stefan J. Green, PhD[3]; Omar Perez, PhD[3]; George E. Chlipala, PhD[3]; Mark Maienschein-Cline, PhD[3]; Kevin J. Kunstman[3]; Susan C. Bleasdale, MD[3]; Marielle J. Fricchione, MD[2]

On October 27, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

Data on transmission of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), among college athletes are limited. In August 2020, the Chicago Department of Public Health (CDPH) was notified of a cluster of COVID-19 cases among a university's men's and women's soccer teams. CDPH initiated an investigation, interviewed members of both teams, and collated laboratory data to understand transmission of SARS-CoV-2 within the teams. Numerous social gatherings with limited mask use or social distancing preceded the outbreak. Transmission resulted in 17 laboratory-confirmed COVID-19 cases across both teams (n = 45), likely from a single source introduction of SARS-CoV-2 (based on whole genome sequencing) and subsequent transmission during multiple gatherings. Colleges and universities are at risk for COVID-19 outbreaks because of shared housing and social gatherings where recommended prevention guidance is not followed. Improved strategies to promote mask use and social distancing among college-aged adults need to be implemented, as well as periodic repeat testing to identify asymptomatic infections and prevent outbreaks among groups at increased risk for infection because of frequent exposure to close contacts in congregate settings on and off campus.

Investigation and Results

University A student athletes returned to campus* during June and were required to have two negative real-time reverse transcription–polymerase chain reaction (RT-PCR) SARS-CoV-2 tests before participating in any preseason training activities. Voluntary training sessions for both soccer teams began in July. In August, a member of the men's soccer team reported COVID-19-related symptoms to coaching staff members (Figure). The student reported attending several social gatherings with teammates in the preceding 14 days, including a birthday party and an unsanctioned soccer match between the men's and women's teams. Over the next 2 days, five other soccer players reported symptoms, and both teams were instructed to isolate or quarantine.† Specimens were collected from symptomatic soccer players and any other persons attending the birthday party or coed soccer match. Nine of 10 tests had positive results for SARS-CoV-2. Three days later, four more soccer players received positive test results. After the university instructed both teams to test all members, including asymptomatic persons, four additional players with SARS-CoV-2 infection were identified, for a total of 17.

All specimens tested for SARS-CoV-2 within its jurisdiction are reportable to CDPH, as are all COVID-19 clusters or outbreaks in congregate settings, including universities.§ A case-control study was conducted to assess exposures among soccer players on both teams who participated in training sessions from the day voluntary training sessions commenced (day 0) to the day both teams were instructed to quarantine (day 18) (the investigation period).¶ A questionnaire was administered to collect symptom history, housing information, training details, contacts, and information on participation in social gatherings, mask use, and social distancing behaviors. Self-reported SARS-CoV-2 test results were confirmed using the university's electronic medical record system and Illinois' National Electronic Disease Surveillance System (I-NEDSS). A case-patient (a student with COVID-19) was defined as a person on the men's or women's soccer team with a positive SARS-CoV-2 RT-PCR test result who participated in training sessions during the investigation period. Controls included students on either soccer team who participated in training sessions during the investigation period and who received a negative SARS-CoV-2 RT-PCR test result during days 0–30. Logistic regression estimated odds ratios (ORs) and 95% confidence intervals (CIs) to determine the association between reported housing accommodations, social gathering attendance, and coed match participation with a positive SARS-CoV-2 test result. Analyses were performed with SAS software (version 9.4; SAS Institute). Whole-genome sequencing was conducted on available specimens to identify phylogenetic relationships based on nucleotide differences. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

* University policy limited on-campus congregating and gatherings and required mask use in all settings (except personal residence), social distancing, and daily health screening.

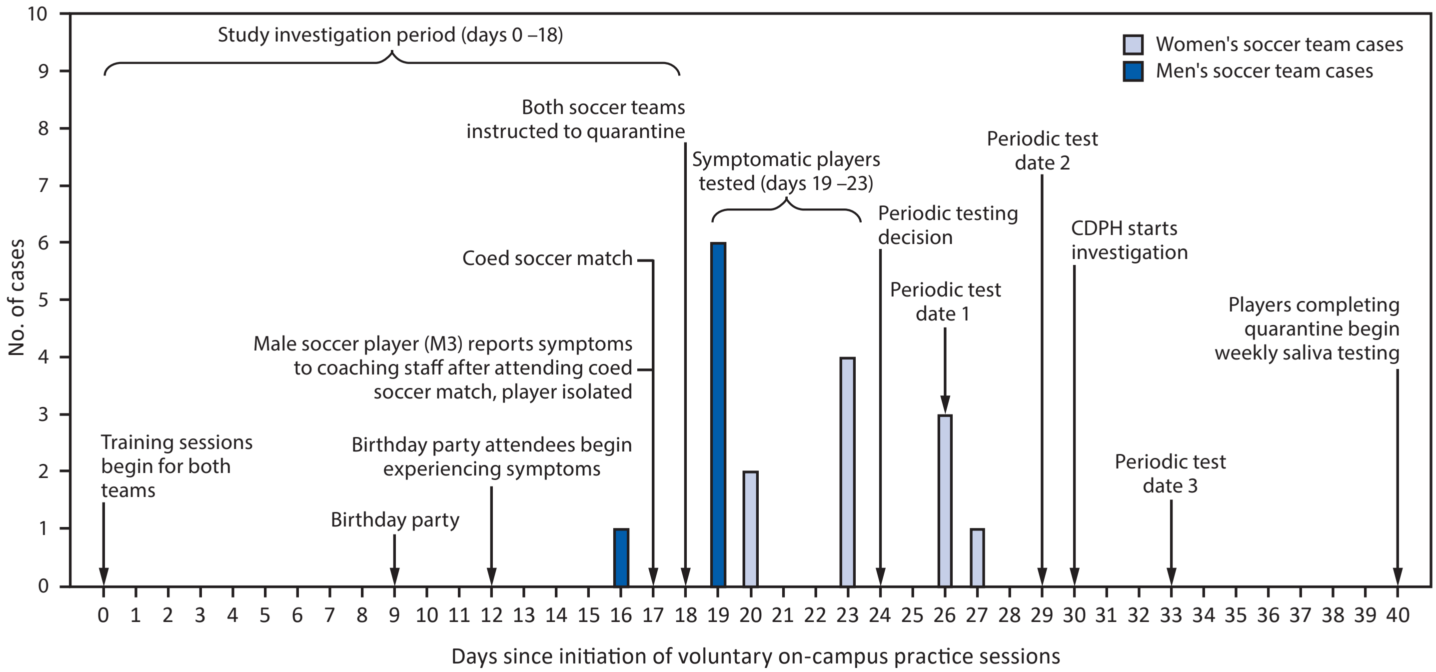
† The term "quarantine" is used to describe the 14-day period after a person who might have been exposed to COVID-19 stays away from others. The term "isolation" is used to describe the 10-day period when a person stays away from others after that person experiences symptom onset or receives a positive SARS-CoV-2 test result.

§ https://www.chicago.gov/content/dam/city/depts/cdph/HealthProtectionandResponse/CDPH%20Order%202020-2%20hospital%20duties%20SECOND%20AMENDED%20AND%20RE-ISSUED%20FINAL.pdf.

¶ Team members who did not participate in the voluntary training sessions and were not living in shared housing with other teammates during the investigation period were excluded from this investigation.

** 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE. COVID-19 cases (n = 17) among a university's* men's and women's soccer teams, by specimen collection date and significant events† — Chicago, Illinois, July–August 2020



Abbreviations: CDPH = Chicago Department of Public Health; COVID-19 = coronavirus disease 2019.

* On day 24, university staff members decided to begin periodic testing of all players on the men's and women's soccer teams to identify asymptomatic students with COVID-19 and control the outbreak. Periodic testing was performed on days 26, 29, and 33.

† A more comprehensive timeline of events is available at https://stacks.cdc.gov/view/cdc/95822.

All students who participated in training sessions during the investigation period (n = 45) were interviewed, among whom 17 SARS-CoV-2 cases were identified (attack rate = 37.8%); the other 28 students served as controls. The 45 students consisted of 21 (46.7%) players on the men's team, 23 (51.1%) on the women's team, and one women's team staff member (Table). Median age was 20 years (interquartile range [IQR] = 18–21 years), 46.7% were non-Hispanic White, and 33.3% were Hispanic or Latino. Thirty-three (73.3%) students lived in shared accommodations with other teammates. In addition to the coed soccer match, 18 social gatherings were reported during the investigation period, including a birthday party, visits to friends' dormitories or apartments, and outdoor lake gatherings. Most students (60.0%) reported attending at least one gathering. In addition, seven students who reported not attending any social gatherings were listed as event contacts by other teammates. All 17 students with COVID-19 attended at least one gathering. Among the students with COVID-19, the median number of days from the last negative SARS-CoV-2 RT-PCR test and the first positive test result was 25.0 days (IQR = 22.0–26.5 days). Eleven of the students with COVID-19 reported symptoms. None of the students were hospitalized. Compared with controls, students with COVID-19 had increased odds of living in shared accommodations with teammates (OR = 10.4; 95% CI = 1.2–89.6).

Probable exposure periods and elicitation windows (the time frame during which a student with COVID-19 was likely infectious and not in isolation)[††] were determined for each student with COVID-19 based on laboratory data and symptom history (Supplementary Figure, https://stacks.cdc.gov/view/cdc/95822). Among 12 events (events 2–13) that occurred during students' probable exposure periods, seven (events 3, 5, and 9–13) occurred 2–5 days before symptom onset or positive SARS-CoV-2 test results. Members of both teams mostly attended different events; however, three events (event 3 [a birthday party], event 5 [a dormitory or apartment visit], and event 11 [a coed soccer match]) most likely contributed to transmission because they were attended by members of both teams and persons not on the teams. The birthday party was attended by seven men's team members (M1–M7), who reported

†† A student's elicitation window is the 2-day period when the student was infectious, before symptom onset (for symptomatic students with COVID-19) or a positive SARS-CoV-2 RT-PCR test result (for asymptomatic students with COVID-19), and not under isolation. For asymptomatic persons, the elicitation window is estimated. Persons are presumed to be infectious at the beginning of the elicitation window and are presumed not to be infectious at discontinuation of isolation. https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/investigating-covid-19-case.html.

TABLE. Characteristics of student athletes on the men's and women's soccer team included in the COVID-19 outbreak investigation — Chicago, Illinois, July–August 2020

Characteristic	No. (column %) All (n = 45)	Cases (n = 17)	Controls (n= 28)	Unadjusted OR (95% CI)
Housing status*				
Shared housing	33 (73.3)	16 (94.1)	17 (60.7)	10.4 (1.2 – 89.6)
Other	12 (26.7)	1 (5.9)	11 (39.3)	Reference
Roommates with a COVID-19 patient				
Yes	21 (46.7)	11 (64.7)	10 (35.7)	3.3 (0.9 – 11.6)
No	24 (53.3)	6 (35.3)	18 (64.3)	Reference
Attendance at coed soccer match				
Yes	28 (62.2)	12 (70.6)	16 (57.1)	1.8 (0.5 – 6.5)
No	17 (37.8)	5 (29.4)	12 (42.9)	Reference
Attendance at any social gathering†				
Yes	27 (60.0)	13 (76.5)	14 (50.0)	3.3 (0.8 – 12.5)
No	18 (40.0)	4 (23.5)	14 (50.0)	Reference

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

* Student athletes living in shared accommodations include 19 persons who lived in off-campus apartments and 14 who lived in on-campus dormitories. Student athletes with a housing status of "other" include 10 persons who lived with family and commuted to campus and two who lived in apartments or dormitories but did not have a roommate during the exposure period.

† Characteristic is based on self-reported attendance at any event and does consider whether the athlete was listed as a contact by another athlete.

wearing masks or social distancing <10% of the time and who all later received positive SARS-CoV-2 test results. Teammates were aware of two student athletes who were not on the soccer teams and who also received COVID-19 diagnoses after the event; investigators confirmed one positive SARS-CoV-2 test result using I-NEDSS. A dormitory or apartment visit (event 5) was attended by students M2–M7 and one women's team player (W6), who later had a positive SARS-CoV-2 test result. Seven days later, these same students attended the coed soccer match (event 11) along with 21 teammates; five additional students later received a positive SARS-CoV-2 test result. Several other events occurred before the coed soccer match, including four lake gatherings (events 2, and 8–10), which also overlapped with students' exposure periods and elicitation windows.

