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Emergency Department Visits for Pedestrians Injured in Motor Vehicle Traffic Crashes — United States, January 2021–December 2023

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Abstract

Traffic-related pedestrian deaths in the United States reached a 40-year high in 2021. Each year, pedestrians also suffer nonfatal traffic-related injuries requiring medical treatment. Near real-time emergency department visit data from CDC's National Syndromic Surveillance Program during January 2021–December 2023 indicated that among approximately 301 million visits identified, 137,325 involved a pedestrian injury (overall visit proportion = 45.62 per 100,000 visits). The proportions of visits for pedestrian injury were 1.53–2.47 times as high among six racial and ethnic minority groups as that among non-Hispanic White persons. Compared with persons aged ≥65 years, proportions among those aged 15–24 and 25–34 years were 2.83 and 2.61 times as high, respectively. The visit proportion was 1.93 times as high among males as among females, and 1.21 times as high during September–November as during June–August. Timely pedestrian injury data can help collaborating federal, state, and local partners rapidly monitor trends, identify disparities, and implement strategies supporting the Safe System approach, a framework for preventing traffic injuries among all road users.

Introduction

In 2021, approximately 7,000 pedestrians were killed in motor vehicle crashes, the most in 40 years (*1*). During 2009–2016, approximately 47,000 traffic-related hospital admissions occurred annually among pedestrians (*2*). Data commonly used to assess pedestrian injuries, such as nationally representative probability sampled surveys of hospitals and police crash reports, might have time lags of ≥2 years between data collection and availability because of time required for data collection, coding, and review.[†] Data timeliness is increasingly important to rapidly identify emerging shifts in injury patterns and evaluate prevention policies, programs, practices, and funding efforts to reduce pedestrian injuries. This report details pedestrian injury data for January 2021–December 2023 from the National Syndromic Surveillance Program (NSSP), a source of near real-time emergency department (ED) data.

[*] These authors contributed equally to this report.

[†] Crash Report Sampling System (https://www.nhtsa.gov/crash-data-systems/crash-report-sampling-system); Fatality Analysis Reporting System (https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars); Healthcare Cost and Utilization Project (https://hcup-us.ahrq.gov/databases.jsp); National Electronic Injury Surveillance System-All Injury Program data (https://health.gov/healthypeople/objectives-and-data/data-sources-and-methods/data-sources/national-electronic-injury-surveillance-system-all-injury-program-neiss-aip); and National Hospital Ambulatory Medical Care Survey (https://www.cdc.gov/nchs/ahcd/datasets_documentation_related.htm).

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Methods

Data Source

CDC used NSSP[§] data to examine ED visits for pedestrian injuries. NSSP is a collaboration among CDC, local and state health departments, and federal, academic, and private sector partners. The program receives electronic health record data from approximately 78% of EDs nationwide, often within 24 hours.

Definitions and Data Analysis

Traffic-related pedestrian injury ED visits (pedestrian visits) were initial encounters (i.e., not follow-up visits) for pedestrians unintentionally injured in motor vehicle crashes on public roads during January 3, 2021–December 31, 2023. Pedestrian visits were identified using a combination of administrative diagnosis codes and free-text reason-for-visit terms, developed and validated by CDC in partnership with five state or local health departments.[¶] The pedestrian visit proportion (visit proportion), defined as the number of pedestrian visits per 100,000 total ED visits, was calculated overall and by race and ethnicity,[**] age group (0–14, 15–24, 25–34, 35–64, and ≥65 years), sex (female and male), season (autumn [September–November], winter [December–February], spring [March–May], and summer [June–August]), and U.S. Department of Health and Human Services (HHS) region.[††] Visit ratios, with corresponding Wald 95% CIs, were calculated as the visit proportion of a given group divided by the visit proportion of a specified referent group.[§§] Because data quality and coding practices can vary by facility and over time, analyses were restricted to EDs that more consistently reported complete data (coefficient of variation ≤40% and average weekly informative discharge diagnosis ≥75% complete during 2021–2023). After this restriction, 81% of all ED visits and 82% of all pedestrian ED visits were used.[¶¶] Analyses were conducted using Base R (version 4.2.2; Posit). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[***]

[§] https://www.cdc.gov/nssp/index.html

[¶] A pedestrian is defined as any person on foot, walking, running, jogging, sitting or lying down, in a motorized or nonmotorized wheelchair, in a baby carriage, on roller skates or inline skates, on a skateboard, on a nonmotorized scooter, on a motorized mobility scooter designed to accommodate disability, or on skis, sleds, or ice skates. To identify *International Classification of Diseases, Ninth Revision, Clinical Modification* and *International Classification of Diseases, Tenth Revision, Clinical Modification* codes for pedestrian motor vehicle traffic injuries, codes currently used or recommended for pedestrian injury surveillance were reviewed and considered for inclusion. These included (but were not limited to) codes used in surveillance at the National Highway Traffic Safety Administration, at CDC, and the codes recommended in the Consensus Recommendations for Pedestrian Injury Surveillance by the Safe States Alliance. https://knowledgerepository.syndromicsurveillance.org/sites/default/files/2023-10/CDC%20Pedestrian%20Motor%20Vehicle%20Traffic%20Injury%20v1.pdf

[**] Race and ethnicity are categorized as non-Hispanic White, non-Hispanic Black or African American, non-Hispanic American Indian or Alaska Native, non-Hispanic Native Hawaiian or Pacific Islander, non-Hispanic Asian, non-Hispanic multiracial or another race, and Hispanic or Latino.

[††] https://www.hhs.gov/about/agencies/iea/regional-offices/index.html; https://www.cdc.gov/nssp/participation-coverage-map.html

[§§] Referent groups are defined as the groups with the lowest proportions for pedestrian injury ED visits per 100,000 visits.

[¶¶] https://www.cdc.gov/nssp/dqc/articles/how-data-quality-filters-work.html

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

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Results

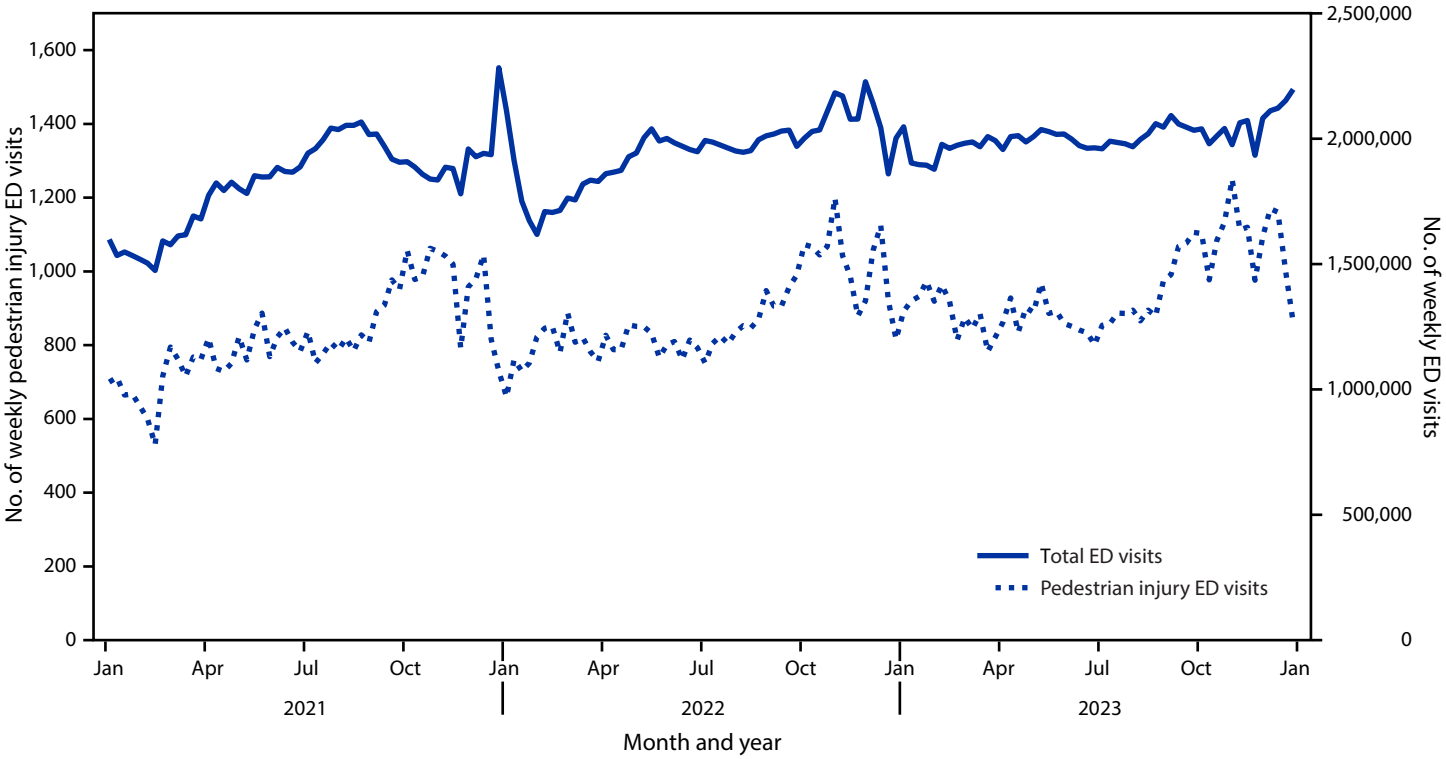
The weekly number of pedestrian visits during the 3-year period (January 2021–December 2023) generally peaked during autumn. Weekly pedestrian visits mostly followed the pattern of all ED visits, with the exception that pedestrian visits flattened during summer while all ED visits increased (Figure).

Among approximately 301 million ED visits, 137,325 involved a pedestrian injury, resulting in an overall visit proportion of 45.62 pedestrian injury ED visits per 100,000 total ED visits. Compared with the visit proportion among non-Hispanic White (White) persons, visit proportions were 2.47 times as high among non-Hispanic multiracial persons or persons of another race, 2.23 times as high among non-Hispanic Asian (Asian) persons, 2.13 times as high among non-Hispanic American Indian or Alaska Native (AI/AN) persons, 1.93 times as high among non-Hispanic Black or African American (Black) persons, 1.70 times as high among Hispanic or Latino (Hispanic) persons, and 1.53 times as high among non-Hispanic Native Hawaiian or Pacific Islander persons (Table). Compared with the visit proportion among persons aged ≥65 years, visit proportions were 2.83 times as high among persons aged 15–24 years, 2.61 times as high among those aged 25–34 years, 2.18 times as high among those aged 35–64 years, and 1.25 times as high among those aged 0–14 years. The visit proportion was 1.93 times as high among males as among females. Compared with visit proportions during summer, the visit proportion was highest during autumn (visit ratio = 1.21). Compared with visit proportion in HHS Region 7 (Iowa, Kansas, Missouri, and Nebraska), the visit proportion was 4.29 times as high in HHS Region 2 (New Jersey and New York).

Discussion

Using syndromic surveillance data from January 2021–December 2023, the proportion of ED visits related to pedestrian injury was highest among six racial and ethnic minority groups. The racial and ethnic disparities in this report are consistent with previous studies. For example, among patients in the U.S. Nationwide Inpatient Sample during 2009–2016, admission rates were elevated among Black, Hispanic, and

FIGURE. Weekly number of emergency department visits for pedestrian injury* — National Syndromic Surveillance Program,† United States, January 2021–December 2023



Abbreviations: ED = emergency department; NSSP = National Syndromic Surveillance Program.

