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Early and Increased Influenza Activity Among Children — Tennessee, 2022–23 Influenza Season

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Influenza seasons typically begin in October and peak between December and February (*1*); however, the 2022–23 influenza season in Tennessee began in late September and was characterized by high pediatric hospitalization rates during November. This report describes a field investigation conducted in Tennessee during November 2022, following reports of increasing influenza hospitalizations. Data from surveillance networks, patient surveys, and whole genome sequencing of influenza virus specimens were analyzed to assess influenza activity and secondary illness risk. Influenza activity increased earlier than usual among all age groups, and rates of influenza-associated hospitalization among children were high in November, reaching 12.6 per 100,000 in children aged <5 years, comparable to peak levels typically seen in high-severity seasons. Circulating influenza viruses were genetically similar to vaccine components. Among persons who received testing for influenza at outpatient clinics, children were twice as likely to receive a positive influenza test result as were adults. Among household contacts exposed to someone with influenza, children were more than twice as likely to become ill compared with adults. As the influenza season continues, it is important for all persons, especially those at higher risk for severe disease, to protect themselves from influenza. To prevent influenza and severe influenza complications, all persons aged ≥6 months should get vaccinated, avoid contact with ill persons, and take influenza antivirals if recommended and prescribed.*

The field investigation was conducted in November 2022 to understand early influenza activity in 14 of 95 Tennessee counties clustered in middle Tennessee and to identify groups most affected.† Weekly, age group–stratified data on emergency department visits for influenza-like illness (ILI-ED) and influenza-associated hospitalizations were obtained from the Electronic Surveillance System for the Early Notification of

* https://www.cdc.gov/flu/prevent/prevention.htm

† FluSurv-NET data identifies influenza-associated hospitalizations in eight middle Tennessee counties: Cheatham, Davidson, Dickson, Robertson, Rutherford, Sumner, Williamson, and Wilson. The Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE) captures emergency department visits statewide; analysis was restricted to the same eight counties. Survey data were collected from two clinic networks in middle Tennessee, including the same eight counties as well as Houston, Humphreys, Maury, Montgomery, Stewart, and Trousdale counties.

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Community-Based Epidemics (ESSENCE) and FluSurv-NET surveillance systems,[§] respectively, and were compared with data from previous influenza seasons.[¶] For influenza-associated hospitalizations, a probability distribution constructed from the three highest weekly rates from each previous season (*2*) was used to define age group–specific intensity thresholds for the 50th (medium), 90th (high), and 98th (very high) percentiles. Hospitalization data from previous seasons were adjusted for underdetection using data on age group–specific testing practices; 2022–23 season data were not adjusted. All surveillance data were restricted to October 2, 2022–January 7, 2023, reported as of January 12, 2023.

Vanderbilt University Medical Center (VUMC) and the Mid-Cumberland Regional Health Department clinics provided the Tennessee Department of Health (TDH) with information about persons who received testing for influenza. These data were merged with influenza vaccination records for the current season obtained from the Tennessee Immunization Information System. Persons who received a positive or negative influenza test result during November 4–18, 2022, were invited to complete a survey asking about their illness, which was facilitated by REDCap electronic data capture tools hosted at TDH[**] (*3*,*4*). Those who received a positive influenza test result were invited to complete a second, follow-up survey 1 week after their test to inquire about illnesses in household contacts.[††] VUMC clinics provided influenza-positive specimens collected during November 4–18 to CDC for whole genome sequencing to characterize circulating influenza viruses.

Factors associated with positive influenza test results in patients who received testing at participating clinics were identified using logistic regression. Characteristics of household contacts were compared using logistic regression accounting for household clustering. Secondary attack rates for symptomatic

[§] ESSENCE is a syndromic surveillance system that captures weekly percentages of ED visits with an influenza-specific diagnosis code or chief complaint suggesting influenza-like illness. FluSurv-NET is a population-based surveillance system that identifies weekly rates of influenza-associated hospitalizations within the catchment area.

[¶] For ESSENCE data, comparison seasons included 2017–18 through 2019–20 and 2021–22. For FluSurv-NET data, comparison seasons included 2012–13 through 2019–20 and 2021–22. The 2020–21 influenza season was excluded from both comparisons because of minimal influenza activity.

[**] The survey was provided in the region's most frequently spoken languages (Arabic, English, or Spanish) and facilitated by REDCap electronic data capture tools hosted at TDH with a Twilio application programming interface. Survey participants could access the survey online through a link provided by text message to their mobile telephone. In addition, TDH- and VUMC-affiliated employees called invited participants and offered the survey by telephone.

[††] The follow-up survey asked about sex, age, and influenza vaccination status of household members, whether they slept in the same room as an ill person, and whether they were ill the week before or after the participant received influenza testing. If an ill household member was reported, additional questions were asked about onset date and symptoms, including fever, chills, cough, sore throat, runny nose, diarrhea, vomiting, and body aches. Responses from participants whose household members had already participated were excluded.

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illness among household contacts with adjustment for age, vaccination status, and household size were assessed with a chain binomial model, assuming a 2-day infectiousness period, beginning at symptom onset, and a 2-day incubation period (5). Descriptive and regression analysis of outpatient data was conducted using SAS software (version 9.4; SAS Institute), and the chain binomial modeling was conducted in C. This activity was reviewed by CDC, TDH, and VUMC and was conducted consistent with applicable federal law and CDC policy.[§§]

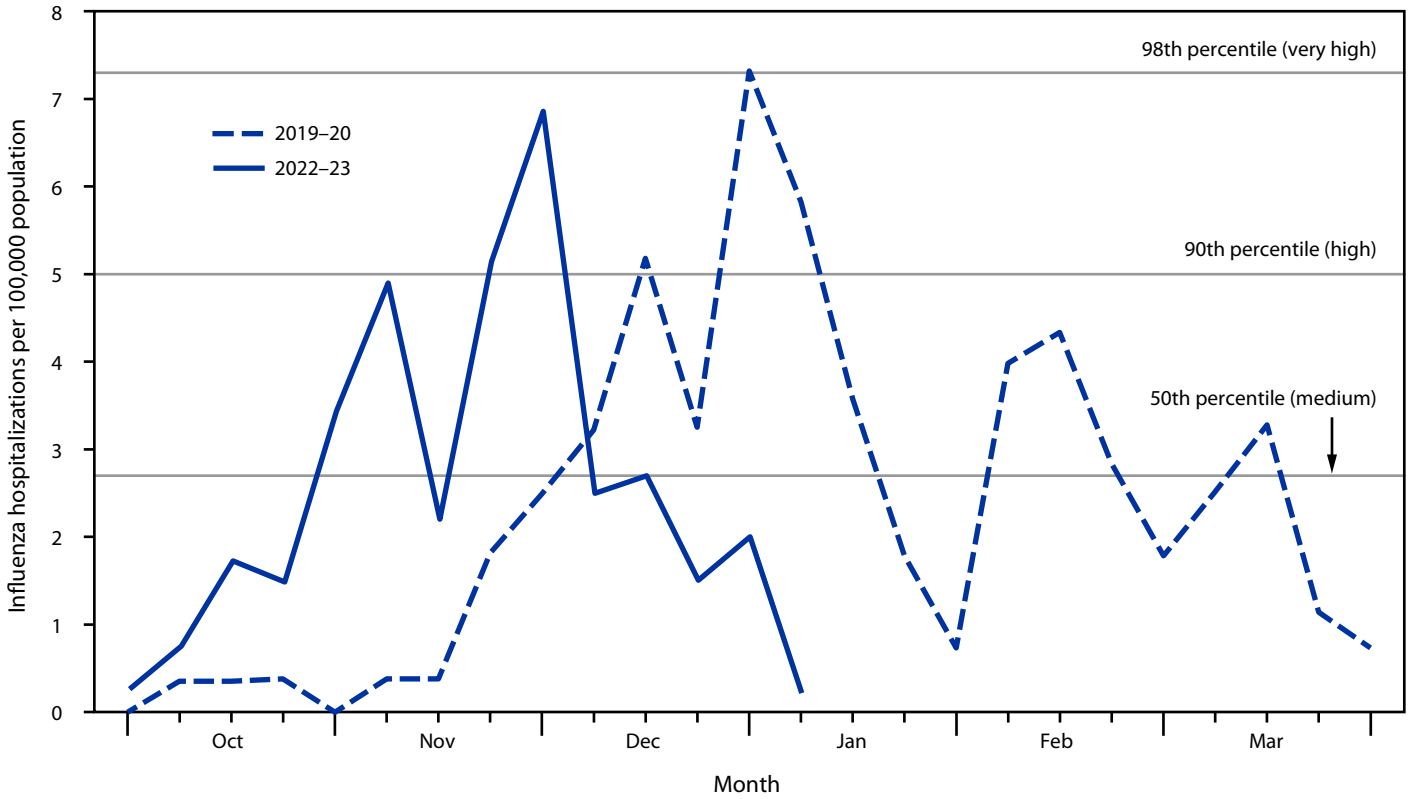
During October 2, 2022–January 7, 2023, ILI-ED visits and influenza-associated hospitalization rates began increasing and reached high levels earlier than in recent influenza seasons. These trends were most evident among persons aged <18 years, with ILI-ED visits in this group accounting for 31% of all visits during the week ending November 26, 2022 (previous seasons' peak levels range = 14%–34%). Weekly pediatric influenza-associated hospitalizations reached 12.6 per 100,000 children aged <5 years and 6.9 per 100,000 persons aged <18 years, exceeding the 90th percentile (high intensity) and approaching the 98th percentile (very high intensity) of peak weekly rates for children reported during previous influenza seasons (Figure). In comparison, among persons of all ages, ILI-ED reached 15% of all visits (previous seasons' peak range = 5%–13%), and influenza-associated hospitalizations surpassed medium intensity.

Among 4,626 persons from participating outpatient clinics who received influenza testing during November 4–18, 2022, a total of 2,164 (47%) were children, who were more likely to receive a positive test result (33%; 714 of 2,164) than were adults (20%; 483 of 2,462) (p<0.001). Seasonal influenza vaccination coverage was low in both children (23%; 499 of 2,164) and adults (34%; 830 of 2,462) who were tested for influenza. Among 332 specimens with completed sequencing data, 179 (54%) were classified as A(H3N2)3C.2a1b2a.2, and 153 (46%) as A(H1N1)pdm096B.1A5a.2; all were genetically similar to vaccine components.[¶¶] Among 489 persons who

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

[¶¶] https://www.cdc.gov/flu/weekly/

FIGURE. Influenza-associated hospitalizations and influenza intensity thresholds among persons aged <18 years — Tennessee, 2019–20 and 2022–23 influenza seasons*



* Medium, high, and very high thresholds are based on the probability distribution of peak weekly influenza-associated hospitalization rates for persons aged <18 years in Tennessee in the nine most recent seasons. The 2019–20 season is also shown for comparison because it had the highest peak rate for this age group in Tennessee in recent seasons.

responded to the survey (11% of 4,626 patients contacted for the survey), 269 (55%) were reported as children. Among 238 persons surveyed who had a positive influenza test result within 48 hours of symptom onset, 109 (46%) received influenza antiviral medication. Children were less likely to be treated (41%; 63 of 155) than were adults (55%; 46 of 83) (p = 0.03).

One hundred eighty-five persons with influenza completed the follow-up household survey.*** Among their 480 household contacts, 151 (31%) reported having any illness before or after the respondent's illness, among whom 83 (55%) reported symptoms of fever and either cough or sore throat consistent with influenza-like illness. From a univariate logistic regression model, household contacts reporting any illness were more likely to be children (odds ratio [OR] = 1.85; 95% CI = 1.45–2.35) or share a bedroom with an ill person (OR = 2.11; 95% CI = 2.59–2.80) during the week before or after the respondent's positive influenza test date compared with contacts who were not ill. In the transmission model, children were more likely to become ill than were adults (adjusted OR = 2.50; 95% CI = 1.55–4.03) (Table). After adjustment for household size and reported vaccination status, the secondary attack rate was 11.9% (range = 6.1%–22.0%) among child contacts and 5.1% (range = 2.7%–9.4%) among adult contacts.

TABLE. Characteristics of 480 household contacts of 185 persons who received a positive influenza test result and percentage of contacts who reported illness compatible with influenza — Tennessee, November 2022

Characteristic	Ill contacts/Total contacts (%)	Adjusted OR (95% CI)*
Age group, yrs		
<18	76/170 (45)	2.5 (1.6–4.0)†
≥18	75/310 (24)	Ref
Vaccination status		
Unvaccinated	103/306 (34)	Ref
Vaccinated	48/174 (28)	1.0 (0.6–1.6)
Total household size		
<5 persons	77/277 (28)	Ref
≥5 persons	74/203 (36)	1.2 (0.5–2.6)

Abbreviations: OR = odds ratio; Ref = referent group.

* Adjusted ORs of illness were estimated using a chain binomial model accounting for age, vaccination status, and household size. In this model, age and vaccination status were covariates affecting susceptibility to illness from within the household and in the community, and household size was a covariate affecting susceptibility to illness from within the household only. Covariates were chosen based on completeness; information on sharing a bedroom was missing for all index patients, and information on sex was missing for 17 persons.

† Statistically significant.

Discussion

Influenza activity in Tennessee during the 2022–23 season began earlier than in previous seasons, and the percentage of outpatient visits for influenza and the rate of influenza-associated hospitalization among children have been high. This investigation found that children seeking outpatient care were more likely to receive a positive influenza test result than were adults, and that pediatric influenza-associated hospitalization rates in late November reached levels similar to peak activity during recent high-severity influenza seasons. Together with the finding that, among household contacts, secondary illnesses occurred more frequently in children than in adults, these results suggest that children are experiencing an increased impact of influenza during the 2022–23 season.

Influenza activity appears to have been declining in Tennessee and nationally since early December 2022; however, influenza continues to circulate and several weeks of the season remain (*6*). Although anyone can be infected with influenza viruses, young children, older adults, and persons with certain underlying medical conditions are at increased risk for influenza-associated morbidity and mortality (*7*). Seasonal influenza vaccination remains the best way to protect against influenza and influenza-associated complications, including among children. All persons aged ≥6 months should receive a seasonal influenza vaccine to protect themselves for the remainder of the influenza season. In addition, everyday preventive actions, such as reducing interactions with persons who are ill; avoiding others when ill; avoiding touching one's mouth, eyes, and nose; frequent handwashing; and wearing facemasks when respiratory virus circulation is high, can help reduce the risk for becoming infected with influenza and other respiratory viruses.

The rates of influenza-associated hospitalization in Tennessee, especially among children, were higher during October–November 2022 than during the same months in recent influenza seasons. The hospitalization rates among children in Tennessee are similar to those seen nationally among children (*8*). Influenza antiviral medication should be prioritized for hospitalized persons and all patients at increased risk for influenza complications (including children aged <2 years and persons with certain underlying medical conditions); these medications can reduce the risk for influenza-associated complications (*9*).

