HIV Stigma and Health Care Discrimination Experienced by Hispanic or Latino Persons with HIV — United States, 2018–2020

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Hispanic or Latino (Hispanic) persons with HIV experience disparities in HIV health outcomes compared with some other racial and ethnic groups. A previous report found that the percentages of Hispanic persons who received HIV care, were retained in care, and were virally suppressed were lower than those among non-Hispanic White persons with HIV (*1*). HIV stigma and discrimination are human rights issues associated with adverse HIV outcomes; eliminating stigma and discrimination among persons with HIV is a national priority*,†,§ (*2,3*). CDC analyzed data from the Medical Monitoring Project (MMP), an annual, cross-sectional study designed to report nationally representative estimates of experiences and outcomes among adults with diagnosed HIV. Data from the 2018–2020 cycles were analyzed to assess self-reported stigma and health care discrimination using adapted versions of validated multicomponent scales among 2,690 adult Hispanic persons with HIV in the United States overall and by six characteristics.¶ The median HIV stigma score on a scale of 0–100 was 31.7, with women (35.6) and American Indian or Alaska Native (AI/AN) persons (38.9) reporting the highest scores among Hispanic persons with HIV. HIV stigma was primarily attributed to disclosure concerns (e.g., fearing others will disclose

one's HIV status and being careful about who one tells about one's HIV status). Nearly one in four (23%) Hispanic persons with HIV experienced health care discrimination. Health care discrimination was experienced more frequently by Hispanic men (23%) than by Hispanic women (18%) and by Black or African American (Black) Hispanic persons (28%) than by White Hispanic persons (21%). Understanding disparities in experiences of stigma and discrimination is important when designing culturally appropriate interventions to reduce stigma and discrimination.

MMP uses a two-stage sampling method. First, in 2004, out of all U.S. states, the District of Columbia, and Puerto Rico,

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* As defined by the National HIV/AIDS Strategy for the United States, stigma is "an attitude of disapproval and discontent toward a person or group because of the presence of an attribute perceived as undesirable" and discrimination occurs "when unfair and often unlawful actions are taken against people based on their belonging to a particular stigmatized group."

† https://www.unaids.org/sites/default/files/media_asset/07-hiv-human-rights-factsheet-stigma-discrmination_en.pdf

§ https://www.whitehouse.gov/wp-content/uploads/2021/11/National-HIV-AIDS-Strategy.pdf

¶ The six demographic characteristics are gender, race, Hispanic origin, birth outside the United States, country of birth, and limited English proficiency.

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

16 states and Puerto Rico were sampled**,†† (*4*). Second, a simple random sample of adults with diagnosed HIV is selected annually from each participating jurisdiction in the National HIV Surveillance System (NHSS), a census of persons with diagnosed HIV in the United States. During the 2018–2020 data cycles, data were collected through telephone or in-person interviews. Response rates for the two data cycles were 100% (jurisdictions) and 40%–45% (individual respondents). HIV stigma was measured using an adapted version of a validated 10-item scale that measures four dimensions of HIV stigma: 1) personalized stigma (consequences of other people knowing their status), 2) disclosure concerns, 3) negative self-image (not feeling as good as others and experiencing shame or guilt), and 4) public attitudes (what people think about HIV)§§ (*5*).

Responses (strongly disagree, somewhat disagree, neutral, somewhat agree, and strongly agree) for each item were given scores of 0, 2.5, 5, 7.5, and 10, respectively, and summed to a score ranging from zero (no stigma) to 100 (high stigma). HIV health care discrimination during the previous 12 months was assessed based on seven forms of discrimination, using an adapted version of a validated Likert scale¶¶ (*6*). Participants who reported experiencing at least one form of health care discrimination were considered to have experienced discrimination in an HIV health care setting; those who experienced any discrimination were asked whether they attributed discrimination to any of six characteristics.***

HIV stigma and health care discrimination were assessed overall and by the following demographic characteristics:

** https://www.cdc.gov/hiv/statistics/systems/mmp/projectareas.html

†† The same jurisdictions (which were sampled in 2004) have participated in MMP since 2005; however, beginning in 2015 the sampling strategy for the second stage changed to select a representative sample of adults with diagnosed HIV, regardless of care status.

§§ Personalized stigma was measured using two items: "I have been hurt by how people reacted to learning I have HIV" and "I have stopped socializing with some people because of their reactions to my HIV status." Disclosure concern was measured using two items: "I am very careful who I tell that I have HIV" and "I worry that people who know I have HIV will tell others." Negative self-image was measured using three items: "I feel that I am not as good a person as others because I have HIV," "Having HIV makes me feel unclean," and "Having HIV makes me feel that I'm a bad person." Public attitudes were measured using two items: "Most people think that a person with HIV is disgusting" and "Most people with HIV are rejected when others find out."

¶¶ The seven forms of discrimination included being treated with less courtesy than other people, being treated with less respect than other people, receiving poorer service than others, having a doctor or nurse act as if he or she believed they were not smart, having a doctor or nurse act as if he or she were afraid of them, having a doctor or nurse act as if he or she were better than them, and having a doctor or nurse not listen to what they were saying. Participants were asked if they experienced this never, rarely, some of the time, most of the time, or all the time.

*** Characteristics included HIV infection, gender, sexual orientation or practices, race and ethnicity, income or social class, and injection drug use. Participants could have selected more than one characteristic.

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gender, race,[†††] Hispanic origin,[§§§] country or region of birth,[¶¶¶] and English proficiency.[****] Analyses were weighted to adjust for individual nonresponse and poststratified to match the actual number of persons with diagnosed HIV in NHSS by age, race and ethnicity, and gender. Median scores and 95% CIs (using t distribution) were calculated to assess HIV stigma; nonoverlapping CIs determined meaningful differences among groups. Prevalence ratios (PRs) with predicted marginal means were used to quantify differences by characteristics; $p < 0.05$ was considered statistically significant. All analyses were conducted using SAS (version 9.4; SAS Institute) and SAS-callable SUDAAN (version 11.0.1; RTI International). This activity was reviewed by CDC and was conducted consistent with applicable federal laws and CDC policy.[††††]

Among Hispanic persons with HIV (2,690), 81% were male, 66% identified as White, 13% identified as Black, and 4% identified as AI/AN (Table 1). Thirty-six percent identified Hispanic origin as Mexican, Mexican American, or Chicano; 34% identified Hispanic origin as Puerto Rican. Nearly two thirds (62%) were born outside the continental United States, 22% were born in Puerto Rico, and 19% in Mexico; 42% had limited English proficiency.

The overall median HIV stigma score among Hispanic persons with HIV was 31.7 (Table 2). HIV stigma was higher among Hispanic women (median = 35.6) than among Hispanic men (median = 30.3) and was also high among Hispanic persons with HIV who identified as AI/AN (median = 38.9) and those who were born in the Caribbean (median = 35.7) (Table 2). Disclosure concerns and perceived public attitudes

TABLE 1. Demographic characteristics of Hispanic or Latino adults with diagnosed HIV — Medical Monitoring Project, United States, 2018–2020

Characteristic*	No.[†]	Weighted % (95% CI)
Overall	**2,690**	—
Gender§		
Male	2,043	80.8 (78.6–82.9)
Female	576	19.2 (17.1–21.4)
Race¶		
Asian	—**	—**
American Indian or Alaska Native	101	3.8 (2.8–4.9)
Black or African American	350	13.1 (10.1–16.1)
White	1,697	66.0 (61.9–70.1)
Multiple races	284	9.4 (7.7–11.2)
Race not selected	206	7.4 (5.9–8.9)
Hispanic origin		
Mexican, Mexican American, or Chicano	842	35.7 (28.7–42.6)
Puerto Rican	1,004	33.5 (22.7–44.3)
Cuban	79	3.2 (2.3–4.2)
Another Hispanic origin[††]	739	27.6 (23.4–31.7)
Born outside the United States§§		
No	977	38.3 (31.9–44.6)
Yes	1,701	61.7 (55.4–68.1)
Puerto Rico	706	22.2 (9.3–35.1)
Mexico	467	19.0 (14.9–23.1)
Central America	186	7.5 (5.6–9.5)
South America	174	6.5 (4.9–8.1)
Caribbean (excludes Puerto Rico)	141	5.5 (4.5–6.6)
Another country or region	27	1.0 (0.5–1.4)
Limited English proficiency¶¶		
Yes	885	41.7 (39.2–44.2)
No	1,257	58.3 (55.8–60.8)

* All variables measured by self-report.
[†] Numbers might not add to total because of missing data.
§ Participants who identified as transgender were excluded from this analysis because of small sample sizes.
¶ Race and ethnicity were measured based on Office of Management and Budget Directive No.15. Participants were asked "Do you consider yourself to be of Hispanic, Latino/a, or Spanish origin?" and "Which racial group or groups do you consider yourself to be in? You may choose more than one option." Hispanic or Latino (Hispanic) participants were categorized as White if they considered themselves to be White and said "no" to all other races. Asian, American Indian or Alaska Native, and Black or African American Hispanic persons were categorized similarly. Participants who answered "no" to all races, refused to identify with all of the races, or had some combination of these were classified as "race not selected." Participants who selected more than one race were classified as "multiple races."
** Data for Hispanic persons who identified as Asian are not included because of small sample sizes.
[††] Participants who selected "another Hispanic, Latino/a, or Spanish origin" or multiple Hispanic or Spanish origins (e.g., Mexican, Puerto Rican, or Cuban) were categorized as "another Hispanic origin."
§§ Persons born in Puerto Rico or another U.S. territory were categorized as being born outside the United States for the purpose of this analysis because of differences in cultural context.
¶¶ Participants who spoke English less than "very well" and spoke a language other than English at home were categorized as having limited English proficiency. Persons currently living in Puerto Rico were excluded from this variable because English is not the primary language spoken in Puerto Rico.

[†††] Race and ethnicity were measured based on Office of Management and Budget Directive No.15. Participants were asked "Do you consider yourself to be of Hispanic, Latino/a, or Spanish origin?" and "Which racial group or groups do you consider yourself to be in? You may choose more than one option." Hispanic participants were categorized as White if they considered themselves to be White and said "no" to all other races. Asian, American Indian or Alaska Native, and Black Hispanic persons were categorized similarly. Participants who answered "no" to all races, refused to identify with all of the races, or had some combination of these were classified as "race not selected." Participants who selected more than one race were classified as "multiple races."