* ED visits for an initial pedestrian injury encounter were identified by querying a categorization developed and validated by CDC in partnership with state and local health departments. This categorization aims to detect initial ED visits among pedestrians unintentionally injured on public roads in crashes involving a motor vehicle. https://knowledgerepository.syndromicsurveillance.org/sites/default/files/2023-10/CDC%20Pedestrian%20Motor%20Vehicle%20Traffic%20Injury%20v1.pdf

† NSSP is a collaboration among CDC, federal partners, local and state health departments, and academic and private sector partners. NSSP receives medical record data from approximately 78% of EDs nationwide, although <50% of facilities from California, Hawaii, Minnesota, and Oklahoma currently participate in NSSP. https://www.cdc.gov/nssp/index.html

TABLE. Emergency department visits for pedestrian injury* per 100,000 total visits and visit ratios, by selected characteristics — National Syndromic Surveillance Program,† United States, January 2021–December 2023

Characteristic§	Visit proportion¶	Visit ratio** (95% CI)
Overall	**45.62**	—
Race and ethnicity††		
American Indian or Alaska Native	68.24	2.13 (2.07–2.19)
Asian	71.51	2.23 (2.19–2.27)
Black or African American	61.88	1.93 (1.91–1.95)
Native Hawaiian or Pacific Islander	49.09	1.53 (1.41–1.66)
White	32.06	Ref
Hispanic or Latino	54.37	1.70 (1.68–1.71)
Multiracial or another race	79.21	2.47 (2.44–2.50)
Age group, yrs		
0–14	29.50	1.25 (1.23–1.28)
15–24	66.67	2.83 (2.79–2.88)
25–34	61.46	2.61 (2.57–2.65)
35–64	51.38	2.18 (2.15–2.22)
≥65	23.53	Ref
Sex		
Female	31.93	Ref
Male	61.57	1.93 (1.91–1.94)
Season		
Sep–Nov	51.01	1.21 (1.20–1.22)
Dec–Feb	45.79	1.09 (1.08–1.10)
Mar–May	43.42	1.03 (1.02–1.04)
Jun–Aug	42.10	Ref
HHS region§§		
1	44.14	1.83 (1.73–1.92)
2	103.56	4.29 (4.08–4.50)
3	43.14	1.78 (1.70–1.88)
4	37.26	1.54 (1.47–1.62)
5	33.28	1.38 (1.31–1.45)
6	38.87	1.61 (1.53–1.69)
7	24.17	Ref
8	44.24	1.83 (1.73–1.93)
9	51.45	2.13 (2.02–2.24)
10	43.28	1.79 (1.70–1.89)

Abbreviations: ED = emergency department; HHS = U.S. Department of Health and Human Services; NSSP = National Syndromic Surveillance Program; Ref = referent group.

* ED visits for an initial pedestrian injury encounter were identified by querying a categorization developed and validated by CDC in partnership with state and local health departments. This categorization aims to detect initial ED visits among pedestrians unintentionally injured on public roads in crashes involving a motor vehicle. https://knowledgerepository.syndromicsurveillance.org/sites/default/files/2023-10/CDC%20Pedestrian%20Motor%20Vehicle%20Traffic%20Injury%20v1.pdf

† NSSP is a collaboration among CDC, federal partners, local and state health departments, and academic and private sector partners. NSSP receives medical record data from approximately 78% of EDs nationwide, although <50% of facilities from California, Hawaii, Minnesota, and Oklahoma currently participate in NSSP. https://www.cdc.gov/nssp/index.html

§ Percentage of missing data for total ED visits and for pedestrian injury ED visits was sex <1% and <1%, respectively; age <1% and 2%, respectively; race and ethnicity 8% and 8%, respectively; season and HHS region 0% and 0%, respectively.

¶ (Number of ED visits for pedestrian injury / total number of ED visits) x 100,000.

** (ED visits for pedestrian injury [comparison group] / all ED visits [comparison group]) / (ED visits for pedestrian injury [Ref] / all ED visits [Ref]).

†† Patients missing ethnicity were categorized as non-Hispanic and based on documented race. Patients missing race data and who were not documented as Hispanic or Latino (Hispanic) were categorized as missing. Persons of Hispanic origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

§§ https://www.hhs.gov/about/agencies/iea/regional-offices/index.html; https://www.cdc.gov/nssp/participation-coverage-map.html

multiracial persons and persons of another race (*2*). Pedestrian death rates nationwide during 2018 were higher among AI/AN and Black persons than among White persons (*3*). However, the visit proportion in the current study was higher among Asian persons than among White persons, whereas pedestrian death rates in 2018 indicated the reverse (*3*).

Unsafe walking environments and limited investment in infrastructure for pedestrians (e.g., sidewalks, street lighting, and crosswalks) can result from past development that prioritized vehicles (*4*) and historical segregation and disinvestment in neighborhoods based on race and income (*5*). Healthy community design strategies exist that address pedestrian injury inequities while minimizing harms, such as displacement, that can occur among persons from some racial and ethnic groups and with lower incomes (*6*).

In addition to racial and ethnic inequities, differences were also found by sex, age, season, and region. The higher proportion of pedestrian visits among males aligns with 2021 pedestrian death rates (*1*). The visit proportion was highest among persons aged 15–24 years compared with other age groups. This finding differs from 2021 pedestrian death rates, which were highest among adults aged 60–64 years (*1*), likely because of increasing frailty with age (*7*). The pedestrian visit proportion was highest during autumn, as was the number of pedestrian deaths in traffic crashes during 2020–2021.††† Variation in regional visit proportions might be influenced by differences in pedestrian volume or population density.§§§

Risk factors for pedestrian injury are generally multifactorial and can include exposure to vehicles traveling at high speeds, alcohol involvement on the part of the driver or pedestrian, and insufficient visibility. Slowing vehicles by narrowing or reducing lanes, reducing speed limits, or using automated speed cameras can protect pedestrians, as can improving crossing safety and separating pedestrians from vehicles through new or improved sidewalks (*8*,*9*). In 2021, an estimated 19% of crashes resulting in pedestrian deaths involved drivers with blood alcohol concentrations of ≥0.08 g/dL (*1*). Despite proven effectiveness of stricter blood alcohol limits (*9*), only one state, Utah, has lowered its legal blood alcohol concentration from 0.08 to 0.05 g/dL. In the year after the law went into effect, the motor vehicle crash death rate per mile driven decreased 18% in Utah, compared with a 6% decrease in the rest of the United States (*10*). Most pedestrian traffic deaths (77% in 2021) occurred after dark (*1*). Enhancing visibility through strategies such as street lighting can help reduce pedestrian traffic deaths.

A comprehensive approach involving collaboration among federal, state, and local partners could help prevent pedestrian injuries and address social and structural inequities

††† https://www.cdc.gov/injury/wisqars/fatal/trends.html

§§§ https://journals.sagepub.com/doi/10.1177/0739456X19845043

Summary

What is already known about this topic?

Traffic-related pedestrian injuries are preventable but are increasing in the United States. In 2021, approximately 7,000 pedestrians died in motor vehicle crashes, representing a 40-year high.

What is added by this report?

During January 2021–December 2023, the proportion of all emergency department visits for pedestrian injury was highest among six racial and ethnic minority groups, persons aged 15–34 years, and males and during September–November.

What are the implications for public health practice?

Timely pedestrian injury data can help collaborating federal, state, and local partners rapidly monitor trends, identify disparities, and implement strategies supporting the Safe System approach, a framework designed to protect all road users.

that contribute to traffic-related injury risk. The Safe System approach[¶¶¶] provides a framework for helping prevent traffic injuries among all road users and minimizing harm when injuries occur and is based on five core elements: safer people, safer roads, safer speeds, safer vehicles, and better postcrash care. An example of collaboration within the Safe System approach is coordination between state and local communities on speed management strategies. Although decisions about road speeds are usually controlled at the state level, local communities increasingly recognize the importance of managing vehicle speed for pedestrian safety. Timely ED data on pedestrian injuries could contribute to state and local data-driven safety traffic plans that help guide similar collaborative prevention strategies to create safer pedestrian environments. The Road to Zero Coalition[****] has assembled organizations and federal partners to work together to achieve zero crash deaths by 2050, using strategies that adopt the Safe System approach. Partners include CDC and the U.S. Department of Transportation. The National Roadway Safety Strategy,[††††] released in 2022, outlines the U.S. Department of Transportation's strategy, emphasizing the Safe System approach. The 2021 Infrastructure Investment and Jobs Act[§§§§] provided funding for transportation programs designed to reduce injury risk and disparities among pedestrians.

Limitations

The findings in this report are subject to at least five limitations. First, NSSP data are not nationally representative. Second, this report includes only a percentage of U.S. EDs, and causes of injuries are not always documented in medical records; therefore, the weekly numbers of pedestrian injury ED visits are likely underestimates. Third, EDs might collect race and ethnicity data differently, which could result in misclassification. Fourth, detailed crash information such as vehicle speed, time of day, roadway and pedestrian infrastructure, and driver and pedestrian behavior (e.g., impairment) are not available in NSSP. Finally, differences in ED usage across groups, both general usage and that specific to pedestrian injuries, could affect results.

Implications for Public Health Practice

Findings from ED data on pedestrian injuries emphasize the need to prioritize prevention efforts for pedestrians. NSSP provides near real-time pedestrian injury data. These data can be analyzed at the local, state, and national levels to monitor the most recent trends, identify populations and areas most affected, and tailor implementation strategies supporting the Safe System approach, a framework designed to protect all road users.

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[¶¶¶] https://publichealth.jhu.edu/sites/default/files/2023-03/recommendations-of-the-safe-system-consortium.pdf
[****] https://www.nsc.org/roadtozero
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Cigarette Smoking Among Pregnant Women During the Perinatal Period: Prevalence and Health Care Provider Inquiries — Pregnancy Risk Assessment Monitoring System, United States, 2021

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Abstract

Cigarette smoking during pregnancy increases the risk for pregnancy complications and adverse infant outcomes such as preterm delivery, restricted fetal growth, and infant death. Health care provider counseling can support smoking cessation. Data from the 2021 Pregnancy Risk Assessment Monitoring System were analyzed to estimate the prevalence of smoking before, during, and after pregnancy; quitting smoking during pregnancy; and whether health care providers asked about cigarette smoking before, during, and after pregnancy among women with a recent live birth. In 2021, the prevalence of cigarette smoking was 12.1% before pregnancy, 5.4% during pregnancy, and 7.2% during the postpartum period; 56.1% of women who smoked before pregnancy quit smoking while pregnant. Jurisdiction-specific prevalences of smoking ranged from 3.5% to 20.2% before pregnancy, 0.4% to 11.0% during pregnancy, and 1.0% to 15.1% during the postpartum period. Among women with a health care visit during the associated period, the percentage of women who reported that a health care provider asked about smoking was 73.7% at any health care visit before pregnancy, 93.7% at any prenatal care visit, and 57.3% at a postpartum checkup. Routine assessment of smoking behaviors among pregnant and postpartum women can guide the development and implementation of evidence-based tobacco control measures at the jurisdiction and health care–system level to reduce smoking among pregnant and postpartum women.

Introduction

Maternal smoking during pregnancy increases the risk for pregnancy complications, including placenta previa, placental abruption, and premature rupture of membranes, and adverse infant outcomes such as cleft lip and palate, infant death, stillbirth, preterm delivery, restricted fetal growth, and sudden infant death syndrome (SIDS) (*1*). Smoking before pregnancy can impair fertility, and smoking after pregnancy increases the risk for SIDS and childhood respiratory infections (*1*). Jurisdictions can implement evidence-based strategies to reduce smoking, including among women of reproductive age (*2*). The U.S. Preventive Services Task Force (USPSTF) recommends that health care providers ask all adults, including pregnant women, about tobacco use, advise them to quit, and provide support for tobacco cessation interventions (*3*). This report assesses jurisdiction-level prevalence of cigarette smoking before, during, and after pregnancy, and whether health care providers asked about cigarette use at health care visits before, during, and after pregnancy.

