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Infant Homicides Within the Context of Safe Haven Laws — United States, 2008–2017

Rebecca F. Wilson, PhD[1]; Joanne Klevens, MD, PhD[1]; Dionne Williams, MPS[2]; Likang Xu, MD[2]

Homicide is the 13th leading cause of death among infants (i.e., children aged <1 year) in the United States (*1*). Infant homicides occurring within the first 24 hours of life (i.e., neonaticide) are primarily perpetrated by the mother, who might be of young age, unmarried, have lower educational attainment, and is most likely associated with concealment of an unintended pregnancy and nonhospital birthing (*2*). After the first day of life, infant homicides might be associated with other factors (e.g., child abuse and neglect or caregiver frustration) (*2*). A 2002 study of the age variation in homicide risk in U.S. infants during 1989–1998 found that the overall infant homicide rate was 8.3 per 100,000 person-years, and on the first day of life was 222.2 per 100,000 person-years, a homicide rate at least 10 times greater than that for any other time of life (*3*). Because of this period of heightened risk, by 2008 all 50 states* and Puerto Rico had enacted Safe Haven Laws. These laws allow a parent† to legally surrender an infant who might otherwise be abandoned or endangered (*4*). CDC analyzed infant homicides in the United States during 2008–2017 to determine whether rates changed after nationwide implementation of Safe Haven Laws, and to examine the association between infant homicide rates and state-specific Safe Haven age limits. During 2008–2017, the overall infant homicide rate was 7.2 per 100,000 person-years, and on the first day of life was 74.0 per 100,000 person-years, representing a 66.7% decrease from 1989–1998. However, the homicide rate on first day of life was still 5.4 times higher than that for any other time in life. No obvious association was found between infant homicide rates and Safe Haven age limits. States are encouraged to evaluate the effectiveness of their Safe Haven Laws and other prevention strategies to ensure they are achieving the intended

* The District of Columbia did not enact Safe Haven Laws until 2009.

† Per the information contained in state Safe Haven Laws through December 2016, the specifics about who may legally surrender an infant under Safe Haven Laws vary by state. For example, in most states, either parent of the infant may legally surrender the infant to a safe haven. However, some states only allow the mother to surrender an infant to a safe haven, while other states allow a representative of the parent (person who has permission by the parent) to legally relinquish an infant to a safe haven. Other states specify who may legally surrender an infant under Safe Haven Laws in their state-specific statutes. https://www.childwelfare.gov/pubpdfs/safehaven.pdf.

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benefits of preventing infant homicides. Programs and policies that strengthen economic supports, provide affordable child-care, and enhance and improve skills for young parents might contribute to the prevention of infant homicides.

Since 1999, when Texas became the first state to implement Safe Haven Laws, an estimated 4,100 infants have been safely surrendered nationwide (*5*). Safe Haven Laws are applied differently in each state, and one notable difference is the age limit of legal relinquishment (*4*). For example, 11 states and Puerto Rico limit relinquishment to infants who are aged ≤3 days, whereas 19 states allow relinquishment up to age 1 month (*4*). North Dakota allows relinquishment of infants aged <1 year (*4*).

Data for this analysis come from the National Vital Statistics System,[§] which includes a linked birth and death certificate for >99% of infants who die in the United States. Birth certificates provided demographic characteristics present at birth (e.g., mother's age). Death certificates indicated both an underlying cause and manner of death, which the medical examiner or coroner is primarily responsible for certifying. Infant homicide was defined as the death of a child before the first birthday, using the *International Classification of Diseases, Tenth Revision* (ICD-10) underlying cause of death codes X85–Y09, Y87.1, U01, and U02.[¶] Age at death was calculated as the difference in days between the dates of birth and death recorded on the death certificate; an infant killed on their date of birth had an age at death of 0 days. To examine the association between homicide rates and state-specific Safe Haven age limits for legal relinquishment, infant homicides were categorized using age limits specified in state Safe Haven Laws as of 2016[**] (*4*). These age limits were treated as stable and applied throughout the entire study period. Data years 2008–2017 were used to coincide with national enactment and implementation of Safe Haven Laws. Homicide rates were presented as rates per person-years of exposure, which allowed for the calculation of homicide risk by age of infant, because infant homicides occurred at different times during infancy (e.g., day of birth, week one).[††]

During 2008–2017, the U.S. population aged <1 year accounted for 39,984,337 person-years of exposure; days of birth accounted for 109,471 person-years (0.27%). The remainder of infancy accounted for 39,874,866 person-years. An estimated 2,851 infants were victims of homicide during 2008–2017

[§] Source: restricted-use National Vital Statistics System, linked birth and infant death data.

[¶] ICD-10 codes U01 and U02 are codes for terrorism only used in the United States and are not a part of the ICD-10 underlying cause codes.

[**] This report used age limits of legal relinquishment specified in state-specific Safe Haven Laws as of December 2016. Any changes made to state-specific Safe Haven age limits after December 2016 are not accounted for in this report.

[††] Homicide rates for infants (i.e., children aged <1 year) are commonly reported per 1,000 live births over a specified period, but alternatively, they can be reported per person-years. In this study, because actual time at risk for homicide is the outcome of interest, and infant homicides occurred during different times of infancy (e.g., day of birth, week one, week two, etc.), presenting rates in person-years allows for the calculation of homicide risk by week during infancy and by day during the first week of life.

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(Table 1). The overall infant homicide rate was 7.2 per 100,000 person-years. The homicide rate of infants killed on the day of birth was 74.0 per 100,000 person-years, which was 5.4 times higher than the rate at any other time of life (Supplementary Table, https://stacks.cdc.gov/view/cdc/93750).

The rate among males (8.0), who accounted for 57.4% of infant homicides, was slightly higher than that among females (6.2) (Table 1). Infants of non-Hispanic White (White) mothers accounted for 62.1% of homicides; however, rates among infants of non-Hispanic Black (Black) mothers (14.4), and non-Hispanic American Indian/Alaska Native (AI/AN) mothers (14.9) were more than twice the rate among infants of White mothers (5.9). Infants of Asian/Pacific Islander mothers had the lowest homicide rate (3.1). In addition, although infants of mothers aged 20–29 years accounted for almost two thirds (65.2%) of infant homicides, the rate among infants of mothers aged <20 years (18.7) was more than twice that among infants of mothers aged 20–29 years (9.1) and more than seven times that among infants of mothers aged ≥30 years (2.6).

Overall, 75.0% of infant homicide victims were born to unmarried mothers; the homicide rate among these infants (13.4) was approximately 4.5 times the rate per 100,000 person-years among infants born to married mothers (3.0). Nearly all infant homicide victims were born at a hospital (95.8%); however, among the small percentage who were born at a residence (2.9%) or another location (0.7%), the homicide rates (23.7 and 66.9) were approximately 3.4 and 9.6 times the rate among infants born at a hospital. Moreover, in the

TABLE 1. Number,* percentage,† and rate§ of infant homicides (N = 2,851), by demographic characteristics — restricted-use National Vital Statistics System linked birth and infant death data, United States,¶ 2008–2017

Characteristic	No. (%) of homicides†	Rate§ (95% CI)	p-value
Age of infant			
All aged <1 year**	2,851	7.2 (6.9-7.4)	N/A
First day of life	81 (2.8)	74.0 (58.8-92.0)	N/A
Sex of infant			
Male	1,636 (57.4)	8.0 (7.6-8.4)	<0.001
Female	1,215 (42.6)	6.2 (5.9-6.6)	Referent
Mother's age group (yrs)			
<20	565 (19.8)	18.7 (17.1-20.2)	<0.001
20–29	1,860 (65.2)	9.1 (8.7-9.5)	<0.001
≥30	426 (14.9)	2.6 (2.3-2.8)	Referent
Mother's race/ethnicity††			
White, non-Hispanic	1,771 (62.1)	5.9 (5.6-6.1)	Referent
Black, non-Hispanic	929 (32.6)	14.4 (13.5-15.4)	<0.001
AI/AN, non-Hispanic	68 (2.4)	14.9 (11.6-18.9)	<0.001
Asian/Pacific Islander, non-Hispanic	83 (2.9)	3.1 (2.4-3.8)	<0.001
Mother's marital status			
Married	705 (24.7)	3.0 (2.8-3.2)	Referent
Unmarried	2,137 (75.0)	13.4 (12.8-14.0)	<0.001
Unknown	9 (0.3)	—	—
Mother's highest educational level			
Less than HS	698 (24.5)	12.2 (11.3-13.1)	Referent
HS or GED certificate	939 (32.9)	10.8 (10.1-11.5)	0.016
Some college, no degree	504 (17.7)	7.1 (6.5-7.7)	<0.001
Associate or bachelors' degree	193 (6.8)	2.1 (1.8-2.4)	<0.001
Graduate degree	37 (1.3)	1.0 (0.7-1.4)	<0.001
Unknown	480 (16.8)	—	
Infant's place of birth			
Hospital	2,730 (95.8)	7.0 (6.7-7.2)	Referent
Freestanding birth center	5 (0.2)	—	—
Residence	82 (2.9)	23.7 (18.9-29.5)	<0.001
Other location	20 (0.7)	66.9 (40.9-103.3)	<0.001
Unknown	14 (0.5)	—	—

Abbreviations: AI/AN = American Indian/Alaska Native; CI = confidence interval; GED = General Education Development; HS = high school; N/A = not applicable.

* During 2008–2017, approximately 2,919 infants were victims of homicide (https://webappa.cdc.gov/sasweb/ncipc/mortrate.html). Because this study used restricted-use National Vital Statistics System linked birth and infant death data, 68 infant homicides were excluded because the corresponding birth and death certificates could not be linked.

† Percentages might not sum to 100% because of rounding.

§ Number of deaths per 100,000 person-years. Rates are not reported for subgroups in which the number of infant homicides is <20 or response is unknown.

¶ Infant homicides for Puerto Rico were not available for this analysis.

** Includes infants who died on first day of life.

†† Mother's race/ethnicity is the best measure of race/ethnicity of the infant; thus, infant race/ethnicity is based on mother's race/ethnicity as reported on the infant's birth certificate.

2,371 cases where the mother's education level was reported (83.2% of all infant homicides), homicide rates were higher among infants of mothers with lower education levels (less than high school, 12.2; high school graduation or equivalent, 10.8) than among infants whose mothers had higher education levels (1.0–7.1).

The percentage of homicides occurring each week of infancy varied (Figure). The first peak occurred in the first week of life, when 3.9% of all homicides occurred. A second peak occurred at week 11. Among the 111 infant homicides that occurred during the first week of life during 2008–2017, 73.0% occurred within the first 24 hours of life, and approximately two thirds of those infants (65.4%) were born at a residence.

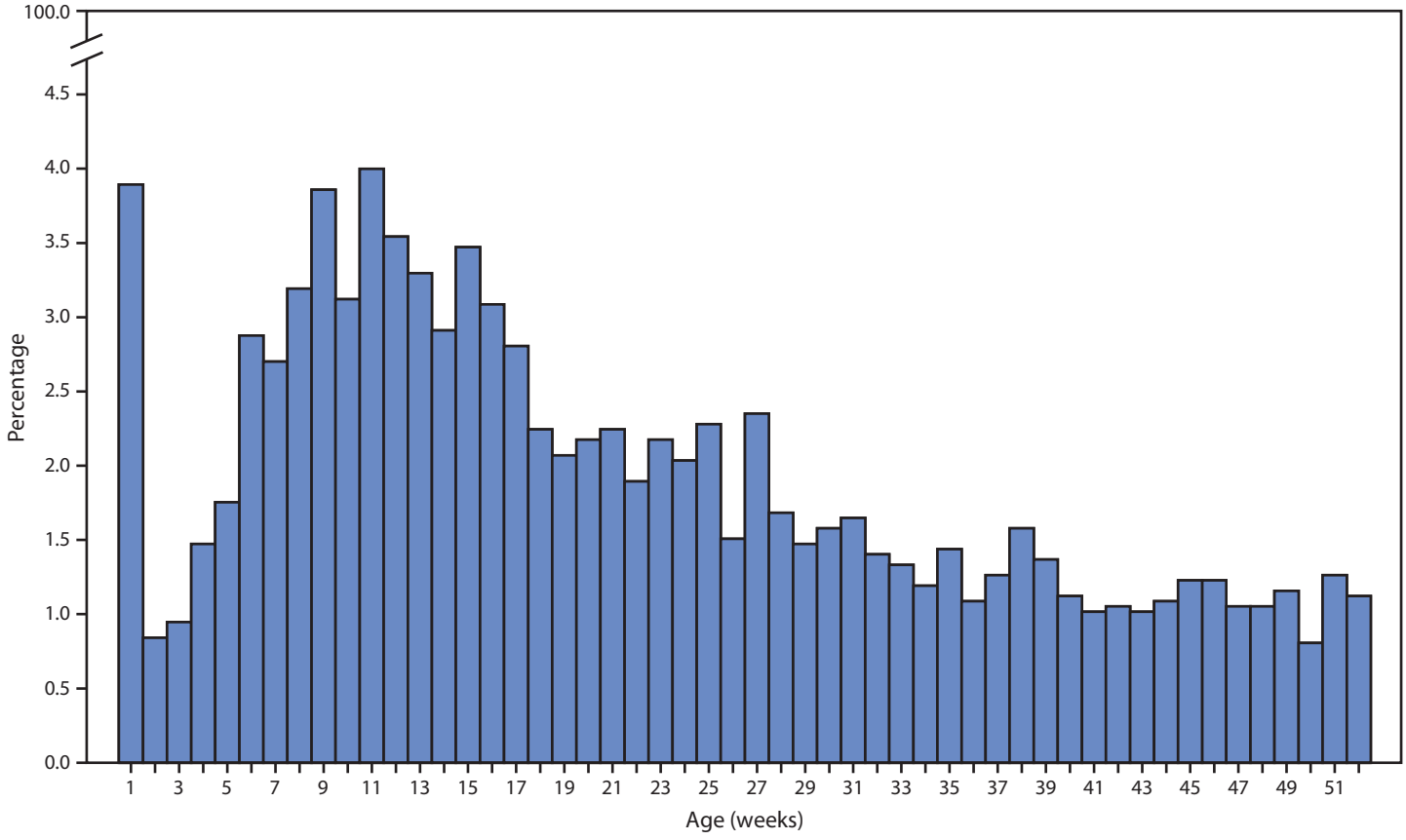
Most (92.4%) homicides occurred among infants who were too old for Safe Haven relinquishment at the time of their deaths; however, there was no obvious association between infant homicide rates and Safe Haven age limits (Table 2). For example, the infant homicide rates in states that limit relinquishment to ≤7 days and ≤14 days were 7.0 and 9.4 per 100,000 person-years, respectively. Conversely, the infant homicide rate for states that limit relinquishment to ≤45 days compared with ≤60 days was 10.6 and 7.3, respectively.