Twelve specimens collected from 10 students during days 23–33[§§] were sequenced and found to be genetically similar, consistent with a single source of SARS-CoV-2 introduction, although the exact chain of transmission could not be ascertained. The sequences in this group belong to the same clade[¶¶] known to be circulating in the Chicago area since March and related to viral sequences from New York.[***]

§§ Two students with COVID-19 on the women's team had two specimens available for sequencing. Fifteen specimens were available for sequencing; however, three specimens were removed because of low amount of sequence data that aligned to the reference genome. Specimens were not available for seven students with COVID-19.

¶¶ All filtered isolates were assigned to clade 20B on Nextclade. https://nextstrain.org/blog/2020-06-02-SARSCoV2-clade-naming.

*** https://www.medrxiv.org/content/10.1101/2020.05.19.20107144v2.

Public Health Response

As part of university A's response plan, symptomatic students were removed from play, received RT-PCR testing, and instructed to start isolation. Students with known or suspected exposure were quarantined separately and tested by RT-PCR. All soccer players living in on-campus dormitories were moved into quarantine dormitories to limit transmission between roommates. After completing isolation or quarantine periods, students could resume training sessions. As an additional mitigation strategy, the university implemented mandatory weekly viral SARS-CoV-2 testing with saliva specimens for all athletes, students living in campus housing, and those in the performing arts.

Discussion

Several reports have described the challenges associated with SARS-CoV-2 transmission among college students who live and socialize together and have ongoing exposure on and off campus (*1–3*). This investigation identified 17 COVID-19 cases among students on a university's men's and women's soccer teams who lived, trained, and socialized together. After commencement of training, numerous social events occurred. Little to no mask use or social distancing was reported at social events attended by symptomatic and asymptomatic students, which might have led to additional cases. Given the number of events during the investigation period, the precise event where transmission occurred cannot be determined and might have also occurred at an unreported event. Living in shared accommodations with persons who also participated in multiple social gatherings without complying with recommended prevention behaviors such as using masks might have compounded transmission risk within this group.

This outbreak highlights challenges to implementation of prevention strategies associated with persuading students at colleges and universities to adopt and adhere to recommended mitigation measures outside campus (*4*). University protocols mandated mask use during training sessions, and coaching staff members reported universal compliance. However, multiple students reported inconsistent mask use and social distancing at social gatherings, which quickly negated the benefits of pretraining testing, on-campus mask use, and social distancing prevention measures. Mask use was reported <10% of the time at the birthday party (event 3) and dormitory or apartment visit (event 5), and only one half of the students reported using masks >90% of the time during the coed soccer match (event 11). Consistent and correct mask use during gatherings can decrease transmission.[†††] Encouraging students to wear masks and practice social distancing outside of official school activities might help prevent SARS-CoV-2 transmission among college students.[§§§]

††† https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover-guidance.html.

§§§ https://www.cdc.gov/coronavirus/2019-ncov/community/colleges-universities/considerations.html.

Summary

What is already known about this topic?

SARS-CoV-2 transmission occurs in congregate settings, including colleges and universities.

What is added by this report?

Investigation of 17 COVID-19 cases among a university's men's and women's soccer team identified numerous social gatherings as possible transmission events. Minimal mask use and social distancing resulted in rapid spread among students who live, practice, and socialize together.

What are the implications for public health practice?

Colleges and universities are at risk for COVID-19 outbreaks because of shared housing and social gatherings where recommended prevention guidance is not followed. Schools should consider conducting periodic repeat testing of asymptomatic students to identify outbreaks early and implementing policies and improving messaging to promote mask use and social distancing.

A complementary prevention measure to mask use and social distancing could include periodic SARS-CoV-2 screening to identify presymptomatic, asymptomatic, or mildly symptomatic persons. For example, periodic testing of team members might have prevented nine players (M2–M7, W4, and W6–W7) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/95822) from attending four social gatherings, had they been alerted of their test results and instructed to isolate.

The findings in this report are subject to at least four limitations. First, some students declined to provide contact information for family members and other close contacts apart from their teammates, limiting ability to assess the extent of secondary transmission. Second, although students were encouraged to refer to calendars, text messages, and social media to recall contacts and dates, many students reported difficulty remembering dates of symptom onset or events and size of gatherings. Third, not all specimens with a positive SARS-CoV-2 test result could be sequenced. Specimens not sequenced might be genetically dissimilar, which would suggest multiple sources of introduction within this group. Finally, estimated exposure periods and elicitation windows for asymptomatic persons might be inaccurate. Some students might have been infectious for >2 days before receiving a positive SARS-CoV-2 test result, limiting the ability to accurately identify all potential transmission events.

SARS-CoV-2 can quickly spread among college athletes. To control COVID-19 outbreaks on college campuses, more effective messaging and prevention strategies are needed to promote mask use and physical distancing in social settings. Also, findings support CDC considerations for institutes of higher education¶¶¶ regarding the utility of periodic repeat testing of persons with known or suspected exposure to COVID-19, persons with possible exposure in the context of an outbreak, and asymptomatic persons without known exposure. These strategies can help improve the timeliness of outbreak detection and inform control measures in settings with moderate to substantial community transmission.

¶¶¶ https://www.cdc.gov/coronavirus/2019-ncov/community/colleges-universities/ihe-testing.html.

Acknowledgments

Jennifer E. Layden, Dailha Acevedo, Saul Ayala, Carla Barrios, Mariam Dolidze, Sanford Gaylord, Janetta Prokopowicz, Luz Vazquez-Perez, Suzanne Beavers, Mark Hutchinson, Mark Potter, Bryan Yonka, Patrick Donovan, Marissa Maeder; all student athletes and coaching staff members associated with the men's and women's soccer teams.

Corresponding author: Richard A. Teran, rteran@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]Chicago Department of Public Health, Illinois; [3]University of Illinois at Chicago.

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

References

1. Lewis M, Sanchez R, Auerbach S, et al. COVID-19 outbreak among college students after a spring break trip to Mexico—Austin, Texas, March 26–April 5, 2020. MMWR Morb Mortal Wkly Rep 2020;69:830–5. https://doi.org/10.15585/mmwr.mm6926e1
2. Wilson E, Donovan CV, Campbell M, et al. Multiple COVID-19 clusters on a university campus—North Carolina, August 2020. MMWR Morb Mortal Wkly Rep 2020;69:1416–8. https://doi.org/10.15585/mmwr.mm6939e3
3. Salvatore PP, Sula E, Coyle JP, et al. Recent increase in COVID-19 cases reported among adults aged 18–22 years—United States, May 31–September 5, 2020. MMWR Morb Mortal Wkly Rep 2020;69:1419–24. https://doi.org/10.15585/mmwr.mm6939e4
4. Hutchins HJ, Wolff B, Leeb R, et al. COVID-19 mitigation behaviors by age group—United States, April–June 2020. MMWR Morb Mortal Wkly Rep 2020;69.

Trends in the Use of Telehealth During the Emergence of the COVID-19 Pandemic — United States, January–March 2020

Lisa M. Koonin, DrPH[1]; Brooke Hoots, PhD[1]; Clarisse A. Tsang, MPH[1]; Zanie Leroy, MD[1]; Kevin Farris, MAEd[1]; Brandon Jolly, MD[2], Peter Antall, MD[3]; Bridget McCabe, MD[4]; Cynthia B.R. Zelis, MD[5]; Ian Tong, MD[6]; Aaron M. Harris, MD[1]

In February 2020, CDC issued guidance advising persons and health care providers in areas affected by the coronavirus disease 2019 (COVID-19) pandemic to adopt social distancing practices, specifically recommending that health care facilities and providers offer clinical services through virtual means such as telehealth.* Telehealth is the use of two-way telecommunications technologies to provide clinical health care through a variety of remote methods.† To examine changes in the frequency of use of telehealth services during the early pandemic period, CDC analyzed deidentified encounter (i.e., visit) data from four of the largest U.S. telehealth providers that offer services in all states.§ Trends in telehealth encounters during January–March 2020 (surveillance weeks 1–13) were compared with encounters occurring during the same weeks in 2019. During the first quarter of 2020, the number of telehealth visits increased by 50%, compared with the same period in 2019, with a 154% increase in visits noted in surveillance week 13 in 2020, compared with the same period in 2019. During January–March 2020, most encounters were from patients seeking care for conditions other than COVID-19. However, the proportion of COVID-19–related encounters significantly increased (from 5.5% to 16.2%; $p<0.05$) during the last 3 weeks of March 2020 (surveillance weeks 11–13). This marked shift in practice patterns has implications for immediate response efforts and longer-term population health. Continuing telehealth policy changes and regulatory waivers might provide increased access to acute, chronic, primary, and specialty care during and after the pandemic.

Data for this analysis were provided to CDC from four large national telehealth providers as part of partner engagement to monitor and improve outcomes during the COVID-19 pandemic. Datasets included the date of the telehealth encounter, patient sex, age, county and state of residence, and, for 2020 visits, disposition after the visit (e.g., home or location the provider recommended that the patient seek additional care, if needed, such as in an emergency department [ED] or with a primary care provider), "reason for visit" (text field), and diagnosis defined by one or more *International Classification of Diseases, Tenth Revision* (ICD-10) codes.¶ No patient, facility, or provider identifiers were included in the datasets. Date of encounter was categorized by epidemiologic surveillance week. For comparison, total ED visit volume by surveillance week in 2019 and 2020 was analyzed from National Syndromic Surveillance Program (NSSP) data, and percentage change from 2019 to 2020 was calculated by week. The national data in NSSP includes ED visits from a subset of hospitals in 47 states, accounting for approximately 73% of ED visits in the United States.

Patient encounters for 2020 were characterized as COVID-19–related or not COVID-19–related. COVID-19–related visits were defined as those with one or more of the following: 1) signs and symptoms in the "reason for visit" field meeting criteria established by CDC in March 2020 for COVID-19–like illness,** 2) ICD-10 codes in the diagnosis field for Z20.828 (contact with and suspected exposure to other viral communicable diseases) or U07.1 (2019-nCoV acute respiratory disease), or 3) the terms "COVID" or "coronavirus" in the "reason for visit" field. COVID-19–like illness was defined as fever plus cough or sore throat or shortness of breath. Patient encounters that did not include one of the described criteria were categorized as not COVID-19–related. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy: [45 C.F.R. part 46.102(l)(2); 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501, et seq.]

A Wilcoxon signed-rank test was used to test the difference in the median encounter count by week from 2019 to 2020. Average weekly percent changes in encounter count were calculated using Joinpoint Regression Analysis Software (version 4.8.0.1).†† Pairwise comparisons of proportions of encounters between weeks were calculated with chi-squared tests; p values <0.05 were considered statistically significant. Approximately 2.7 million encounter records were available for analysis. Approximately 1,629,000 telehealth encounters

* https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-hcf.html.
† https://telehealth.hhs.gov/patients/understanding-telehealth/#what-is-telehealth.
§ Amwell Medical Group, Boston, Massachusetts; Teladoc Health, Inc., Purchase, New York; MDLIVE, Miramar, Florida; and Doctor on Demand, Inc., San Francisco, California.

¶ https://www.cdc.gov/nchs/icd/icd10cm.htm.
** Symptoms used to characterize COVID-19–like illness during January–March 2020 included fever, cough and shortness of breath https://www.cdc.gov/nchs/data/icd/interim-coding-advice-coronavirus-March-2020-final.pdf. Since that time, CDC has expanded the list of symptoms associated with this illness. https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.
†† https://surveillance.cancer.gov/joinpoint/.

occurred in the first 3 months of 2020 (early pandemic period), compared with approximately 1,084,000 encounters during the same period in 2019 (50% increase overall; p<0.05). During surveillance week 13 in 2020, telehealth visits increased 154% (p<0.05), compared with the same week in 2019 (Figure 1). In contrast, the number of ED visits in the last 3 weeks of March 2020 decreased markedly, compared with the same period in 2019.