Methods

Data Source

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a population-based, jurisdiction-specific surveillance system that collects information on self-reported behaviors and experiences before, during, and after pregnancy among women with a recent live birth.* Women are surveyed by U.S. mail or by telephone 2–6 months after delivery (*4*). Maternal age, race and ethnicity, and education were obtained from the birth certificate. Health insurance coverage and history of depression before pregnancy were derived from the PRAMS questionnaire.†

Descriptive and Statistical Analyses

The analysis includes 36,493 women (1,854,527 weighted) from 37 jurisdictions§ with a ≥50% response rate during 2021. This report presents data on measures of the following smoking behaviors before, during, and after pregnancy: 1) smoking during the 3 months before pregnancy, 2) smoking during the last 3 months of pregnancy, 3) quitting smoking during the last 3 months of pregnancy among women who smoked during the 3 months before pregnancy, and 4) smoking during the postpartum period (assessed at the time of questionnaire completion).¶,**

* Not all pregnant persons identify as women. "Women" is used in this report because PRAMS data are sampled from birth certificates of women with a recent live birth.

† Health insurance coverage was defined from women's reported coverage during prenatal care.

§ Alabama, Arkansas, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Hawaii, Illinois, Kansas, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New Mexico, New York, New York City, North Dakota, Oklahoma, Oregon, Pennsylvania, Puerto Rico, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

¶ PRAMS questions used to calculate cigarette smoking behavior measures included 1) "In the 3 months before you got pregnant, how many cigarettes did you smoke on an average day?"; 2) "In the last 3 months of your pregnancy, how many cigarettes did you smoke on an average day?"; and 3) "How many cigarettes do you smoke on an average day now?" Based on responses to these questions (e.g., "at least one cigarette per day on an average day"), dichotomous variables were created to define any cigarette smoking before pregnancy, during pregnancy, and during the postpartum period. Data on smoking during other time points in pregnancy are not collected.

** https://www.cdc.gov/prams/questionnaire.htm

Respondents with health care visits during the associated period (any health care visit during the 12 months before pregnancy, any prenatal care visit, and a postpartum checkup) reported whether a health care provider asked about cigarette smoking.[††,§§]

Prevalence of smoking behaviors and whether a health care provider asked about cigarette use were estimated by jurisdiction and demographic characteristics. All analyses were conducted using SAS software (version 9.4; SAS Institute). PRAMS data are weighted at the jurisdiction level; prevalence estimates and 95% CIs were calculated, and nonoverlapping CIs were considered statistically significant.[¶¶] This study was reviewed and approved by the Institutional Review Boards at CDC and each participating PRAMS site.[***]

Results

Characteristics of Respondents and Smoking Behaviors

During 2021, 12.1% of surveyed women with a recent live birth reported smoking cigarettes during the 3 months before pregnancy, 5.4% smoked during the last 3 months of pregnancy, and 7.2% smoked during the postpartum period (Table 1). Among women who smoked during the 3 months before pregnancy, 56.1% quit smoking during pregnancy. The prevalence of smoking before pregnancy ranged from 3.5% in Puerto Rico to 20.2% in West Virginia; during pregnancy, from 0.4% in Puerto Rico to 11.0% in Maine; and during the postpartum period, from 1.0% in Puerto Rico to 15.1% in West Virginia. The prevalence of quitting smoking during pregnancy ranged from 35.9% in Wyoming to 87.9% in Puerto Rico. The following groups of women reported higher prevalences of smoking during pregnancy: non-Hispanic American Indian or Alaska Native (AI/AN) women, those who were Medicaid-insured for prenatal care, those who had completed ≤12 years of education, and those with a history of depression before pregnancy (Table 2).

Health Care Provider Asking About Smoking

Among women with a health care visit during the associated period, 73.7% reported that a health care provider asked about current cigarette smoking at a health care visit during the 12 months before pregnancy, 93.7% reported that a health care provider asked about cigarette smoking at any prenatal care visit, and 57.3% reported that a health care provider asked about cigarette smoking at a postpartum checkup (Table 3). The percentage of women who were asked about cigarette smoking by a health care provider at a postpartum checkup was lower in the following groups: women aged ≥35 years, those who had completed >12 years of education, those without a history of depression, and those who did not smoke before pregnancy.

Discussion

This analysis found that during 2021, one in 18 women with a recent live birth smoked during pregnancy, with wide variation by jurisdiction (range = 0.4%–11.0%). Although 56.1% of women who smoked before pregnancy quit during pregnancy, approximately one in 13 smoked during the postpartum period. USPSTF recommends that health care providers ask all adult patients about tobacco use, including pregnant and postpartum women (*3*). However, although 93.7% of women reported being asked about cigarette smoking during a prenatal care visit, only 57.3% reported being asked about cigarette smoking at a postpartum checkup. In addition, only 69.7% of women who reported smoking before pregnancy were asked about cigarette smoking during the postpartum period. Assessment of tobacco use by health care providers is an important first step in improving quitting success, affording an opportunity to follow up with patients about their readiness to quit and to provide access to cessation resources (*3*). Guidance for the comprehensive postpartum visit includes screening for tobacco use, with counseling regarding relapse during the postpartum period among women who quit smoking during pregnancy (*5*).

Both behavioral and pharmacological interventions are effective methods to increase smoking cessation (*3*). For nonpregnant adults, smoking cessation medications approved by the Food and Drug Administration can improve the likelihood of successfully quitting smoking and result in higher rates of quitting when used in combination with behavioral cessation counseling; however, these medications are not recommended during pregnancy because of insufficient evidence that nicotine replacement therapy does not affect birth outcomes (*3*). Insurance coverage for comprehensive and barrier-free smoking cessation counseling and treatments

[††] PRAMS questions used to calculate health care providers asking about cigarette smoking included 1) "During any of your health care visits in the 12 months before you got pregnant, did a doctor, nurse, or other health care worker ask you if you were smoking cigarettes?"; 2) "During any of your prenatal care visits, did a doctor, nurse, or other health care worker ask you if you were smoking cigarettes?"; and 3) "During your postpartum checkup, did a doctor, nurse, or other health care worker ask you if you were smoking cigarettes?" Women could have had more than one health care visit during the postpartum period.

[§§] Among women with a recent live birth, 33% did not have a health care visit during the 12 months before pregnancy, 1% did not attend prenatal care visits, and 9% did not have a postpartum care visit. Percentages are reported among those who attended a visit during the relevant period and provided a response to the question about a health care provider asking about cigarette use.

[¶¶] Each participating jurisdiction selects a monthly stratified sample of women from birth certificate records. Data were weighted to adjust for noncoverage and nonresponse and to represent the total population of women with a live birth in each jurisdiction in 2021. PRAMS aggregate data are not weighted to provide national estimates. The analyses were conducted using survey analysis procedures to account for the complex sampling design of PRAMS.

[***] 45 C.F.R. part 46, 21 C.F.R. part 56.

TABLE 1. Prevalence of smoking before, during, and after pregnancy, and quitting smoking during pregnancy among women with a recent live birth, by jurisdiction — Pregnancy Risk Assessment Monitoring System, 2021*

Jurisdiction	No. of respondents	Weighted % (95% CI)			
		Smoked before pregnancy†	Smoked during pregnancy§	Quit smoking during pregnancy¶	Smoked during postpartum period**
All jurisdictions	**36,493**	**12.1 (11.6–12.7)**	**5.4 (5.0–5.8)**	**56.1 (53.7–58.5)**	**7.2 (6.8–7.6)**
Alabama	697	15.0 (12.1–17.8)	5.4 (3.5–7.2)	63.7 (53.3–74.2)	8.2 (5.9–10.5)
Arkansas	842	19.3 (15.3–23.3)	10.1 (7.1–13.2)	48.9 (37.3–60.6)	12.1 (8.9–15.4)
Colorado	1,261	9.8 (7.9–11.7)	3.5 (2.3–4.7)	66.5 (56.7–76.2)	4.4 (3.1–5.7)
Connecticut	1,328	8.9 (7.0–10.9)	2.9 (1.8–4.1)	68.8 (58.0–79.5)	5.2 (3.7–6.7)
Delaware	834	14.7 (11.9–17.4)	8.2 (6.1–10.3)	44.0 (33.7–54.2)	10.3 (8.0–12.7)
District of Columbia	500	8.4 (5.5–11.4)	3.4 (1.4–5.5)	59.4 (40.6–78.2)	5.0 (2.6–7.4)
Georgia	785	10.1 (7.3–12.9)	4.6 (2.7–6.6)	57.0 (42.3–71.7)	6.2 (4.0–8.5)
Hawaii	1,349	9.4 (7.3–11.4)	3.7 (2.3–5.0)	61.1 (49.7–72.5)	3.8 (2.5–5.1)
Illinois	1,119	12.3 (10.1–14.5)	4.3 (3.0–5.6)	65.2 (56.2–74.2)	6.7 (5.1–8.4)
Kansas	1,136	15.3 (12.6–18.0)	8.1 (6.1–10.2)	46.6 (36.9–56.2)	8.7 (6.7–10.8)
Louisiana	670	13.5 (10.7–16.4)	6.1 (4.0–8.2)	55.0 (43.3–66.7)	8.3 (6.0–10.7)
Maine	790	19.8 (16.2– 23.3)	11.0 (8.2–13.9)	44.2 (34.0–54.4)	13.3 (10.2–16.3)
Massachusetts	1,321	8.2 (6.0–10.5)	3.7 (2.1–5.3)	55.2 (40.7–69.7)	4.7 (2.9–6.5)
Michigan	1,374	16.4 (13.8–18.9)	8.5 (6.5–10.4)	48.2 (39.5–56.8)	10.0 (8.0–12.1)
Minnesota	634	12.4 (8.5–16.2)	4.5 (2.1–6.8)	64.2 (48.2–80.3)	6.7 (3.7–9.8)
Mississippi	886	15.7 (12.7–18.7)	8.3 (6.0–10.5)	46.8 (36.4–57.2)	11.1 (8.5–13.6)
Missouri	832	16.4 (13.5– 19.4)	8.7 (6.6–10.9)	47.9 (38.0–57.7)	10.8 (8.4–13.2)
Montana	1,169	19.4 (17.0–21.8)	9.5 (7.7–11.3)	51.0 (43.9–58.1)	10.8 (8.9–12.7)
Nebraska	1,226	11.8 (9.3–14.3)	4.4 (2.9–6.0)	62.3 (51.4–73.3)	7.4 (5.4–9.3)
New Jersey	942	7.0 (5.3–8.7)	2.2 (1.3–3.1)	70.6 (59.4–81.8)	3.9 (2.7–5.1)
New Mexico	1,064	11.8 (9.8–13.8)	5.0 (3.7–6.4)	59.2 (50.3–68.2)	6.5 (4.9–8.0)
New York††	868	13.4 (10.3–16.5)	5.6 (3.3–7.8)	57.8 (45.0–70.5)	7.4 (4.9–9.8)
New York City	1,263	4.5 (3.2–5.8)	0.6 (0.2–1.0)	87.4 (78.3–96.6)	2.2 (1.3–3.1)
North Dakota	586	15.9 (12.4–19.4)	6.6 (4.3–9.0)	58.3 (46.3–70.4)	9.0 (6.2–11.8)
Oklahoma	1,460	15.5 (12.6–18.4)	5.9 (4.0–7.8)	61.7 (51.6–71.8)	9.7 (7.2–12.1)
Oregon	1,878	10.9 (8.5–13.2)	4.2 (2.7–5.7)	61.4 (50.0–72.7)	6.5 (4.6–8.4)
Pennsylvania	934	15.8 (12.8–18.8)	8.7 (6.4–11.0)	44.8 (34.4–55.1)	10.0 (7.6–12.4)
Puerto Rico	965	3.5 (2.2–4.8)	0.4 (0–0.9)	87.9 (74.9–100.0)	1.0 (0.3–1.6)
South Dakota	1,026	19.5 (17.0–22.1)	9.8 (7.8–11.8)	49.4 (42.1–56.7)	13.4 (11.2–15.5)
Tennessee	633	16.1 (12.8–19.4)	7.1 (4.8–9.4)	55.6 (44.5–66.8)	9.5 (6.9–12.1)
Utah	1,259	6.1 (4.7–7.5)	2.3 (1.4–3.2)	62.2 (50.3–74.1)	2.9 (2.0–3.9)
Vermont	960	16.8 (14.3–19.3)	8.1 (6.3–10.0)	52.6 (44.4–60.9)	10.1 (8.0–12.2)
Virginia	939	10.6 (7.1–14.1)	4.8 (2.3–7.2)	63.5 (46.6–80.5)	6.0 (3.2–8.7)
Washington	1,147	8.3 (6.2–10.4)	4.2 (2.7–5.8)	52.1 (38.7–65.5)	5.0 (3.3–6.7)
West Virginia	604	20.2 (16.4–24.1)	10.3 (7.5–13.2)	49.0 (38.5–59.5)	15.1 (11.8–18.5)
Wisconsin	764	10.3 (7.4–13.1)	5.8 (3.6–8.1)	42.7 (27.8–57.6)	7.6 (5.0–10.2)
Wyoming	448	16.3 (12.2–20.5)	10.5 (6.9–14.1)	35.9 (22.6–49.1)	12.5 (8.6–16.3)

