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HIV Preexposure Prophylaxis Awareness and Referral to Providers Among Hispanic/Latino Persons — United States, 2019

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Hispanic or Latino* (Hispanic) persons are disproportionately affected by HIV in the United States. In 2019, Hispanic persons accounted for 18% of the U.S. population, but for 29% of new diagnoses of HIV infection (*1*). The Ending the HIV Epidemic in the U.S. (EHE) initiative aims to reduce new HIV infections by 90% by 2030 (*2*). Preexposure prophylaxis (PrEP), medication taken to prevent acquisition of HIV, is an effective strategy for preventing HIV infection.† To examine PrEP awareness and referral to providers among Hispanic persons, CDC analyzed 2019 National HIV Prevention Program Monitoring and Evaluation HIV testing data. Approximately one quarter (27%) of Hispanic persons tested for HIV at CDC-funded sites (n = 310,954) were aware of PrEP, and 22% of those who received a negative HIV test result and were eligible for referral (111,644) were referred to PrEP providers. PrEP awareness and referrals among Hispanic persons were lower compared with those among non-Hispanic White persons. Among Hispanic persons, significant differences were found in PrEP awareness and referrals by age, gender, race, population group, geographic region, and test setting. HIV testing programs can expand PrEP services for Hispanic persons by implementing culturally and linguistically appropriate strategies that routinize PrEP education and referral, collaborating with health care and other providers, and addressing social and structural barriers.

CDC analyzed 2019 National HIV Prevention Program Monitoring and Evaluation HIV testing data submitted by 60 CDC-funded state, local, and territorial health departments§ and 29 directly funded community-based organizations to assess measures of PrEP awareness¶ and referral to a PrEP provider.** Persons whose HIV status is negative are eligible

* Hispanic persons can be of any race.

† https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2017.pdf

§ Fifty states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and seven Metropolitan Statistical Areas or specified Metropolitan Divisions: Baltimore, Chicago, Houston, Los Angeles County, New York City, Philadelphia, and San Francisco.

¶ PrEP awareness was assessed by HIV test providers documenting a response to the question, "Has the client ever heard of PrEP (PreExposure Prophylaxis)?" The PrEP awareness question was required from all persons testing for HIV although the response could have been collected before or after the test was performed.

** Referral to PrEP providers was assessed by HIV test providers documenting a response to the question, "Was the client given a referral to a PrEP provider?" Referral was provided if the person testing negative for HIV infection met the appropriate clinical criteria for using PrEP or was determined to be eligible for a PrEP referral based on CDC guidelines or local protocol. Referral to providers in this report might include passive referral (e.g., client is provided information about the PrEP provider) as well as active referral (e.g., client is assisted with contacting and making an appointment with the PrEP provider).

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for PrEP referral when they meet the clinical criteria for PrEP prescription based on CDC guidelines or local protocols. PrEP awareness among persons tested for HIV infection was defined by an affirmative response documented by HIV test providers to the question, "Has the client ever heard of PrEP?" Similarly, PrEP referral among persons eligible for referral was defined by an affirmative response documented by HIV test providers to the question, "Was the client given a referral to a PrEP provider?" PrEP awareness and referrals among Hispanic persons were compared with those of persons of other racial and ethnic groups. PrEP measures among Hispanic persons were also compared by age, gender, race,[††] ethnicity,[§§] test setting,[¶¶] U.S. Census region,[***] and population groups defined by transmission risk.[†††] Robust Poisson regression was used to calculate prevalence ratios (PRs) and 95% confidence intervals (CIs). This activity was reviewed and approved by CDC and conducted consistent with applicable federal law and CDC policy.[§§§]

During 2019 in the United States, 2,341,342 CDC-funded HIV tests were conducted. These included 546,337 (23.3%) tests conducted among Hispanic persons, 919,066 (39.3%) among non-Hispanic Black/African American (Black) persons, 658,496 (28.1%) among non-Hispanic White (White) persons, and 217,443 (9.3%) among persons of other or unspecified race. Among all tested persons with PrEP-related data, PrEP awareness was slightly higher among Hispanic persons (27.4%) than among Black persons (26.2%; PR = 1.05; 95% CI = 1.04–1.06) but lower than that among White persons (31.4%; PR = 0.87; 95% CI = 0.87–0.88)

†† Race refers to the client's self-reported classification or classifications of the biologic heritage with which they most closely identify. For this report, Hispanic persons are stratified into three race groups: Black or African American (Black), White, and other, which includes American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander persons, or those with more than one race.

§§ Ethnicity refers to the client's self-report of whether they are of Hispanic or Latino origin.

¶¶ For each CDC-funded test, test setting is the location where the test was administered. Health care settings are clinical settings in which both medical diagnostic and treatment services were provided (e.g., primary care clinics, community health centers, emergency departments). Non–health care settings are nonclinical settings in which neither medical diagnostic nor treatment services are provided (e.g., schools or educational facilities, faith-based facilities, and field testing sites).

*** State and local health department jurisdictions were categorized into the four U.S. Census regions (Northeast, Midwest, South, and West) (https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf). Puerto Rico and the U.S. Virgin Islands were grouped into the category "U.S. territories."

††† Data on behavioral risk characteristics were reported for the last 5 years before the HIV test. Men who have sex with men (MSM) includes males who reported male-to-male sexual contact and represents gay, bisexual, and other MSM; and males who reported both male-to-male sexual contact and injection drug use. Persons who inject drugs include persons who reported injection drug use. Heterosexual males include males who reported only heterosexual contact with a female. Heterosexual females include females who reported only heterosexual contact with a male. Others include transgender persons who inject drugs, transgender persons, women who have sex with women, men or women who have sex with transgender persons, and persons with no history of sexual contact or injection drug use.

§§§ 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.

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and those of other racial or ethnic groups (42.1%; PR = 0.65; 95% CI = 0.64–0.66) (Figure).

Among Hispanic persons, awareness was higher among persons aged 25–49 years (29.9%; PR = 1.07) and lower among those aged ≥50 years (17.0%; PR = 0.60) compared with those aged 13–24 years (28.1%) (Table 1). By gender, compared with females, 14.5% of whom were aware of PrEP, awareness was highest among transgender persons (68.6%; PR = 4.74) followed by males (36.6%; PR = 2.53). Awareness was higher among Black Hispanic persons (39.3%; PR = 1.91) and persons of other races (39.3%; PR = 1.91) than among White Hispanic persons (20.6%). Compared with heterosexual Hispanic females (awareness = 17.5%), PrEP awareness was higher among gay, bisexual, and other men who have sex with men (MSM) (63.5%; PR = 3.62), persons who inject drugs (28.9%; PR = 1.65), and heterosexual males (21.5%; PR = 1.22). Awareness was higher among persons tested in non–health care settings (35.4%; PR = 1.95) than among those tested in health care settings (18.1%). By U.S. Census region, PrEP awareness was lower among Hispanic persons tested in the West (49.1%; PR = 0.87), Midwest (30.1%; PR = 0.54), South (13.4%; PR = 0.24), and U.S. territories (12.9%; PR = 0.23) than among those tested in the Northeast (56.2%).

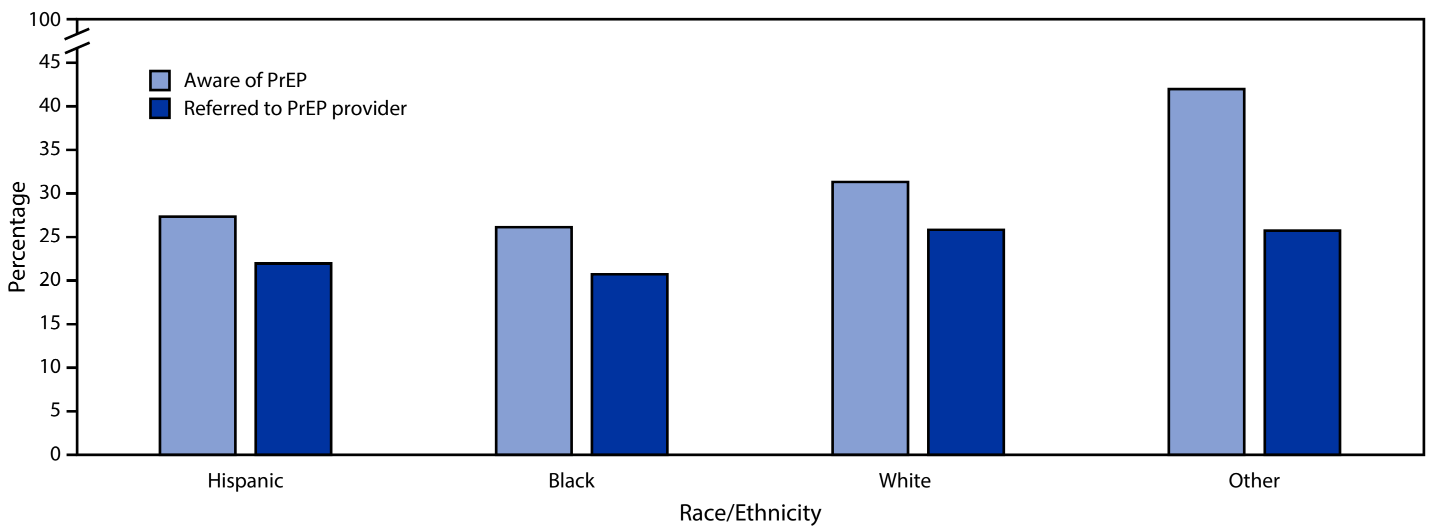
Overall, referral to a PrEP provider was higher among Hispanic persons (22.0%) compared with non-Hispanic Black persons (20.8%; PR = 1.06; 95% CI = 1.04–1.07) but lower when compared with non-Hispanic White persons (25.9%; PR = 0.85; 95% CI = 0.84–0.86) and those of other racial/ethnic groups (25.8%; PR = 0.85; 95% CI= 0.83–0.87) (Figure).

Among Hispanic persons eligible for referral to a PrEP provider, PrEP referral was higher among Hispanic persons aged 25–49 years (22.8%; PR = 1.05) and lower among those aged ≥50 years (16.6%; PR = 0.77) compared with those aged 13–24 years (21.7%) (Table 2). By gender, referral was higher among transgender persons (30.3%; PR = 2.04) and males (25.7%; PR = 1.73) than among females (14.8%). PrEP referral was lower among Black Hispanic persons (13.4%; PR = 0.55) and Hispanic persons of other races (21.6%; PR = 0.89) than among White Hispanic persons (24.3%). PrEP referral was higher among Hispanic MSM (39.5%; PR = 2.57) and persons who inject drugs (17.2%; PR = 1.12) but lower among heterosexual males (11.7%; PR = 0.76) than heterosexual females (15.4%). By test setting, PrEP referral was lower among persons tested in non–health care settings (20.4%; PR = 0.83) than among those tested in health care settings (24.6%). By U.S. Census region, PrEP referral was higher among Hispanic persons tested in the Midwest (32.9%; PR = 2.14), South (26.9%; PR = 1.75), and West (17.8%; PR = 1.16) and lower among those tested in U.S. territories (13.4%; PR = 0.87) compared with persons tested in the Northeast (15.4%).

Discussion

Approximately one in four Hispanic persons who received a CDC-funded HIV test was aware of PrEP, and approximately one in five who were eligible for PrEP referral was referred to a

FIGURE. Preexposure prophylaxis awareness and referral to preexposure prophylaxis providers, by race and ethnicity* — United States, 2019†,§



Abbreviation: PrEP = preexposure prophylaxis.
* Black, White, and persons of other races were non-Hispanic; Hispanic persons could be of any race.
† Valid HIV tests for this analysis include tests for which a test result (i.e., positive or negative) was known and had a nonmissing value for PrEP awareness and referral.
§ PrEP awareness among persons tested for HIV infection was defined by an affirmative response documented by HIV test providers to the question, "Has the client ever heard of PrEP?" PrEP referral among persons eligible for referral was defined by an affirmative response documented by HIV test providers to the question, "Was the client given a referral to a PrEP provider?" This analysis excluded HIV tests with missing values on PrEP awareness and referral to a PrEP provider.

TABLE 1. Preexposure prophylaxis awareness among Hispanic persons tested for HIV infection, by demographic characteristics, U.S. Census region, and test setting — United States, 2019

	No. of persons (column %)		
Characteristic	**Tested for HIV infection***	**Aware of PrEP***	**PR (95% CI)**
Total (row %)	**310,954 (100.0)**	**85,288 (27.4)**	**N/A**
Age group, yrs†			
13–24	80,166 (25.8)	22,494 (28.1)	Ref
25–49	183,396 (59.0)	54,887 (29.9)	1.07 (1.05–1.08)
≥50	44,226 (14.2)	7,500 (17.0)	0.60 (0.59–0.62)
Gender§			
Female	133,308 (42.9)	19,308 (14.5)	Ref
Male	172,769 (55.6)	63,207 (36.6)	2.53 (2.49–2.56)
Transgender	3,517 (1.1)	2,414 (68.6)	4.74 (4.62–4.86)
Race¶			
White	185,173 (59.5)	38,181 (20.6)	Ref
Black	20,488 (6.6)	8,054 (39.3)	1.91 (1.87–1.94)
Other	10,110 (3.3)	3,978 (39.3)	1.91 (1.86–1.96)
Population group**			
Heterosexual female	88,234 (28.4)	15,469 (17.5)	Ref
Gay, bisexual, and other male who has sex with males	66,657 (21.4)	42,312 (63.5)	3.62 (3.57–3.68)
Person who injects drugs	11,937 (3.8)	3,444 (28.9)	1.65 (1.59–1.70)
Heterosexual male	65,276 (21.0)	14,010 (21.5)	1.22 (1.20–1.25)
Test setting††			
Health care setting	181,348 (58.3)	32,846 (18.1)	Ref
Non–health care settings	109,231 (35.1)	38,637 (35.4)	1.95 (1.93–1.98)
U.S. Census region			
Northeast	32,232 (10.4)	18,109 (56.2)	Ref
Midwest	17,139 (5.5)	5,159 (30.1)	0.54 (0.52–0.55)
South	173,218 (55.7)	23,259 (13.4)	0.24 (0.24–0.24)
West	75,479 (24.3)	37,095 (49.1)	0.87 (0.86–0.89)
U.S. territories§§	12,886 (4.1)	1,666 (12.9)	0.23 (0.22–0.24)

Abbreviations: CI = confidence interval; N/A = not applicable; PR = prevalence ratio; PrEP = preexposure prophylaxis; Ref = referent group.

* Valid HIV tests for this analysis included tests for which a test result (i.e., positive or negative) was known and had a nonmissing value on PrEP awareness. PrEP awareness was assessed by HIV test providers documenting a response to the following question, "Has the client ever heard of PrEP?"

† For age, the numbers of records missing or invalid are as follows: 3,166 (1.0%) in the column "Tested for HIV infection" and 407 (0.5%) in the column "Aware of PrEP."

§ For gender, the numbers of records missing or invalid are as follows: 1,360 (0.4%) in the column "Tested for HIV infection" and 359 (0.4%) in the column "Aware of PrEP."

¶ Race categories include the following: "White" = Hispanic White; "Black" = Hispanic Black or African American; and "Other" = Hispanic persons of other races including Asian, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and multirace. For race, the numbers of records missing or invalid are as follows: 95,183 (30.6%) in the column "Persons tested for HIV infection" and 35,075 (41.1%) in the column "Aware of PrEP."

** For population groups, the numbers of records missing or invalid are as follows: 23,002 (7.4%) in the column "Tested for HIV infection" and 3,399 (4.0%) in the column "Aware of PrEP." In addition, the numbers of records for "other" excluded from this table are as follows: 55,848 (18.0%) in the column "Tested for HIV infection" and 6,654 (7.8%) in the column "Aware of PrEP."

†† Mobile settings and unknown settings are excluded.

§§ Includes Puerto Rico and the U.S. Virgin Islands.

TABLE 2. Referral to preexposure prophylaxis providers among Hispanic persons who were eligible for PrEP, by demographic characteristics, U.S. Census region, and test setting — United States, 2019

	Eligible for a PrEP referral*	Referred to a PrEP provider*	
Characteristic	**No. (column %)**	**No. (row %)**	**PR (95% CI)**
Total	**111,644 (100.0)**	**24,506 (22.0)**	**N/A**
Age group, yrs†			
13–24	32,698 (29.3)	7,088 (21.7)	Ref
25–49	68,061 (61.0)	15,538 (22.8)	1.05 (1.03–1.08)
≥50	10,333 (9.3)	1,717 (16.6)	0.77 (0.73–0.80)
Gender§			
Female	39,339 (35.2)	5,828 (14.8)	Ref
Male	69,966 (62.7)	17,981 (25.7)	1.73 (1.69–1.78)
Transgender	1,920 (1.7)	581 (30.3)	2.04 (1.90–2.19)
Race¶			
White	58,960 (52.8)	14,318 (24.3)	Ref
Black	11,235 (10.1)	1,509 (13.4)	0.55 (0.53–0.58)
Other	4,795 (4.3)	1,037 (21.6)	0.89 (0.84–0.94)
Population group**			
Heterosexual females	32,429 (29.0)	4,980 (15.4)	Ref
Gay, bisexual, and other male who has sex with males	34,583 (31.0)	13,645 (39.5)	2.57 (2.50–2.64)
Person who injects drugs	6,777 (6.1)	1,166 (17.2)	1.12 (1.06–1.19)
Heterosexual male	27,814 (24.9)	3,243 (11.7)	0.76 (0.73–0.79)
Test setting††			
Health care settings	54,105 (48.5)	13,323 (24.6)	Ref
Non–health care settings	53,574 (48.0)	10,916 (20.4)	0.83 (0.81–0.85)
U.S. Census region			
Northeast	28,325 (25.4)	4,353 (15.4)	Ref
Midwest	8,445 (7.6)	2,775 (32.9)	2.14 (2.05–2.23)
South	45,878 (41.1)	12,363 (26.9)	1.75 (1.70–1.81)
West	25,450 (22.8)	4,540 (17.8)	1.16 (1.12–1.21)
U.S. territories§§	3,546 (3.2)	475 (13.4)	0.87 (0.80–0.95)

Abbreviations: CI = confidence interval; N/A = not applicable; PR = prevalence ratio; PrEP = preexposure prophylaxis; Ref = referent group.

* Eligibility for a PrEP referral was assessed by HIV test providers documenting a response to the question, "Was the client eligible for a referral to a PrEP provider?" Referral to a PrEP provider was assessed by HIV test providers documenting a response to the question, "Was the client given a referral to a PrEP provider)?" HIV tests with missing values for eligibility for PrEP referral and referral to a PrEP provider were excluded.

† For age, the numbers of records missing or invalid are as follows: 552 (0.5%) in the column "Eligible for a PrEP referral" and 163 (0.7%) in the column "Referred to a PrEP provider."

§ For gender, the numbers of records missing or invalid are as follows: 419 (0.4%) in the column "Eligible for a PrEP referral" and 116 (0.5%) in the column "Referred to a PrEP provider."

¶ Race categories include the following: "White" = Hispanic White; "Black" = Hispanic Black or African American; and "Other" = Hispanic persons of other races including Asian, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and multirace. For race, the numbers of records missing or invalid are as follows: 36,654 (32.8%) in the column "Eligible for a PrEP referral" and 7,642 (31.2%) in the column "Referred to a PrEP provider."

** For population groups, the numbers of records missing or invalid are as follows: 1,747 (1.6%) in the column "Eligible for a PrEP referral," and 360 (1.5%) in the column "Referred to a PrEP provider." In addition, the numbers of records for "other" excluded from this table are as follows: 8,294 (7.4%) in the column "Eligible for a PrEP referral" and 1,112 (4.5%) in the column "Referred to a PrEP provider."

†† Mobile settings and setting unknown are excluded.

§§ Includes Puerto Rico and the U.S. Virgin Islands.

PrEP provider. PrEP use is increasing among Hispanic persons in the United States (*3*); however, low levels of PrEP awareness and referrals to PrEP providers among Hispanic persons in general and compared with non-Hispanic White persons suggest a need to identify and remove barriers to awareness of, referral to, and receipt of PrEP services. Routinizing PrEP education and referrals, expanding coverage for PrEP medications, and implementing culturally and linguistically relevant strategies might improve optimal and equitable use of PrEP among Hispanic persons at risk for HIV infection (*4*).

PrEP awareness and referral were higher among Hispanic MSM and transgender persons than among those in other population groups. This finding is consistent with other studies that have documented higher PrEP coverage among MSM and transgender persons (*3*,*5*). Given that HIV incidence and prevalence are substantially higher among MSM and transgender persons (*1*,*6*), efforts to further increase PrEP awareness and referral among these populations are important to reach persons who might benefit from a PrEP prescription. PrEP referral was lower among Black Hispanic persons compared with that among White Hispanic persons, consistent with lower PrEP coverage among Black persons compared with other racial or ethnic groups (*6*), suggesting that Black Hispanic persons might experience additional challenges to accessing PrEP services.

Hispanic persons tested in the South and U.S. territories had the lowest levels of PrEP awareness. Communities in the South and U.S. territories are disproportionately affected by HIV (*2*,*6*) and have higher need for PrEP services. Low PrEP coverage in the South and other regions is attributed to individual, social, and structural barriers, including lack of health insurance; PrEP- and HIV-related stigma; lower HIV risk perception; limited availability of PrEP services in primary care and sexually transmitted disease clinics and community health centers; and lack of effective messaging about PrEP (*7*–*9*). In addition, immigration status, English language fluency, and education level are barriers to PrEP access among Hispanic persons (*8*).

PrEP referrals were higher among Hispanic persons tested in health care settings than among those tested in non–health care settings. Health care settings might have routinized referrals to PrEP providers. Health care providers can improve PrEP awareness and use by discussing PrEP benefits, developing culturally tailored messages to destigmatize PrEP, and integrating PrEP into routine primary care (*7*,*9*). Establishing linkage agreements with clinical providers and expanding PrEP navigation might increase PrEP referrals in non–health care settings (*10*).

The findings in this report are subject to at least three limitations. First, data were based on CDC-funded HIV testing programs that were not representative of all U.S. HIV testing programs or persons receiving PrEP care in non–CDC-funded HIV testing programs. Second, data were collected at the test level and might overrepresent persons tested multiple times. Finally, the percentages of Hispanic persons who were aware of PrEP and those referred to a PrEP provider might be overestimated because missing records were excluded from the denominators.

Summary

What is already known about this topic?

Hispanic or Latino (Hispanic) persons are disproportionately affected by HIV. Preexposure prophylaxis (PrEP) is an effective strategy to prevent HIV infection.

What is added by this report?

Approximately one in four Hispanic persons tested for HIV at CDC-funded sites was aware of PrEP, and 22% of those eligible for referral were referred to PrEP providers. PrEP awareness and referrals among Hispanic persons were lower compared with those among non-Hispanic White persons.

What are the implications for public health practice?

HIV testing programs can expand PrEP services for Hispanic persons by implementing culturally and linguistically appropriate strategies that routinize PrEP education and referral, collaborating with health care and other providers, and addressing social and structural barriers.

Broader implementation of PrEP services among Hispanic persons at risk for HIV infection is an essential strategy of the EHE initiative (*2*). CDC has developed an integrated HIV prevention campaign, Let's Stop HIV Together/Detengamos Juntos el VIH,¶¶¶ featuring messaging and resources to increase PrEP awareness and use among Spanish speakers. In addition, the Ready, Set, PrEP**** program provides free PrEP medication to eligible persons. HIV prevention programs can help achieve the goals of the EHE initiative by addressing individual, social, and structural barriers to receipt of PrEP services, collaborating with health care and other providers, expanding health care coverage, and implementing culturally and linguistically relevant strategies for Hispanic persons.