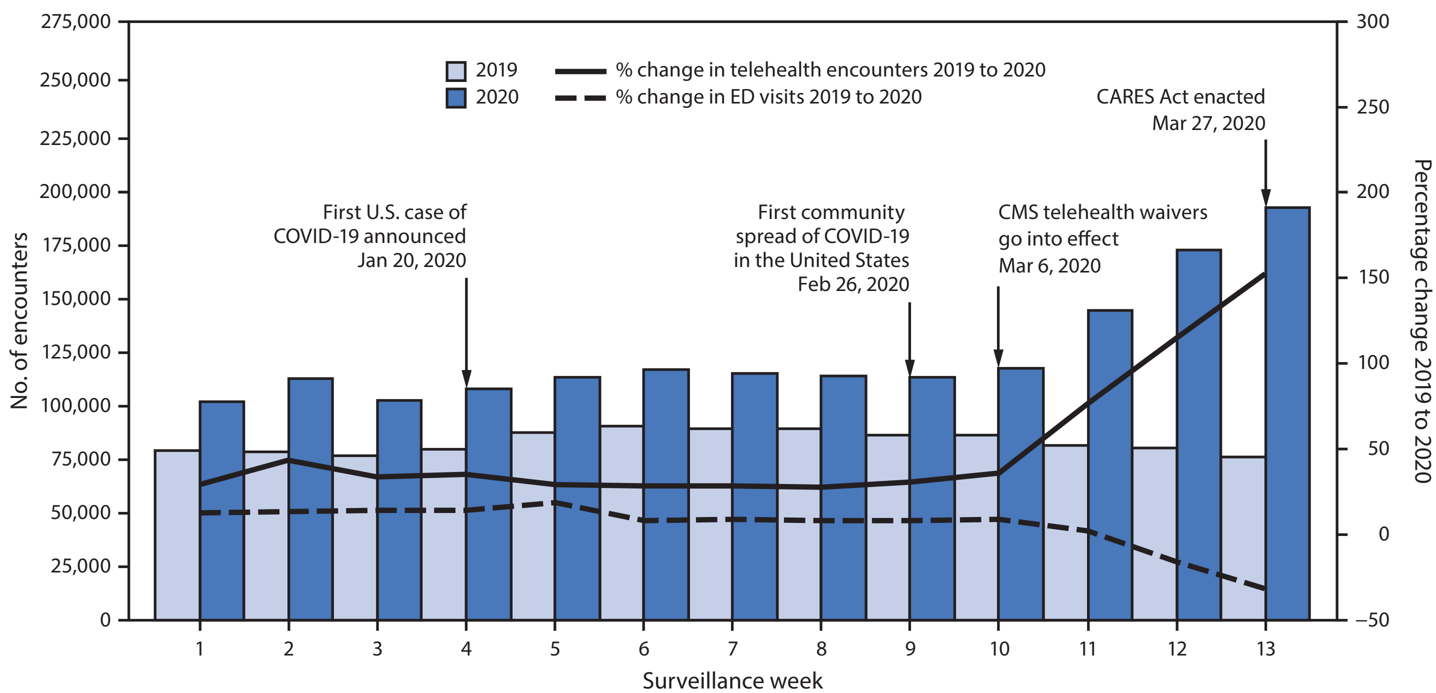
Most telehealth encounters were for adults aged 18–49 years (66% in 2019 and 69% in 2020) and female patients (63% in both 2019 and 2020). During the early pandemic period in 2020, the percentage of telehealth visits for persons aged 18–49 years increased slightly, from 68% during the first week of January 2020 to 73% during the last week of March (p<0.05). There was a slight decrease in the percentage of telehealth encounters for children during the emerging pandemic period, compared with the same period in 2019. An average of 3.5% of encounters were for children aged <5 years in 2020 (compared with 4.0% in 2019), and 8.6% were for those aged 5–17 years in 2020 (compared with 10.0% in 2019).

During January–March 2020, most telehealth patients (93%) sought care for conditions other than COVID-19. However, the proportion of COVID-19–related encounters grew (from 5.5% to 16.2%; p<0.05) during the last 3 weeks of March, when an increasing number of visits included mention of COVID-19 in the "reason for visit" field (Figure 2). In addition, 69% of patients who had a telehealth encounter during the early pandemic period in 2020 were managed at home, with 26% advised to seek follow-up from their primary care provider as needed or, if their condition worsened or did not improve, 1.5% were advised to seek care in an ED, and 3% were referred to an urgent care setting. During 2020, referral patterns were consistent during the early pandemic period; the increases or decreases in referral categories between weeks 1–9 and weeks 10–13 were <1%.

Discussion

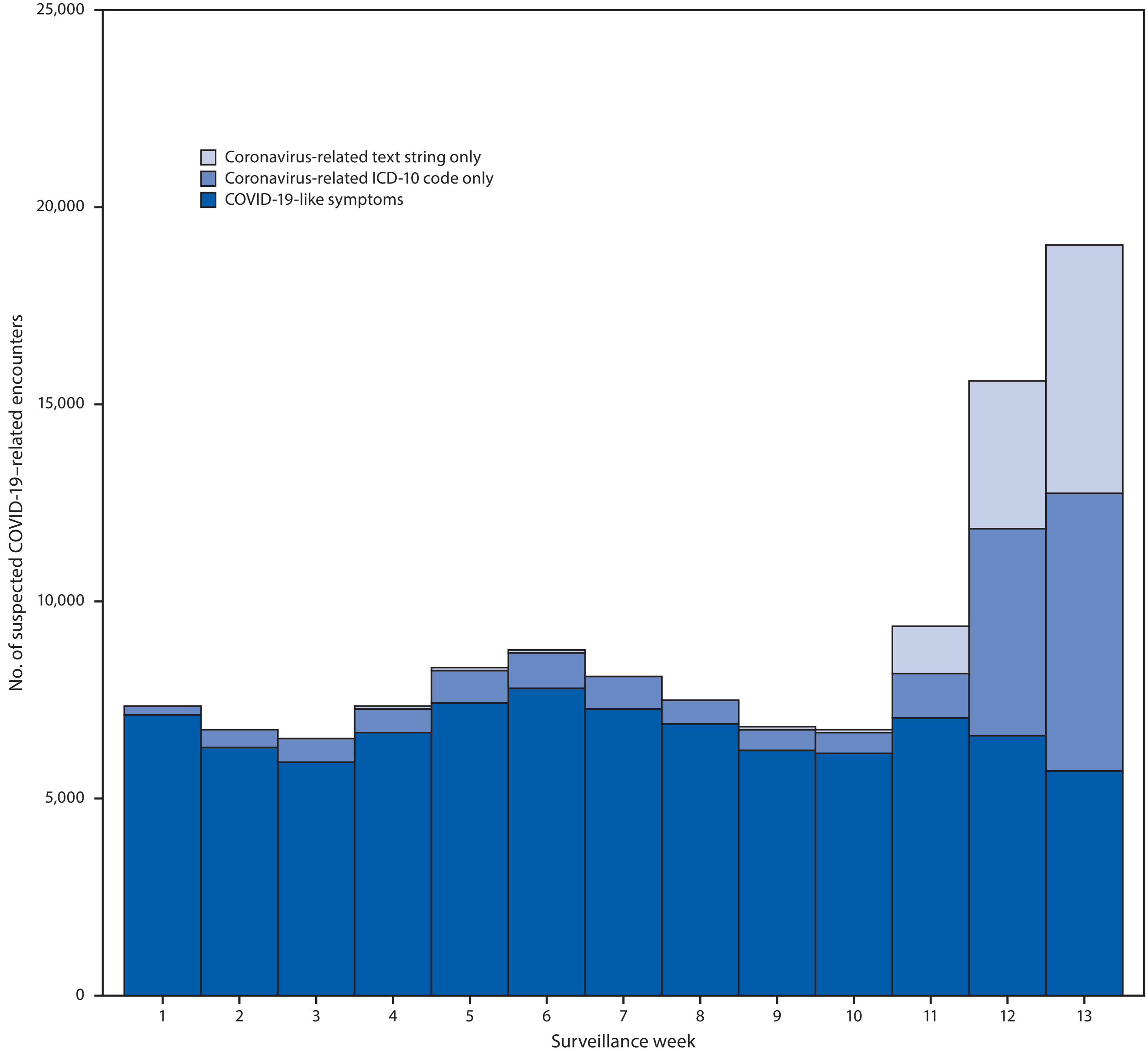
This cross-sectional analysis of telehealth use during the emergence of the COVID-19 pandemic in the United States (January–March 2020) provides information on use patterns of this health care delivery modality for planners and providers. The age and sex of patients who accessed telehealth services in this analysis were similar to those seeking telehealth services in other studies (*1*). Substantially more telehealth visits were made during the first 3 months of 2020 than during the same period in 2019; whereas visits to EDs sharply declined. Other researchers have noted a marked overall increase in the use of telehealth services in the latter weeks of March 2020 and sharp declines in the use of EDs (*2*–*4*). Overall, an estimated 41%–42% of U.S. adults reported having delayed or avoided seeking care during the pandemic because of concerns about COVID-19, including 12% who reported having

FIGURE 1. Number of telehealth patient encounters reported by four telehealth providers that offer services in all states and percentage change in telehealth encounters and emergency department (ED) visits — United States, January 1–March 30, 2019 (comparison period) and January 1–March 28, 2020 (early pandemic period)*



Abbreviations: CARES Act = Coronavirus Aid, Relief, and Economic Security Act; CMS = Center for Medicare & Medicaid Services; COVID-19 = coronavirus disease 2019.
* Unpublished ED visit data obtained from the National Syndromic Surveillance Program.

FIGURE 2. Number of telehealth patient encounters for persons with COVID-19-like symptoms, coronavirus-related ICD-10 codes, or coronavirus-related text string entries reported by four telehealth providers that offer services in all states — United States, January 1–March 28, 2020



Abbreviations: COVID-19 = coronavirus disease 2019; ICD-10 = *International Classification of Diseases, Tenth Revision*.

avoided seeking urgent or emergency care (*3*,*4*). The sharp rise in telehealth encounters might be temporally associated with these declines in in-person visits. The increased number of visits in the latter weeks in March, 2020 might also be related to the March 6, 2020 policy changes and regulatory waivers from Centers for Medicare & Medicaid Services[§§] (1,135 waivers) in response to COVID-19 and provisions of the U.S. Coronavirus Aid, Relief, and Economic Security (CARES) Act, effective March 27, 2020.[¶¶] These emergency policies included improved provider payments for telehealth, allowance for providers to serve out-of-state patients, authorization for multiple types of providers to offer telehealth services, reduced or waived cost-sharing for patients, and permission

§§ https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet.

¶¶ https://www.congress.gov/bill/116th-congress/senate-bill/3548/text?q=product+update.

for federally qualified health centers or rural health clinics to offer telehealth services. The waivers also allowed for virtual visits to be conducted from the patient's home, rather than in a health care setting. Other contributing factors that could have affected utilization of services include state-issued stay-at-home orders (*5*), states' inclusion of telehealth as a Medicaid covered benefit,*** and CDC's guidance for social distancing and increased use of virtual clinical visits.

Telehealth might have multiple benefits for public and individual health during the COVID-19 pandemic. During the latter weeks in March 2020, remote screening and management of persons who needed clinical care for COVID-19 and other conditions might have increased access to care when many outpatient offices were closed or had limited operating hours. The increased availability of telehealth services also might have reduced disease exposure for staff members and patients, preserved scarce supplies of personal protective equipment, and minimized patient surge on facilities (*6*). In addition, most patients seeking telehealth in the early pandemic period were managed at home, which might have reduced large volumes of patients seeking care at health care facilities. Access to telehealth services might have been particularly valuable for those patients who were reluctant to seek in-person care, had difficulty accessing in-person care or who had chronic conditions that place them at high risk for severe COVID-19 (*1*).

Although telehealth is generally well-accepted by patients and clinicians (*7*), it is not without challenges. Limited access to the Internet or devices such as smartphones, tablets, or computers, and lack of familiarity with technology might be potential barriers for some patients (*1*,*8*). In addition, virtual visits might not be appropriate for some persons based on level of acuity or necessity to conduct an in-person physical examination or diagnostic testing. Although several reports have described concern in the decline of emergency department use during the early pandemic period, a very small proportion of telehealth patients in this analysis were referred to emergency care. Increases in the use of telehealth precipitated by COVID-19 could have long-term benefits for improving appropriate emergency department utilization.

The findings in this report are subject to at least two limitations. First, the data in this analysis are from a sample of four large national telehealth providers and do not represent all virtual encounters conducted during the study period. In addition, the symptoms used initially to identify patients with possible COVID-19 were limited, and it was not possible to distinguish them from those with influenza-like illness symptoms or other respiratory conditions; therefore, some patients might have been unidentified or misclassified.