Abbreviation: PRAMS = Pregnancy Risk Assessment Monitoring System.
* All jurisdictions met the minimum overall response rate threshold of ≥50%.
† Defined as any smoking during the 3 months before pregnancy.
§ Defined as any smoking during the last 3 months of pregnancy.
¶ Defined as no smoking during the last 3 months of pregnancy among women who smoked during the 3 months before pregnancy.
** Defined as any smoking at the time of PRAMS questionnaire administration (approximately 2–6 months after delivery).
†† New York data do not include New York City.

is cost-effective.††† Beginning in 2010, Medicaid programs were required to cover tobacco cessation services for pregnant women without cost sharing (*6*). Health care providers can also refer persons who smoke to toll-free national Quitline telephone numbers§§§ to link patients to telephone-based cessation resources. In addition to health care–related strategies, effective tobacco control measures at the population level, such as tobacco taxes, public health campaigns, and smoke-free policies, support smoking cessation among adults (*2*). Studies have demonstrated the benefits of strategies such as public health campaigns (*7*) and Quitlines (*8*) among pregnant women.

The prevalence of smoking during the perinatal period has decreased. Analyses using PRAMS data have demonstrated a decreased prevalence of smoking before, during, and after pregnancy, as well as an increase in quitting during pregnancy, from 2000 to 2020 (*9*). Estimates of smoking during pregnancy from PRAMS differ from other data sources; however, methods also differ. According to the 2020 National Survey on Drug Use

††† Barrier-free refers to health insurance coverage that removes or reduces barriers to accessing cessation treatments (e.g., copayments, coinsurance, deductibles, and prior authorization). https://archive.cdc.gov/#/details?url=https://www.cdc.gov/tobacco/quit_smoking/cessation/coverage/index.htm
§§§ https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html

TABLE 2. Prevalence of smoking before, during, and after pregnancy, and quitting smoking during pregnancy among women with a recent live birth, by maternal characteristics — Pregnancy Risk Assessment Monitoring System, 2021*

Characteristic	No. of respondents	Weighted % (95% CI)			
		Smoked before pregnancy†	Smoked during pregnancy§	Quit smoking during pregnancy¶	Smoked during postpartum period**
All women with a recent live birth	**36,493**	**12.1 (11.6–12.7)**	**5.4 (5.0–5.8)**	**56.1 (53.7–58.5)**	**7.2 (6.8–7.6)**
Age group, yrs					
<20	1,512	12.6 (9.8–15.4)	4.3 (2.6–5.9)	66.2 (55.1–77.3)	7.2 (5.0–9.4)
20–24	6,100	15.8 (14.2–17.4)	5.8 (4.9–6.8)	63.0 (57.7–68.2)	8.6 (7.4–9.8)
25–34	21,263	11.9 (11.2–12.6)	5.6 (5.1–6.1)	53.9 (50.8–57.1)	7.2 (6.6–7.8)
≥35	7,617	9.7 (8.6–10.8)	4.8 (4.0–5.6)	52.1 (46.2–58.0)	6.1 (5.2–6.9)
Race and ethnicity††					
American Indian or Alaska Native	1,361	31.4 (26.3–36.5)	16.6 (11.3–21.9)	47.4 (37.3–57.5)	21.8 (16.6–27.0)
Asian or Pacific Islander	2,798	2.9 (1.9–3.8)	0.5 (0.2–0.9)	80.7 (69.9–91.5)	1.2 (0.5–1.8)
Black or African American	5,703	9.4 (8.2–10.5)	3.9 (3.2–4.5)	60.2 (54.2–66.2)	6.9 (5.9–8.0)
White	16,695	14.9 (14.1–15.7)	7.1 (6.5–7.7)	53.5 (50.4–56.5)	8.9 (8.2–9.5)
Hispanic or Latino	7,431	6.7 (5.8–7.5)	2.0 (1.5–2.4)	71.4 (65.4–77.3)	2.9 (2.4–3.5)
Another race or multiple races	2,206	16.4 (13.4–19.4)	8.7 (6.1–11.3)	47.2 (37.6–56.8)	9.8 (7.2–12.3)
Education, yrs					
<12	4,000	19.6 (17.5–21.6)	11.8 (10.1–13.5)	40.3 (34.7–45.9)	13.4 (11.7–15.2)
12	8,678	19.9 (18.5–21.3)	9.5 (8.5–10.5)	52.3 (48.4–56.3)	12.9 (11.7–14.1)
>12	23,561	8.0 (7.5–8.6)	2.9 (2.5–3.2)	65.8 (62.4–69.2)	4.1 (3.7–4.5)
Health insurance coverage§§					
Private	20,025	7.1 (6.5–7.7)	2.2 (1.9–2.5)	69.9 (66.0–73.8)	3.3 (2.9–3.7)
Medicaid	13,038	21.5 (20.3–22.7)	11.4 (10.4–12.3)	48.0 (44.9–51.2)	14.5 (13.4–15.5)
Other insurance¶¶	751	8.1 (4.6–11.6)	1.9 (0.7–3.1)	77.3 (62.1–92.4)	4.3 (1.6–7.0)
Uninsured	263	10.5 (4.5–16.5)	6.5 (0.9–12.1)	38.2 (12.3–64.1)	5.9 (0.7–11.1)
History of depression before pregnancy* **					
Yes	6,358	27.1 (25.3–29.0)	14.6 (13.0–16.1)	48.1 (44.0–52.2)	18.1 (16.5–19.8)
No	29,775	9.2 (8.7–9.7)	3.6 (3.3–4.0)	60.9 (57.9–63.8)	5.1 (4.7–5.5)

Abbreviation: PRAMS = Pregnancy Risk Assessment Monitoring System.

* Data were aggregated for the following 37 PRAMS jurisdictions with a response rate of ≥50% during 2021: Alabama, Arkansas, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Hawaii, Illinois, Kansas, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New Mexico, New York, New York City, North Dakota, Oklahoma, Oregon, Pennsylvania, Puerto Rico, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

† Defined as any smoking during the 3 months before pregnancy.

§ Defined as any smoking during the last 3 months of pregnancy.

¶ Defined as no smoking during the last 3 months of pregnancy among women who smoked during the 3 months before pregnancy.

** Defined as any smoking at the time of PRAMS questionnaire administration (approximately 2–6 months after delivery).

†† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are single-race non-Hispanic unless otherwise specified. Another race or multiple races include those with more than one race or other race.

§§ Determined from women's reported coverage during prenatal care.

¶¶ Other health insurance coverage includes Tricare, other military health insurance, Indian Health Service, or state-specific State Children's Health Insurance Program or Children's Health Insurance Program.

*** History of depression before pregnancy was defined as depression during the 3 months before pregnancy as reported in PRAMS.

and Health, 8.4% of pregnant women used tobacco products.[¶¶¶] Based on 2021 birth certificate data, 4.6% of women who gave birth in the United States smoked during pregnancy.[****] Similar to the current report, the National Center for Health Statistics report found the prevalence of smoking during pregnancy was higher among younger age groups and AI/AN women, with variation by jurisdiction. New York City and Puerto Rico were the only PRAMS jurisdictions that met the Healthy People 2020 goal of reducing prenatal smoking to 1.4%.[††††]

Comprehensive tobacco control measures at the state and jurisdiction level have been demonstrated to reduce smoking at the population level (*2*). For example, in jurisdictions with low levels of prenatal smoking (New York City and Puerto Rico), cigarette excise taxes were above $4 per pack and comprehensive smoke-free indoor air legislation had been enacted jurisdiction-wide.[§§§§] In contrast, among PRAMS jurisdictions with the highest levels of prenatal smoking (Maine, West Virginia, and Wyoming), cigarette excise taxes were ≤$2 per pack. West Virginia and Wyoming had no statewide comprehensive smoke-free indoor air legislation.

[¶¶¶] https://www.samhsa.gov/data/sites/default/files/reports/slides-2020-nsduh/2020NSDUHWomenSlides072522.pdf

[****] https://www.cdc.gov/nchs/data/databriefs/db458.pdf

[††††] https://wayback.archive-it.org/5774/20220415223525/https://www.healthypeople.gov/2020/topics-objectives/objective/mich-113

[§§§§] https://www.cdc.gov/statesystem/statehighlights.html

TABLE 3. Prevalence of a health care provider asking about current cigarette smoking before, during, and after pregnancy among women with a recent live birth, by selected maternal characteristics (N = 36,493) — Pregnancy Risk Assessment Monitoring System, 2021*,†

Characteristic	Asked about cigarette smoking, weighted % (95% CI)		
	At any visit 12 months before pregnancy§ n = 23,539	At any prenatal care visit¶ n = 35,513	During a postpartum checkup** n = 31,866
All women with a recent live birth	**73.7 (72.8–74.6)**	**93.7 (93.3–94.1)**	**57.3 (56.4–58.1)**
Age group, yrs			
<20	78.9 (73.8–83.9)	94.5 (92.6–96.4)	73.8 (69.7–78.0)
20–24	76.5 (74.1–78.9)	92.9 (91.8–94.1)	66.7 (64.6–68.9)
25–34	73.9 (72.8–75.0)	94.3 (93.8–94.7)	56.1 (55.0–57.2)
≥35	71.1 (69.2–73.0)	92.8 (91.8–93.7)	50.5 (48.7–52.4)
Race and ethnicity††			
American Indian or Alaska Native	76.0 (66.7–85.2)	97.3 (96.2–98.4)	76.2 (72.1–80.2)
Asian or Pacific Islander	62.3 (58.4–66.3)	91.7 (89.9–93.5)	54.7 (51.4–58.1)
Black or African American	76.0 (73.5–78.5)	92.9 (91.7–94.0)	67.8 (65.6–70.1)
White	73.3 (72.1–74.4)	94.2 (93.7–94.7)	51.6 (50.5–52.8)
Hispanic or Latino	77.0 (74.8–79.2)	93.1 (92.2–94.1)	68.7 (66.8–70.5)
Another race or multiple races	76.9 (72.8–81.1)	95.5 (93.7–97.3)	57.6 (53.0–62.3)
Education, yrs			
<12	74.2 (70.2–78.1)	89.5 (87.8–91.2)	72.8 (70.0–75.6)
12	76.1 (74.1–78.2)	93.4 (92.5–94.3)	67.4 (65.6–69.2)
>12	73.0 (72.0–74.0)	94.5 (94.1–95.0)	51.7 (50.7–52.7)
Health insurance coverage§§			
Private	73.3 (72.3–74.3)	94.4 (93.9–94.9)	50.6 (49.5–51.7)
Medicaid	76.5 (74.8–78.3)	94.6 (93.9–95.2)	69.1 (67.7–70.6)
Other insurance¶¶	58.7 (48.5–68.9)	79.4 (74.4–84.5)	53.8 (46.7–60.9)
Uninsured	73.7 (59.6–87.7)	93.0 (88.8–97.1)	73.7 (64.6–82.8)
History of depression before pregnancy***			
Yes	81.4 (79.6–83.2)	94.9 (94.0–95.8)	61.2 (59.0–63.3)
No	72.1 (71.1–73.1)	93.6 (93.1–94.0)	56.5 (55.5–57.4)
Smoked before pregnancy†††			
Yes	85.6 (83.3–87.9)	97.3 (96.6–98.0)	69.7 (67.3–72.2)
No	72.2 (71.3–73.2)	93.3 (92.8–93.7)	55.8 (54.9–56.7)

Abbreviation: PRAMS = Pregnancy Risk Assessment Monitoring System.