¶¶¶ https://www.cdc.gov/stophivtogether/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Factagainstaids%2Fabout%2Findex.html

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

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References

1. CDC. Estimated HIV incidence and prevalence in the United States, 2015–2019: HIV surveillance report: supplemental report. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-supplemental-report-vol-26-1.pdf
2. US Department of Health and Human Services. What is ending the HIV epidemic in the U.S.? Washington, DC: US Department of Health and Human Services; 2021. https://www.hiv.gov/federal-response/ending-the-hiv-epidemic/overview
3. Kamitani E, Wichser ME, Adegbite AH, et al. Increasing prevalence of self-reported HIV preexposure prophylaxis use in published surveys: a systematic review and meta-analysis. AIDS 2018;32:2633–5. PMID:30096073 https://doi.org/10.1097/QAD.0000000000001983
4. Page KR, Martinez O, Nieves-Lugo K, et al. Promoting pre-exposure prophylaxis to prevent HIV infections among sexual and gender minority Hispanics/Latinxs. AIDS Educ Prev 2017;29:389–400. PMID:29068715 https://doi.org/10.1521/aeap.2017.29.5.389
5. Kamitani E, Johnson WD, Wichser ME, Adegbite AH, Mullins MM, Sipe TA. Growth in proportion and disparities of HIV PrEP use among key populations identified in the United States national goals: systematic review and meta-analysis of published surveys. J Acquir Immune Defic Syndr 2020;84:379–86. PMID:32205721 https://doi.org/10.1097/QAI.0000000000002345
6. CDC. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas, 2019. HIV Surveillance Supplemental Report 2021;26(No. 2). Atlanta, GA: US Department of Health and Human Services, CDC; 2021. https://www.cdc.gov/hiv/library/reports/hiv-surveillance.html
7. Sullivan PS, Mena L, Elopre L, Siegler AJ. Implementation strategies to increase PrEP use in the South. Curr HIV/AIDS Rep 2019;16:259–69. PMID:31177363 https://doi.org/10.1007/s11904-019-00447-4
8. Brooks RA, Landrian A, Lazalde G, Galvan FH, Liu H, Chen YT. Predictors of awareness, accessibility, and acceptability of pre-exposure prophylaxis (PrEP) among English- and Spanish-speaking Latino men who have sex with men in Los Angeles, California. J Immigr Minor Health 2020;22:708–16. PMID:31823164 https://doi.org/10.1007/s10903-019-00955-w
9. Pinto RM, Berringer KR, Melendez R, Mmeje O. Improving PrEP implementation through multilevel interventions: a synthesis of the literature. AIDS Behav 2018;22:3681–91. PMID:29872999 https://doi.org/10.1007/s10461-018-2184-4
10. Hosek SG. HIV pre-exposure prophylaxis diffusion and implementation issues in nonclinical settings. Am J Prev Med 2013;44(Suppl 2):S129–32. PMID:23253753 https://doi.org/10.1016/j.amepre.2012.09.032

Prevalence of Arthritis and Arthritis-Attributable Activity Limitation — United States, 2016–2018

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Arthritis has been the most frequently reported main cause of disability among U.S. adults for >15 years (*1*), was responsible for >$300 billion in arthritis-attributable direct and indirect annual costs in the U.S. during 2013 (*2*), is linked to disproportionately high levels of anxiety and depression (*3*), and is projected to increase 49% in prevalence from 2010-2012 to 2040 (*4*). To update national prevalence estimates for arthritis and arthritis-attributable activity limitation (AAAL) among U.S. adults, CDC analyzed combined National Health Interview Survey (NHIS) data from 2016–2018. An estimated 58.5 million adults aged ≥18 years (23.7%) reported arthritis; 25.7 million (10.4% overall; 43.9% among those with arthritis) reported AAAL. Prevalence of both arthritis and AAAL was highest among adults with physical limitations, few economic opportunities, and poor overall health. Arthritis was reported by more than one half of respondents aged ≥65 years (50.4%), adults who were unable to work or disabled* (52.3%), or adults with fair/poor self-rated health (51.2%), joint symptoms in the past 30 days (52.2%), activities of daily living (ADL)† disability (54.8%), or instrumental activities of daily living (IADL)§ disability (55.9%). More widespread dissemination of existing, evidence-based, community-delivered interventions, along with clinical coordination and attention to social determinants of health (e.g., improved social, economic, and mental health opportunities), can help reduce widespread arthritis prevalence and its adverse effects.

NHIS is an ongoing, nationally representative, in-person interview health survey of the noninstitutionalized, U.S. civilian population. Analyses were limited to adults aged ≥18 years. Unweighted sample sizes and final response rates of the Sample Adult component¶ for 2016, 2017, and 2018 were 33,028 (54.3%); 26,742 (53.0%); and 25,417 (53.1%), respectively. Arthritis was ascertained by a response of "yes" to, "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" AAAL was ascertained among those with arthritis by a response of "yes" to, "Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?" Annualized unadjusted and age-standardized** prevalence estimates of arthritis and AAAL were generated overall and by selected sociodemographic,†† health,§§ and function characteristics.¶¶ Sampling weights were applied to account for the complex survey design, to generate nationally representative estimates, and to adjust for nonresponse. Subgroup differences were assessed using pairwise t-tests; orthogonal linear contrasts were performed to conduct linear trend tests in ordinal variables. Unadjusted estimates are reported in text unless otherwise noted; all differences are significant at $\alpha = 0.05$. To examine change over time, a secondary analysis using identical methods was conducted to produce annualized absolute prevalence estimates of arthritis and AAAL for the combined years 2003–2005, 2007–2009, 2010–2012, and 2013–2015. These years were chosen to correspond to previous surveillance reports.*** A linear model trend test was conducted with significance set at $\alpha = 0.05$.††† Analyses were conducted in SAS (version 9.4; SAS Institute) and SUDAAN

* This category is a combination of respondents self-reporting their reason for not working as: "temporarily unable to work because of health reasons" or "disabled."

† ADL disability was queried in the Person File and matched to respondents in the Sample Adult file, identified by "yes" to, "Because of a physical, mental, or emotional problem, [do you] need the help of other persons with personal care needs, such as eating, bathing, dressing, or getting around inside this home?"

§ IADL disability was queried in the Person File and matched to respondents in the Sample Adult file, identified by "yes" to, "Because of a physical, mental, or emotional problem, [do you] need the help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?"

¶ Survey description documents are available at https://www.cdc.gov/nchs/nhis/1997-2018.htm.

** Age-standardized to the 2000 projected U.S. population with three age groups (18–44, 45–64, and ≥65 years). https://www.cdc.gov/nchs/data/statnt/statnt20.pdf

†† Age, sex, race and ethnicity, sexual identity, education, employment status, and income-to-poverty ratio values for the income-to-poverty ratio variable were calculated using NHIS imputed income files https://www.cdc.gov/nchs/data/nhis/tecdoc18.pdf.

§§ Body mass index [weight (kg)/(height [m])^2] reported as: under/healthy weight (<25.0), overweight (25.0–29.9), or obese (≥30); aerobic physical activity level reported as: active (≥150 minutes), insufficiently active (1–149 minutes), or inactive (0 minutes) moderate-intensity leisure-time aerobic physical activity per 2018 Physical Activity Guidelines for Americans (https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf); psychological distress (none/mild, moderate, severe measured by the Kessler-6 Scale https://www.hcp.med.harvard.edu/ncs/k6_scales.php); self-rated health (excellent/very good, good, or fair/poor).

¶¶ Measured by joint symptoms (pain, aching, or stiffness in the past 30 days), ADL disability, and IADL disability.

*** https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5540a2.htm?s_cid = mm5540a2_e; https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5939a1.htm?s_cid = mm5939a1_w; https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6244a1.htm; and https://www.cdc.gov/mmwr/volumes/66/wr/mm6609e1.htm

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

(version 11.0; RTI International). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[§§§]

During 2016–2018, 58.5 million U.S. adults aged ≥18 years (23.7%; 21.5% age-standardized) are estimated to have arthritis; 25.7 million (43.9%; 40.8% age-standardized) of those with arthritis are estimated to have AAAL (Figure), representing 10.4% (9.4% age-standardized) of the total U.S. adult population. Annualized absolute prevalence of both arthritis and AAAL continues nearly two decades of an increasing statistically significant linear trend (Figure). Prevalence of arthritis increased with increasing age, body mass index (BMI), aerobic physical inactivity, and worsening psychological distress and self-rated health, and decreased with increasing educational attainment and income-to-poverty ratio (Table 1). Arthritis prevalence was >50% among adults aged ≥65 years (50.4%), adults who were unable to work or disabled (52.3%), and adults with fair/poor self-rated health (51.2%), joint symptoms in the past 30 days (52.2%), ADL disability (54.8%), and IADL disability (55.9%).

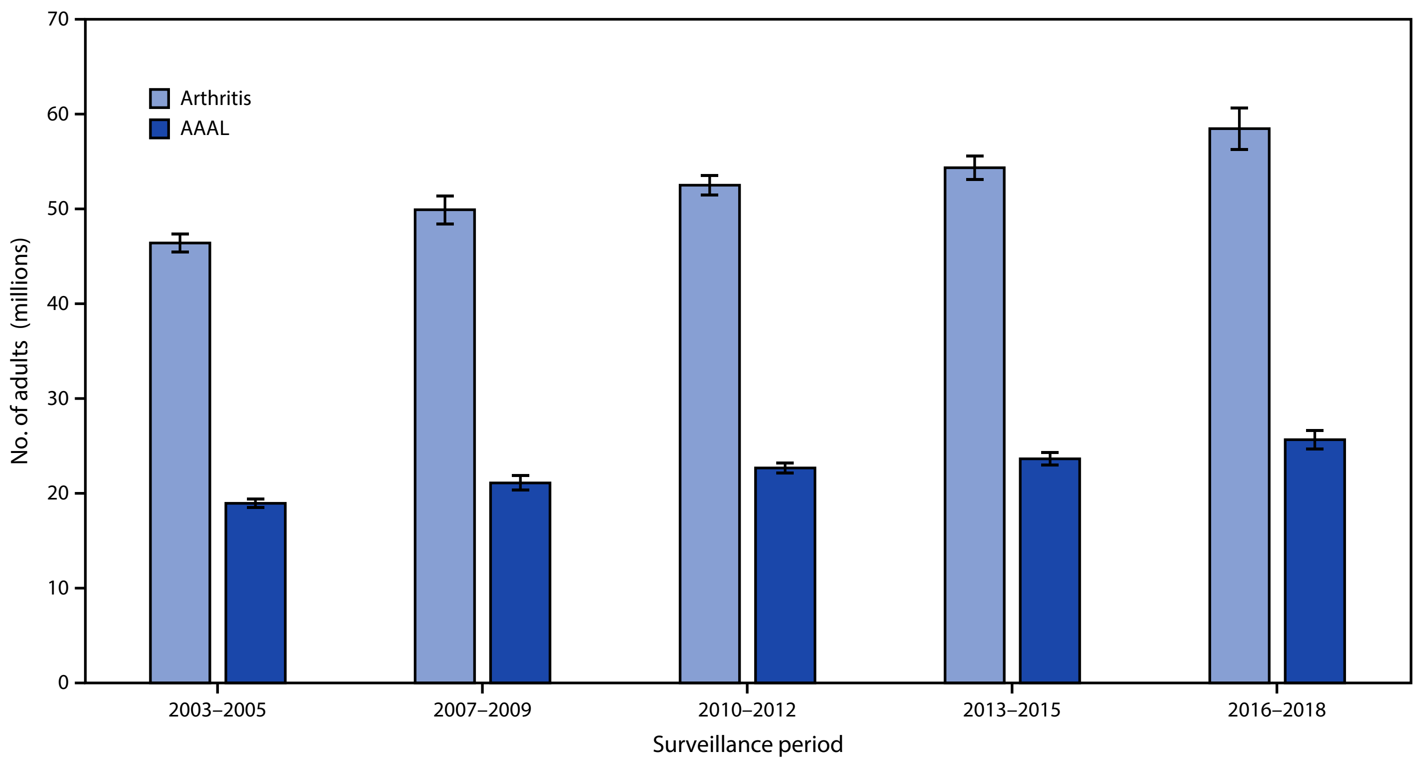
Among adults with arthritis, unadjusted prevalence of AAAL exceeded 50% in several groups, including adults with joint symptoms in the past 30 days (51.6%), adults who were unable to work or disabled (54.7%), adults of other/multiple races (54.5%) or non-Hispanic American Indian or Alaska Natives (60.7%), adults with low income (53.3%) or poor/near poor income-to-poverty ratios (63.3%), or with moderate psychological distress (59.5%) (Table 2). AAAL was also reported by a high proportion of adults with arthritis who had an ADL disability (82.6%), IADL disability (80.4%), serious psychological distress (76.3%), or fair/poor self-rated health (72.6%).

Discussion

Annualized estimates from 2016–2018 indicate that the number of U.S. adults with arthritis (58.5 million) and AAAL (25.7 million) increased compared with 2013–2015 estimates (54.4 million and 23.7 million, respectively) (*5*). Arthritis

[§§§] 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. Weighted number of adults aged ≥18 years with arthritis* and arthritis-attributable activity limitation[†,§,¶,] — National Health Interview Survey, United States, 2003–2018**



Abbreviation: AAAL = arthritis-attributable activity limitation.
* Responded "yes" to, "Have you ever been told by a doctor or other health professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"
† Responded "yes" to, "Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?"
§ 95% confidence intervals indicated by error bars.
¶ Separate linear model trend tests were conducted for both outcomes with significance set at $\alpha = 0.05$.
** The p for trend for both outcomes was <0.001.

TABLE 1. Unadjusted and age-standardized* annualized prevalence of doctor-diagnosed arthritis† among adults aged ≥18 years — National Health Interview Survey, United States, 2016–2018

Characteristic	No. of adults with arthritis (unweighted)§	No. of adults with arthritis in population§ (millions)	Distribution among adults with arthritis¶ (%)	Prevalence of doctor-diagnosed arthritis, % (95% CI)	
				Unadjusted	Age-standardized
Overall	**23,921**	**58.5**	**100**	**23.7 (23.2–24.2)**	**21.5 (21.1–21.9)**
Sociodemographic characteristic					
Age group, yrs					
18–44	2,594	8.1	13.8	7.1 (6.7–7.5)	—
45–64	9,313	25.4	43.5	30.5 (29.7–31.4)	—
≥65	12,014	25.0	42.7	50.4 (49.4–51.3)	—
Sex					
Male	9,159	23.8	40.7	20.0 (19.4–20.6)	18.5 (18.0–19.0)
Female	14,762	34.7	59.3	27.2 (26.5–27.8)	24.2 (23.6–24.7)
Race/Ethnicity					
Hispanic or Latino, any race	1,733	5.4	9.3	13.7 (12.7–14.6)	16.4 (15.5–17.3)
White, NH	18,399	43.4	74.2	27.6 (27.0–28.2)	23.2 (22.7–23.7)
Black, NH	2,548	6.4	10.9	22.0 (20.8–23.2)	21.8 (20.8–22.9)
Asian or Other Pacific Islander, NH	549	1.7	3.0	11.9 (10.6–13.2)	12.2 (11.0–13.5)
American Indian or Alaska Native, NH	211	0.5	0.8	26.3 (20.9–31.6)	26.8 (22.0–32.3)
Other/Multiple races, NH	481	1.1	1.9	23.5 (20.9–26.1)	26.9 (24.6–29.4)
Sexual identity					
Lesbian or gay	356	0.8	1.4	21.2 (18.9–23.6)	22.4 (20.0–25.0)
Straight	22,498	55.1	96.5	23.9 (23.3–24.4)	21.4 (21.0–21.9)
Bisexual	197	0.5	0.8	16.9 (14.1–19.8)	25.6 (22.1–29.5)
Something else/Don't know the answer**	336	0.7	1.2	22.2 (19.1–25.5)	22.4 (19.8–25.2)
Education					
Less than high school graduate	3,310	7.8	13.4	26.9 (25.7–28.0)	22.0 (21.1–23.0)
High school graduate or equivalent	6,494	16.0	27.4	26.5 (25.5–27.4)	23.0 (22.2–23.7)
Some college	7,631	18.3	31.4	24.3 (23.5–25.1)	23.4 (22.7–24.0)
College degree or greater	6,410	16.2	27.8	20.0 (19.3–20.7)	18.5 (18.0–19.1)
Employment status					
Employed/Self-employed	8,849	24.4	41.8	15.7 (15.2–16.2)	18.2 (17.7–18.8)
Unemployed	475	1.3	2.2	14.9 (13.3–16.5)	20.0 (17.9–22.2)
Unable to work/Disabled††	3,578	8.4	14.4	52.3 (50.6–54.0)	43.1 (41.3–44.9)
Other§§	11,012	24.3	41.7	36.7 (35.7–37.7)	21.8 (21.1–22.6)
Income-to-poverty ratio¶¶					
Poor/Near poor (<125%)	4,811	10.1	17.2	24.7 (23.7–25.8)	25.7 (24.8–26.7)
Low income (125% to <200%)	3,554	7.9	13.6	25.1 (24.0–26.1)	22.7 (21.8–23.7)
Middle income (200% to <400%)	6,972	17.1	29.2	24.1 (23.3–24.9)	21.6 (21.0–22.3)
High income (≥400%)	8,583	23.4	40.0	22.6 (22.0–23.3)	19.7 (19.2–20.3)
Health characteristic					
BMI (kg/m²)					
Under/Healthy weight (<25.0)	6,128	14.6	25.8	17.6 (17.0–18.2)	17.2 (16.7–17.7)
Overweight (25.0 to <30.0)	7,609	18.4	32.6	22.2 (21.6–22.9)	19.1 (18.5–19.6)
Obese (≥30.0)	9,349	23.5	41.6	32.0 (31.1–32.9)	28.8 (28.1–29.5)
Aerobic physical activity level***					
Meets recommendations	9,598	24.1	41.9	18.8 (18.3–19.4)	19.1 (18.6–19.6)
Insufficiently active	5,443	13.3	23.1	27.0 (26.1–27.9)	23.4 (22.7–24.2)
Inactive	8,426	20.1	34.9	30.9 (29.9–31.9)	24.3 (23.5–25.1)
Joint symptoms†††					
Yes	17,973	43.9	75.1	52.2 (51.4–53.0)	42.0 (41.1–42.8)
No	5,943	14.6	24.9	9.0 (8.6–9.3)	9.6 (9.3–10.0)
ADL disability§§§					
Yes	1,493	3.3	5.7	54.8 (52.2–57.5)	41.4 (37.9–44.9)
No	22,426	55.2	94.3	22.9 (22.4–23.4)	21.1 (20.6–21.5)
IADL disability¶¶¶					
Yes	3,098	6.5	11.1	55.9 (54.0–57.7)	41.8 (39.5–44.0)
No	20,818	52.0	88.9	22.1 (21.6–22.6)	20.5 (20.1–21.0)

See table footnotes on the next page.

TABLE 1. (*Continued*) Unadjusted and age-standardized* annualized prevalence of doctor-diagnosed arthritis† among adults aged ≥18 years — National Health Interview Survey, United States, 2016–2018

Characteristic	No. of adults with arthritis (unweighted)§	No. of adults with arthritis in population§ (millions)	Distribution among adults with arthritis¶ (%)	Prevalence of doctor-diagnosed arthritis, % (95% CI)	
				Unadjusted	Age-standardized
Psychological distress******					
None/Mild	16,450	40.2	70.7	21.4 (20.8–21.9)	18.8 (18.4–19.3)
Moderate	5,236	12.8	22.5	29.9 (28.9–30.8)	29.4 (28.6–30.3)
Serious	1,589	3.9	6.8	44.3 (42.0–46.7)	41.1 (39.1–43.2)
Self-rated health					
Excellent/Very good	9,198	22.8	38.9	15.2 (14.7–15.7)	15.8 (15.4–16.3)
Good	8,027	19.6	33.5	29.9 (29.0–30.8)	25.0 (24.2–25.8)
Fair/Poor	6,684	16.1	27.6	51.2 (49.8–52.5)	40.7 (39.2–42.2)

Abbreviations: ADL = activities of daily living; BMI = body mass index; CI = confidence interval; IADL = instrumental activities of daily living; NH = non-Hispanic.
* Age-standardized to the 2000 U.S. projected adult population, using three age groups: 18–44, 45–64, and ≥65 years.
† Responded "yes" to, "Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"
§ Might not sum to overall total for some categories because of item-specific missing data.
¶ Might not sum to 100 because of rounding.
** Responded "I don't know the answer" to, "Which of the following best represents how you think of yourself?"
†† This category is a combination of respondents who self-reported their reason for not working as: "temporarily unable to work due to health reasons" or "disabled."
§§ Students, homemakers, and retirees.
¶¶ Income-to-poverty ratio estimates were derived using NHIS imputed income file. https://www.cdc.gov/nchs/data/nhis/tecdoc18.pdf
*** Respondents were considered to have met recommendations if they reported ≥150 minutes of moderate-intensity leisure-time aerobic physical activity per week, insufficiently active if they reported 1–149 minutes, and inactive if they reported 0 minutes. Reported vigorous-intensity physical activity minutes were counted twice and added to moderate-intensity physical activity minutes.
††† Responded "yes" to, "The next questions refer to your joints. Please do not include the back or neck. During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint?"
§§§ Responded "yes" to, "Because of a physical, mental, or emotional problem, [do you] need the help of other persons with personal care needs, such as eating, bathing, dressing, or getting around inside this home?"
¶¶¶ Responded "yes" to, "Because of a physical, mental, or emotional problem, [do you] need the help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?"
**** Psychological distress was classified as none/mild, moderate, or severe and measured by the Kessler-6 Scale. https://www.hcp.med.harvard.edu/ncs/k6_scales.php

prevalence continues to align closely with projections, but the percentage of the U.S. population reporting AAAL during 2016–2018 (10.4%) had already exactly met the 2020 projection (10.4%) (*4*), continuing a previously observed acceleration in the rise of AAAL (*5*).

Age-standardization had varying effects on subgroup estimates (e.g., changes in magnitude of point estimates [from <1.0 to >10.0 percentage points] and in direction). These shifts reflect both the aging of the U.S. population and that the standard projected 2000 population does not always closely match current demographics for U.S. adults with arthritis, underscoring the importance of focusing on absolute numbers in public health planning. Between the 2013–2015 and 2016–2018 estimates, 4.1 and 2 million more adults reported arthritis and AAAL respectively, continuing a statistically significant linear trend started in 2003–2005 (Figure).

This report characterizes a specific arthritis impact measure, AAAL, and identifies subgroups to prioritize for interventions. The prevalence of both arthritis and AAAL was higher in subgroups representing adults with fewer economic opportunities (i.e., lower education, unable to work or disabled, and lower income-to-poverty ratios), poorer overall health (i.e., higher BMI, less physical activity, more serious psychological distress, and worse self-rated health), and more physical limitations (i.e., joint symptoms in the past 30 days and ADL and IADL disabilities). To address the substantial and growing effects of arthritis and AAAL on the U.S. adult population, it is therefore important to consider adults with this combination of characteristics who would be ideally suited to a multifaceted approach, including intentional outreach to groups at or soon to be at high risk through a social determinants of health approach (*6*), enhanced clinical and community linkages, and more widespread dissemination of evidenced-based public health interventions.