*** https://www.medicaid.gov/medicaid/benefits/telemedicine/index.html.

Summary

What is already known about this topic?

Use of telehealth (the remote provision of clinical care) early during the COVID-19 pandemic has not been well characterized.

What is added by this report?

The 154% increase in telehealth visits during the last week of March 2020, compared with the same period in 2019 might have been related to pandemic-related telehealth policy changes and public health guidance.

What are the implications for public health practice?

Telehealth could have multiple benefits during the pandemic by expanding access to care, reducing disease exposure for staff and patients, preserving scarce supplies of personal protective equipment, and reducing patient demand on facilities. Telehealth policy changes might continue to support increased care access during and after the pandemic.

Health care delivery has shifted during the COVID-19 pandemic, with telehealth encounters sharply increasing in late March 2020. Telehealth can serve an important role in pandemic planning and response. Continued availability and promotion of telehealth services might play a prominent role in increasing access to services during the public health emergency. The regulatory waivers in place during COVID-19 might have helped increase adoption of telehealth services along with public health guidance encouraging virtual visits and CDC recommendations for use of telehealth services during the COVID-19 pandemic.††† Data from telehealth encounters can inform public health surveillance systems, especially during the pandemic. With expanded access and improved reimbursement policies in place, as well as ongoing acceptability by patients and health care providers, telehealth might continue to serve as an important modality for delivering care during and after the pandemic.§§§

††† https://www.cdc.gov/coronavirus/2019-ncov/hcp/telehealth.html.

§§§ https://www.federalregister.gov/d/2020-17364/improving-rural-health-and-telehealth-access.

Corresponding author: Lisa M. Koonin, lmk1@cdc.gov.

[1]Healthcare Systems and Worker Safety Task Force, CDC COVID-19 Emergency Response Team; [2]HHS COVID-19 Health Care Resilience Task Force; [3]Amwell Medical Group, Boston, Massachusetts; [4]Teladoc Health, Inc., Purchase, New York; [5]MDLIVE, Miramar, Florida; 6Doctor on Demand, Inc., San Francisco, California.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Peter Antall reports that he is President and Chief Medical Officer of Amwell Medical Group and on the advisory board of Chatbot Company; Bridget McCabe reports personal fees from Teladoc Health, Inc., as the Medical Director, Clinical Quality/Clinical Informatics; Ian Tong reports personal fees from Doctor On Demand, Inc, as the Chief Medical Officer; and Cynthia Zelis reports personal fees from MDLIVE, Inc., as the Chief Medical Officer. No other potential conflicts of interest were disclosed.

References

1. Reed ME, Huang J, Graetz I, et al. Patient characteristics associated with choosing a telemedicine visit vs office visit with the same primary care clinicians. JAMA Netw Open 2020;3:e205873. https://doi.org/10.1001/jamanetworkopen.2020.5873
2. Mehrotra A, Chernew M, Linetsky D, Hatch H, Cutler D. The impact of the COVID-19 pandemic on outpatient visits: a rebound emerges. New York, NY: Commonwealth Fund; 2020. https://www.commonwealthfund.org/publications/2020/apr/impact-covid-19-outpatient-visits
3. Hartnett KP, Kite-Powell A, DeVies J, et al.; National Syndromic Surveillance Program Community of Practice. Impact of the COVID-19 pandemic on emergency department visits—United States, January 1, 2019–May 30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:699–704. https://doi.org/10.15585/mmwr.mm6923e1
4. Czeisler MÉ, Marynak K, Clarke KEN, et al. Delay or avoidance of medical care because of COVID-19–related concerns—United States, June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1250–7. https://doi.org/10.15585/mmwr.mm6936a4
5. Moreland A, Herlihy C, Tynan MA, et al.; CDC Public Health Law Program; CDC COVID-19 Response Team, Mitigation Policy Analysis Unit. Timing of state and territorial COVID-19 stay-at-home orders and changes in population movement—United States, March 1–May 31, 2020. MMWR Morb Mortal Wkly Rep 2020;69:1198–203. https://doi.org/10.15585/mmwr.mm6935a2
6. Larry A. Green Center. Quick COVID-19 primary care survey, series 3, fielded March 27–30, 2020. Richmond, VA: Larry A. Green Center; 2020. https://static1.squarespace.com/static/5d7ff8184cf0e01e4566cb02/t/5e861fd6f218f93aefa2f0b8/1585848278581/C19+Series+3+National+Sample+Executive+Summary.pdf
7. Almathami HKY, Win KT, Vlahu-Gjorgievska E. Barriers and facilitators that influence telemedicine-based, real-time, online consultation at patients' homes: systematic literature review. J Med Internet Res 2020;22:e16407. https://doi.org/10.2196/16407
8. Zhai Y. A call for addressing barriers to telemedicine: health disparities during the COVID-19 pandemic. Psychother Psychosom. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7316653/pdf/pps-0001.pdf

COVID-19 Outbreak at an Overnight Summer School Retreat — Wisconsin, July–August 2020

Ian W. Pray, PhD[1,2]; Suzanne N. Gibbons-Burgener, DVM, PhD[1]; Avi Z. Rosenberg, MD, PhD[3]; Devlin Cole, MD[1,4]; Shmuel Borenstein[5]; Allen Bateman, PhD[6]; Eric Pevzner, PhD[7]; Ryan P. Westergaard, MD, PhD[1,4]

During July 2–August 11, 2020, an outbreak of coronavirus disease 2019 (COVID-19) occurred at a boys' overnight summer school retreat in Wisconsin. The retreat included 152 high school-aged boys, counselors, and staff members from 21 states and territories and two foreign countries. All attendees were required to provide documentation of either a positive serologic test result* within the past 3 months or a negative reverse transcription–polymerase chain reaction (RT-PCR) tests result for SARS-CoV-2 (the virus that causes COVID-19) ≤7 days before travel, to self-quarantine within their households for 7 days before travel, and to wear masks during travel. On July 15, the Wisconsin Department of Health Services (WDHS) began an investigation after being notified that two students at the retreat had received positive SARS-CoV-2 RT-PCR test results. WDHS offered RT-PCR testing to attendees on July 28 and serologic testing on August 5 and 6. Seventy-eight (51%) attendees received positive RT-PCR results (confirmed cases), and 38 (25%) met clinical criteria for COVID-19 without a positive RT-PCR result (probable cases). By the end of the retreat, 118 (78%) persons had received a positive serologic test result. Among 24 attendees with a documented positive serologic test result before the retreat, all received negative RT-PCR results. After RT-PCR testing on July 28, WDHS recommended that remaining susceptible persons (asymptomatic and with negative RT-PCR test results) quarantine from other students and staff members at the retreat. Recommended end dates for isolation or quarantine were based on established guidance (*1,2*) and determined in coordination with CDC. All attendees were cleared for interstate and commercial air travel to return home on August 11. This outbreak investigation documented rapid spread of SARS-CoV-2, likely from a single student, among adolescents and young adults in a congregate setting. Mitigation plans that include prearrival quarantine and testing, cohorting, symptom monitoring, early identification and isolation of cases, mask use, enhanced hygiene and disinfection practices, and maximal outdoor programming are necessary to prevent COVID-19 outbreaks in these settings (*3,4*).

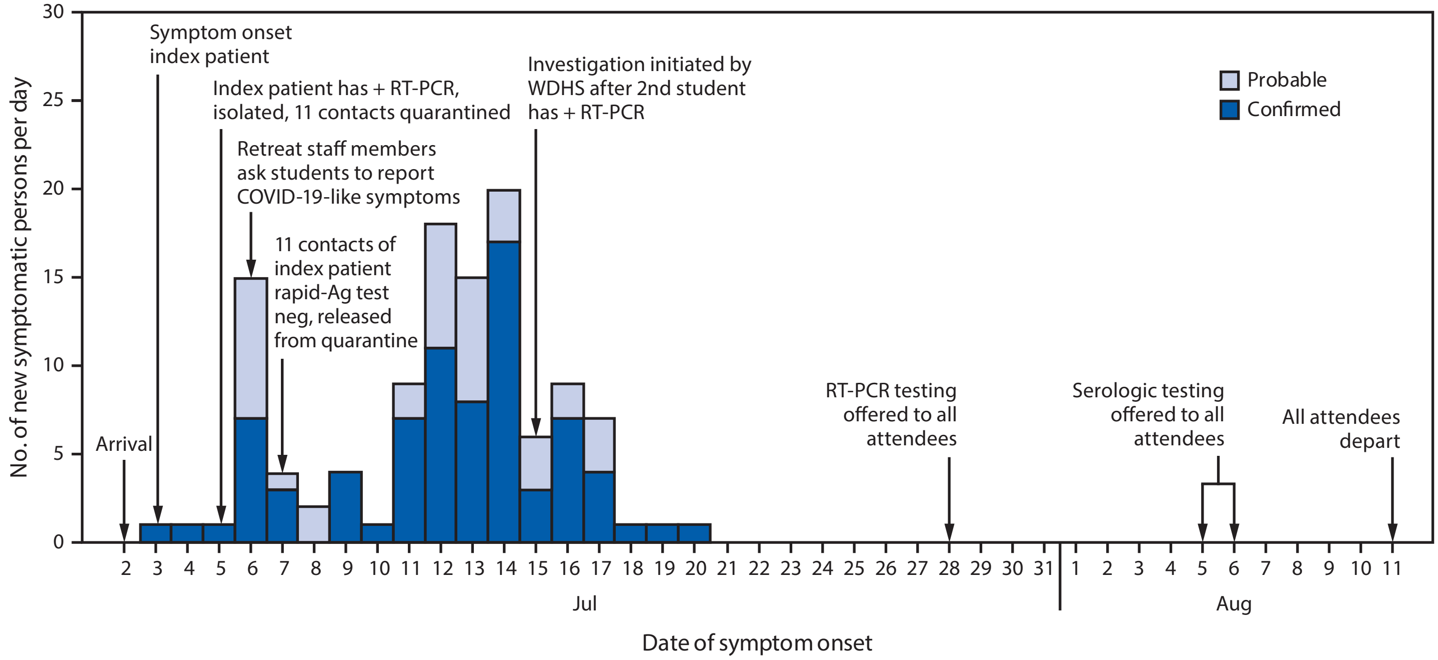
* Documentation provided by retreat attendees from a laboratory of any SARS-CoV-2 serologic test done within 3 months before the retreat.

Investigation and Findings

Students and staff members (two teachers, one principal, and one emergency medical technician) traveled from 21 states and territories and two foreign countries to attend a faith-based educational retreat for boys in grades 9–11. In an effort to prevent introduction of COVID-19, all attendees were required to provide documentation of either a positive serologic test result within the past 3 months or a negative SARS-CoV-2 RT-PCR result ≤7 days before travel, to self-quarantine within their households for 7 days before travel, and to wear masks during travel. At the retreat, students and counselors were not required to wear masks or social distance, and students mixed freely. Classes were held in outdoor pavilions with approximately 20 students per class seated <6 feet (<2 m) apart at tables. Teachers wore masks during class and were socially distanced from students at all times. The 127 students resided in dormitories (four to six per room) and yurts (eight per room), organized by grade. Beds in dormitory rooms and yurts were tightly spaced with three to four sets of bunks each, shared bathrooms, and shared common areas. Counselors (21; aged 17–24 years) roomed together in dormitories and yurts, and the four staff members resided in four separate housing units.

On July 2, students traveled by air and ground to a regional hub, met with counselors and staff members, and boarded three buses to the retreat (Figure). On July 3, a ninth-grade student (the index patient) who had received a negative RT-PCR result <1 week earlier experienced sore throat, cough, and chills, and received a positive RT-PCR result on July 5. This student later learned that a family member received a positive RT-PCR result approximately 1 week after his departure. At the retreat, he was isolated in a private room, and 11 of his close contacts (including four roommates) were quarantined together in a separate dormitory. The 11 contacts received negative rapid SARS-CoV-2 antigen results and were released from quarantine on July 7, but neither the tests that were conducted nor the results could be verified by public health. During July 4–7, six of 11 close contacts of the index patient and 18 additional students with unknown exposure histories reported new onset of mild symptoms. These students were given masks, but contact tracing was not done and the students were not isolated. On

FIGURE. Dates of symptom onset of confirmed (n = 78) and probable (n = 38) COVID-19 cases at an overnight summer school retreat — Wisconsin, July 2–August 11, 2020



Abbreviations: + = positive; Ag = antigen; COVID-19 = coronavirus disease 2019; neg = negative; RT-PCR = reverse transcription–polymerase chain reaction; WDHS = Wisconsin Department of Health Services.