The findings in this report are subject to at least five limitations. First, these findings are limited in generalizability because the population represents a sample from middle Tennessee recruited over a period of 2 weeks in November, and only 11% of invited participants completed the survey. Second, this early season assessment might not be indicative or predictive of the remainder of this influenza season. Third, because Tennessee does not require reporting to the state immunization

*** The median household size was three persons (IQR = three to four persons). Most (77%; 142) households included children, with a median of two children per household (IQR = one to two children).

Summary

What is already known about this topic?

During fall 2022, many states reported increased respiratory virus activity earlier than is typically observed. Information was limited about the impact of early influenza activity.

What is added by this report?

After several low-severity influenza seasons, the 2022–23 season in Tennessee has been characterized by earlier activity, higher rates of pediatric hospitalization, and a higher rate of symptomatic illness among children than among adults or during past seasons.

What are the implications for public health practice?

To prevent influenza and severe influenza complications, all persons aged ≥6 months should get vaccinated, avoid contact with ill persons, and take influenza antivirals if recommended and prescribed.

registry, vaccination status might be underestimated. Fourth, survey participants were recruited from among clinic patients and likely represent a subset of the population with more access to health care services. Finally, the transmission model assumes that ill household contacts had influenza, which might overestimate infection because other respiratory viruses were also circulating.

In Tennessee, the 2022–23 influenza season has been marked by early and intense activity, particularly affecting children, with higher rates of pediatric influenza-associated hospitalizations than have been reported in recent influenza seasons. As the influenza season continues, it is important for all persons, especially those at higher risk for severe disease, to protect themselves from influenza. To prevent influenza and severe influenza complications, all persons aged ≥6 months should get vaccinated, avoid contact with ill persons, and take influenza antivirals if recommended and prescribed.

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Alcohol Use, Screening, and Brief Intervention Among Pregnant Persons — 24 U.S. Jurisdictions, 2017 and 2019

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Alcohol use during pregnancy is a major preventable cause of adverse alcohol-related outcomes, including birth defects and developmental disabilities.* Alcohol screening and brief intervention (ASBI) is an evidence-based primary care tool that has been shown to prevent or reduce alcohol consumption during pregnancy; interventions have resulted in an increase in the proportion of pregnant women reporting abstinence (odds ratio = 2.26; 95% CI = 1.43–3.56) (*1*). Previous national estimates have not characterized ASBI in populations of pregnant persons. Using 2017 and 2019 Behavioral Risk Factor Surveillance System (BRFSS) data, CDC examined prevalence of ASBI and characteristics of pregnant persons and nonpregnant women aged 18–49 years (reproductive-aged women) residing in jurisdictions that participated in the BRFSS ASBI module. During their most recent health care visit within the past 2 years, approximately 80% of pregnant persons reported being asked about their alcohol use; however, only 16% of pregnant persons who self-reported current drinking at the time of the survey (at least one alcoholic beverage in the past 30 days) were advised by a health care provider to quit drinking or reduce their alcohol use. Further, the prevalence of screening among pregnant persons who did not graduate from high school was lower than that among those who did graduate from high school or had at least some college education. This gap between screening and brief intervention, along with disparities in screening based on educational level, indicate missed opportunities to reduce alcohol use during pregnancy. Strategies to enhance ASBI during pregnancy include integrating screenings into electronic health records, increasing reimbursement for ASBI services, developing additional tools, including electronic ASBI, that can be implemented in a variety of settings (*2,3*).

There is no known safe amount of alcohol, type of alcohol, or timing of alcohol use during pregnancy or while trying to become pregnant. Alcohol use among pregnant persons remains a public health concern. During 2015–2017, 11.5% of pregnant U.S. women aged 18–44 years reported current drinking (*4*), and during 2018–2020, 13.5% of pregnant adults aged 18–49 years reported current drinking (*5*). Brief intervention or behavioral counseling conducted in a primary care setting has been shown to increase the likelihood of abstaining from alcohol during pregnancy (*1*). The U.S. Preventive Services Task Force recommends implementing ASBI for all adults aged ≥18 years in primary health care settings, including those who are pregnant, to reduce excessive alcohol use, which includes any alcohol use while pregnant (*6*). Despite these recommendations for universal screening, some populations might not be screened as frequently as others (*7*).

BRFSS is a cross-sectional, random-digit–dialed, annual telephone survey of noninstitutionalized U.S. adults aged ≥18 years† that collects data on health-related behaviors. CDC analyzed data from 23 states and the District of Columbia§ that participated in an optional BRFSS ASBI module in 2017 and 2019¶ (unweighted sample size = 248,901; median response rate = 45.9% [2017] and 49.4% [2019]). For states that participated in the ASBI module both years (California, Kansas, and Nebraska), analytic weights were adjusted proportionally to their sample size for each year. Pregnant persons** and reproductive-aged women were compared by age, race and ethnicity,†† education level,§§ employment status,¶¶ disability

* https://www.cdc.gov/ncbddd/fasd/alcohol-use.html

† https://www.cdc.gov/brfss/

§ Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Georgia, Illinois, Kansas, Maryland, Minnesota, Montana, Nebraska, Nevada, New Hampshire, North Carolina, Oklahoma, Rhode Island, South Carolina, Tennessee, Utah, and Wisconsin.

¶ https://www.cdc.gov/brfss/questionnaires/modules/category2017.htm; https://www.cdc.gov/brfss/questionnaires/modules/category2019.htm

** Self-reported pregnancy was based on responses to the question, "To your knowledge, are you now pregnant?" This question was asked if the respondent's sex was female and the respondent was aged <49 years.

†† Race and ethnicity was defined as non-Hispanic Black or African American, Hispanic or Latino, non-Hispanic White, and Other (including non-Hispanic American Indian or Alaska Native, non-Hispanic Asian, non-Hispanic Native Hawaiian or other Pacific Islander, and non-Hispanic multiracial).

§§ Self-reported education level was based on computed levels as follows: "Did not graduate High School," "Graduated High School," "Attended College or Technical School," and "Graduated from College or Technical School." Responses to "Attended College or Technical School" and "Graduated from College or Technical School" were combined to a variable of "Some college or more."

¶¶ Employment status included employed for wages or self-employed. Unemployment status included being out of work for ≥1 year, out of work for <1 year, a homemaker, a student, retired, or unable to work.

status,*** HIV risk,††† experience of frequent mental distress,§§§ chronic conditions,¶¶¶ health insurance status,**** having a usual health care provider,†††† residence in a state with expanded Medicaid,§§§§ cigarette use,¶¶¶¶ any alcohol use,***** and binge drinking.††††† Analyses were conducted to estimate the prevalence of alcohol use and screening§§§§§ among pregnant persons and reproductive-aged women who visited a health care provider in the past 2 years. Prevalence of brief intervention¶¶¶¶¶ was calculated among pregnant persons.

Summary

What is already known about this topic?

Alcohol screening and brief intervention (ASBI) is an evidence-based tool to reduce alcohol consumption in adults, including pregnant persons.

What is added by this report?

In 2017 and 2019, during their most recent health care visit, 80% of pregnant persons reported being asked about their alcohol use; only 16% of those with past 30-day alcohol consumption were advised by a health care provider to quit or reduce their alcohol use. Disparities in alcohol screening were observed among pregnant persons with lower educational attainment.

What are the implications for public health practice?

Implementation of recommended ASBI among pregnant persons can help prevent alcohol use or reduce current drinking. Strategies to enhance ASBI include integrating screenings into electronic health records, increasing reimbursement for ASBI services, and development of additional tools including electronic ASBI.

Prevalence estimates and 95% CIs were standardized to the age distribution of persons who gave birth to a live singleton infant in 2017 using vital statistics data.****** Survey procedures with Taylor series variance and weights were used to account for the sample design and nonresponse. Wald chi-square tests were used to test for differences with $p<0.05$ considered statistically significant. All analyses were conducted using SAS (version 9.4; SAS Institute). BRFSS data are publicly available, and their use is not subject to human subjects review. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.††††††

Among 950 pregnant persons in jurisdictions included in the 2017 and 2019 BRFSS ASBI module, 13.3% reported current drinking and 6.9% reported binge drinking (Table 1). Among reproductive-aged women, 56.4% reported current drinking and 20.2% reported binge drinking. Overall, 80.1% of pregnant persons and 86.0% of reproductive-aged women reported being screened for alcohol use at their last visit to

*** Disability was defined as an affirmative response to any of the following questions: "Are you deaf or have serious difficulty hearing?," "Are you blind or have serious difficulty seeing, even when wearing glasses?," "Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?," "Do you have serious difficulty walking or climbing stairs?," "Do you have difficulty dressing or bathing?," and "Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?"

††† Respondents were classified as reporting behaviors that might increase the risk for HIV transmission if they reported at least one of the following: 1) injection of any drug other than one prescribed in the past year, 2) being treated for a sexually transmitted disease in the past year, 3) having given or received money or drugs in exchange for sex in the past year, 4) had anal sex without a condom in the past year, or 5) had four or more sexual partners in the past year.

§§§ Frequent mental distress was based on responses to the question, "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" where ≥14 days was considered frequent mental distress.

¶¶¶ Chronic condition was defined as ever having been told by a health care provider that the person had a heart attack, angina, coronary heart disease, stroke, hypertension (including gestational hypertension), diabetes (including gestational diabetes), arthritis, asthma, chronic obstructive pulmonary disease, emphysema, chronic bronchitis, depression, any cancer, or chronic kidney disease.

**** Health insurance status was based on responses to the question, "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?"

†††† Having a usual health care provider was based on responses to the question, "Do you have one person you think of as your personal doctor or health care provider?" where one or more was included.

§§§§ States were included that had expanded Medicaid before 2017 or 2019, depending on the year or years each state was included in the BRFSS ASBI module survey. https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/

¶¶¶¶ Cigarette use was based on responses to the questions, "Have you smoked at least 100 cigarettes in your entire life?" and "Do you now smoke cigarettes every day, some days, or not at all?" Responses of "every day" and "some days" were combined to create a dichotomous variable of cigarette use, and persons who responded "no" to the question, "Have you smoked at least 100 cigarettes in your entire life?" were combined with persons who reported "not at all."

***** Self-reported alcohol use was based on the BRFSS calculated variable of "Adults who reported having had at least one drink of alcohol in the past 30 days."

††††† Self-reported binge drinking was based on the BRFSS calculated variable of "Considering all types of alcoholic beverages, how many times during the past 30 days did you have 5 or more drinks [for men] or 4 or more drinks [for women] on an occasion?"

§§§§§ Alcohol screening was based on responses to the question, "You told me earlier that your last routine checkup was [within the past 2 years]. At that checkup, were you asked in person or on a form if you drink alcohol?"

¶¶¶¶¶ Among participants who responded "yes" to the question "You told me earlier that your last routine checkup was [within the past 2 years]. At that checkup, were you asked in person or on a form if you drink alcohol?," brief intervention was based on responses to the questions, "Were you offered advice about what level of drinking is harmful or risky for your health?" and "At your last routine checkup, were you advised to reduce or quit your drinking?"

****** https://wonder.cdc.gov/

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

TABLE 1. Age-standardized* characteristics of pregnant persons and nonpregnant reproductive-aged women — Behavioral Risk Factor Surveillance System, Alcohol Screening and Brief Intervention module, 23 states and the District of Columbia,† 2017 and 2019

Characteristic§	Weighted % (95% CI)		P-value
	Pregnant persons¶ (unweighted n = 950)	Nonpregnant reproductive-aged women (unweighted n = 28,476)	
Age group, yrs			
18–24	25.1 (20.5–29.7)	22.4 (21.5–23.3)	<0.001
25–34	53.2 (48.0–58.4)	30.9 (30.0–31.8)	
35–49	21.7 (17.5–25.9)	46.7 (45.8–47.6)	
Race and ethnicity			
Black or African American, non-Hispanic	13.9 (10.1–17.7)	15.4 (14.5–16.3)	0.113
Hispanic or Latino	28.1 (23.4–32.8)	23.7 (22.7–24.7)	
White, non-Hispanic	45.7 (40.6–50.9)	48.6 (47.4–49.7)	
Other, non-Hispanic**	12.2 (8.4–16.1)	12.3 (11.4–13.1)	
Education††			
Did not graduate from high school	15.3 (10.7–19.9)	11.0 (10.1–11.8)	0.116
Graduated from high school	24.1 (19.7–28.4)	23.9 (22.9–24.9)	
Some college or more	60.7 (55.4–66.0)	65.1 (63.9–66.3)	
Employment status§§			
Employed	57.3 (52.1–62.6)	62.3 (61.1–63.4)	0.030
Not employed	42.7 (37.4–47.9)	37.7 (36.6–38.9)	
Disability status¶¶			
Reported disability	13.7 (9.6–17.8)	18.5 (17.6–19.4)	0.016
No reported disability	86.3 (82.2–90.4)	81.5 (80.6–82.4)	
Reported behaviors that increase risk for HIV transmission* **			
Yes	8.3 (5.7–11.0)	10.1 (9.4–10.9)	0.996
No	91.7 (89.0–94.3)	89.9 (89.1–90.6)	
Mental distress†††			
Frequent mental distress	11.6 (7.7–15.5)	16.9 (16.0–17.7)	0.030
No frequent mental distress	88.4 (84.5–92.3)	83.1 (82.3–84.0)	
Chronic conditions§§§			
Any chronic condition	55.4 (49.0–61.8)	57.1 (55.7–58.5)	0.123
No chronic condition	44.6 (38.2–51.0)	42.9 (41.5–44.3)	
Health insurance status¶¶¶			
Any health insurance	88.9 (85.7–92.2)	86.6 (85.8–87.5)	0.507
No health insurance	11.1 (7.8–14.3)	13.4 (12.5–14.2)	
Health care provider**			
Has a usual health care provider	75.2 (70.7–79.7)	76.5 (75.5–77.5)	0.033
Does not have a usual health care provider	24.8 (20.3–29.3)	23.5 (22.5–24.5)	
Medicaid expansion††††			
Lives in Medicaid expansion state	62.9 (58.0–67.7)	62.9 (62.1–63.7)	0.841
Does not live in Medicaid expansion state	37.1 (32.3–42.0)	37.1 (36.3–37.9)	

See table footnotes on the next page.

a health care provider (Table 2). Pregnant persons who did not graduate from high school reported a lower prevalence of alcohol screening (53.5%) compared with those who graduated from high school (83.4%) and those with at least some college education (84.5%). A higher proportion of pregnant persons who reported behaviors that might increase the risk for HIV transmission were screened (95.8%) than were those without reported risk behaviors (78.6%). No significant differences in screening prevalence among pregnant persons were observed based on race and ethnicity, disability status, frequent mental distress, health insurance status, having a usual health care provider, or living in a Medicaid expansion state. However, among reproductive-aged women, screening prevalence was lower among those who were non-Hispanic and of another race or ethnicity (i.e., American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, or multiracial) than among those who were Hispanic or Latino, non-Hispanic Black or African American, and non-Hispanic White. Screening prevalence was also lower among reproductive-aged women who did not have health insurance than among those with any health insurance. Among pregnant persons who reported current drinking at the time of the survey, 96.7% (95% CI = 93.4–100.0) reported having been screened at their most recent health care visit.