[§§§] Hispanic participants were asked, "Which of the following describes your Hispanic, Latino/a, or Spanish origin? You can choose more than one." The categories were "Mexican, Mexican American, or Chicano/a," "Puerto Rican," "Cuban," and "another Hispanic, Latino/a, or Spanish origin." Participants who selected "another Hispanic, Latino/a, or Spanish origin" or multiple Hispanic or Spanish origins (e.g., Mexican, Puerto Rican, or Cuban) were categorized as "another Hispanic origin."

[¶¶¶] Persons born in Puerto Rico or another U.S. territory were categorized as being born outside the United States for the purpose of this analysis because of differences in cultural context.

[****] Participants who spoke English less than "very well" and spoke a language other than English at home were categorized as having limited English proficiency. Persons currently living in Puerto Rico were excluded from this variable because English is not the primary language spoken in Puerto Rico.

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

TABLE 2. HIV stigma scores and prevalence of HIV health care discrimination experienced by Hispanic or Latino adults with diagnosed HIV, by selected characteristics — Medical Monitoring Project, United States, 2018–2020

Selected characteristic[§]	HIV stigma*		Experienced any health care discrimination[†]			
	No.[¶]	Median score (95% CI)**	No.[¶]	% (95% CI)**	Prevalence ratio (95% CI)	p-value
Overall	**2,535**	**31.7 (30.3–33.1)**	**574**	**22.6 (20.7–24.5)**	**NA**	**NA**
Gender[††]						
Male	1,932	30.3 (28.7–31.8)	453	23.4 (21.2–25.6)	Ref	
Female	537	35.6 (33.5–37.7)	102	18.3 (14.7–21.8)	0.8 (0.6–1.0)	0.018
Race[§§]						
Asian		—[¶¶]	—[¶¶]	—[¶¶]	—[¶¶]	—[¶¶]
American Indian or Alaska Native	97	38.9 (33.2–44.5)	26	24.7 (15.8–33.5)	1.2 (0.8–1.7)	0.389
Black or African American	336	32.7 (30.5–34.9)	85	27.7 (23.0–32.5)	1.3 (1.1–1.7)	0.010
White	1,604	30.4 (28.8–32.1)	343	20.8 (18.5–23.2)	Ref	
Multiple races	261	31.7 (28.6–34.8)	72	28.7 (22.3–35.0)	1.4 (1.1–1.7)	0.010
Race not selected	192	34.7 (30.0–39.5)	40	22.7 (15.6–29.7)	1.1 (0.8–1.5)	0.622
Hispanic origin						
Mexican, Mexican American, or Chicano	793	32.3 (30.1–34.4)	171	20.4 (17.2–23.6)	Ref	NA
Puerto Rican	956	33.0 (31.4–34.7)	215	23.7 (21.2–26.3)	1.2 (1.0–1.4)	0.118
Cuban	75	32.9 (28.0–37.7)	17	30.0 (16.5–43.5)	1.5 (0.9–2.4)	0.134
Another Hispanic origin***	697	29.2 (27.5–30.9)	167	23.2 (19.4–26.9)	1.1 (0.9–1.4)	0.258
Born outside the United States[†††]						
Yes	1,608	31.0 (29.2–32.8)	330	20.2 (17.8–22.6)	0.8 (0.6–0.9)	0.002
No	926	32.9 (30.6–35.2)	243	26.5 (23.2–29.8)	Ref	NA
Country or region of birth						
United States	926	32.9 (30.6–35.2)	243	26.5 (23.2–29.8)	Ref	
Puerto Rico	673	32.7 (31.3–34.1)	154	23.9 (21.4–26.4)	0.9 (0.8–1.1)	0.196
Mexico	435	30.4 (27.7–33.0)	78	16.4 (12.3–20.5)	0.6 (0.5–0.8)	0.001
Central America	171	29.0 (26.8–31.2)	28	16.8 (10.6–23.0)	0.6 (0.4–0.9)	0.014
South America	170	26.7 (22.3–31.1)	33	16.7 (10.8–22.6)	0.6 (0.4–0.9)	0.012
Caribbean (excludes Puerto Rico)	132	35.7 (31.4–40.0)	26	22.0 (13.5–30.4)	0.8 (0.6–1.2)	0.352
Another country or region	27	27.3 (20.4–34.1)	11	—[§§§]	—[§§§]	—[§§§]
Limited English proficiency[¶¶¶]						
Yes	830	32.4 (30.3–34.5)	141	16.6 (13.7–19.5)	0.6 (0.5–0.8)	<0.001
No	1,191	30.1 (28.2–31.9)	313	26.5 (23.4–29.5)	Ref	NA

Abbreviations: NA = not applicable; Ref = referent group.
  * Range is from zero (no stigma) to 100 (high stigma).
  [†] During the previous 12 months.
  [§] All variables measured by self-report.
  [¶] Numbers are unweighted. Numbers might also not add to total because of missing data.
  ** Percentages are weighted row percentages, and CIs incorporate weighted percentages. All analyses were weighted to adjust for individual nonresponse and poststratified to match the actual number of persons with diagnosed HIV in National HIV Surveillance System (a census of persons with diagnosed HIV in the United States) by age, race and ethnicity, and sex.
  [††] Participants who identified as transgender were excluded because of small sample sizes.
  [§§] Race and ethnicity were measured based on Office of Management and Budget Directive No.15. Participants were asked "Do you consider yourself to be of Hispanic, Latino/a, or Spanish origin?" and "Which racial group or groups do you consider yourself to be in? You may choose more than one option." Hispanic or Latino (Hispanic) participants were categorized as White if they considered themselves to be White and said "no" to all other races; Asian, American Indian or Alaska Native, and Black or African American Hispanic persons were categorized similarly. Participants who answered "no" to all races, refused to identify with all of the races, or had some combination of these were classified as "race not selected." Participants who selected more than one race were classified as "multiple races."
  [¶¶] Data not included because of small sample sizes.
  *** Participants who selected "another Hispanic, Latino/a, or Spanish origin" or multiple Hispanic or Spanish origins (e.g., Mexican, Puerto Rican, or Cuban) were categorized as "another Hispanic origin."
  [†††] Persons born in Puerto Rico or another U.S. territory were categorized as being born outside the United States for the purpose of this analysis because of differences in cultural context.
  [§§§] Estimates with a CI width ≥30 and those with an underlying denominator <30 were considered to be unstable and were therefore suppressed.
  [¶¶¶] Participants who spoke English less than "very well" and spoke a language other than English at home were categorized as having limited English proficiency. Persons currently living in Puerto Rico were excluded from this variable because English is not the primary language spoken in Puerto Rico.

about persons with HIV were the most reported HIV stigma domains. Forty-eight percent to 78% of persons with HIV strongly agreed with the two items about disclosure concerns, and 20%–28% strongly agreed with the two items about perceived public attitudes (Figure 1) (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/121706).

Overall, 22.6% of Hispanic persons with HIV reported experiencing any HIV health care discrimination during the previous 12 months (Table 2); 8% reported one, 4% reported two, and 11% reported three or more health care discrimination experiences (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/121707). Among those who experienced health

FIGURE 1. HIV stigma* reported by Hispanic or Latino adults with diagnosed HIV — Medical Monitoring Project, United States, 2018–2020
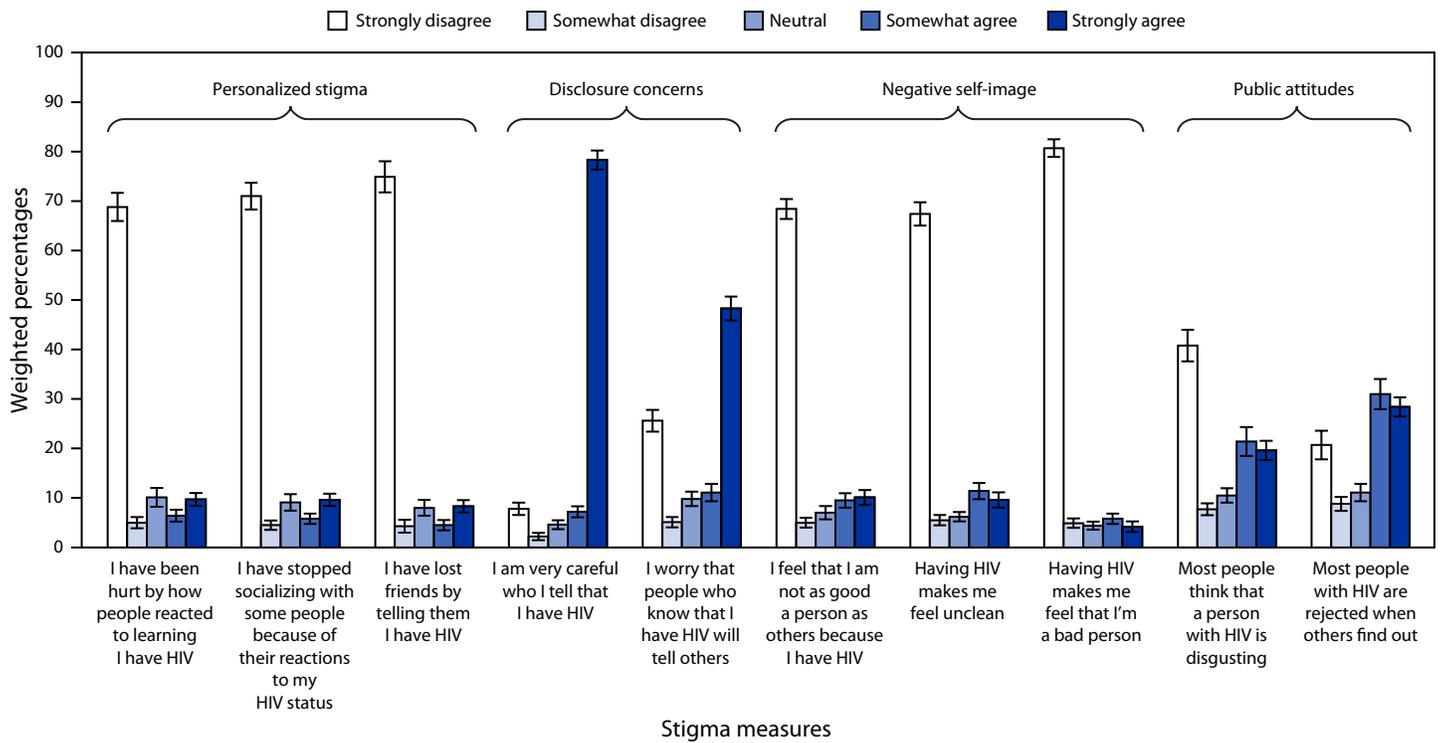
* Personalized stigma domain asked about the previous 12 months; other HIV stigma domains asked about current experiences of HIV stigma.

care discrimination, 62% felt that a doctor or nurse was not listening to what they were saying, 48% felt they were treated with less respect than others, and 48% perceived they were treated with less courtesy than others (Figure 2). Thirty percent attributed health care discrimination to their HIV infection, 23% to their sexual orientation or sexual practices, and 20% to their race or ethnicity (Figure 2).