Discussion

In this study, the overall infant homicide rate (7.2 per 100,000 person-years) represented a 13.3% decrease from the 8.3 rate reported during 1989–1998 (*3*). Maternal characteristics associated with infant homicide included young age, being unmarried, having lower educational attainment, having a nonhospital birthing, Black race, and AI/AN ethnicity.

Among infants, the highest risk for homicide is on the day of birth. The rate on the day of birth in this study (74.0 per 100,000 person-years) represented a 66.7% decrease from the rate of 222.2 during 1989–1998 (*3*), but the rate on day of birth was still at least 5.4 times higher than the rate at any other time during life. Infant homicides occurring on the day of birth are primarily perpetrated by young, unmarried mothers with lower education levels who do not seek prenatal care; these homicides often are associated with concealment of an unintended pregnancy, and giving birth at a residence (*2*). After the first day of life, an infant homicide might occur within the context of young parental age, caregiver frustration, maternal mental illness, removal of an unwanted child, or abuse or neglect; depending on the context, the homicide might be perpetrated by the mother (*2*), mother's male companion, or

FIGURE. Percentage of infant homicides, by age at death (weeks) — restricted-use National Vital Statistics System, linked birth and infant death data, United States, 2008–2017



the biologic father of the infant (*6*). The presence or absence of these factors is important when assessing safety and quality of the infant's home environment. Racial disparities in infant homicides might be attributed, at least in part, to the fact that Black and AI/AN families are more likely to experience sociodemographic disparities and poverty compared with White families (*7*). Circumstances of poverty (e.g., inadequate resources for childcare, housing, and food) might make parenting difficult (*7*). In addition, the association between infant homicide and Safe Haven age limits did not follow a linear pattern of risk, suggesting that rates cannot be explained by Safe Haven age limits, but might be related to other factors (e.g., maternal age or unintended pregnancy) (*2*). Given that most (92.4%) homicides occurred among infants who were too old for Safe Haven relinquishment at the time of their deaths, states are encouraged to evaluate the effectiveness of their Safe Haven Laws and other prevention strategies to ensure they are achieving the intended benefits of preventing infant homicides.

The findings in this report are subject to at least two limitations. First, an infant's death might be misclassified on the death certificate (*8*) or undiscovered, leading to potential underascertainment or overascertainment of infant homicides. The lack of precise pathological markers for live births or cause of death can lead to errors in coding of the manner of death (*9*). Second, homicide rates for Safe Haven age-limit categories were calculated using age limits specified in state statutes as of December 2016. Two changes were made to state-specific age limits; one occurred during the study period and one after. In both instances, the age limit was raised to be more inclusive. Given that age limits did not have an obvious association with infant homicide rates, the results are expected to be similar if these changes in age limit were accounted for.

Although infants make up a small percentage of homicide victims, these deaths are preventable. Programs and policies that strengthen economic supports for families, provide quality and affordable childcare, develop parenting skills (e.g., through home visiting programs), assure safe, stable, nurturing

Summary

What is already known about this topic?

The highest risk for infant homicide is on the day of birth. Because of this, by 2008, all 50 states and Puerto Rico had enacted Safe Haven Laws to address infant abandonment and endangerment.

What is added by this report?

The infant homicide rate on the day of birth decreased from 222.2 per 100,000 person-years during 1989–1998 to 74.0 during 2008–2017 (66.7% decline), but remains at least 5.4 times higher than the rate at any other time in life.

What are the implications for public health practice?

Programs and policies that strengthen economic supports, provide affordable childcare, and enhance and improve skills for young parents might contribute to the prevention of infant homicides.

TABLE 2. Number,* percentage,† and rate§ of homicides among infants (N = 2,849), by state¶ and corresponding Safe Haven Law age limit category — restricted-use National Vital Statistics System linked birth and infant death data, United States, 2008–2017

State/Area where homicide occurred	Safe Haven Law age limit	No. (%) of homicides†	Rate per 100,000 person-years (95% CI)§
Alabama, Arizona, California, Colorado, Hawaii, Michigan, Mississippi, Tennessee, Utah, Washington, Wisconsin	3 days	738 (25.9)	6.3 (5.8–6.7)
Florida, Georgia, Massachusetts, Minnesota, New Hampshire, North Carolina, Oklahoma	7 days	478 (16.8)	7.0 (6.4–7.6)
Maryland	10 days	54 (1.9)	7.7 (5.7–10.0)
Delaware, District of Columbia, Iowa, Virginia, Wyoming	14 days	162 (5.7)	9.4 (8.0–10.9)
Alaska	21 days	—	—
Arkansas, Connecticut, Idaho, Illinois, Indiana, Kentucky, Louisiana, Maine, Montana, Nebraska, Nevada, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, West Virginia	30 days	923 (32.4)	7.4 (6.9–7.8)
Kansas, Missouri	45 days	124 (4.4)	10.6 (8.7–12.4)
South Carolina, South Dakota, Texas	60 days	335 (11.8)	7.3 (6.5–8.0)
New Mexico	90 days	22 (0.8)	8.6 (5.4–13.0)
North Dakota	<1 year	—	—

Abbreviation: CI = confidence interval.

* During 2008–2017, approximately 2,919 infants were victims of homicide https://webappa.cdc.gov/sasweb/ncipc/mortrate.html. Because this study used restricted-use National Vital Statistics System linked birth and infant death data, 68 infant homicides were excluded because the corresponding birth and death certificates could not be linked. The District of Columbia did not enact a Safe Haven Law until 2009; therefore, the two infant homicides that occurred in 2008, in the District of Columbia, were removed when infant homicide rates were examined within the context of Safe Haven Laws. Counts are not reported when the number of infant homicides is <10.

† Percentages might not sum to 100% because of rounding.

§ Infant homicide rates are based on the state in which the infant's death occurred (i.e., state of occurrence). Rates are not reported when number of infant homicides is <20. Denominator includes number of live births multiplied by the Safe Haven days in each Safe Haven age limit category.

¶ Infant homicides for Puerto Rico, which has a Safe Haven Law age limit of 3 days, were not available for this analysis.

relationships and environments for all infants (*10*), and increase the public's awareness of Safe Haven Laws might contribute to preventing infant homicides.

Corresponding author: Rebecca F. Wilson, ysp2@cdc.gov.

[1]Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; [2]Division of Injury Prevention, National Center for Injury Prevention and Control, CDC.

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Influenza and Tdap Vaccination Coverage Among Pregnant Women — United States, April 2020

Hilda Razzaghi, PhD[1]; Katherine E. Kahn, MPH[2]; Carla L. Black, PhD[1]; Megan C. Lindley, MPH[1]; Tara C. Jatlaoui, MD[1]; Amy Parker Fiebelkorn, MSN, MPH[1]; Fiona P. Havers, MD[3]; Denise V. D'Angelo, MPH[4]; Angela Cheung, MPH[5]; Nicholas A. Ruther, MS[5]; Walter W. Williams, MD[1]

Vaccination of pregnant women with influenza vaccine and tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) can decrease the risk for influenza and pertussis among pregnant women and their infants. The Advisory Committee on Immunization Practices (ACIP) recommends that all women who are or might be pregnant during the influenza season receive influenza vaccine, which can be administered at any time during pregnancy (*1*). ACIP also recommends that women receive Tdap during each pregnancy, preferably during the early part of gestational weeks 27–36 (*2*,*3*). Despite these recommendations, vaccination coverage among pregnant women has been found to be suboptimal with racial/ethnic disparities persisting (*4*–*6*). To assess influenza and Tdap vaccination coverage among women pregnant during the 2019–20 influenza season, CDC analyzed data from an Internet panel survey conducted during April 2020. Among 1,841 survey respondents who were pregnant anytime during October 2019–January 2020, 61.2% reported receiving influenza vaccine before or during their pregnancy, an increase of 7.5 percentage points compared with the rate during the 2018–19 season. Among 463 respondents who had a live birth by their survey date, 56.6% reported receiving Tdap during pregnancy, similar to the 2018–19 season (*4*). Vaccination coverage was highest among women who reported receiving a provider offer or referral for vaccination (influenza = 75.2%; Tdap = 72.7%). Compared with the 2018–19 season, increases in influenza vaccination coverage were observed during the 2019–20 season for non-Hispanic Black (Black) women (14.7 percentage points, to 52.7%), Hispanic women (9.9 percentage points, to 67.2%), and women of other non-Hispanic (other) races (7.9 percentage points, to 69.6%), and did not change for non-Hispanic White (White) women (60.6%). As in the 2018–19 season, Hispanic and Black women had the lowest Tdap vaccination coverage (35.8% and 38.8%, respectively), compared with White women (65.5%) and women of other races (54.0%); in addition, a decrease in Tdap vaccination coverage was observed among Hispanic women in 2019–20 compared with the previous season. Racial/ethnic disparities in influenza vaccination coverage decreased but persisted, even among women who received a provider offer or referral for vaccination. Consistent provider offers or referrals, in combination with conversations culturally and linguistically tailored for patients of all races/ethnicities, could increase vaccination coverage among pregnant women in all racial/ethnic groups and reduce disparities in coverage.

An Internet panel* survey was conducted to assess end-of-season influenza and Tdap vaccination coverage estimates among women pregnant during the 2019–20 influenza season; the methods have been previously described (*5*). The survey was conducted during April 2–April 14, 2020, among women aged 18–49 years who reported being pregnant anytime since August 1, 2019, through the date of the survey. Among 18,314 women who were screened, 2,515 were eligible, and of these, 2,268 completed the survey (cooperation rate† = 90.2%). Data were weighted to reflect the age, race/ethnicity, and geographic distribution of the total U.S. population of pregnant women (*5*). Analysis of influenza vaccination coverage was limited to 1,841 women pregnant anytime during October 2019–January 2020. A woman was considered to have been vaccinated against influenza if she reported having received 1 dose of influenza vaccine (before or during her most recent pregnancy) since July 1, 2019. To accommodate the optimal timing for Tdap vaccination during 27–36 weeks' gestation, analysis of Tdap coverage was limited to women pregnant anytime since August 1, 2019, who had a live birth by their survey date. A woman was considered to have received Tdap if she reported receiving 1 dose of Tdap vaccine during her most recent pregnancy. Among 532 women with a recent live birth, 69 (12.9%) were excluded because they did not know whether they had ever received Tdap (10.3%) or whether they received it during their pregnancy (2.6%), leaving a final analytic sample of 463. The proportion of pregnant women who received both recommended maternal vaccines (i.e., full vaccination) was assessed among 462 women (one respondent reported Tdap but not influenza vaccination status). A difference was noted as an increase or decrease when a percentage-point difference

* Pregnant women were recruited from a large, pre-existing, opt-in Internet panel of the general population, a panel operated by Dynata (https://www.dynata.com).

† An opt-in Internet panel survey is a nonprobability sampling survey. The denominator for a response rate calculation cannot be determined because no sampling frame with a selection probability is involved at the recruitment stage. Instead, the survey cooperation rate (the percentage interviewed among all eligible persons contacted) is provided.

of ≥5 was found between any values being compared.[§] SAS-callable SUDAAN software (version 11.0.1; RTI International) was used to conduct all analyses.

Among 1,841 pregnant women, 61.2% reported receiving 1 dose of influenza vaccine since July 1, 2019, an increase of 7.5 percentage points compared with 53.7% reported for the 2018–19 influenza season; Tdap coverage was 56.6% among women with a recent live birth, similar to that reported for 2018–19 (54.9%) (Table 1) (Figure). Full vaccination was reported by 40.3% of women with a recent live birth overall, but only among 23.0% of Black and 25.4% of Hispanic women. Influenza vaccination coverage was lowest among Black women (52.7%), and Tdap coverage was lowest among Black (38.8%) and Hispanic (35.8%) women. Vaccination coverage was highest among women who reported receiving a provider offer or referral for vaccination (75.2% for influenza and 72.7% for Tdap). Women who had 10 or more provider visits since July 1, 2019, were more likely to have received influenza vaccine (67.5%) than were those with one to five visits (50.6%).

Increases in influenza vaccination coverage were observed during 2019–20 for Black women (14.7 percentage points, to 52.7%), Hispanic women (9.9 percentage points, to 67.2%), and women of other races (7.9 percentage points, to 69.6%). Correspondingly, the difference in influenza vaccination coverage between White and Black women decreased from 19 to 8 percentage points from 2018–19 to 2019–20 (Figure). A decrease in Tdap coverage was observed among Hispanic women from 2018–2019 to 2019–2020.