* Data were aggregated for the following 37 PRAMS jurisdictions with a response rate of ≥50% during 2021: Alabama, Arkansas, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Hawaii, Illinois, Kansas, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New Mexico, New York, New York City, North Dakota, Oklahoma, Oregon, Pennsylvania, Puerto Rico, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

† Although 99% of women with a recent live birth attended prenatal care visits, 33% did not have a health care visit during the 12 months before pregnancy and 9% did not have a postpartum care visit.

§ Among women who reported that they had a health care visit with a doctor, nurse, or other health care worker, including a dental or mental health worker during the 12 months before pregnancy and provided a response to the PRAMS question about a health care provider asking about cigarette use.

¶ Among women who reported a prenatal care visit and provided a response to the PRAMS question about a health care provider asking about cigarette use.

** Among women who reported having had a postpartum checkup and provided a response to the PRAMS question about a health care provider asking about cigarette use.

†† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are single-race non-Hispanic unless otherwise specified. Another race or multiple races include those with more than one race or other race.

§§ Determined from women's reported coverage during prenatal care.

¶¶ Other health insurance coverage includes Tricare, other military health insurance, Indian Health Service, or state-specific State Children's Health Insurance Program or Children's Health Insurance Program.

*** History of depression before pregnancy was defined as depression during the 3 months before pregnancy as reported in PRAMS.

††† Smoking before pregnancy was defined as any smoking during the 3 months before pregnancy as reported in PRAMS.

Limitations

The findings in this report are subject to at least six limitations. First, women might underreport socially undesirable behaviors such as smoking during pregnancy or overreport socially desirable behaviors such as quitting smoking during pregnancy. Second, because PRAMS responses are obtained 2–6 months postpartum, they might be affected by recall bias. Third, smoking prevalences in this report did not include other types of tobacco use, such as electronic vapor products, which likely results in an underestimate of the prevalence of tobacco use (*10*). Fourth, the reported prevalence of smoking during pregnancy was limited to the timeframe of the last 3 months of pregnancy and did not capture smoking during other periods in pregnancy. Fifth, only women who attended a health care visit could be queried by their provider regarding their smoking status. Finally, the generalizability of the findings of this report is limited to PRAMS jurisdictions included in this analysis.

Summary

What is already known about this topic?

Cigarette smoking has wide-ranging adverse health consequences, and when it occurs during pregnancy, there are increased risks of pregnancy complications and adverse outcomes for infants.

What is added by this report?

In 2021, among women with a recent live birth, 12.1% reported smoking before pregnancy, 5.4% reported smoking during pregnancy, and 7.2% reported smoking during the postpartum period. Smoking behaviors varied by demographic characteristics and jurisdiction. Overall, 73.7%, 93.7%, and 57.3% of women reported being asked about smoking by a health care provider at any health care visit before pregnancy, at any prenatal visit, and at a postpartum checkup, respectively.

What are the implications for public health practice?

Routine assessment of smoking behaviors among pregnant and postpartum women can guide the development and implementation of evidence-based tobacco control measures.

Implications for Public Health Practice

Routine assessment of smoking behaviors among pregnant and postpartum women can guide the development and implementation of evidence-based tobacco control measures at the jurisdiction and health care–system level to reduce smoking.[¶¶¶¶] Health care providers can increase their efforts to assess smoking status among all adults, including pregnant and postpartum women, provide cessation counseling and medication when appropriate, refer women for more intensive cessation counseling, and promote available cessation services. Jurisdictions can support evidence-based tobacco control measures to reduce smoking among pregnant and postpartum women.

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[¶¶¶¶] https://www.hhs.gov/sites/default/files/hhs-framework-support-accelerate-smoking-cessation-2024.pdf

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Prevalence of Positive Childhood Experiences Among Adults — Behavioral Risk Factor Surveillance System, Four States, 2015–2021

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Abstract

Positive childhood experiences (PCEs) promote optimal health and mitigate the effects of adverse childhood experiences, but PCE prevalence in the United States is not well-known. Using Behavioral Risk Factor Surveillance System data, this study describes the prevalence of individual and cumulative PCEs among adults residing in four states: Kansas (2020), Montana (2019), South Carolina (2020), and Wisconsin (2015). Cumulative PCE scores were calculated by summing affirmative responses to seven questions. Subscores were created for family-related (three questions) and community-related (four questions) PCEs. The prevalence of individual PCEs varied from 59.5% (enjoyed participating in community traditions) to 90.5% (adult in respondents' household made them feel safe), and differed significantly by race and ethnicity, age, and sexual orientation. Fewer non-Hispanic Black or African American (49.2%), non-Hispanic Alaska Native or American Indian (37.7%), and Hispanic or Latino respondents (38.9%) reported 6–7 PCEs than did non-Hispanic White respondents (55.2%). Gay or lesbian, and bisexual respondents were less likely than were straight respondents to report 6–7 PCEs (38.1% and 27.4% versus 54.7%, respectively). A PCE score of 6–7 was more frequent among persons with higher income and education. Improved understanding of the relationship of PCEs to adult health and well-being and variation among population subgroups might help reduce health inequities.

Introduction

Positive childhood experiences (PCEs), children's experience of having safe, stable, nurturing relationships and environments, promote healthy child development and adult mental and relational health* (*1*). PCEs also buffer the effects of adverse childhood experiences (*1*) and reduce the prevalence of adult health risk behaviors, such as smoking or unhealthy alcohol use (*2*). Previous reports have looked at single states (*1*,*2*) or selected populations (*3*). This report, presenting the weighted prevalence of individual and cumulative PCEs in four states that included PCE questions in their Behavioral Risk Factor Surveillance System (BRFSS), is the largest study of the prevalence of PCEs among U.S. adults to date.

* Relational health is defined as "the ability to develop and maintain safe, stable, nurturing relationships with other individuals and to engage in social activities."

Methods

Data Source

BRFSS is an annual, state-based telephone survey of health-related behaviors and chronic health conditions of noninstitutionalized adults collected from all 50 states and the District of Columbia (*4*). This study analyzed BRFSS data from four states that included seven identical, PCE questions added by the states on their survey: Kansas (2020), Montana (2019), South Carolina (2020), and Wisconsin (2015). The survey response rates ranged from 45.0% to 51.5%; response rate to PCE questions ranged from 97.3% to 99.6%. PCE survey items were adapted from the Child and Youth Resilience Measure (*1*,*5*) and included three family items† and four community items.§ The survey used a five-level Likert-type scale and directed the respondents to "refer to the time before you were 18 years of age." Responses were scored as present if the respondent answered "Often," "Very Often," "Most of the time," or "All of the time." After accounting for missing values, the final analytic sample included 24,893 respondents. Participants who were not living in the survey administration state at the time of the survey (249; 0.8%) or who were missing data for more than two PCE items (3,728; 12%) were excluded. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¶

Data Analysis

Cumulative PCE scores were calculated by summing affirmative responses to each of the seven PCE types and then categorized into groups 0–2, 3–5, or 6–7 (*1*). Family and community subscores were created by summing affirmative responses to the family and community PCE items. Weighted prevalence estimates and 95% CIs were calculated for individual PCEs and cumulative PCE scores in total, by state, and by sociodemographic characteristic (sex, age, race and ethnicity, annual household income, educational attainment, employment status,

† Felt able to talk to their family about their feelings; felt their family stood by them during difficult times; felt safe and protected by an adult in their home.

§ Enjoyed participating in community traditions; felt a sense of belonging in high school (not including those who did not attend school or were homeschooled); felt supported by friends; had at least two nonparent adults who took genuine interest in them.

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

and sexual orientation). Nonoverlapping CIs were used to assess statistically significant prevalence differences between sociodemographic categories. Weighted family and community subscore means and 95% CIs were compared using t-tests. All analyses accounted for survey design using recommended weights, and complex survey procedures were conducted in SAS (version 9.4; SAS Institute) and verified in Stata (version 18; StataCorp).

Results

Prevalence of individual PCEs ranged from 59.5% (enjoyed participating in community traditions) to 90.5% (adult in respondent's household who made them feel safe) (Table 1). Prevalence of individual PCEs varied significantly by race and ethnicity, age group, and sexual orientation. For example, 47.4% of participants self-identifying as bisexual reported that they "felt a sense of belonging in high school" compared with 73.1% of participants who identified as straight.

Overall, 53.1% of respondents reported 6–7 PCEs, 34.7% reported 3–5, and 12.2% reported 0–2 (Table 2). Prevalence of low PCE scores (0–2) was higher among women (13.2%) than among men (11.2%).

The proportion of respondents with high PCE scores (6–7) varied by race and ethnicity, age, employment status, and sexual orientation. In particular, 37.7% of non-Hispanic American Indian or Alaska Native adults reported high PCE scores, compared with 55.2% of non-Hispanic White adults. Gay or lesbian and bisexual respondents were less likely to report high PCE scores (38.1% and 27.4%, respectively) than were those who identified as straight (54.7%). Respondents with income ≥$50,000 were more likely to report 6–7 PCEs (61.6%) than were those with income <$15,000 (37.8%). Similarly, respondents with a college degree were more likely than those who had not completed high school to report 6–7 PCEs (64.3% versus 30.9%) (Table 2).

TABLE 1. Positive childhood experiences among adults — Behavioral Risk Factor Surveillance System, four U.S. states, 2015–2020

Characteristic (no. of respondents)	Weighted % (95% CI)*						
	Adult made you feel safe and protected	Felt sense of belonging in high school	Felt supported by friends	At least two nonparent adults took an interest	Felt family stood by you	Enjoyed community traditions	Felt able to talk to family
Total (20,916)	**90.5 (89.9–91.1)**	**71.8 (70.8–72.7)**	**80.3 (79.5–81.2)**	**71.8 (70.9–72.8)**	**61.0 (60.0–62.0)**	**59.5 (58.5–60.6)**	**82.1 (81.3–82.9)**
Sex							
Female (11,357)	89.6 (88.7–90.4)	70.5 (69.2–71.7)	79.6 (78.5–80.7)	72.3 (70.9–73.5)	60.1 (58.7–61.5)	61.6 (60.2–63.0)	79.8 (78.6 –81.0)
Male (9,559)	91.5 (90.6–92.3)	73.1 (71.8–74.5)	81.1 (79.8–82.3)	71.4 (69.9–72.8)	62.0 (60.4–63.4)	57.4 (55.8–58.9)	84.5 (83.4–85.6)
State							
Kansas (4,456)	88.7 (87.4–89.9)	69.7 (67.9–71.4)	80.6 (79.0–82.1)	70.9 (69.1–72.4)	64.2 (62.3–66.0)	65.7 (63.9–67.6)	82.9 (81.3–84.3)
Montana (5,627)	89.5 (88.4–90.5)	69.5 (67.9–71.0)	80.7 (79.3–82.0)	71.1 (69.6–72.5)	56.1 (54.5–57.7)	59.8 (58.2–61.4)	79.3 (77.9–80.6)
South Carolina (5,950)	91.1 (90.0–92.0)	73.1 (71.5–74.6)	79.6 (78.1–80.9)	73.9 (72.6–75.5)	61.2 (59.4–62.9)	61.2 (59.4–62.9)	81.5 (80.0–82.9)
Wisconsin (4,883)	91.2 (90.0–92.3)	72.2 (70.3–74.0)	80.6 (79.0–82.1)	70.5 (68.6–72.3)	60.1 (58.1–62.1)	54.4 (52.4–56.5)	82.9 (81.4–84.3)
Income							
<$15,000 (1,545)	83.7 (80.8–86.2)	55.3 (51.2–59.3)	65.2 (61.3–68.9)	61.0 (57.0–64.8)	53.7 (49.8–57.4)	49.6 (46.6–52.5)	69.8 (65.9–73.4)
$15,000–$24,999 (2,721)	86.5 (84.6–88.3)	61.8 (59.9–64.7)	71.8 (69.1–74.4)	62.3 (59.3–65.2)	55.1 (52.2–58.0)	50.0 (47.1–53.0)	73.4 (70.8–75.9)
$25,000–$34,999 (1,954)	89.4 (87.3–91.3)	69.6 (66.3–72.7)	75.4 (72.2–78.3)	69.2 (66.0–72.3)	59.0 (55.6–62.4)	55.7 (52.6–59.2)	80.7 (77.7–83.4)
$35,000–$49,999 (2,767)	90.1 (88.1–91.8)	71.3 (68.4–73.9)	80.6 (78.1–82.8)	69.7 (66.8–72.5)	59.3 (57.6–62.1)	55.7 (52.8–58.7)	82.1 (79.7–84.2)
>$50,000 (9,036)	93.1 (92.2–93.8)	78.0 (76.7–79.3)	86.4 (85.3–87.5)	77.8 (76.5–79.1)	64.5 (63.0–66.0)	65.7 (64.2–67.2)	86.8 (85.8–87.9)
Education							
Less than high school (1,177)	83.7 (80.7–86.4)	47.9 (43.5–52.5)	60.7 (56.6–64.7)	54.5 (50.3–58.7)	53.3 (49.1–57.5)	45.8 (41.7–50.1)	71.3 (67.4–75.0)
High school diploma or GED (5,746)	89.8 (88.6–90.9)	71.5 (69.7–73.2)	80.0 (78.4–81.6)	68.6 (66.7–70.4)	62.0 (60.1–63.9)	54.6 (52.7–56.5)	81.0 (79.5–82.5)
Some college (6,192)	90.9 (89.8–91.9)	73.1 (71.5–74.7)	82.0 (80.6–83.3)	73.1 (71.5–74.8)	59.6 (57.7–61.3)	59.1 (57.3–60.9)	81.7 (80.3–83.1)
College degree (7,752)	93.5 (92.6–94.3)	78.5 (77.1–79.9)	86.1 (84.9–87.3)	80.5 (79.2–81.8)	64.7 (63.1–66.2)	70.9 (69.4–72.4)	88.0 (86.9–89.0)