Existing self-management education and physical activity public health interventions that are arthritis-appropriate and inclusive of adults with disabilities have proven benefits, including improved aerobic activity, confidence, and self-rated health and reduced depression, fatigue, and pain (*7*,*8*). These positive effects might be bolstered by combination with medical management, particularly for joint symptoms and mental health. Self-management and clinical efforts might be further enhanced through greater systematic attention to vulnerable groups and by preemptively taking a social determinants of health approach to examine the influence of environment and opportunities on health outcomes, such as for adults whose employment has been negatively affected by arthritis. Persons with rheumatic conditions are known

TABLE 2. Unadjusted and age-standardized* annualized prevalence of arthritis-attributable activity limitation† among adults aged ≥18 years and unadjusted and age-standardized prevalence of arthritis-attributable activity limitation among those with doctor-diagnosed arthritis§ — National Health Interview Survey, United States, 2016–2018

Characteristic	Unweighted no. of adults with arthritis¶	No. of adults with AAAL in population¶ (millions)	Distribution among adults with AAAL** (%)	Prevalence of AAAL among all US adults, % (95% CI)		Prevalence of AAAL among adults with doctor-diagnosed arthritis, % (95% CI)	
				Unadjusted	Age-standardized	Unadjusted	Age-standardized
Overall	**10,682**	**25.7**	**100**	**10.4 (10.1–10.7)**	**9.4 (9.1–9.6)**	**43.9 (42.9–44.8)**	**40.8 (39.4–42.1)**
Sociodemographic characteristic							
Age group, yrs							
18–44	996	3.0	11.6	2.6 (2.4–2.8)	N/A	36.8 (34.6–39.1)	N/A
45–64	4,378	11.7	45.6	14.0 (13.5–14.6)	N/A	46.0 (44.5–47.5)	N/A
≥65	5,308	11.0	42.8	22.2 (21.5–22.9)	N/A	44.0 (42.9–45.2)	N/A
Sex							
Male	3,831	9.6	37.6	8.1 (7.8–8.5)	7.5 (7.2–7.8)	40.6 (39.3–41.9)	37.1 (35.1–39.3)
Female	6,851	16.0	62.4	12.5 (12.1–13.0)	11.1 (10.7–11.5)	46.1 (45.0–47.3)	43.3 (41.5–45.1)
Race/Ethnicity							
Hispanic or Latino, any race	875	2.7	10.4	6.7 (6.1–7.4)	8.2 (7.5–8.9)	49.1 (46.0–52.3)	43.4 (39.3–47.6)
White, NH	7,854	18.2	71.0	11.6 (11.2–12.0)	9.6 (9.3–9.9)	41.9 (40.9–43.0)	39.3 (37.7–40.9)
Black, NH	1,300	3.1	12.2	10.8 (9.9–11.7)	10.6 (9.9–11.5)	48.9 (46.2–51.6)	43.2 (39.3–47.1)
API, NH	244	0.8	3.1	5.5 (4.6–6.5)	5.7 (4.8–6.6)	46.2 (40.4–52.1)	42.8 (34.0–52.1)
AI/AN, NH	134	0.3	1.1	15.9 (12.9–19.6)	16.3 (13.5–19.6)	60.7 (50.3–70.2)	58.9 (46.0–70.8)
Other/Multiple races, NH	275	0.6	2.3	13.1 (11.0–15.5)	15.1 (13.0–17.5)	54.5 (48.5–60.3)	54.2 (46.4–61.7)
Sexual identity							
Lesbian or gay	163	0.4	1.6	10.2 (8.3–12.1)	10.5 (8.7–12.7)	48.1 (41.3–54.8)	47.8 (39.6–56.1)
Straight	9,960	24.0	96.0	10.4 (10.0–10.7)	9.3 (9.0–9.5)	43.5 (42.5–44.5)	40.1 (38.7–41.6)
Bisexual	103	0.2	1.0	8.7 (6.5–11.0)	13.1 (10.2–16.6)	51.7 (42.8–60.6)	50.8 (42.2–59.4)
Something else/Don't know the answer††	169	0.3	1.4	10.7 (8.8–13.0)	11.0 (9.2–13.1)	48.4 (41.2–55.8)	51.5 (41.0–61.8)
Education							
Less than HS graduate	1,902	4.5	17.5	15.4 (14.5–16.3)	12.4 (11.8–13.2)	57.2 (55.0–59.3)	51.1 (46.9–55.2)
HS graduate or equivalent	2,954	7.1	27.9	11.8 (11.2–12.3)	10.2 (9.7–10.7)	44.6 (43.1–46.1)	42.0 (39.4–44.7)
At least some college	3,427	8.1	31.7	10.7 (10.3–11.2)	10.3 (9.9–10.7)	44.3 (42.9–45.7)	42.6 (40.5–44.7)
College degree or greater	2,350	5.8	22.9	7.2 (6.8–7.6)	6.7 (6.3–7.0)	36.1 (34.5–37.7)	32.7 (30.4–35.1)
Employment status							
Employed/Self-employed	2,716	7.5	29.2	4.8 (4.6–5.1)	5.5 (5.2–5.9)	30.7 (29.4–32.1)	29.8 (28.2–31.4)
Unemployed	215	0.6	2.2	6.6 (5.6–7.8)	8.6 (7.1–10.2)	44.4 (38.8–50.2)	42.4 (36.1–49.0)
Unable to work/Disabled§§	2,904	6.9	26.9	27.6 (26.8–28.4)	26.7 (25.1–28.3)	54.7 (53.5–55.8)	72.2 (69.5–74.7)
Other¶¶	4,840	10.7	41.6	16.1 (15.5–16.7)	9.4 (8.9–9.9)	43.8 (42.6–45.1)	40.7 (36.4–45.1)
Income-to-poverty ratio* **							
Poor/Near poor (<125%)	3,058	6.4	24.9	15.7 (14.8–16.5)	16.4 (15.6–17.1)	63.3 (61.4–65.2)	59.0 (56.1–61.8)
Low income (125% to <200%)	1,855	4.2	16.5	13.4 (12.6–14.2)	12.2 (11.5–13.0)	53.3 (51.0–55.6)	50.9 (47.2–54.7)
Middle income (200% to <400%)	2,962	7.4	28.8	10.4 (9.9–10.9)	9.3 (8.9–9.8)	43.2 (41.7–44.8)	39.3 (36.8–41.8)
High income (≥400%)	2,806	7.7	29.9	7.4 (7.0–7.8)	6.4 (6.1–6.7)	32.8 (31.4–34.2)	28.7 (26.5–30.9)
Health characteristic							
BMI (kg/m²)							
Under/Healthy weight (<25.0)	2,455	5.7	23.2	6.9 (6.5–7.3)	6.8 (6.4–7.1)	39.2 (37.6–41.0)	38.1 (35.2–41.0)
Overweight (25.0 to <30.0)	3,060	7.2	29.4	8.8 (8.4–9.2)	7.4 (7.1–7.8)	39.5 (38.0–41.0)	35.7 (33.3–38.1)
Obese (≥30.0)	4,749	11.7	47.5	16.0 (15.4–16.6)	14.2 (13.7–14.7)	49.8 (48.5–51.2)	45.5 (43.6–47.4)

See table footnotes on the next page.

TABLE 2. (*Continued*) Unadjusted and age-standardized* annualized prevalence of arthritis-attributable activity limitation† among adults aged ≥18 years and unadjusted and age-standardized prevalence of arthritis-attributable activity limitation among those with doctor-diagnosed arthritis§ — National Health Interview Survey, United States, 2016–2018

Characteristic	Unweighted no. of adults with arthritis¶	No. of adults with AAAL in population¶ (millions)	Distribution among adults with AAAL** (%)	Prevalence of AAAL among all US adults, % (95% CI)		Prevalence of AAAL among adults with doctor-diagnosed arthritis, % (95% CI)	
				Unadjusted	Age-standardized	Unadjusted	Age-standardized
Aerobic physical activity level†††							
Meets recommendations	3,073	7.7	30.7	6.0 (5.7–6.4)	6.1 (5.8–6.4)	32.1 (30.9–33.4)	30.8 (29.1–32.5)
Insufficiently active	2,418	5.8	23.1	11.9 (11.2–12.5)	10.2 (9.7–10.8)	43.9 (42.1–45.7)	42.4 (39.5–45.4)
Inactive	4,982	11.6	46.2	17.9 (17.2–18.6)	14.0 (13.4–14.6)	58.0 (56.5–59.4)	54.6 (51.7–57.4)
Joint symptoms§§§							
Yes	9,401	22.6	88.2	26.9 (26.2–27.6)	21.1 (20.5–21.8)	51.6 (50.5–52.6)	48.8 (47.2–50.4)
No	1,276	3.0	11.8	1.9 (1.7–2.0)	2.0 (1.9–2.1)	20.7 (19.3–22.1)	19.1 (17.2–21.1)
ADL disability¶¶¶							
Yes	1,236	2.8	10.7	45.3 (42.8–47.7)	34.7 (31.7–37.7)	82.6 (80.2–84.8)	82.7 (75.6–88.1)
No	9,444	22.9	89.3	9.5 (9.2–9.8)	8.7 (8.4–9.0)	41.5 (40.6–42.5)	38.9 (37.6–40.3)
IADL disability****							
Yes	2,476	5.2	20.4	44.9 (43.1–46.6)	34.6 (32.5–36.6)	80.4 (78.6–82.1)	82.4 (78.1–86.0)
No	8,205	20.4	79.6	8.7 (8.4–9.0)	8.0 (7.8–8.3)	39.3 (38.3–40.3)	37.0 (35.6–38.4)
Psychological distress††††							
None/Mild	5,995	14.2	57.4	7.6 (7.3–7.9)	6.6 (6.3–6.8)	35.5 (34.4–36.5)	30.7 (29.0–32.4)
Moderate	3,122	7.6	30.7	17.8 (16.9–18.6)	17.4 (16.7–18.2)	59.5 (57.7–61.2)	54.1 (51.8–56.5)
Serious	1,213	2.9	11.9	33.8 (31.7–36.0)	31.1 (29.3–32.9)	76.3 (73.5–79.0)	72.3 (68.1–76.1)
Self-rated health							
Excellent/Very good	2,290	5.6	21.7	3.7 (3.5–4.0)	3.9 (3.6–4.1)	24.4 (23.2–25.7)	23.3 (21.5–25.2)
Good	3,516	8.4	32.7	12.8 (12.3–13.4)	10.5 (10.1–11.0)	42.9 (41.5–44.3)	39.7 (37.6–41.9)
Fair/Poor	4,868	11.7	45.6	37.1 (35.9–38.3)	29.1 (27.8–30.4)	72.6 (71.1–73.9)	70.2 (67.3–72.9)

Abbreviations: AAAL = arthritis-attributable activity limitation; ADL = activities of daily living; AI/AN = American Indian/Alaska Native; API = Asian or Other Pacific Islander; BMI = body mass index; CI = confidence interval; HS = high school; IADL = instrumental activities of daily living; N/A = not applicable; NH = non-Hispanic.

* Age-standardized to the 2000 U.S. projected adult population, using three age groups: 18–44, 45–64, and ≥65 years. Subgroup differences were assessed using pairwise t-tests with significance set at α = 0.05. Results exactly correspond to interpretation of non-overlapping CIs; all categories of education were statistically significantly different from each other per t-test results for unadjusted prevalence of AAAL among all U.S. adults.

† Responded "yes" to, "Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?"

§ Responded "yes" to, "Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"

¶ Might not sum to overall total for some categories because of item-specific missing data.

** Might not sum to 100 because of rounding.

†† Responded "I don't know the answer" to, "Which of the following best represents how you think of yourself?"

§§ This category is a combination of respondents self-reporting their reason for not working as: "temporarily unable to work due to health reasons" or "disabled."

¶¶ Students, homemakers, and retirees.

*** Income-to-poverty ratio estimates were derived using NHIS imputed income file. https://www.cdc.gov/nchs/data/nhis/tecdoc18.pdf.

††† Respondents were classified as meets recommendations if they reported ≥150 minutes of moderate intensity leisure time aerobic physical activity per week, insufficiently active if they reported 1–149 minutes, and inactive if they reported 0 minutes. Reported vigorous intensity physical activity minutes were counted twice and added to moderate intensity physical activity minutes.

§§§ Responded "yes" to, "The next questions refer to your joints. Please do NOT include the back or neck. During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint?"

¶¶¶ Responded "yes" to, "Because of a physical, mental, or emotional problem, [do you/does anyone in the family] need the help of other persons with personal care needs, such as eating, bathing, dressing, or getting around inside this home?"

**** Responded "yes" to, "Because of a physical, mental, or emotional problem, [do you/any of these family members] need the help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?"

†††† Psychological distress was classified as none/mild, moderate, or severe and measured by the Kessler-6 Scale. https://www.hcp.med.harvard.edu/ncs/k6_scales.php

to underuse the Americans with Disabilities Act to address community barriers (e.g., transportation, building access) or receive workplace accommodations, but physician suggestion can increase use, promoting behavior change toward action (*9*). In addition, the Job Accommodation Network¶¶¶ is a free service that provides confidential individual counseling, advice, facilitation of job accommodations, and resolution of disability employment issues.

A 2018 study found that symptoms of anxiety are more common than are those of depression among adults with arthritis and more prevalent among these adults aged 18–44 years versus older age groups and in persons with chronic pain versus without (*3*). Psychological distress and despair have previously been identified as contributing factors for excess mortality among

¶¶¶ https://askjan.org/about-us/index.cfm

Summary

What is already known about this topic?

Arthritis is a leading cause of disability among U.S. adults. Arthritis-attributable medical care expenditures and earnings losses were responsible for >$300 billion direct and indirect annual costs in 2013.

What is added by this report?

National prevalence of arthritis and arthritis-attributable activity limitations (AAAL) continue to increase in absolute number: 58.5 million (23.7%) U.S. adults have arthritis, 25.7 million (43.9%) of whom have AAAL. Both conditions are most prevalent among adults with worse physical and mental health profiles and more social disadvantage.

What are the implications for public health practice?

More widespread dissemination of existing, evidence-based, community-delivered interventions, along with clinical coordination and attention to social determinants of health (e.g., improved social, economic, and mental health opportunities), can help reduce widespread arthritis prevalence and its adverse effects.

all adults aged 25–64 years (*10*). Younger adults with arthritis might especially benefit from mental health screening,[****] the functional and psychological benefits of physical activity,[††††] and clinical interventions for pain and disability management.

The findings in this report are subject to at least two limitations. First, data were self-reported and are subject to recall and social desirability bias. Second, because of the cross-sectional design, a causal relationship between the study outcomes (i.e., arthritis and AAAL) and the characteristics examined cannot be inferred.

During 2016–2018, the estimated number of U.S. adults aged ≥18 years reporting arthritis and AAAL increased by 4.1 and 2 million, respectively, compared with 2013–2015. In addition, AAAL prevalence continues to increase more rapidly than was projected. Because population aging and other contributing factors (e.g., obesity) are expected to sustain these trends, public health, medical, and senior and other service systems face substantial challenges in addressing the needs of adults with arthritis, who already account for nearly one quarter of U.S. adults. A coordinated approach of expanding intervention implementation among adults already limited by arthritis while mitigating future negative arthritis effects by creating "social, physical, and economic environments that promote attaining the full potential for health and well-being,"[§§§§] could help improve quality of life and limit the personal and societal impacts of arthritis.

**** https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/depression-in-adults-screening1 and https://www.integration.samhsa.gov/clinical-practice/screening-tools#bmb

†††† https://health.gov/paguidelines/guidelines/chapter4.aspx

§§§§ https://health.gov/healthypeople/objectives-and-data/social-determinants-health

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References:

1. Theis KA, Steinweg A, Helmick CG, Courtney-Long E, Bolen JA, Lee R. Which one? what kind? how many? types, causes, and prevalence of disability among U.S. adults. Disabil Health J 2019;12:411–21. PMID:31000498 https://doi.org/10.1016/j.dhjo.2019.03.001
2. Murphy LB, Cisternas MG, Pasta DJ, Helmick CG, Yelin EH. Medical expenditures and earnings losses among U.S. adults with arthritis in 2013. Arthritis Care Res (Hoboken) 2018;70:869–76. PMID:28950426 https://doi.org/10.1002/acr.23425
3. Guglielmo D, Hootman JM, Boring MA, et al. Symptoms of anxiety and depression among adults with arthritis—United States, 2015–2017. MMWR Morb Mortal Wkly Rep 2018;67:1081–7. PMID:30286053 https://doi.org/10.15585/mmwr.mm6739a2
4. Hootman JM, Helmick CG, Barbour KE, Theis KA, Boring MA. Updated projected prevalence of self-reported doctor-diagnosed arthritis and arthritis-attributable activity limitation among U.S. adults, 2015–2040. Arthritis Rheumatol 2016;68:1582–7. PMID:27015600 https://doi.org/10.1002/art.39692
5. Barbour KE, Helmick CG, Boring M, Brady TJ. Vital signs: prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation—United States, 2013–2015. MMWR Morb Mortal Wkly Rep 2017;66:246–53. PMID:28278145 https://doi.org/10.15585/mmwr.mm6609e1
6. Hunter DJ, March L, Chew M. Osteoarthritis in 2020 and beyond: a Lancet commission. Lancet 2020;396:1711–2. PMID:33159851 https://doi.org/10.1016/S0140-6736(20)32230-3
7. Brady TJ, Murphy L, O'Colmain BJ, et al. A meta-analysis of health status, health behaviors, and health care utilization outcomes of the Chronic Disease Self-Management Program. Prev Chronic Dis 2013;10:120112. PMID:23327828 https://doi.org/10.5888/pcd10.120112
8. Kelley GA, Kelley KS, Hootman JM, Jones DL. Effects of community-deliverable exercise on pain and physical function in adults with arthritis and other rheumatic diseases: a meta-analysis. Arthritis Care Res (Hoboken) 2011;63:79–93. PMID:20824798 https://doi.org/10.1002/acr.20347
9. Allaire SH, Evans SR, LaValley MP, Merrigan DM. Use of the Americans with Disabilities Act by persons with rheumatic diseases and factors associated with use. Arthritis Rheum 2001;45:174–82. PMID:11324782 https://doi.org/10.1002/1529-0131(200104)45:2<174::AID-ANR171>3.0.CO;2-1
10. Woolf SH, Schoomaker H. Life expectancy and mortality rates in the United States, 1959–2017. JAMA 2019;322:1996–2016. PMID:31769830 https://doi.org/10.1001/jama.2019.16932

Walking and Other Common Physical Activities Among Adults with Arthritis — United States, 2019

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The numerous health benefits of physical activity include reduced risk for chronic disease and improved mental health and quality of life (*1*). Physical activity can improve physical function and reduce pain and fall risk among adults with arthritis, a group of approximately 100 conditions affecting joints and surrounding tissues (most commonly osteoarthritis, fibromyalgia, gout, rheumatoid arthritis, and lupus) (*1*). Despite these benefits, the 54.6 million U.S. adults currently living with arthritis are generally less active than adults without arthritis, and only 36.2% of adults with arthritis are aerobically active (i.e., meet aerobic physical activity guidelines*) (*2*). Little is known about which physical activities adults with arthritis engage in. CDC analyzed 2019 Behavioral Risk Factor Surveillance System (BRFSS) data to examine the most common nonwork–related physical activities among adults with arthritis who reported any physical activity during the past month, nationally and by state. In 2019, 67.2% of adults with arthritis reported engaging in physical activity in the past month; among these persons, the most commonly reported activities were walking (70.8%), gardening (13.3%), and weightlifting (7.3%). In 45 U.S. states, at least two thirds of adults with arthritis who engaged in physical activity reported walking. Health care providers can help inactive adults with arthritis become active and, by encouraging physical activity and referring these persons to evidence-based physical activity programs, improve their health and quality of life.

BRFSS is an ongoing, state-based landline and cellular telephone survey of noninstitutionalized U.S. adults aged ≥18 years conducted by health departments in 50 states, the District of Columbia (DC), and U.S. territories.† In 2019, the median response rate among the 49 states included in this analysis§ was 49.4% (range = 37.3%–73.1%).¶ Arthritis was defined as an affirmative response to the question, "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"** Engaging in physical activity was defined as responding "yes" to the question, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Among the 380,418 (92.8%) BRFSS respondents in 49 states and DC who reported arthritis status, age, and physical activity status, 87,299 (22.9%) reported having arthritis and engaging in physical activity. These participants were asked to report up to two activities in which they most frequently engaged from a list of 74 activities.††

Unadjusted percentages for each activity were calculated for the combined 49 states and DC. Age-specific and age-adjusted§§ percentages for the three most commonly reported activities (walking, gardening, and weightlifting) were calculated for adults with arthritis engaging in nonwork–related physical activity by selected sociodemographic and health-related characteristics, including joint pain severity, body mass index, physical limitations, and self-rated health. Unadjusted state-specific prevalences of walking, gardening, and weightlifting among adults with arthritis were also estimated. Paired t-tests were performed to assess differences across subgroups for all variables, and linear trend tests using orthogonal linear contrasts were conducted for ordinal variables; all comparisons reported are statistically significant (p-value <0.05). Analyses accounted for BRFSS's complex sampling design, were weighted to be representative of each state, and were conducted using SAS (version 9.4; SAS Institute) and SUDAAN

* The earlier study used the 2008 Physical Activity Guidelines for Americans (https://health.gov/sites/default/files/2019-09/paguide.pdf), which are equivalent to the most recent (2018) Physical Activity Guidelines for Americans, 2nd Ed. https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf

† https://www.cdc.gov/brfss/about/index.htm

§ This analysis included 49 states and the District of Columbia. In 2019, New Jersey did not collect enough data to meet the minimum requirement for inclusion in the BRFSS public-use data set.

¶ https://www.cdc.gov/brfss/annual_data/2019/pdf/2019-sdqr-508.pdf

** https://www.cdc.gov/arthritis/basics/types.html

†† A specific activity was counted once if it was reported in response to one of the following questions: "What type of physical activity or exercise did you spend the most time doing during the past month?" or "What other type of physical activity gave you the next most exercise during the past month?" Participants who reported one activity but had missing data for the second most frequent activity (e.g., "don't know" or "refused") were included in the analysis. Among 87,299 adults with arthritis engaging in physical activity, 77,733 participants answered at least the first question (7,859 reported "Don't know," 366 refused, and 1,341 responses were missing). The 74 activities were organized into major headings using a modified version of the 2011 Compendium of Physical Activities by Ainsworth et al. (https://cdn-links.lww.com/permalink/mss/a/mss_43_8_2011_06_13_ainsworth_202093_sdc1.pdf). Activities were grouped on the basis of similarity and on response rates, with activities having <400 respondents combined into "Other" categories corresponding to the major headings.

§§ Age-adjusted estimates were generated in weighted logistic regression models that included age as a categorical covariate (18–44 years, 45–64 years, and ≥65 years).

(version 11.0; RTI International). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.¶¶

In 2019, 67.2% of adults with arthritis engaged in non-work–related physical activity in the past month; walking was the most commonly reported activity (70.8%), followed by gardening (13.3%), and weightlifting (7.3%) (Table 1). The percentage reporting walking was lowest among those 18–44 years (63.7%) (Table 2). The age-adjusted prevalence of walking was higher among women (76.0%) than among men (63.9%), higher among non-Hispanic Black (75.4%) adults than among non-Hispanic White (70.0%) and non-Hispanic other/multiple race adults (68.3%), and higher among those who were unable to work or disabled (79.0%) compared with those adults with other employment statuses (67.7%–74.8%). The age-adjusted percentage of adults with arthritis who reported walking increased with increasing joint pain severity and body mass index, and decreased with increasing education, income, and self-rated health.

The percentage of adults with arthritis who reported gardening increased with age from 7.0% among adults aged 18–44 years to 16.4% among those aged ≥65 years. The age-adjusted prevalence of gardening was higher among women (15.1%) than among men (10.9%), and higher among non-Hispanic White adults (14.4%) than among non-Hispanic American Indian/Alaska Native adults (8.0%) and non-Hispanic Black adults (7.8%). The percentage reporting gardening was lower among those without a high school diploma (10.5%) than among persons with higher levels of educational attainment (12.7%–14.5%). Gardening prevalence increased with increasing rurality.

¶¶ 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.

TABLE 1. Weighted unadjusted percentages of adults with arthritis* who reported engaging in physical activity in the past month,† reporting first or second most frequent activities§ — Behavioral Risk Factor Surveillance System, United States,¶ 2019

Activity group**	No. of respondents	% (95% CI)
Walking or backpacking	**62,902**	**72.1 (71.4–72.7)**
Walking	61,931	70.8 (70.2–71.4)
Hiking or backpacking	1,312	1.6 (1.5–1.8)
Lawn and garden	**18,297**	**19.6 (19.1–20.2)**
Gardening	12,094	13.3 (12.8–13.8)
Yard work	6,585	6.6 (6.3–7.0)
Muscle strengthening	**9,885**	**12.8 (12.3–13.2)**
Weightlifting	5,357	7.3 (7.0–7.7)
Calisthenics††	2,014	2.6 (2.4–2.8)
Yoga	2,368	2.7 (2.5–2.9)
Pilates	349	0.4 (0.3–0.5)
Aerobic conditioning exercise	**9,196**	**10.0 (9.6–10.4)**
Bicycling machine exercise	4,241	4.5 (4.2–4.8)
Aerobics video or class	2,210	2.4 (2.2–2.6)
Elliptical or elliptical fitness crosstrainer machine exercise	1,675	2.1 (1.9–2.3)
Stair climbing or StairMaster	959	0.9 (0.8–1.1)
Other aerobic conditioning exercise	377	0.4 (0.4–0.5)
Home activities§§	**7,621**	**7.9 (7.5–8.2)**
Sports	**5,115**	**6.3 (6.0–6.7)**
Golf	2,571	2.9 (2.7–3.1)
Bowling	394	0.5 (0.4–0.6)
Tennis	379	0.5 (0.4–0.6)
Other sports	1,881	2.6 (2.4–2.9)
Running or jogging	**2,459**	**4.5 (4.2–4.9)**
Water activities	**3,654**	**4.4 (4.2–4.7)**
Swimming	3,345	4.1 (3.8–4.4)
Other water activities	315	0.3 (0.3–0.4)
Bicycling	**3,314**	**4.3 (4.0–4.6)**
Dancing	**966**	**1.3 (1.2–1.5)**
Fishing and hunting	**716**	**0.9 (0.8–1.0)**
Farm or ranch work	**1,182**	**0.9 (0.8–1.0)**
Winter activities	**900**	**0.6 (0.5–0.7)**
Snow shoveling by hand	626	0.4 (0.4–0.5)
Other winter activities	286	0.2 (0.1–0.2)

Abbreviations: BRFSS = Behavioral Risk Factor Surveillance System; CI = confidence interval.