The proportion of women who reported receipt of a provider offer or referral for influenza vaccination was higher among Hispanic women (76.9%) than among White (69.5%) and Black (69.1%) women but was similar to that among women of other races (73.7%). Among women with an offer or referral, influenza vaccination coverage was lower among Black (66.7%) than among White (75.6%) and Hispanic (79.0%) women and women of other races (80.7%) (Table 2). Among women with an offer or referral and 10 or more provider visits, influenza vaccination coverage was 64.3% in Black and 80.5% in White women. Influenza vaccination coverage was similar among White (73.6%) and Black (72.7%) women with an offer or referral and a condition[¶] (other than pregnancy) that put them at high risk for severe complications from influenza, but among those without high-risk conditions, coverage was lower among Black (62.8%) than among White women (77.4%).

Receipt of a provider offer or referral for Tdap was lower among Black (55.7%) than among Hispanic women (66.6%), women of other races (71.3%), and White women (81.0%). Among those with a provider offer or referral for Tdap vaccination, Tdap coverage was lowest for Hispanic women (52.5%), followed by Black women (64.7%), women of other races (73.1%), and White women (77.5%).

Summary

What is already known about this topic?

Maternal vaccination with influenza and tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccines can decrease the risk for severe influenza and pertussis among pregnant women and their infants; racial/ethnic coverage disparities exist.

What is added by this report?

During 2019–20, 61.2% of pregnant women received influenza vaccination, 56.6% received Tdap during pregnancy, and 40.3% received both vaccines. Influenza vaccination coverage among Black and Hispanic women increased, yet disparities persisted; Tdap vaccination increased among Black women but decreased in Hispanic women compared with 2018–19.

What are the implications for public health practice?

Additional interventions to encourage consistent provider offers or referrals for influenza and Tdap vaccination and culturally competent conversations with patients are needed to address racial disparities in maternal vaccination.

Discussion

Findings from this survey indicate that approximately 40% of pregnant women do not receive influenza and Tdap vaccines, leaving themselves and their infants more vulnerable to influenza and pertussis infection, with potential serious complications including hospitalization and death (*4*). Although influenza vaccination coverage remains suboptimal, an increase in coverage was observed during 2019–20. The overall increase was driven by increased vaccination coverage among Black and Hispanic women and those of other races. Higher vaccination coverage was observed among women who received a provider

[§] Because the opt-in Internet panel sample is not probability-based, no statistical tests were performed. Additional information on obstacles to inference in nonprobability samples is available at https://www.aapor.org/AAPOR_Main/media/MainSiteFiles/NPS_TF_Report_Final_7_revised_FNL_6_22_13.pdf and https://www.aapor.org/getattachment/Education-Resources/For-Researchers/AAPOR_Guidance_Nonprob_Precision_042216.pdf.aspx. Although the estimates reported here have variance, there has been no attempt to quantify the size of the variance.

[¶] Conditions other than pregnancy associated with increased risk for serious medical complications of influenza include chronic asthma, a lung condition other than asthma, a heart condition, diabetes, a kidney condition, a liver condition, obesity, or a weakened immune system caused by a chronic illness or by medicines taken for a chronic illness.

TABLE 1. Influenza and Tdap vaccination coverage among pregnant women, by selected characteristics — Internet panel survey, United States, April 2020

Characteristic	Influenza*		Tdap†		Both vaccines (full vaccination)	
	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated
Total	**1,841 (100)**	**61.2**	**463 (100)**	**56.6**	**462 (100)**	**40.3**
Age group (yrs)						
18–24	631 (24.4)	54.6§	88 (13.8)	53.4	87 (13.6)	30.6
25–34	861 (55.6)	62.5	253 (61.6)	60.0§	253 (61.7)	44.4§
35–49¶	349 (20.0)	65.8	122 (24.6)	50.1	122 (24.7)	35.3
Race/Ethnicity**						
White, non-Hispanic¶	890 (49.7)	60.6	302 (63.7)	65.5	301 (63.6)	46.0
Black, non-Hispanic	323 (19.7)	52.7§	52 (13.9)	38.8§	52 (14.0)	23.0§
Hispanic	436 (23.1)	67.2§	60 (14.1)	35.8§	60 (14.1)	25.4§
Other, non-Hispanic	192 (7.4)	69.6§	49 (8.3)	54.0§	49 (8.3)	51.0§
Education						
High school diploma or less	450 (23.4)	45.9§	114 (24.3)	45.2§	114 (24.4)	25.0§
Some college, no degree	287 (15.4)	50.9§	72 (15.6)	54.4§	72 (15.6)	40.2§
College degree (2- or 4-year)	708 (39.7)	68.3	188 (42.1)	62.7	188 (42.2)	47.0
More than college degree¶	396 (21.4)	72.2	89 (18.0)	60.0	88 (17.8)	45.2
Marital status††						
Married¶	1,012 (57.4)	70.3	293 (62.6)	65.3	293 (62.7)	51.0
Unmarried	828 (42.6)	49.1§	170 (37.4)	42.1§	169 (37.3)	22.3§
Employment status§§						
Working¶	1,158 (64.5)	66.9	269 (58.6)	56.9	293 (58.7)	40.2
Not working	682 (35.5)	50.8§	194 (41.4)	56.3	193 (41.3)	40.4
Poverty status¶¶						
At or above poverty¶	1,431 (79.6)	64.8	366 (79.7)	59.4	366 (79.7)	43.1
Below poverty	395 (20.4)	47.8§	96 (20.3)	46.3§	96 (20.3)	29.2§
Area of residence***						
Rural	262 (13.9)	56.8§	92 (19.0)	60.9§	91 (18.9)	42.9
Nonrural¶	1,579 (86.1)	61.9	371 (81.0)	55.6	371 (81.1)	39.7
Region†††						
Northeast¶	379 (18.1)	64.0	75 (13.1)	58.7	75 (13.1)	42.7
Midwest	370 (20.0)	59.5	95 (19.3)	68.8§	95 (19.3)	46.8
South	753 (38.0)	59.6	181 (36.9)	50.0§	180 (36.8)	34.6§
West	339 (23.8)	63.2	112 (30.8)	56.1	112 (30.8)	41.9
Prenatal insurance status§§§						
Private/Military¶	857 (48.7)	67.4	251 (55.2)	64.0	251 (55.3)	46.2
Public	882 (45.8)	56.3§	189 (39.9)	49.4*	189 (40.0)	34.7§
Uninsured	102 (5.5)	47.9§	<30 (—¶¶¶)	—¶¶¶	<30 (—¶¶¶)	—¶¶¶
Provider recommendation/offer****						
Offered or referred¶	1,294 (71.4)	75.2	346 (74.6)	72.7	286 (62.1)††††	57.8
Recommended, no offer or referral	132 (7.3)	50.2§	<30 (—¶¶¶)	—¶¶¶	140 (30.8)§§§§	13.9§
No recommendation	388 (21.3)	20.6§	95 (20.5)	1.9§	34 (7.2)¶¶¶¶	0.0§

See table footnotes on the next page.

offer or referral or a recommendation alone (*4*), indicating increased acceptance of vaccination overall. However, despite approximately 70% of Black and White women receiving a provider offer or referral for influenza vaccination, Black women were still less likely to be vaccinated than White women. Factors including negative attitudes and beliefs about vaccines, less knowledge about and access to vaccines, and a lack of trust in health care providers and vaccines has been shown to contribute to lower vaccination rates in Black adults (*6*,*7*). Provider offers or referrals for vaccination, in combination with culturally competent conversations with patients, could increase vaccination coverage among pregnant women in all racial/ethnic groups and reduce disparities (*8*).

Approximately 20% of pregnant women reported not receiving a provider recommendation for vaccination. This circumstance might be partly attributable to differences in perception of a provider recommendation between patients and providers. One study indicated that providers might believe they are giving a recommendation for vaccination, but it might not be remembered by patients (*9*). Differences by patient race/ethnicity in reported vaccination offers might result from provider-patient communication problems or reflect deficits in quality of care provided to some minority patients (*10*). CDC

TABLE 1. (*Continued*) Influenza and Tdap vaccination coverage among pregnant women, by selected characteristics — Internet panel survey, United States, April 2020

Characteristic	Influenza*		Tdap†		Both vaccines (full vaccination)	
	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated
No. of provider visits since July 2019						
None	<30 (—¶¶¶)	—¶¶¶	N/A	N/A	N/A	N/A
1–5	439 (23.9)	50.6§	N/A	N/A	N/A	N/A
6–10	725 (38.7)	63.3	N/A	N/A	N/A	N/A
>10¶	652 (36.2)	67.5	N/A	N/A	N/A	N/A
High-risk condition for influenza***						
Yes¶	779 (48.0)	65.9	N/A	N/A	N/A	N/A
No	829 (52.0)	59.1§	N/A	N/A	N/A	N/A

Abbreviations: N/A = not applicable; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Women pregnant any time during October 2019–January 2020 were included in the analyses to assess influenza vaccination coverage for the 2019–20 season. Women who received an influenza vaccination since July 1, 2019, before or during their pregnancy were considered vaccinated.

† Women pregnant any time since August 1, 2019, and who had a live birth were included in the analysis to assess Tdap coverage. Women who received a Tdap vaccination during their recent pregnancy were considered vaccinated.

§ ≥5 percentage-point difference compared with referent group.

¶ Referent group for comparison within subgroups.

** Race/ethnicity was self-reported. Women identified as Hispanic might be of any race. The "Other" race category included Asians, American Indians/Alaska Natives, Native Hawaiians or other Pacific Islanders, and women who selected "other" or multiple races.

†† Excludes one woman who did not report marital status.

§§ Women who were employed for wages and self-employed were categorized as working; those who were out of work, homemakers, students, retired, or unable to work were categorized as not working.

¶¶ Poverty status was defined based on the reported number of persons living in the household and annual household income, according to U.S. Census poverty thresholds. https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.

*** Rurality was defined using ZIP codes where >50% of the population resides in a nonmetropolitan county, a rural U.S. Census tract, or both, according to the Health Resources and Services Administration's definition of rural population. https://www.hrsa.gov/rural-health/about-us/definition/index.html.

††† *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

§§§ Women pregnant on their survey date were asked about current insurance; women who had already delivered were asked about insurance "during your most recent pregnancy." Women considered to have public insurance selected at least one of the following when asked what kind of medical insurance they had: Medicaid, Medicare, Indian Health Service, state-sponsored medical plan, or other government plan. Women considered to have private/military insurance selected private medical insurance and/or military medical insurance and did not select any type of public insurance).

¶¶¶ Estimates with sample size <30 are not reported.

**** Excluded women who did not report having a provider visit since July 2019 (25) for the influenza vaccination coverage analysis; no women were excluded for the Tdap vaccination coverage analysis.

†††† Received provider offer/referral for both influenza and Tdap vaccines.

§§§§ Received a combination of provider offer/referral, recommendation with no referral, or no recommendation for influenza or Tdap vaccines that does not include receipt of offer/referral for both vaccines or no recommendation received for both vaccines. For example, the respondent might have received an offer/referral for influenza vaccine and a recommendation with no referral for Tdap. If information about provider recommendation for either vaccine was missing, then the respondent was excluded from the analysis (2).

¶¶¶¶ Did not receive a provider recommendation for influenza or Tdap vaccine.

***** Conditions other than pregnancy associated with increased risk for serious medical complications of influenza include chronic asthma, a lung condition other than asthma, a heart condition, diabetes, a kidney condition, a liver condition, obesity, or a weakened immune system caused by a chronic illness or by medicines taken for a chronic illness. Women who were missing information (233) were excluded from analysis.

has resources to assist providers in effectively communicating the importance of vaccination, such as sharing specific reasons that recommended vaccines are right for the patient and highlighting positive experiences with vaccines (personal or clinical).** In addition, the American College of Obstetricians and Gynecologists has an immunization toolkit†† that includes communication strategies for providers.