July 13, a second student (one of the 11 initial close contacts of the index patient) received a positive RT-PCR test result at a local clinic. On July 15, WDHS was notified and initiated an outbreak investigation. WDHS instructed retreat organizers in mitigation measures such as symptom monitoring, isolation of symptomatic attendees, and quarantine of contacts, but the capacity for such measures was exceeded by the large volume of symptomatic attendees.

On July 28, WDHS coordinated RT-PCR testing for 148 (97%) of 152 retreat attendees. At the time of specimen collection, no new illnesses had occurred since July 20. During August 5–6, WDHS returned to collect a serum sample for serologic[†] testing from 148 (97%) attendees; 145 (95%) attendees received both tests. Positive RT-PCR isolates with sufficient cycle threshold values (six of 82; 7%) were analyzed with whole genome sequencing.[§]

A confirmed COVID-19 case was defined as receipt of a positive SARS-CoV-2 RT-PCR test result after July 2 in a retreat attendee. A probable case was an illness meeting clinical criteria for COVID-19 (*5*) with symptom onset during the retreat in an attendee with no prior serologic results who was either not tested by RT-PCR or received a negative RT-PCR result on a sample obtained ≥10 days after symptom onset (to account for attendees who might have cleared the virus by the time of RT-PCR specimen collection). Serologic results were not used for case classification. All analyses were performed using Stata (version 14.2; StataCorp). Fisher's exact test was used for attack rate comparisons; p-values <0.05 were considered statistically significant. This investigation was reviewed by WDHS for human subjects' protection and determined to be nonresearch.

Among 152 attendees, 116 (76%) were classified as having confirmed (78; 51%) or probable (38; 25%) COVID-19. Thirty-four (89%) attendees with probable COVID-19 received negative RT-PCR test results on specimens obtained 11–22 days (median = 16 days) after symptom onset. Among the 148 attendees who underwent serologic testing at the end of the retreat (four attendees refused testing), 118 (80%) received positive results. This included 30 (81%) of 37 attendees with probable COVID-19 (one missing), 65 (86%) of 76 with confirmed COVID-19 (two missing), 16 (70%) of 23 attendees with positive serology before the retreat (one missing), and seven (58%) of 12 attendees without a COVID-19 diagnosis or prior serologic result (Table 1). Whole genome sequences for RT-PCR–positive isolates from six attendees

[†] Abbott Architect SARS-CoV-2 Immunoglobulin G chemiluminescent microparticle assay (Abbott Laboratories). https://www.corelaboratory.abbott/us/en/offerings/segments/infectious-disease/sars-cov-2.

[§] Whole genome sequencing conducted by Wisconsin State Laboratory of Hygiene on positive RT-PCR specimens with cycle threshold values less than 30. Samples were extracted on a KingFisher Flex with MagMAX reagents, library preparation was performed following the ARTIC protocol, and sequencing was performed on an Oxford Nanopore Technologies MinION.

TABLE 1. Symptoms and serologic test results among persons with confirmed and probable COVID-19 at an overnight summer school retreat — Wisconsin, July–August 2020

Characteristic	No. (%)		
	All cases	Confirmed*	Probable*
Total no.	**116**	**78**	**38**
Positive serologic result† on Aug 5 or 6, no./total no. (%)§	**95/113 (84)**	**65/76 (86)**	**30/37 (81)**
Days between symptom onset and serum collection (median, range)	**23 (16–33)**	**23 (16–33)**	**24 (19–30)**
Signs/Symptoms			
None (asymptomatic), no./No. (%)	1/116 (1)	1/78 (1)	NA
Shortness of breath	14 (12)	11 (14)	3 (8)
Cough	85 (73)	53 (68)	32 (84)
Fever	62 (53)	43 (55)	19 (50)
Chills	81 (70)	54 (69)	27 (71)
Sore throat	87 (75)	57 (73)	30 (79)
Fatigue	92 (79)	60 (77)	32 (84)
Myalgia	54 (47)	31 (40)	23 (61)
Loss of taste or smell	55 (47)	40 (51)	15 (39)
Diarrhea	32 (28)	19 (24)	13 (34)
Nausea or vomiting	39 (34)	25 (32)	14 (37)
Headache	96 (83)	64 (82)	32 (84)
Congestion or runny nose	86 (74)	58 (74)	28 (74)

Abbreviations: COVID-19 = coronavirus disease 2019; NA = not applicable; RT-PCR = reverse transcription–polymerase chain reaction.
* Confirmed: positive RT-PCR test results; probable: met clinical criteria only.
† Abbott Architect SARS-CoV-2 Immunoglobulin G chemiluminescent microparticle assay.
§ Four attendees refused testing. An additional 16 of 23 attendees with prior positive serologic results and seven of 12 without COVID-19 diagnoses or prior positive serologic results received positive serologic test results.

differed by 0–1 single nucleotide polymorphisms, suggesting a common source for these six attendees.

At least one confirmed case occurred in every dormitory room and yurt (Supplementary Figure, https://stacks.cdc.gov/view/cdc/95625). Attack rates did not differ significantly among counselors and students, dormitories and yurts, or grade levels (Table 2). All four staff members received negative RT-PCR test results; one staff member (an emergency medical technician) was classified as having a probable case. To comply with the retreat's attendance requirements, 24 (16%) attendees provided documentation of a positive serology results before the retreat. All 24 received negative RT-PCR results. Six (25%) experienced mild symptoms at the retreat but were not classified as having confirmed or probable COVID-19. Excluding the 24 attendees with previous positive serologic results, the COVID-19 attack rate on the remaining susceptible population was 91% (116 of 128). One (1.2%) of 78 persons with a positive SARS-CoV-2 RT-PCR test result was asymptomatic. All illnesses were mild to moderate, and no hospitalizations or deaths occurred.

TABLE 2. Characteristics of persons with confirmed or probable COVID-19 among students, counselors, and staff members at an overnight summer school retreat (N = 152), by case classification status — Wisconsin, July–August 2020

Characteristic	No./total no. (%)		
	All cases	Confirmed*	Probable*
Role (age range, yrs) [no. of persons]			
Students, grade			
9 (14–15) [42]	34/42 (81)	23/40 (58)†	11/42 (26)
10 (15–16) [45]	32/45 (71)	24/43 (56)†	8/45 (18)
11 (16–17) [40]	34/40 (85)	17/40 (43)	17/40 (43)
All students [127]	100/127 (79)	64/123 (52)†	36/127 (28)
Counselors (17–24) [21]	**15/21 (71)**	**14/21 (67)**	**1/21 (5)**
Staff members (21–45) [4]	**1/4 (25)**	**0/4 (0)**	**1/4 (25)**
Total [152]	**116/152 (76)**	**78/148 (53)**	**38/152 (25)**
Room type			
Dormitory [94]	71/94 (76)	53/90 (59)	20/94 (21)
Yurt [54]	44/54 (82)	25/54 (46)	19/54 (35)
Staff member housing [4]	1/4 (25)	0/4 (0)	1/4 (25)
Previous serologic results (IgG)			
Positive [24]	0/24 (0)	0/24 (0)	0/24 (0)
None documented [128]	116/128 (91)	78/124 (63)†	38/124 (31)

Abbreviations: COVID-19 = coronavirus disease 2019; IgG = immunoglobulin G; RT-PCR = reverse-transcription–polymerase chain reaction.
* Confirmed: positive RT-PCR test results; probable: met clinical criteria only.
† Four students did not have RT-PCR test results (two were not present during specimen collection and for two others, laboratory errors occurred).

Public Health Response

When WDHS initiated the investigation on July 15, retreat staff members reported that the majority of students had recovered from mild illnesses. After RT-PCR testing on July 28, WDHS recommended that remaining 36 susceptible persons (24%; asymptomatic and with negative RT-PCR test results) quarantine from other students and staff members at the retreat. Recommended end dates for isolation or quarantine were based on established guidance (*1,2*) and determined in coordination with CDC's Division of Global Migration and Quarantine. Outdoor coursework and recreational programming were able to continue for the duration of the retreat, and all attendees were cleared for interstate and commercial air travel to return home on August 11.

Discussion

Extensive and rapid transmission of SARS-CoV-2 occurred at an overnight retreat where adolescents and young adults aged 14–24 years had prolonged contact and shared sleeping quarters. A single student, who received a negative SARS-CoV-2 RT-PCR test result <1 week before the retreat and experienced symptoms 1 day after arriving, was the likely source of introduction, resulting in infection of 76% of attendees. Similar rapid spread has been described among younger children in overnight camps (*6,7*) and adults in congregate settings (*8,9*).

Nonpharmaceutical interventions have been effective in preventing SARS-CoV-2 transmission at overnight camps (*3*). Effective measures include prearrival quarantine and testing, cohorting, symptom monitoring, physical distancing, mask use, enhanced hygiene measures, enhanced cleaning and disinfection, outdoor activities and programming, and early identification of infections and isolation. At this retreat, organizers required documentation of a negative prearrival RT-PCR result, 7-day prearrival quarantine, and outdoor programming, but did not implement other recommended nonpharmaceutical interventions. The capacity of retreat organizers to contain transmission through isolation and quarantine early in the outbreak was exceeded given the large number of persons exposed and experiencing symptoms. A robust COVID-19 mitigation plan that included a full 14-day prearrival quarantine might have prevented introduction of SARS-CoV-2 in this setting. As well, cohorting of attendees for 14 days after arrival might have permitted early containment of the outbreak. Finally, earlier engagement with public health authorities to discuss recommended mitigation strategies (*4*) might also have aided prevention and control efforts.

An important feature of this outbreak was that 24 attendees had documented evidence of antibodies to SARS-CoV-2 before arrival. None of these persons received a positive SARS-CoV-2 RT-PCR test result at the retreat. Evidence to date is insufficient to determine whether the presence of detectable antibodies indicates protective immunity[¶] or how long such immunity might persist. The absence of RT-PCR–confirmed infections among persons with previous positive serology results suggests that some protective effect was present, given the high attack rate observed at the retreat.

The proportion of SARS-CoV-2 infections that were asymptomatic (1%) in this population was low, compared with those described in other published reports (*10*). Retreat staff members kept detailed symptom logs for students, which likely facilitated improved ascertainment of mild or delayed COVID-19 symptoms, compared with other settings and might explain the low rate of asymptomatic infection observed. In addition, some mild symptoms experienced by attendees possibly were not related to infection (e.g., allergies or travel fatigue) or were caused by another viral illnesses, which would have led to overestimation of the number of probable cases.

The findings in this report are subject to at least four limitations. First, RT-PCR testing was conducted after the outbreak (no new illnesses in the 8 days before testing), likely leading to underestimation of the number of confirmed cases. Second, baseline serology results were not available for all retreat attendees. Some positive results in follow-up serologic testing might have been caused by past undocumented infections rather than SARS-CoV-2 infection at the retreat. Third, dates of prior illnesses among attendees with previous positive serologic results were not known, and the duration of possible acquired immunity against SARS-CoV-2 infection could not be assessed. Fourth, the definition for probable COVID-19 used in this investigation was adapted from the Council of State and Territorial Epidemiologists interim COVID-19 case definition (*5*) to account for the delay in RT-PCR testing and availability of prior serologic results for some attendees; results may not be comparable with other outbreak investigations.

SARS-CoV-2 can spread rapidly among adolescents and young adults in a congregate setting with inadequate COVID-19 mitigation measures. These findings provide preliminary evidence that detectable antibodies might provide protection against new SARS-CoV-2 infections for an unknown duration. A robust COVID-19 mitigation plan developed in collaboration with public health authorities is important for preventing and containing similar outbreaks at overnight camps and residential schools. Avoidance of travel for attendees who were in isolation or quarantine likely prevented transmission to communities and family members during this outbreak and could be considered in COVID-19 mitigation plans for other congregate settings. To prevent introduction of COVID-19, mitigation plans should also include prearrival quarantine, prearrival and postarrival testing and symptom screening, the ability to isolate and quarantine, cohorting, physical distancing, mask use, enhanced hygiene and disinfection, and maximal outdoor programming (*3*).

Summary

What is already known about this topic?

SARS-CoV-2 can spread rapidly in congregate settings such as overnight camps.