* Respondents were classified as having arthritis if they responded "Yes" to the question, "Have you ever been told you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"

† Respondents with arthritis were classified as engaging in physical activity if they responded "Yes" to the question, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"

§ Those who engaged in physical activity were classified as participating in an activity if they reported this activity in response to two questions: 1) "What type of physical activity or exercise did you spend the most time doing during the past month?" or 2) "What other type of physical activity gave you the next most exercise during the past month?" Participants who reported one activity but had missing data for the other most frequent activity (e.g., "don't know" or "refused") were included in the analysis. The sum of respondents for all activities exceeds the total number of respondents since each respondent could report up to two activities. Survey interviewers coded activities not listed among the 74 activities in the BRFSS Activity List for Common Leisure Activities into a single, heterogeneous "other" category representing a wide variety of different activities (n = 13,241; 13.7% [95% CI: 13.2–14.1]).

¶ In 2019, New Jersey did not collect enough data to meet the minimum requirement for inclusion in the BRFSS public-use data set.

** The 74 activities were organized into major headings using a modified version of the 2011 Compendium of Physical Activities by Ainsworth, et. al. (https://cdn-links.lww.com/permalink/mss/a/mss_43_8_2011_06_13_ainsworth_202093_sdc1.pdf). Activities were grouped on the basis of similarity and on response rates, with activities having <400 respondents combined into "Other" categories corresponding to the major headings.

†† Some calisthenics activities might be classified as aerobic conditioning exercise.

§§ Home activities included household activities (e.g., vacuuming, dusting, or home repair), child care, carpentry, and painting or wallpapering.

TABLE 2. Age-specific and age-adjusted* percentages of reporting walking, gardening, or weightlifting as a first or second most frequent activity† among adults with arthritis§ who reported engaging in physical activity in the past month,¶ by selected characteristics — Behavioral Risk Factor Surveillance System, United States, 2019**

Characteristic	No. of adults with arthritis engaging in physical activity	Age-adjusted % (95% CI)*		
		Walking	Gardening	Weightlifting
Overall	87,299	70.0 (69.3–70.7)	10.7 (10.3–11.2)	10.3 (9.8–10.9)
Sociodemographic characteristic				
Age group, yrs (unadjusted)				
18–44	8,107	63.7 (61.8–65.5)	7.0 (6.1–8.0)	12.3 (11.1–13.6)
45–64	30,635	73.5 (72.6–74.5)	12.8 (12.0–13.7)	7.0 (6.5–7.6)
≥65	48,557	71.2 (70.3–72.0)	16.4 (15.7–17.1)	5.5 (5.1–6.0)
Sex				
Male	34,886	63.9 (62.9–64.9)	10.9 (10.2–11.6)	10.9 (10.2–11.5)
Female	52,413	76.0 (75.2–76.7)	15.1 (14.5–15.8)	4.7 (4.3–5.1)
Race/Ethnicity				
White, non-Hispanic	72,415	70.0 (69.4–70.7)	14.4 (13.9–14.9)	7.3 (6.9–7.7)
Black, non-Hispanic	5,607	75.4 (73.3–77.4)	7.8 (6.7–9.1)	7.9 (6.6–9.4)
Hispanic	3,059	72.8 (69.7–75.7)	11.7 (8.9–15.2)	7.3 (5.8–9.2)
Asian, non-Hispanic	794	72.1 (65.2–78.0)	11.4 (7.4–17.1)	8.7 (5.7–13.1)
American Indian or Alaska Native, non-Hispanic	1,290	74.8 (68.6–80.2)	8.0 (5.4–11.8)	4.4 (3.1–6.3)
Other/Multiple race, non-Hispanic	2,495	68.3 (64.5–71.9)	14.3 (11.7–17.3)	6.0 (4.6–7.9)
Highest level of education				
Less than high school graduate	4,963	76.7 (74.5–78.7)	10.5 (9.1–12.0)	3.2 (2.4–4.3)
High school graduate or equivalent	21,782	71.7 (70.4–72.8)	13.6 (12.6–14.6)	5.5 (4.9–6.2)
Technical school or some college	26,276	70.8 (69.6–71.9)	14.5 (13.7–15.4)	6.7 (6.1–7.4)
College degree or higher	34,120	68.1 (67.1–69.1)	12.7 (12.0–13.5)	11.2 (10.5–11.9)
Employment status				
Employed or self-employed	30,192	67.7 (66.6–68.8)	13.0 (12.1–13.9)	9.2 (8.6–9.9)
Unemployed	2,822	74.8 (71.2–78.1)	11.6 (9.5–14.1)	5.8 (4.2–8.1)
Retired	41,668	71.0 (69.8–72.2)	14.2 (13.3–15.1)	6.7 (6.0–7.6)
Unable to work or disabled	8,058	79.0 (77.1–80.7)	11.1 (9.9–12.5)	2.1 (1.7–2.7)
Student or homemaker	4,206	73.5 (70.8–76.0)	14.6 (12.7–16.7)	7.1 (5.6–9.1)
Federal poverty level††				
≤125% FPL	11,478	77.3 (75.7–78.8)	11.0 (10.0–12.2)	3.4 (2.8–4.1)
>125% to ≤200% FPL	12,531	72.8 (71.2–74.3)	13.4 (12.2–14.7)	5.5 (4.6–6.4)
>200% to ≤400% FPL	21,874	70.7 (69.4–71.9)	14.7 (13.8–15.7)	7.2 (6.5–7.9)
>400% FPL	26,569	66.7 (65.5–67.8)	13.3 (12.4–14.2)	11.2 (10.4–12.0)
Sexual orientation§§				
Straight	48,499	70.6 (69.7–71.4)	13.9 (13.3–14.6)	7.0 (6.5–7.5)
Lesbian, gay, bisexual, queer, or questioning	2,700	74.0 (70.9–76.9)	12.1 (9.9–14.8)	6.6 (4.9–8.8)
Urban-rural status¶¶				
Large central metro	11,279	72.4 (70.8–73.9)	11.8 (10.6–13.2)	8.5 (7.6–9.4)
Large fringe metro	15,941	67.9 (66.6–69.2)	12.9 (12.1–13.8)	8.2 (7.4–9.1)
Medium metro	18,392	70.3 (69.1–71.4)	13.4 (12.6–14.3)	7.0 (6.4–7.6)
Small metro	12,587	70.2 (68.7–71.7)	13.9 (12.8–15.1)	6.8 (6.0–7.7)
Micropolitan	14,468	69.6 (68.2–71.1)	14.5 (13.5–15.6)	5.6 (4.9–6.5)
Noncore	14,632	71.9 (70.3–73.5)	15.7 (14.4–17.0)	4.0 (3.3–4.7)
Health-related characteristic				
Joint pain severity***				
None/Mild	46,371	69.1 (68.2–70.0)	13.5 (12.8–14.2)	9.4 (8.8–10.0)
Moderate	20,280	71.6 (70.3–72.8)	13.5 (12.6–14.4)	6.5 (5.8–7.3)
Severe	19,421	73.6 (72.4–74.9)	12.7 (11.8–13.7)	4.3 (3.7–4.9)
Body mass index (kg/m^2)				
Underweight or healthy weight (<25)	22,816	68.5 (67.2–69.7)	13.5 (12.6–14.5)	7.9 (7.2–8.7)
Overweight (25 to <30)	30,115	69.1 (68.0–70.1)	13.7 (12.8–14.6)	8.9 (8.3–9.7)
Obese (≥30)	30,171	73.6 (72.6–74.5)	12.9 (12.1–13.6)	5.9 (5.3–6.4)
Mobility limitations†††				
No	63,303	69.7 (68.9–70.4)	13.9 (13.3–14.5)	8.6 (8.1–9.0)
Yes	23,530	73.9 (72.8–75.1)	11.8 (10.9–12.7)	3.9 (3.3–4.4)
Arthritis-attributable activity limitations§§§				
No	54,910	70.1 (69.3–70.9)	13.3 (12.7–13.9)	8.6 (8.1–9.1)
Yes	31,562	71.9 (70.9–72.9)	13.4 (12.6–14.1)	5.3 (4.9–5.8)

See table footnotes on the next page.

TABLE 2. (*Continued*) Age-specific and age-adjusted* percentages of reporting walking, gardening, or weightlifting as a first or second most frequent activity† among adults with arthritis§ who reported engaging in physical activity in the past month,¶ by selected characteristics — Behavioral Risk Factor Surveillance System, United States, 2019**

Characteristic	No. of adults with arthritis engaging in physical activity	Age-adjusted % (95% CI)*		
		Walking	Gardening	Weightlifting
Arthritis-attributable work limitations¶¶¶				
No	63,083	70.1 (69.3–70.8)	13.0 (12.5–13.6)	8.7 (8.3–9.3)
Yes	22,660	72.4 (71.3–73.6)	14.0 (13.1–15.0)	4.5 (4.0–5.0)
Self-rated health				
Excellent or very good	35,055	67.5 (66.4–68.4)	13.2 (12.5–14.0)	10.5 (9.8–11.2)
Good	31,206	72.1 (71.1–73.1)	14.5 (13.6–15.4)	6.2 (5.7–6.8)
Fair or poor	20,858	74.1 (72.9–75.3)	11.8 (11.0–12.7)	4.2 (3.6–4.8)

Abbreviations: CI = confidence interval; FPL = federal poverty level.

* Except for age groups, age-adjusted estimates were generated in weighted logistic regression models that included age as a categorical covariate (18–44 years, 45–64 years, and ≥65 years).

† Those who were engaging in physical activity were classified as participating in an activity if they reported this activity for one of two questions: 1) "What type of physical activity or exercise did you spend the most time doing during the past month?" or 2) "What other type of physical activity gave you the next most exercise during the past month?" Participants who reported one activity but had missing data for the second most frequent activity (e.g., "don't know" or "refused") were included in the analysis.

§ Respondents were classified as having arthritis if they responded "yes" to the question, "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"

¶ Respondents with arthritis were classified as engaging in physical activity if they responded "yes" to the question, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"

** In 2019, New Jersey did not collect enough data to meet the minimum requirement for inclusion in the BRFSS public-use data set.

†† FPL is the ratio of total family income to federal poverty level per family size. Overall, 14,847 adults with arthritis engaging in physical activity had missing FPL data.

§§ Sexual orientation was asked in 30 states (Alaska, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Iowa, Kansas, Louisiana, Maryland, Minnesota, Mississippi, Montana, New York, North Carolina, Ohio, Oklahoma, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin). A total of 788 adults with arthritis who engaged in physical activity refused to answer.

¶¶ Urban-rural status was categorized using the National Center for Health Statistics 2013 Urban-Rural Classification Scheme for Counties. https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf

*** For the question, "On a scale of 0 to 10 where 0 is no pain or aching and 10 is pain or aching as bad as it can be, during the past 30 days, how bad was your joint pain on average," an answer of 0–4 was defined as none/mild, an answer of 5–6 was defined as moderate, and an answer of 7–10 was defined as severe.

††† Respondents were classified as having mobility limitations if they responded "yes" to the question, "Do you have serious difficulty walking or climbing stairs?"

§§§ Respondents were classified as having arthritis-attributable activity limitations if they responded "yes" to the question, "Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?"

¶¶¶ Respondents were classified as having arthritis-attributable work limitations if they responded "yes" to the question, "In this next question, we are referring to work for pay. Do arthritis or joint symptoms now affect whether you work, the type of work you do, or the amount of work you do?"

The prevalence of weightlifting was highest among those aged 18–44 years (12.3%), declined with age, and was higher among men (10.9%) than among women (4.7%) and higher among those who were employed or self-employed (9.2%) than among those who were unable to work or disabled (2.1%). Weightlifting prevalence increased with increasing education, income, and self-rated health and decreased with increasing joint pain severity and rurality.

The median state-specific unadjusted percentage of adults with arthritis who reported walking was 70.5% (range = 62.9% [Hawaii] to 75.4% [Alabama]) (Table 3). The median percentage who reported gardening was 12.6% (range = 3.8% [DC] to 17.6% [Florida], and the median who reported weightlifting was 7.1% (range = 3.6% [Maine] to 13.9% [DC]).

Discussion

In 2019, walking was overwhelmingly the most common activity among adults with arthritis who engaged in non-work–related physical activity in the past month, followed by gardening and weightlifting. The most common activities in this report parallel the activities for adults with mobility disabilities, whose most common activities in 2017 were walking and gardening (*3*). These similarities are expected because arthritis is a leading cause of disability (*4*). Despite arthritis being a cause of pain and disability, walking prevalence increased with increasing joint pain severity. A previous report on walking using national data described a similar finding, specifically for lower extremity joint pain (*5*). Collectively, these findings might signify that the presence of pain might not automatically preclude walking, other physical activities, and their associated benefits.

Walking is an ideal activity for adults with arthritis because it can be inexpensive, safe, convenient, low-impact, and adaptable to individual fitness levels.*** The American College of Rheumatology and the Arthritis Foundation recommend that health care providers offer specific guidance to patients with arthritis regarding physical activity (*6*). This report identifies activities to which adults with arthritis seem amenable. These

*** https://www.hhs.gov/sites/default/files/call-to-action-walking-and-walkable-communites.pdf

TABLE 3. Unadjusted reported prevalence of walking, gardening, or weightlifting as a first or second most frequent activity* among adults with arthritis† who reported engaging in physical activity in the past month§ — Behavioral Risk Factor Surveillance System, United States,¶ 2019

Jurisdiction	Walking		Gardening		Weightlifting	
	Weighted no.**	Unadjusted % (95% CI)	Weighted no.**	Unadjusted % (95% CI)	Weighted no.**	Unadjusted % (95% CI)
Alabama	548,000	75.4 (72.6–78.0)	111,000	15.3 (13.3–17.6)	39,000	5.3 (4.0–7.1)
Alaska	60,000	74.8 (69.7–79.3)	7,000	9.0 (6.2–12.9)	5,000	5.9 (4.0–8.8)
Arizona	603,000	73.3 (69.9–76.4)	82,000	9.9 (8.2–12.0)	73,000	8.9 (6.9–11.5)
Arkansas	278,000	71.6 (67.8–75.0)	62,000	16.0 (13.6–18.8)	19,000	5.0 (3.4–7.2)
California	3,053,000	74.2 (71.3–76.8)	653,000	15.9 (13.8–18.2)	330,000	8.0 (6.6–9.8)
Colorado	489,000	67.7 (65.1–70.3)	59,000	8.2 (6.8–9.8)	80,000	11.0 (9.4–12.9)
Connecticut	300,000	70.2 (67.3–72.9)	55,000	13.0 (11.2–15.0)	30,000	6.9 (5.5–8.7)
Delaware	86,000	70.4 (65.4–74.9)	16,000	13.0 (10.3–16.3)	7,000	5.3 (3.9–7.4)
District of Columbia	42,000	70.5 (64.8–75.6)	2,000	3.8 (2.3–6.2)	8,000	13.9 (9.7–19.7)
Florida	1,867,000	68.9 (65.7–72.0)	477,000	17.6 (14.5–21.2)	182,000	6.7 (5.2–8.7)
Georgia	793,000	70.2 (66.2–73.9)	137,000	12.2 (9.8–15.0)	96,000	8.5 (5.9–12.1)
Hawaii	100,000	62.9 (59.3–66.4)	24,000	15.3 (13.0–17.9)	12,000	7.3 (5.5–9.5)
Idaho	141,000	63.3 (58.4–67.9)	37,000	16.7 (13.7–20.2)	13,000	5.8 (3.8–8.7)
Illinois	1,067,000	67.6 (64.2–70.9)	209,000	13.2 (11.1–15.7)	130,000	8.3 (6.5–10.5)
Indiana	562,000	73.0 (70.2–75.6)	80,000	10.4 (8.7–12.3)	55,000	7.1 (5.6–8.9)
Iowa	276,000	68.9 (66.4–71.2)	46,000	11.5 (10.0–13.1)	27,000	6.8 (5.6–8.3)
Kansas	257,000	73.3 (70.9–75.5)	43,000	12.4 (10.9–14.1)	25,000	7.2 (5.8–8.8)
Kentucky	460,000	71.8 (68.4–75.0)	89,000	13.8 (11.7–16.3)	38,000	5.9 (4.3–8.2)
Louisiana	399,000	72.5 (68.6–76.1)	88,000	15.9 (13.3–19.0)	35,000	6.4 (4.4–9.3)
Maine	141,000	68.4 (65.5–71.1)	33,000	15.9 (13.9–18.0)	7,000	3.6 (2.5–5.2)
Maryland	522,000	71.5 (69.4–73.6)	81,000	11.1 (9.9–12.5)	62,000	8.6 (7.2–10.1)
Massachusetts	593,000	68.6 (65.3–71.7)	109,000	12.6 (10.5–15.0)	52,000	6.0 (4.6–7.7)
Michigan	1,132,000	73.4 (71.0–75.6)	152,000	9.8 (8.4–11.4)	111,000	7.2 (5.9–8.7)
Minnesota	469,000	71.1 (69.0–73.0)	103,000	15.6 (14.1–17.2)	40,000	6.1 (5.1–7.3)
Mississippi	243,000	73.7 (69.4–77.6)	43,000	12.9 (10.5–15.7)	18,000	5.6 (3.9–7.8)
Missouri	527,000	67.4 (64.0–70.6)	69,000	8.8 (7.1–10.9)	43,000	5.5 (4.3–7.1)
Montana	119,000	68.2 (65.4–71.0)	22,000	12.6 (10.8–14.8)	14,000	8.2 (6.6–10.1)
Nebraska	155,000	72.6 (70.3–74.8)	23,000	10.9 (9.5–12.5)	15,000	7.2 (5.8–8.8)
Nevada	251,000	68.8 (62.0–74.8)	27,000	7.5 (5.3–10.7)	36,000	9.8 (6.3–14.8)
New Hampshire	136,000	71.6 (68.2–74.7)	24,000	12.5 (10.5–14.8)	12,000	6.2 (4.5–8.3)
New Mexico	204,000	73.6 (70.2–76.7)	29,000	10.5 (8.6–12.8)	26,000	9.2 (7.3–11.6)
New York	1,509,000	73.5 (70.9–76.0)	202,000	9.8 (8.4–11.5)	148,000	7.2 (5.8–8.9)
North Carolina	970,000	69.0 (65.1–72.7)	242,000	17.2 (14.4–20.5)	97,000	6.9 (5.2–9.0)
North Dakota	64,000	65.1 (61.1–68.9)	10,000	10.2 (8.2–12.5)	9,000	9.6 (7.4–12.4)
Ohio	1,123,000	68.8 (66.3–71.3)	177,000	10.8 (9.6–12.3)	107,000	6.5 (5.2–8.2)
Oklahoma	325,000	71.1 (67.6–74.3)	42,000	9.1 (7.5–11.1)	35,000	7.6 (5.8–9.9)
Oregon	398,000	65.5 (62.1–68.8)	102,000	16.8 (14.3–19.8)	40,000	6.6 (4.9–8.8)
Pennsylvania	1,277,000	67.2 (64.0–70.3)	241,000	12.7 (10.7–14.9)	164,000	8.6 (6.8–10.9)
Rhode Island	101,000	71.2 (67.8–74.4)	19,000	13.3 (11.2–15.7)	10,000	7.0 (5.2–9.4)
South Carolina	504,000	75.4 (72.6–78.0)	99,000	14.8 (12.7–17.3)	48,000	7.2 (5.6–9.1)
South Dakota	68,000	65.3 (59.1–71.0)	8,000	8.1 (5.7–11.3)	9,000	8.8 (6.0–12.6)
Tennessee	662,000	74.3 (71.0–77.3)	117,000	13.1 (11.0–15.7)	64,000	7.1 (5.4–9.5)
Texas	1,880,000	70.2 (66.4–73.7)	386,000	14.4 (11.9–17.3)	215,000	8.0 (6.1–10.6)
Utah	264,000	67.4 (65.1–69.7)	42,000	10.8 (9.4–12.4)	36,000	9.3 (7.9–10.8)
Vermont	64,000	72.0 (68.8–75.1)	11,000	12.8 (10.8–15.0)	5,000	5.5 (3.9–7.5)
Virginia	765,000	70.0 (67.3–72.7)	130,000	11.9 (10.2–13.8)	68,000	6.3 (5.1–7.7)
Washington	739,000	71.1 (68.9–73.2)	177,000	17.1 (15.4–18.9)	65,000	6.2 (5.3–7.4)
West Virginia	237,000	68.4 (65.3–71.3)	35,000	10.1 (8.3–12.2)	18,000	5.3 (4.0–7.0)
Wisconsin	605,000	74.2 (70.8–77.3)	123,000	15.0 (12.6–17.8)	54,000	6.6 (5.0–8.8)
Wyoming	51,000	70.0 (65.8–73.8)	8,000	11.4 (9.0–14.4)	5,000	7.3 (5.3–10.2)

See table footnotes on the next page.

findings could help health care providers encourage patients to participate in these common activities, including referring them to low-cost physical activity programs delivered by worksites and community organizations.

The cost of physical activity is an important consideration for adults with arthritis (*7*). Whereas all adults with arthritis can benefit from physical activity, those with the lowest levels of household income are more likely to be inactive (*8*). In this report of adults who engaged in physical activity, type of physical activity varied by income level. For example, adults with lower socioeconomic status had lower weightlifting and higher walking prevalences compared with those with higher

TABLE 3. (*Continued*) Unadjusted reported prevalence of walking, gardening, or weightlifting as a first or second most frequent activity* among adults with arthritis† who reported engaging in physical activity in the past month§ — Behavioral Risk Factor Surveillance System, United States,¶ 2019

Jurisdiction	Walking		Gardening		Weightlifting	
	Weighted no.**	Unadjusted % (95% CI)	Weighted no.**	Unadjusted % (95% CI)	Weighted no.**	Unadjusted % (95% CI)
Median (49 states and District of Columbia)	—	70.5	—	12.6	—	7.1
Guam	6,000	57.8 (47.2–67.8)	2,000	25.2 (15.5–38.3)	1,000	11.9 (7.4–18.8)
Puerto Rico	153,000	68.3 (63.5–72.8)	22,000	9.8 (7.3–13.0)	3,000	—††

Abbreviation: CI = confidence interval.
* Adults engaging in physical activity were classified as participating in an activity if they reported this activity for one of two questions: 1) "What type of physical activity or exercise did you spend the most time doing during the past month?" or 2) "What other type of physical activity gave you the next most exercise during the past month?" Participants who reported one activity but had missing data for the other most frequent activity (e.g., "don't know," or "refused") were included in the analysis.
† Respondents were classified as having arthritis if they responded "yes" to the question, "Have you ever been told by a doctor or other health care provider that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"
§ Respondents with arthritis were classified as engaging in physical activity if they responded "yes" to the question, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"
¶ In 2019, New Jersey did not collect enough data to meet the minimum requirement for inclusion in the BRFSS public-use data set.
** Weighted number represents the estimated number of adults with arthritis engaging in physical activity who reported the activity (walking, gardening, or weightlifting) as their first or second most frequent activity.
†† Unreliable estimate (relative standard error >30%).

incomes. Adults with arthritis who are inactive and have lower incomes might be more receptive to low-cost physical activities, such as walking (*7*).[†††]

Adults with arthritis experience optimal health benefits through diverse physical activity regimens, including aerobic, muscle strengthening, and balance exercises (*1*). Benefits of gardening include reduced stress and fatigue and improved mental health and quality of life (*9*). Muscle strengthening can improve fitness and independence, prevent muscle loss, and reduce arthritis pain (*1*). Low-cost muscle strengthening activity options, including lifting objects (e.g., dumbbells, cans of food, or water bottles), using resistance bands, and engaging in bodyweight exercises, are all suitable activities for adults with arthritis.[§§§]

The findings in this report are subject to at least six limitations. First, BRFSS data are self-reported, which can introduce recall and social desirability biases and potential misclassification of activities. Second, the relatively low state-specific response rates (as low as 37.3%) might reduce generalizability and bias the findings. Third, specific activity participation might be underestimated because only the two most frequent activities per person could be reported and data were assessed only for leisure-time (nonwork) activities. Fourth, differences in other activities by characteristics such as income were not assessed. Fifth, data was available for only 49 states and aggregated data might not be nationally representative. Finally, this study provides estimates of reported activities undertaken versus preferred; health care providers might find that this affects physical activity sustainability among patients.