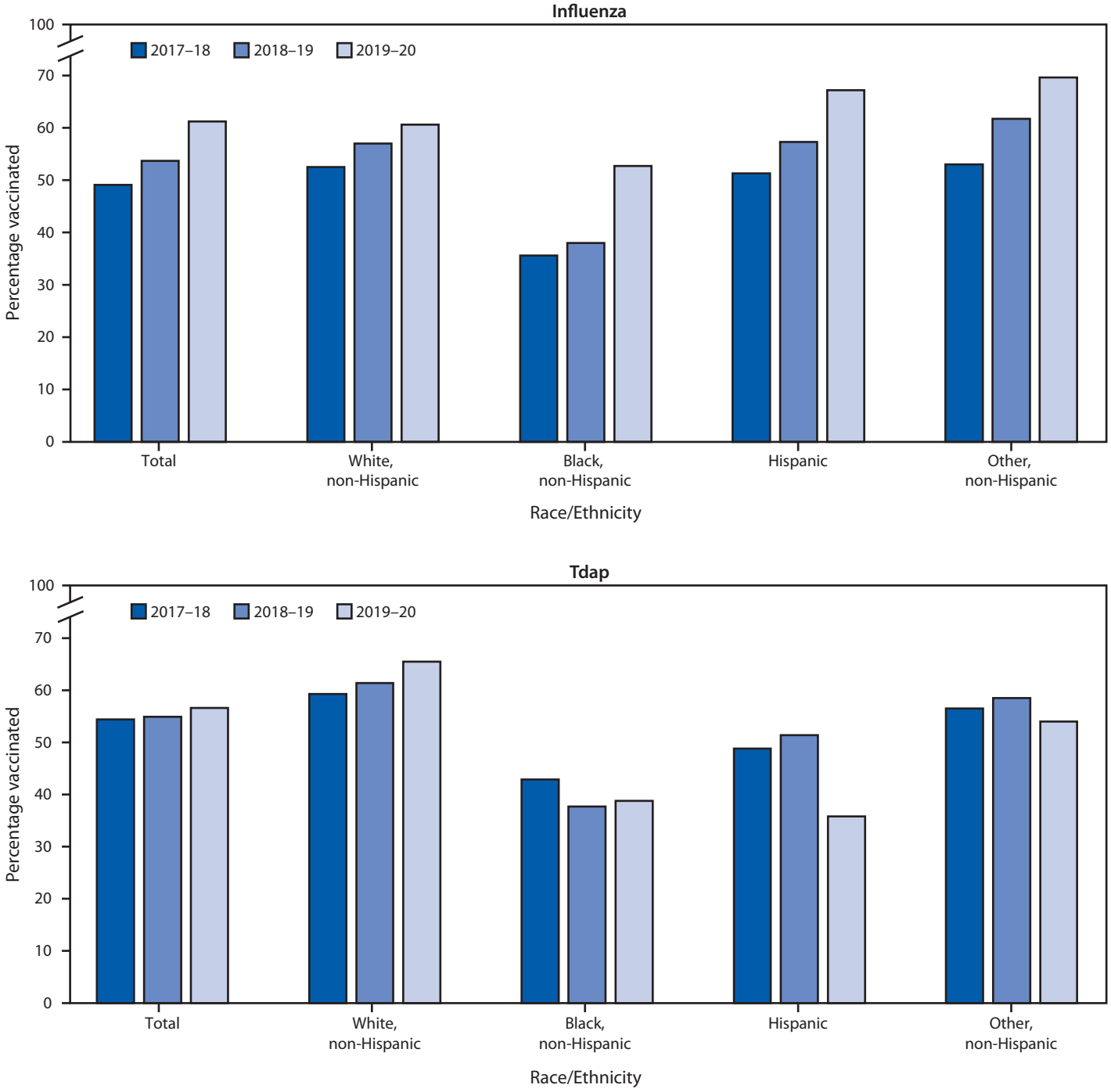
The findings in this report are subject to at least three limitations (*5*). First, this was a nonprobability sample, and results might not be generalizable to all pregnant women in the United States. Second, vaccination status was self-reported and might be subject to recall or social desirability bias. Finally, Tdap coverage estimates are subject to uncertainty, given the small sample size and exclusion of 12.9% of women with unknown Tdap vaccination status. Despite these limitations, Internet panel surveys are a useful assessment tool for timely evaluation of routine maternal vaccination coverage.

Despite ACIP recommendations and an increase of approximately 12 percentage points in influenza vaccination since the 2017–18 season, maternal vaccination with influenza and Tdap vaccines is suboptimal, and missed opportunities to vaccinate are common. Although racial/ethnic disparities in vaccination persist, the magnitude in coverage differences were reduced

** https://www.cdc.gov/vaccines/hcp/adults/for-practice/standards/recommend.html.

†† https://www.acog.org/programs/immunization-for-women/provider-tools.

FIGURE. Influenza* and Tdap† vaccination coverage among pregnant women, by race/ethnicity — Internet panel survey, United States, 2017–18§ through 2019–20¶ influenza seasons



Abbreviation: Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Women pregnant any time during October 2019–January 2020 were included in the analyses to assess influenza vaccination coverage for the 2019–20 season. Women who received an influenza vaccination since July 1, 2019, before or during their pregnancy, were considered vaccinated.

† Women pregnant any time since August 1, 2019, and had a live birth were included in the analysis to assess Tdap coverage. Women who received a Tdap vaccination during their recent pregnancy were considered vaccinated.

§ Kahn KE, Black CL, Ding H, et al. Influenza and Tdap vaccination coverage among pregnant women—United States, April 2018. MMWR Morb Mortal Wkly Rep 2018;67:1055–9.

¶ Lindley MC, Kahn KE, Bardenheier BH, et al. Vital signs: burden and prevention of influenza and pertussis among pregnant women and infants—United States. MMWR Morb Mortal Wkly Rep 2019;68:885–92.

TABLE 2. Influenza vaccination coverage among pregnant women* who reported a health care provider offer or referral for vaccination, by selected characteristics, stratified by race/ethnicity† — Internet panel survey, United States, April 2020

Characteristic	All women		White, non-Hispanic		Black, non-Hispanic		Hispanic		Other, non-Hispanic	
	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated
Total	**1,294 (100)**	**75.2**	**613 (100)**	**75.6**	**216 (100)**	**66.7**	**329 (100)**	**79.0**	**136 (100)**	**80.7**
Age group (yrs)										
18–24	438 (24.1)	67.1§	132 (21.4)	64.2§	108 (29.9)	65.6	151 (29.0)	71.5§	47 (11.2)	76.6
25–34	611 (55.8)	77.7	333 (57.9)	79.5	81 (52.4)	64.0	137 (52.4)	83.8§	60 (61.6)	79.5
35–49	245 (20.1)	77.8	148 (20.7)	76.8	<30 (—**)	—**	41 (18.7)	77.5	<30 (—**)	—**
Education										
High school diploma or less	273 (20.0)	64.2§	130 (21.0)	57.1§	52 (20.2)	55.4§	75 (21.7)	81.3	<30 (—**)	—**
Some college, no degree	194 (15.2)	65.3§	78 (13.5)	62.1§	39 (19.1)	69.4	53 (15.2)	69.8§	<30 (—**)	—**
College degree (2- or 4-year)	521 (41.4)	81.0	251 (41.6)	84.6	86 (41.6)	69.9	123 (38.5)	80.9	61 (48.1)	85.4
More than college degree¶	306 (23.4)	80.6	154 (23.9)	84.0	39 (19.1)	69.0	78 (24.5)	79.8	35 (27.8)	84.5
Marital status††										
Married¶	757 (61.2)	81.0	418 (68.0)	80.6	84 (43.9)	79.5	169 (57.4)	81.1	86 (73.4)	85.2
Unmarried	537 (38.8)	66.0§	195 (32.0)	65.2§	132 (56.1)	56.6§	160 (42.6)	76.2	50 (26.6)	68.6§
Employment status§§										
Working¶	847 (67.3)	79.2	410 (66.1)	79.7	147 (72.8)	70.6	206 (65.5)	82.1	84 (66.8)	89.5
Not working	446 (32.7)	66.9§	203 (33.9)	67.8§	68 (27.2)	55.2§	123 (34.5)	73.3§	52 (33.2)	63.0§
Poverty status¶¶										
At or above poverty¶	1032 (81.3)	78.3	511 (83.4)	80.0	150 (72.9)	69.5	258 (81.7)	79.7	113 (88.0)	82.3
Below poverty	253 (18.7)	62.1§	100 (16.6)	53.5§	63 (27.1)	59.4§	68 (18.3)	77.2	<30 (—**)	—**
Area of residence***										
Rural	174 (13.1)	72.2	105 (17.5)	70.3§	<30 (—**)	—**	<30 (—**)	—**	<30 (—**)	—**
Nonrural¶	1,120 (86.9)	75.6	508 (82.5)	76.8	189 (88.5)	65.8	301 (93.0)	79.2	122 (91.6)	80.9
Region†††										
Northeast¶	276 (18.8)	78.2	154 (22.1)	77.3	37 (16.0)	71.4	71 (17.2)	84.6	<30 (—**)	—**
Midwest	255 (19.8)	72.3§	142 (23.4)	71.6§	39 (18.7)	62.0§	50 (15.2)	79.7	<30 (—**)	—**
South	520 (37.3)	74.2	217 (33.2)	74.5	125 (53.6)	70.6	122 (34.0)	77.4§	56 (34.0)	76.3
West	243 (24.1)	76.7	100 (21.3)	80.0	<30 (—**)	—**	86 (33.5)	77.5§	42 (41.8)	82.1
Prenatal insurance status§§§										
Private/Military¶	631(50.9)	79.8	359 (58.1)	82.1	80 (41.2)	68.6	119 (39.8)	80.1	73 (65.6)	83.0
Public	608 (44.9)	70.5§	229 (37.8)	65.6§	125 (54.3)	67.3	196 (56.1)	77.9	58 (31.4)	77.7§
Uninsured	55 (4.2)	70.1§	<30 (—**)	—**	<30 (—**)	—**	<30 (—**)	—**	<30 (—**)	—**

See table footnotes on the next page.

in the 2019–20 influenza season as a result of increased vaccination coverage in Black, Hispanic, and other race women. Increases or decreases in vaccination coverage observed in this survey should be compared with information from other data sources and additional survey years. Racial disparities in vaccination coverage could decrease further with consistent provider offers or referrals for vaccination, in combination with culturally competent conversations with patients§§ (*8*,*9*).

§§ https://www.thecommunityguide.org/topic/vaccination.

Corresponding author: Hilda Razzaghi, HRazzaghi@cdc.gov.

[1]Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC; [2]Leidos, Atlanta, Georgia; [3]Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; [4]Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [5]Abt Associates, Inc., Atlanta, Georgia.

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TABLE 2. (*Continued*) Influenza vaccination coverage among pregnant women* who reported a health care provider offer or referral for vaccination, by selected characteristics, stratified by race/ethnicity† — Internet panel survey, United States, April 2020

Characteristic	All women		White, non-Hispanic		Black, non-Hispanic		Hispanic		Other, non-Hispanic	
	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated	No. (weighted %)	% (weighted) vaccinated
No. of provider visits since July 2019										
1–5	257 (19.7)	70.2§	111 (18.0)	65.5§	36 (17.2)	61.8	77 (23.5)	80.5	33 (23.9)	74.1§
6–10	522 (39.8)	76.2	248 (40.5)	75.2§	89 (39.5)	71.4§	133 (39.7)	80.8	52 (36.8)	79.2§
>10¶	515 (40.5)	76.6	254 (41.4)	80.5	91 (43.4)	64.3	119 (36.8)	76.1	51 (39.4)	86.3
High-risk condition for influenza¶¶¶										
Yes¶	606 (51.7)	76.8	254 (44.3)	73.6	112 (59.2)	72.7	183 (65.5)	82.5	57 (40.0)	86.2
No	546 (48.3)	75.8	314 (55.7)	77.4	74 (40.8)	62.8§	92 (34.5)	81.2	66 (60.0)	78.9§

* Women pregnant any time during October 2019–January 2020 were included in the analyses to assess influenza vaccination coverage for the 2019–20 season. Women who received an influenza vaccination since July 1, 2019, before or during their pregnancy were considered vaccinated.

† Race/ethnicity was self-reported. Women identified as Hispanic might be of any race. The "Other" race category included Asians, American Indians/Alaska Natives, Native Hawaiians or Other Pacific Islanders, and women who selected "other" or multiple races.

§ ≥5 percentage-point difference compared with referent group.

¶ Referent group for comparison within subgroups.

** Estimates with sample size <30 are not reported.

†† Excludes one woman who did not report marital status.

§§ Women who were employed for wages and self-employed were categorized as working; those who were out of work, homemakers, students, retired, or unable to work were categorized as not working.

¶¶ Poverty status was defined based on the reported number of persons living in the household and annual household income, according to U.S. Census poverty thresholds. https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.

*** Rurality was defined using ZIP codes where >50% of the population resides in a nonmetropolitan county, a rural U.S. Census tract, or both, according to the Health Resources and Services Administration's definition of rural population. https://www.hrsa.gov/rural-health/about-us/definition/index.html.

††† *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

§§§ Women pregnant on their survey date were asked about current insurance; women who had already delivered were asked about insurance "during your most recent pregnancy." Women considered to have public insurance selected at least one of the following when asked what kind of medical insurance they had: Medicaid, Medicare, Indian Health Service, state-sponsored medical plan, or other government plan. Women considered to have private/military insurance selected private medical insurance and/or military medical insurance and did not select any type of public insurance.

¶¶¶ Conditions other than pregnancy associated with increased risk for serious medical complications of influenza include chronic asthma, a lung condition other than asthma, a heart condition, diabetes, a kidney condition, a liver condition, obesity, or a weakened immune system caused by a chronic illness or by medicines taken for a chronic illness. Women who were missing information (142) were excluded from analysis.