Hispanic women were less likely to experience health care discrimination than were Hispanic men (PR = 0.8 Table 2). Black (PR = 1.3) and multiracial Hispanic persons were more likely than White Hispanic persons to experience health care discrimination (PR = 1.4). Non-U.S.–born persons (PR = 0.8) were less likely to experience health care discrimination than U.S.-born persons. Specifically, persons born in Mexico (PR = 0.6), Central America (PR = 0.6), and South America (PR = 0.6) were less likely to experience health care discrimination than U.S.-born persons. Persons with limited English proficiency (PR = 0.6) were less likely to experience health care discrimination than their counterparts.

Summary

What is already known about this topic?

Hispanic or Latino (Hispanic) persons with HIV experience disparities in health outcomes compared with other racial and ethnic groups. Eliminating stigma and discrimination, which are barriers to HIV care and treatment, is a national priority.

What is added by this report?

Hispanic persons with HIV commonly reported HIV stigma and health care discrimination. Among Hispanic persons with HIV, HIV stigma was highest among women (median stigma score = 35.6 of 100) and American Indian or Alaska Native persons (median stigma score = 32.7); health care discrimination was experienced more frequently by men than by women (23% vs. 18%) and by Black or African American Hispanic persons than by White Hispanic persons (28% vs. 21%).

What are the implications for public health practice?

Culturally appropriate efforts to reduce stigma and discrimination among Hispanic persons with HIV should consider disparities by gender and race.

FIGURE 2. Forms of HIV health care discrimination*,† (A) and attributions of HIV health care discrimination (B) reported by Hispanic or Latino adults with diagnosed HIV — Medical Monitoring Project, United States, 2018–2020
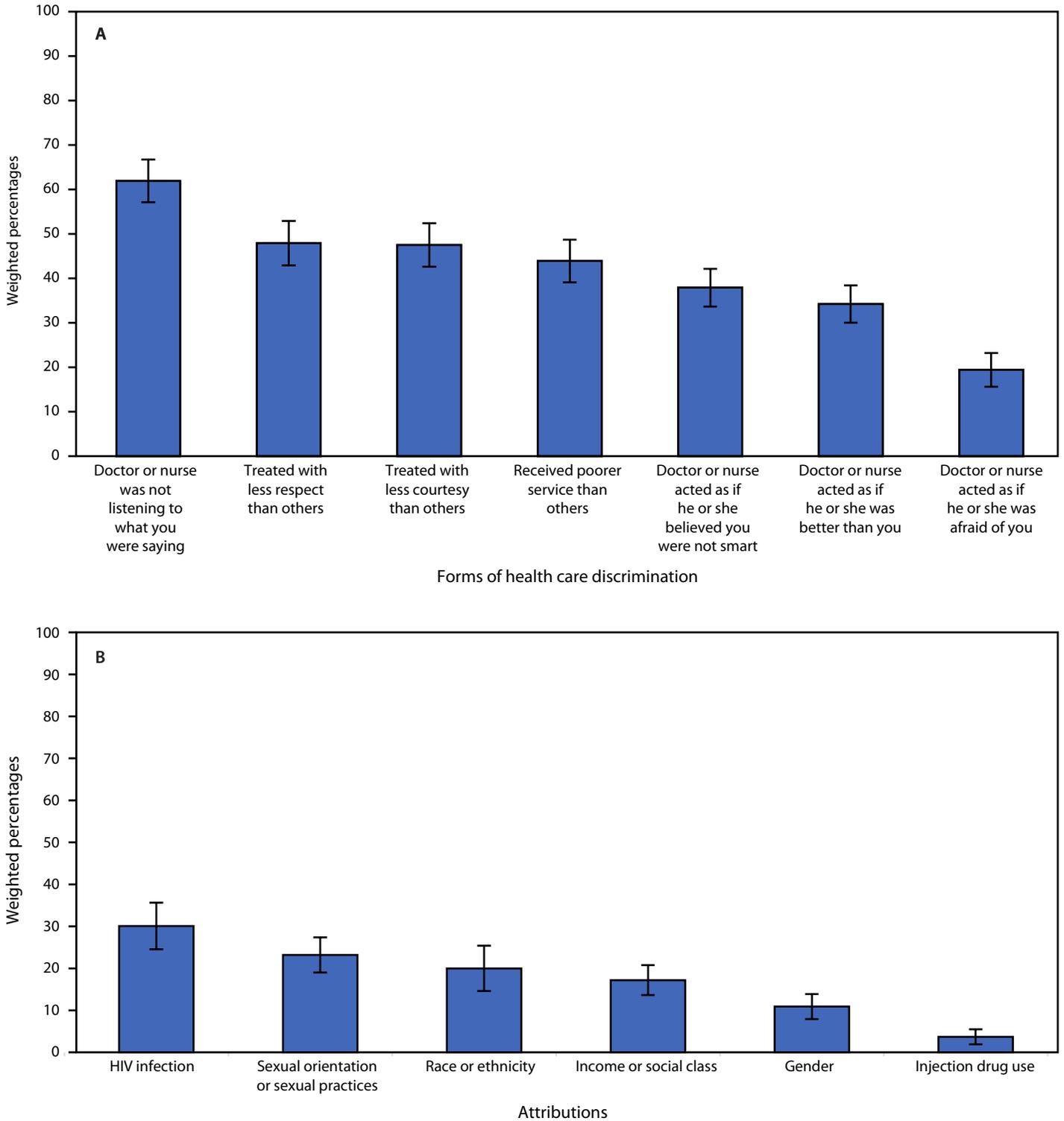
* 95% CIs indicated by error bars.
† HIV health care discrimination experiences were measured during the previous 12 months.

Discussion

HIV stigma and discrimination experiences in an HIV health care setting were commonly reported among Hispanic persons with HIV and varied by characteristics such as race, gender, and English proficiency. Hispanic persons with HIV are highly diverse. Efforts to reduce HIV stigma and discrimination should consider the varied and unique experiences of this population.

Similar to experiences reported by all U.S. persons with HIV, the most prevalent HIV stigma domain among Hispanic persons with HIV was concern about disclosure of HIV status (2), and the most reported form of health care discrimination was feeling that a clinician was not listening to them (3). This underscores the importance of addressing disclosure concerns when designing interventions to reduce HIV stigma. Training for providers should focus on actively listening to patient concerns, including stigma experiences, using culturally and linguistically appropriate methods.§§§§

Although HIV stigma was more commonly reported by Hispanic women than men, women experienced lower levels of health care discrimination. This contrasts with a study of Hispanic adults that found Latino men were less likely to report health care discrimination than women (7). The present study indicates that stigma and health care discrimination, although related, are distinct concepts experienced differently by Hispanic men and women. Given that more Hispanic men with HIV than women identified as gay or bisexual, these health care discrimination findings could also be based on sexual orientation.

Black Hispanic persons with HIV were more likely than White Hispanic persons with HIV to report health care discrimination. Though not equivalent to racial identity, some Hispanic persons use skin color to select a racial identity category. Health care discrimination experienced by Hispanic persons might differ based on skin color, with one study finding that Hispanic persons with darker skin experienced greater health care discrimination than those with lighter skin (8). Another study found that U.S.-born Hispanic persons experienced more day-to-day discrimination than non-U.S.–born Hispanic persons (9). Others have found that U.S.-born racial and ethnic minority groups have greater awareness of race-based discrimination than do non-U.S.–born persons, perhaps because race and ethnicity are experienced differently in different countries (9,10).

The findings in this report are subject to at least two limitations. First, MMP data are self-reported and subject to recall and social desirability bias. Second, the interview only captured discrimination in HIV health care settings, excluding persons not in care and not capturing other forms of discrimination.

This study underscores disparities in HIV stigma and health care discrimination experiences of Hispanic persons with HIV and the need to tailor HIV care efforts. Eliminating stigma and discrimination is a national priority and will require person-, provider-, facility-, and community-level interventions. Provider-focused trainings, policies, and practices are needed to address HIV stigma and discrimination experienced by Hispanic persons with HIV. Trauma-informed approaches to HIV care and treatment might reduce discrimination in HIV care settings by creating feelings of safety, empowerment, and trust among patients while moving beyond cultural biases and stereotypes.¶¶¶¶ HIV care providers should also maintain cultural and linguistic competency. Community-level interventions include supporting organizations that reflect the Hispanic population and increase access to HIV care and leveraging campaigns such as CDC's Let's Stop HIV Together (Detengamos Juntos el VIH).*****

Data disaggregation among Hispanic persons with HIV revealed disparities in stigma and discrimination experiences. Designing multilevel, culturally, and linguistically appropriate approaches that address stigma and discrimination, particularly among priority populations such as Hispanic persons with HIV, is key to improving care and treatment outcomes and ending the HIV epidemic.