††† https://www.cdc.gov/arthritis/basics/physical-activity-overview.html
§§§ https://www.arthritis.org; https://www.cdc.gov/arthritis/interventions/physical-activity.html

To promote physical activity among adults with arthritis, health care providers can offer advice or counseling for walking or referrals to low-cost, evidence-based physical activity programs.[§§§] These programs might help adults with arthritis overcome common barriers to physical activity, including cost, lack of instructions about preventing risk for injury while exercising, and fear of arthritis worsening (*7*). Communities can address physical environment barriers to walking by providing safe and supportive infrastructures such as sidewalks, benches, and green spaces.[¶¶¶] Promoting engagement in physical activity among adults with arthritis can reduce their risk for chronic health conditions and improve their mental health and quality of life.

¶¶¶ https://www.thecommunityguide.org/findings/physical-activity-built-environment-approaches

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Summary

What is already known about this topic?

Among adults with arthritis, physical activity can reduce pain, disability, and functional limitations, and improve mental health and quality of life; however, just over one third of adults with arthritis are aerobically active.

What is added by this report?

Approximately 71% of adults with arthritis who engaged in physical activity in the past month reported walking as one of their two most frequent activities. Gardening (13.3%) and weightlifting (7.3%) were the second and third most common activities.

What are the implications for public health practice?

Health care providers can help inactive adults with arthritis become active and, by encouraging physical activity and referring them to evidence-based physical activity programs, improve their health and quality of life.

References

1. 2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee scientific report. Washington, DC: U.S. Department of Health and Human Services, 2018. https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf
2. Murphy LB, Hootman JM, Boring MA, et al. Leisure time physical activity among US adults with arthritis, 2008–2015. Am J Prev Med 2017;53:345–54. PMID:28601405 https://doi.org/10.1016/j.amepre.2017.03.017
3. Hollis ND, Zhang QC, Cyrus AC, Courtney-Long E, Watson K, Carroll DD. Physical activity types among US adults with mobility disability, Behavioral Risk Factor Surveillance System, 2017. Disabil Health J 2020;13:100888. PMID:32061542 https://doi.org/10.1016/j.dhjo.2020.100888
4. Theis KA, Steinweg A, Helmick CG, Courtney-Long E, Bolen JA, Lee R. Which one? What kind? How many? Types, causes, and prevalence of disability among US adults. Disabil Health J 2019;12:411–21. PMID:31000498 https://doi.org/10.1016/j.dhjo.2019.03.001
5. Hootman JM, Theis KA, Barbour KE, Paul P, Carlson SA. Leisure time and transportation walking among adults with and without arthritis in the United States, 2010. Arthritis Care Res (Hoboken) 2019;71:178–88. PMID:30346654 https://doi.org/10.1002/acr.23790
6. Kolasinski SL, Neogi T, Hochberg MC, et al. 2019 American College of Rheumatology/Arthritis Foundation guideline for the management of osteoarthritis of the hand, hip, and knee. Arthritis Care Res (Hoboken) 2020;72:149–62. PMID:31908149 https://doi.org/10.1002/acr.24131
7. Wilcox S, Der Ananian C, Abbott J, et al. Perceived exercise barriers, enablers, and benefits among exercising and nonexercising adults with arthritis: results from a qualitative study. Arthritis Rheum 2006;55:616–27. PMID:16874785 https://doi.org/10.1002/art.22098
8. Guglielmo D, Murphy LB, Boring MA, et al. State-specific severe joint pain and physical inactivity among adults with arthritis—United States, 2017. MMWR Morb Mortal Wkly Rep 2019;68:381–7. PMID:31048678 https://doi.org/10.15585/mmwr.mm6817a2
9. Soga M, Gaston KJ, Yamaura Y. Gardening is beneficial for health: a meta-analysis. Prev Med Rep 2017;5:92–9. PMID:27981022 https://doi.org/10.1016/j.pmedr.2016.11.007

Distribution of SARS-CoV-2 Variants in a Large Integrated Health Care System — California, March–July 2021

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Data from observational studies demonstrate that variants of SARS-CoV-2, the virus that causes COVID-19, have evolved rapidly across many countries (*1*,*2*). The SARS-CoV-2 B.1.617.2 (Delta) variant of concern is more transmissible than previously identified variants,* and as of September 2021, is the predominant variant in the United States.† Studies characterizing the distribution and severity of illness caused by SARS-CoV-2 variants, particularly the Delta variant, are limited in the United States (*3*), and are subject to limitations related to study setting, specimen collection, study population, or study period (*4*–*7*). This study used whole genome sequencing (WGS) data on SARS-CoV-2–positive specimens collected across Kaiser Permanente Southern California (KPSC), a large integrated health care system, to describe the distribution and risk of hospitalization associated with SARS-CoV-2 variants during March 4–July 21, 2021, by patient vaccination status. Among 13,039 SARS-CoV-2–positive specimens identified from KPSC patients during this period, 6,798 (52%) were sequenced and included in this report. Of these, 5,994 (88%) were collected from unvaccinated persons, 648 (10%) from fully vaccinated persons, and 156 (2%) from partially vaccinated persons. Among all sequenced specimens, the weekly percentage of B.1.1.7 (Alpha) variant infections increased from 20% to 67% during March 4–May 19, 2021. During April 15–July 21, 2021, the weekly percentage of Delta variant infections increased from 0% to 95%. During March 4–July 21, 2021, the weekly percentage of variants was similar among fully vaccinated and unvaccinated persons, but the Delta variant was more commonly identified among vaccinated persons then unvaccinated persons overall, relative to other variants. The Delta variant was more prevalent among younger persons, with the highest percentage (55%) identified among persons aged 18–44 years. Infections attributed to the Delta variant were also more commonly identified among non-Hispanic Black persons, relative to other variants. These findings reinforce the importance of continued monitoring of SARS-CoV-2 variants and implementing multiple COVID-19 prevention strategies, particularly during the current period in which Delta is the predominant variant circulating in the United States.

* https://www.medrxiv.org/content/10.1101/2021.06.03.21258293v1.full.pdf
† https://covid.cdc.gov/covid-data-tracker/#variant-proportions (Accessed September 27, 2021).

KPSC facilities represent 15 large medical centers that provide care to approximately 4.6 million members across Southern California. As of 2021, KPSC performs molecular SARS-CoV-2 testing for all patients upon request, regardless of symptoms, and before hospital admission or medical procedures. During March 4–July 21, 2021, specimens were primarily collected via nasopharyngeal or oropharyngeal swab, but self-collection of saliva was also available. During this period, WGS was performed in accredited laboratories on all specimens collected by KPSC facilities that yielded a positive SARS-CoV-2 test result.§,¶ The four most commonly identified SARS-CoV-2 variants were defined according to the CDC classification system as of September 2021.** All other identified variants were grouped together as 'other' variants. WGS data were linked with patient electronic medical records. The distributions (frequency and percentage) of variants were compared by week of specimen collection, vaccination status,†† age, sex, race/ethnicity, and underlying medical conditions§§ (*8*).

§ Specimens were tested at KPSC laboratories with FDA-authorized real-time reverse transcription–polymerase chain reaction (RT-PCR) using the TaqPath COVID-19 High-Throughput Combo Kit on the Thermo Fisher Scientific Amplitude Solution (Thermo Fisher Scientific, Waltham, Massachusetts) or using the cobas SARS-CoV-2 assay on the cobas 8800 System or the cobas SARS-CoV-2 & Influenza A/B Assay on the cobas Liat Analyzer (Roche Diagnostics, Indianapolis, Indiana). Specimens were sequenced using the NovaSeq 6000 Sequencing System S1 flow cell, which included the NovaSeq 6000 S1 Reagent Kit v1.5 (300 cycles) and the NovaSeq 6000 Sequencing System (Illumina Inc., San Diego, California).
¶ Specimens sequenced before March 4, 2021 were excluded from the analyses because their collection preceded the mass sequencing project; therefore, these specimens were not representative of all positive specimens and were not sequenced using the standardized protocol outlined in the current report.
** https://www.cdc.gov/coronavirus/2019-ncov/variants/variant-info.html (Accessed September 27, 2021).
†† Vaccination status was defined as follows: Fully vaccinated persons had completed all recommended doses of an FDA–authorized COVID-19 vaccine, including Pfizer-BioNTech, Moderna, and Janssen (Johnson & Johnson) ≥14 days before the positive SARS-CoV-2 test date; unvaccinated persons had no record of receiving an FDA–authorized COVID-19 vaccine ≥14 days before the positive SARS-CoV-2 test date. Partially vaccinated persons had completed a single dose of Pfizer-BioNTech or Moderna COVID-19 vaccine ≥14 days before the positive SARS-CoV-2 test date.
§§ Underlying medical conditions were defined according to the weighted Charlson Comorbidity Index, which included conditions of interest available in electronic medical records from the 12 months before the date of SARS-CoV-2 test. Conditions included in the Charlson index were immunosuppressive disorders, acute myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic obstructive pulmonary disease, rheumatoid disease, peptic ulcer disease, mild and moderate/severe liver disease.

Differences between groups were calculated using chi-square tests; statistical significance was defined as p<0.05.

Patients were followed up for 14 days from the date of SARS-CoV-2 specimen collection. COVID-19–related hospitalization was defined as hospital admission from 2 days before until 14 days after the SARS-CoV-2 positive test result. For patients hospitalized 0–2 days before the date of specimen collection, medical chart reviews were conducted to confirm that the hospitalization was related to COVID-19.¶¶ For patients hospitalized during the 14 days after the specimen collection date, it was assumed that the hospitalization was related to the COVID-19 diagnosis. Cox proportional hazards regression analysis was used to obtain the adjusted hazard ratio (aHR) and corresponding 95% confidence interval (CI) for the risk for COVID-19 hospitalization associated with the Delta variant (i.e., the predominant variant) relative to all other variants. Regression models were stratified by vaccination status, and were adjusted for age, sex, race/ethnicity, presence of underlying medical conditions, and study period. Data analyses were performed using SAS (version 9.4; SAS Institute). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.***

Among 6,798 sequenced SARS-CoV-2–positive specimens collected from KPSC patients during March 4–July 21, 2021, a total of 5,994 (88%) were collected from unvaccinated persons, 648 (10%) from fully vaccinated persons, and 156 (2%) from partially vaccinated persons (Table) (Supplementary Figure 1, https://stacks.cdc.gov/view/cdc/110072). Approximately 45% of all positive SARS-CoV-2 specimens during March 4–July 21,

¶¶ Medical records of all patients with a hospital admission on the same day or 1–2 days before their positive SARS-CoV-2 specimen collection date were reviewed for possible COVID-19–related codes or medical notes. Patients were considered to have a confirmed COVID-19 related hospital admission if their medical records indicated that COVID-19 was either the primary reason for the admission or for extension of hospitalizations that were initially for an unrelated condition.

*** 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. Characteristics of study participants with sequenced SARS-CoV-2 specimens, by variant — California, March–July 2021

Characteristic	Variant, no. (%)				p-value§
	All positive specimens	Alpha (B.1.1.7)	Gamma (P.1, P.1.1 and P.1.2)	Delta (B.1.617.2, AY.1, AY.2 and AY.3)	
Total	**6,798 (100)**	**2,176 (100)**	**509 (100)**	**2,156 (100)**	**N/A**
Vaccination status*					**<0.001**
Fully	648 (9.5)	84 (3.9)	39 (7.7)	469 (21.8)	
Partially	156 (2.3)	48 (2.2)	20 (3.9)	33 (1.5)	
Unvaccinated	5,994 (88.2)	2,044 (93.9)	450 (88.4)	1,654 (76.7)	
Sex					**0.415**
Female	3,640 (53.6)	1,160 (53.3)	289 (56.8)	1,167 (54.1)	
Male	3,157 (46.4)	1,016 (46.7)	220 (43.2)	989 (45.9)	
Other	1 (—)	0 (—)	0 (—)	0 (—)	
Age group, yrs					**<0.001**
<12	585 (8.6)	200 (9.2)	35 (6.9)	193 (9.0)	
12–17	524 (7.7)	181 (8.3)	34 (6.7)	153 (7.1)	
18–44	3,469 (51.0)	1,060 (48.7)	264 (51.9)	1,192 (55.3)	
45–64	1,823 (26.8)	620 (28.5)	124 (24.4)	495 (23.0)	
65–74	291 (4.3)	83 (3.8)	38 (7.5)	87 (4.0)	
≥75	106 (1.6)	32 (1.5)	14 (2.8)	36 (1.7)	
Median (IQR)	**35 (23–50)**	**36 (23–50)**	**37 (26–52)**	**33 (23–47)**	
Race/Ethnicity					**<0.001**
Hispanic	2,988 (44.0)	909 (41.8)	222 (43.6)	850 (39.4)	
Asian, non-Hispanic	337 (5.0)	83 (3.8)	13 (2.6)	143 (6.6)	
Black, non-Hispanic	822 (12.1)	254 (11.7)	78 (15.3)	353 (16.4)	
White, non-Hispanic	2,045 (30.1)	724 (33.3)	154 (30.3)	619 (28.7)	
Other/Unknown	606 (8.9)	206 (9.5)	42 (8.3)	191 (8.9)	
Charlson Comorbidity Index†					**0.586**
0	5,510 (81.1)	1,739 (79.9)	403 (79.2)	1,773 (82.2)	
1	791 (11.6)	275 (12.6)	62 (12.2)	237 (11.0)	
2	250 (3.7)	84 (3.9)	20 (3.9)	76 (3.5)	
≥3	247 (3.6)	78 (3.6)	24 (4.7)	70 (3.3)	

Abbreviations: FDA = Food and Drug Administration; IQR = interquartile range; N/A = not applicable.

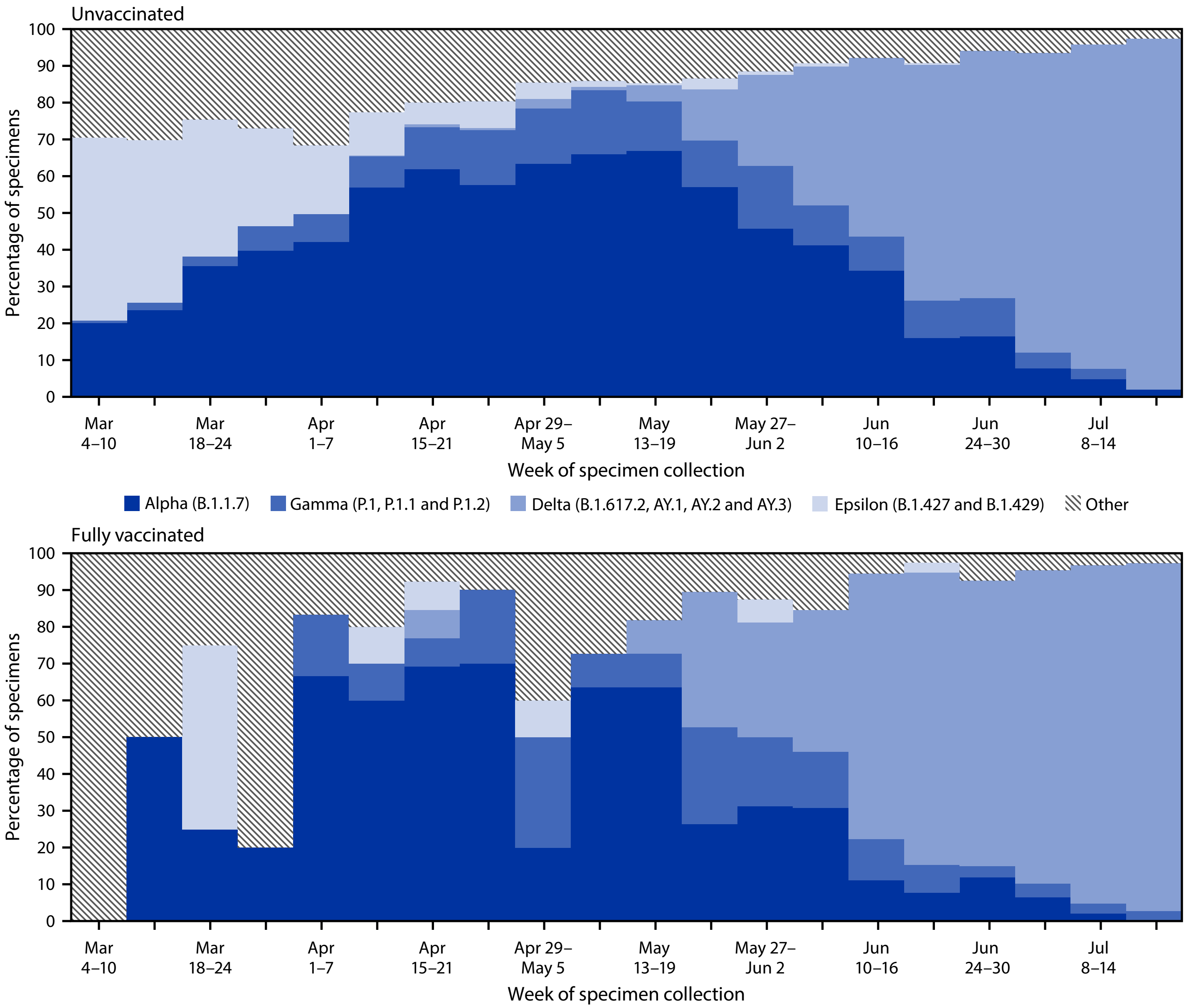
* Vaccination status was defined as follows: fully vaccinated persons had completed all recommended doses of an FDA–authorized COVID-19 vaccine, including Pfizer-BioNTech, Moderna, and Janssen (Johnson & Johnson) ≥14 days before the positive SARS-CoV-2 test date; partially vaccinated persons had completed a single dose of Pfizer-BioNTech or Moderna COVID-19 vaccine ≥14 days before the positive SARS-CoV-2 test date; unvaccinated persons had no record of receiving a FDA-authorized COVID-19 vaccine ≥14 days before the positive SARS-CoV-2 test date.

† Charlson Comorbidity Index is a weighted composite score based on 17 comorbidities.

§ Chi-square test for heterogeneity.

2021, failed sequencing; specimens most likely to fail sequencing were those collected from vaccinated persons, non-Hispanic Asians persons, older persons (those aged ≥65 years), and those with underlying medical conditions. Compared with unvaccinated persons, fully vaccinated persons were older and included a larger proportion of non-Hispanic Asian persons and persons with multiple underlying conditions. During March 4–May 19, 2021, the weekly percentage of infections attributed to the Alpha variant increased steadily from 20% to approximately 67%, after which it declined. During April 15–July 21, 2021, the weekly percentage attributed to the Delta variant increased from 0% to 95% of all sequenced specimens (Figure).

FIGURE. Percentage of SARS-CoV-2 variants* identified among all sequenced specimens, by unvaccinated (n = 5,994) and fully vaccinated (n = 648) status† — California, March–July 2021



Abbreviation: FDA = Food and Drug Administration.

* Variants and their associated SARS-CoV-2 (Pango) lineages were defined according to the CDC classification system at the time of the report (https://www.cdc.gov/coronavirus/2019-ncov/variants/variant-info.html). The four most commonly identified variants were displayed separately, and all other identified lineages were grouped together as other variants.

† Fully vaccinated persons had completed all recommended doses of an FDA-authorized COVID-19 vaccine, including Pfizer-BioNTech, Moderna, and Janssen (Johnson & Johnson) ≥14 days before the positive SARS-CoV-2 test date. Unvaccinated persons had no record of receiving an FDA-authorized COVID-19 vaccine ≥14 days before the positive SARS-CoV-2 test date. Partially vaccinated persons had completed a single dose of Pfizer-BioNTech or Moderna COVID-19 vaccine ≥14 days before the positive SARS-CoV-2 test date; these persons were not included in the current analysis because of sample size limitations.

The absolute number of specimens that yielded a positive SARS-CoV-2 result was much lower among fully vaccinated persons (648) than among unvaccinated persons (5,994). In general, the weekly percentages of SARS-CoV-2 variants among fully vaccinated persons approximately mirrored those among unvaccinated persons (Supplementary Figure 2, https://stacks.cdc.gov/view/cdc/110120). However, overall, the percentage of fully vaccinated persons with infections attributed to the Delta variant was slightly higher (22%) than the percentage infected with other variants (4%–8%). There were slight differences in the distribution of selected variants by age group and race/ethnicity, but the distribution did not substantially differ between males and females, or between patients with and without multiple underlying medical conditions (Table). Compared with all infections, those from the Delta variant were slightly more common among non-Hispanic Black persons (16.4% versus 12.1%, respectively). Infections attributed to the Delta variant were also more common among younger persons, with the majority of infections identified among persons aged 18–44 years (55.3%). Twenty-five (3.9%) fully vaccinated patients and 393 (6.6%) unvaccinated patients were admitted to hospital within 2 days before to 14 days after the specimen collection date. Among unvaccinated persons, infection with the Delta variant compared with all other variants was associated with an increased adjusted risk of hospitalization (aHR = 1.81, 95% CI = 1.30–2.52).

Discussion

In this study, conducted within a large integrated health care system in southern California, the weekly percentage of all infections attributed to the Delta variant rapidly increased to 95% during March 4–July 21, 2021. Infection with the Delta variant was more common among younger persons (aged 18–44 years) and among non-Hispanic Black persons. The Delta variant was associated with an apparent increased risk of hospitalization among unvaccinated persons. These findings reinforce the importance of implementing multicomponent COVID-19 prevention strategies, particularly vaccination among eligible populations.

Consistent with national and global sequencing data, a rapid change in the distribution of SARS-CoV-2 variants was observed, with Alpha becoming the dominant variant between approximately mid-April and late-May 2021, and Delta quickly becoming the dominant variant thereafter (*3*,*4*). Similar to previous reports, persons with infections attributed to the Delta variant were younger, relative to all persons with positive sequenced specimens. This could be due to multiple factors, including increasing vaccination coverage among older adults and increased social interactions among younger adults during periods when the Delta variant predominated (*3*,*4*). Similarly, the observed differences in prevalence of Delta variant infections across race/ethnicity categories might reflect differences in risk for COVID-19 exposure among these persons during periods of high Delta variant transmission.

In general, the weekly percentages of isolated variants in this population of KPSC members were similar by vaccination status, but cumulatively, from March 4 to July 21, 2021, the total percentage of infections attributed to the Delta variant was higher among fully vaccinated persons than among unvaccinated persons, relative to other variants. Previous studies have attributed this to either a possible reduction in vaccine efficacy associated with Delta (*3*,*4*) or to the coincidental waning of vaccine-induced immunity in certain subpopulations (e.g., those vaccinated earlier in the pandemic) during recent periods when Delta variant transmission was high.[†††] Compared with other variants, infections attributed to Delta were associated with an observed increased risk of hospitalization among unvaccinated persons, aligning with previous reports that infection with the Delta variant appears to result in more severe disease (*3*,*4*,*9*). However, this finding could also be the result of systematic differences in the testing behavior or clinical risk factors of persons with infections attributed to the Delta variant relative to other variants.

The findings in this report are subject to at least five limitations. First, approximately 45% of specimens were not successfully sequenced, and therefore, the study population was not representative of all positive specimens in this population. Sequence success rates are correlated with the amount of viral genetic material in the specimen, which can be influenced by factors such as age, vaccination status, variant, or type of specimen, as observed in the current report. Second, community testing was largely self-selected; therefore, testing patterns might have differed between vaccinated and unvaccinated patients, or among patients infected with different variants. However, models were adjusted for study period to control for potential changing testing behaviors throughout the pandemic. Third, patients with infections attributed to different variants might have differed systematically in other respects not covered in the current report, which in turn might have affected COVID-19 severity. Fourth, the numbers of partially vaccinated and fully vaccinated persons were small, limiting the power for these subgroup analyses and precluding comparisons of hospitalization among vaccinated persons. Finally, KPSC patients were possibly tested elsewhere; specimens from these patients would not be included in the current data.