Approximately one quarter (25.3%; 95% CI = 19.6–31.0) of pregnant persons who received alcohol screening were offered

TABLE 1. (*Continued*) Age-standardized* characteristics of pregnant persons and nonpregnant reproductive-aged women — Behavioral Risk Factor Surveillance System, Alcohol Screening and Brief Intervention module, 23 states and the District of Columbia,† 2017 and 2019

Characteristic§	Weighted % (95% CI)		P-value
	Pregnant persons¶ (unweighted n = 950)	Nonpregnant reproductive-aged women (unweighted n = 28,476)	
Alcohol use			
Current drinking§§§§	13.3 (8.9–17.6)	56.4 (55.2–57.5)	<0.001
Binge drinking¶¶¶¶	6.9 (3.0–10.8)	20.2 (19.2–21.1)	<0.001
Cigarette use***			
Every day or some days	5.4 (2.7–8.0)	12.6 (11.8–13.3)	<0.001
No cigarette use	94.6 (92.0–97.3)	87.4 (86.7–88.2)	

Abbreviation: BRFSS = Behavioral Risk Factor Surveillance System.

* Prevalence estimates and 95% CIs were standardized to the age distribution of persons who gave birth to a live singleton infant in 2017 using vital statistics data. https://wonder.cdc.gov/

† Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Georgia, Illinois, Kansas, Maryland, Minnesota, Montana, Nebraska, Nevada, New Hampshire, North Carolina, Oklahoma, Rhode Island, South Carolina, Tennessee, Utah, and Wisconsin.

§ Not all response categories were mutually exclusive.

¶ Self-reported pregnancy was based on responses to the question, "To your knowledge, are you now pregnant?" This question is asked if the respondent's sex is female and respondent was aged ≤49 years.

** Includes persons who are American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and multiracial.

†† Self-reported education level was based on computed levels as follows: "Did not graduate High School," "Graduated High School," "Attended College or Technical School," and "Graduated from College or Technical School." Responses to "Attended College or Technical School" and "Graduated from College or Technical School" were combined to a variable of "Some college or more."

§§ Employment status included employed for wages or self-employed. Unemployment status included being out of work for ≥1 year, out of work for <1 year, a homemaker, a student, retired, or unable to work.

¶¶ Disability was defined as responding "yes" to any of the following questions: "Are you deaf or do you have serious difficulty hearing?," "Are you blind or do you have serious difficulty seeing, even when wearing glasses?," "Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?," "Do you have serious difficulty walking or climbing stairs?," "Do you have difficulty dressing or bathing?" and "Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?"

*** Respondents were classified as reporting behaviors that might increase the risk of HIV transmission if they reported at least one of the following: 1) injection of any drug other than prescribed in the past year, 2) being treated for a sexually transmitted disease in the past year, 3) having given or received money or drugs in exchange for sex in the past year, 4) had anal sex without a condom in the past year, or 5) had four or more sexual partners in the past year.

††† Frequent mental distress was based on responses to the question, "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" where ≥14 days was considered frequent mental distress.

§§§ Chronic condition was defined as ever being told by a health care provider that the person had a heart attack, angina, coronary heart disease, stroke, hypertension (including gestational hypertension), diabetes (including gestational diabetes), arthritis, asthma, chronic obstructive pulmonary disease, emphysema, chronic bronchitis, depression, any cancer, or chronic kidney disease.

¶¶¶ Health insurance status was based on responses to the question, "Do you have any kind of health care coverage, including health insurance, prepaid plans such as health maintenance organizations, or government plans such as Medicare, or Indian Health Service?"

**** Having a usual health care provider was based on responses to the question, "Do you have one person you think of as your personal doctor or health care provider?" where one or more than one was included.

†††† States were included that had expanded Medicaid before 2017 or 2019, depending on the year or years each state was included in the BRFSS Alcohol Screening and Brief Intervention module survey. https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/

§§§§ Self-reported current drinking was based on the BRFSS calculated variable of "Adults who reported having had at least one drink of alcohol in the past 30 days."

¶¶¶¶ Self-reported binge drinking was based on the BRFSS calculated variable of "Considering all types of alcoholic beverages, how many times during the past 30 days did you have ≥5 drinks [for men] or ≥4 drinks [for women] on an occasion?"

***** Cigarette use was based on responses to the questions, "Have you smoked at least 100 cigarettes in your entire life?" and "Do you now smoke cigarettes every day, some days, or not at all?" Responses of "every day" and "some days" were combined to create a dichotomous variable of cigarette use, and persons who responded "no" to the question "Have you smoked at least 100 cigarettes in your entire life?" were combined with persons who reported "not at all."

advice from a health care provider about what level of drinking is harmful or risky to their health (including any amount of drinking during pregnancy), and 12.3% (95% CI = 7.6–17.0) were advised to reduce their intake or quit drinking (Figure). Among pregnant persons who reported being screened during their last health care visit and self-reported current drinking, 28.8% (95% CI = 12.2–45.4) were offered advice about what level of drinking is harmful or risky to health and 16.1% (95% CI = 6.9–25.3) were advised to reduce their alcohol intake or quit drinking.

Discussion

Despite recommendations for universal alcohol screening, approximately 20% of pregnant persons were not screened for alcohol use at their last visit to a primary health care provider, and among those with past 30-day alcohol use, only 16% who were screened were advised by a health care provider to quit drinking or reduce their alcohol use. Some groups of pregnant persons, such as those who did not graduate from high school and those who did not report behaviors that might increase the risk for HIV transmission, reported lower prevalences of screening compared with those who graduated from high

TABLE 2. Age-standardized* prevalence of alcohol screening† by a health care provider in the past 2 years, by pregnancy status among women of reproductive age — Behavioral Risk Factor Surveillance System, Alcohol Screening and Brief Intervention module, 23 states and the District of Columbia,§ 2017 and 2019

	Alcohol screening prevalence			
	Pregnant persons** (unweighted n = 753*)		Nonpregnant reproductive-aged women (unweighted n = 22,440*)	
Characteristic¶	Weighted % (95% CI)	P-value	Weighted % (95% CI)	P-value
Total	**80.1 (75.3–84.8)**	—	**86.0 (84.9–87.0)**	—
Age group, yrs				
18–24	78.8 (69.9–87.7)	0.738	83.0 (80.9–85.2)	<0.001
25–34	79.6 (72.8–86.4)		86.8 (85.3–88.3)	
35–49	83.4 (75.0–91.8)		87.3 (86.3–88.3)	
Race and ethnicity				
Black or African American, non-Hispanic	79.7 (67.1–92.3)	0.472	85.1 (82.9–87.3)	<0.001
Hispanic or Latino	79.0 (69.1–88.8)		86.3 (84.7–87.9)	
White, non-Hispanic	83.2 (77.2–89.2)		88.4 (87.3–89.6)	
Other, non-Hispanic††	69.6 (53.1–86.1)		77.1 (73.4–80.7)	
Education§§				
Did not graduate from high school	53.5 (35.5–71.5)	<0.001	82.4 (79.7–85.1)	<0.001
Graduated from high school	83.4 (75.1–91.7)		83.0 (81.2–84.9)	
Some college or more	84.5 (79.9–89.0)		87.8 (86.6–88.9)	
Employment status¶¶				
Employed	82.2 (76.6–87.9)	0.283	87.6 (86.5–88.8)	<0.001
Not employed	77.3 (69.4–85.2)		83.6 (81.9–85.2)	
Disability status* **				
Reported disability	86.5 (78.1–94.9)	0.193	85.3 (83.6–87.1)	0.451
No reported disability	79.3 (74.1–84.5)		86.1 (85.0–87.3)	
Reported behaviors that increase risk for HIV transmission†††				
Yes	95.8 (90.2–100.0)	<0.001	88.4 (85.2–91.7)	0.318
No	78.6 (73.5–83.7)		85.7 (84.7–86.8)	
Mental distress§§§				
Frequent mental distress	89.6 (81.7–97.5)	0.072	87.0 (85.1–88.9)	0.359
No frequent mental distress	79.4 (74.2–84.5)		85.8 (84.6–86.9)	
Chronic conditions¶¶¶				
Chronic condition	83.6 (76.8–90.4)	0.261	86.8 (85.5–88.2)	<0.001
No chronic condition	78.3 (69.7–87.0)		83.3 (81.4–85.3)	
Health insurance status** **				
Any health insurance	80.4 (75.4–85.4)	0.672	87.0 (86.0–88.1)	<0.001
No health insurance	77.0 (63.2–90.9)		79.3 (76.4–82.1)	

See table footnotes on the next page.

school and those who reported behaviors that might increase HIV transmission risk. Screening prevalence was significantly lower among reproductive-aged women who did not have health insurance than among those with any health insurance, indicating that lack of health insurance might interfere with engaging in routine alcohol screening and subsequent interventions. In addition, racial and ethnic disparities in ASBI were observed among reproductive-aged women.

The American College of Obstetricians and Gynecologists recommends that health care providers conduct a brief intervention with all persons who are pregnant if they report any alcohol use (*8*). Approximately one third of pregnant persons who reported being screened during their most recent health care visit and self-reported current drinking received advice about what level of drinking is risky or harmful to health. This represents a missed opportunity for providers to discuss the potential adverse effects of alcohol consumption during pregnancy. Brief interventions can vary in length, can be delivered in a wide variety of health care settings, and can be delivered either in person or electronically.§§§§§§

The findings in this report are subject to at least six limitations. First, BRFSS relies on self-reported responses, which are subject to recall and social desirability biases. Second, not all pregnancies might be recognized at the time of health care visit or survey. Third, BRFSS does not ask for trimester of pregnancy, and although it is recognized that alcohol use varies across pregnancy (*9*), brief intervention is warranted

§§§§§§ https://www.thecommunityguide.org/findings/alcohol-excessive-consumption-electronic-screening-and-brief-interventions-e-sbi

TABLE 2. (*Continued*) Age-standardized* prevalence of alcohol screening† by a health care provider in the past 2 years, by pregnancy status among women of reproductive age — Behavioral Risk Factor Surveillance System, Alcohol Screening and Brief Intervention module, 23 states and the District of Columbia,§ 2017 and 2019

	Alcohol screening prevalence			
	Pregnant persons** (unweighted n = 753*)		Nonpregnant reproductive-aged women (unweighted n = 22,440*)	
Characteristic¶	Weighted % (95% CI)	P-value	Weighted % (95% CI)	P-value
Health care provider††††				
Has a usual health care provider	79.8 (74.3–85.3)	0.825	86.5 (85.4–87.7)	0.006
Does not have a usual health care provider	80.7 (71.6–89.7)		84.2 (82.2–86.2)	
Medicaid expansion§§§§				
Lives in Medicaid expansion state	78.8 (72.4–85.1)	0.498	85.7 (84.4–87.0)	0.317
Does not live in Medicaid expansion state	82.1 (75.6–88.6)		86.5 (85.2–87.7)	

Abbreviation: BRFSS = Behavioral Risk Factor Surveillance System.

* Prevalence estimates and 95% CIs were standardized to the age distribution of persons who gave birth to a live singleton infant in 2017 using vital statistics data. https://wonder.cdc.gov/

† Alcohol screening was based on responses to the question, "You told me earlier that your last routine checkup was [within the past 2 years]. At that checkup, were you asked in person or on a form if you drink alcohol?" Among 950 pregnant persons who had a health checkup in the past 2 years, 753 (79.3%) had nonmissing data on alcohol screening. Among 28,476 nonpregnant women of reproductive age who had a health checkup in the past 2 years, 22,440 (78.8%) had nonmissing data on alcohol screening.

§ Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Georgia, Illinois, Kansas, Maryland, Minnesota, Montana, Nebraska, Nevada, New Hampshire, North Carolina, Oklahoma, Rhode Island, South Carolina, Tennessee, Utah, and Wisconsin.

¶ Not all response categories were mutually exclusive.

** Self-reported pregnancy was based on responses to the question, "To your knowledge, are you now pregnant?" This question is asked if the respondent's sex is female and respondent was aged ≤49 years.

†† Includes persons who are American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and multiracial.

§§ Self-reported education level was based on computed levels as follows: "Did not graduate High School," "Graduated High School," "Attended College or Technical School," and "Graduated from College or Technical School." Responses to "Attended College or Technical School" and "Graduated from College or Technical School" were combined to a variable of "Some college or more."

¶¶ Employment status included employed for wages or self-employed. Unemployment status included being out of work for ≥1 year, out of work for <1 year, a homemaker, a student, retired, or unable to work.

*** Disability was defined as responding "yes" to any of the following questions: "Are you deaf or do you have serious difficulty hearing?," "Are you blind or do you have serious difficulty seeing, even when wearing glasses?," "Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?," "Do you have serious difficulty walking or climbing stairs?," "Do you have difficulty dressing or bathing?" and "Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?"

††† Respondents were classified as reporting behaviors that might increase the risk for HIV transmission if they reported at least one of the following: 1) injection of any drug other than one prescribed in the past year, 2) being treated for a sexually transmitted disease in the past year, 3) having given or received money or drugs in exchange for sex in the past year, 4) had anal sex without a condom in the past year, or 5) had four or more sexual partners in the past year.

§§§ Frequent mental distress was based on responses to the question, "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" where ≥14 days was considered frequent mental distress.

¶¶¶ Chronic condition was defined as ever being told by a health care provider that the person had a heart attack, angina, coronary heart disease, stroke, hypertension (including gestational hypertension), diabetes (including gestational diabetes), arthritis, asthma, chronic obstructive pulmonary disease, emphysema, chronic bronchitis, depression, any cancer, or chronic kidney disease.

**** Health insurance status was based on responses to the question, "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?"