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CDC Deployments to State, Tribal, Local, and Territorial Health Departments for COVID-19 Emergency Public Health Response — United States, January 21–July 25, 2020

Emilio Dirlikov, PhD[1]; Ethan Fechter-Leggett, DVM[1]; Stacy L. Thorne, PhD[1]; Caitlin M. Worrell, MPH[1]; Jennifer C. Smith-Grant, MSPH[1]; Jonathan Chang, MPH[1]; Alexandra M. Oster, MD[1]; Adam Bjork, PhD[1]; Stanley Young, MS, MPH[2]; Alvina U. Perez, MPH[2]; Tricia Aden[1]; Mark Anderson, MD[1]; Susan Farrall, MPH[1]; Jaime Jones-Wormley, MPH[1]; Katherine Hendricks Walters, MD[1]; Tanya T. LeBlanc, PhD[1]; Rebecca Greco Kone, MPH[1]; David Hunter, MPH, MSW[1]; Laura A. Cooley, MD[1]; Vikram Krishnasamy, MD[1]; Jennifer Fuld, PhD[1]; Carolina Luna-Pinto, MPH[1]; Tanya Williams, MPH[1]; Ann O'Connor, MPA[1]; Randall J. Nett, MD[1]; Julie Villanueva, PhD[1]; Nadia L. Oussayef, JD[1]; Henry T. Walke, MD[1]; Jill M. Shugart, MSPH[1]; Margaret A. Honein, PhD[1]; Dale A. Rose, PhD[1]; CDC COVID-19 State, Tribal, Local, and Territorial Response Team

Coronavirus disease 2019 (COVID-19) is a viral respiratory illness caused by SARS-CoV-2. During January 21–July 25, 2020, in response to official requests for assistance with COVID-19 emergency public health response activities, CDC deployed 208 teams to assist 55 state, tribal, local, and territorial health departments. CDC deployment data were analyzed to summarize activities by deployed CDC teams in assisting state, tribal, local, and territorial health departments to identify and implement measures to contain SARS-CoV-2 transmission (*1*). Deployed teams assisted with the investigation of transmission in high-risk congregate settings, such as long-term care facilities (53 deployments; 26% of total), food processing facilities (24; 12%), correctional facilities (12; 6%), and settings that provide services to persons experiencing homelessness (10; 5%). Among the 208 deployed teams, 178 (85%) provided assistance to state health departments, 12 (6%) to tribal health departments, 10 (5%) to local health departments, and eight (4%) to territorial health departments. CDC collaborations with health departments have strengthened local capacity and provided outbreak response support. Collaborations focused attention on health equity issues among disproportionately affected populations (e.g., racial and ethnic minority populations, essential frontline workers, and persons experiencing homelessness) and through a place-based focus (e.g., persons living in rural or frontier areas). These collaborations also facilitated enhanced characterization of COVID-19 epidemiology, directly contributing to CDC data-informed guidance, including guidance for serial testing as a containment strategy in high-risk congregate settings, targeted interventions and prevention efforts among workers at food processing facilities, and social distancing.

CDC Deployments to Assist Health Departments

On January 21, 2020, CDC activated its Emergency Operations Center to facilitate coordination for domestic and international COVID-19 response efforts (*2*); the same day, at the request of the Washington State Health Department, CDC deployed a team to Washington to support the health department's epidemiologic investigation of the first U.S. case of COVID-19 in a traveler returning from China (*3*). On March 15, CDC established a dedicated COVID-19 response section to support state, tribal, local, and territorial health departments (*4*). CDC deployment data were analyzed to describe activities by deployed CDC teams in assisting state, tribal, local, and territorial health departments in the identification and implementation of measures to contain SARS-CoV-2 transmission (*1*). The CDC COVID-19 state, tribal, local, and territorial response section provides support to health departments by responding to inquiries, identifying and collaborating with CDC subject matter experts, and deploying CDC teams in response to receipt of official requests for assistance from health departments. Dedicated teams of CDC subject matter experts have participated in evaluating contact tracing efforts and have investigated COVID-19 epidemiology in counties with rapidly increasing numbers of cases and incidence ("hotspots") to identify jurisdictions needing targeted support (*5*). Further, the CDC COVID-19 state, tribal, local, and territorial response section helps coordinate efforts between CDC, health departments, and subject matter experts across federal agencies and other organizations including the CDC Foundation, the National Association of County and City Health Officials, the Association of Public Health Laboratories, Association of State and Territorial Health Officials, and the Council of State and Territorial Epidemiologists.

The CDC COVID-19 state, tribal, local, and territorial response section coordinated deployment requirements with health departments and selected staff members with the necessary skills after an official request for assistance. CDC COVID-19 Response General Staff, Division of Emergency Operations, and Office of Safety, Security, and Asset Management ensured that all deployers were supported before, during, and after deployment, including providing briefings before and after deployments; coordinating risk assessments, medical clearance, and travel and lodging arrangements; and issuing deployment-essential equipment, including personal protective equipment to prevent SARS-CoV-2 transmission

during field deployments. Deployer feedback received during postdeployment debriefings were used to improve deployment processes and procedures for subsequent deployments.

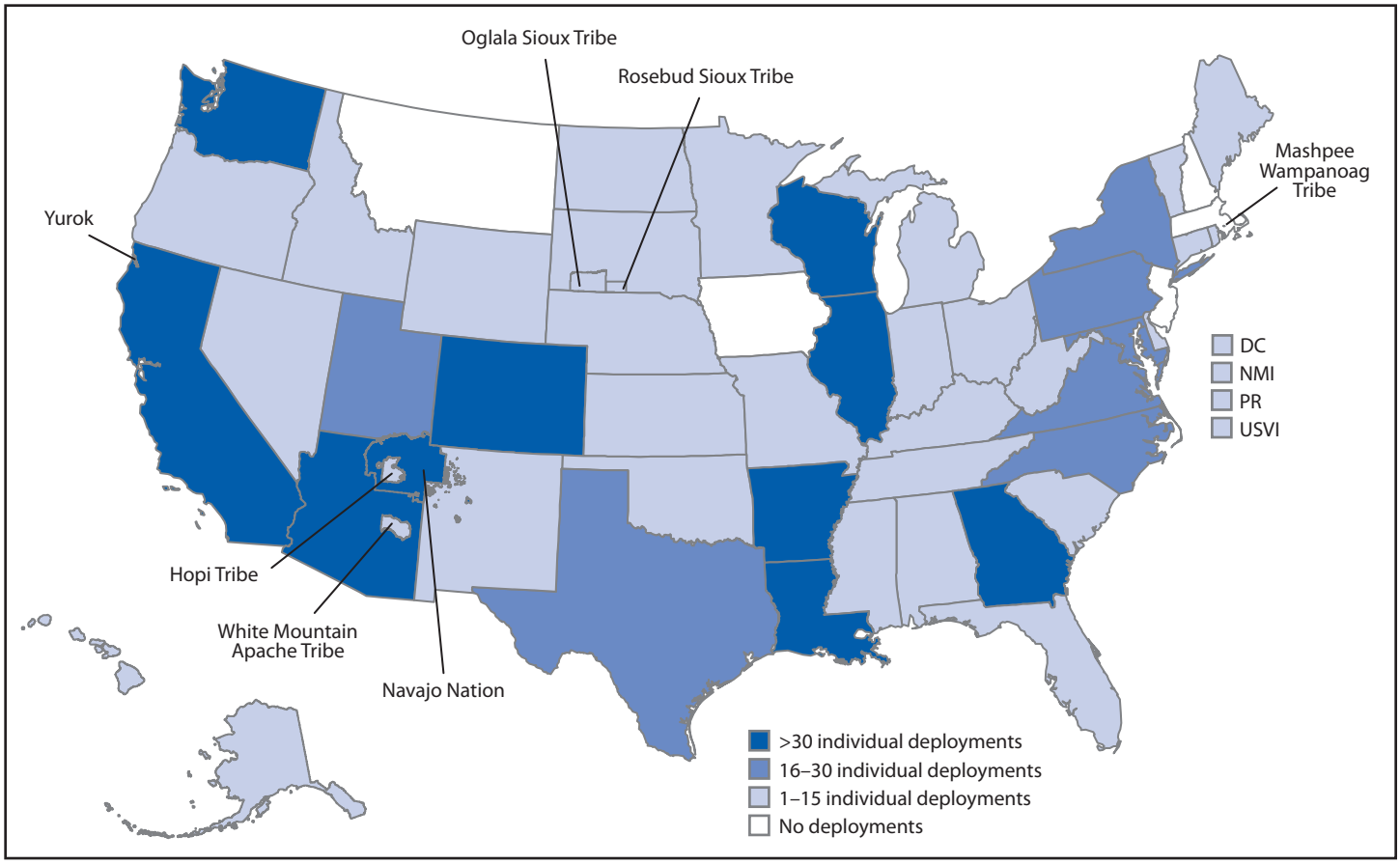
During January 21–July 25, in response to official requests for assistance, 1,009 CDC staff members participated in 208 CDC deployment teams to assist 55 state, tribal, local, and territorial health departments with COVID-19 emergency public health response activities (Figure 1)*; some persons deployed multiple times. Trends in the deployment of CDC teams generally followed trends in national COVID-19 case counts. The number of deployed field teams per week increased during January–April and declined during May–June; however, from mid-June to July 25, the number of deployed teams increased (Figure 2).

Among 168 (81%) teams that had completed deployment by July 25, the mean deployment duration was 20 days (range 1–89 days) (Table). Among the remaining 40 teams deployed as of July 25, duration of deployment ranged from 1–146 days; several teams were providing sustained epidemiologic support. Among the 208 teams deployed following official requests for assistance, 178 (85%) provided assistance to state health departments, 12 (6%) to tribal health departments, 10 (5%) to local health departments, and eight (4%) to territorial health departments.

Because state, tribal, local, and territorial health departments could request assistance with a range of public health activities, deployed team members possessed diverse technical skills and expertise, and a single team could provide technical assistance in multiple areas. The top five areas of technical assistance provided by deployed teams were the following: 1) epidemiologic support (144 teams; 69%), 2) infection prevention and control in health care settings (77; 37%), 3) health communications (37; 18%), 4) community mitigation (36; 17%), and 5) occupational safety and health (31; 15%). Some deployed CDC teams provided subject matter expertise in investigation

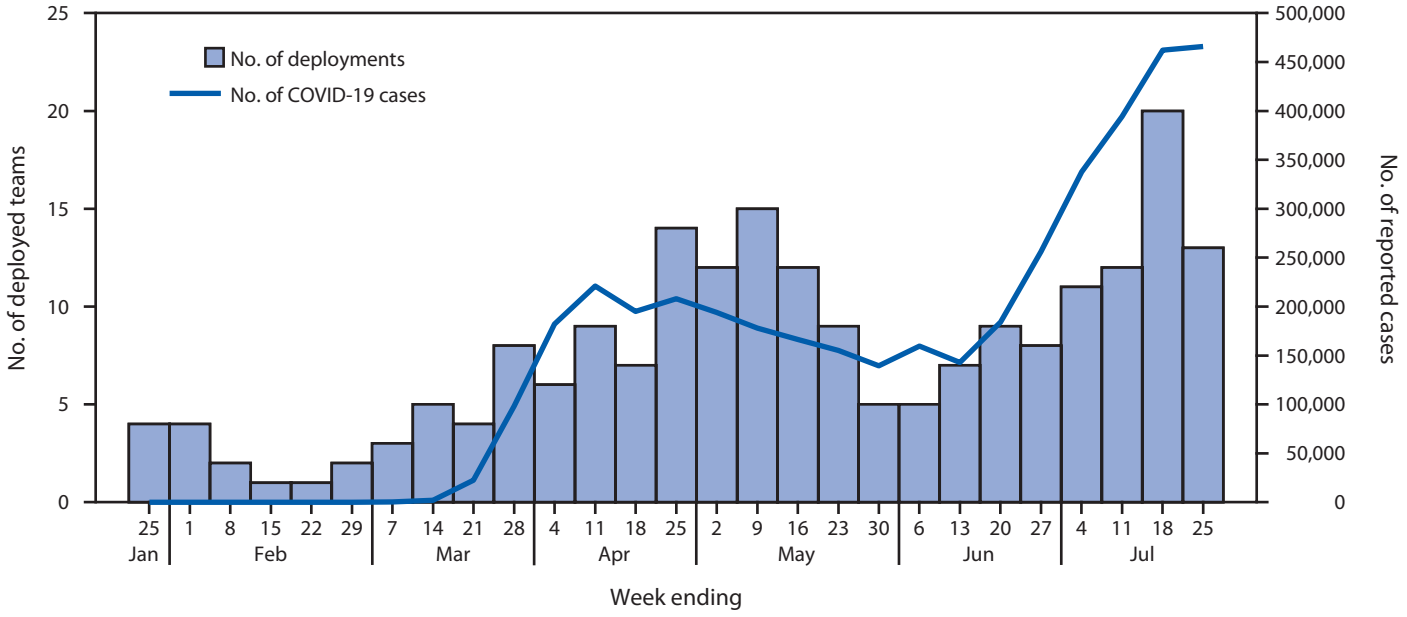
*Includes both in-field and remote deployments and does not include CDC staff members deployed to U.S. quarantine stations and airports, repatriations centers, or as part of outbreak response on cruise ships.

FIGURE 1. Location of deployments* by CDC staff members to state, tribal, local, and territorial health departments — United States, January 21–July 25, 2020



Abbreviations: DC = District of Columbia; NMI = Northern Mariana Islands; PR = Puerto Rico; USVI = U.S. Virgin Islands.
* 726 CDC staff members deployed on 208 teams, as part of 1,009 total deployments (individual staff members could deploy more than one time).

FIGURE 2. Number of CDC deployment teams to state, tribal, local, and territorial health departments and reported COVID-19 cases, by week — United States, week 4–30 (N = 208 teams)*



Abbreviation: COVID-19 = coronavirus disease 2019.
* Does not include deployments to U.S. quarantine stations and airports, repatriations centers, as part of outbreak response on cruise ships, or other response teams.

and mitigation of SARS-CoV-2 transmission in high-risk congregate settings, which often include populations at increased risk for severe COVID-19–associated outcomes, such as long-term care facilities (53 teams; 26%), food processing facilities (24 teams; 12%), correctional facilities (12; 6%), and settings that provide services to persons experiencing homelessness (10; 5%). Knowledge, attitudes, and practices surveys helped involve community members in identifying barriers to services, difficulties experienced when trying to follow prevention actions, and preferred communication channels. Aligned with CDC's COVID-19 health equity strategy,[†] some teams focused attention on supporting local officials in describing health equity issues, such as describing SARS-CoV-2 transmission among disproportionately affected racial and ethnic minority populations, essential frontline workers, persons experiencing homelessness, as well as through a place-based focus, such as responding to COVID-19 outbreaks in rural communities and frontier areas. Twenty-eight (13%) teams deployed specifically to assist in addressing SARS-CoV-2 transmission among racial and ethnic minority groups, including supporting tribal health departments and those focused on COVID-19 among migrant farm workers.