See table footnotes on the next page.

TABLE 1. (*Continued*) Positive childhood experiences among adults — Behavioral Risk Factor Surveillance System, four U.S. states, 2015–2020

Characteristic (no. of respondents)	Weighted % (95% CI)*						
	Adult made you feel safe and protected	Felt sense of belonging in high school	Felt supported by friends	At least two nonparent adults took an interest	Felt family stood by you	Enjoyed community traditions	Felt able to talk to family
Employment status							
Employed (10,385)	91.5 (90.6–92.2)	72.2 (70.9–73.5)	81.8 (80.6–82.8)	73.3 (72.0–74.6)	62.2 (60.8–63.5)	59.1 (57.6–60.5)	83.5 (82.4–84.6)
Unemployed (821)	84.2 (80.3–87.4)	60.5 (55.4–65.3)	71.5 (66.6–75.9)	65.9 (61.0–70.5)	52.6 (47.6–57.6)	52.3 (47.2–57.3)	72.7 (67.8–77.0)
Unable to work (1,358)	80.6 (77.1–83.6)	54.1 (50.1–58.1)	64.2 (60.4–67.8)	58.1 (54.2–61.9)	49.0 (45.1–52.8)	47.3 (43.4–51.2)	65.7 (61.8–69.4)
Other (8,232)	92.0 (91.0–92.8)	76.9 (75.4–78.3)	82.8 (81.5–84.1)	73.1 (71.6–74.6)	63.1 (61.5–64.7)	64.6 (63.0–66.2)	84.6 (83.3–85.8)
Race and ethnicity†							
AI/AN (530)	86.4 (78.4–91.8)	56.2 (47.8–64.3)	71.3 (63.4–78.1)	69.9 (61.8–77.0)	51.2 (42.9–59.4)	58.4 (49.9–66.5)	76.9 (70.0–82.6)
Asian (129)	85.2 (74.1–92.0)	70.4 (58.3–80.1)	82.6 (71.8–89.8)	64.8 (52.0–75.8)	55.8 (43.3–67.7)	60.2 (47.9–71.3)	73.3 (60.9–82.8)
Black or African American (1,651)	91.7 (89.5–93.5)	71.6 (68.0–75.0)	75.0 (71.8–78.0)	73.8 (70.4–77.0)	59.9 (56.2–63.5)	58.0 (54.2–61.6)	79.3 (75.9–82.3)
White (17,212)	91.0 (90.4–91.7)	72.8 (71.8–73.8)	82.2 (81.3–83.0)	72.7 (71.7–73.7)	61.5 (60.4–62.6)	60.5 (59.4–61.6)	83.5 (82.6–84.3)
Hispanic or Latino (567)	86.6 (82.9–89.7)	67.0 (61.2–72.3)	70.8 (65.2–75.9)	56.9 (51.0–62.5)	58.6 (53.0–64.1)	51.4 (45.6–57.2)	74.1 (68.9–78.7)
Other race (164)	84.0 (73.3–90.9)	56.8 (43.0–69.7)	72.6 (58.2–83.5)	67.5 (52.1–79.9)	57.8 (45.1–69.6)	55.4 (42.0–68.0)	79.9 (69.4–87.5)
Multiracial (419)	83.2 (76.8–88.1)	59.5 (51.6–67.0)	70.8 (63.4–77.3)	70.9 (63.2–77.6)	61.6 (54.3–68.4)	49.9 (42.3–57.4)	76.0 (69.2–81.7)
Age group, yrs							
18–24 (1,259)	90.5 (88.0–92.4)	68.0 (64.4–71.1)	78.9 (75.7–81.9)	73.2 (69.7–76.5)	61.0 (57.4–64.5)	50.3 (46.6–54.0)	79.4 (76.2–82.3)
25–34 (1,899)	88.9 (87.0–90.5)	64.2 (61.2–67.2)	79.1 (76.5–81.4)	69.3 (66.2–72.1)	59.8 (56.7–62.8)	52.6 (49.4–55.7)	78.1 (75.4–80.6)
35–44 (2,296)	89.4 (87.5–91.0)	69.1 (66.3–71.7)	77.6 (75.0–80.0)	72.8 (70.0–75.4)	60.1 (57.2–63.0)	58.4 (55.5–61.3)	79.9 (77.5–82.2)
45–54 (2,930)	89.1 (87.4–90.6)	72.1 (69.8–74.3)	80.5 (78.5–82.4)	71.9 (69.5–74.1)	59.4 (56.9–61.8)	61.5 (58.9–63.9)	82.4 (80.5–84.3)
55–64 (4,469)	91.6 (90.4–92.8)	73.0 (71.3–74.9)	80.4 (78.7–82.1)	71.5 (69.6–73.4)	60.5 (58.4–62.5)	61.7 (59.6–63.8)	83.0 (81.4–84.5)
≥65 (8,063)	92.4 (91.5–93.2)	79.2 (77.8–80.5)	83.5 (82.2–84.8)	72.3 (70.8–73.8)	63.9 (62.3–65.5)	66.7 (65.1–68.3)	86.6 (85.4–87.7)
Sexual orientation							
Bisexual (412)	77.9 (72.0–82.9)	47.4 (40.9–53.9)	70.3 (64.2–75.8)	58.6 (51.9–64.9)	39.9 (33.9–46.3)	45.3 (39.0–51.7)	69.8 (63.5–75.3)
Gay or lesbian (268)	89.5 (84.0–93.2)	55.5 (46.5–64.2)	70.6 (62.2–77.7)	61.6 (52.3–70.0)	49.5 (40.6–58.5)	47.1 (38.3–56.1)	76.2 (68.7–82.3)
Straight (19,485)	91.2 (90.6–91.8)	73.1 (72.1–74.0)	81.1 (80.2–82.0)	73.0 (72.0–73.9)	62.0 (60.9–63.0)	60.5 (59.4–61.5)	82.9 (82.0–83.7)
Another sexual orientation (234)	71.4 (62.1–79.2)	48.4 (39.0–57.9)	63.5 (53.9–72.1)	46.7 (37.6–56.2)	38.8 (30.0–48.4)	39.0 (30.3–48.4)	63.3 (53.4–72.2)

Abbreviations: AI/AN = American Indian or Alaska Native; GED = general educational development certificate.
* Reflects noninstitutionalized adults (aged ≥18 years) in Kansas, Montana, South Carolina, and Wisconsin.
† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

Subscore Results

Overall, the mean family PCE subscore was 2.3 (out of 3); the mean community PCE subscore was 2.8 (out of 4) (Table 3). The mean community subscore was lower among respondents with household income <$15,000 than among those with income ≥$50,000 (2.2 versus 3.1; p<0.001) and was lower among persons with less than a high school education (2.0) than among those with a college degree (3.2; p<0.001). The mean community subscore was higher among employed respondents (2.8) than among those who were unemployed (2.5) or unable to work (2.2) (p<0.001); the mean was higher among respondents who identified as straight (2.8) than among those who described themselves as gay or lesbian (2.3), bisexual (2.2), or another sexual orientation (2.0) (p<0.001).

TABLE 2. Positive childhood experiences among adults — Behavioral Risk Factor Surveillance System, four U.S. states, 2015–2020

Characteristic (no. of respondents)	No. of positive childhood experiences % (95% CI)		
	0–2	3–5	6–7
Total (20,916)*	**12.2 (11.5–12.9)**	**34.7 (33.7–35.7)**	**53.1 (52.1–54.1)**
Sex			
Female (11,357)	13.2 (12.3–14.2)	33.6 (32.2–35.0)	53.2 (51.8–54.6)
Male (9,559)	11.2 (10.2–12.2)	35.9 (34.4–37.4)	53.0 (51.4–54.5)
State			
Kansas (4,456)	11.3 (10.1–12.6)	34.0 (32.3–35.9)	54.6 (52.7–56.5)
Montana (5,627)	13.8 (12.7–15.0)	35.9 (34.4–37.5)	50.3 (48.7–51.9)
South Carolina (5,950)	11.8 (10.7–13.1)	34.6 (32.9–36.3)	53.6 (51.9–55.3)
Wisconsin (4,883)	12.7 (11.4–14.1)	35.0 (33.0–36.9)	52.3 (50.3–54.3)
Income			
<$15,000 (1,545)	23.3 (19.9–27.0)	38.9 (35.2–42.7)	37.8 (34.2–41.6)
$15,000–$24,999 (2,721)	19.7 (17.5–22.1)	39.5 (36.6–42.5)	40.8 (38.0–43.7)
$25,000–$34,999 (1,954)	13.7 (11.6–16.1)	37.7 (34.3–41.3)	48.6 (45.1–52.0)
$35,000–$49,999 (2,767)	12.9 (11.0–15.1)	36.1 (33.3–39.0)	51.0 (48.1–53.9)
>$50,000 (9,036)	7.9 (7.1–8.8)	30.5 (29.1–32.0)	61.6 (60.0–63.1)
Education			
Less than high school (1,177)	25.5 (22.2–29.3)	43.6 (39.5–47.8)	30.9 (27.2–34.9)
High school diploma or GED (5,746)	12.9 (11.7–14.3)	36.6 (34.7–38.5)	50.5 (48.6–52.4)
Some college (6,192)	11.3 (10.2–12.4)	35.4 (33.7–37.2)	53.3 (51.5–55.2)
College degree (7,752)	7.4 (6.6–8.3)	28.3 (26.8–29.8)	64.3 (62.7–65.9)
Employment status			
Employed (10,385)	11.3 (10.4–12.3)	34.0 (32.7–35.4)	54.7 (53.2–56.1)
Unemployed (821)	19.7 (15.9–24.1)	41.4 (36.5–46.5)	38.9 (34.2–43.8)
Unable to work (1,358)	26.1 (22.8–29.7)	40.3 (36.5–44.3)	33.5 (30.1–37.1)
Other (8,232)	9.5 (8.5–10.5)	33.3 (31.7–35.0)	57.2 (55.5–58.8)