¶¶¶¶ https://ncsacw.acf.hhs.gov/userfiles/files/SAMHSA_Trauma.pdf
***** https://www.cdc.gov/stophivtogether/index.html

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§§§§ https://thinkculturalhealth.hhs.gov/

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Adverse Childhood Experiences During the COVID-19 Pandemic and Associations with Poor Mental Health and Suicidal Behaviors Among High School Students — Adolescent Behaviors and Experiences Survey, United States, January–June 2021

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Social and educational disruptions during the COVID-19 pandemic have exacerbated concerns about adolescents' mental health and suicidal behavior. Data from the 2021 Adolescent Behaviors and Experiences Survey (ABES) indicate that 37.1% of U.S. high school students reported poor mental health during the COVID-19 pandemic, with 19.9% considering and 9.0% attempting suicide in the preceding year (1). Adverse childhood experiences (ACEs)* are associated with poor mental health and suicidal behaviors (2,3), and high prevalence of some ACEs have been documented during the pandemic (4). ACEs are preventable, potentially traumatic events that occur in childhood (ages 0–17 years) such as neglect, experiencing or witnessing violence, or having a family member attempt or die by suicide. Also included are aspects of a child's environment that can undermine their sense of safety, stability, and bonding. Associations between ACEs occurring during the pandemic and mental health or suicidal behaviors among U.S. high school students were examined using ABES data. Experience of one to two ACEs was associated with poorer mental health and increased suicidal behaviors, and these deleterious outcomes increased with additional ACE exposure. After adjusting for demographic characteristics, adolescents who reported four or more ACEs during the pandemic had a prevalence of poor current mental health four times as high as, and a prevalence of past-year suicide attempts 25 times as high as, those without ACEs during the pandemic. Experience of specific ACE types (e.g., emotional abuse) was associated with higher prevalences of poor mental health and suicidal behaviors. Prevention and intervention strategies (5), including early identification and trauma-informed mental health service and support provision, for ACEs and their acute and long-term impacts could help address the U.S. child and adolescent mental health and suicide crisis.†

The voluntary, probability-based online ABES used stratified, three-stage cluster sampling to obtain nationally representative data from U.S. public and private high school students in grades 9–12 during January–June 2021§ (1,4). Prevalence estimates for some ACEs, mental health, and suicidal behaviors have been reported previously (1,4). Students self-reported experiences of some adversities during the COVID-19 pandemic (i.e., emotional abuse, physical abuse, parent or caregiver job loss, and food insecurity) or during the past 12 months¶ (i.e., sexual violence by any perpetrator, physical teen dating violence, and electronic bullying), as well as their mental health (i.e., current poor mental health, poor mental health during the pandemic, and persistent feelings of sadness or hopelessness during the past year) and suicidal behaviors (i.e., seriously considering suicide, making a suicide plan, or attempting suicide during the past year) (Supplementary Box, https://stacks.cdc.gov/view/cdc/121661).

The analysis was restricted to 4,390 high school students aged <18 years with complete data on analytic variables, to align with the ACEs focus. ACEs were examined by type (e.g., emotional abuse), category (e.g., exposure to either of the two abuse-related ACEs), and cumulative number of ACEs (zero, one to two, three, and four or more). Weighted pairwise prevalence estimates and 95% CIs for reported ACE exposure by poor mental health or suicidal behaviors were calculated. Adjusted prevalence ratios (aPRs) and 95% CIs were calculated using Poisson regression with robust SEs to

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* ACEs are preventable, potentially traumatic events that occur in childhood (ages 0–17 years), such as neglect, experiencing or witnessing violence, and having a family member attempt or die by suicide. Also included are aspects of a child's environment that can undermine their sense of safety, stability, and bonding. These examples do not comprise an exhaustive list of childhood adversity, as there are other traumatic experiences that can also impact health and well-being. https://www.cdc.gov/violenceprevention/aces/index.html and https://vetoviolence.cdc.gov/apps/aces-infographic/home.

† Multiple declarations related to the children and adolescents' mental health and suicide crisis have occurred, including from federal authorities and national healthcare organizations. https://www.hhs.gov/sites/default/files/surgeon-general-youth-mental-health-advisory.pdf; https://www.aap.org/en/advocacy/child-and-adolescent-healthy-mental-development/aap-aacap-cha-declaration-of-a-national-emergency-in-child-and-adolescent-mental-health/

§ https://www.cdc.gov/healthyyouth/data/abes.htm

¶ Some items in ABES were asked with a past-year reference period. Because of the timing of the widespread onset of the COVID-19 pandemic (March 2020), and the period for ABES administration (January–June 2021), the past-year reference period generally reflects a similar, although not exact, time frame to questions that use the reference period "during the COVID-19 pandemic."

examine associations between reported ACE exposure during the pandemic and mental health or suicidal behaviors, with and without inclusion of other ACEs. aPRs were adjusted for sex, grade in school, race and ethnicity, sexual identity, and method of school instruction at recruitment into ABES; 95% CIs that excluded 1.0 were considered statistically significant. The ABES study protocol was reviewed and approved by the institutional review boards at CDC and ICF International, CDC's survey contractor.** Analyses were conducted using SAS statistical software (version 9.4, SAS Institute), accounting for complex survey design.

Nearly three quarters (73.1%) of high school students aged <18 years reported at least one ACE during the COVID-19 pandemic (53.2%, 12.0%, and 7.8% reported one to two, three, and four or more ACEs, respectively (mean = 1.47; SE = 0.04). Compared with adolescents without ACEs, adolescents who reported one to two ACEs during the pandemic had higher prevalences of poor mental health and suicidal behaviors (aPR range = 1.97–2.39 and 3.29–5.92, respectively) (Table 1). A dose-response relationship between accumulating exposure to ACEs during the pandemic and poor mental health and suicidal behaviors was observed (Figure). Compared with adolescents without ACEs, adolescents with four or more ACEs during the pandemic had a prevalence of poor mental health three to four times as high (aPR range = 3.04–4.06) as well as substantially higher prevalences of past-year suicidal behaviors (seriously considering suicide: 57.4% versus 5.3%, aPR = 7.06, 95% CI = 5.02–9.93; making a suicide plan: 48.6% versus 3.7%, aPR = 8.27, 95% CI = 5.09–13.42; attempted suicide: 38.7% versus 0.9%, aPR = 25.06, 95% CI = 11.35–55.30), after adjusting for demographic characteristics (Table 1).

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

After adjusting for demographic characteristics, experience of each ACE type was associated with a higher prevalence of current poor mental health (aPR range = 1.26–2.22), poor mental health during the COVID-19 pandemic (aPR range = 1.28–1.87), and past-year persistent feelings of sadness or hopelessness (aPR range = 1.21–1.94) (Table 2). The prevalence of poor mental health among adolescents who reported specific types of ACEs was high. For example, 82.7% and 82.0% who experienced past-year sexual violence or physical teen dating violence, respectively, felt persistently sad or hopeless. Likewise, exposure to each ACE type was associated with a higher prevalence of seriously considering suicide (aPR range = 1.23–3.13), making a suicide plan (aPR range = 1.74–3.62 [except for parent or caregiver job loss]), and attempting suicide in the past year (aPR range = 1.45–5.42). Suicidal behavior prevalence by each ACE type was high; for example, 33.0% of adolescents who experienced any sexual violence during the past year reported attempting suicide. After adjusting for all other assessed ACEs and demographic characteristics, emotional abuse was most strongly associated with poor mental health (aPRs for poor current mental health, poor mental health during the pandemic, and past-year persistent sadness or hopelessness were 1.96, 1.68, and 1.73, respectively) and past-year suicidal behaviors (aPRs for having seriously considered suicide, made a suicide plan, and attempted suicide were 2.61, 2.89, and 3.62, respectively). Experience of any abuse-related ACEs during the pandemic was more strongly associated with mental health and suicidal behaviors than was experience of other forms of violence or family economic pressures (Supplementary Table, https://stacks.cdc.gov/view/cdc/121662).

TABLE 1. Associations between number of adverse childhood experiences during the COVID–19 pandemic and poor mental health and suicidal behaviors among high school students (N = 4,390) — Adolescent Behaviors and Experiences Survey, United States, 2021

	aPR* (95% CI)			
Indicator	No ACEs (n = 1,167)	One or two ACEs (n = 2,358)	Three ACEs (n = 512)	Four or more ACEs (n = 353)
Poor mental health				
Current poor mental health (past 30 days)	Ref	2.39 (1.96–2.92)	3.22 (2.59–3.99)	4.06 (3.31–4.99)
Poor mental health during the COVID–19 pandemic	Ref	2.13 (1.84–2.48)	2.72 (2.29–3.23)	3.18 (2.71–3.74)
Persistent feelings of sadness or hopelessness during the past year	Ref	1.97 (1.72–2.26)	2.80 (2.41–3.24)	3.04 (2.63–3.52)
Suicidal behaviors				
Seriously considered suicide during the past year	Ref	3.29 (2.31–4.69)	5.13 (3.54–7.45)	7.06 (5.02–9.93)
Made a suicide plan during the past year	Ref	3.29 (2.02–5.35)	5.85 (3.48–9.83)	8.27 (5.09–13.42)
Attempted suicide during the past year	Ref	5.92 (2.71–12.94)	15.85 (7.35–34.19)	25.06 (11.35–55.30)

Abbreviations: ACEs = adverse childhood experiences; aPR = adjusted prevalence ratio; Ref = referent group.
* Adjusted for sex, race and ethnicity, grade in school, sexual identity, and method of school instruction.