What is added by this report?

During July 2–August 11, 2020, a COVID-19 outbreak at an overnight high-school retreat likely began with a single student who had received a negative SARS-CoV-2 molecular test result <1 week before the retreat and led to 116 (76%) diagnosed COVID-19 cases among attendees.

What are the implications for public health practice?

A multicomponent COVID-19 mitigation plan including prearrival quarantine and testing, cohorting, symptom monitoring, early identification and isolation of cases, mask use, and enhanced hygiene and disinfection practices is critical for reducing the risk for SARS-CoV-2 transmission in congregate settings such as residential schools and overnight camps.

[¶] https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/antibody-tests-guidelines.html.

Acknowledgments

Wisconsin State Laboratory of Hygiene; Exact Sciences Laboratory, Madison, Wisconsin; Wisconsin National Guard; Division of Global Migration and Quarantine, CDC.

Corresponding author: Ian Pray, ian.pray@dhs.wisconsin.gov.

[1]Wisconsin Department of Health Services; [2]Epidemic Intelligence Service, CDC; [3]Department of Pathology, Johns Hopkins University Baltimore, Maryland; [4]Department of Medicine, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin; [5]Lander College of Arts and Sciences, Tuoro College, New York, New York; [6]Wisconsin State Laboratory of Hygiene; [7]CDC COVID-19 Response Team.

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

References

1. CDC. Coronavirus disease 2019 (COVID-19): discontinuation of isolation for persons with COVID-19 not in healthcare settings. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html
2. CDC. Coronavirus disease 2019 (COVID-19): when to quarantine. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/quarantine.html
3. Blaisdell LL, Cohn W, Pavell JR, Rubin DS, Vergales JE. Preventing and mitigating SARS-CoV-2 transmission—four overnight camps, Maine, June–August 2020. MMWR Morb Mortal Wkly Rep 2020;69:1216–20.
4. CDC. Coronavirus disease 2019 (COVID-19): suggestions for youth and summer camps. Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/summer-camps.html
5. Council of State and Territorial Epidemiologists. Interim 20-ID-02: update to the standardized surveillance case definition and national notification for 2019 novel coronavirus disease (COVID-19) [position statement]. Atlanta, GA: Council of State and Territorial Epidemiologists; 2020. https://cdn.ymaws.com/www.cste.org/resource/resmgr/ps/positionstatement2020/Interim-20-ID-02_COVID-19.pdf
6. Szablewski CM, Chang KT, Brown MM, et al. SARS-CoV-2 transmission and infection among attendees of an overnight camp—Georgia, June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1023–5.
7. Huang L, Zhang X, Zhang X, et al. Rapid asymptomatic transmission of COVID-19 during the incubation period demonstrating strong infectivity in a cluster of youngsters aged 16–23 years outside Wuhan and characteristics of young patients with COVID-19: a prospective contact-tracing study. J Infect 2020;80:e1–13.
8. Payne DC, Smith-Jeffcoat SE, Nowak G, et al.; CDC COVID-19 Surge Laboratory Group. SARS-CoV-2 infections and serologic responses from a sample of U.S. Navy service members—USS Theodore Roosevelt, April 2020. MMWR Morb Mortal Wkly Rep 2020;69:714–21.
9. Arons MM, Hatfield KM, Reddy SC, et al.; Public Health–Seattle and King County; CDC COVID-19 Investigation Team. Presymptomatic SARS-CoV-2 infections and transmission in a skilled nursing facility. N Engl J Med 2020;382:2081–90.
10. Daniel P. Oran EJT. Prevalence of asymptomatic SARS-CoV-2 infection. Ann Intern Med 2020. Epub June 3, 2020.

SARS-CoV-2 Exposure and Infection Among Health Care Personnel — Minnesota, March 6–July 11, 2020

Ashley Fell, MPH[1]; Amanda Beaudoin, DVM, PhD[1]; Paige D'Heilly, MPH[1]; Erica Mumm, MPH[1,2]; Cory Cole, MPH[1,2]; Laura Tourdot, MPH[1]; Abbey Ruhland, MPH[1]; Carrie Klumb, MPH[1]; Josh Rounds, MPH[1]; Brittney Bailey, MPH[1]; Gina Liverseed, DNP[1]; Molly Peterson, MPH[1]; J.P. Mahoehney, MPH[1]; Malia Ireland, DVM[1]; Maria Bye, MPH[1]; Sudha Setty, MPH[1]; Maureen Leeds, MPH[1]; Joanne Taylor, PhD[1,3,5]; Stacy Holzbauer, DVM[1,4]; Minnesota Department of Health COVID-19 HCW Monitoring Response Team; Minnesota Department of Health COVID-19 Response Task Force

Health care personnel (HCP) are at increased risk for infection with SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), as a result of their exposure to patients or community contacts with COVID-19 (*1*,*2*). Since the first confirmed case of COVID-19 in Minnesota was reported on March 6, 2020, the Minnesota Department of Health (MDH) has required health care facilities* to report HCP† exposures to persons with confirmed COVID-19 for exposure risk assessment and to enroll HCP with higher-risk exposures into quarantine and symptom monitoring. During March 6–July 11, MDH and 1,217 partnering health care facilities assessed 21,406 HCP exposures; among these, 5,374 (25%) were classified as higher-risk§ (*3*). Higher-risk exposures involved direct patient care (66%) and nonpatient care interactions (e.g., with coworkers and social and household contacts) (34%). Within 14 days following a higher-risk exposure, nearly one third (31%) of HCP who were enrolled in monitoring reported COVID-19–like symptoms,¶ and more than one half (52%) of enrolled HCP with symptoms received positive SARS-CoV-2 test results. Among all HCP with higher-risk exposures, irrespective of monitoring enrollment, 7% received positive SARS-CoV-2 test results. Compared with HCP with higher-risk exposures working in acute care settings, those working in congregate living or long-term care settings more often returned to work (57%), worked while symptomatic (5%), and received a positive test result (10%) during 14-day postexposure monitoring than did HCP working outside of such settings. These data highlight the need for awareness of nonpatient care SARS-CoV-2 exposure risks and for targeted interventions to protect HCP, in addition to residents, in congregate living and long-term care settings. To minimize exposure risk among HCP, health care facilities need improved infection prevention and control, consistent personal protective equipment (PPE) availability and use, flexible sick leave, and SARS-CoV-2 testing access. All health care organizations and HCP should be aware of potential exposure risk from coworkers, household members, and social contacts.

After detection of the first confirmed COVID-19 case in Minnesota on March 6, MDH requested that health care facilities provide a list of HCP who were exposed to persons with laboratory-confirmed SARS-CoV-2 infection. Health care facilities were asked to assess each exposure for evidence of higher risk for transmission. Higher-risk exposures occurred when HCP had close, prolonged contact with a person with confirmed COVID-19 or their secretions or excretions, while not wearing recommended PPE, or close, prolonged contact with persons with COVID-19 in the household or community (*3*). MDH staff members conducted 20-minute telephone risk-assessment interviews with HCP who had unknown or higher-risk exposure. The interviews included questions addressing how the exposure occurred, what type of PPE (if any) was worn, and whether a PPE breach occurred; MDH staff members made recommendations regarding quarantine and symptom monitoring. HCP who did not experience higher-risk exposure were asked to self-monitor for COVID-19–compatible signs or symptoms. For those HCP with higher-risk exposures, MDH recommended voluntary quarantine, including exclusion from work and community activities and daily MDH-supervised health monitoring via an emailed REDCap survey (*4*) for 14 days after the last known exposure. If COVID-19–like

* Health care facilities as defined by MDH include acute care hospitals, critical access hospitals, long-term acute care hospitals, skilled nursing facilities, assisted living facilities, group homes, adult foster care, treatment facilities, dialysis centers, outpatient clinics, dental clinics, home health care, and hospice.

† HCP as defined by MDH include, but are not limited to, emergency medical service personnel, nurses, nursing assistants, physicians, technicians, therapists, phlebotomists, pharmacists, students and trainees, contractual staff members not employed by the health care facility, and persons not directly involved in patient care, but who could be exposed to infectious agents that can be transmitted in the health care setting (e.g., clerical, dietary, environmental services, laundry, security, engineering and facilities management, administrative, billing, and volunteer personnel). HCP does not include clinical laboratory personnel.

§ During February 8–May 18, 2020, CDC exposure risk assessment guidance included medium- and high-risk categories, with risk level based on PPE worn and type of potential contact with a person with confirmed COVID-19. On May 19, CDC's risk assessment was updated to include a single higher-risk exposure category to include close (within 6 feet), prolonged (≥15 minutes or of any duration during an aerosol-generating procedure) contact with a person with confirmed COVID-19 or their secretions or excretions, while not wearing appropriate PPE (https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-risk-assesment-hcp.html), or close, prolonged contact with cases in the household or community (https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-risk-assesment-hcp.html). For the purpose of this analysis, medium-, high- and higher-risk exposures were combined into a single variable and identified as "higher-risk exposures." Higher-risk exposures assessed by MDH included nonpatient care interactions (e.g., coworkers, social contacts, and from household contacts).

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

symptoms were experienced, HCP were encouraged to get tested. If the facility was experiencing a critical staffing shortage, HCP were told that they could return to work during their quarantine period if they were asymptomatic and wore appropriate PPE. HCP named during MDH interviews as close contacts of persons with confirmed COVID-19 were also assessed for exposure and enrolled into symptom monitoring. Information about exposed HCP was cross-referenced with MDH data on confirmed COVID-19 cases to identify HCP who potentially worked while infectious or received positive test results during monitoring. Descriptive analyses of HCP exposures and subsequent infection by exposure and facility type were conducted; facility types were categorized as acute care, ambulatory care, congregate living or long-term care, or other settings. A chi-squared test was used to assess the relationship between facility type and HCP exposure characteristics. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

During March 6–July 11, 2020, MDH and 1,217 participating health care facilities throughout Minnesota assessed 17,330 HCP for 21,406 exposures to a confirmed COVID-19 case in acute or ambulatory care patients (21% of exposures); residents in congregate living or long-term care settings (24%); coworkers (25%); congregate setting outbreak exposures (25%)††; and household or social contacts (5%). Among these, 5,374 (25%) were considered higher-risk exposures, 597 (11%) of which involved HCP caring for patients or residents at multiple facilities.

Among 4,020 (75%) HCP with higher-risk exposures for whom data were available, mean age was 39 years (range = 16–80 years). For 4,669 (87%) higher-risk exposures with available data, common HCP roles included nursing assistant or patient care aide (1,857; 40%), nursing staff members (1,416; 30%), administration (247; 5%), medical provider§§ (220; 5%), and environmental services (155; 3%).

Among 5,374 higher-risk exposures, 4,328 (81%) occurred in a health care setting, and 1,046 (19%) were related to household or social contacts. Among 4,328 exposures in health care settings, 1,380 (32%) involved patients in acute or ambulatory care, 1,185 (27%) involved congregate living or long-term care facility residents, 980 (23%) involved multiple infected HCP or residents in a congregate living or long-term care facility with four or more simultaneous cases, and 783 (18%) involved a coworker (Table 1). Higher-risk exposures involved direct patient care (66%) and nonpatient care interactions (e.g., with coworkers and social and household contacts) (34%). Among COVID-19 investigations that resulted in identification of one or more higher-risk HCP exposure, a single COVID-19 case in congregate living or long-term care resulted in higher-risk exposure of a median of three HCPs (interquartile range [IQR] = 1–6), compared with a median of one exposed HCP per case in acute or ambulatory care (IQR = 1–4). Across settings, an HCP with COVID-19 exposed a median of two coworkers (IQR = 1–3). Within 14 days following a higher-risk exposure, 373 (6.9%) of 5,374 HCP received a positive SARS-CoV-2 test result; HCP exposed to household or social contacts with COVID-19 had the highest positivity rate (13%) among all exposure types.

Data on PPE use for acute care and ambulatory patient exposures were available for 913 higher-risk exposures; among these 822 (90%) HCP were wearing a medical-grade face mask or respirator and 240 (26%) were wearing eye protection. In comparison, when exposed to a congregate living or long-term care resident with COVID-19, significantly fewer HCP were wearing a medical-grade mask or respirator (611 of 905; 68%) or eye protection (140 of 905; 16%) (Table 2).