These findings reinforce the importance of continued monitoring of SARS-CoV-2 variants and implementing multicomponent COVID-19 prevention strategies, particularly during

[†††] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3909743

Summary

What is already known about this topic?

The highly transmissible SARS-CoV-2 B.1.617.2 (Delta) variant is the predominant variant circulating in the United States.

What is added by this report?

During March 4–July 21, 2021, sequencing data from 6,798 SARS-CoV-2–positive specimens were linked to electronic health records among Kaiser Permanente Southern California members. The weekly percentage of all infections attributed to the Delta variant rapidly increased to 95% during this period. Infection with the Delta variant was more common among younger persons and among non-Hispanic Black persons.

What are the implications for public health practice?

These findings reinforce the importance of continued monitoring of SARS-CoV-2 variants and implementing multicomponent COVID-19 prevention strategies, particularly during the current period in which Delta is the predominant circulating variant in the United States.

the current period in which Delta is the predominant circulating variant in the United States. Such preventive strategies include increasing COVID-19 vaccination coverage among eligible populations in coordination with other strategies such as universal masking and physical distancing.

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References

1. Hanage WP, Russell CA. Partial immunity and SARS-CoV-2 mutations. Science 2021;372:354. PMID:33888632 https://doi.org/10.1126/science.abi4727
2. Saad-Roy CM, Morris SE, Metcalf CJE, et al. Epidemiological and evolutionary considerations of SARS-CoV-2 vaccine dosing regimes. Science 2021;372:363–70. PMID:33688062 https://doi.org/10.1126/science.abg8663
3. Herlihy R, Bamberg W, Burakoff A, et al. Rapid increase in circulation of the SARS-CoV-2 B.1.617.2 (Delta) variant—Mesa County, Colorado, April–June 2021. MMWR Morb Mortal Wkly Rep 2021;70:1084–7. PMID:34383734 https://doi.org/10.15585/mmwr.mm7032e2
4. Sheikh A, McMenamin J, Taylor B, Robertson C; Public Health Scotland and the EAVE II Collaborators. SARS-CoV-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness. Lancet 2021;397:2461–2. PMID:34139198 https://doi.org/10.1016/S0140-6736(21)01358-1
5. Borges V, Sousa C, Menezes L, et al. Tracking SARS-CoV-2 lineage B.1.1.7 dissemination: insights from nationwide spike gene target failure (SGTF) and spike gene late detection (SGTL) data, Portugal, week 49 2020 to week 3 2021. Euro Surveill 2021;26:2100131. PMID:33706862 https://doi.org/10.2807/1560-7917.ES.2021.26.10.2100130
6. Nyberg T, Twohig KA, Harris RJ, et al. Risk of hospital admission for patients with SARS-CoV-2 variant B.1.1.7: cohort analysis. BMJ 2021;373:n1412. PMID:34130987 https://doi.org/10.1136/bmj.n1412
7. Patone M, Thomas K, Hatch R, Tan PS, Coupland C, Liao W. Mortality and critical care unit admission associated with the SARS-CoV-2 lineage B.1.1.7 in England: an observational cohort study. Lancet Infect Dis 2021; Epub Jun 22 2021. https://doi.org/10.1016/S1473-3099(21)00318-2
8. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 1987;40:373–83. PMID:3558716 https://doi.org/10.1016/0021-9681(87)90171-8
9. Twohig KA, Nyberg T, Zaidi A, et al. Hospital admission and emergency care attendance risk for SARS-CoV-2 delta (B.1.617.2) compared with alpha (B.1.1.7) variants of concern: a cohort study. Lancet Infect Dis 2021; Epub Aug 27, 2021. https://doi.org/10.1016/S1473-3099(21)00475-8

Multicomponent Strategies to Prevent SARS-CoV-2 Transmission — Nine Overnight Youth Summer Camps, United States, June–August 2021

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Most U.S. overnight youth camps did not operate during the summer of 2020 because of the COVID-19 pandemic* (*1*). Several that did operate demonstrated that multiple prevention strategies, including pre- and postarrival testing for SARS-CoV-2, the virus that causes COVID-19, masking, and physical distancing helped prevent the introduction and spread of COVID-19; in contrast, camps that relaxed prevention strategies, such as requiring a single prearrival test without subsequent testing, experienced outbreaks (*2*–*4*). The availability of COVID-19 vaccines for persons aged ≥12 years enabled implementation of an additional prevention strategy that was not available in summer 2020. This study assessed the number of COVID-19 cases and potential secondary spread among 7,173 staff members and campers from 50 states, 13 countries, and U.S. military overseas bases at nine independently operated U.S. summer youth camps affiliated with the same organization. The camps implemented multiple prevention strategies including vaccination, testing, podding (cohorting), masking, physical distancing, and hand hygiene during June–August 2021. Vaccination coverage was 93% among eligible persons aged ≥12 years.† All staff members (1,955) and campers (5,218) received site-specific, protocol-defined screening testing, which included prearrival testing and screening tests during the camp session (38,059 tests). Screening testing identified six confirmed COVID-19 cases (one in a staff member and five in campers) by reverse transcription–polymerase chain reaction (RT-PCR) testing (screening test positivity rate = 0.02%). Three additional cases (in two staff members and one camper) were identified based on symptoms and were confirmed by RT-PCR testing. Testing for SARS-CoV-2, isolation, and quarantine in a population with high vaccination coverage resulted in no known secondary transmission of SARS-CoV-2 identified during camp. Implementation of multicomponent strategies is critical for prevention of COVID-19 outbreaks in congregate settings, including overnight youth camps.

During 2021, each of the nine affiliated camps designed site-specific COVID-19 protocols with guidance from their organization's national medical committee, CDC, the American Academy of Pediatrics, the American Camp Association, and state and local health departments (*5*–*7*). In March 2021, camp staff members became eligible for vaccination as group 1b (frontline essential workers) (*8*). All camps strongly recommended vaccination for eligible persons; seven of nine camps required staff members aged ≥17 years to be fully vaccinated before camp arrival. Data collection for this study included documentation of COVID-19 protocols, demographic and vaccination characteristics of camp populations, results of SARS-CoV-2 screening testing, characteristics of persons who received positive test results, and actions taken in response to cases. Deidentified demographic information, testing counts, and descriptions of positive tests and confirmed cases were submitted via a secure portal. Institutional Review Board approval and waiver of informed consent were granted through NorthShore University HealthSystems (Evanston, Illinois).

Physical camp locations were in the New England (two), Middle Atlantic (two), South (one), Midwest (one), and West (three) U.S. Census regions/divisions. Camp session duration (range = 2–8 weeks [eight camps had multiple sessions]) and size (300–1,130 persons) varied (Table 1). Seven camps had an intersession (1–14 days) between two or more sessions. All 7,173 persons attending the nine camps during June–August 2021 were included in the study, including 5,218 (73%) and 1,955 (27%) staff members. Approximately 30% of persons were aged <12 years and thus ineligible for COVID-19 vaccination. Among eight camps with vaccination data, 4,000 (65%) of all 6,135 persons were vaccinated, including 93% of age-eligible persons (aged ≥12 years), 88% of persons aged 12–16 years, and 99% of those aged ≥17 years.

All camps requested that staff members and campers adhere to masking and physical distancing when interacting with persons outside their immediate family for 10–14 days before arrival at camp. Masking and physical distancing requirements were strongly recommended while traveling to camp. Campers§ across all nine camps were required to submit at least one negative SARS-CoV-2 RT-PCR test result from a test performed within 72 hours before the start of camp, regardless of vaccination status.

* https://www.medrxiv.org/content/10.1101/2021.02.18.21250271v1

† Vaccination rates reflect data submitted from eight of nine camps; 4,289 persons aged ≥12 years were eligible for vaccination.

§ Eight camps required staff members to submit a negative SARS-CoV-2 RT-PCR test result upon arrival for staff member week. In the one camp without this requirement, all staff members received rapid antigen testing before arrival of campers.

Summary

What is already known about this topic?

Previous studies have demonstrated the importance of prevention strategies to reduce SARS-CoV-2 transmission in overnight camps.

What is added by this report?

During June–August 2021, a total of 7,173 campers and staff members attended nine U.S. overnight camps that implemented multiple prevention strategies including high vaccination coverage (>93% among eligible persons aged ≥12 years); prearrival and frequent screening testing (38,059 tests); and additional concomitant prevention measures. Nine laboratory-confirmed COVID-19 cases and no secondary infections were detected.

What are the implications for public health practice?

Implementation of high vaccination coverage coupled with multiple prevention strategies is critical to averting COVID-19 outbreaks in congregate settings, including overnight camps. These findings highlight important guiding principles for school and youth-based COVID-19 prevention protocols.

The frequency and type of screening testing during camp varied across the camps and by vaccination status. In addition to a prearrival RT-PCR screening test, at least three screening tests were required by all camps for unvaccinated campers through the first 12 days after arrival. Six camps used a combination of rapid antigen and RT-PCR testing for screening; the remaining three used only RT-PCR testing for screening. RT-PCR test results were returned within approximately 12–24 hours. One camp performed wastewater RT-PCR surveillance testing three times per week in addition to screening testing.

Frequent testing was coupled with multiple prevention strategies, including podding, masking, physical distancing, and hand washing. A pod began as a group of campers and staff members who were in the same cabin. Pod residents were allowed to interact with each other without masking or physically distancing. Camps merged pods in stages, growing from one cabin to multiple cabins, to age groups. Each session required new campers and staff members to follow the same podding protocol. Three camps reached campwide pod expansion. The decision to end indoor masking at each pod expansion stage was predicated on all persons having a negative test result, unless state or local regulations prevented this (one camp). Staff members were permitted to remove masks when they were among other vaccinated staff members and separated from unvaccinated persons. To facilitate physical distancing, camps maximized outdoor activities, staggered mealtimes, divided persons into groups to eat indoors and outdoors, staggered medication administration,[¶] segregated infirmary care, and designated sick call by pod.[**] Hand sanitizing or washing before and after all activities and meals was required and facilitated by increased availability of dispensers and wash stations across camp. Camps varied with regard to whether staff members or campers were permitted off site; three camps permitted staff members to have days off outside of camp and four camps permitted off-site activities for staff members during intersession; only one camp permitted campers off site on one supervised trip. Off-site excursions were supervised in controlled settings or required staff member self-attestation to protocol compliance while off site. Compliance was monitored in-person by senior administrative staff members. If off-site excursions occurred between sessions, screening testing protocols were implemented.

During June–August 2021, a total of 38,059 rapid antigen and RT-PCR prearrival and camp screening tests were performed across the nine camps (Table 2). Screening testing identified 21 persons with positive test results; among these, 15 persons had a positive rapid antigen screening test result who were found to have negative RT-PCR test results. Thus, a total of six persons had SARS-CoV-2 infections confirmed by RT-PCR screening testing, for a screening test positivity rate of 0.02%. Three additional cases were confirmed among symptomatic persons by RT-PCR, yielding a total of nine cases (0.1%) identified across the camp population during the 2021 season. The nine cases occurred at four camps. Three of the nine cases occurred in vaccinated staff members and six in unvaccinated campers aged 8–14 years. The three staff member cases were identified before the arrival of campers. One case in a vaccinated symptomatic staff member occurred during initial staff week, and the other two cases in vaccinated staff members (one asymptomatic, one symptomatic) occurred between sessions. These two cases, which resulted from exposures between sessions and before camper arrival, were attributed to activity outside of camp and occurred when surrounding community case counts had risen two- to sevenfold since the start of camp for six of the seven camps with intersessions (Table 1). Thereafter, off-site activities were cancelled.

Two of the six campers with cases were asymptomatic and identified by prearrival screening; these campers did not enter camp. Three additional cases were identified by screening testing, and one was identified because the camper was symptomatic; all were identified within the first 8 days of camp.

¶ All medications (prescription or over-the-counter) needed by campers during the summer were required to be administered by medical staff members at the infirmary. Campers were not permitted to keep any medication in their cabin.

** Infirmary sick call followed an established schedule such that specific hours were designated for each pod or group of pods. Exceptions were made for emergency medical circumstances.

TABLE 1. Demographic characteristics and vaccination status of campers and staff members, camp characteristics, and local SARS-CoV-2 community transmission — nine U.S. overnight camps, June–August 2021

	Camp (total no. of campers and staff members), %									
Characteristic	**Total (N = 7,173)**	**A (n = 677)**	**B (n = 1,062)**	**C (n = 1,130)**	**D (n = 300)**	**E (n = 831)**	**F (n = 1,038)**	**G (n = 525)**	**H (n = 490)**	**I (n = 1,120)**
Camp population										
Campers	**72.8**	68.1	76.7	72.5	77.0	62.7	71.9	69.9	80.0	77.3
Staff members	**27.2**	31.9	23.3	27.5	23.0	37.3	28.1	30.1	20.0	22.7
Sex										
Male	**46.4**	43.6	45.5	44.8	69.7	47.2	46.3	50.1	42.2	43.8
Female	**53.5**	55.8	54.5	54.7	30.3	52.8	53.7	49.7	57.8	56.3
Undefined	**0.1**	0.6	0.0	0.5	0.0	0.0	0.0	0.2	0.0	0.0
Age group, yrs* (all campers/staff members)										
<12	**30.1**	24.2	27.0	37.2	22.3	35.1	30.2	27.6	28.6	29.4
12–16	**37.8**	42.0	46.7	31.8	52.3	23.2	37.1	34.3	49.4	37.1
≥17	**32.1**	33.8	26.3	31.0	25.3	41.7	32.7	38.1	22.0	33.5
Age group, yrs (vaccinated[†] campers/staff members [n = 6,135])										
<12	**0.1**	0.0	0.0	0.0	1.5	0.0	NR	0.7	0.0	0.0
12–16	**88.1**	91.5	94.6	85.0	89.2	88.6	NR	77.8	81.0	88.5
≥17	**99.3**	99.1	100.0	99.7	100.0	99.4	NR	97.5	99.1	99.2
Region/Division[§] of camper or staff member home residence										
New England	**8.0**	0.4	42.2	1.9	12.3	1.1	1.0	8.0	0.6	0.3
Middle Atlantic	**26.9**	72.4	13.9	84.9	56.3	1.6	2.4	19.0	3.7	1.0
South	**22.4**	13.3	35.7	2.2	15.7	3.7	88.9	14.7	4.1	1.3
Midwest	**11.0**	2.1	0.8	0.2	4.7	78.9	2.5	9.9	0.8	1.3
West	**25.1**	1.2	1.2	1.4	6.3	7.8	1.5	40.4	81.6	93.6
International	**6.1**	10.5	6.2	9.5	4.7	6.9	0.4	8.0	9.2	2.5
Missing	**0.5**	0.1	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0
Camp characteristic										
Persons per cabin, range	**NA**	14–20	8–15	16–17	2–3	15–17	14–20	10–15	14–40	12–16
Length of session, wks (no. of sessions)	**NA**	6.5 (1)	8 (1); 4 (2)[¶]	4 (1); 3 (1)[¶]	2 (3)[¶]	8 (1); 4 (2)[¶]	8 (1); 4 (2)[¶]	4 (2)[¶]	6.5 (1); 2 (3)[¶]	3 (2)[¶]
Local SARS-CoV-2 community transmission[**]										
At start of camp	**NA**	1.4	0.8	0.9	1.8	1.9	2.5	7.3	2.1	1.1
At intersession	**NA**	NA	6.0	6.3	2.4 (1st); 5.3 (2nd)	NA	4.2	7.3	0 (1st); 4.0 (2nd)	4.4

Abbreviations: NA = not applicable; NR = not reported.
* Age at start of camp.
† Vaccinated is defined as ≥2 weeks after completion of the primary vaccination series (i.e., 2 doses of one of the mRNA COVID-19 vaccines [Pfizer-BioNTech or Moderna] or single dose of the Janssen [Johnson & Johnson] COVID-19 vaccine). Documentation (upload of vaccination card) or parent attestation of vaccination was submitted to each camp by the start of camp. Vaccination rates (denominators) only include eight camps that provided vaccination data: camps A, B, C, D, E, G, H, and I.
§ Domestic home regions defined according to U.S. Census regions. International included Argentina, Canada, Colombia, Dominican Republic, Great Britain, Hungary, Israel, Jamaica, Japan, Mexico, Netherlands, Poland, United Kingdom, and U.S. military overseas bases. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf
¶ Campers and staff members may stay for multiple sessions.
** Daily new cases per 100,000 population. https://www.covidactnow.org

One camper case was traced to an exposure during an activity outside of camp between sessions. Campers from camps with confirmed cases were either sent home or isolated according to local health department guidance. Camps tested all potentially exposed contacts and varied according to whether all or only unvaccinated contacts were quarantined. No cases were identified at the camp that conducted wastewater surveillance. No secondary transmission was detected during camp.

Discussion

Implementation of multicomponent prevention strategies, including achievement of high vaccination coverage among those eligible for vaccination, prearrival and frequent screening testing, and use of additional concomitant prevention measures were critical to limiting the introduction and spread of COVID-19 in overnight youth camps. Frequent screening and testing of symptomatic campers and staff members resulted in rapid identification and isolation of persons with COVID-19 and quarantine of exposed contacts according to local health agency recommendations. Podding aided in containment of potential cases and provided campers the ability to continue to interact with their peers. These multipronged strategies ultimately resulted in no identified cases of secondary transmission during camp. Achieving a successful summer of preventing spread of COVID-19 at these overnight camps required extensive preparation and coordination. The organization's national medical committee was essential to providing

TABLE 2. SARS-CoV-2 screening testing* — nine U.S. overnight camps, June–August 2021

Timing of testing	No. of rapid antigen and RT-PCR screening tests	No. of persons with RT-PCR–positive screening test results	No. of persons with rapid antigen–positive, RT-PCR–negative screening test results
Total	**38,059**	**6**	**15**
Staff member week			
Prearrival day −14 or −10	502	—†	—
Prearrival day −3	1,547	—	—
Arrival day 0	664	—	—
Day 3	184	—	—
Day 5 or 6	343	—	—
Session 1			
Prearrival day −14 or −10	2,407	—	—
Prearrival day −3	4,001	1§,¶	—
Day 0	3,749	—	1¶
Day 2 or 3	1,675	—	3§,¶
Day 4 or 5	2,082	1§,¶	1§,¶
Day 7 or 8	2,060	1§,¶	—
Day 11–16	1,293	—	—
Day 18–22	1,776	—	—
Intersession			
Day 0	235	1¶	—
Day 3	238	—	—
Day 5	188	—	—
Session 2			
Prearrival day −14 or −10	636	—	—
Prearrival day −3	1,592	—	—
Day 0	2,635	1§,¶	—
Day 2 or 3	934	—	—
Day 4 or 5	2,150	1§,¶	1¶
Day 7 or 8	2,418	—	—
Day 11–16	1,796	—	3¶, 5§,¶
Day 18–22	1,262	—	—
Day 23 or 26	878	—	—
Session 3			
Prearrival day −3	151	—	—
Day 0	459	—	1¶
Day 3	110	—	—
Day 5	94	—	—

Abbreviation: RT-PCR = reverse transcription–polymerase chain reaction.

* Results include all preplanned screening testing according to each camp's COVID-19 prevention protocol from prearrival staff member week and through camp. Symptomatic and exposure testing results (positive and negative results) are not included. All screening tests had Food and Drug Administration Emergency Use Authorization.

† No confirmed cases or persons with positive rapid antigen and negative RT-PCR test result.

§ Unvaccinated (defined as not having received any dose of the COVID-19 vaccine).

¶ Asymptomatic.

guidance on the myriad prevention strategies and sharing critical real-time experiences throughout the summer.

Several camps permitted staff members to leave camp under specific protocol guidance. These outings increased the risk for SARS-CoV-2 exposure, infection, and transmission. Three of the nine cases resulted from this type of activity, underscoring the importance of vigilance when permitting activity outside the established controlled camp environment. These cases, combined with the rise in transmission across surrounding camp communities, led to the mid-summer cancellation of off-site activities.

The findings in this study are subject to at least two limitations. First, although symptomatic testing was performed according to protocol, and all positive test results were documented, negative results of tests conducted for symptoms or exposure were not always documented because of infirmary staffing challenges. This resulted in an unknown number of total tests performed after arrival. Consequently, results from symptomatic and exposure testing were not included in the test positivity rate, resulting in an overestimation. Second, one camp did not collect documentation of vaccination status among campers. All persons from this camp were removed from vaccination rate results, yet all staff members from this camp attested to full vaccination before the start of camp. As such, the overall vaccination rates and that among persons aged ≥17 years are likely underestimates.

These findings underscore the importance of simultaneous implementation of multicomponent strategies to reduce and prevent the transmission of SARS-CoV-2 in overnight youth camp settings. The combination of high vaccination rates among persons eligible for vaccination, frequent testing, podding, modified programming, masking, physical distancing, and attention to hand hygiene afforded campers and staff members safe engagement with their peers and camp community. These findings also highlight important guiding factors for development and implementation of COVID-19 prevention protocols in other youth-focused settings, including schools and related youth programs.

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References

1. American Camp Association. CampCounts 2020: COVID-19 responses and practices. Martinsville, IN: American Camp Association; 2021. https://www.acacamps.org/sites/default/files/resource_library/research/Camp-Counts-2020-Camp-COVID-Approach.pdf
2. 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. PMID:32881850 https://doi.org/10.15585/mmwr.mm6935e1
3. 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. PMID:32759921 https://doi.org/10.15585/mmwr.mm6931e1
4. Pray IW, Gibbons-Burgener SN, Rosenberg AZ, et al. COVID-19 outbreak at an overnight summer school retreat—Wisconsin, July–August 2020. MMWR Morb Mortal Wkly Rep 2020;69:1600–4. PMID:33119558 https://doi.org/10.15585/mmwr.mm6943a4
5. CDC. COVID-19: guidance for operating youth camps. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. Accessed May 12, 2021. https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/summer-camps.html
6. American Camp Association. Field guide for camps. Martinsville, IN: American Camp Association; 2021. Accessed May 13, 2021. https://www.acacamps.org/resource-library/coronavirus/camp-business/field-guide-camps
7. American Academy of Pediatrics. Guidance for families and pediatricians on camp attendance during the COVID-19 pandemic. Itasca, IL: American Academy of Pediatrics; 2021. Accessed August 13, 2021. https://www.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/guidance-for-families-and-pediatricians-on-camp-attendance-during-the-covid-19-pandemic/
8. CDC. Interim list of categories of essential workers mapped to standardized industry codes and titles. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. Accessed September 12, 2021. https://www.cdc.gov/vaccines/covid-19/categories-essential-workers.html

COVID-19 Outbreaks at Youth Summer Camps — Louisiana, June–July 2021

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According to sequencing data reported by CDC, the highly transmissible B.1.617.2 (Delta) variant of SARS-CoV-2, the virus that causes COVID-19, has been the predominant lineage circulating in Louisiana since the week of June 20, 2021 (*1*). In Louisiana, the increased spread of the Delta variant corresponded with the start of the state's fourth and largest increase in average daily COVID-19 incidence to date (*1*,*2*). This report describes COVID-19 outbreaks in Louisiana youth summer camps as the Delta variant became the predominant lineage during June–July 2021. This activity was reviewed by the Louisiana Department of Health (LDH) and was conducted consistent with applicable state law and LDH policy.*

During June–July 2021, LDH used camp reports and contact tracing data† to identify 28 camp outbreaks§ statewide, which included a total of 321 COVID-19 cases¶ among an estimated 2,988 campers and staff members. Fourteen (50.0%) of the camps were day camps, and 14 (50.0%) were overnight camps. The mean outbreak size was 11.5 cases (range = 2–59 cases); the mean outbreak size of day camps was 9.3 cases (range = 2–21 cases) and overnight camps was 13.6 cases (range = 2–59 cases). Compared with June–July 2020, when two outbreaks (each with five confirmed camp-associated cases) were identified statewide, this represented a thirty-one-fold increase in confirmed camp-associated cases.