TABLE 2. (*Continued*) Positive childhood experiences among adults — Behavioral Risk Factor Surveillance System, four U.S. states, 2015–2020

Characteristic (no. of respondents)	No. of positive childhood experiences % (95% CI)		
	0–2	3–5	6–7
Race and ethnicity†			
AI/AN (530)	16.9 (11.9–23.4)	45.4 (37.1–53.9)	37.7 (30.3–45.7)
Asian (129)	15.9 (8.7–27.4)	37.6 (26.8–49.9)	46.4 (34.4–58.9)
Black or African American (1,651)	11.7 (9.4–14.3)	39.1 (35.5–42.8)	49.2 (45.6–52.9)
White (17,212)	11.6 (10.9–12.4)	33.1 (32.1–34.2)	55.2 (54.1–56.4)
Hispanic or Latino (567)	17.3 (13.6–21.7)	43.8 (38.1–49.6)	38.9 (33.5–44.6)
Other race (164)	15.8 (8.9–26.4)	45.0 (32.1–58.6)	39.2 (27.8–51.8)
Multiracial (419)	18.5 (13.5–24.8)	37.6 (30.3–45.4)	43.9 (36.7–51.3)
Age group, yrs			
18–24 (1,259)	12.0 (9.8–14.7)	40.3 (36.7–44.0)	47.7 (44.0–51.3)
25–34 (1,899)	14.4 (12.4–16.7)	39.3 (36.3–42.5)	46.3 (43.2–49.4)
35–44 (2,296)	14.6 (12.6–16.8)	32.1 (29.4–35.0)	53.3 (50.3–56.2)
45–54 (2,930)	13.6 (12.0–15.5)	32.6 (30.3–35.0)	53.8 (51.3–56.3)
55–64 (4,469)	11.2 (10.0–12.6)	34.6 (32.6–36.6)	54.2 (52.1–56.3)
≥65 (8,063)	9.1 (8.2–10.1)	32.0 (30.5–33.6)	58.9 (57.2–60.5)
Sexual orientation			
Bisexual (412)	23.6 (18.5–29.7)	48.9 (42.5–55.4)	27.4 (22.3–33.2)
Gay or lesbian (268)	20.9 (14.3–29.4)	41.0 (32.6–50.1)	38.1 (29.8–47.1)
Straight (19,485)	11.5 (10.8–12.2)	33.8 (32.8–34.9)	54.7 (53.6–55.8)
Another sexual orientation (234)	31.9 (23.6–41.5)	43.3 (34.3–52.8)	24.8 (17.8–33.3)

Abbreviations: AI/AN = American Indian or Alaska Native; GED = general educational development certificate.

* All estimates are weighted to reflect noninstitutionalized adults (aged ≥18 years) in Kansas, Montana, South Carolina, and Wisconsin.

† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

Discussion

This study is the largest population-based assessment of PCEs among U.S. adults to date. Experiencing PCEs is common among adults and varies by sociodemographic characteristics. An estimated one half of adults report at least six of seven measured PCEs, and approximately one in eight persons report 2 or fewer. A higher PCE score was observed among employed adults and those with higher educational attainment and income. In addition to associations with adult mental and relational health (*1*), longitudinal data from Australia suggests that PCEs lead to improved mental health and academic attainment in adolescence (*6*). Further exploration is needed to understand differences in the prevalence of PCEs across educational attainment, employment, and income subgroups. CDC's ACEs Prevention: Resource for Action** and Tufts Medical Center's HOPE National Resource Center†† offer practical suggestions for interventions to bolster PCEs and prevent adversity. PCEs occur within families, schools, and the community. Public policies that promote parent-infant bonding, such as paid family leave and home visiting, and

** https://www.cdc.gov/violenceprevention/pdf/aces-prevention-resource_508.pdf

†† htpps://positiveexperience.org

TABLE 3. Positive childhood experience subscores* among adults, by demographic characteristic — Behavioral Risk Factor Surveillance System, four U.S. states, 2015–2020

Characteristic (no. of respondents)	Family subscore Mean (95% CI)	p-value†	Community subscore Mean (95% CI)	p-value†
Total (20,916)	**2.3 (2.3–2.4)**	—	**2.8 (2.7–2.8)**	—
Sex				
Female (11,357)	2.3 (2.2–2.3)	<0.001	2.8 (2.7–2.8)	0.669
Male (9,559)	2.4 (2.3–2.4)	Ref	2.8 (2.7–2.8)	Ref
State				
Kansas (4,456)	2.4 (2.3–2.4)	Ref	2.8 (2.8–2.9)	Ref
Montana (5,627)	2.2 (2.2–2.3)	<0.001	2.8 (2.7–2.8)	0.053
South Carolina (5,950)	2.3 (2.3–2.4)	0.318	2.8 (2.8–2.9)	0.926
Wisconsin (4,883)	2.3 (2.3–2.4)	0.571	2.7 (2.7–2.8)	0.023
Income				
<$15,000 (1,545)	2.1 (2.0–2.1)	Ref	2.2 (2.1–2.4)	Ref
$15,000–$24,999 (2,721)	2.1 (2.1–2.2)	0.110	2.4 (2.3–2.5)	0.055
$25,000–$34,999 (1,954)	2.3 (2.2–2.4)	<0.001	2.7 (2.6–2.8)	<0.001
$35,000–$49,999 (2,767)	2.3 (2.2–2.4)	<0.001	2.8 (2.7–2.9)	<0.001
>$50,000 (9,036)	2.4 (2.4–2.5)	<0.001	3.1 (3.0–3.1)	<0.001
Education				
Less than high school (1,177)	2.1 (2.0–2.2)	Ref	2.0 (1.9–2.1)	Ref
High school diploma or GED (5,746)	2.3 (2.3–2.4)	<0.001	2.7 (2.7–2.8)	<0.001
Some college (6,192)	2.3 (2.3–2.4)	<0.001	2.9 (2.8–2.9)	<0.001
College degree (7,752)	2.5 (2.4–2.5)	<0.001	3.2 (3.1–3.2)	<0.001
Employment status				
Employed (10,385)	2.4 (2.3–2.4)	Ref	2.8 (2.8–2.9)	Ref
Unemployed (821)	2.1 (2.0–2.2)	<0.001	2.5 (2.3–2.6)	<0.001
Unable to work (1,358)	1.9 (1.8–2.0)	<0.001	2.2 (2.1–2.3)	<0.001
Other (8,232)	2.4 (2.3–2.4)	0.384	2.9 (2.9–3.0)	0.001
Race and ethnicity§				
AI/AN (530)†	2.1 (2.0–2.3)	0.007	2.5 (2.3–2.8)	0.005
Asian (129)	2.1 (1.9–2.4)	0.064	2.7 (2.4–3.0)	0.456
Black or African American (1,651)	2.3 (2.2–2.4)	0.120	2.7 (2.7–2.8)	0.029
White (17,212)	2.4 (2.3–2.4)	Ref	2.8 (2.8–2.9)	Ref
Hispanic or Latino (567)	2.2 (2.1–2.3)	0.002	2.4 (2.2–2.5)	<0.001
Other race (164)	2.2 (2.0–2.5)	0.270	2.5 (2.2–2.8)	0.028
Multiracial (419)	2.2 (2.0–2.4)	0.069	2.5 (2.3–2.7)	<0.001
Age group, yrs				
18–24 (1,259)	2.3 (2.2–2.4)	Ref	2.7 (2.6–2.8)	Ref
25–34 (1,899)	2.3 (2.2–2.3)	0.352	2.6 (2.5–2.7)	0.310
35–44 (2,296)	2.3 (2.2–2.3)	0.765	2.7 (2.7–2.8)	0.368
45–54 (2,930)	2.3 (2.2–2.3)	0.882	2.8 (2.8–2.9)	0.010
55–64 (4,469)	2.4 (2.3–2.4)	0.389	2.8 (2.8–2.9)	0.006
≥65 (8,063)	2.4 (2.4–2.5)	0.004	3.0 (2.9–3.0)	<0.001
Sexual orientation				
Bisexual (412)	1.9 (1.7–2.0)	<0.001	2.2 (2.0–2.4)	<0.001
Gay or lesbian (268)	2.1 (2.0–2.3)	<0.001	2.3 (2.1–2.6)	<0.001
Straight (19,485)	2.3 (2.3–2.4)	Ref	2.8 (2.8–2.9)	Ref
Another sexual orientation (234)	1.7 (1.5–1.9)	<0.001	2.0 (1.7–2.2)	<0.001
Positive childhood experience score				
0–2 (2,310)	0.7 (0.7–0.8)	Ref	0.5 (0.5–0.6)	Ref
3–5 (6,835)	2.0 (2.0–2.1)	<0.001	2.2 (2.1–2.2)	<0.001
6–7 (11,771)	2.9 (2.8–2.9)	<0.001	3.7 (3.7–3.8)	<0.001

Abbreviations: AI/AN = American Indian or Alaska Native; GED = general educational development certificate; Ref = referent group.

* All estimates are weighted to reflect noninstitutionalized adults (aged ≥18 years) in four states (Kansas, Montana, South Carolina, and Wisconsin).

† p-values are based on t-test.

§ Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

Summary

What is already known about this topic?

Positive childhood experiences (PCEs), children's experiences of safe, stable, and nurturing relationships and environments, promote healthy child development and adult mental and relational health and buffer against negative impacts of adverse childhood experiences.

What is added by this report?

This population-based study presents PCE prevalence among U.S. adults in four states. Approximately one half of adults (53.1%) reported six to seven PCEs; 12.2% reported two or fewer. PCEs were lower among lesbian, gay, and bisexual adults and higher among respondents with higher income and educational attainment.

What are the implications for public health practice?

Integration of PCEs data collection into public health surveillance can guide approaches to promote well-being and reduce health disparities.

free or low-cost access to out-of-school time programming, including arts and athletics, might help to reduce observed inequities in PCE scores.

Limitations

The findings in this report are subject to at least four limitations. First, population-based estimates of PCEs in these four states might have limited generalizability nationally. Second, BRFSS questions measure a limited set of PCEs that do not include all postulated PCEs (*6*). Third, social desirability and recall biases might reduce the accuracy of self-reported PCEs. Specific PCEs might have been experienced differently by certain groups, contributing to the sociodemographic differences observed. Finally, cross-sectional data cannot demonstrate causality.

Implications for Public Health Practice

Assessment of PCEs could be added to other public health data collection efforts. This action has the potential to improve understanding of determinants of overall well-being, which could in turn guide public health interventions that might support structures that promote PCEs (*7*,*8*) and reduce inequities in adult health and well-being. Further study is needed to examine the effects of PCEs on adult health as well as interactions among PCEs, adverse childhood experiences, and health outcomes.

Individual PCEs and PCE scores might provide applicable metrics for public health surveillance (*9*) and for evaluating interventions to improve child and adult well-being. Public health approaches might improve access to community-level PCEs, which are associated with higher adult economic status and educational attainment. The National Council of State

Legislatures, for example, cited efforts to improve early childhood education and fund family resources as policy levers to promote resilience (*10*). Inequities in PCEs might be a focus for public health interventions, especially given the previously reported effects of PCEs on protecting mental and relational health (*1*). Given that fewer racial, ethnic, and sexual minority adults felt a sense of belonging in high school, efforts to promote a sense of belonging for all high school students might be helpful. Further research might address the possible lifelong effects of PCEs, including the observed association of high PCE scores and higher educational and income attainment.