FIGURE. Number of adverse childhood experiences during the COVID-19 pandemic and crude prevalences of poor mental health and suicidal behaviors* among high school students (N = 4,390) — Adolescent Behaviors and Experiences Survey, United States, 2021
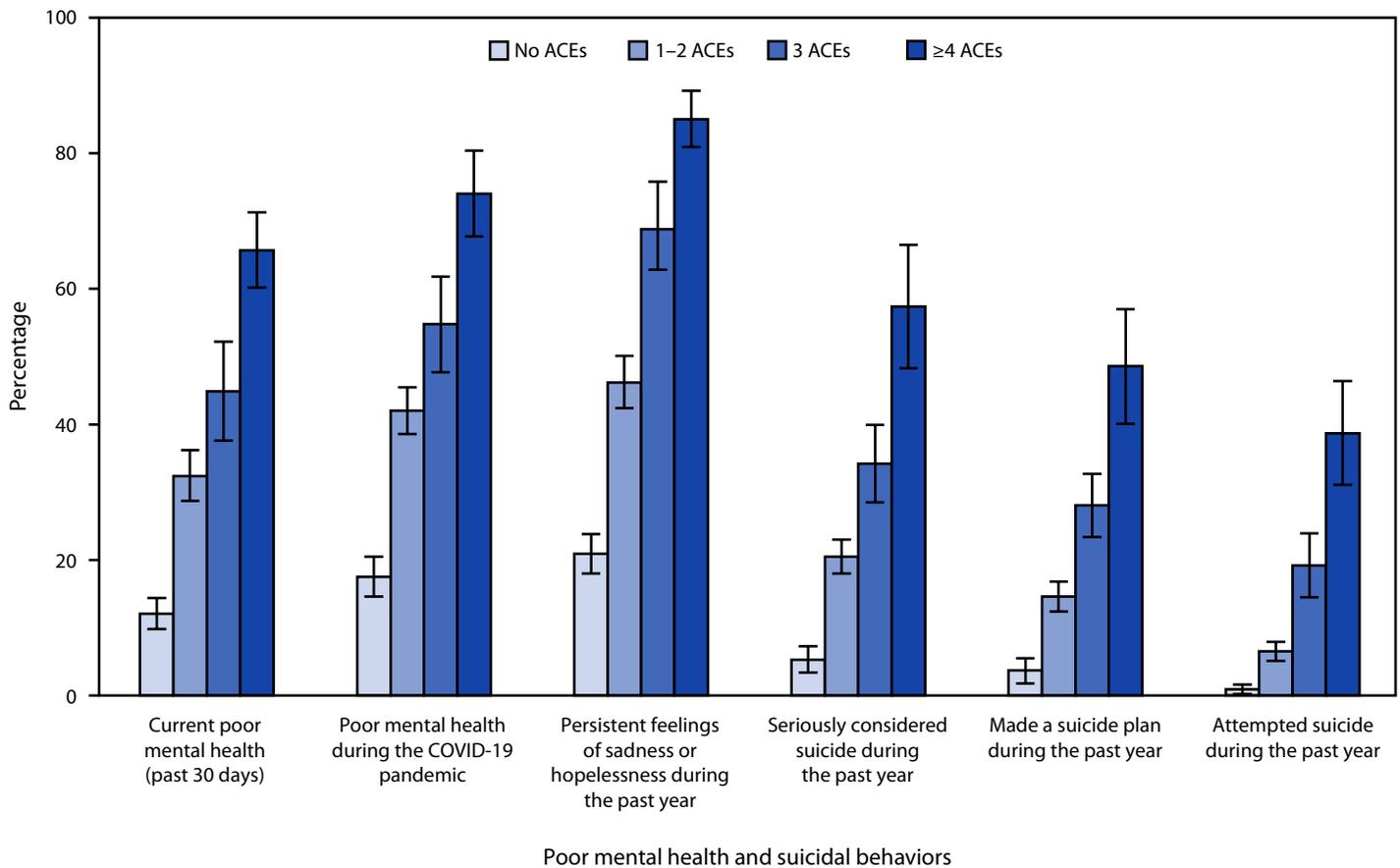
Abbreviation: ACEs = adverse childhood experiences.
* 95% CIs indicated by error bars.

Discussion

Nearly three of every four U.S. high school students reported at least one ACE, and one in 13 (7.8%) reported four or more ACEs during the COVID-19 pandemic. Comparable prepandemic estimates of cumulative ACE exposure among U.S. adolescents are limited; estimates derived from prepandemic, retrospectively collected data among U.S. adults indicate that 60.9% reported at least one, and 15.6% reported four or more ACEs before age 18 years (2). Nevertheless, ACEs were common among U.S. adolescents during the pandemic and often resulted in acute consequences for mental health and suicidal behaviors, even among some adolescents who reported one to two ACEs. Consistent with literature indicating a dose-response relationship between ACEs and poor outcomes (2,3), after adjusting for demographic characteristics, the prevalences of poor current mental health and of past-year suicide attempts among adolescents who reported four or more ACEs during the COVID-19 pandemic were four and 25 times as high as those with no reported ACEs during the pandemic, respectively. The magnitude of effect associated with past-year suicide attempts is particularly concerning, given that a 2019 meta-analysis examining the association between having four or more ACEs and attempting suicide was considerably lower, albeit compelling (i.e., aOR = 7.3) (3). Differences in survey methods, ACEs assessed, exposure periods, and respondent age necessitate caution when comparing estimates. The findings of the current analysis are consistent with studies documenting the negative impacts of specific types of ACEs, including child abuse and neglect (6), sexual violence (7), teen dating violence (7), bullying (7), and family economic pressures (8). After considering demographic characteristics and ACEs assessed, emotional abuse was most strongly associated with poor mental health and suicidal behaviors. This finding is consistent with literature indicating that, although all forms of abuse contribute to adolescent suicidal behaviors, emotional abuse might be relatively more harmful (9).

TABLE 2. Associations between types of adverse childhood experiences during the COVID–19 pandemic and poor mental health and suicidal behaviors among high school students (N = 4,390) — Adolescent Behaviors and Experiences Survey, United States, 2021

Indicator		Physical abuse during the COVID-19 pandemic		Emotional abuse during the COVID-19 pandemic		Sexual violence during the past year		Physical teen dating violence during the past year		Electronic bullying during the past year		Parent lost job during the COVID-19 pandemic		Food insecurity during the COVID-19 pandemic	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
		(n = 519)	(n = 3,871)	(n = 2,547)	(n = 1,843)	(n = 474)	(n = 3,916)	(n = 140)	(n = 4,250)	(n = 599)	(n = 3,791)	(n = 1,226)	(n = 3,164)	(n = 959)	(n = 3,431)
Poor mental health															
Current poor mental health (past 30 days)	% Yes,	51.8	28.5	42.3	16.1	58.3	28.1	56.3	30.4	51.7	27.9	37.9	28.2	43.3	27.6
	95% CI	(45.2–58.4)	(25.6–31.4)	(38.5–46.1)	(13.6–18.6)	(53.1–63.6)	(25.1–31.1)	(44.3–68.3)	(27.3–33.4)	(45.9–57.5)	(25.1–30.7)	(33.1–42.8)	(25.5–30.9)	(39.6–47.0)	(24.4–30.8)
	aPR,*	1.66	—	2.22	—	1.53	—	1.52	—	1.55	—	1.26	—	1.51	—
	95% CI	(1.47–1.88)		(1.93–2.56)		(1.34–1.76)		(1.25–1.86)		(1.37–1.74)		(1.13–1.42)		(1.34–1.69)	
	aPR,†	1.21	—	1.96	—	1.17	—	1.05	—	1.23	—	1.13	—	1.20	—
	95% CI	(1.06–1.37)		(1.69–2.27)		(1.02–1.34)		(0.84–1.31)		(1.08–1.39)		(1.01–1.26)		(1.05–1.37)	
Poor mental health during the COVID–19 pandemic	% Yes,	58.6	37.1	51.5	23.4	70.7	36.0	67.3	38.7	60.7	36.2	48.6	35.7	53.2	35.6
	95% CI	(52.7–64.5)	(33.7–40.4)	(47.8–55.3)	(19.9–26.8)	(65.9–75.6)	(32.7–39.4)	(55.8–78.8)	(35.3–42.1)	(54.7–66.7)	(33.2–39.3)	(43.5–53.6)	(32.5–38.8)	(48.9–57.6)	(32.3–38.8)
	aPR,*	1.47	—	1.87	—	1.48	—	1.47	—	1.41	—	1.28	—	1.45	—
	95% CI	(1.32–1.63)		(1.65–2.12)		(1.34–1.63)		(1.25–1.72)		(1.29–1.54)		(1.17–1.41)		(1.33–1.57)	
	aPR,†	1.11	—	1.68	—	1.19	—	1.07	—	1.15	—	1.17	—	1.20	—
	95% CI	(0.99–1.23)		(1.47–1.92)		(1.07–1.32)		(0.90–1.28)		(1.04–1.26)		(1.06–1.29)		(1.09–1.32)	
Persistent feelings of sadness or hopelessness during the past year	% Yes,	69.7	42.1	59.3	26.4	82.7	41.0	82.0	44.1	71.1	41.2	54.0	41.5	64.1	39.8
	95% CI	(64.3–75.2)	(38.8–45.4)	(55.5–63.0)	(23.3–29.4)	(78.1–87.3)	(37.7–44.3)	(72.9–91.2)	(40.7–47.6)	(67.2–75.0)	(37.7–44.7)	(49.1–58.8)	(38.1–44.9)	(59.7–68.5)	(36.2–43.3)
	aPR,*	1.48	—	1.94	—	1.58	—	1.57	—	1.50	—	1.21	—	1.47	—
	95% CI	(1.36–1.60)		(1.75–2.14)		(1.46–1.70)		(1.41–1.76)		(1.37–1.63)		(1.11–1.32)		(1.33–1.62)	
	aPR,†	1.09	—	1.73	—	1.24	—	1.11	—	1.20	—	1.09	—	1.22	—
	95% CI	(0.99–1.19)		(1.56–1.93)		(1.14–1.35)		(0.97–1.27)		(1.10–1.31)		(1.01–1.18)		(1.10–1.35)	
Suicidal behaviors															
Seriously considered suicide during the past year	% Yes,	42.2	18.3	30.7	7.9	53.6	17.3	56.9	19.9	41.7	17.8	25.6	19.0	33.7	17.3
	95% CI	(35.1–49.4)	(16.3–20.2)	(27.7–33.7)	(6.1–9.7)	(48.4–58.9)	(15.4–19.3)	(45.6–68.3)	(17.8–22.1)	(37.2–46.1)	(15.7–19.8)	(21.8–29.4)	(16.8–21.2)	(29.5–37.8)	(15.0–19.6)
	aPR,*	1.89	—	3.13	—	2.22	—	2.21	—	1.81	—	1.23	—	1.71	—
	95% CI	(1.62–2.22)		(2.54–3.87)		(1.92–2.56)		(1.79–2.73)		(1.62–2.03)		(1.05–1.44)		(1.45–2.01)	
	aPR,†	1.20	—	2.61	—	1.55	—	1.25	—	1.25	—	1.06	—	1.26	—
	95% CI	(1.04–1.39)		(2.06–3.29)		(1.33–1.81)		(1.02–1.53)		(1.11–1.41)		(0.92–1.23)		(1.07–1.50)	
Made a suicide plan during the past year	% Yes,	34.6	13.6	24.0	5.2	46.0	12.6	46.4	15.1	35.4	12.9	19.5	14.5	26.6	12.9
	95% CI	(27.7–41.5)	(12.0–15.2)	(21.0–27.0)	(3.8–6.7)	(39.6–52.4)	(11.1–14.2)	(34.2–58.6)	(13.3–16.9)	(30.7–40.1)	(11.2–14.7)	(16.4–22.6)	(12.0–16.9)	(22.8–30.4)	(10.9–14.9)
	aPR,*	2.04	—	3.62	—	2.59	—	2.34	—	2.14	—	1.20	—	1.74	—
	95% CI	(1.74–2.40)		(2.70–4.85)		(2.18–3.09)		(1.73–3.16)		(1.89–2.41)		(0.97–1.50)		(1.44–2.10)	
	aPR,†	1.24	—	2.89	—	1.75	—	1.18	—	1.41	—	1.02	—	1.24	—
	95% CI	(1.04–1.48)		(2.12–3.95)		(1.46–2.09)		(0.90–1.54)		(1.22–1.63)		(0.84–1.23)		(1.03–1.50)	
Attempted suicide during the past year	% Yes,	26.8	6.8	14.4	2.0	33.0	6.4	33.0	8.4	24.5	6.7	12.4	7.7	19.0	6.2
	95% CI	(21.7–32.0)	(5.5–8.1)	(12.0–16.7)	(1.3–2.7)	(27.0–39.0)	(5.3–7.5)	(22.3–43.6)	(6.9–9.8)	(20.2–28.9)	(5.5–7.9)	(9.1–15.6)	(6.3–9.0)	(15.9–22.1)	(4.9–7.5)
	aPR,*	2.97	—	5.42	—	3.44	—	2.81	—	2.60	—	1.45	—	2.56	—
	95% CI	(2.45–3.60)		(3.81–7.71)		(2.59–4.58)		(1.82–4.35)		(2.11–3.21)		(1.04–2.00)		(2.03–3.22)	
	aPR,†	1.57	—	3.62	—	2.02	—	1.11	—	1.49	—	1.10	—	1.60	—
	95% CI	(1.29–1.91)		(2.55–5.14)		(1.50–2.73)		(0.70–1.75)		(1.20–1.83)		(0.82–1.48)		(1.23–2.08)	