Because CDC staff members could deploy more than once, the 1,009 CDC staff member deployments included 726 individual CDC staff members. Overall, 516 (71%) staff members deployed once, 156 (21%) deployed twice, and 54 (8%) deployed three or more times. Among the 1,009 individual deployments, the top four primary deployer roles were epidemiologic support (422; 42%), leadership (137; 14%), infection prevention and control (88; 9%), and clinical support (65; 6%); additional primary deployer roles included data science, laboratory science, health communications and community outreach, occupational safety and health, coordination, veterinary science, and behavioral science. Deployed CDC staff members helped increase local capacity by assisting with developing data collection instruments, conducting trainings on COVID-19 case investigation and contact tracing, and providing support to improve public health information technology systems.

Discussion

CDC continues to respond to official requests for assistance from state, tribal, local, and territorial health departments toward supporting COVID-19 emergency public health response activities, including through the deployment of CDC staff members. CDC deployments were responsive to evolving public health needs, as reflected by similar trends in number of deployed teams and reported national case counts. Approximately 700 CDC staff members deployed, and approximately one half of individual deployments were completed by staff members who had deployed more than once. On average,

[†] https://www.cdc.gov/coronavirus/2019-ncov/downloads/community/CDC-Strategy.pdf.

TABLE. Summary of CDC deployment teams* and staff members to state, tribal, local, and territorial health departments for COVID-19 emergency public health response — United States, January 21–July 25, 2020

Characteristic	No. (%)
Total teams	**208 (100)**
Team deployment duration, mean days (range)	
Completed deployment (168 teams)	20 (1–89)
Currently deployed as of July 25 (40 teams)	48 (1–146)
Teams by jurisdiction type	
State	178 (85)
Tribal	12 (6)
Local	10 (5)
Territorial	8 (4)
Teams by types of technical assistance provided†	
Epidemiology	144 (69)
Infection prevention and control in health care settings	77 (37)
Health communications	37 (18)
Community mitigation	36 (17)
Occupational safety and health	31 (15)
Laboratory	21 (10)
Surge support	9 (4)
Information technology	8 (4)
Teams that assisted with investigating transmission in high-risk congregate settings	
Total§	87 (42)
Long-term care facilities	53 (26)
Food processing facilities	24 (12)
Correctional facilities	12 (6)
Settings that provide services to persons experiencing homelessness	10 (5)
Deployed staff members*	
Total individual deployments	1,009
Total individual CDC staff members who deployed	726
No. of times individual staff members deployed¶	
1	516 (71)
2	156 (21)
3	40 (6)
4	9 (1)
5	5 (1)
Primary deployer role among total individual deployments	
Epidemiologic support	422 (42)
Leadership**	137 (14)
Infection prevention and control	88 (9)
Clinical support††	65 (6)
Data science	59 (6)
Laboratory science	47 (5)
Health communications and community outreach	46 (5)
Subject matter expertise§§	36 (4)
Occupational safety and health	31 (3)
Coordination	28 (3)
Veterinary science	11 (1)
Behavioral science	12 (1)
Other¶¶	27 (3)

Abbreviation: COVID-19 = coronavirus disease 2019.

* Deployments through CDC COVID-19 health department response section. Does not include deployments to U.S. quarantine stations and airports, repatriations centers, as part of outbreak response on cruise ships, or other response teams. Some individual CDC staff members were deployed more than once.

† Deployed teams provided a diversity of technical assistance, and a single team could assist with more than one area of technical assistance.

§ Total differs from sum of all high-risk congregate settings because some teams worked in multiple high-risk congregate settings.

¶ Percent represents percentage of total CDC staff members who deployed.

** Leadership includes staff members with any deployment roles listed as "Senior," "Lead," "Deputy," "Team Lead," "Co-Lead," or "Deputy Lead," with leadership staff member classification superseding all other classifications.

†† Clinical support includes staff members who were physicians, nurses, or pharmacists who were not listed with an alternate primary deployer role.

§§ Subject matter expertise includes staff members with any deployment roles listed as "SME," "Specialist," and deployments under COVID-19 Resource Assistance Field Team and Centers for Medicare & Medicaid Services teams.

¶¶ Other includes staff members listed as vessel sanitation, technical assistance, focus groups, and individual deployments that could not otherwise be classified (n = 23).

teams deployed for nearly 3 weeks, and several teams provided more sustained support.

Collaborations between health departments and CDC have provided critical information for developing new or revised national guidance including improved mitigation strategies (https://www.cdc.gov/coronavirus/2019-ncov/communication/guidance-list.html). For example, CDC and health departments developed and implemented the use of serial testing as a successful containment strategy, which was used to interrupt transmission in long-term care facilities in Washington§ (*6*), in correctional and detention facilities in Louisiana¶ (*7*), and among residents and staff members of homeless shelters in Washington** (*8*). Multijurisdictional support helped describe the need for targeted interventions and prevention efforts among workers at food processing facilities, including an analysis of COVID-19 cases among meat and poultry processing facility workers in 23 states that found that among cases with race/ethnicity reported, 87% occurred among racial or ethnic minorities†† (*9*). More generally, deployed teams assisted health departments conduct epidemiologic investigation after outbreaks associated with social gatherings, such as cases and deaths resulting from transmission at two family gatherings in Chicago (*10*); the results of these investigations helped support and refine CDC COVID-19 recommendations on social distancing. The impact of collaborations extends beyond health agencies. For example, on April 2, the Centers for Medicare & Medicaid Services and CDC issued guidance to implement universal testing of long-term care facility residents, covered

§ https://www.cdc.gov/longtermcare/index.html.

¶ https://www.cdc.gov/coronavirus/2019-ncov/community/correction-detention/guidance-correctional-detention.html.

** https://www.cdc.gov/coronavirus/2019-ncov/community/homeless-shelters/plan-prepare-respond.html.

†† https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/meat-poultry-processing-workers-employers.html.

Summary

What is already known about this topic?

As part of the COVID-19 emergency public health response, CDC deploys field teams upon request to assist state, tribal, local, and territorial health departments.

What is added by this report?

As of July 25, 2020, CDC had deployed 208 teams to assist 55 state, tribal, local, and territorial health departments. Teams worked with local counterparts to address transmission in high-risk settings, including long-term care facilities (26%), food processing facilities (12%), correctional facilities (6%), and settings providing services to persons experiencing homelessness (5%).

What are the implications for public health practice?

CDC collaborations with health departments have strengthened local capacity, assisted with outbreak response, and directly contributed to data-informed guidance, benefiting local and national response efforts.

through Medicare, as an effective containment strategy, based on collaborative work between CDC and health departments, including in King County, Washington[§§] (*6*). On July 30, Tyson Foods, the world's second largest processor of chicken, beef, and pork, announced it would expand weekly COVID-19 testing and symptom monitoring among employees as part of a nationwide strategy to contain infections, per CDC guidance[¶¶] and after data analysis conducted in collaboration with 23 state health departments (*9*). Among 90 total COVID-19–related reports published in *MMWR* up to the August 28th issue, 30 (33%) resulted from these deployments.

The findings in this report are subject to at least two limitations. First, deployment data could be subject to data quality issues, despite regular data reviews and a full review of individual deployment data for this report. Second, this report describes deployments through the CDC COVID-19 state, tribal, local, and territorial response section. Health departments were also supported by other CDC COVID-19 response sections, as well as by CDC staff members already working within state, tribal, local, and territorial departments of health, such as Career Epidemiology Field Officers, Public Health Associates,[***] and Epidemic Intelligence Service Officers.[†††] In addition, during January 17–July 25, 2020, CDC deployed 513 staff members to U.S. quarantine stations and airports as well as 159 staff members to support repatriation missions.[§§§]

As the COVID-19 pandemic continues, ongoing collaboration between health departments and CDC will aim to strengthen local capacity, assist with outbreak response, and, as new evidence emerges, directly contribute to data-informed guidance that will benefit local and national response efforts.

Acknowledgments

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CDC COVID-19 State, Tribal, Local, and Territorial Response Team

Noelle Anderson, CDC; David Bang, CDC; Terrika Barham, CDC; Shaliondel Benton, CDC; Amy Blain, CDC; Mary Boyd, CDC; Bruce Bradley, CDC; Shakia Bright, CDC; Michael Bruce, CDC; Victor Cabada, CDC; Georgina Castro, CDC; Dena Cherry-Brown, CDC; Erik Coleman, CDC; Janet Cowins, CDC; Pamela Craig, CDC; Johnni Daniel, CDC; Darlene Davis, CDC; Stacy De, CDC; Naomi Drexler, CDC; Jessica Dull, CDC; Sherry Farr, CDC; Phillip Finley, CDC; Karrie Finn, CDC; Denise Freeman, CDC; Corinne Fukayama, CDC; Nicole Gaarenstroom, CDC; Micha Ghertner, CDC; Maleeka Glover, CDC; Gail Grant, CDC; Sean Griffing, CDC; DeMoncheri Harris, CDC; Diane Harris, CDC; Nikki Hayes, CDC; Seung Hee, CDC; Corey Henry, CDC; Donna Henry, CDC; Janine Hines, CDC; Amy Hudson, CDC; Kashif Iqbal, CDC; Jennifer Isenberg, CDC; Mary Jenkins, CDC; Charlotte Kabore, CDC; Sandor Karpathy, CDC; Daphne Kennebrew, CDC; Karen Kun, CDC; Ryan Lash, CDC; Rene Lavinghouze, CDC; Rachel Leavitt, CDC; Sooji Lee, CDC; Eva Leidman, CDC; Oscar Leon, CDC; Sarah Leonard, CDC; Garry Lowry, CDC; Elizabeth Lundeen, CDC; Mechele Lynch, CDC; Michon Mabry, CDC; Jana Manning, CDC; Kelsey McCall, CDC; Henraya McGruder, CDC; Sarah Merkle, CDC; Jenna Meyer, CDC; Patrick Moonan, CDC; Jazmyn Moore, CDC; Pamelian Norwood, CDC; Seseni Nu, CDC; John Oeltmann, CDC; Krishna Palipudi, CDC; Monica Parise, CDC; Ritchard Parry, CDC; Abrienne Patta, CDC; Chandra Pendergraft, CDC; Kristen Pettrone, CDC; Heidi Pfeifer, CDC; Tracy Powell, CDC; Nykiconia Preacely, CDC; Yanping Qi, CDC; Jessica Ricaldi, CDC; Regina Richardson-Moore, CDC; LaShonda Roberson, CDC; Sergio Rodriguez, CDC; Tomas Rodriguez, CDC; Andrew Ruiz, CDC; Sharon Saydah, CDC; Abdoulie Senesie, CDC; Connie Sexton, CDC; Shari Shanklin, CDC; Christopher Sieradzki, CDC; Amberia Simpson, CDC; De'Lisa Simpson, CDC; Stephanie Snodgrass, CDC; Lisa Speissegger, CDC; Alisa Spieckerman, CDC; Danielle Stollar, CDC; Nimalie Stone, CDC; Brittany Sunshine, CDC; Philana Swann, CDC; Rezwana Uddin, CDC; Diana Valencia, CDC; Chastity Walker, CDC; Malaika Washington, CDC; Seh Welch, CDC; Shawna Williams, CDC;

[§§] https://www.cms.gov/files/document/4220-covid-19-long-term-care-facility-guidance.pdf.
[¶¶] https://www.meatpoultry.com/articles/23549-tyson-expanding-covid-19-testing-monitoring-as-part-of-nationwide-strategy.
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[†††] https://www.cdc.gov/eis/index.html.
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Rebecca Woodruff, CDC; Evonne Woodson, CDC; Graydon Yatabe, CDC; Hussain Yusuf, CDC.

Corresponding author: Emilio Dirlikov, klt9@cdc.gov.

[1]CDC COVID-19 Emergency Response Team; [2]Division of Emergency Operations, CDC.

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Changing Age Distribution of the COVID-19 Pandemic — United States, May–August 2020

Tegan K. Boehmer, PhD[1]; Jourdan DeVies, MS[1]; Elise Caruso, MPH[1]; Katharina L. van Santen, MSPH[2]; Shichao Tang, PhD[1]; Carla L. Black, PhD[1]; Kathleen P. Hartnett, PhD[1]; Aaron Kite-Powell, MS[1]; Stephanie Dietz, PhD[1]; Matthew Lozier, PhD[1]; Adi V. Gundlapalli, MD, PhD[1]

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As of September 21, 2020, the coronavirus disease 2019 (COVID-19) pandemic had resulted in more than 6,800,000 reported U.S. cases and more than 199,000 associated deaths.* Early in the pandemic, COVID-19 incidence was highest among older adults (*1*). CDC examined the changing age distribution of the COVID-19 pandemic in the United States during May–August by assessing three indicators: COVID-19–like illness-related emergency department (ED) visits, positive reverse transcription–polymerase chain reaction (RT-PCR) test results for SARS-CoV-2, the virus that causes COVID-19, and confirmed COVID-19 cases. Nationwide, the median age of COVID-19 cases declined from 46 years in May to 37 years in July and 38 in August. Similar patterns were seen for COVID-19–like illness-related ED visits and positive SARS-CoV-2 RT-PCR test results in all U.S. Census regions. During June–August, COVID-19 incidence was highest in persons aged 20–29 years, who accounted for >20% of all confirmed cases. The southern United States experienced regional outbreaks of COVID-19 in June. In these regions, increases in the percentage of positive SARS-CoV-2 test results among adults aged 20–39 years preceded increases among adults aged ≥60 years by an average of 8.7 days (range = 4–15 days), suggesting that younger adults likely contributed to community transmission of COVID-19. Given the role of asymptomatic and presymptomatic transmission (*2*), strict adherence to community mitigation strategies and personal preventive behaviors by younger adults is needed to help reduce their risk for infection and subsequent transmission of SARS-CoV-2 to persons at higher risk for severe illness.