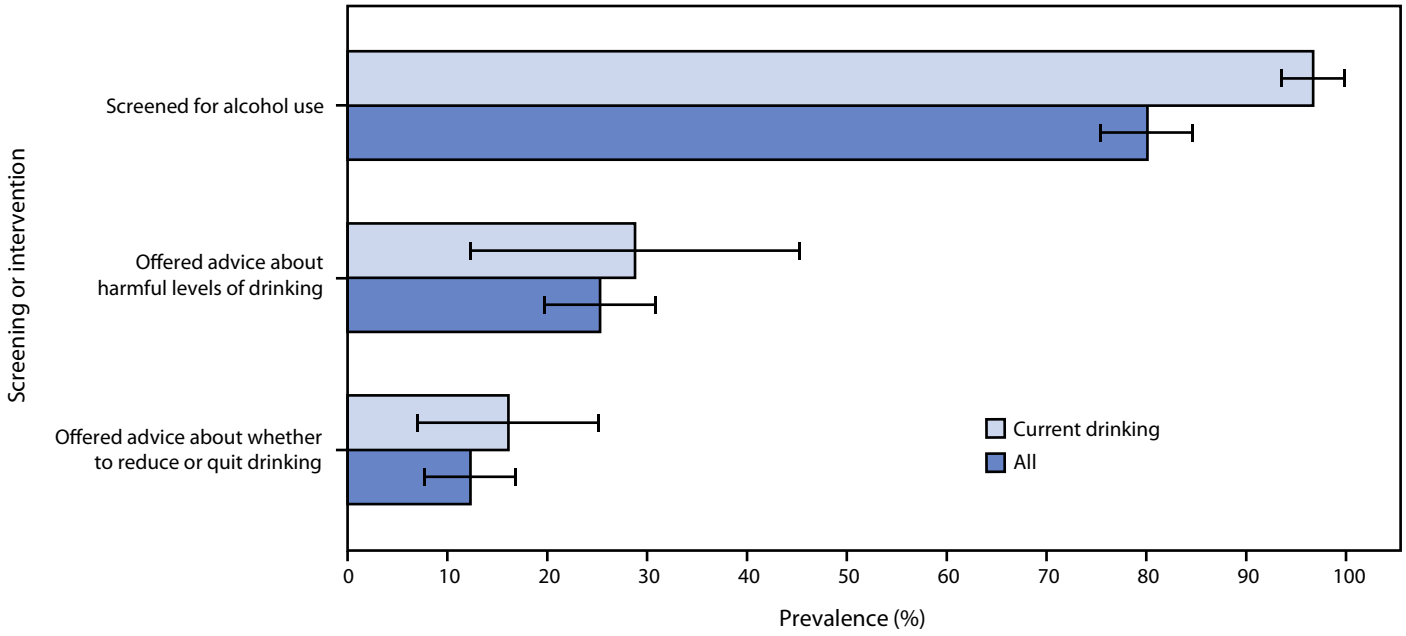
†††† Having a usual health care provider was based on responses to the question, "Do you have one person you think of as your personal doctor or health care provider?" where one or more than one was included.

§§§§ States were included that had expanded Medicaid before 2017 or 2019, depending on the year or years each state was included in the BRFSS Alcohol Screening and Brief Intervention module survey. https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/

irrespective of the timing of alcohol use during pregnancy. Fourth, because of the survey design, it could not be ascertained whether the health care provider screened for alcohol use and gave a brief intervention before or after the patient reported alcohol use, or if the patient was using alcohol at the time of the clinic visit. Fifth, specific sociodemographic subgroups of interest (e.g., veterans and sexual and gender minority groups) were not evaluated because of small sample sizes. Finally, because only jurisdictions that participated in the ASBI module were included, the findings in this report might not be generalizable to other jurisdictions.

Despite evidence that ASBI is effective in reducing alcohol use (*1*), this analysis indicates that ASBI is underutilized in certain populations of pregnant persons. Although alcohol screening among pregnant persons was high, one in five were not screened. Health care providers face multiple barriers in conducting ASBI (*10*); strategies to address these include integrating screenings into electronic health records, increasing

FIGURE. Prevalence* of age-standardized alcohol screening and brief intervention† among pregnant persons — Behavioral Risk Factor Surveillance System, Alcohol Screening and Brief Intervention module, 23 states and the District of Columbia, 2017 and 2019§



Abbreviation: BRFSS = Behavioral Risk Factor Surveillance System.

* With 95% CIs indicated by error bars.

† Brief intervention was based on responses to the questions, "Were you offered advice about what level of drinking is harmful or risky for your health?" and "At your last routine checkup, were you advised to reduce or quit your drinking?" These questions are only asked if participants responded "Yes" to the question, "You told me earlier that your last routine checkup was [within the past 2 years]. At that checkup, were you asked in person or on a form if you drink alcohol?" Because of survey design, it could not be determined whether the health care provider screened for alcohol use and gave a brief intervention before or after the patient reported alcohol use, or if the patient was using alcohol at the time of the health care visit. Self-reported current drinking was based on the BRFSS calculated variable of "Adults who reported having had at least one drink of alcohol in the past 30 days."

§ Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Georgia, Illinois, Kansas, Maryland, Minnesota, Montana, Nebraska, Nevada, New Hampshire, North Carolina, Oklahoma, Rhode Island, South Carolina, Tennessee, Utah, and Wisconsin.

reimbursement for ASBI services, implementing electronic ASBI (*2*), and developing training and tools for conducting ASBI in both traditional and nontraditional settings (*3*). Disparities in brief intervention highlight opportunities for expanding communication with patients who report alcohol consumption during pregnancy about associated risks to prevent and reduce adverse alcohol-associated pregnancy outcomes.

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Substance Use Among Persons with Syphilis During Pregnancy — Arizona and Georgia, 2018–2021

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Despite universal prenatal syphilis screening recommendations and availability of effective antibiotic treatment, syphilis prevalence during pregnancy and the incidence of congenital syphilis have continued to increase in the United States (*1*,*2*). Concurrent increases in methamphetamine, injection drug, and heroin use have been described in women with syphilis (*3*). CDC used data on births that occurred during January 1, 2018–December 31, 2021, from two states (Arizona and Georgia) that participate in the Surveillance for Emerging Threats to Pregnant People and Infants Network (SET-NET) to describe the prevalence of substance use among pregnant persons with syphilis by congenital syphilis pregnancy outcome (defined as delivery of a stillborn or live-born infant meeting the surveillance case definition for probable or confirmed congenital syphilis). The prevalence of substance use (e.g., tobacco, alcohol, cannabis, illicit use of opioids, and other illicit, nonprescription substances) in persons with a congenital syphilis pregnancy outcome (48.1%) was nearly double that among those with a noncongenital syphilis pregnancy outcome (24.6%). Persons with a congenital syphilis pregnancy outcome were six times as likely to report illicit use of opioids and four times as likely to report using other illicit, nonprescription substances during pregnancy than were persons with a noncongenital syphilis pregnancy outcome. Approximately one half of persons who used substances during pregnancy and had a congenital syphilis pregnancy outcome had late or no prenatal care. Tailored interventions should address barriers and facilitators to accessing screening and treatment for syphilis among persons who use substances. The need for syphilis screening and treatment should be addressed at any health care encounter during pregnancy, especially among persons who use substances.

SET-NET is a longitudinal surveillance approach established to identify infectious exposures, including syphilis, during pregnancy and monitor health outcomes in pregnant persons and their infants (*4*). In collaboration with CDC, Arizona and Georgia conducted enhanced surveillance for both syphilis in pregnancy and congenital syphilis based on case investigations, medical records, and linkage of laboratory results with vital records. Arizona focused surveillance efforts on Maricopa, Pima, and Yuma counties (approximately 80% of the state's births); Georgia's surveillance was statewide. Pregnancies were included if 1) the person met the Council of State and Territorial Epidemiologists (CSTE) case definition* for syphilis (all stages) at any point during pregnancy or 2) the person had a syphilitic stillborn or live-born infant or child who met the CSTE case definition for probable or confirmed congenital syphilis. Substance use during pregnancy, obtained from case investigation interviews or from medical records, included use of tobacco (e.g., cigars, cigarettes, smokeless tobacco, or e-cigarettes), alcohol, cannabis, illicit use of opioids (e.g., prescription opioids not taken as prescribed, fentanyl, or heroin), and other illicit, nonprescription substances (e.g., cocaine, methamphetamines, inhalants, or hallucinogens such as LSD or PCP).

Births that occurred during January 1, 2018–December 31, 2021,† and were reported to CDC as of September 9, 2022, were analyzed to compare the prevalence of any substance use among pregnant persons with syphilis by whether their pregnancy outcome met the surveillance case definition for probable or confirmed congenital syphilis§ (congenital syphilis pregnancy outcome) or did not (noncongenital syphilis pregnancy outcome) and to describe selected demographic, prenatal care, clinical and treatment information, and history of incarceration and homelessness in the 12 months preceding case report or positive test results or during pregnancy. All analyses

* https://ndc.services.cdc.gov/case-definitions/syphilis-2018/

† For Arizona, a pregnant person's receipt of a positive syphilis test result and pregnancy outcome date occurred during 2019–2021. For Georgia, a pregnant person's receipt of a positive syphilis test result occurred during 2017–2019 and pregnancy outcome date during 2018–2019.

§ Live-born infants were considered to have confirmed congenital syphilis if they met laboratory criteria for demonstration of *Treponema pallidum*. Live-born infants were considered to have probable congenital syphilis if the pregnant person had untreated or inadequately treated syphilis during pregnancy based on CDC treatment guidelines or if the infant received a reactive nontreponemal test result for syphilis and any of the following: evidence of syphilis on physical examination (excluding jaundice alone after 2019), abnormalities identified on long bone radiographs, reactive cerebrospinal fluid (CSF) venereal disease research laboratory test, or elevated CSF white blood cell counts or protein values. Stillborn infants were considered a syphilitic stillbirth if the pregnant person had untreated or inadequately treated syphilis during pregnancy based on CDC treatment guidelines and fetal death occurred after 20 weeks' gestation or the fetus weighed >1.1 lbs (>0.5 kg).

were performed using R statistical software (version 4.1.2; R Foundation). This activity was reviewed by CDC and conducted consistent with applicable federal law and CDC policy.¶

Among 770 pregnant persons who met inclusion criteria (17 with multiple gestations), 360 (46.8%) had a congenital syphilis pregnancy outcome (Table 1). Among 309 persons with a noncongenital syphilis pregnancy outcome and who did not use substances, 47.2% were aged <25 years, compared with 31.8% of those with a congenital syphilis pregnancy outcome who used substances. The prevalence of other age groups was distributed similarly across congenital syphilis pregnancy outcome and substance use status.

Among persons with a congenital syphilis pregnancy outcome, 53.2% of those who used substances and 32.1% of those who did not use substances received late (third trimester) or no prenatal care. Among persons with a noncongenital syphilis pregnancy outcome, 16.8% of those who used a substance and 6.1% of those who did not use a substance received late or no prenatal care. Irrespective of congenital syphilis pregnancy outcome, 39.8% of persons who used substances during pregnancy (274) either did not receive prenatal care or received it in the third trimester compared with 15.9% for those without substance use during pregnancy (496). Persons who used substances had, on average, six prenatal care visits, and those without substance use had nine. Among persons who used substances during pregnancy, 38.2% of those with a congenital syphilis pregnancy outcome received no prenatal care, compared with 4.0% of those with a noncongenital syphilis pregnancy outcome.

Among persons with a congenital syphilis pregnancy outcome, adequate treatment was received by 15.0% of those who did use any substances during pregnancy and 24.6% who did not. More than one half (53.2%) of 173 persons with a congenital syphilis pregnancy outcome and who used substances received no treatment for syphilis during pregnancy, compared with 42.2% of 187 persons who did not use substances.

Among persons who used substances during pregnancy, 16.2% of persons with a congenital syphilis outcome and 10.9% of persons with a noncongenital syphilis outcome had a history of incarceration; for history of homelessness in these groups the frequency was 26.6% and 8.9%. Data on incarceration were missing or not reported for 39% of all persons included in this analysis. Data on homelessness were missing or not reported for 35% of all persons included in this analysis.

Persons with a congenital syphilis pregnancy outcome were almost twice as likely to have used any substance during pregnancy as were those without this outcome (48.1% versus 24.6%; prevalence ratio [PR] = 1.95) (Table 2). Illicit use of opioids and illicit, nonprescription substances were the substance uses most frequently associated with a congenital syphilis pregnancy outcome. Illicit use of opioids during pregnancy was six times higher (PR = 6.09) and use of other illicit, nonprescription substances was more than four times higher (PR = 4.41) among persons with a congenital syphilis pregnancy outcome compared with those with a noncongenital syphilis outcome.

¶45 C.F.R. part 46.102(l)(2), 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a

Discussion

Among pregnant persons in Arizona and Georgia, substance use prevalence was higher among those with a congenital syphilis pregnancy outcome than among those with a noncongenital syphilis outcome; the largest difference was observed in persons who used opioids illicitly or used other illicit, nonprescription substances. Consistent with previous research (*5*); the prevalence of late or no prenatal care was high among persons who used any substance during pregnancy, and those who did receive care had fewer prenatal visits. Prompt diagnosis and treatment of syphilis are critical to reducing adverse syphilis-related outcomes for persons who are pregnant, congenital syphilis, and overall syphilis transmission. The need for syphilis screening and treatment should be addressed at any health care encounter during pregnancy, especially among persons who use substances, and in all health care encounters with persons of childbearing age who have a high risk for syphilitic infection (*6*). Although syphilis is highly treatable with penicillin G (*5*,*7*), one third of persons in this analysis who used any substances remained untreated.

Previous studies suggest that social determinants of health, including incarceration and homelessness, might be associated with substance use and contribute to deficiencies in care and syphilis treatment (*5*,*8*). Although this study included small numbers and had high levels of missingness for history of incarceration and homelessness, up to one quarter of those who used substances and had a congenital syphilis pregnancy outcome had a history of incarceration or homelessness. Prioritizing persons with these lived experiences for screening and treatment of syphilis at every health care encounter is critical, and innovative strategies need to be developed to reach these populations.

The findings in this report are subject to at least five limitations. First, data collection is ongoing and is from only two states. Data from one of these states are restricted to only three counties; however, these counties represent approximately 80% of births in the state. Prevalence of substance use and other risk factors for congenital syphilis likely vary by jurisdiction, thereby limiting the generalizability of these results. Second, stigma and social desirability bias might have resulted in underreporting of substance use and contributed to the high

TABLE 1. Characteristics of pregnant persons with syphilis, by reported substance use* and congenital syphilis pregnancy outcome† (N = 770) — Surveillance for Emerging Threats to Pregnant People and Infants Network, Arizona and Georgia, 2018–2021

Characteristic	No. (%)			
	Congenital syphilis (n = 360)		Noncongenital syphilis (n = 410)	
	Any substance use (n = 173)	No substance use (n = 187)	Any substance use (n = 101)	No substance use (n = 309)
Age, yrs, median (IQR)	27.7 (23.4–31.9)	26.3 (21.8–30.7)	27.8 (23.8–31.3)	25.3 (22.2–29.6)
Age group, yrs				
<25	55 (31.8)	72 (38.5)	37 (36.6)	146 (47.2)
25–29	59 (34.1)	63 (33.7)	31 (30.7)	92 (29.8)
30–34	37 (21.4)	34 (18.2)	25 (24.8)	54 (17.5)
≥35	21 (12.1)	16 (8.6)	8 (7.9)	17 (5.5)
Missing/Not reported	1 (0.6)	2 (1.1)	0 (—)	0 (—)
Education level				
Less than high school	51 (29.5)	55 (29.4)	30 (29.7)	94 (30.4)
High school graduate or GED	53 (30.6)	50 (26.7)	35 (34.7)	113 (36.6)
Some college but no degree	24 (13.9)	35 (18.7)	24 (23.8)	59 (19.1)
College degree or more	5 (2.9)	23 (12.3)	8 (7.9)	22 (7.1)
Missing/Not reported	40 (23.1)	24 (12.8)	4 (4.0)	21 (6.8)
Insurance at delivery				
Public	130 (75.1)	91 (48.7)	81 (80.2)	164 (53.1)
Private	12 (6.9)	12 (6.4)	6 (5.9)	31 (10.0)
Other/None/Self-pay	14 (8.1)	10 (5.3)	2 (2.0)	12 (3.9)
Missing/Not reported	17 (9.8)	74 (39.6)	12 (11.9)	102 (33.0)
Prenatal care				
First/Second trimester	78 (45.1)	124 (66.3)	79 (78.2)	281 (90.9)
Third trimester	26 (15.0)	25 (13.4)	13 (12.9)	16 (5.2)
No care	66 (38.2)	35 (18.7)	4 (4.0)	3 (1.0)
Missing/Not reported	3 (1.7)	3 (1.6)	5 (5.0)	9 (2.9)
No. of prenatal visits, median (IQR)	1 (0–6)	6 (1–10)	9 (6–11)	10 (7–13)
Treatment				
Adequate§	26 (15.0)	46 (24.6)	101 (100)	309 (100)
Inadequate¶	55 (31.8)	62 (33.2)	NA	NA
Not treated during pregnancy¶	92 (53.2)	79 (42.2)	NA	NA
History of incarceration**				
Yes	28 (16.2)	6 (3.2)	11 (10.9)	5 (1.6)
No	70 (40.5)	102 (54.5)	63 (62.4)	181 (58.6)
Missing/Not reported	75 (43.4)	79 (42.2)	27 (26.7)	123 (39.8)
History of homelessness**				
Yes	46 (26.6)	2 (1.1)	9 (8.9)	3 (1.0)
No	70 (40.5)	106 (56.7)	71 (70.3)	190 (61.5)
Missing/Not reported	57 (32.9)	79 (42.2)	21 (20.8)	116 (37.5)

Abbreviations: CSTE = Council of State and Territorial Epidemiologists; GED = general educational development certificate; NA = not applicable.