Abbreviation: aPR = adjusted prevalence ratio.
* Adjusted for sex, race and ethnicity, grade in school, sexual identity, and method of school instruction.
† Adjusted for sex, race and ethnicity, grade in school, sexual identity, method of school instruction, and all other types of adverse childhood experiences.

General ABES limitations have been documented previously[††] (1,4). The findings in this report are subject to five additional limitations. First, the cross-sectional nature of the data does not permit causal inferences in associations and might not account for all other factors affecting adolescent mental health or suicidal behaviors. Second, only seven ACEs were included in this analysis; inclusion of more ACEs[§§] might have altered the ACE score distribution and which ACEs were most associated with mental health or suicidal behaviors. Third, this analysis did not directly assess experiences of or the impact of the pandemic, and instead included ACEs that adolescents commonly experience, including during the pandemic. Fourth, data on lifetime childhood exposure to ACEs were not available and might exacerbate or alter effects on mental health and suicidal behaviors for exposed children. Finally, the prevalences of some ACEs (e.g., teen dating violence), when comparable data are available, were lower in ABES[¶¶] than 2019 Youth

[††] https://www.cdc.gov/healthyyouth/data/abes/reports.htm
[§§] https://www.cdc.gov/violenceprevention/aces/ace-brfss.html

[¶¶] https://www.cdc.gov/healthyyouth/data/abes/tables/summary.htm#UIV (Accessed August 2, 2022).

Risk Behavior Survey national estimates,*** possibly related to differences in methodology or behavior patterns during the COVID-19 pandemic. These differences could result in misclassification of ACEs exposure and have a potential impact on the strength of observed associations.

Concerns about poor adolescent mental health and suicidal behaviors preceded the COVID-19 pandemic (10) but escalated during the pandemic. For more than a decade, suicide has been the second or third leading cause of death among adolescents aged 14–18 years.††† This analysis highlights the ongoing, urgent need to address adversity experienced before and during the pandemic to mitigate its impact on mental and behavioral health. CDC's comprehensive approach to ACEs prevention and intervention emphasizes actions to create the structural and social environments that help children and families thrive, including bolstering family economic supports, supporting a strong start for children, and connecting youth and parents to community- and school-based resources§§§,¶¶¶ (5). Comprehensive, cross-sector approaches, partnerships, and policies focused on primary ACE****,†††† and suicide§§§§ prevention and intervention, including those focusing on early identification, linkage to care,¶¶¶¶ and access to trauma-informed services and supports, are necessary to improve adolescent mental and behavioral health.

*** https://nccd.cdc.gov/youthonline/App/Default.aspx (Accessed August 2, 2022).
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Summary

What is already known about this topic?

Adverse childhood experiences (ACEs) are associated with poor mental health and suicidal behaviors.

What is added by this report?

The prevalences of poor current mental health and past-year suicide attempts among adolescents reporting four or more ACEs during the COVID-19 pandemic were four and 25 times as high as those without ACEs, respectively. Exposure to specific ACE types (e.g., emotional abuse) were associated with higher prevalences of poor mental health and suicidal behaviors.

What are the implications for public health practice?

Primary prevention and intervention strategies for ACEs and their acute and long-term impacts, including early identification and trauma-informed mental health service and support provision, could help address the U.S. child and adolescent mental health and suicide crisis.

Notes from the Field

Harmful Algal Bloom Affecting Private Drinking Water Intakes — Clear Lake, California, June–November 2021

Gina M. Solomon, MD[1,2]; Beckye Stanton, PhD[3]; Sarah Ryan[4]; Amy Little, MS[5]; Catherine Carpenter, MAS[6]; Susan Paulukonis, MA, MPH[6]

During June–November 2021, multiple cyanobacteria harmful algal blooms (HABs) occurred in Clear Lake, the largest freshwater body of water located entirely within the state of California. During this period, measured chemical concentrations of microcystins (a class of cyanotoxins produced by cyanobacteria) in the water of the Lower and Oaks arms of Clear Lake were persistently above the California recreational "Danger" health advisory level of 20 μg/L (1). A maximum microcystin detection of 160,378 μg/L was measured at a beach in the city of Clearlake in September 2021 (2). Microcystins are potent hepatotoxins and can cause gastroenteritis, dermatitis, and allergic reactions (3). The 17 local public drinking water systems with source lake water intakes in Clear Lake monitored and managed their systems with frequent testing, adjustment of treatment, and other measures to ensure that microcystins in finished drinking water did not exceed the Environmental Protection Agency (EPA) drinking water health advisory of 0.3 μg/L (4). However, an unknown number of homes around Clear Lake relied on private water systems with lake water intakes or wells, and the quality of the private drinking water at those homes was unknown.

To address this uncertainty, the California Water: Assessment of Toxins for Community Health (Cal-WATCH) project collected and analyzed tap water samples for cyanotoxins from households with private lake water intakes and private wells located ≤50 ft (15.2 m) of the lake. To identify potentially eligible homes, parcel maps of lakefront land were overlaid with built structure and water system boundary maps of all 17 local public drinking water systems. Staff members from the Big Valley Rancheria Environmental Protection Department visually inspected the shoreline by boat to identify potential lake water intakes. A total of 493 parcels with structures that were not within the boundary of any public water system or that had a visible lake water intake were identified. Outreach to homeowners included postcards, door hangers, and knocking on doors. Broader community outreach was also conducted via social media and local earned media. This study was reviewed and approved by the Public Health Institute Institutional Review Board.*

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

Forty-six eligible homeowners enrolled in the study, and study staff members collected questionnaires and at least one water sample from each home during June to November 2021. Microcystins were not detected in the tap water of any homes with near-shore wells; however, several water samples had cyanobacteria visible on microscopy, potentially indicating lake water intrusion. Six out of the 15 well owners did not have filtration systems. In contrast, microcystins were detected in the tap water of 22 of the 31 homes with lake water intakes (Supplementary Figure, https://stacks.cdc.gov/view/cdc/121659). In 18 of these homes, the level of microsystin concentration was at or above the EPA drinking water health advisory level of 0.3 μg/L (maximum = 3.9 μg/L). All 31 private lake water intakes had some type of filtration; of these, 27 also had one or more forms of prefiltration treatment, including chlorination, ultraviolet disinfection, or ozone treatment (Table). Chlorination or other treatment could lyse cyanobacteria cells, releasing cyanotoxins. Although the sampling team did not inspect the treatment systems, homeowners mentioned difficulties with setup and ongoing maintenance and testing; even well-maintained systems might have been overwhelmed by the high concentrations of microcystins in the source water.

On September 15, 2021, based on the Cal-WATCH findings and the increasing severity of HABs in the lake, the local health officer issued an emergency "Do Not Drink" advisory for private lake water drinking systems.† State, local, and tribal governments coordinated with nearby public water systems to provide free drinking water filling stations for the affected population. The local health officer lifted the advisory on November 16, 2021, when levels of microcystins in most lake water samples had declined below "Danger" advisory levels.§ Residents were advised to flush their systems, have them professionally inspected, and have filters changed before any household use; drinking water fill stations remained open.