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Notes from the Field

Increase in Nontoxigenic *Corynebacterium diphtheriae* — Washington, 2018–2023

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Toxin-producing *Corynebacterium diphtheriae*, an aerobic Gram-positive coccobacillus, is the predominant causative agent of diphtheria and is responsible for substantial morbidity worldwide (*1*). Infection with nontoxigenic *C. diphtheriae* is also associated with disease, but little is known about the clinical spectrum of illness or the incidence of nontoxigenic *C. diphtheriae* infections in the United States (*2*). Toxin gene acquisition and expression by nontoxigenic *C. diphtheriae* is biologically plausible and could lead to reintroduction of diphtheria into the United States, where diphtheria is no longer endemic (*3*). Understanding diseases caused by nontoxigenic forms of *C. diphtheriae* is important because diphtheria toxoid–containing vaccines create immunity to the toxin itself but cannot protect against infection or illness caused by nontoxigenic strains. In the state of Washington, detection of *C. diphtheriae* in any clinical specimen is immediately notifiable (*4*). Beginning in 2000, Washington mandated submission of all *C. diphtheriae* isolates to Washington State Public Health Laboratories (WSPHL). The number of reported nontoxigenic *C. diphtheriae* isolates in Washington has increased approximately tenfold, from 17 during 2012–2017 to 179 during 2018–2023; most infections occurred among King County residents. In November 2023, Washington State Department of Health, Public Health – Seattle & King County, and CDC conducted a statewide investigation of nontoxigenic *C. diphtheriae* cases to determine factors contributing to this increase and to describe the epidemiology of nontoxigenic *C. diphtheriae* and clinical characteristics of patients with nontoxigenic *C. diphtheriae* infections in Washington.

Investigation and Outcomes

During January 1, 2018–September 30, 2023, *C. diphtheriae* isolates from 176 patients were identified in 14 (36%) of 39 Washington counties; all isolates were identified as *C. diphtheriae* at WSPHL and subsequently determined to be nontoxigenic by CDC. A public health team abstracted patient data[§] from medical charts. Descriptive statistics were calculated using R software (version 4.3.1; R Foundation). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[¶]

Chart abstraction was conducted for 166 (94%) patients; 120 (72%) were male, and the median age was 44 years (range = 8 months–76 years) (Table). Among these patients, 171 nontoxigenic *C. diphtheriae* isolates were identified, including 134 (78%) from cutaneous wound culture; 130 (97%) of these cultures yielded polymicrobial results. However, *C. diphtheriae* was also isolated from blood (21; 12%) and other body fluids (16; 9%), including urine, sputum, and synovial fluid. Persons experiencing unstable housing (64%) or who recently[**] used illicit substances[††] (63%) were disproportionately represented among patients. Lifetime injection drug use was only documented in 43% of patients and 40% of patients with cutaneous infections. Six patients (4%) received a diagnosis of endocarditis attributable to *C. diphtheriae* alone. Fourteen (8%) patients died from any cause during the study period. No patient had clinical findings suggestive of diphtheria.

Laboratory directors from five clinical laboratories that had processed 65% of the total *C. diphtheriae* isolates were interviewed about protocols for identifying gram-positive bacilli. Most reported increasing use of matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry, which can identify unknown molecules from a robust database of common patterns. The laboratory that identified the largest proportion of *C. diphtheriae* isolates in Washington (56; 34%) has not changed microbiological techniques or protocols for identifying *C. diphtheriae* since 2013, when MALDI-TOF was implemented.

Preliminary Conclusions and Actions

Although the clinical characteristics of nontoxigenic *C. diphtheriae* infections are distinct from those of diphtheria caused by toxin-producing *C. diphtheriae* strains, nontoxigenic *C. diphtheriae* infection can be associated with severe disease; in this analysis, 74% of patients were initially evaluated in an emergency department, 12% had bacteremia, and 4% had endocarditis. Presentation of illness was consistent with infections caused by other organisms and recognized as *C. diphtheriae* only when cultures resulted. Recognizing

[*] These authors contributed equally to this report.
[†] These senior authors contributed equally to this report.
[§] Demographic characteristics, housing status, substance use information, medical comorbidities, clinical management and illness course, and health care use patterns.
[¶] 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.
[**] Recent use of substances refers to the 90 days leading up to the encounter when *C. diphtheriae* was isolated.
[††] Illicit substance use includes amphetamines, opiates, and psychoactive recreational drugs and does not include alcohol, tobacco, or marijuana.

TABLE. Demographic and clinical characteristics of patients with nontoxigenic *Corynebacterium diphtheriae* infection (N = 166) — Washington, 2018–2023

Characteristic	No. (%)
Median age, yrs (range)	43.9 (0.7–75.9)
Sex	
Female	45 (27.1)
Male	120 (72.3)
Unknown	1 (0.6)
Medical history	
History of hepatitis C infection	56 (33.7)
Venous stasis or insufficiency	28 (16.9)
Previous abscesses	28 (16.9)
Previous diagnosis of sepsis	21 (12.7)
Diabetes mellitus	19 (11.4)
Chronic kidney disease	8 (4.8)
HIV	7 (4.2)
Heart failure	7 (4.2)
Cardiac valve disease	5 (3.0)
Cirrhosis	5 (3.0)
Housing	
Currently experiencing homelessness	106 (63.9)
Previously experienced homelessness	27 (16.3)
Stable	12 (7.2)
Unknown	21 (12.7)
Drug use	
Recent illicit substance use*	104 (62.7)
Lifetime IV drug use	72 (43.4)
Specimen source (N = 171 isolates)†	
Wound	134 (78.4)
C. diphtheriae only§	3 (2.2)
Polymicrobial§,¶	130 (97.0)
Unknown§	1 (0.6)
Blood	21 (12.3)
C. diphtheriae only**	11 (52.4)
Polymicrobial§,**	10 (47.6)
Other body fluid††	16 (9.4)
Setting	
Emergency department	123 (74.1)
Primary care	15 (9.0)
Urgent care	12 (7.2)
Other	16 (9.6)
Outcomes and complications	
Deceased during study period (2018–2023)§§	14 (8.4)
Hospitalization in ICU during encounter when *C. diphtheriae* infection was diagnosed	11 (6.7)
Bacteremia with *C. diphtheriae*	21 (12.7)
Endocarditis caused by *C. diphtheriae*¶¶	6 (3.6)

Abbreviations: ICU = intensive care unit; IV = intravenous.
* Recent use refers to the 90 days preceding the encounter when *C. diphtheriae* was isolated. Illicit substances include amphetamines, opiates, and psychoactive recreational drugs and does not include alcohol, tobacco, or marijuana.
† Some patients had more than one specimen collected.
§ Percentage of 134 wound cultures.
¶ Wound culture with *C. diphtheriae* and at least one other organism.
** Percentage of 21 blood cultures.
†† Other isolates were from urine, sputum, or synovial fluid.
§§ Death attributable to any cause (not limited to infection).
¶¶ Clinical diagnosis of endocarditis in addition to monomicrobial *C. diphtheriae* blood culture.

C. diphtheriae is important because it is associated with morbidity and mortality. Fourteen (8%) patients died soon after detection of nontoxigenic *C. diphtheriae* infection; causes of death varied and were affected by factors that included underlying medical conditions, infections, experience of homelessness, and substance use.

The stability of laboratory procedures in place since 2013 suggests that the increase in *C. diphtheriae* in Washington is likely not due to changes in laboratory techniques or protocols. The findings from this investigation are consistent with those from a 2011 Canadian study of 33 patients with cutaneous infections caused by nontoxigenic *C. diphtheriae* during 1998–2007; those infections primarily affected vulnerable populations experiencing unstable housing (*5*). Further investigations of reasons for the increase in nontoxigenic *C. diphtheriae* infections, including an assessment of risk factors for severe outcomes, could help identify opportunities to implement strategies to reduce community spread of *C. diphtheriae*.

Summary

What is already known about this topic?

Corynebacterium diphtheriae infections can be caused by toxigenic and nontoxigenic strains. Diphtheria toxoid–containing vaccines (DTaP, Tdap, Td) only protect against toxigenic strains. Nontoxigenic *C. diphtheriae* infections are most frequently associated with cutaneous disease and are not vaccine preventable.

What is added by this report?

Review of all Washington nontoxigenic *C. diphtheriae* cases during a 5-year period revealed that infection prevalence is increasing. Unstable housing and recent illicit substance use were prevalent among patients. Severe disease can manifest as endocarditis and bacteremia.

What are the implications for public health practice?

Future nontoxigenic *C. diphtheriae* studies focusing on understanding treatment indications and effectiveness and characterizing modifiable risk factors and barriers to quality wound care might identify opportunities to implement strategies for reducing community spread of *C. diphtheriae*.

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Prevention; Benton-Franklin Health District; Clark County Public Health; Columbia County Public Health; Cowlitz County Health Department; Kitsap Public Health District; Lewis County Public Health & Social Services; Public Health – Seattle & King County; Skagit County Public Health; Snohomish County Health Department; Spokane Regional Health District; Tacoma-Pierce County Health Department; Thurston County Public Health & Social Services Department; Whatcom County Health and Community Services; Yakima Health District.

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Erratum

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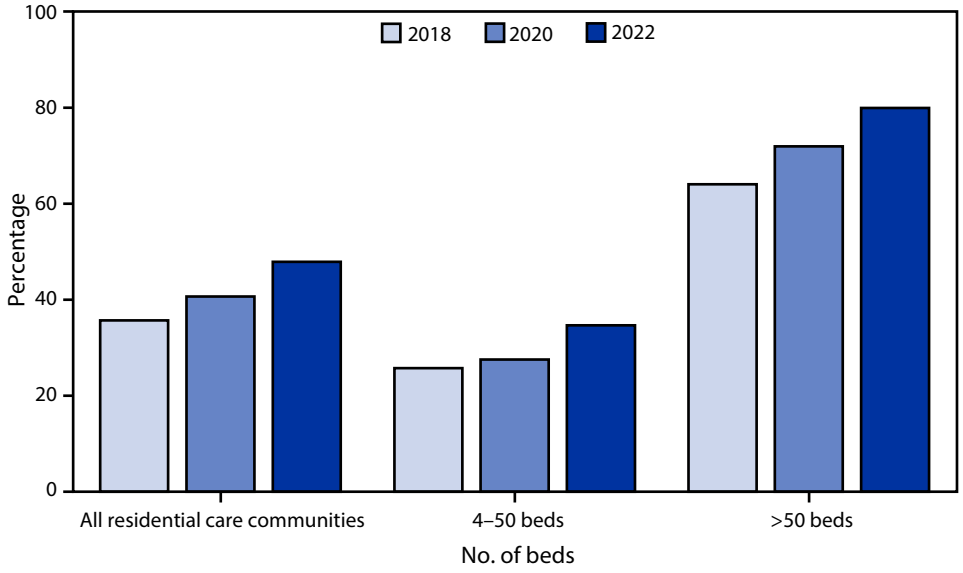
In the report, "Arthritis Among Children and Adolescents Aged <18 Years — United States, 2017–2021," on page 790, there was an error in the Table. Under Characteristic, under Race,*** the third entry should have read, "**Asian or Native Hawaiian or other Pacific Islander**."

The ninth table footnote should have read, "*** Race was recoded from responses to the question, "What is this child's race?" and included American Indian or Alaska Native, Black or African American, **Asian or** Native Hawaiian or other Pacific Islander, White, and two or more races. The 2017 and 2018 surveys included a response for "Some other race only," which are coded as missing. Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic. **Asian and Native Hawaiian or other Pacific Islander were combined to make one racial group**."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Residential Care Communities* That Use Electronic Health Records, by Community Bed Size — United States, 2018, 2020, and 2022†



* Residential care communities are state-regulated, have four or more beds, provide room and board with at least two meals per day, and are staffed to provide supervision and assistance with personal care and health-related services to adults who cannot live independently but do not require intensive nursing care.
† Residential care communities with missing data were excluded.

From 2018 to 2022, the percentage of residential care communities (RCCs) using electronic health records (EHRs) increased from 36% to 48%. Use of EHRs increased during this time regardless of RCC size, and larger RCCs were more likely to use EHRs compared with smaller RCCs.

Supplementary Table: https://stacks.cdc.gov/view/cdc/153378

Source: National Center for Health Statistics, National Post-acute and Long-term Care Study, 2018, 2020, and 2022 data. https://www.cdc.gov/nchs/npals/questionnaires.htm

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