* Any substance use includes any use of tobacco (e.g., cigars, cigarettes, smokeless tobacco, or e-cigarettes), alcohol, cannabis, illicit use of opioids (e.g., prescription opioids not taken as prescribed, fentanyl, or heroin), and other illicit, nonprescription substances (e.g., cocaine, methamphetamines, inhalants, or hallucinogens, such as LSD or PCP).

† Congenital syphilis pregnancy outcome includes pregnancy outcomes that meet the CSTE surveillance case definition for syphilitic stillborn or live-born infant with probable or confirmed congenital syphilis.

§ Adequacy of treatment dependent on syphilis stage. Primary, secondary, and early latent syphilis require at least 1 dose of penicillin during pregnancy, with the dose administered ≥30 days before pregnancy outcome. Late latent, latent of unknown duration, tertiary, and other cases of syphilis require ≥3 doses of penicillin, spaced 5–9 days apart, with the first dose administered ≥30 days before delivery and the final dose administered during pregnancy.

¶ Stillborn and live-born infants born to pregnant persons inadequately treated or not treated during pregnancy meet the CSTE case definition for a probable congenital syphilis pregnancy outcome.

** Within the 12 months preceding case report or positive test results or during pregnancy.

missingness identified for history of incarceration and homelessness (*9*). Further, self-reported substance use creates the potential for recall bias by congenital syphilis status if captured retrospectively (after the birth) among those with a congenital syphilis pregnancy outcome. Fourth, because treatment is highly effective, the finding of 20% of persons with adequate treatment among those with congenital syphilis outcome could be an artifact of the CSTE case definition, which includes nonspecific clinical findings for probable cases or could be related to occult or undiagnosed reinfection that could not be assessed. Finally, there is no age limit for diagnosing congenital syphilis, which might create some misclassification in these data; however, almost all congenital syphilis cases are diagnosed during the neonatal period (*10*).

TABLE 2. Reported substance use*,† among pregnant persons with syphilis, by congenital syphilis pregnancy outcome§ — Surveillance for Emerging Threats to Pregnant People and Infants Network, Arizona and Georgia, 2018–2021

Substance used	No. (%)		Prevalence ratio¶ (95% CI)
	Congenital syphilis (n = 360)	Noncongenital syphilis (n = 410)	
Any substance*	173 (48.1)	101 (24.6)	1.95 (1.60–2.38)
Tobacco	99 (27.5)	46 (11.2)**	2.45 (1.78–3.37)
Alcohol	29 (8.1)	20 (4.9)**	1.65 (0.95–2.86)
Cannabis	69 (19.2)	56 (13.7)††	1.40 (1.01–1.93)
Illicit use of opioids§§	75 (20.8)	14 (3.4)**	6.09 (3.50–10.58)
Illicit, nonprescription substance¶¶	101 (28.1)	26 (6.4)**	4.41 (2.94–6.63)

Abbreviation: CSTE = Council of State and Territorial Epidemiologists.

* Any substance use includes any use of tobacco (e.g., cigars, cigarettes, smokeless tobacco, or e-cigarettes), alcohol, cannabis, illicit use of opioids (e.g., prescription opioids not taken as prescribed, fentanyl, or heroin), and other illicit, nonprescription substances (e.g., cocaine, methamphetamines, inhalants, or hallucinogens such as LSD or PCP).

† Numbers in categories are not mutually exclusive.

§ Congenital syphilis pregnancy outcome includes pregnancy outcomes that meet CSTE surveillance case definition for syphilitic stillborn and live-born infant with probable or confirmed congenital syphilis.

¶ Unadjusted.

** Denominator = 409.

†† Denominator = 408.

§§ Includes prescription opioids not taken as prescribed, fentanyl, and heroin.

¶¶ Includes other illicit, nonprescription substances (e.g., cocaine, methamphetamines, inhalants, or hallucinogens such as LSD or PCP).

This report highlights the value of the SET-NET surveillance approach of linking data on pregnant persons to data on infants to understand factors related to congenital syphilis. The increasing numbers of congenital syphilis cases across the United States demand further exploration of factors that contribute to this trend and development of strategies to address missed opportunities for diagnosis and treatment before, during, and after pregnancy (*1*,*2*). Although screening and treatment can prevent most cases of congenital syphilis, numerous barriers to implementing these prevention strategies exist, some of which might be amplified among persons who use substances. Tailored interventions need to address barriers and facilitators for accessing screening and treatment for syphilis for persons with current or previous substance use, including those with a history of incarceration and homelessness.

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Summary

What is already known about this topic?

Substance use prevalence has increased among women with syphilis; however, its association with congenital syphilis is less clear.

What is added by this report?

During 2018–2021, the prevalence of substance use among persons with syphilis during pregnancy in Arizona and Georgia was nearly twice as high among those with a congenital syphilis pregnancy outcome (48.1%) as among those without this outcome (24.6%). Approximately one half of persons who used substances during pregnancy and had a congenital syphilis pregnancy outcome had late or no prenatal care.

What are the implications for public health practice?

The need for syphilis screening and treatment should be addressed at every health care encounter during pregnancy, especially among persons using substances.

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Epidemiology of Human Mpox — Worldwide, 2018–2021

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Monkeypox (mpox) is a zoonotic disease caused by *Monkeypox virus* (MPXV), an *Orthopoxvirus*; the wild mammalian reservoir species is not known. There are two genetic clades of MPXV: clade I and clade II (historically found in central and west Africa, respectively), with only Cameroon reporting both clades (*1*). Human cases have historically been reported from 1) mostly rural, forested areas in some central and west African countries; 2) countries reporting cases related to population migration or travel of infected persons; and 3) exposure to imported infected mammals (*2*). The annual number of cases in Africa has risen since 2014 and cumulatively surpassed reports from the previous 40 years for most countries. This reemergence of mpox might be due to a combination of environmental and ecological changes, animal or human movement, the cessation of routine smallpox vaccination since its eradication in 1980, improvements in disease detection and diagnosis, and genetic changes in the virus (*2*). This report describes the epidemiology of mpox since 1970 and during 2018–2021, using data from national surveillance programs, World Health Organization (WHO) bulletins, and case reports, and addresses current diagnostic and treatment challenges in countries with endemic disease. During 2018–2021, human cases were recognized and confirmed in six African countries, with most detected in the Democratic Republic of the Congo (DRC) and Nigeria. The reemergence and increase in cases resulted in its being listed in 2019 as a priority disease for immediate and routine reporting through the Integrated Disease Surveillance and Response strategy in the WHO African region.* In eight instances, patients with mpox were identified in four countries outside of Africa after travel from Nigeria. Since 2018, introductory and intermediate training courses on prevention and control of mpox for public health and health care providers have been available online at OpenWHO.†,§ The global outbreak that began in May 2022¶ has further highlighted the need for improvements in laboratory-based surveillance and access to treatments and vaccines to prevent and contain the infection, including in areas of Africa with endemic mpox.

Annual mpox case and death counts during 2018–2021 were compiled from national surveillance data, WHO bulletins, and published case reports or outbreak investigations, and were verified with country surveillance teams; these data are presented with human mpox case report data since 1970. Since 2018, cases occurred in six African countries: Cameroon, Central African Republic (CAR), DRC, Nigeria, Republic of the Congo (ROC), and Sierra Leone (Table 1) (Figure). DRC reported >3,000 suspected cases per year, with a peak of 6,216 cases and 222 deaths in 2020. During 2018–2021, the number of confirmed mpox cases in CAR (79) from seven localities represented a notable increase compared with previous years, and an average of nine annual mpox outbreaks have occurred in CAR since 2018. In addition, nine cases were confirmed in Cameroon, where no human case of mpox had been documented since 1989; in a 2018 case, the virus shared genetic similarity with a clade II strain previously isolated from Nigeria (*1*), and additional cases were reported in different regions of the country in 2020 and 2021. Two cases each in ROC and Sierra Leone were reported during 2018–2021.

After 39 years without reports, Nigeria experienced a reemergence of cases caused by Clade II beginning in August 2017; this outbreak culminated in May 2018 with 122 confirmed or probable cases among 17 states and included seven deaths (*3*). The country has continued to report mpox cases, with most concentrated in the southernmost states, including in urban settings since the outbreak period. In 2020, during the COVID-19 pandemic, the number of cases reported in Nigeria declined sharply (eight cases reported); however, case reports rose again in 2021. Nigeria has had a number of patients with MPXV and HIV coinfections, including four of the seven fatal cases in 2018. In addition, clinicians noticed atypical presentation that included lesions first appearing on the genitals and the absence of a febrile prodrome (*3*,*4*). Five cases were reported in a prison in 2017, highlighting the need for infection prevention and control in high-density settings, such as correctional facilities and shelters, to prevent person-to-person transmission (*3*).

During 2018–2021, eight independent travel-associated cases of mpox occurred outside Africa in persons traveling from Nigeria (Table 2). The patients were all men aged 30–50 years, and three reported that the rash first appeared in the groin area (*5*–*7*). In one instance, secondary transmission resulted in an

* https://www.afro.who.int/publications/technical-guidelines-integrated-disease-surveillance-and-response-african-region-third
† https://openwho.org/courses/monkeypox-introduction
§ https://openwho.org/courses/monkeypox-intermediate
¶ https://www.who.int/emergencies/situations/monkeypox-oubreak-2022

TABLE 1. Reported suspected and confirmed cases of human mpox and mpox-related deaths, by country — Africa, 1970–2021

Country	Year	Location	Suspected cases	Confirmed cases*	Deaths
Benin†	1978	Parakou	NA	1	0
Cameroon	1979	Mfou	NA	1	0
	1989	Nkoteng	NA	1	0
	2018	Akwaya, Njikwa	NA	2	0
	2019	Ekondo Titi	NA	1	0
	2020	Ayos, Doumé	NA	2	0
	2021	Ayos, Nkambé	NA	4	0
Central African Republic	1984	Sangha	NA	6	0
	2001	Mbomou	0	3	2
	2010	Lobaye	0	1	0
	2012	Ouham	0	2	0
	2015	Haute Kotto, Mbomou	3	4	4
	2016	Basse Kotto, Mbomou	7	4	2
	2017	Lobaye, Mbomou	1	6	0
	2018	Lobaye, Mbomou, M'Poko, Ombella	5	28	0
	2019	Lobaye, Ouaka	18	15	2
	2020	Lobaye, Mbomou, Sangha Mbaéré	2	8	0
	2021	Haute-Kotto, Lobaye, Mambéré Kadéi, Mbomou, Sangha Mbaéré	25	28	2
Côte d'Ivoire	1971	Abengourou	NA	1	0
	1981	Daloa	NA	1	NA
Democratic Republic of the Congo	1970–1986	Multiple provinces	NA	386	NA
	1987–1995		NA	NA	NA
	1996–2004		>200 per year	NA	NA
	2005–2015		>1,000 per year	NA	NA
	2016		3,750	NA	NA
	2017		2,500	NA	NA
	2018		3,784	NA	78§
	2019		5,288	NA	107§
	2020		6,216	NA	222§
	2021		2,841	NA	76§
Gabon	1987	Region between Lambarene and N'Djole	NA	5	2
Liberia	1970	Grand Geddah	NA	4	0
	2017	Rivercess and Maryland counties	NA	2	0
Nigeria	1971	Aba	NA	2	0
	2017	Abia, Akwa Ibom, Bayelsa, Benue, Cross River, Delta, Edo, Ekiti, Enugu, Federal Capital Territory, Lagos, Imo, Nasarawa, Oyo, Rivers	202	88	5
	2018	Abia, Anambra, Bayelsa, Cross River, Delta, Edo, Enugu, Imo, Lagos, Nasarawa, Oyo, Plateau, Rivers	117	49	3
	2019	Akwa Ibom, Anambra, Bayelsa, Cross River, Delta, Edo, Enugu, Imo, Lagos, Oyo, Rivers	98	47	1
	2020	Delta, Lagos, Plateau, Ebonyi, Rivers	35	8	0
	2021	Bayelsa, Cross River, Delta, Edo, Federal Capital Territory, Lagos, Niger, Ogun, Rivers	98	34	0
Republic of the Congo	2003	Likouala	NA	11	1
	2009	Likouala	NA	2	0
	2017	Likouala	88	87	6
	2019	Gambona	NA	2	0
Sierra Leone	1970	Aguebu	NA	1	0
	2014	Bo	NA	1	1
	2017	Pujehan	NA	1	0
	2019	Kailahun	NA	1	0
	2021	Koinadugu	NA	1	0
South Sudan¶	2005	Unity State	9	10	0

Abbreviation: NA = not available.