The frequency of HABs in drinking water sources might increase because of climate change.¶ During a freshwater HAB event, households with private lake water intakes are at high risk of cyanotoxin contamination. Frequent monitoring for early detection of HABs, partnerships across agencies for public health response, emergency alerts, and provision of alternative drinking water are short-term solutions. Longer-term solutions include transitioning homes to public water systems and

† http://www.lakecountyca.gov/Government/PressReleases/TapWater091621.htm
§ http://www.lakecountyca.gov/Government/PressReleases/11172021.htm
¶ https://www.epa.gov/nutrientpollution/climate-change-and-harmful-algal-blooms

TABLE. Drinking water sampling results, by private water source and treatment system — Clear Lake, California, 2021

Private water source/Treatment system	No.*	Result, no.	
		Microcystin detected[†]	Microcystin ≥0.3 μg/L
Lake water intake			
Chlorination and filtration	20	11[§]	9
Chlorination, filtration, and ultraviolet disinfection	3	3	2
Chlorination, filtration, and ozone treatment	1	1	1
Filtration only	4	4	4
Filtration and ultraviolet disinfection	2	2	1
Filtration and ozone treatment	1	1	1
Total	**31**	**22**	**18**
Well			
Chlorination and filtration	6	0	0
Filtration and ultraviolet disinfection	1	0	0
Filtration, ultraviolet disinfection, and ozone treatment	1	0	0
Filtration only	1	0	0
None	6	0	0
Total	**15**	**0**	**0**

* Water was sampled multiple times at several homes. For those homes, the highest result was used.
† Limit of detection for most assays was 0.1 μg/L.
§ Does not include one value from a lake water intake system with chlorination and filtration that was listed as "detected not quantifiable."

ongoing public education about HABs. Research into other strategies to mitigate HABs, including reduction of nutrient runoff, revegetation of shorelines, and aeration, might offer additional long-term prevention opportunities (5).

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Notes from the Field

Antihistamine Positivity and Involvement in Drug Overdose Deaths — 44 Jurisdictions, United States, 2019–2020

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Antihistamines are frequently used to treat allergy symptoms (1). Misuse of antihistamines has been documented primarily in adolescents and young adults (2); however, antihistamine involvement in overdose deaths has not been widely studied. Among the various antihistamine subtypes, the first-generation H1 subtype can cause anticholinergic effects, including strong sedation (3) that might be exacerbated when co-used with other sedative drugs (e.g., opioids).* Diphenhydramine, a common over-the-counter first-generation H1 antihistamine, has been combined with opioids as an adulterant† in illicit drug supply (4) and can be used to reduce opioid-related side effects (e.g., itchy skin because of histamine release from opioid use).

To describe unintentional and undetermined intent overdose deaths with antihistamine positivity, involvement, or both, CDC analyzed available 2019–2020 data from the State Unintentional Drug Overdose Reporting System (SUDORS) in 43 states and the District of Columbia.§,¶ A death was defined as antihistamine-positive if any antihistamine was detected on postmortem toxicology or was listed as a cause of death on the death certificate.** A death was defined as antihistamine-involved if the drug class was listed as a cause of death on the death certificate (i.e., antihistamine-involved is a subset of antihistamine-positive). Descriptive data for deaths are presented by sex, age, race and ethnicity, U.S. Census Bureau region,†† and other drugs involved. Analyses were restricted to decedents for whom postmortem toxicology results were available.§§

Among 92,033 overdose deaths during 2019–2020, 13,574 (14.7%) were antihistamine-positive and 3,345 (3.6%) were antihistamine-involved; fewer than 0.1% (90) involved antihistamines alone (Table). Nearly all antihistamine-positive and -involved deaths (13,475, 99.6%; 3,339, 99.8%, respectively) included first-generation H1 antihistamines, primarily diphenhydramine (9,645, 71.1%; 2,226, 66.5%, respectively). The proportions of antihistamine- and diphenhydramine-involved overdose deaths were highest for females (52.0%; 52.8%), persons aged 35–44 years (26.1%; 26.5%), and White, non-Hispanic persons (78.1%; 78.7%); demographic patterns of antihistamine- and diphenhydramine-positive deaths were similar, except that deaths were more frequent among males (57.8%; 59.6%) and in the Midwest region (43.6%; 51.0%). Most antihistamine- and diphenhydramine-involved overdose deaths co-involved opioids (82.8% and 82.7%, respectively), primarily illicitly manufactured fentanyls (IMFs)¶¶ (5).

Nearly 15% of overdose deaths during 2019–2020 were antihistamine-positive, and 4% were antihistamine-involved;

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* https://www.elsevier.com/books/a-manual-of-adverse-drug-interactions/griffin/978-0-444-82406-6

† Adulterants are substances mixed with illicit drugs to lengthen the lifespan of the resulting product. Adulterants are pharmacologically active ingredients (e.g., caffeine and phenacetin).

§ SUDORS captures data on fatal unintentional and undetermined intent overdoses. For all captured overdose deaths, SUDORS records all drugs detected by postmortem toxicology, even those not ruled by a medical examiner or coroner as causing death. The medical examiner or coroner lists drugs on the death certificate based on any of the following: postmortem toxicology detection, evidence of drug use at the scene, or witness reports of drug use.

¶ Among 48 funded jurisdictions, 43 states and District of Columbia (DC) reported data during January 2019–December 2020. Twenty-six jurisdictions reported deaths during the entire period: Alaska, Connecticut, Delaware, DC, Georgia, Illinois, Kentucky, Maine, Massachusetts, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia, Washington, and West Virginia. Eighteen additional jurisdictions reported deaths during at least one 6-month period during January 2019–December 2020 (i.e., January–June 2019, July–December 2019, January–June 2020, or July–December 2020): Alabama, Arizona, Arkansas, Colorado, Florida, Hawaii, Indiana, Iowa, Kansas, Louisiana, Maryland, Michigan, Mississippi, Montana, Nebraska, Oregon, South Dakota, and Wisconsin. Fifteen jurisdictions reported deaths from counties that accounted for ≥75% of drug overdose deaths in the state in 2017 for at least one 6-month period per SUDORS funding requirements (Alabama, Arkansas, Colorado, Florida, Hawaii, Illinois, Indiana, Louisiana, Michigan, Missouri, Nebraska, Pennsylvania, South Dakota, Washington, and Wisconsin); all other jurisdictions reported deaths from the full jurisdiction. Data were current as of April 25, 2022.

** Drug entries coded as antihistamines in SUDORS were allergy, allergy relief, antihistamines, Atarax, Benadryl, brompheniramine, carbinoxamine, cetirizine or cetirizine metabolite, chlorcyclizine or chlorcyclizine metabolite, chlorpheniramine or chlorpheniramine metabolite, cyproheptadine or cyproheptadine metabolite, desalkylhydroxyzine, descarboethoxyloratadine, desloratadine, dexbrompheniramine, dexchlorpheniramine, diphenhydramine or diphenhydramine metabolite, doxylamine or doxylamine metabolite, fexofenadine, hydroxyzine or hydroxyzine metabolite, hydroxyzine/cetirizine/meclizine (not distinguished) metabolite, levocetirizine, loratadine, mereprine, norchlorcyclizine, norcyproheptadine, nordiphenhydramine, norhydroxyzine norpromethazine, Nytol, phenergan, pheniramine, phenyltoloxamine, promethazine or promethazine metabolite, pyrilamine, tripelennamine, triprolidine, Unisom, Vistaril, and Zyrtec.

†† https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

§§ Ninety-three percent of all SUDORS decedents in the 44 included jurisdictions had a toxicology report. Per SUDORS funding requirements, in a given 6-month period, ≥75% of SUDORS decedents in each individual jurisdiction had a toxicology report; 35 jurisdictions had toxicology reports for ≥90% of decedents in their jurisdiction in all included 6-month periods.

¶¶ IMFs include illicitly manufactured fentanyl and illicit fentanyl analogs, which were identified using both toxicology and scene evidence because toxicology alone cannot distinguish between pharmaceutical fentanyl and IMFs.

TABLE. Characteristics of overdose decedents with antihistamine*-positive or -involved results† — State Unintentional Drug Overdose Reporting System, 44 Jurisdictions,§ United States, 2019–2020

Characteristic	Classification of deaths, no. (%)			
	Antihistamine-positive (n = 13,574)	Antihistamine-involved (n = 3,345)	Diphenhydramine-positive (n = 9,645)	Diphenhydramine-involved (n = 2,226)
Sex				
Male	7,842 (57.8)	1,605 (48.0)	5,745 (59.6)	1,050 (47.2)
Female	5,732 (42.2)	1,740 (52.0)	3,900 (40.4)	1,176 (52.8)
Age group, yrs¶				
<18	46 (0.3)	21 (0.6)	26 (0.3)	13 (0.6)
18–24	736 (5.4)	179 (5.4)	498 (5.2)	110 (4.9)
25–34	3,056 (22.5)	685 (20.5)	2,155 (22.3)	422 (19.0)
35–44	3,538 (26.1)	874 (26.1)	2,502 (25.9)	591 (26.5)
45–54	3,151 (23.2)	781 (23.3)	2,219 (23.0)	539 (24.2)
55–64	2,450 (18.1)	637 (19.0)	1,776 (18.4)	427 (19.2)
≥65	596 (4.4)	168 (5.0)	468 (4.9)	124 (5.6)
Race and ethnicity				
White, non-Hispanic	9,513 (70.6)	2,589 (78.1)	6,613 (69.0)	1,732 (78.7)
Black, non-Hispanic	2,822 (20.9)	400 (12.1)	2,200 (23.0)	274 (12.4)
Other or multi-race, non-Hispanic**	289 (2.1)	81 (2.4)	179 (1.9)	53 (2.4)
Hispanic	859 (6.4)	244 (7.4)	587 (6.1)	143 (6.5)
Unknown or missing	91	31	66	24
U.S. Census Bureau region††				
Northeast	2,439 (18.0)	930 (27.8)	1,487 (15.4)	597 (26.8)
Midwest	5,921 (43.6)	894 (26.7)	4,916 (51.0)	662 (29.7)
South	3,952 (29.1)	909 (27.2)	2,555 (26.5)	596 (26.8)
West	1,262 (9.3)	612 (18.3)	687 (7.1)	371 (16.7)
Co-involved drugs (listed as a cause of death)§§,¶¶				
Opioids	11,867 (87.4)	2,771 (82.8)	8,570 (88.9)	1,841 (82.7)
IMFs ***	9,307 (68.6)	1,735 (51.9)	7,012 (72.7)	1,190 (53.5)
Non-IMF opioids	2,560 (18.9)	1,036 (31.0)	1,558 (16.2)	651 (29.2)
Heroin†††	3,242 (23.9)	587 (17.5)	2,491 (25.8)	395 (17.7)
Prescription opioids§§§	3,676 (27.1)	1,410 (42.2)	2,432 (25.2)	937 (42.1)
Cocaine	3,221 (23.7)	555 (16.6)	2,282 (23.7)	378 (17.0)
Methamphetamine	1,815 (13.4)	365 (10.9)	1,198 (12.4)	235 (10.6)
Benzodiazepines	2,703 (19.9)	1,152 (34.4)	1,786 (18.5)	739 (33.2)
Alcohol	2,044 (15.1)	603 (18.0)	1,484 (15.4)	411 (18.5)
Gabapentin	1,189 (8.8)	642 (19.2)	732 (7.6)	385 (17.3)
No other drug¶¶¶	27 (0.2)	90 (2.7)	23 (0.2)	71 (3.2)

See table footnotes on the next page.

only 90 deaths involved antihistamines as the sole drug. Most antihistamine-positive and antihistamine-involved deaths included diphenhydramine, which is easily accessible over the counter as an allergy medication and sleep aid. Antihistamine-involved deaths commonly co-involved opioids; this might be partly attributable to adulteration of the illicit opioid supply with antihistamines, in particular diphenhydramine, which can be dangerous because of potentially combined sedative effects. Naloxone administration is important for any overdose with suspected opioid involvement. Because antihistamines do not respond to naloxone, co-involved opioid and antihistamine overdoses might require naloxone administration plus other immediate medical response measures to prevent death.