As of July 11, 3,580 (67%) HCP with higher-risk exposure had enrolled in MDH daily monitoring (Table 1) (Table 3). Among 3,399 HCP who completed 14-day monitoring, 1,060 (31%) reported COVID-19–compatible signs or symptoms during the monitoring period. Median interval between exposure and symptom onset was 7 days (IQR = 5–10 days). HCP working in group homes¶¶ had the highest test positivity rate (16%) during monitoring. HCP working in congregate living or long-term care settings more often worked following higher-risk exposures (57% versus 37%, p<0.001), worked while symptomatic (4.8% versus 1.3%, p<0.001), and received a SARS-CoV-2 positive test result during monitoring (9.6% versus 3%, p<0.001) than did HCP working in acute care.

Discussion

HCP working in congregate living or long-term care settings, including skilled nursing, assisted living, and group home facilities, were less likely to wear appropriate PPE; worked more often when they were symptomatic; and were more likely to receive a positive SARS-CoV-2 test result within 14 days of a higher-risk exposure than were HCP working in acute care settings. These data also highlight the need for awareness of

** 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. **241(d); 5 U.S.C. **552a; 44 U.S.C. **3501 et seq.

†† Outbreak exposures as defined by MDH involved four or more simultaneous cases in HCP or residents in the same congregate setting (i.e., HCP had potential for exposure to multiple person with COVID-19 at time of exposure risk assessment).

§§ The medical provider category as defined by MDH includes medical doctor, doctor of osteopathy, nurse practitioner, and physician assistant.

¶¶ Group homes as defined by MDH included licensed home and community-based services, intermediate care for persons with intellectual disabilities, child foster Services, supervised living facilities, and boarding care.

TABLE 1. Characteristics of higher-risk* SARS-CoV-2 exposures among health care personnel (HCP), by type of exposure investigation — Minnesota, March 6–July 11, 2020†

Characteristic	Exposures among health care personnel by type of exposure					
	Patient	Resident of congregate setting	Congregate setting outbreak exposures§	HCP	Household/ Social	Total
No. (%) of higher-risk HCP exposures§	1,380 (26)	1,185 (22)	980 (18)	783 (15)	1,046 (19)	**5,374 (100)**
No. of confirmed COVID-19 investigations resulting in ≥1 higher-risk HCP exposure	305	280	100	259	919	**1,776**
Median (IQR) higher-risk HCP exposures per case	1 (1–4)	3 (1–6)	4 (1.5–12.5)	2 (1–3)	1 (1–1)	**1 (1–2)**
HCP with higher-risk exposures who received a positive SARS-CoV-2 test result within 14 days of exposure (%)	18 (1.3)	87 (7.3)	107 (10.9)	30 (3.8)	131 (12.5)	**373 (6.9)**
No. (%) of HCP enrolled in MDH monitoring	881 (63.8)	860 (72.6)	757 (77.2)	465 (59.4)	617 (59.0)	**3,580 (66.6)**
No. (%) of enrolled HCP who completed MDH monitoring	861 (97.7)	815 (94.8)	713 (94.2)	458 (98.5)	552 (89.5)	**3,399 (94.9)**
No. (%) HCP reporting symptoms during monitoring	250 (29.0)	302 (37.1)	224 (31.4)	143 (31.2)	141 (25.5)	**1,060 (31.2)**
Median (IQR) days from last exposure to symptom onset	8 (6–11)	7 (5–10)	7 (5–9)	8 (5–11)	4.5 (2–8)	**7 (5–10)**
No. (%) HCP tested for SARS-CoV-2 during monitoring	199 (23.1)	233 (28.6)	270 (37.9)	126 (27.5)	193 (35.0)	**1,021 (30.0)**
No. (%) HCP reporting symptoms who were tested for SARS-CoV-2 during monitoring	125 (50.0)	148 (49.0)	129 (57.6)	68 (47.6)	77 (54.6)	**547 (51.6)**

Abbreviations: COVID-19 = coronavirus disease 2019; IQR = interquartile range; MDH = Minnesota Department of Health.

* High-risk exposure category focused on eyes, nose, and mouth as primary routes of transmission, and HCP in this category lack protection of those areas. Medium-risk exposure category included potential for transmission by contamination of HCP hands or body during patient care activities. On May 19, CDC's risk assessment was updated to include a single higher-risk exposure category. For this analysis, medium-, high- and higher-risk exposures were combined as "higher-risk exposures." Higher-risk exposures assessed by MDH included nonpatient care interactions (e.g., coworkers, social contacts, and from household contacts).

† The denominator includes all higher-risk HCP exposures, not the number of individual HCP exposed.

§ Outbreak exposures as defined by MDH involved four or more simultaneous COVID-19 cases in HCP or residents in the same congregate setting (i.e., HCP had potential for exposure to multiple positive individuals at time of exposure risk assessment).

TABLE 2. Comparison of personal protective equipment (PPE) use and patient source control reported by health care personnel (HCP) during higher-risk* SARS-CoV-2 exposures in acute- and ambulatory-care settings and congregate living and long-term-care settings — Minnesota, March 6–July 11, 2020†

PPE and exposure characteristic	No. (%)		
	Acute- and ambulatory-care setting exposures (n = 913)	Congregate living/long- term care setting exposures (n = 905)	p-value§
HCP mask	757 (82.9)	565 (62.4)	<0.001
HCP respirator	65 (7.1)	46 (5.1)	0.07
HCP eye protection	240 (26.3)	140 (15.5)	<0.001
Patient/Resident mask	119 (13.0)	59 (6.5)	<0.001
HCP no PPE	92 (10.1)	131 (14.5)	0.004
HCP PPE breach	142 (15.6)	101 (11.2)	0.006
HCP in the same room when an AGP¶ was performed	167 (18.3)	34 (3.8)	<0.001

Abbreviation: AGP = aerosol-generating procedure.

* High-risk exposure category focused on eyes, nose, and mouth as primary routes of transmission and HCP in this category lack protection of those areas. Medium-risk exposure category included potential for transmission by contamination of HCP hands or body during patient care activities. On May 19, CDC's risk assessment was updated to include a single higher-risk exposure category. For this analysis, medium-, high- and higher-risk exposures were combined as "higher-risk exposures." Higher-risk exposures assessed by Minnesota Department of Health included nonpatient care interactions (e.g., coworkers, social contacts, and from household contacts).

† The denominator includes all higher-risk HCP exposures, not the number of individual HCP exposed.

§ Calculated with chi-squared test.

¶ AGP included open suctioning of airway secretions, sputum induction, cardiopulmonary resuscitation, endotracheal intubation and extubation, noninvasive positive pressure ventilation (e.g., bilevel positive airway pressure and continuous positive airway pressure), bronchoscopy, manual ventilation; nebulizer was considered an AGP through March 26, 2020.

nonpatient care SARS-CoV-2 exposure risks and for targeted interventions to protect HCP, in addition to residents, in congregate living and long-term care settings. HCP are at high risk for SARS-CoV-2 infection and could introduce and spread COVID-19 in skilled nursing and assisted living facilities, where risk for spread among residents and coworkers is high (*1*,*5*). Congregate living or long-term care facilities often experience PPE shortages and chronic staffing shortages, and workers frequently lack formal training in infection prevention and control practices (*6*). HCP working in multiple long-term care facilities have been shown to be at higher risk for infection (*7*). The disparate exposure risks identified by MDH through HCP risk assessment and monitoring highlight a need for consistent PPE access and infection prevention and control

TABLE 3. Characteristics of health care personnel (HCP) with higher-risk exposure, by type of facility where exposure occurred — Minnesota, March 6–July 11, 2020*

Characteristic	No. (%)							
	Type of facility							
	Type of congregate living/ long-term care facility							
	Skilled nursing	Assisted living	Group home	All congregate settings	Acute care	Ambulatory care	Other settings†	Overall
HCP with higher-risk exposures	1,396 (26)	799 (15)	381 (7)	2,576 (48)	1,953 (36)	306 (6)	539 (10)	**5,374 (100)**
Facilities with confirmed COVID-19 investigations resulting in ≥1 higher-risk HCP exposure	113 (14)	165 (20)	145 (18)	423 (51)	78 (9)	127 (15)	199 (24)	**827 (100)**
Median (IQR) exposures per facility	5 (1–16)	2 (1–4)	1 (1–3)	2 (1–5)	5 (2–18)	1 (1–2)	1 (1–2)	**2 (1–4)**
HCP with higher-risk exposures who tested positive for SARS-CoV-2 within 14 days of exposure (% of all higher-risk exposures)	120 (8.6)	65 (8.1)	62 (16.3)	247 (9.6)	58 (3.0)	20 (6.5)	48 (8.9)	**373 (6.9)**
HCP enrolled in MDH monitoring	1,001 (28)	562 (16)	217 (6)	1,780 (50)	1,256 (35)	201 (6)	343 (10)	**3,580 (100)**
Enrolled HCP who completed MDH monitoring	951 (95.0)	520 (92.5)	197 (90.8)	1,668 (93.7)	1,217 (96.9)	196 (97.5)	318 (92.7)	**3,399 (94.9)**
HCPs reporting symptoms during monitoring	328 (34.5)	168 (32.3)	69 (35.0)	565 (33.9)	339 (27.9)	62 (31.6)	94 (29.6)	**1,060 (31.2)**
Median (IQR) days from last exposure to symptom onset	7 (5–10)	8 (6–9)	7 (4–10)	7 (5–10)	8 (5–10)	8 (6–11)	6 (3–10)	**7 (5–10)**
HCP tested for SARS-CoV-2 during monitoring	258 (27.1)	199 (38.3)	86 (43.7)	543 (32.6)	312 (25.6)	52 (26.5)	114 (35.8)	**1,021 (30.0)**
HCP asked to return to work§ during monitoring	591 (65.5)	316 (67.1)	115 (60.2)	1,022 (65.3)	463 (45.0)	78 (53.4)	158 (51.8)	**1,721 (56.6)**
HCP returned to work§ during monitoring	500 (55.4)	283 (60.1)	100 (52.4)	883 (56.5)	382 (37.2)	65 (44.5)	134 (43.9)	**1,464 (48.1)**
HCP reporting working with symptoms§,¶ during monitoring	41 (4.5)	25 (5.3)	9 (4.7)	75 (4.8)	13 (1.3)	3 (2.1)	7 (2.3)	**98 (3.2)**

Abbreviations: COVID-19 = coronavirus disease 2019; IQR = interquartile range; MDH = Minnesota Department of Health.
* The denominator includes all higher-risk HCP exposures, not the number of individual HCP exposed.
† Other settings include home health, hospice, adult foster care, pharmacies, and mental health and substance use treatment centers.
§ The denominator for these results includes HCP that were enrolled in symptom monitoring after April 7, the date that MDH began asking HCP if they had been asked to return to work and if they had returned in daily symptom monitoring surveys. Denominators include acute-care hospital (n = 1,028), skilled nursing (n = 902), assisted-living facility (n = 471), group home (n = 191), outpatient (n = 146), other (n = 305), and total (n = 3,043).
¶ https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.

training, especially in congregate living and long-term care settings. Recommended PPE use might reduce the number of HCP quarantined, ease staffing shortages, and prevent HCP infection (*8*).

The importance of interventions to prevent SARS-CoV-2 exposures for HCP is highlighted by the finding that approximately one third of higher-risk exposures resulted from exposures to coworkers and to household or social contacts with COVID-19, and not through patient care. HCP exposed to household or social contacts with COVID-19 also had the highest positivity rate among all exposure types. HCP exposures to persons with COVID-19 in social or household settings had the highest test positivity rates during the 14-day monitoring period. Whereas most HCP recognize potential risks to residents or patients, interactions between coworkers in breakrooms, nursing stations, or other gathering areas might lead to higher-risk exposures, because HCP might not practice social distancing or use PPE when they are not working in patient care situations. Genetic sequencing of SARS-CoV-2 isolated from HCP working in Dutch health care facilities demonstrated multiple facility introductions by HCP (*9*). In Minnesota, some HCP working in skilled nursing facilities had genetically diverse SARS-CoV-2 virus strains indicating that they were infected through community or household exposures (*1*). Health care facilities and HCP should recognize the risk for infection from nonpatient care exposures that contribute to infections among HCP. Facilities need to clearly communicate these risks and promote preventative practices, as well as establish monitoring and exclusion protocols for recognized exposures (*10*). Such efforts could reduce risk for onward transmission in the health care setting.