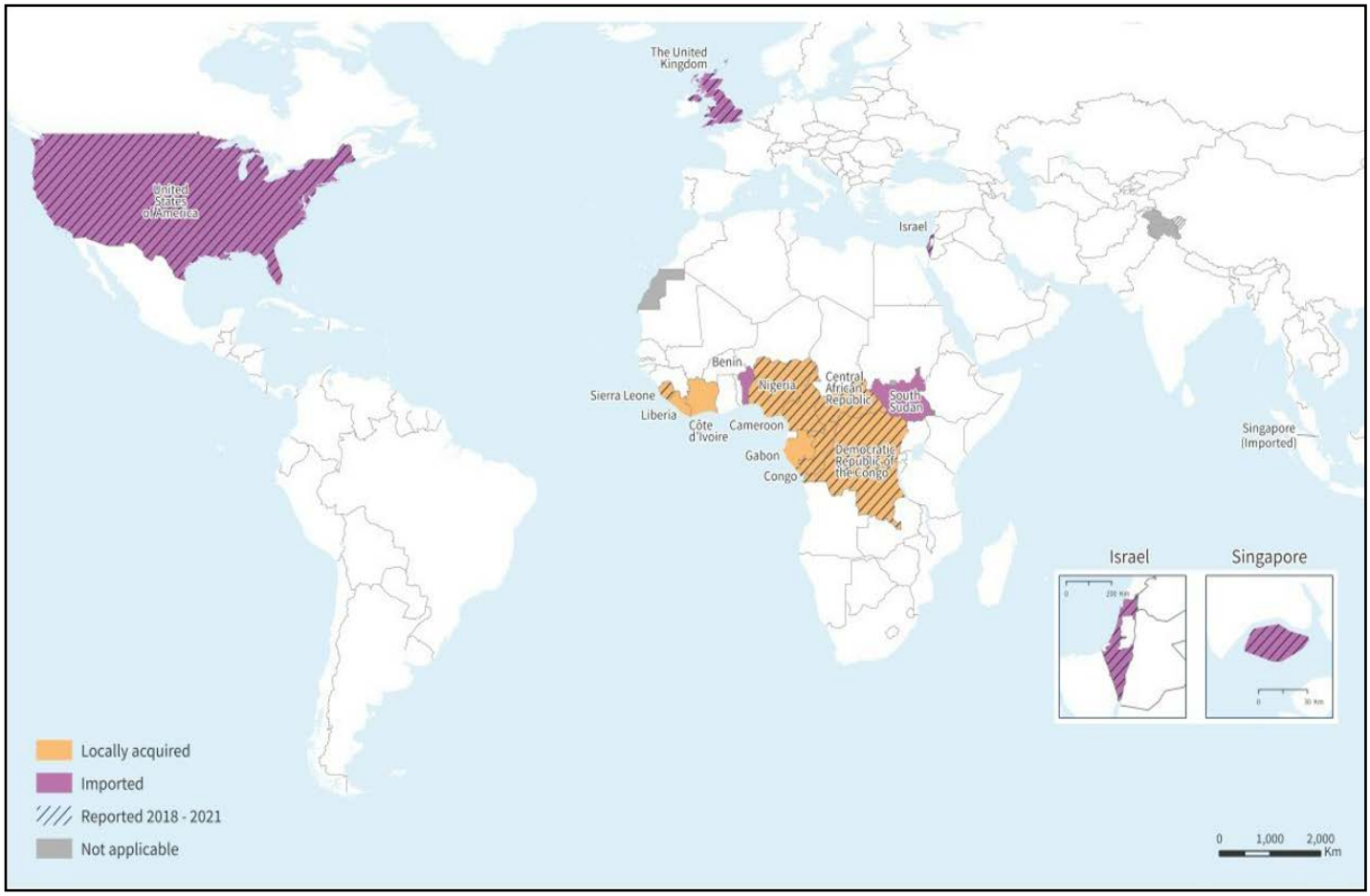
* Includes laboratory-confirmed and probable cases with an epidemiologic (close contact), spatial, or temporal link to a laboratory-confirmed case. For Central African Republic, confirmed cases are in addition to suspected cases; whereas for Nigeria confirmed cases are a subset of suspected cases. For many countries, the number of suspected cases is not available.

† Travel-associated case from Oyo, Nigeria.

§ Deaths in the Democratic Republic of the Congo include those among both suspected and confirmed cases.

¶ The presence of *Monkeypox virus* in South Sudan was attributed to movement of the virus from the Democratic Republic of the Congo.

FIGURE. Reported confirmed human mpox cases — worldwide, 1970–2021



Source: World Health Organization as of December 6, 2022.

infection in a health care provider, and in another instance, in two family members. Each travel-associated case required public health resources to identify community contacts (including airline passengers in some cases) and health care contacts, and to establish care and treatment under strict infection prevention and control measures in health care and some residential environments (*6*).

In 2021, WHO conducted a survey of orthopoxvirus testing capacity in 127 global laboratories. Among these, 78 (61%) reported working with orthopoxviruses for diagnostic (50), research (52), vaccine development (15), or manufacturing (four) purposes; and 38 (30%) worked with MPXV. Laboratories working with orthopoxviruses were present in the European (30 laboratories), Americas (21), African (11), Eastern Mediterranean (two), Southeast Asian (three), and Western Pacific (11) regions.

Discussion

MPXV was first identified in 1970 in DRC during the global effort to eradicate smallpox, a disease caused by another *Orthopoxvirus* (*Variola virus*). It was during the period of intensified surveillance for smallpox-like disease in the early 1980s that the clinical presentation, epidemiology, and transmission of mpox were largely defined. It was also during this time that investigations to identify mammalian reservoir species in the regions of Africa with endemic disease (largely in DRC with clade I) occurred. Additional assessments of human disease, including refinements of the different clinical spectrum of illness and epidemiology associated with clade II, occurred during a multistate U.S. outbreak in 2003 associated with the exotic pet trade (*8*). The impact of the route of exposure on disease severity and presentation has been well documented (*8*); however, it was not until the 2017 outbreak in Nigeria when the propensity of clade II MPXV for human-to-human transmission and clinical severity, including death, were recognized (*3*).

TABLE 2. Reported cases of human mpox outside of Africa,* by country — Israel, Singapore, United Kingdom, and United States, 1970–2021

Country	Year	Location	Confirmed cases	Deaths
Israel	2018	Jerusalem	1	0
Singapore	2019	Central Region	1	0
United Kingdom	2018	Blackpool and Cornwall, England	3†	0
	2019	Southwest England	1	0
	2021	Wales	3§	0
United States	2003	Illinois, Indiana, Kansas, Missouri, Ohio, Wisconsin	47¶	0
	2021	Texas, Maryland	2	0

* All index cases are related to travel from Nigeria except for those in the United States in 2003.
† Includes one secondary transmission in a health care setting in Blackpool from a travel-associated case. https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2018.23.38.1800509; https://wwwnc.cdc.gov/eid/article/26/4/19-1164_article
§ Includes one secondary transmission in a household setting from a travel-associated case, and one tertiary case during isolation of a family member in a health setting with the secondary case. https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2021.26.32.2100745
¶ This outbreak includes confirmed and probable cases and was attributed to an infection of animals in the United States co-housed with a shipment of wild animals from Ghana. https://academic.oup.com/jid/article/194/6/773/864712

Mpox continues to present challenges to public health and health care providers in areas with endemic disease owing to inadequate capacity to diagnose and clinically manage patients and accurately identify exposures. WHO launched an introductory mpox course in 2018 and an intermediate course in December 2021 with content tailored to clinicians and public health providers. The intermediate course offers in-depth information on the epidemiology, presentation, diagnostics, and treatment of mpox and strategies needed for effective prevention and outbreak response, based on information available by late 2021. As of December 14, 2022, 62,196 persons had enrolled in the introductory course and 41,578 had enrolled in the intermediate course.

Until 2017, cases almost exclusively occurred in forested, rural areas where populations might be dependent on wild animal meat for protein. Case-control studies focused on identifying hunting activities that might lead to exposure have not been able to identify a presumptive animal reservoir species. Additional investigations are warranted to examine human interactions with live and dead wild animals, animal meat, and animal products used for cultural, religious, or medicinal purposes. A holistic investigative approach conducted by trained interviewers to identify any risk linked to the diversity of human activities associated with wild animals could be beneficial.

Patients might have difficulty reporting exposures to animals infected with MPXV or to other persons with mpox if exposures are unrecognized. In addition, patients might not provide information regarding possible exposures from sexual interactions if the interactions are associated with stigma or even criminalization. The 2017 outbreak data from Nigeria yielded hypotheses about the role of sexual contact for many of the cases, but investigators were unable to pinpoint this as a significant route of transmission (*3*,*4*). Training of case investigators in stigma-free interview skills and compassionate care might help to better understand mpox transmission, including in historically long-affected areas.

Summary

What is already known about this topic?

The number of mpox cases reported from rural areas in West and Central Africa had been increasing before 2018.

What is added by this report?

During 2018–2021, mpox cases were confirmed in six African countries. Eight primary and three secondary cases associated with travel to Nigeria were identified in four non-African countries. Online training courses on mpox prevention and control have been available since 2018.

What are the implications for public health practice?

Mpox continues to present challenges to public health and health care personnel in endemic areas. Improvements in surveillance and community engagement will be critical to detection and containment of the virus. Vaccines and treatments might reduce morbidity and mortality in areas with endemic disease.

Continued advancements in laboratory diagnostic assays and validation of additional specimen types during the course of infection will aid the ability to detect MPXV, and use of these assays in areas with endemic disease will be necessary to improve surveillance capacity. Laboratory capacity for *Orthopoxvirus* detection has been limited in Africa, hindering the confirmatory diagnosis of suspected mpox disease. Molecular testing (via polymerase chain reaction testing) of lesion specimens has been a standard and effective method of diagnosis of cases in persons with active rash illness. The lack of MPXV-specific serology and existence of cross-reactivity with other orthopoxviruses, including vaccinia virus, hampers the use of serology as a confirmatory test for diagnosis of an infection. This poses challenges for ecologic investigations, where wild mammals must be sampled during an active

infection or soon thereafter, as detectable virus and viral DNA appear to be quickly cleared from mucosal surfaces and major organ systems in putative reservoir species (*9*). Further work is needed to better understand the dynamics of disease, including viral dissemination and shedding, in small mammals to guide investigations of animal reservoirs.

Treatment of MPXV infection in patients with immunosuppression due to health conditions is challenging (*4*,*10*). Notwithstanding very limited compassionate use of therapeutics and the launch of some clinical trials and expanded access protocols during the 2022 global outbreak, patient treatment is still dependent on supportive care in both rural and urban areas in many countries (*10*). Research on safe and effective vaccines and therapeutics against orthopoxviruses has been sustained under the smallpox preparedness research agenda mandated and overseen by WHO.** Additional data are needed to assess the efficacy of vaccines and treatments for mpox to develop recommendations and guidance for their use. Such research should be considered in affected countries in partnership with local scientific, and public health authorities. The findings in this report are limited to reporting of cases, which might be incomplete.

Countries with enzootic mpox face an increasingly complex epidemiologic situation, which might include extensive human-to-human transmission, in addition to zoonotic transmission. The use of nonstigmatizing methods for community engagement in populations at risk will be critical to detection and containment. Advances in diagnostics, treatments, and safer vaccines identified through basic and clinical research including during the current outbreak response might be used to improve surveillance, treatment, and prevention of disease in areas where mpox is endemic.

** https://www.who.int/groups/who-advisory-committee-on-variola-virus-research

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Reasons for Receiving or Not Receiving Bivalent COVID-19 Booster Vaccinations Among Adults — United States, November 1–December 10, 2022

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Bivalent COVID-19 booster vaccines, developed to protect against both ancestral and Omicron BA.4/BA.5 variants, are recommended to increase protection against SARS-CoV-2 infection and severe disease* (*1*,*2*). However, relatively few eligible U.S. adults have received a bivalent booster dose (*3*), and reasons for low coverage are unclear. An opt-in Internet survey of 1,200 COVID-19–vaccinated U.S. adults was conducted to assess reasons for receiving or not receiving a bivalent booster dose. Participants could select multiple reasons from a list of suggested reasons to report why they had or had not received a bivalent booster dose. The most common reasons cited for not receiving the bivalent booster dose were lack of awareness of eligibility for vaccination (23.2%) or of vaccine availability (19.3%), and perceived immunity against infection (18.9%). After viewing information about eligibility and availability, 67.8% of participants who had not received the bivalent booster dose indicated that they planned to do so; in a follow-up survey 1 month later, 28.6% of these participants reported having received the dose. Among those who had planned to receive the booster dose but had not yet done so, 82.6% still intended to do so. Participants who had still not received the booster dose most commonly reported being too busy to get vaccinated (35.6%). To help increase bivalent booster dose coverage, health care and public health professionals should use evidence-based strategies to convey information about booster vaccination recommendations and waning immunity (*4*), while also working to increase convenient access.

Participants were recruited via Prolific, an online survey platform.† Eligible participants included persons who were aged ≥18 years, fluent in English, U.S. residents, and had received ≥1 previous COVID-19 vaccine dose. Quota-sampling was used to recruit approximately equal numbers of adults aged 18–39, 40–59, and ≥60 years. Because of low racial and ethnic diversity among persons in the Prolific participant pool (most identified as non-Hispanic White [White]), particularly among adults aged ≥60 years and those who had previously received a COVID-19 vaccine, the sample was not weighted by race or ethnicity. Data collection occurred during November 1–5, 2022 (initial survey), and December 6–10 (follow-up survey). CDC first recommended a bivalent booster dose for persons aged ≥12 years on September 1, 2022. Participants were not informed during the initial survey that they would later be recontacted for a follow-up survey. This study was reviewed and approved by the Duke University Institutional Review Board.§

Participants reported dates of all previous COVID-19 infections (as determined by positive rapid test results or reverse transcription-polymerase chain reaction test results) and COVID-19 vaccine doses. Participants who reported receiving a bivalent booster dose viewed a randomly ordered set of 10 suggested reasons for getting the booster dose,¶ and could select multiple reasons that contributed to their decision, as well as optionally input other reasons.** Similarly, participants who had not received a bivalent booster dose could select from a different randomly ordered set of 10 reasons for not getting the booster dose,†† and optionally input other reasons; they then viewed information about bivalent booster vaccine eligibility

* https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html

† Prolific is an online survey platform (www.prolific.co/). Participants were paid $1 for a survey that took 3–5 minutes to complete. After 1 month, participants were recontacted for a 1.5-minute follow-up survey that paid $1. Survey creators recruit participants on the basis of previous responses to a demographic survey administered by Prolific; only participants who met the eligibility criteria were able to view the study and opt in.

§ 45 C.F.R. part 46; 21 C.F.R. part 56.

¶ Suggested reasons for receiving the booster dose are as follows: 1) I wanted to protect myself; 2) I wanted to protect others; 3) I wanted to prevent my own severe illness due to COVID-19; 4) I wanted to prevent my own long-term symptoms due to COVID-19 (long COVID); 5) My doctor (or other health care provider) recommended getting the booster dose; 6) I wanted to prevent life disruption due to COVID-19 (e.g., missing work or vacations); 7) CDC recommended getting the booster dose; 8) My friend or family members got the booster dose; 9) I read content in the news or on social media about the booster dose; and 10) My employer or school required it.

** Participants optionally input other text to describe additional reasons (31.6% among those who had already received the bivalent booster dose, and 53.9% among those who had not). However, because many of these responses were not informative (e.g., writing "nothing to add" or providing a reason that was redundant with a reason already selected from the list), these text-entry responses were excluded from analyses.