The findings in this report are subject to at least two limitations. First, results included 44 jurisdictions and might not be nationally representative. Second, drug testing methods are not standardized across jurisdictions, which might limit interpretation of results. Antihistamine-positivity could reflect use to treat allergy or other symptoms rather than misuse. It is also possible that some persons did not knowingly consume antihistamines and were exposed to these drugs through adulteration of the illicit drug supply with antihistamines. Despite these limitations, these data highlight the importance of continued surveillance to understand the drugs and drug combinations contributing to overdose deaths and to guide awareness efforts about the potential dangers of the unpredictable illicit drug supply and the intentional or unintentional co-use of substances, including antihistamines and opioids.

TABLE. (*Continued*) Characteristics of overdose decedents with antihistamine*-positive or -involved results[†] — State Unintentional Drug Overdose Reporting System, 44 Jurisdictions,[§] United States, 2019–2020

Abbreviations: IMFs = illicitly manufactured fentanyls; SUDORS = State Unintentional Drug Overdose Reporting System.

 * Drug entries coded as antihistamines in SUDORS were allergy, allergy relief, antihistamines, Atarax, Benadryl, brompheniramine, carbinoxamine, cetirizine or cetirizine metabolite, chlorcyclizine or chlorcyclizine metabolite, chlorpheniramine or chlorpheniramine metabolite, cyproheptadine or cyproheptadine metabolite, desalkylhydroxyzine, descarboethoxyloratadine, desloratadine, dexbrompheniramine, dexchlorpheniramine, diphenhydramine or diphenhydramine metabolite, doxylamine or doxylamine metabolite, fexofenadine, hydroxyzine or hydroxyzine metabolite, hydroxyzine/cetirizine/meclizine (not distinguished) metabolite, levocetirizine, loratadine, mereprine, norchlorcyclizine, norcyproheptadine, nordiphenhydramine, norhydroxyzine norpromethazine, Nytol, phenergan, pheniramine, phenyltoloxamine, promethazine or promethazine metabolite, pyrilamine, tripelennamine, triprolidine, Unisom, Vistaril, and Zyrtec.

 [†] SUDORS captures data on fatal unintentional and undetermined intent overdoses. For all captured overdose deaths, SUDORS records all drugs detected by postmortem toxicology, even those not ruled by a medical examiner or coroner as causing death. A drug was recorded as positive when it was detected on postmortem toxicology or listed as a cause of death on the death certificate. A drug was recorded as involved when it was listed as a cause of death on the death certificate. The medical examiner or coroner lists drugs on the death certificate based on any of the following: postmortem toxicology detection, evidence of drug use at the scene, or witness reports of drug use.

 [§] Among 48 funded jurisdictions, 43 states and the District of Columbia reported data during January 2019–December 2020. Twenty-six jurisdictions reported deaths that occurred during the entire period: Alaska, Connecticut, Delaware, District of Columbia, Georgia, Illinois, Kentucky, Maine, Massachusetts, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia, Washington, and West Virginia. Eighteen additional jurisdictions reported deaths during at least one 6-month period during January 2019–December 2020 (i.e., January–June 2019, July–December 2019, January–June 2020, or July–December 2020): Alabama, Arizona, Arkansas, Colorado, Florida, Hawaii, Indiana, Iowa, Kansas, Louisiana, Maryland, Michigan, Mississippi, Montana, Nebraska, Oregon, South Dakota, and Wisconsin. Fifteen jurisdictions reported deaths from counties that accounted for ≥75% of drug overdose deaths in the state in 2017 for at least one 6-month period per SUDORS funding requirements (Alabama, Arkansas, Colorado, Florida, Hawaii, Illinois, Indiana, Louisiana, Michigan, Missouri, Nebraska, Pennsylvania, South Dakota, Washington, and Wisconsin); all other jurisdictions reported deaths from the full jurisdiction. Data were current as of April 25, 2022.

 [¶] Age data were missing for one decedent.

 ** Includes non-Hispanic American Indian or Alaska Native, non-Hispanic Asian or Pacific Islander, or non-Hispanic multiracial persons.

 [††] https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

 [§§] Identified as a cause of death by a medical examiner or coroner.

 [¶¶] Multiple drugs could be listed as a cause of death; therefore, drugs are not mutually exclusive.

 *** IMFs include illicitly manufactured fentanyl and illicit fentanyl analogs, which were identified using both toxicology and scene evidence because toxicology alone cannot distinguish between pharmaceutical fentanyl and IMFs.

 [†††] Drug entries coded as heroin in SUDORS were heroin and 6-acetylmorphine. In addition, morphine was coded as heroin if detected along with 6-acetylmorphine or if scene, toxicology, or witness evidence indicated presence of known heroin adulterants or impurities (including quinine, procaine, xylazine, noscapine, papaverine, the thebaine, or acetylcodeine), injection, illicit drug use, or a history of heroin use.

 [§§§] Drug entries coded as prescription opioids in SUDORS were alfentanil, buprenorphine, butorphanol, codeine, dextrorphan, dihydrocodeine, hydrocodone, hydromorphone, levorphanol, loperamide, meperidine, methadone, morphine, nalbuphine, noscapine, oxycodone, oxymorphone, pentazocine, prescription fentanyl, propoxyphene, sufentanil, tapentadol, and tramadol. Also included as prescription opioids were brand names and metabolites (e.g., nortramadol) of these drugs and combinations of these drugs and nonopioids (e.g., acetaminophen-oxycodone). Morphine was included as prescription only if scene or witness evidence did not indicate likely heroin use and if 6-acetylmorphine was not also detected. Fentanyl was coded as a prescription opioid based on scene, toxicology, or witness evidence.

 [¶¶¶] Includes antihistamine-positive deaths with antihistamines as only drug positive, antihistamine-involved deaths with antihistamines as only drug involved, diphenhydramine-positive deaths with diphenhydramine as only drug positive, and diphenhydramine-involved deaths with diphenhydramine as only drug involved.

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QuickStats

Age-Adjusted Death Rates* from Stroke† Among Adults Aged ≥65 Years, by Race and Hispanic Origin — National Vital Statistics System, United States, 2000–2020
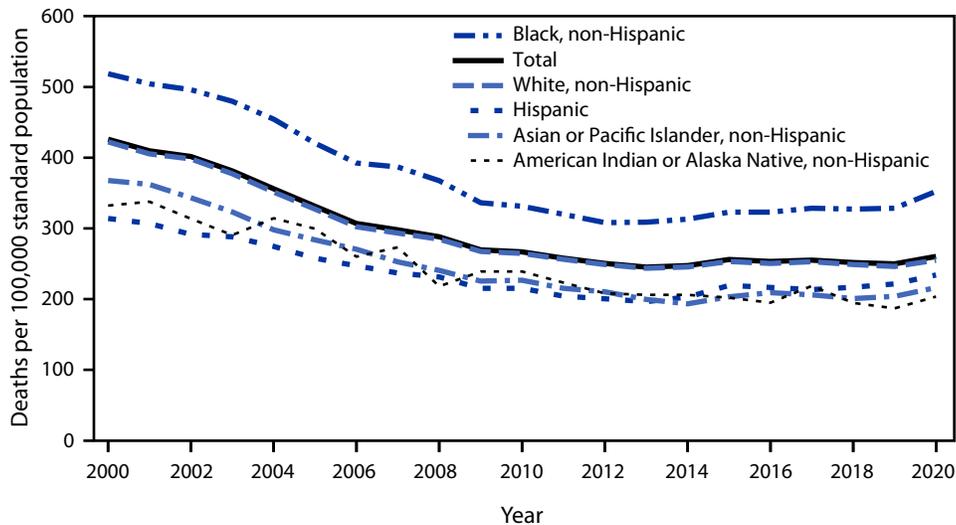
* Age-adjusted death rates are deaths per 100,000 population, adjusted to the 2000 U.S. standard population.
† Stroke deaths were identified using the *International Classification of Diseases, Tenth Revision* underlying cause-of-death codes I60-I69 (cerebrovascular diseases).

Age-adjusted death rates from stroke among adults aged ≥65 years generally declined from 425.9 deaths per 100,000 standard population in 2000 to 250.0 in 2019 before increasing to 260.5 in 2020. During 2019–2020, stroke death rates increased for Hispanic adults (from 221.6 to 234.0), non-Hispanic Asian or Pacific Islander adults (from 203.9 to 216.4), non-Hispanic Black adults (from 328.4 to 352.2), and non-Hispanic White adults (from 246.2 to 255.0); changes for non-Hispanic American Indian or Alaska Native adults were not significant. Throughout the 2000–2020 period, death rates for non-Hispanic Black adults were higher than those for adults in other race and Hispanic origin groups.

Source: National Vital Statistics System, Mortality Data. https://www.cdc.gov/nchs/nvss/deaths.htm

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