CDC examined age trends during May–August for 50 states and the District of Columbia (DC) using three indicators: 1) COVID-19–like illness-related ED visits; 2) positive SARS-CoV-2 RT-PCR test results; and 3) confirmed COVID-19 cases. COVID-19–like illness-related ED visits reported by health facilities to the National Syndromic Surveillance Program (NSSP),† had fever with cough, shortness of breath, or difficulty breathing in the chief complaint text or a discharge diagnostic code for COVID-19 and no diagnostic codes for influenza.§ Analyses of COVID-19–like illness-related ED visits were based on the ED visit date.

SARS-CoV-2 RT-PCR test results were obtained from COVID-19 electronic laboratory reporting data submitted by state health departments (37 states) and, when age was unavailable in state-submitted data, from data submitted directly by public health, commercial, and reference laboratories (13 states and DC).¶ Data represent the number of specimens tested, not individual persons who received testing. Analyses were based on the specimen collection date or test order date.** The daily percentage of positive SARS-CoV-2 test results (percent positivity) was calculated as the number of positive test results divided by the sum of positive and negative test results.

Confirmed COVID-19 cases were identified from individual-level case reports submitted by state health

* https://www.cdc.gov/covid-data-tracker/index.html#trends.

† During May–August, an average of 3,679 facilities in 47 states and DC reported to the National Syndromic Surveillance Program representing 73% of total ED visits nationwide. Data from Hawaii, South Dakota, and Wyoming were not included. https://www.cdc.gov/nssp/participation-coverage-map.html.

§ The query for COVID-19–like illness is applied in the ESSENCE system and includes COVID-19 symptoms (fever AND either cough, OR difficulty breathing, OR shortness of breath) or coronavirus diagnostic codes. The query excludes diagnostic codes related to influenza.

¶ COVID-19 electronic laboratory reporting data submitted by state health departments from all laboratories performing SARS-CoV-2 RT-PCR testing were used for 37 states (Alabama, Alaska, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, North Carolina, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, and Wisconsin). SARS-CoV-2 RT-PCR testing data from a subset public health, commercial, and reference laboratories were used for DC and 13 states (California, Delaware, Maine, Mississippi, Missouri, New Mexico, New York, North Dakota, Ohio, Oklahoma, Rhode Island, Washington, and Wyoming). The data from the public health, commercial, and reference laboratories represent approximately 50% of all tests. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority, but not all, SARS-CoV-2 RT-PCR tests in the United States. The data represent laboratory test totals, not individual persons, and exclude antibody and antigen tests.

** Within COVID-19 electronic laboratory reporting data: state was assigned using location of the state health department that reported the test (available for 100% of tests), specimen collection date was used to assign date (available for approximately 98% of tests), and records with missing specimen collection data were excluded. Within data submitted directly by public health, commercial, and reference laboratories: state was assigned using patient location for 96% of tests, provider location was substituted for 1%, and records with both location fields missing (3%) were excluded; order date was used for 80% of tests, specimen collection date was substituted for 19%, and records with both date fields missing (1%) were excluded.

Summary

What is already known about this topic?

Early in the pandemic, COVID-19 incidence was highest among older adults.

What is added by this report?

During June–August 2020, COVID-19 incidence was highest in persons aged 20–29 years, who accounted for >20% of all confirmed cases. Younger adults likely contribute to community transmission of COVID-19. Across the southern United States in June 2020, increases in percentage of positive SARS-CoV-2 test results among adults aged 20–39 years preceded increases among those aged ≥60 years by 4–15 days.

What are the implications for public health practice?

Strict adherence to community mitigation strategies and personal preventive behaviors by younger adults is needed to help reduce infection and subsequent transmission to persons at higher risk for severe illness.

departments[††]; analyses were based on the date the case was reported to CDC.[§§] Confirmed COVID-19 cases had a positive SARS-CoV-2 RT-PCR test result. Case data represent individual persons (some of whom might have had multiple positive test results). Monthly incidence was calculated using 2018 U.S. Census population estimates.

National case counts, percentage distributions, and estimated incidence of confirmed COVID-19 cases were calculated by 10-year age increments and by month (May–August). The weekly median age of persons with COVID-19–like illness-related ED visits, positive SARS-CoV-2 test results, and confirmed COVID-19 cases, as well as that of persons for whom all SARS-CoV-2 tests were conducted, were plotted nationally for the four U.S. Census regions. To minimize the impact of testing availability on findings, the early pandemic period (January–April) was excluded.

[††] Throughout the COVID-19 pandemic, CDC has been tracking both aggregate and individual (i.e., line-list) counts of cases and deaths. CDC official counts of cases and deaths, released daily on https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html, are aggregate counts from reporting jurisdictions. Some jurisdictions electronically submit standardized information for individual cases of COVID-19 to CDC using a case report form (https://www.cdc.gov/coronavirus/2019-ncov/php/reporting-pui.html) or the National Notifiable Diseases Surveillance System (NNDSS; https://wwwn.cdc.gov/nndss; https://wwwn.cdc.gov/nndss/covid-19-response.html). Individual-level case report data were available for approximately 68% of the aggregate number of confirmed cases.

[§§] CDC report date, the date the case was reported to CDC by the state health department, was used because it is the most complete date variable across jurisdictions. If CDC report date was missing, report date was populated with the earliest date in a series of variables submitted by the jurisdiction, including hospital or ICU admission and discharge date, diagnosis date, symptom onset and resolution dates, and positive specimen dates. As of September 7, 2020, approximately 10% of reported COVID-19 confirmed cases in the 50 states and DC had no available date information; an estimation of how many of these were reported to CDC during May–August 2020 (the period of analysis for this study) is not possible at this time.

The southern United States experienced regional COVID-19 outbreaks during June–July 2020. For U.S. Department of Health and Human Services (HHS) Regions 4, 6, and 9,[¶¶] daily percent positivity was plotted for four age groups (0–19 years, 20–39 years, 40–59 years, and ≥60 years). The segmented package (version 1.2-0) in R software (version 3.6.0; The R Foundation) was used to segment the age group-specific trend lines and identify inflection points when the slopes changed.

National incidence of confirmed COVID-19 increased from 185 cases per 100,000 persons in May to 316 in July, then declined to 275 in August (Table). During May–July, incidence increased among persons in all age groups <80 years, with the largest increases in persons aged <30 years. As a result, the median age of confirmed COVID-19 cases decreased from 46 years in May to 37 years in July and 38 years in August. During June–August, incidence was highest among persons aged 20–29 years, who accounted for the largest proportion of total cases (>20%). Similar age shifts were observed nationwide.

The median age trend lines for all three indicators (COVID-19–like illness-related ED visits, positive SARS-CoV-2 test results, and confirmed COVID-19 cases) followed similar patterns in the national data (Figure 1) and within each U.S. Census region (Figure 2); however, patterns differed by region. Nationally and in the South and Midwest, median age decreased until mid- to late June, increased during July, and decreased in the latter half of August. In the West, median age declined from May to mid-June and then remained relatively stable or slightly increased during July–August. In the Northeast, median age of persons with positive test results and confirmed cases was stable in May, decreased sharply in June, increased slightly in July, and decreased in August; median age for persons with COVID-19–like illness-related ED visits declined steadily from mid-June to mid-August. In all four U.S. Census regions, the median age of persons for whom all SARS-CoV-2 tests were conducted was relatively stable in May (whereas median age of persons with positive test results and confirmed cases declined) in May and began to decrease following declines in the other three indicators.

During June 2020 in HHS Regions 4, 6, and 9, the change to an upward slope in percent positivity among persons aged 20–39 years occurred an average of 8.7 days (range 4–15 days) before the change to an upward slope among persons aged ≥60 years (Supplementary Figure, https://stacks.cdc.gov/view/cdc/93914). This pattern was most evident in Region 4 (Southeast) where the increase in percent positivity among persons aged 20–39 years preceded increases among persons aged

[¶¶] HHS *Region 4*: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee; *Region 6*: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas; *Region 9*: Arizona, California, Hawaii, and Nevada. https://www.hhs.gov/about/agencies/iea/regional-offices/index.html.

TABLE. Reported number of confirmed* COVID-19 cases and estimated incidence,† by age group§ and month — United States, May 1–Aug 31, 2020

	May 2020		June 2020		July 2020		Aug 2020	
Age group (yrs)	No. (%)	Incidence†	No. (%)	Incidence†	No. (%)	Incidence†	No. (%)	Incidence†
0–9	13,987 (2.3)	35.0	24,772 (3.3)	61.9	40,093 (3.9)	100.2	35,612 (4.0)	89.0
10–19	31,053 (5.1)	74.0	55,596 (7.5)	132.4	104,048 (10.1)	247.9	103,637 (11.5)	246.9
20–29	93,741 (15.5)	206.3	149,761 (20.2)	329.6	240,105 (23.2)	528.5	189,366 (21.0)	416.8
30–39	101,917 (16.9)	233.2	130,415 (17.6)	298.4	183,478 (17.8)	419.9	148,500 (16.5)	339.8
40–49	98,982 (16.4)	244.6	119,043 (16.0)	294.2	157,019 (15.2)	388.1	134,288 (14.9)	331.9
50–59	99,058 (16.4)	231.3	108,509 (14.6)	253.4	139,004 (13.4)	324.6	124,835 (13.9)	291.5
60–69	72,115 (11.9)	192.7	73,225 (9.9)	195.7	89,586 (8.7)	239.4	84,247 (9.4)	225.1
70–79	42,476 (7.0)	187.3	40,714 (5.5)	179.6	47,851 (4.6)	211.1	47,060 (5.2)	207.6
≥80	51,241 (8.5)	404.4	41,023 (5.5)	323.7	32,370 (3.1)	255.4	33,005 (3.7)	260.5
Total	**604,570 (100.0)**	**184.8**	**743,058 (100.0)**	**227.1**	**1,033,554 (100.0)**	**315.9**	**900,550 (100.0)**	**275.3**

Abbreviation: COVID-19 = coronavirus disease 2019.
* A confirmed COVID-19 case required detection of SARS-CoV-2 RNA in a clinical specimen using a molecular amplification detection test.
† Cases per 100,000 population calculated using 2018 U.S. Census population estimates.
§ Data from individual-level case reports submitted by state health departments, using date case was reported to CDC. Case report data were available for approximately 68% of the total aggregate counts of confirmed cases submitted by state health departments. Case reports with missing information on age (3,845) were not included.

40–59 years by 9 days and those aged ≥60 years by 15 days; percent positivity among persons aged 0–19 years increased steadily from early May to early July. Within HHS Regions 6 and 9 (Southcentral and Southwest), the percent positivity among persons aged 0–19, 20–39, and 40–59 years increased at approximately the same time and preceded increases among persons aged ≥60 years by approximately 7 days in Region 6 and 4 days in Region 9.

Discussion

During June–August, the COVID-19 pandemic in the United States affected a larger proportion of younger persons than during January–May 2020 (*1*). The shift toward younger ages occurred in all four U.S. Census regions, regardless of changes in incidence during this period, and was reflected in COVID-19–like illness-related ED visits, positive SARS-CoV-2 RT-PCR test results, and confirmed COVID-19 cases. A similar age shift occurred in Europe, where the median age of COVID-19 cases declined from 54 years during January–May to 39 years during June–July, during which time persons aged 20–29 years constituted the largest proportion of cases (19.5%) (*3*).

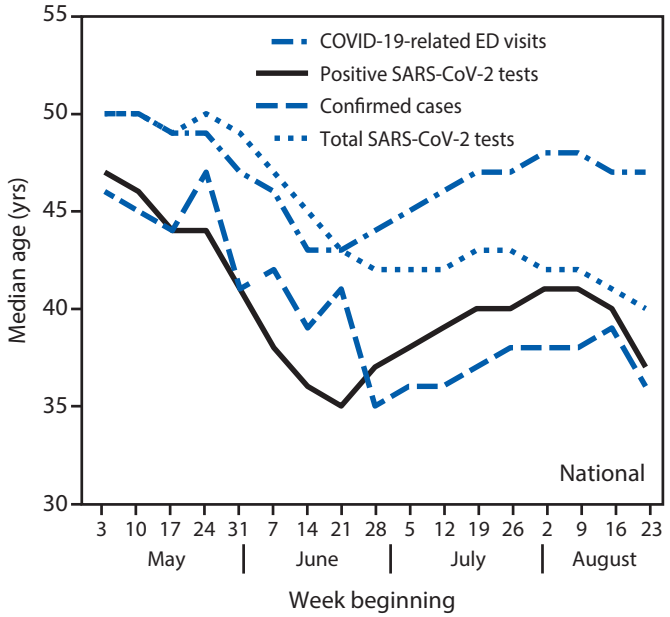
Case and laboratory surveillance are based on consistent availability of diagnostic testing to all segments of the population, and changes in testing across age groups could affect the age distribution of positive SARS-CoV-2 test results and confirmed cases. Although testing availability has varied by place, time, and test provider, it is unlikely that the observed age shift resulted solely from changes in testing availability. First, the decline in median age of persons for whom all SARS-CoV-2 tests were conducted lagged behind declines in median age of persons with positive test results and confirmed cases, suggesting that infection patterns drove testing patterns. Second, the age distribution of persons for whom all SARS-CoV-2 tests were conducted shifted toward younger groups from May to June but remained relatively consistent during June–August. Third, the percent positivity continued to increase in the face of increased testing volume; this was most evident in HHS Regions 4 and 6 among persons aged 20–39 years during early to mid-June. (Supplementary Figure, https://stacks.cdc.gov/view/cdc/93914). Fourth, the median age of persons with COVID-19–like illness-related ED visits, which is not dependent on testing availability, showed similar patterns to those of persons with positive test results and confirmed cases.