†† Suggested reasons for not receiving the booster dose are as follows: 1) I believe I still have strong protection against COVID-19 infection; 2) I believe I still have strong protection against severe illness due to COVID-19; 3) I didn't want to experience vaccine side effects; 4) I couldn't take time off work to get the vaccine or recover afterwards; 5) I believe the vaccines are not effective anymore; 6) I didn't know the new booster was available; 7) I didn't know if I was eligible for the new booster; 8) It's too much effort to get the booster shot; 9) I don't know if the new formula is effective; and 10) I don't know if the new formula is safe.

and availability.[§§] After viewing this information, participants who had not received a bivalent booster dose reported whether they planned to receive it and were recontacted via Prolific after 1 month to complete a follow-up survey. Descriptive statistics were calculated using R (version 4.1.1; R Foundation). Survey materials, data, and code used for data preprocessing and analysis are available online.[¶¶]

The initial survey included 1,200 participants, with approximately one third in each age group (Table 1). Nearly two thirds (65.4%) of participants were White, and approximately one half (51.9%) were women. Most participants (95.8%) had received ≥2 COVID-19 vaccine doses; among these participants, 396 (34.4%) had received the bivalent booster dose, and 714 (62.1%) had not. Participants who had received only 1 vaccine dose (50) or were unsure if they had received a bivalent booster dose (41) were excluded from further analyses.

The 396 participants who had received the bivalent booster dose selected a median of five reasons for getting it.[***] The most common reasons were to protect oneself (90.7%), prevent severe disease (80.6%), and protect others (75.0%) (Figure); these top reasons were consistent among age groups.

The 714 participants who had not received the bivalent booster dose selected a median of one reason for not receiving it (Figure).[†††] Reasons for not receiving the bivalent booster dose differed among age groups (Supplementary Figure, https://stacks.cdc.gov/view/cdc/123508). Among adults aged 18–39 years, the most commonly reported reasons for not receiving the bivalent booster dose were being unaware that they were eligible (29.8%), being unaware that updated booster doses were available (23.5%), or believing they still had strong protection against infection (18.4%). The most commonly reported reasons among adults aged 40–59 years were being unaware that they were eligible (22.1%) or believing they still had strong protection against severe disease (21.3%) or infection (18.5%). Among adults aged ≥60 years, the most commonly reported reasons were believing they still had strong protection against infection (20.2%), concern about side effects (17.5%), or being unsure whether the bivalent booster dose was effective (16.1%).

Adults aged 40–59 and ≥60 years commonly reported not receiving a booster dose because they believed they were already sufficiently protected against infection or severe disease. However, among 223 participants who cited one or both of these reasons, 160 (71.7%) had not experienced a SARS-CoV-2 infection or received a COVID-19 vaccine dose within the preceding 6 months, and 114 (51.1%) had never been infected.

Reasons for nonvaccination were descriptively grouped into the following three categories: 1) lack of awareness (related to eligibility and availability), 2) perceived immunity (i.e., self-perceived strong protection against infection or severe disease), and 3) concern and uncertainty (related to vaccine effectiveness, safety, and side effects). Reasons within each descriptive category were more often reported together (co-occurrence frequency >15%)[§§§] (Table 2).

After participants who had not received the booster dose (714) selected their reasons, they read a message about vaccine eligibility and availability and then reported their intention to get the booster dose. Overall, more than two thirds (67.8% [484 of 714]) indicated that they planned to get the booster dose (similar across age groups). Among those who had reported being unaware about eligibility or availability, 88.0% (227 of 258) indicated that they planned to get the booster dose.

After 1 month, the 714 participants who had not received the booster dose at the initial evaluation were recontacted; 624 (87.4%) completed the follow-up survey (Table 1). Among 427 (68.4%) participants who planned to receive the booster dose, 122 (28.6%) had done so. In contrast, among 197 participants who did not plan to receive the booster dose, nine (4.6%) had received it. Among the 305 participants who planned to get the booster dose but had not yet done so, 252 (82.6%) still intended to get it, three (1.0%) no longer planned to get it, and 50 (16.4%) were unsure. Recontacted participants who still had not received the booster dose selected reasons again[¶¶¶]; the

[§§] Participants read a message describing CDC recommendations and eligibility criteria for bivalent booster doses along with a link to an appointment-finding tool (https://www.vaccines.gov/search/). Click-tracking indicated that 5.7% of participants clicked on the link, although this measure might fail to count some clicks (e.g., if a participant copied and pasted the link or used a keyboard shortcut to open it in a new tab or window). Participants might have been unlikely to click the link because of concerns about losing their place in the survey.

[¶¶] https://osf.io/t3szm/

[***] 6.6% of participants cited one reason, 5.3% cited two reasons, 9.6% cited three reasons, 14.6% cited four reasons, and 63.9% cited five or more reasons.

[†††] 7.0% did not cite any of the suggested reasons, 61.3% cited one reason, 22.7% cited two reasons, and 15.3% cited three or more reasons.

[§§§] Although only one third of participants cited more than one reason, recommendations based on the descriptive categories (lack of awareness, perceived immunity, and concern and uncertainty) apply to all participants who chose one or more of the reasons associated with each category.

[¶¶¶] Suggested reasons for not receiving the booster dose in the follow-up study are as follows (listed in order of prevalence): 1) I've been too busy to get the booster dose; 2) I didn't want to experience vaccine side effects; 3) I intended to get the booster dose, but I forgot to make an appointment; 4) I believe I still have strong protection against COVID-19 infection; 5) I believe I still have strong protection against severe illness due to COVID-19; 6) I don't know if the new formula is effective; 7) I don't know if the new formula is safe; 8) I had COVID-19 recently, so I think I should wait before getting a booster dose; 9) I believe the vaccines are not effective anymore; 10) I couldn't take time off work to get the vaccine or recover afterwards; 11) I am still not sure if I am eligible to receive a booster dose; and 12) I am not sure if vaccine doses (or the specific brand I prefer) are available near me.

TABLE 1. Characteristics of participants in the initial survey,* by bivalent-booster dose status, and in the follow-up survey† — United States, November 1–December 10, 2022

Characteristic	No. (%)			
	Initial survey participants			
	Total (1,200)	Received bivalent booster dose (396)	Did not receive bivalent booster dose (759)	Follow-up survey participants (624)
Age group, yrs				
18–39	**406 (33.8)**	101 (25.5)	287 (37.8)	225 (36.1)
40–59	**397 (33.1)**	120 (30.3)	262 (34.5)	225 (36.1)
≥60	**397 (33.1)**	175 (44.2)	210 (27.7)	174 (27.9)
Race and ethnicity§				
Asian	**132 (11.0)**	44 (11.1)	81 (10.7)	66 (10.6)
Black or African American	**103 (8.6)**	23 (5.8)	71 (9.4)	51 (8.2)
Hispanic or Latino	**89 (7.4)**	27 (6.8)	59 (7.8)	50 (8.0)
Alaska Native or Native American	**20 (1.7)**	5 (1.3)	13 (1.7)	11 (1.8)
White	**785 (65.4)**	271 (68.4)	491 (64.7)	409 (65.5)
Multiple races	**60 (5.0)**	20 (5.1)	40 (5.3)	34 (5.4)
Other	**11 (1.0)**	6 (1.5)	4 (0.5)	3 (0.5)
Gender				
Man	**559 (46.6)**	179 (45.2)	358 (47.2)	297 (47.6)
Woman	**623 (51.9)**	209 (52.8)	391 (51.5)	320 (51.3)
Other (nonbinary or prefer not to say)	**18 (1.5)**	8 (2.0)	10 (1.3)	7 (1.1)
No. of COVID-19 vaccine doses received				
1	**50 (4.2)¶**	0 (—)	45 (5.9)¶	0 (—)
2	**339 (28.5)**	23 (5.8)	307 (40.4)	264 (42.3)
3	**413 (34.4)**	69 (17.4)	328 (43.2)	288 (46.2)
4	**272 (22.7)**	185 (46.7)	75 (9.9)	68 (10.9)
5	**126 (10.5)**	119 (30.1)	4 (0.1)	4 (0.6)
Bivalent booster dose received				
Yes	**396 (33.0)**	396 (100.0)	0 (—)	131 (21.0)
No	**759 (63.3)**	0 (—)	759 (100.0)	493 (79.0)
Unsure	**41 (3.4)¶**	0 (—)	0 (—)	0 (—)
No. of previous SARS-CoV-2 infections**				
0	**680 (56.7)**	268 (67.7)	388 (51.1)	360 (57.7)
1	**363 (30.3)**	92 (23.2)	255 (33.6)	213 (34.1)
2	**80 (6.7)**	21 (5.3)	55 (7.2)	43 (6.9)
≥3	**12 (1.0)**	2 (0.1)	10 (1.3)	8 (1.3)

* The initial sample consisted of 1,200 previously COVID-19–vaccinated U.S. residents.
† The follow-up survey consisted of 624 participants from the initial survey, recontacted after 1 month. Only participants who had reported not yet receiving the bivalent booster dose during the initial survey were recontacted.
§ Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic. Persons identified as being of multiple races had more than one race category selected. Persons identified as "other" race selected the "other" option or identified as Native Hawaiian or other Pacific Islander.
¶ Participants who were unsure whether they had received a bivalent booster dose were excluded from analyses (41). In addition, participants who had received only 1 previous COVID-19 vaccine dose were excluded from analyses (50), because those who did not complete a primary series (or received a 1-dose primary vaccine) might not be eligible to receive a bivalent booster dose or might have different reasons for receiving booster doses. One participant reported both having received 1 dose and also being unsure about their bivalent booster vaccination status; thus, a total of 90 participants were excluded.
** Participants reported all previous SARS-CoV-2 infections for which they had received a positive test result (rapid test or reverse transcription–polymerase chain reaction test).

most common reasons were being too busy (35.6%), forgetting (22.7%), and worrying about side effects (22.7%).****

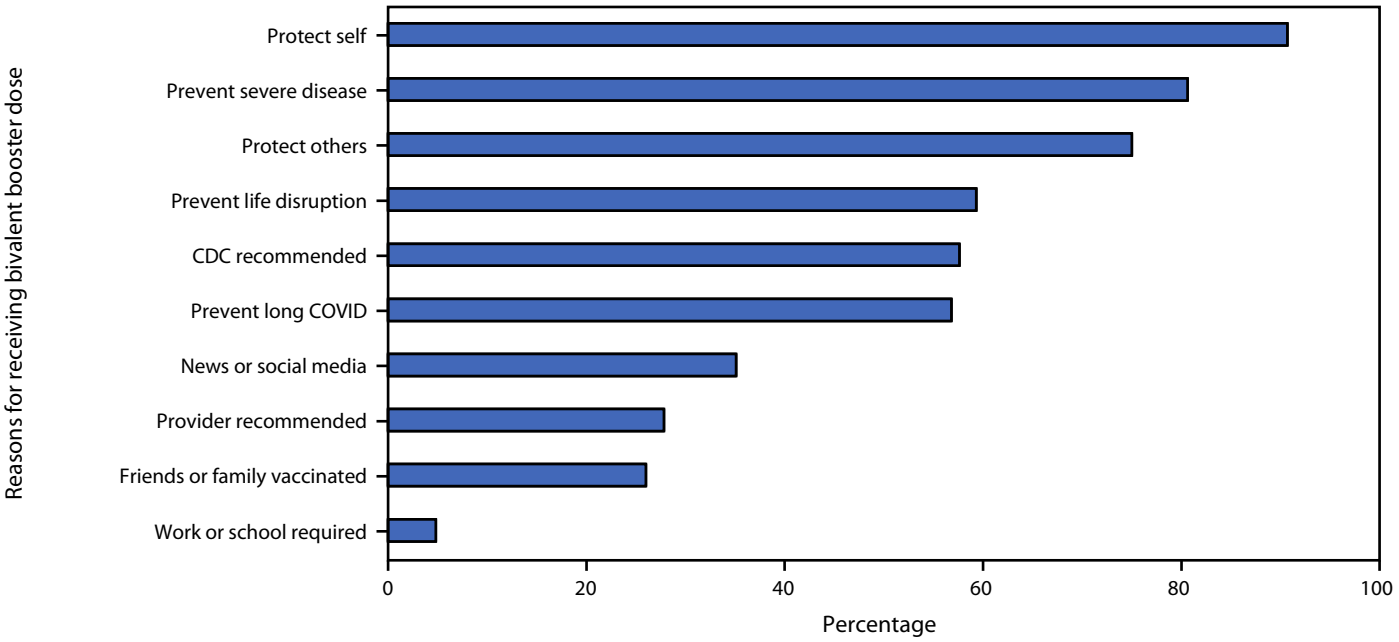
**** In the follow-up survey, among the subset of participants (305) who were unsure or no longer planned to get the booster dose, the top reasons for not getting it were being too busy (37.7%), concern about side effects (34.0%), and strong perceived protection against infection (24.5%) and severe disease (24.5%).

Discussion

In this online survey aimed at understanding reasons for low bivalent COVID-19 booster vaccination coverage, the most common reasons for not receiving a bivalent booster dose were lack of awareness of eligibility (23.2%) or availability (19.3%) and perceived existing protection against infection (18.9%), although top reasons differed across age groups. Bivalent booster dose coverage in the U.S. was low when the survey was conducted (12.1% of adults), and currently remains low

FIGURE. Reasons for receiving (A) or not receiving (B) a bivalent COVID-19 booster dose, among persons who did and did not receive it — United States, November–December 2022

A. Received bivalent booster dose (N = 396)



B. Did not receive bivalent booster dose (N = 714)

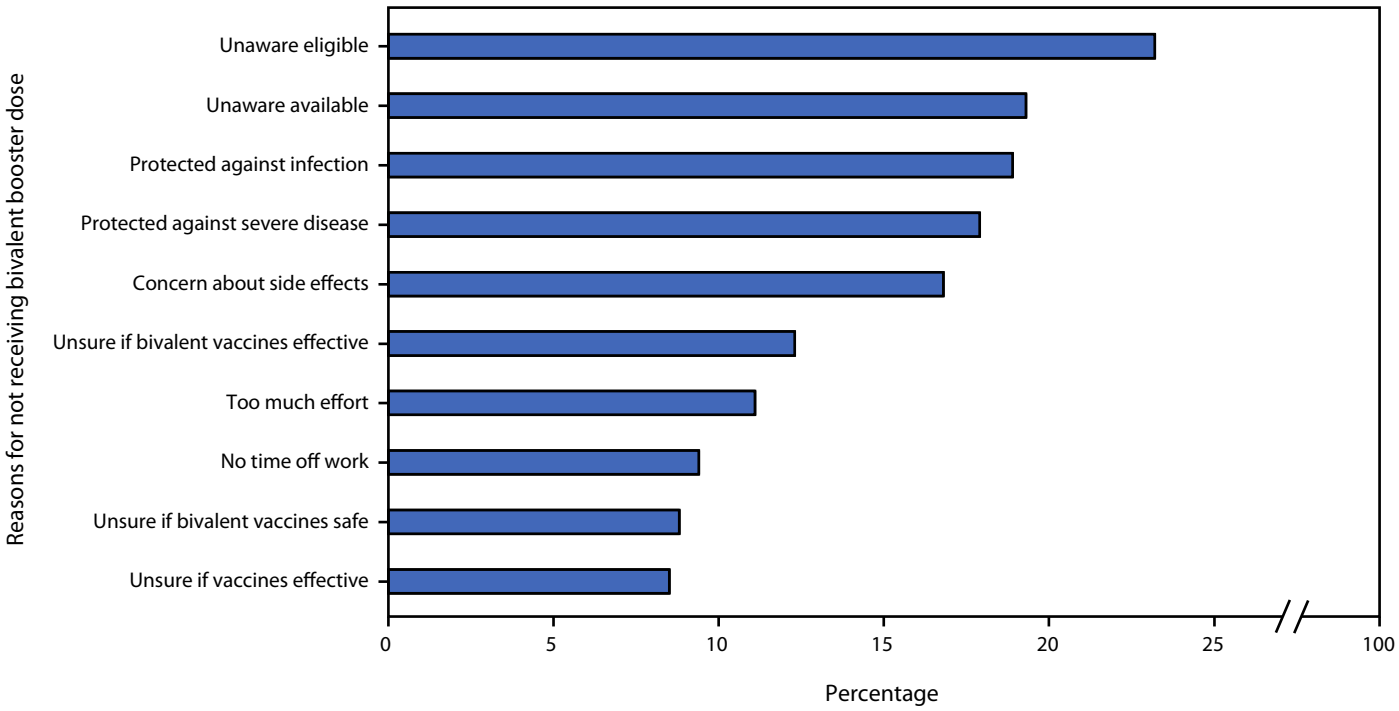


TABLE 2. Co-occurrence* of reasons for not receiving the COVID-19 bivalent booster vaccine among participants who cited two or more reasons (N = 251) — United States, November 1–5, 2022