Among the 321 camp-associated cases identified during the June–July 2021 outbreaks, the median age was 12 years (range = 5–54 years), 274 (85.4%) cases occurred among campers (range = 5–18 years), and 47 (14.6%) among staff members (range = 16–54 years). Among all campers with COVID-19, two (0.7%) were fully vaccinated against COVID-19; 133 (48.5%) were age-eligible but not vaccinated (representing 98.5% of the 135 vaccine-eligible campers with COVID-19), and 139 (50.7%) were not age-eligible for vaccination. All cases among staff members occurred in persons who had not received COVID-19 vaccine.

The first 2021 camp outbreak (11 cases) began the week of June 13 (Table). The number of outbreaks and total number of cases peaked during the week of July 4, when nine outbreaks and 118 cases were reported to LDH. The average camp outbreak size peaked at 15.3 cases during the week of July 18. Among the 28 camps with outbreaks during June–July 2021, one (3.6%) required indoor masking for staff members and campers with an outbreak size of eight cases among four staff members and four campers, and one (3.6%) mandated vaccination for all staff members and contractors with an outbreak size of 20 cases among campers. All camps reported some form of cohorting of campers, and seven (25.0%) reported unmasked interactions among cohorts of campers.

* https://ldh.la.gov/assets/oph/Center-PHCH/Center-CH/infectious-epi/Surveillance/sanitarycode_06_21_Revision_final.pdf

† Outbreaks were voluntarily reported to LDH by camp administration or LDH-staffed epidemiologists identified clusters of cases through contact-tracing data.

§ Outbreaks were defined as the occurrence of two or more confirmed COVID-19 cases within a setting, with a date of symptom onset (or date of specimen collection, if asymptomatic) within 14 days of one another.

¶ Cases were defined as positive reverse transcription–polymerase chain reaction or antigen test results for SARS-CoV-2.

TABLE. Camp-associated COVID-19 outbreaks and cases reported, by week of symptom onset and percentage of SARS-CoV-2 B.1.617.2 (Delta) variant circulating — Louisiana, June–July 2021

Week beginning	% SARS-CoV-2 Delta variant circulating in Louisiana*,†	No. of outbreaks reported	No. of outbreak-associated cases reported (average no. of cases per outbreak)
Jun 1	N/A	0	0 (—)
Jun 6	N/A	0	0 (—)
Jun 13	38.7	1	11 (—)
Jun 20	54.2	3	30 (10.0)
Jun 27	70.1	4	25 (6.3)
Jul 4	81.3	9	118 (13.1)
Jul 11	84.3	4	41 (10.3)
Jul 18	93.5	6	92 (15.3)
Jul 25	96.4	1	4 (—)
Total	—	**28**	**321§ (11.5)**

Abbreviation: N/A = not available.

* Variant proportion data not available before June 13, 2021.

† https://covid.cdc.gov/covid-data-tracker/#variant-proportions. Accessed September 26, 2021.

§ Median = 35.5; interquartile range = 21.5–98.5.

During the two previously identified camp outbreaks during June–July 2020, COVID-19 vaccines were not available, and all persons aged ≥8 years were required to wear a mask while indoors. However, the statewide mask mandate was lifted on May 25, 2021, ahead of the June–July 2021 camp outbreaks described in this study. LDH recommendations for 2021 youth summer camps were to vaccinate all eligible staff members and campers, incorporate universal indoor masking, and maintain separated cohorts or groups of campers. After the 2021 camp outbreak investigations, because approximately one half of infected campers were not age-eligible for vaccination, LDH reinforced its existing recommendations to vaccinate eligible persons, require masking, and to cohort staff members and campers, and included a new recommendation to test all close contacts of persons with confirmed COVID-19.

This study is subject to at least three limitations. First, genomic sequencing was not performed to genetically characterize SARS-CoV-2 isolates from cases. Second, outbreaks were voluntarily reported to LDH, which might result in underestimation of outbreaks. Finally, the role of differences in camp attendance levels by year on case counts could not be examined.

The increased number of outbreaks and cases observed in Louisiana youth summer camps in 2021 compared with the previous year coincided with the widespread circulation of the highly transmissible Delta variant. This period also coincided with apparent underutilization of preventive measures such as vaccination, masking, and physical distancing. Multicomponent prevention measures, including vaccination of all eligible adults and adolescents, wearing masks indoors, regular screening testing, physical distancing and cohorting, and increasing ventilation can help prevent transmission of SARS-CoV-2 in settings with youths who cannot be vaccinated (*3*,*4*).

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References

1. CDC. COVID data tracker. Atlanta, GA; US Department of Human Services, CDC; 2021. Accessed September 26, 2021. https://covid.cdc.gov/covid-data-tracker/#variant-proportions
2. Louisiana Department of Health. Louisiana coronavirus (COVID-19) information. Baton Rouge, LA: Louisiana Department of Health; 2021. Accessed September 7, 2021. https://ladhh.maps.arcgis.com/apps/opsdashboard/index.html#/4ecc2bfa2fa54b6eb5c0eccda972d203
3. CDC. COVID-19: guidance for COVID-19 prevention in K–12 schools. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. Accessed September 20, 2021. https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-guidance.html
4. Van Naarden Braun K, Drexler M, Rozenfeld RA, et al. Multicomponent strategies to prevent SARS-CoV-2 transmission—nine overnight youth summer camps, United States, June–August 2021. MMWR Morb Mortal Wkly Rep 2021;70. Epub October 1, 2021.

National and State Trends in Anxiety and Depression Severity Scores Among Adults During the COVID-19 Pandemic — United States, 2020–2021

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Recent studies indicate an increase in the percentage of adults who reported clinically relevant symptoms of anxiety and depression during the COVID-19 pandemic (*1*–*3*). For example, based on U.S. Census Bureau Household Pulse Survey (HPS) data, CDC reported significant increases in symptoms of anxiety and depressive disorders among adults aged ≥18 years during August 19, 2020–February 1, 2021, with the largest increases among adults aged 18–29 years and among those with less than a high school education (*1*). To assess more recent national trends, as well as state-specific trends, CDC used HPS data (*4*) to assess trends in reported anxiety and depression among U.S. adults in all 50 states and the District of Columbia (DC) during August 19, 2020–June 7, 2021 (*1*). Nationally, the average anxiety severity score increased 13% from August 19–31, 2020, to December 9–21, 2020 (average percent change [APC] per survey wave = 1.5%) and then decreased 26.8% from December 9–21, 2020, to May 26–June 7, 2021 (APC = –3.1%). The average depression severity score increased 14.8% from August 19–31, 2020, to December 9–21, 2020 (APC = 1.7%) and then decreased 24.8% from December 9–21, 2020, to May 26–June 7, 2021 (APC = –2.8%). State-specific trends were generally similar to national trends, with both anxiety and depression scores for most states peaking during the December 9–21, 2020, or January 6–18, 2021, survey waves. Across the entire study period, the frequency of anxiety and depression symptoms was positively correlated with the average number of daily COVID-19 cases. Mental health services and resources, including telehealth behavioral services, are critical during the COVID-19 pandemic.

Data were obtained from HPS (*4*), a biweekly, online survey. The survey, developed with assistance from CDC and other federal agencies to assess the social and economic impacts of the COVID-19 pandemic on U.S. households, began on April 23, 2020. Samples for HPS are drawn from an extract of the U.S. Census Bureau's master address file that includes email and mobile telephone numbers of approximately 117 million U.S. housing units. Survey data include sample weights to be used in analyses to generate results representative of U.S. adults aged ≥18 years based on age, sex, race/ethnicity, and educational attainment; the data from this experimental product were designed to produce estimates at state and national levels.* This analysis examined data for adults aged ≥18 years collected from the 19 biweekly surveys (waves) conducted during August 19, 2020–June 7, 2021 (waves 13–31), with breaks during December 22, 2020–January 5, 2021, because of expected decreases in survey response rates during holiday seasons, and during March 30–April 13, 2021, when HPS transitioned to a new survey cycle (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/110122). The total sample size was 1,526,154 for all 19 waves, ranging from 58,729 (wave 18) to 110,019 (wave 14). Overall survey response rates ranged from 5.3% to 10.3% among the 19 waves examined.

Frequency of experiencing anxiety and depressive symptoms was assessed using the four-item Patient Health Questionnaire (PHQ-4),† which includes the two-item Generalized Anxiety Disorder (GAD-2) scale and the two-item PHQ-2, which assesses symptoms of depression (*5*). For each survey response, answers were assigned a numerical value: not at all = 0, several days = 1, more than one half of the days = 2, and nearly every day = 3. The anxiety severity score was calculated by summing the two GAD-2 responses, and the depression severity score was calculated by summing the two PHQ-2 responses. The sum of both severity scores could range from 0 to 6.

Weighted mean anxiety and depression severity scores for the United States were calculated for each wave. For state estimates, weighted age-standardized mean scores were calculated using direct standardization. State-specific trends were modeled using linear mixed models with cubic splines for sampling waves (*6*) to obtain smoothed age-adjusted estimates for each wave. The age-standardized state-level average anxiety and depression severity scores for the 50 states and DC are presented for the first two waves (August 19–September 24, 2020), the peak period in anxiety and depression severity scores nationally (December 9, 2020–January 18, 2021), and the last two waves (May 12–June 7, 2021). APCs for anxiety and depression

* U.S. Census Bureau experimental data products are statistical products created using new data sources or previously untested methodologies.

† HPS includes a modified version of the validated PHQ-4 measure for depression and anxiety with a 1-week (versus a 2-week) recall period to reflect the weekly administration of the questions. The two anxiety questions asked about 1) feeling nervous, anxious, or on edge and 2) not being able to stop or control worrying. The two depression questions asked about 1) having little interest or pleasure in doing things and 2) feeling down, depressed, or hopeless.

severity scores per wave were calculated, and bootstrapping was used to obtain 95% confidence intervals (CIs) for APCs[§] (*7*). A change in the mean severity score indicates a change in the frequency of symptoms. To allow relative comparisons of HPS estimates with those from a nonpandemic period, weighted means and CIs were calculated for anxiety and depression severity scores using data from the 2019 National Health Interview Survey (NHIS), with data from 31,997 adults aged ≥18 years.[¶] Daily numbers of COVID-19 cases were obtained from the CDC COVID Data Tracker and were averaged across the same periods that the HPS anxiety and depression symptom data were collected. Average counts of daily cases were compared with the symptom data using Pearson correlations. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[**]

Nationally, the average anxiety severity scores increased from 2.0 during August 19–31, 2020, to 2.3 during December 9–21, 2020 (APC = 1.5% per wave), reflecting a 13.0% increase in symptoms (Figure) (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/110123). During this same period, the average depression severity score increased from 1.6 to 2.0, reflecting a 14.8% increase. From December 9–21, 2020, to May 26–June 7, 2021, the average anxiety severity score decreased to 1.7 (APC = −3.1% per wave), reflecting a 26.8% decrease; during this same period, the average depression severity score decreased to 1.4 (APC = −2.8% per wave), reflecting a 24.8% decrease.

Analyses of 2019 NHIS data indicate that the weighted average anxiety and depression severity scores among adults aged ≥18 years were 0.63 and 0.51, respectively. Quarterly weighted average anxiety and depression severity scores ranged from 0.61 to 0.65 and from 0.50 to 0.52, respectively; variation in these quarterly scores was substantially less than that in HPS during similar months.

In most states, the average anxiety and depression severity scores increased from August–September 2020 to December 2020–January 2021 (Table 1) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/110121). By May–June 2021, anxiety and depression severity scores were similar to or lower than those during August–September 2020. During August–December 2020 and January–June 2021, state-level trends in anxiety and depression severity scores were similar to national trends, with scores for most states peaking during December 9–21, 2020, or January 6–18, 2021. States with larger increases in severity scores during August–December 2020 also tended to have larger decreases during January–June 2021 (Table 2). Mississippi, Oklahoma, and South Carolina had the largest percentage increases in anxiety scores during August–December 2020, whereas Minnesota, Mississippi, and South Carolina had the largest percentage increases in depression scores; Florida and New York had the smallest percentage increases in depression and anxiety scores, respectively. During January–June 2021, Minnesota, Rhode Island, and Utah had the largest percentage decreases in anxiety scores; Idaho, Michigan, and Wisconsin had the largest percentage decreases for depression severity scores, whereas New York had the smallest decrease in both anxiety and depression scores.

For the same periods that HPS was administered, an association was found between numbers of COVID-19 cases and the frequency of anxiety and depression symptoms. The average number of daily COVID-19 cases was highly positively correlated with anxiety (rho = 0.79) and depression (rho = 0.81) severity scores (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/110123).

Discussion

The frequency of anxiety and depression symptoms experienced among U.S. adults increased after August 2020 and peaked during December 2020–January 2021. The frequency of symptoms subsequently decreased but in June 2021 remained elevated compared with estimates from the 2019 NHIS. The relative increases and decreases in frequency of reported symptoms of anxiety and depression at both the national and state levels mirrored the national weekly number of new COVID-19 cases during the same period.

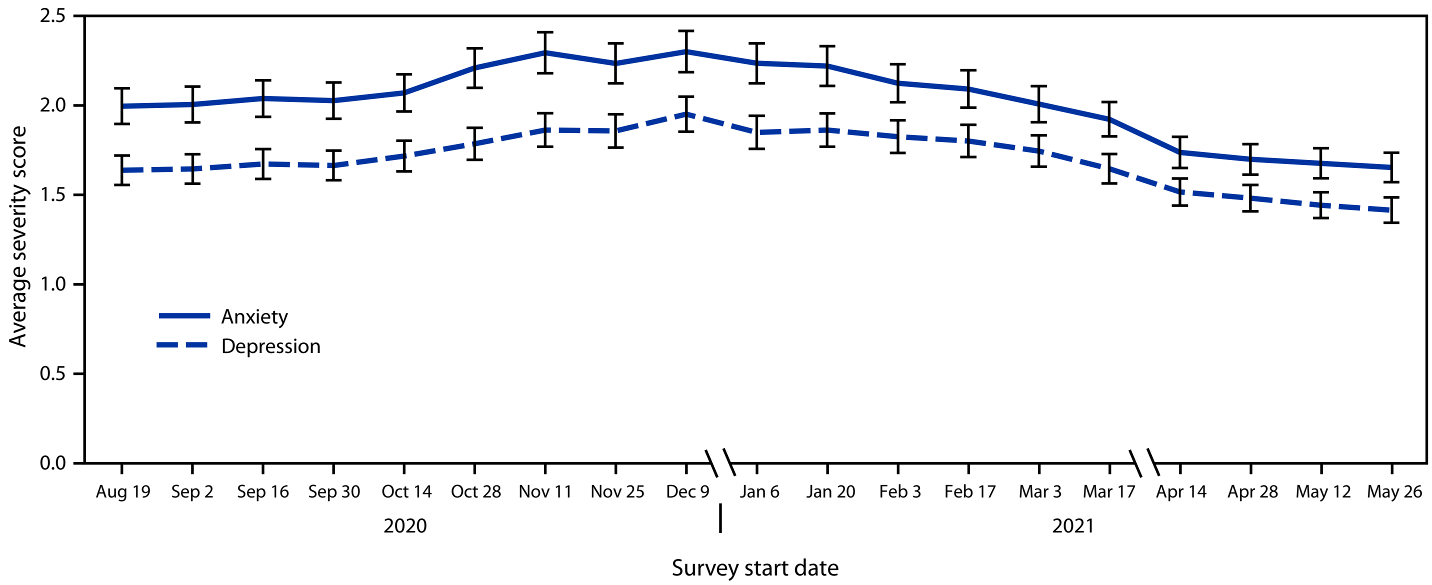
An international group of clinicians and mental health experts recommends that during pandemics, delivery systems for mental health care be adapted to mitigate disparities in the provision of health care (*8*). Predicting and planning for fluctuations in demand for behavioral health services is often difficult; however, real-time monitoring of mental health symptoms can provide important information for responding

§ Percent change (PC) from wave *i* to *i*+1 is defined as $PC_{t+1} = \left(\frac{\mu_{i+1} - \mu_i}{\mu_i} - 1\right) \times 100$. APC was calculated for a period of *n*+1 waves' data from wave *i* to wave *i*+*n* as $APC = \left\{exp\left[\frac{\sum_{t=i+1}^{i+n} ln(PC_t + 1)}{n}\right] - 1\right\} \times 100$.

¶ Data for the 2019 survey year were obtained from NHIS, a survey conducted continuously throughout the year by CDC's National Center for Health Statistics. NHIS is a nationally representative cross-sectional survey of the U.S. civilian noninstitutionalized population. NHIS uses geographically clustered sampling to select each household; one adult per household is randomly selected to be interviewed. Interviews are generally conducted in respondents' homes; follow-up interviews to complete surveys might occur by telephone when necessary. Methodological details, protocols, and Ethics Review Board approvals are described elsewhere (https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm). Weighted means for the anxiety and depression severity scores were estimated, accounting for the complex sampling design. Means and CIs for adults aged ≥18 years were estimated using the SAS SurveyMeans procedure.

** 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.0 Sect.552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE. Trends in average anxiety and depression severity scores* among adults, by survey start date — Household Pulse Survey, United States, August 19, 2020–June 7, 2021†



* 95% confidence intervals indicated by error bars.
† Data for adults aged ≥18 years were collected from 19 biweekly surveys (waves) conducted during August 19, 2020–June 7, 2021 (waves 13–31), with breaks during December 22, 2020–January 5, 2021, and March 30–April 13, 2021.

to surges in the demand for mental health services during national emergencies. The observed differences in severity score magnitude and peaks across states in this study indicate that these efforts are important at both the national and state levels.

The findings in this report are subject to at least six limitations. First, modified GAD-2 and PHQ-2 items were administered using a 1-week time frame rather than a 2-week time frame, which might have reduced comparability between HPS and NHIS. Second, short forms were used for GAD and PHQ; restricted ranges of scores might have decreased the likelihood of detecting differences in symptoms nationally or by state. Third, the HPS response rate was <10%, which might have introduced bias; however, trends are less likely than point estimates to be affected, and sample weights somewhat mitigate this bias (*9*). Fourth, peak periods in mental health symptoms overlapped with a break in survey data collection during the holiday season; reported symptoms during that period might have been underestimates if the peak occurred during the break. Fifth, the decrease in the frequency of symptoms observed through June 2021 occurred before the recent surge in COVID-19 cases involving the B.1.617.2 (Delta) variant; that decreasing trend might have slowed or reversed since June. Finally, these data are based on self-report and are subject to recall and social desirability biases.

The increased frequency of reported symptoms of anxiety and depression in this study indicates that mental health services and resources, including telehealth behavioral services, are critical during the COVID-19 pandemic, particularly among populations disproportionately affected by COVID-19. National COVID-19 trends demonstrate that certain populations have been disproportionately affected by high COVID-19 incidence, which also suggests that these populations might be more vulnerable to the psychological consequences of COVID-19. The mental health impact of COVID-19 also might have community-specific effects when morbidity and mortality rates are increasing as a result of COVID-19. Fluctuations in symptoms of anxiety and depression during the pandemic highlight the importance of real-time monitoring of mental health symptoms. Tracking these outcomes, including by demographic characteristics, can provide early indicators of potential increases in the demand for mental health services and for the health care providers needed to treat persons with clinically significant symptoms (*10*).

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TABLE 1. Average anxiety and depression severity scores, by state/area — Household Pulse Survey, United States, August–September 2020, December 2020–January 2021, and May–June 2021