The findings in this report are subject to at least three limitations. First, facilities conducted their own initial risk assessment of exposed HCP, so some HCP exposures initially classified as no- or low-risk might have been misclassified. Second, not all exposed HCP were assessed by this program because some

Summary

What is already known about this topic?

Health care personnel (HCP) are at increased risk for COVID-19 from workplace exposures.

What is added by this report?

Among 21,406 Minnesota SARS-CoV-2 HCP exposures, 5,374 (25%) were higher-risk (within 6 feet, ≥15 minutes, or during an aerosol-generating procedure); exposures involved patient care (66%) and nonpatient contacts (34%). Compared with HCP working in acute care settings, those working in congregate living and long-term care more often worked while symptomatic and received positive SARS-CoV-2 test results.

What are the implications for public health practice?

HCP should recognize potential exposures unrelated to patient care and use prevention measures, including masks. HCP in congregate living and long-term care settings experience considerable risk and pose a transmission risk to residents. Improved access to personal protective equipment, flexible medical leave, and testing is needed.

facilities did not provide a list of exposed HCP to MDH for risk assessment follow-up, and MDH was unable to reach all exposed HCP referred by facilities or enroll all those with higher-risk exposures into monitoring. Finally, some infections of monitored HCP occurring within 14 days of a workplace exposure might have resulted from unrecognized community exposure.

Implementation of a statewide standardized system for HCP exposure reporting and risk assessment and partnership between MDH and occupational health departments at acute care and ambulatory facilities, and nursing directors at congregate living or long-term care facilities enabled and strengthened HCP monitoring. A state-level comprehensive approach to HCP monitoring has enabled MDH and partners to 1) implement a program to identify HCP exposures and provide quarantine guidance and state-supervised symptom monitoring, which might have decreased the risk for SARS-CoV-2 transmission in health care settings; 2) describe HCP exposures, including those potentially associated with infection; and 3) deliver information about risk, testing recommendations, PPE, quarantine, and symptom monitoring directly to HCP. Data from this surveillance program have highlighted the need for HCP to recognize the risk for SARS-CoV-2 exposure risks not associated with patient care and for targeted interventions to protect HCP, in addition to residents, in congregate living and long-term care settings.

Acknowledgments

Kris Bisgard; Emilio Dirlikov; Minnesota's health care personnel; infection control and occupational health staff members; leadership from Minnesota health care facilities.

Minnesota Department of Health COVID-19 HCW Monitoring Response Team

Nicky Anderson, Minnesota Department of Health; Rich Austin, Minnesota Department of Health; Chris Ballard, Minnesota Department of Health; Nick Braun, Minnesota Department of Health; Margaret Brown, Minnesota Department of Health; Rachel Cahoon, Minnesota Department of Health; Amy Casey-Paal, Minnesota Department of Health; Dominique Cavallo, Minnesota Department of Health; Ben Christianson, Minnesota Department of Health; Pete Cole, Minnesota Department of Health; Sarah Conboy, Minnesota Department of Health; Jessica Davis, Minnesota Department of Health; Karmen Dippmann, Minnesota Department of Health; Karl Fernstrom, Minnesota Department of Health; Lydia Fess, Minnesota Department of Health; Barbara Frohnert, Minnesota Department of Health; Patti Fuller, Minnesota Department of Health; Ruth Furan, Minnesota Department of Health; Paul Germann, Minnesota Department of Health; Shelbi Giesel, Minnesota Department of Health; Christopher Greene, Minnesota Department of Health; Erin Hammell, Minnesota Department of Health; Rachel Hannigan, Minnesota Department of Health; Nicole Hedeen, Minnesota Department of Health; Mike Hentges, Minnesota Department of Health; David Hesse, Minnesota Department of Health; Mona Highsmith, Minnesota Department of Health; Catherine Johnson, Minnesota Department of Health; Susan Kalis, Minnesota Department of Health; Nathan Kemp, Minnesota Department of Health; Nathan Kemp, Minnesota Department of Health; Joan Kindt, Minnesota Department of Health; Hannah Kinzer, Minnesota Department of Health; Gretchen Koenigs, Minnesota Department of Health; Alina Kraynak, Minnesota Department of Health; Mary Beth Lacina, Minnesota Department of Health; Susan LaMotte, Minnesota Department of Health; Amy Longhenry, Minnesota Department of Health; Jerry Malloy, Minnesota Department of Health; Jamie Margetta, Minnesota Department of Health; Olga Mastrodemos, Minnesota Department of Health; Davis Melin, Minnesota Department of Health; Laurie Menke, Minnesota Department of Health; Michelle Messer, Minnesota Department of Health; Stephanie Meyer, Minnesota Department of Health; Greg Nelson, Minnesota Department of Health; Jessica Nelson, Minnesota Department of Health; James Noyola, Minnesota Department of Health; Elizabeth Palmi, Minnesota Department of Health; James Peacock, Minnesota Department of Health; Tina Peters, Minnesota Department of Health; Molly Peterson, Minnesota Department of Health; Lauren Piper, Minnesota Department of Health; Angela Serfling, Minnesota Department of Health; Alyssa Steidl, Minnesota Department of Health; Emily Styles, Minnesota Department of Health; Erin Tibbetts, Minnesota Department of Health; Marie Tran, Minnesota Department of Health; Daniel Tranter, Minnesota Department of Health; Brenda Waltz, Minnesota Department of Health; Cynthia Wentkiewicz, Minnesota Department of Health; Kari Witte, Minnesota Department of Health; John Woodside, Minnesota Department of Health.

Minnesota Department of Health COVID-19 Response Task Force

Mary Ellen Bennett, Minnesota Department of Health; Kathy Como-Sabetti, Minnesota Department of Health; Richard Danila, Minnesota Department of Health; Kris Ehresmann, Minnesota Department of Health; Tammy Hale, Minnesota Department of Health; Leslie Lovett, Minnesota Department of Health; Ruth Lynfield, Minnesota Department of Health; Karen Martin, Minnesota Department of Health; Kirk Smith, Minnesota Department of Health; Jacy Walters, Minnesota Department of Health.

Corresponding author: Ashley Fell, ashley.g.fell@state.mn.us.

[1]Minnesota Department of Health; [2]Council of State and Territorial Epidemiologists Fellowship Program, Atlanta, Georgia; [3]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [4]Division of State and Local Readiness, Center for Preparedness and Response, CDC; [5]Epidemic Intelligence Service, CDC.

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

References

1. Taylor J, Carter R, Lehnertz N, et al. Serial testing for SARS-CoV-2 and virus whole genome sequencing inform infection risk at two skilled nursing facilities with COVID-19 outbreaks—Minnesota, April–June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1288–95. https://doi.org/10.15585/mmwr.mm6937a3
2. Burrer SL, de Perio MA, Hughes MM, et al.; CDC COVID-19 Response Team. Characteristics of health care personnel with COVID-19—United States, February 12–April 9, 2020. MMWR Morb Mortal Wkly Rep 2020;69:477–81. https://doi.org/10.15585/mmwr.mm6915e6
3. CDC. Coronavirus disease 2019 (COVID-19): interim U.S. guidance for risk assessment and public health management of healthcare personnel with potential exposure in a healthcare setting to patients with coronavirus disease (COVID-19). Atlanta, GA: US Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-risk-assesment-hcp.html
4. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42:377–81. https://doi.org/10.1016/j.jbi.2008.08.010
5. Arons MM, Hatfield KM, Reddy SC, et al.; Public Health–Seattle and King County and CDC COVID-19 Investigation Team. Presymptomatic SARS-CoV-2 infections and transmission in a skilled nursing facility. N Engl J Med 2020;382:2081–90. https://doi.org/10.1056/NEJMoa2008457
6. Grabowski DC, Mor V. Nursing home care in crisis in the wake of COVID-19. JAMA 2020;324:23–4. https://doi.org/10.1001/jama.2020.8524
7. Ladhani SN, Chow JY, Janarthanan R, et al.; London Care Home Investigation Team. Increased risk of SARS-CoV-2 infection in staff working across different care homes: enhanced CoVID-19 outbreak investigations in London care homes. J Infect 2020;81:621–4. https://doi.org/10.1016/j.jinf.2020.07.027
8. Baker MA, Fiumara K, Rhee C, et al.; CDC Prevention Epicenters Program. Low risk of COVID-19 among patients exposed to infected healthcare workers. Clin Infect Dis 2020. Epub August 28, 2020.
9. Sikkema RS, Pas SD, Nieuwenhuijse DF, et al. COVID-19 in health-care workers in three hospitals in the south of the Netherlands: a cross-sectional study. Lancet Infect Dis 2020;20:30527–2. https://doi.org/10.1016/S1473-3099(20)30527-2
10. Bielicki JA, Duval X, Gobat N, et al. Monitoring approaches for health-care workers during the COVID-19 pandemic. Lancet Infect Dis 2020;20:e261–7. https://doi.org/10.1016/S1473-3099(20)30458-8

Errata

Vol. 69, No. 34

In the report "Support for Transition from Adolescent to Adult Health Care Among Adolescents With and Without Mental, Behavioral, and Developmental Disorders — United States, 2016–2017," on page 1159, the third sentence in the Discussion should have read "However, among adolescents aged 15–17 years, only 21.5% of those **with** MBDDs and 19.5% of those **without** MBDDs were receiving transition planning guidance, indicating a significant gap in transition planning for all adolescents."

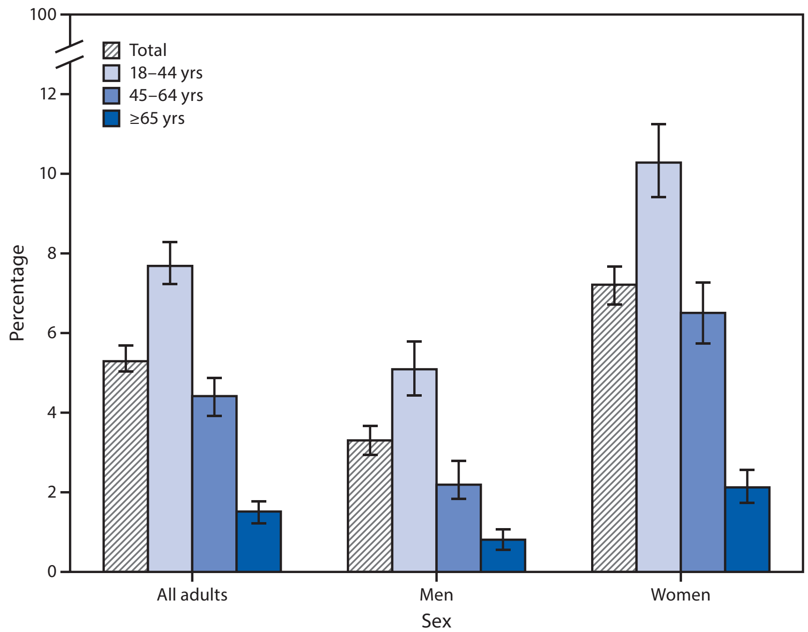
Vol. 69, No. 42

In the report "Valley Fever (Coccidioidomycosis) Awareness — California, 2016–2017," on page 1515, the e-mail address for the Corresponding author, Duc J. Vugia, was incorrect. The correct address is **duc.vugia@cdph.ca.gov**.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Had an Unmet Mental Health Care Need Because of Cost in the Past 12 Months,† by Age Group and Sex — National Health Interview Survey, United States 2019§



* With 95% confidence intervals shown with error bars.
† Adults were considered to have an unmet mental health care need because of cost if they reported delaying getting counseling or therapy or needing but not getting counseling or therapy because of cost in the past 12 months.
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are shown for sample adults aged ≥18 years.

In 2019, 5.3% of adults aged ≥18 years had an unmet mental health care need because of cost in the past 12 months. Women (7.2%) were more likely than men (3.3%) to have an unmet mental health care need because of cost, regardless of age group. The percentage of men with an unmet mental health care need decreased with age, from 5.1% among those aged 18–44 years to 0.8% among those aged ≥65 years. Similarly, the percentage among women decreased with age, from 10.3% among those aged 18–44 years to 2.1% among those aged ≥65 years.

Source: National Center for Health Statistics, National Health Interview Survey, 2019. https://www.cdc.gov/nchs/nhis.htm.

Reported by: Emily P. Terlizzi, MPH, ljx9@cdc.gov, 301-458-4991; Benjamin Zablotsky, PhD.

ISSN: 0149-2195 (Print)