Reasons for not getting bivalent COVID-19 booster dose	Percentage									
	Unaware eligible	Unaware available	Protected against infection†	Protected against severe disease§	Concern about side effects	Unsure if vaccines are effective	Unsure if bivalent vaccines are effective	Unsure if bivalent vaccines are safe	Too much effort	No time off work
Unaware eligible	NA	—¶	—	—	—	—	—	—	—	—
Unaware available	47.4*	NA	—	—	—	—	—	—	—	—
Protected against infection†	5.7	9.6	NA	—	—	—	—	—	—	—
Protected against severe disease§	8.4	6.2	33.1*	NA	—	—	—	—	—	—
Concern about side effects	10.3	2.7	14.2	19.4*	NA	—	—	—	—	—
Unsure if vaccines are effective	2.5	0.9	9.2	6.2	18.3*	NA	—	—	—	—
Unsure if bivalent vaccines are effective	5.0	1.6	13.3	8.4	22.5*	30.2*	NA	—	—	—
Unsure if bivalent vaccines are safe	2.3	2.7	9.4	5.8	15.2*	28.9*	37.9*	NA	—	—
Too much effort	4.0	4.0	13.5	11.7	9.2	6.3	7.0	4.5	NA	—
No time off work	8.8	5.6	3.5	6.0	9.9	4.1	3.2	1.2	12.7	NA

Abbreviation: NA = not applicable.

* Pairs of reasons that co-occurred >15% of the time. Co-occurrence was calculated as the percentage of instances in which a participant cited both reasons, given that at least one of the two reasons was cited. An arbitrary threshold of 15% was used to identify notable co-occurrences. Reasons that frequently co-occurred aligned with the descriptive categories described in the main text (e.g., the "unaware" category included the "unaware eligible" and "unaware available" reasons, which had a co-occurrence frequency of 47.4%).

† Full text of reason: "I believe I still have strong protection against COVID-19 infection."

§ Full text of reason: "I believe I still have strong protection against severe illness due to COVID-19."

¶ Dashes indicate cells that are omitted because the values would be redundant with other cells; the matrix of reasons is symmetric on both sides of the diagonal.

(18.2% of adults) (*3*). Increasing bivalent booster vaccination coverage will require a multifaceted approach (*4*) to address reasons for nonvaccination.

Lack of awareness about eligibility to receive a booster dose and vaccine availability were among the three most common reasons for not receiving the booster dose among adults aged 18–39 and 40–59 years. After viewing information about current booster vaccination guidelines, most participants who had been unaware of their eligibility or about availability reported planning to get the booster dose. Increased outreach, such as through provider recommendations and trusted messengers (*4*,*5*), is necessary to increase awareness of eligibility criteria and vaccine availability. Increasing awareness is a crucial first step toward increasing coverage; promotion of tools that provide vaccination guidance (such as CDC's COVID-19 booster tool)†††† by public health authorities and trusted messengers might help encourage persons who are unsure about bivalent booster dose recommendations to receive the booster dose.

Other respondents did not receive a booster dose because they believed they were protected against infection or severe disease because of previous vaccination or infection. These reasons were among those most frequently cited by adults aged 40–59 and ≥60 years. Among participants who cited these reasons, nearly three quarters had not experienced a SARS-CoV-2 infection or received a COVID-19 vaccine dose within the preceding 6 months, and more than one half had never been infected. Because of waning of vaccine- and infection-conferred immunity and evolving viral variants (*6*,*7*), these participants likely overestimated their protection. An online intervention has been shown to correct inaccurate estimation of COVID-19 exposure risk (*8*); similar strategies could correct misconceptions about the need for COVID-19

Summary

What is already known about this topic?

Bivalent COVID-19 booster vaccines increase protection against infection and severe disease. However, few eligible U.S. residents have received a bivalent booster dose, and factors underlying low coverage are unclear.

What is added by this report?

An online opt-in survey of 1,200 previously vaccinated U.S. residents found that the most common reasons for not getting a bivalent booster dose were lack of awareness about eligibility or availability and overconfidence in immunity; reasons varied by age group.

What are the implications for public health practice?

All eligible adults should receive a bivalent COVID-19 booster vaccine. To help increase bivalent booster dose coverage, health care and public health professionals should use evidence-based strategies to inform persons about booster vaccine recommendations and waning immunity.

†††† https://www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html

bivalent booster vaccination, such as interactive online tools that provide personalized immunity estimates.

Some participants expressed concern about bivalent booster dose side effects, safety, and effectiveness. These concerns were among the most frequent reasons for not receiving the booster dose among adults aged ≥60 years. Increasing awareness of emerging safety and effectiveness data related to bivalent booster vaccination among providers and public health messengers could help address these concerns (*1*,*2*,*5*).

After 1 month, 29% of participants who had planned to get the bivalent booster dose had received it; 83% of those who had not yet received a booster dose still planned to receive it. Recontacted participants who had not received the booster dose most commonly reported being too busy, forgetting, or worrying about side effects. Reminders from providers and trusted messengers, accommodations (e.g., time off work to recover), and convenient access (e.g., at workplaces, schools, or shopping centers) might motivate persons to act on their intentions (*4*,*5*). Increased awareness of safety data could also address concerns about side effects.

The findings in this report are subject to at least six limitations. First, most users in the Prolific participant pool identified as White (particularly among adults aged ≥60 years and previously COVID-19–vaccinated adults), making it impossible to weight the sample by race or ethnicity to represent the general U.S. population. Second, the survey used a nonprobability sample, and the cumulative response rate cannot be reported because Prolific does not report the number of users who viewed a survey but did not opt-in. Third, inferences are limited to persons who received ≥2 previous COVID-19 vaccine doses. These three limitations constrain the generalizability of the findings as well as inferences about demographic or geographic differences. Previous studies have demonstrated racial and ethnic disparities in COVID-19 booster vaccination (*9*); reasons for nonvaccination might differ among communities because of work, transportation, or language barriers. Fourth, self-reported information is subject to social desirability and recall biases (*10*); participants might have felt pressured to provide socially desirable answers or inaccurately recalled past experiences, which limits the interpretability of the survey responses. Fifth, the survey only assessed booster vaccination intentions at the end of the survey, making it difficult to determine whether providing information about vaccination eligibility or vaccine availability influenced intentions. Finally, because of selection bias, those who had strong opinions about COVID-19 vaccination might have been more likely to participate.

This study identified lack of awareness, perceived immunity, and concern and uncertainty as important reasons underlying low adult bivalent booster vaccination coverage. All eligible adults should receive a bivalent booster dose to protect themselves against SARS-CoV-2 infection and severe disease. To help increase bivalent booster coverage, health care professionals and public health practitioners should use evidence-based strategies to convey information about booster vaccination recommendations and waning immunity, in addition to increasing convenient access to vaccination.

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Notes from the Field

Follow-Up Assessment 1 Year After a Chemical Exposure Investigation — Winnebago County, Illinois, July–August 2022

Ahlia Sekkarie, PhD[1]; Peter DeJonge, PhD[1]; Sandra Martell, DNP[2]; Sarah Patrick, PhD[3]; Motria Caudill, PhD[4]; D. Kevin Horton, DrPH[4]; Maureen Orr, MS[4]; Stacey Konkle, PhD[4]

On June 14, 2021, an industrial manufacturing facility in Winnebago County, Illinois caught fire and released smoke, dust, and debris, requiring evacuation of the area in the vicinity of the facility for 4 days. Following the emergency response, the Illinois Department of Public Health (IDPH) and Winnebago County Health Department (WCHD) requested assistance from the Agency for Toxic Substances and Disease Registry (ATSDR) to conduct a community Assessment of Chemical Exposure (ACE). That assessment found that almost one half of respondents reported symptoms during the 2 weeks after the fire (*1*).

One year after the fire, IDPH and WCHD invited ATSDR to conduct a follow-up ACE investigation to assess ongoing health impacts. WCHD and ATSDR emailed a modified survey to all 2,030 previous 2021 survey respondents, through the existing electronic system, to collect information related to ongoing exposure and mental and physical health symptoms. This investigation team also conducted a total of 22 semistructured interviews to collect open-ended responses to questions regarding mental health symptoms and community needs. Nine residents of a neighborhood adjacent to the fire site were interviewed in-person and 13 survey respondents who expressed interest in participating were interviewed by phone.

Among the 2,030 previous survey respondents, 33% (676) completed the follow-up survey. In the follow-up survey, 39% (265) of respondents reported new or worsening mental health symptoms since the fire, among whom 98% were still experiencing these symptoms 1 year after the fire; 59% (400) reported new or worsening physical health symptoms, among whom 90% were still experiencing these symptoms 1 year after the fire.

Semistructured interviews enriched the quantitative information from the electronic survey and revealed themes related to anxiety, disappointment in communication, and overall poor mental health. More formal qualitative analysis is underway; however, preliminary findings suggest that residents were unable to easily access information related to environmental exposures or fire-site cleanup efforts. In addition, when information was available, respondents found it to be overly technical and difficult to interpret.

The semistructured interviews also provided an opportunity for residents to offer unprompted remarks. Residents reported avoidance of previous activities, such as gardening, because of concerns about fire-related contaminants. This information provides local authorities with specific actions such as targeted community environmental risk education.

This follow-up ACE investigation provided informative and immediately actionable data. Communities that have experienced a similar type of fire or environmental disaster would benefit from a consolidated source of information, summarized in easily understandable, plain language. The CDC Clear Communication Index is a set of research-based criteria that can be used to craft messages in an effective, interpretable way, especially for complex scientific information related to toxic substances (*2*). One limitation of this analysis is that data collected following disasters might be biased toward more reported adverse outcomes than those representative of the overall community (*3*).

Lessons learned from the follow-up survey are being applied to both the chemical fire and other environmental exposures such as per- and polyfluoroalkyl substances in water systems in Winnebago County. WCHD is working with IDPH and the Illinois Environmental Protection Agency on communications about chemical exposures that incorporate the concepts highlighted by this qualitative study including transparency about what is unknown and simple communications based on the CDC Clear Communication Index.

This investigation documented persistent mental and physical health symptoms reported among residents 1 year after a chemical fire, highlighted the importance of clear and accessible public health communications (*4*), and informed local authorities about previously unrecognized concerns. A follow-up ACE investigation for environmental disaster events by public health authorities can help gauge long-term health concerns and demonstrate ongoing investment in the wellbeing of affected communities.

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Erratum

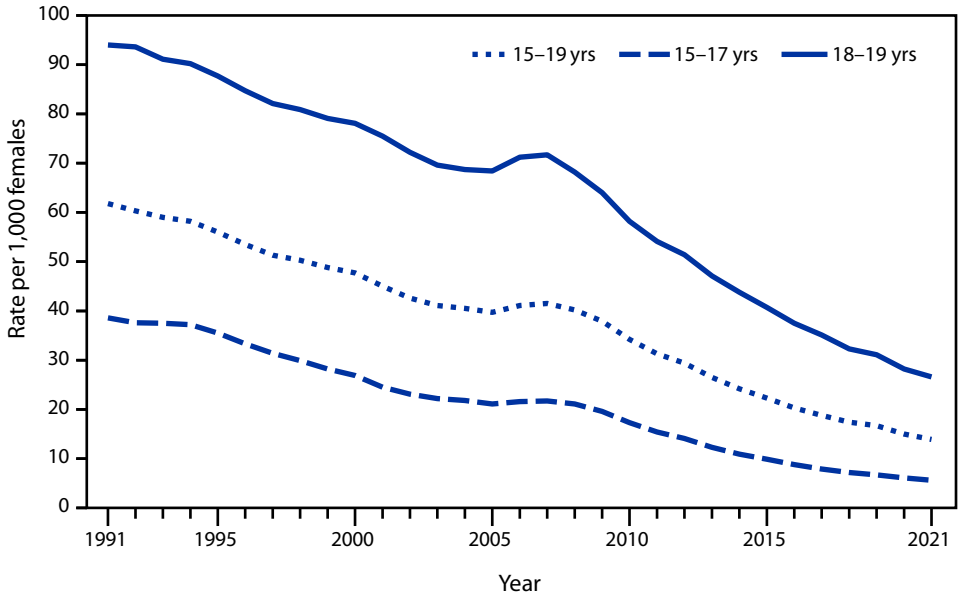
Vol. 71, No. 45

In the report "Epidemiologic Features of the Monkeypox Outbreak and the Public Health Response — United States, May 17–October 6, 2022," on page 1450, the last sentence of the second full paragraph should have read, "Date of vaccination and date of symptom onset was available for **1,563** (**6%**) patients, **610** (**39%**) of whom were vaccinated after symptom onset and **953** (**61%**) before symptoms began."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Birth Rates* for Females Aged 15–19 Years, by Age Group — National Vital Statistics System, United States, 1991–2021



* Births per 1,000 females aged 15–19 years.

The birth rate for females aged 15–19 years declined from a 1991 peak of 61.8 per 1,000 females to a record low of 13.9 in 2021. From 1991 to 2021, the rate for females aged 15–17 years declined from 38.6 to 5.6 and from 94.0 to 26.6 for those aged 18–19 years. Most of the decline occurred during 2007–2021, with rates down 67% for females aged 15–19 years, 74% for females aged 15–17 years, and 63% for females aged 18–19 years. During 1991–2021, decreases in birth rates for females aged 15–17 years were larger than the decreases for those aged 18–19 years.

Source: National Center for Health Statistics, National Vital Statistics System, Natality Data, 2021. https://www.cdc.gov/nchs/nvss/births.htm

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