State/Area	Mean severity score (95% CI)					
	Anxiety			Depression		
	Aug 19–Sep 14, 2020	Dec 9, 2020–Jan 18, 2021	May 12–Jun 7, 2021	Aug 19–Sep 14, 2020	Dec 9, 2020–Jan 18, 2021	May 12–Jun 7, 2021
Alabama	2.02 (1.90–2.15)	2.38 (2.19–2.57)	1.75 (1.49–2.00)	1.73 (1.61–1.84)	1.99 (1.81–2.16)	1.48 (1.26–1.71)
Alaska	1.84 (1.73–1.95)	2.24 (2.11–2.36)	1.51 (1.32–1.70)	1.54 (1.43–1.64)	1.89 (1.77–2.02)	1.29 (1.12–1.46)
Arizona	2.05 (1.95–2.15)	2.16 (2.05–2.27)	1.82 (1.62–2.01)	1.77 (1.68–1.87)	1.92 (1.80–2.04)	1.50 (1.34–1.67)
Arkansas	2.06 (1.94–2.19)	2.35 (2.16–2.54)	1.73 (1.46–1.99)	1.74 (1.63–1.85)	1.92 (1.75–2.09)	1.51 (1.29–1.73)
California	2.12 (2.05–2.20)	2.45 (2.35–2.55)	1.73 (1.61–1.86)	1.80 (1.72–1.87)	2.06 (1.96–2.16)	1.51 (1.39–1.62)
Colorado	2.04 (1.94–2.14)	2.30 (2.18–2.42)	1.78 (1.59–1.97)	1.64 (1.56–1.72)	1.90 (1.78–2.01)	1.41 (1.24–1.58)
Connecticut	2.09 (1.97–2.20)	2.39 (2.24–2.55)	1.53 (1.31–1.74)	1.61 (1.51–1.71)	1.97 (1.83–2.11)	1.21 (1.02–1.40)
Delaware	1.84 (1.69–1.99)	2.26 (2.08–2.44)	1.74 (1.45–2.03)	1.58 (1.43–1.72)	1.90 (1.73–2.07)	1.43 (1.17–1.70)
District of Columbia	2.05 (1.85–2.24)	2.10 (1.91–2.28)	1.59 (1.38–1.79)	1.59 (1.40–1.78)	1.58 (1.42–1.74)	1.35 (1.15–1.54)
Florida	2.10 (2.01–2.20)	2.31 (2.17–2.45)	1.67 (1.48–1.85)	1.73 (1.64–1.81)	1.85 (1.72–1.97)	1.36 (1.19–1.52)
Georgia	1.96 (1.86–2.06)	2.32 (2.17–2.47)	1.78 (1.57–1.99)	1.63 (1.53–1.72)	1.93 (1.78–2.07)	1.50 (1.32–1.68)
Hawaii	2.17 (2.01–2.34)	2.02 (1.81–2.23)	1.81 (1.54–2.07)	1.80 (1.65–1.94)	1.66 (1.46–1.85)	1.47 (1.22–1.71)
Idaho	1.91 (1.80–2.02)	2.18 (2.04–2.33)	1.59 (1.33–1.84)	1.54 (1.44–1.64)	1.88 (1.74–2.02)	1.23 (1.04–1.43)
Illinois	2.04 (1.95–2.14)	2.27 (2.14–2.40)	1.64 (1.45–1.83)	1.62 (1.54–1.71)	1.79 (1.68–1.90)	1.43 (1.24–1.62)
Indiana	1.95 (1.85–2.05)	2.11 (1.98–2.24)	1.67 (1.50–1.85)	1.56 (1.47–1.65)	1.75 (1.62–1.87)	1.45 (1.28–1.62)
Iowa	1.82 (1.72–1.92)	2.14 (1.98–2.31)	1.57 (1.36–1.78)	1.50 (1.40–1.60)	1.87 (1.72–2.02)	1.38 (1.18–1.58)
Kansas	1.90 (1.81–2.00)	2.18 (2.04–2.32)	1.53 (1.37–1.70)	1.52 (1.43–1.61)	1.86 (1.71–2.01)	1.30 (1.15–1.45)
Kentucky	2.13 (2.01–2.25)	2.36 (2.18–2.54)	1.64 (1.39–1.90)	1.81 (1.69–1.92)	2.00 (1.84–2.16)	1.57 (1.33–1.81)
Louisiana	2.25 (2.10–2.39)	2.49 (2.28–2.71)	1.86 (1.61–2.11)	1.83 (1.70–1.96)	2.11 (1.91–2.31)	1.56 (1.33–1.79)
Maine	2.14 (2.00–2.28)	2.28 (2.06–2.49)	1.54 (1.28–1.80)	1.63 (1.50–1.76)	1.81 (1.62–2.00)	1.39 (1.15–1.62)
Maryland	1.92 (1.83–2.02)	2.21 (2.08–2.34)	1.56 (1.39–1.72)	1.56 (1.47–1.65)	1.84 (1.71–1.97)	1.25 (1.12–1.37)
Massachusetts	1.98 (1.88–2.07)	2.27 (2.14–2.40)	1.62 (1.47–1.77)	1.52 (1.44–1.60)	1.79 (1.67–1.91)	1.36 (1.22–1.50)
Michigan	2.01 (1.91–2.11)	2.42 (2.29–2.55)	1.49 (1.33–1.66)	1.62 (1.53–1.71)	2.07 (1.93–2.20)	1.34 (1.18–1.50)
Minnesota	1.79 (1.71–1.87)	2.04 (1.92–2.17)	1.51 (1.35–1.67)	1.38 (1.30–1.45)	1.69 (1.58–1.80)	1.29 (1.13–1.45)
Mississippi	1.98 (1.85–2.11)	2.47 (2.26–2.68)	1.96 (1.63–2.30)	1.71 (1.59–1.82)	2.20 (2.01–2.40)	1.74 (1.33–2.15)
Missouri	1.90 (1.80–2.00)	2.28 (2.13–2.43)	1.88 (1.65–2.12)	1.58 (1.48–1.68)	1.93 (1.76–2.10)	1.63 (1.42–1.85)
Montana	1.89 (1.75–2.02)	2.34 (2.16–2.52)	1.31 (1.08–1.55)	1.46 (1.34–1.58)	1.88 (1.71–2.05)	1.21 (0.97–1.45)
Nebraska	1.71 (1.61–1.81)	1.95 (1.81–2.09)	1.29 (1.12–1.47)	1.45 (1.36–1.55)	1.74 (1.60–1.88)	1.10 (0.93–1.27)
Nevada	2.15 (2.03–2.27)	2.40 (2.24–2.55)	1.88 (1.64–2.13)	1.78 (1.66–1.90)	2.10 (1.96–2.24)	1.66 (1.42–1.90)
New Hampshire	1.97 (1.84–2.09)	2.10 (1.93–2.27)	1.75 (1.50–2.00)	1.52 (1.40–1.65)	1.67 (1.49–1.85)	1.60 (1.37–1.84)
New Jersey	2.07 (1.96–2.17)	2.27 (2.13–2.41)	1.73 (1.53–1.93)	1.61 (1.52–1.70)	1.87 (1.74–2.01)	1.46 (1.23–1.69)
New Mexico	2.26 (2.13–2.39)	2.39 (2.23–2.55)	1.80 (1.57–2.04)	1.86 (1.74–1.99)	2.07 (1.92–2.23)	1.63 (1.40–1.86)
New York	2.07 (1.96–2.17)	2.22 (2.08–2.36)	1.63 (1.41–1.84)	1.65 (1.56–1.75)	1.82 (1.70–1.95)	1.49 (1.29–1.69)
North Carolina	1.94 (1.83–2.05)	2.27 (2.12–2.42)	1.79 (1.55–2.04)	1.52 (1.42–1.63)	1.87 (1.73–2.01)	1.56 (1.35–1.77)
North Dakota	1.55 (1.42–1.68)	1.94 (1.72–2.16)	1.46 (1.09–1.84)	1.21 (1.08–1.34)	1.56 (1.39–1.74)	1.37 (0.97–1.77)
Ohio	2.02 (1.91–2.14)	2.29 (2.12–2.46)	1.64 (1.43–1.84)	1.75 (1.63–1.86)	2.11 (1.95–2.27)	1.48 (1.27–1.69)
Oklahoma	2.10 (1.98–2.22)	2.49 (2.34–2.64)	1.76 (1.54–1.99)	1.72 (1.61–1.83)	2.09 (1.95–2.23)	1.56 (1.36–1.76)
Oregon	2.25 (2.17–2.34)	2.50 (2.39–2.61)	1.85 (1.69–2.00)	1.78 (1.70–1.87)	2.12 (2.01–2.23)	1.57 (1.43–1.72)
Pennsylvania	1.99 (1.89–2.08)	2.21 (2.07–2.34)	1.73 (1.57–1.90)	1.62 (1.53–1.71)	1.95 (1.82–2.09)	1.38 (1.22–1.53)
Rhode Island	1.99 (1.86–2.13)	2.32 (2.10–2.54)	1.62 (1.26–1.98)	1.59 (1.46–1.73)	1.85 (1.67–2.03)	1.40 (1.05–1.75)
South Carolina	1.75 (1.63–1.87)	2.23 (2.07–2.40)	1.72 (1.46–1.99)	1.44 (1.33–1.55)	1.83 (1.67–1.99)	1.50 (1.27–1.73)
South Dakota	1.57 (1.46–1.68)	1.90 (1.70–2.10)	1.51 (1.23–1.79)	1.30 (1.19–1.41)	1.60 (1.41–1.80)	1.42 (1.09–1.74)
Tennessee	1.99 (1.88–2.10)	2.25 (2.10–2.40)	1.61 (1.42–1.80)	1.67 (1.57–1.78)	1.95 (1.81–2.09)	1.38 (1.20–1.57)
Texas	1.97 (1.89–2.05)	2.25 (2.14–2.36)	1.79 (1.62–1.96)	1.67 (1.60–1.75)	1.92 (1.82–2.02)	1.54 (1.37–1.70)
Utah	1.82 (1.73–1.91)	2.14 (2.04–2.24)	1.53 (1.39–1.68)	1.48 (1.40–1.57)	1.80 (1.70–1.90)	1.31 (1.18–1.45)
Vermont	1.97 (1.82–2.12)	2.23 (2.03–2.44)	1.57 (1.27–1.87)	1.55 (1.41–1.69)	1.73 (1.55–1.91)	1.41 (1.06–1.76)
Virginia	1.94 (1.83–2.04)	2.26 (2.13–2.40)	1.67 (1.48–1.85)	1.60 (1.50–1.70)	1.88 (1.75–2.02)	1.49 (1.30–1.67)
Washington	2.02 (1.95–2.09)	2.34 (2.24–2.44)	1.78 (1.65–1.91)	1.60 (1.53–1.67)	1.97 (1.87–2.06)	1.54 (1.40–1.67)
West Virginia	2.02 (1.87–2.17)	2.58 (2.38–2.77)	1.77 (1.48–2.05)	1.67 (1.53–1.82)	2.33 (2.14–2.52)	1.51 (1.28–1.74)
Wisconsin	1.79 (1.69–1.89)	2.11 (1.97–2.25)	1.46 (1.26–1.65)	1.46 (1.36–1.55)	1.73 (1.60–1.86)	1.12 (0.96–1.28)
Wyoming	1.94 (1.80–2.07)	2.19 (1.94–2.45)	1.32 (1.04–1.60)	1.50 (1.37–1.63)	1.72 (1.51–1.92)	1.23 (1.01–1.44)

Abbreviation: CI = confidence interval.

TABLE 2. National and state average percent change in anxiety and depression severity scores, by state/area — Household Pulse Survey, United States, August 2020–June 2021

State/Area	Anxiety severity score: Average % change* (95% CI) Aug–Dec 2020	Anxiety severity score: Average % change* (95% CI) Jan–Jun 2021	Anxiety severity score: Peak survey wave	Depression severity score: Average % change* (95% CI) Aug–Dec 2020	Depression severity score: Average % change* (95% CI) Jan–Jun 2021	Depression severity score: Peak survey wave
U.S. total	**1.5 (1.3 to 1.7)**	**−3.1 (−3.3 to −2.9)**	**21**	**1.7 (1.5 to 2.0)**	**−2.8 (−3.0 to −2.6)**	**22**
Alabama	1.7 (0.8 to 2.6)	−2.8 (−3.7 to −2.0)	22	1.7 (0.7 to 2.7)	−2.5 (−3.4 to −1.5)	22
Alaska	1.9 (1.4 to 2.5)	−3.3 (−3.9 to −2.7)	21	2.2 (1.6 to 2.8)	−3.0 (−3.7 to −2.3)	22
Arizona	1.2 (0.5 to 1.8)	−2.6 (−3.3 to −1.9)	20	1.1 (0.3 to 1.8)	−2.6 (−3.3 to −1.9)	22
Arkansas	1.8 (1.0 to 2.7)	−2.7 (−3.6 to −1.8)	21	1.7 (0.8 to 2.6)	−2.4 (−3.3 to −1.4)	22
California	1.5 (0.9 to 2.1)	−3.2 (−3.7 to −2.7)	21	1.5 (0.8 to 2.2)	−2.6 (−3.2 to −2.0)	22
Colorado	1.6 (0.9 to 2.2)	−3.0 (−3.6 to −2.3)	20	1.6 (0.9 to 2.3)	−2.6 (−3.3 to −1.8)	21
Connecticut	1.7 (1.0 to 2.4)	−3.3 (−4.0 to −2.6)	21	2.3 (1.4 to 3.1)	−3.3 (−4.0 to −2.5)	22
Delaware	1.8 (1.1 to 2.5)	−3.0 (−3.8 to −2.3)	20	2.0 (1.2 to 2.9)	−2.8 (−3.7 to −1.9)	21
District of Columbia	1.4 (0.6 to 2.3)	−2.9 (−3.6 to −2.2)	21	1.6 (0.5 to 2.6)	−2.5 (−3.3 to −1.6)	22
Florida	1.1 (0.3 to 1.8)	−2.8 (−3.6 to −2.1)	20	0.9 (0.1 to 1.7)	−2.5 (−3.3 to −1.6)	19
Georgia	1.9 (1.1 to 2.8)	−2.7 (−3.5 to −1.9)	21	2.3 (1.4 to 3.2)	−2.7 (−3.6 to −1.8)	22
Hawaii	0.9 (0.0 to 1.8)	−2.9 (−3.7 to −2.1)	20	1.0 (0.0 to 2.1)	−2.7 (−3.6 to −1.7)	20
Idaho	1.7 (1.0 to 2.4)	−3.3 (−4.0 to −2.6)	21	2.3 (1.5 to 3.1)	−3.4 (−4.2 to −2.7)	22
Illinois	1.3 (0.6 to 2.0)	−3.0 (−3.6 to −2.3)	21	1.8 (1.0 to 2.6)	−2.7 (−3.6 to −1.9)	22
Indiana	1.5 (0.8 to 2.2)	−3.0 (−3.7 to −2.2)	21	2.0 (1.2 to 2.8)	−2.8 (−3.5 to −2.0)	21
Iowa	1.9 (1.1 to 2.7)	−3.2 (−3.9 to −2.5)	21	2.2 (1.3 to 3.1)	−3.0 (−3.8 to −2.2)	22
Kansas	1.6 (0.9 to 2.3)	−3.4 (−4.1 to −2.7)	20	2.2 (1.4 to 3.0)	−3.2 (−4.0 to −2.4)	21
Kentucky	1.2 (0.4 to 2.1)	−3.0 (−3.8 to −2.2)	21	1.2 (0.3 to 2.1)	−2.5 (−3.4 to −1.7)	22
Louisiana	1.5 (0.6 to 2.3)	−2.9 (−3.8 to −1.9)	22	2.0 (1.0 to 3.0)	−2.7 (−3.7 to −1.7)	22
Maine	1.4 (0.6 to 2.1)	−3.4 (−4.1 to −2.7)	21	2.0 (1.1 to 2.9)	−3.2 (−4.1 to −2.4)	22
Maryland	1.8 (1.1 to 2.5)	−3.3 (−4.0 to −2.7)	21	2.1 (1.3 to 2.9)	−3.2 (−4.0 to −2.5)	22
Massachusetts	1.6 (0.9 to 2.3)	−3.1 (−3.7 to −2.6)	20	2.0 (1.3 to 2.8)	−2.9 (−3.6 to −2.2)	21
Michigan	1.7 (0.9 to 2.4)	−3.5 (−4.1 to −2.8)	22	2.3 (1.5 to 3.1)	−3.5 (−4.2 to −2.8)	22
Minnesota	2.0 (1.4 to 2.7)	−3.5 (−4.1 to −2.8)	20	2.6 (1.8 to 3.4)	−3.1 (−3.9 to −2.3)	21
Mississippi	2.2 (1.3 to 3.0)	−3.4 (−4.3 to −2.5)	22	2.5 (1.5 to 3.5)	−3.3 (−4.2 to −2.3)	22
Missouri	1.9 (1.1 to 2.7)	−2.8 (−3.5 to −2.0)	21	2.0 (1.1 to 3.0)	−2.7 (−3.5 to −1.8)	22
Montana	1.7 (0.9 to 2.4)	−3.5 (−4.3 to −2.6)	20	2.2 (1.3 to 3.0)	−3.2 (−4.1 to −2.4)	21
Nebraska	1.8 (1.1 to 2.5)	−3.4 (−4.0 to −2.7)	20	2.2 (1.4 to 3.0)	−3.3 (−4.0 to −2.5)	22
Nevada	1.7 (0.9 to 2.4)	−3.4 (−4.2 to −2.7)	20	2.0 (1.1 to 2.8)	−3.3 (−4.1 to −2.5)	21
New Hampshire	1.7 (1.0 to 2.3)	−3.1 (−3.8 to −2.3)	21	2.1 (1.2 to 2.9)	−2.5 (−3.4 to −1.7)	22
New Jersey	1.3 (0.6 to 2.0)	−3.0 (−3.7 to −2.3)	21	1.7 (0.9 to 2.6)	−2.6 (−3.4 to −1.8)	22
New Mexico	1.4 (0.7 to 2.1)	−3.1 (−3.8 to −2.5)	20	1.7 (0.9 to 2.5)	−2.9 (−3.6 to −2.2)	21
New York	0.8 (0.1 to 1.6)	−2.4 (−3.2 to −1.6)	22	1.1 (0.2 to 2.0)	−1.9 (−2.8 to −0.9)	23
North Carolina	2.0 (1.2 to 2.9)	−2.7 (−3.5 to −1.9)	22	2.3 (1.3 to 3.3)	−2.5 (−3.4 to −1.6)	22
North Dakota	1.9 (1.1 to 2.7)	−3.2 (−4.1 to −2.4)	21	2.2 (1.3 to 3.1)	−2.9 (−3.9 to −1.9)	22
Ohio	1.5 (0.7 to 2.4)	−3.3 (−4.1 to −2.5)	21	1.8 (0.8 to 2.8)	−2.8 (−3.7 to −1.9)	22
Oklahoma	2.2 (1.4 to 2.9)	−3.2 (−4.1 to −2.4)	21	2.3 (1.4 to 3.2)	−2.7 (−3.6 to −1.9)	22
Oregon	1.0 (0.5 to 1.6)	−3.0 (−3.5 to −2.5)	21	1.8 (1.1 to 2.4)	−3.0 (−3.6 to −2.4)	22
Pennsylvania	1.6 (0.8 to 2.3)	−2.8 (−3.4 to −2.1)	20	2.0 (1.1 to 2.8)	−3.0 (−3.8 to −2.2)	21
Rhode Island	1.8 (1.0 to 2.5)	−3.5 (−4.3 to −2.7)	21	2.2 (1.3 to 3.0)	−3.4 (−4.2 to −2.5)	22
South Carolina	2.2 (1.3 to 3.2)	−2.9 (−3.8 to −2.0)	20	2.6 (1.6 to 3.7)	−2.9 (−3.9 to −1.9)	21
South Dakota	2.0 (1.3 to 2.7)	−3.5 (−4.3 to −2.7)	21	2.3 (1.5 to 3.1)	−3.0 (−4.0 to −2.1)	21
Tennessee	1.8 (1.0 to 2.6)	−3.1 (−3.9 to −2.3)	22	2.0 (1.1 to 3.0)	−3.1 (−3.9 to −2.2)	22
Texas	2.1 (1.4 to 2.8)	−2.7 (−3.4 to −2.0)	20	2.0 (1.2 to 2.7)	−2.3 (−3.1 to −1.5)	20
Utah	2.0 (1.4 to 2.7)	−3.7 (−4.3 to −3.1)	21	2.2 (1.5 to 3.0)	−3.3 (−4.0 to −2.6)	22
Vermont	1.6 (1.0 to 2.3)	−3.1 (−3.9 to −2.4)	20	1.8 (1.0 to 2.5)	−2.7 (−3.5 to −1.8)	21
Virginia	1.7 (0.9 to 2.4)	−2.9 (−3.7 to −2.2)	21	1.4 (0.5 to 2.3)	−2.3 (−3.1 to −1.4)	22
Washington	1.7 (1.1 to 2.2)	−3.1 (−3.6 to −2.6)	21	2.1 (1.5 to 2.8)	−2.8 (−3.4 to −2.2)	22
West Virginia	1.8 (1.0 to 2.7)	−2.9 (−3.7 to −2.0)	21	2.2 (1.2 to 3.2)	−2.9 (−3.7 to −2.0)	22
Wisconsin	1.7 (0.9 to 2.5)	−3.4 (−4.2 to −2.6)	20	2.2 (1.3 to 3.1)	−3.5 (−4.3 to −2.7)	21
Wyoming	1.8 (1.1 to 2.4)	−3.3 (−4.2 to −2.5)	21	2.1 (1.4 to 2.9)	−3.1 (−4.0 to −2.2)	22

Abbreviation: CI = confidence interval.

* Percent change (PC) from wave *i* to *i*+1 is defined as $PC_{t+1} = \left(\frac{\mu_{i+1} - \mu_i}{\mu_i} - 1\right) \times 100$. Average percent change (APC) was calculated for a period of *n*+1 waves' data from wave *i* to wave *i*+*n* as $APC = \left\{exp\left[\frac{\sum_{t=i+1}^{i+n} ln(PC_t + 1)}{n}\right] - 1\right\} \times 100$. https://doi.org/10.1002/sim.3733

Summary

What is already known about this topic?

U.S. Census Bureau Household Pulse Survey data indicate that the percentage of U.S. adults with symptoms of anxiety and depressive disorders increased nationwide from August 2020 to February 2021.

What is added by this report?

Nationwide, average anxiety severity scores increased 13% from August to December 2020 and then decreased 26.8% from December 2020 to June 2021. Similar increases and decreases occurred in depression severity scores.

What are the implications for public health practice?

Mental health services and resources, including telehealth behavioral services, are critical during the COVID-19 pandemic.

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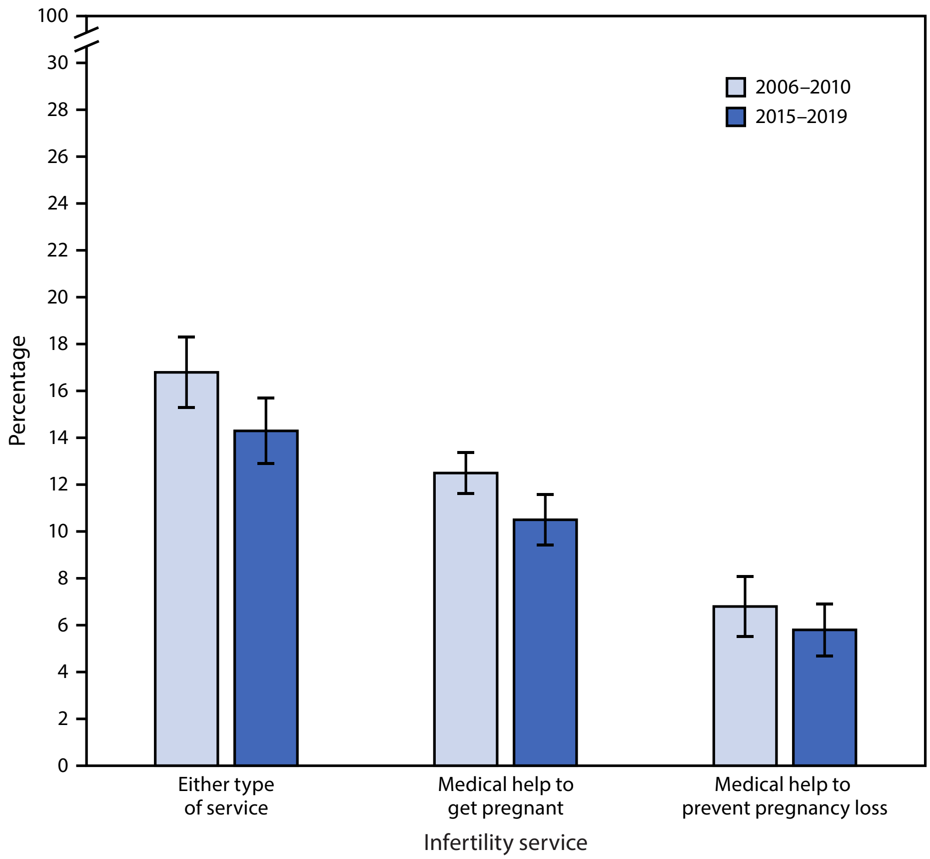
References

1. Vahratian A, Blumberg SJ, Terlizzi EP, Schiller JS. Symptoms of anxiety or depressive disorder and use of mental health care among adults during the COVID-19 pandemic—United States, August 2020–February 2021. MMWR Morb Mortal Wkly Rep 2021;70:490–4. PMID:33793459 https://doi.org/10.15585/mmwr.mm7013e2
2. Browning MHEM, Larson LR, Sharaievska I, et al. Psychological impacts from COVID-19 among university students: risk factors across seven states in the United States. PLoS One 2021;16:e0245327. PMID:33411812 https://doi.org/10.1371/journal.pone.0245327
3. Daly M, Robinson E. Psychological distress and adaptation to the COVID-19 crisis in the United States. J Psychiatr Res 2021;136:603–9. PMID:33138985 https://doi.org/10.1016/j.jpsychires.2020.10.035
4. Fields JF, Hunter-Childs J, Tersine A, et al. Design and operation of the 2020 Household Pulse Survey. Suitland, MD: US Department of Commerce, US Census Bureau; 2020. https://www2.census.gov/programs-surveys/demo/technical-documentation/hhp/2020_HPS_Background.pdf
5. Kroenke K, Spitzer RL, Williams JBW, Löwe B. An ultra-brief screening scale for anxiety and depression: the PHQ-4. Psychosomatics 2009;50:613–21. PMID: 19996233
6. Grajeda LM, Ivanescu A, Saito M, et al. Modelling subject-specific childhood growth using linear mixed-effect models with cubic regression splines. Emerg Themes Epidemiol 2016;13:1 https://ete-online.biomedcentral.com/articles/10.1186/s12982-015-0038-3. PMID:26752996 https://doi.org/10.1186/s12982-015-0038-3
7. Clegg LX, Hankey BF, Tiwari R, Feuer EJ, Edwards BK. Estimating average annual per cent change in trend analysis. Stat Med 2009;28:3670–82. PMID:19856324 https://doi.org/10.1002/sim.3733
8. Moreno C, Wykes T, Galderisi S, et al. How mental health care should change as a consequence of the COVID-19 pandemic. Lancet Psychiatry 2020;7:813–24. PMID:32682460 https://doi.org/10.1016/S2215-0366(20)30307-2
9. Peterson S, Toribio N. Nonresponse bias report for the 2020 Household Pulse Survey. Suitland, MD: US Department of Commerce, US Census Bureau; 2021. https://www2.census.gov/programs-surveys/demo/technical-documentation/hhp/2020_HPS_NR_Bias_Report-final.pdf
10. McKnight-Eily LR, Okoro CA, Strine TW, et al. Racial and ethnic disparities in the prevalence of stress and worry, mental health conditions, and increased substance use among adults during the COVID-19 pandemic—United States, April and May 2020. MMWR Morb Mortal Wkly Rep 2021;70:162–6. PMID:33539336 https://doi.org/10.15585/mmwr.mm7005a3

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Women Aged 25–44 Years Who Had Ever Used Infertility Services,† by Type of Service — National Survey of Family Growth, United States, 2006–2010 and 2015–2019



* Estimates are based on interviews of the U.S. household population for sample adults aged 25–44 years. 95% confidence intervals indicated with error bars.
† Infertility services include both medical help to get pregnant and medical help to prevent pregnancy loss.

During 2015–2019, among women aged 25–44 years, 14.3% had ever used any infertility services, down from 16.8% during 2006–2010. The percentage who had ever used medical help to get pregnant declined from 12.5% during 2006–2010 to 10.5% during 2015–2019, but the difference in the percentage ever using medical help to prevent pregnancy loss (6.8% during 2006–2010 and 5.8% during 2015–2019) was not statistically significant. During both periods, a higher percentage had ever received medical help to get pregnant than had ever received medical help to prevent pregnancy loss.

Source: National Survey of Family Growth, 2006–2010 and 2015–2019. https://www.cdc.gov/nchs/nsfg/index.htm

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