This report provides preliminary evidence that younger adults contributed to community transmission of COVID-19 to older adults. Across the southern United States in June 2020, the increase in SARS-CoV-2 infection among younger adults preceded the increase among older adults by 4–15 days (or approximately one to three incubation periods). Similar observations have been reported by the World Health Organization.*** Further investigation of community transmission dynamics across age groups to identify factors that might be driving infection among younger adults and subsequent transmission to older adults is warranted.

These findings have important clinical and public health implications. First, occupational and behavioral factors might put younger adults at higher risk for exposure to SARS-CoV-2. Younger adults make up a large proportion of workers in frontline occupations (e.g., retail stores, public transit, child care, and social services) and highly exposed industries (e.g., restaurants/bars, entertainment, and personal services) (*4,5*), where consistent implementation of prevention strategies might be difficult or not possible. In addition, younger adults might also be less likely to follow community mitigation strategies, such as social distancing and avoiding group gatherings (*6,7*). Second, younger adults, who are more likely to have mild or no symptoms,††† can unknowingly contribute to presymptomatic

*** https://www.who.int/westernpacific/news/speeches/detail/virtual-press-conference-on-covid-19-in-the-western-pacific.
††† https://arxiv.org/ftp/arxiv/papers/2006/2006.08471.pdf.

FIGURE 1. Weekly median age of persons with COVID-19–like illness-related emergency department (ED) visits,* positive SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) test results,† and confirmed COVID-19 cases,§ and of persons for whom all SARS-CoV-2 RT-PCR tests were conducted¶ — United States, May 3–August 29, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* From CDC National Syndromic Surveillance Program (NSSP), using date of ED visit. NSSP records 73% of all emergency department visits in the United States.

† From COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by public health, commercial, and reference laboratories for 13 states and the District of Columbia, based on specimen collection or test order date. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority of, but not all, SARS-CoV-2 RT-PCR tests in the United States.

§ From case reports with individual-level information submitted by state health departments, using date case was reported to CDC. Case report data were available for approximately 68% of the total daily aggregate number of confirmed cases submitted by state health departments.

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or asymptomatic transmission to others (*2*), including to persons at higher risk for severe illness. Finally, SARS-CoV-2 infection is not benign in younger adults, especially among those with underlying medical conditions,§§§ who are at risk for hospitalization, severe illness, and death (*8*).

The findings in this report are subject to at least five limitations. First, case report data submitted to CDC by state health departments underestimates true incidence. Second, batch reporting of historical cases by some states might have led to spikes in median age trend lines, such as the increase seen in the Midwest region in June. Third, the report's three data sources varied in their geographic coverage, with laboratory data being the most comprehensive. Nevertheless, consistent patterns and trends were observed across the three indicators. Fourth, analyzing data at a regional level could minimize differences in age group–specific trends that might otherwise be observed at the state or local level. Finally, use of ten- and twenty-year age groups might mask age patterns among smaller age groups and those that cross decades, such as recent increases in COVID-19 cases among college and university students.¶¶¶

Increased prevalence of SARS-CoV-2 infection among younger adults likely contributes to community transmission of COVID-19, including to persons at higher risk for severe illness, such as older adults. Emphasis should be placed on targeted mitigation strategies to reduce infection and transmission among younger adults, including age-appropriate prevention messages (*7*), restricting in-person gatherings and events,**** recommending mask use and social distancing in settings where persons socialize,†††† implementing safe practices at on-site eating and drinking venues (*9*), and enforcing protection measures for essential and service industry workers.§§§§ Given the role of asymptomatic and presymptomatic transmission (*2*), all persons, including young adults, should take extra precautions to avoid transmission to family and community members who are older or who have underlying medical conditions. Strict adherence to community mitigation strategies and personal preventive behaviors by younger adults is needed to help reduce their risk for infection and minimize subsequent transmission of SARS-CoV-2 to persons at higher risk for severe COVID-19.

§§§ https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html.

¶¶¶ https://www.nytimes.com/interactive/2020/us/covid-college-cases-tracker.html.

**** https://www.cdc.gov/coronavirus/2019-ncov/community/large-events/considerations-for-events-gatherings.html.

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

§§§§ https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/businesses-employers.html.

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Corresponding author: Tegan K. Boehmer, tboehmer@cdc.gov.

[1]CDC COVID-19 Response Team; [2]ICF International Inc., Atlanta, Georgia.

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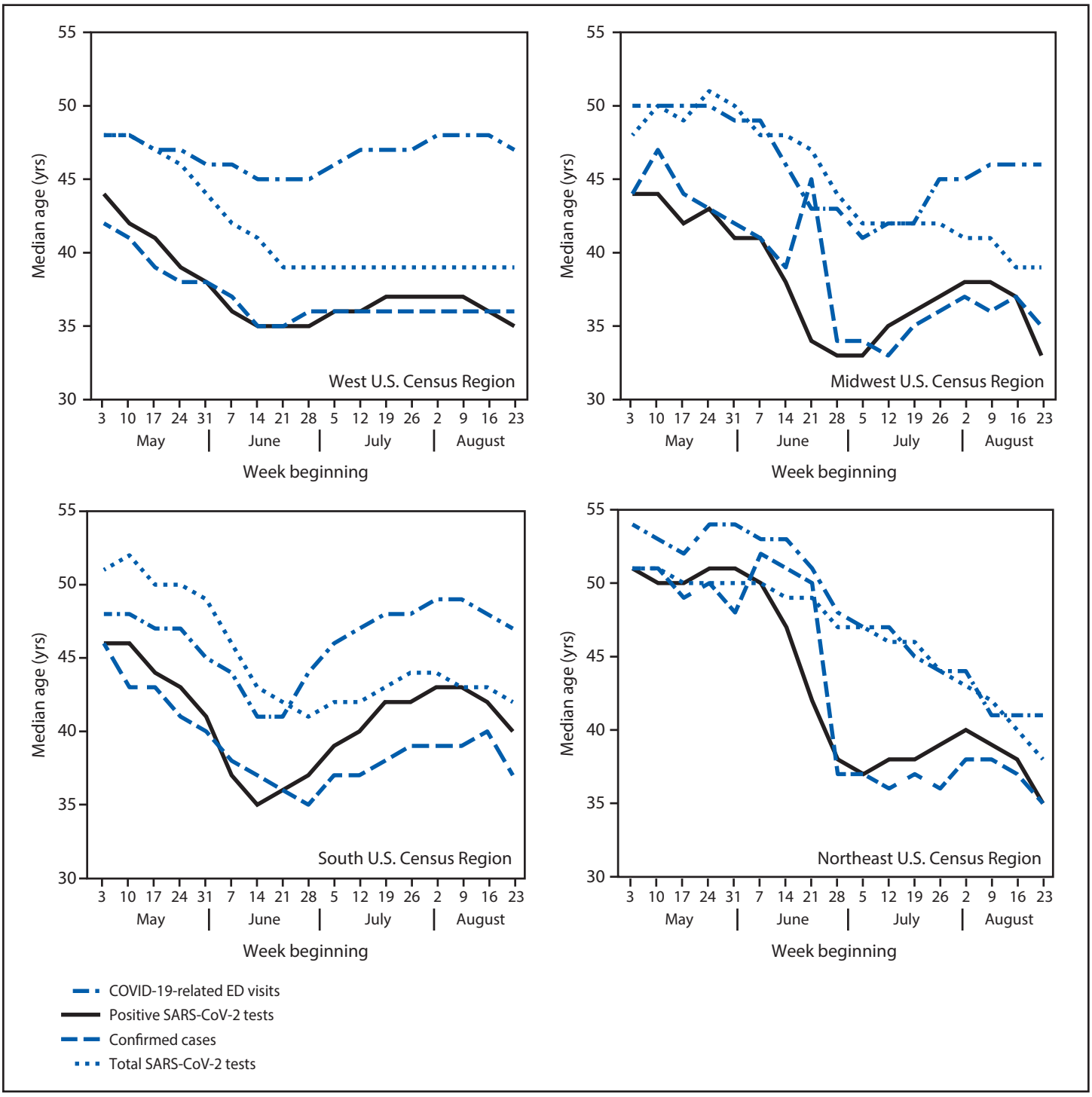
FIGURE 2. Weekly median age of persons with COVID-19–like illness-related emergency department (ED) visits,* positive SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) test results,† and confirmed COVID-19 cases,§ and of persons for whom all SARS-CoV-2 RT-PR tests were conducted,¶ by U.S. Census region — United States, May 3–August 29, 2020**



See figure footnotes on the next page.

FIGURE 2. (*Continued*) Weekly median age of persons with COVID-19–like illness-related emergency department (ED) visits,* positive SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) test results,† and confirmed COVID-19 cases,§ and of persons for whom all SARS-CoV-2 RT-PR tests were conducted,¶ by U.S. Census region — United States, May 3–August 29, 2020**

Abbreviation: COVID-19 = coronavirus disease 2019.

* From CDC National Syndromic Surveillance Program (NSSP), using date of ED visit. NSSP records 73% of all emergency department visits in the United States.

† From COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by public health, commercial, and reference laboratories for 13 states and the District of Columbia, based on specimen collection or test order date. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority, but not all, SARS-CoV-2 RT-PCR tests in the United States.

§ From case reports with individual-level information submitted by state health departments, using date case was reported to CDC. Case report data were available for approximately 68% of the total daily aggregate number of confirmed cases submitted by state health departments.

¶ From COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by public health, commercial, and reference laboratories for 13 states and the District of Columbia, based on specimen collection or test order date. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority, but not all, SARS-CoV-2 RT-PCR tests in the United States.

** *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

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Morbidity and Mortality Weekly Report

COVID-19 Trends Among School-Aged Children — United States, March 1–September 19, 2020

Rebecca T. Leeb, PhD[1]; Sandy Price[1]; Sarah Sliwa, PhD[1]; Anne Kimball, MD[1,2]; Leigh Szucs, PhD[1]; Elise Caruso, MPH[1]; Shana Godfred-Cato, DO[1]; Matthew Lozier, PhD[1]

On September 28, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

Approximately 56 million school-aged children (aged 5–17 years) resumed education in the United States in fall 2020.* Analysis of demographic characteristics, underlying conditions, clinical outcomes, and trends in weekly coronavirus disease 2019 (COVID-19) incidence during March 1–September 19, 2020 among 277,285 laboratory-confirmed cases in school-aged children in the United States might inform decisions about in-person learning and the timing and scaling of community mitigation measures. During May–September 2020, average weekly incidence (cases per 100,000 children) among adolescents aged 12–17 years (37.4) was approximately twice that of children aged 5–11 years (19.0). In addition, among school-aged children, COVID-19 indicators peaked during July 2020: weekly percentage of positive SARS-CoV-2 test results increased from 10% on May 31 to 14% on July 5; SARS-CoV-2 test volume increased from 100,081 tests on May 31 to 322,227 on July 12, and COVID-19 incidence increased from 13.8 per 100,000 on May 31 to 37.9 on July 19. During July and August, test volume and incidence decreased then plateaued; incidence decreased further during early September and might be increasing. Percentage of positive test results decreased during August and plateaued during September. Underlying conditions were more common among school-aged children with severe outcomes related to COVID-19: among school-aged children who were hospitalized, admitted to an intensive care unit (ICU), or who died, 16%, 27%, and 28%, respectively, had at least one underlying medical condition. Schools and communities can implement multiple, concurrent mitigation strategies and tailor communications to promote mitigation strategies to prevent COVID-19 spread. These results can provide a baseline for monitoring trends and evaluating mitigation strategies.

School-aged children were stratified by age into two groups: children aged 5–11 years and adolescents aged 12–17 years. Confirmed COVID-19 cases were identified from individual-level case reports submitted by state health departments for the weeks beginning March 1–September 13, 2020.† Confirmed cases had a positive real-time reverse transcription–polymerase chain reaction (RT-PCR) test result for SARS-CoV-2, the virus that causes COVID-19. COVID-19 case data for all children were analyzed to examine demographic characteristics, underlying conditions,§ hospitalization, ICU admission, and death. Trends were analyzed using CDC report date¶ to calculate a a daily 7-day moving average, aggregated by week. Analyses are descriptive; statistical comparisons were not performed.

To examine trends in laboratory testing volume and percentage of positive test results, data from COVID-19 electronic laboratory data were used. SARS-CoV-2 RT-PCR test results were obtained for the weeks beginning May 31–September 13, 2020 from COVID-19 electronic laboratory reporting data submitted by state health departments (37 states); when age was unavailable in state-submitted data, information from data submitted directly by public health, commercial, and reference laboratories (13 states, Puerto Rico, and the District of

* https://nces.ed.gov/fastfacts/display.asp?id=372.

† During the COVID-19 pandemic, CDC receives both aggregate and individual (i.e., line-list) counts of cases and deaths from reporting jurisdictions. CDC official counts of cases and deaths, released daily at https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html, are aggregate counts from reporting jurisdictions. Some jurisdictions electronically submit standardized information for individual cases of COVID-19 to CDC using the Human Infection with 2019 Novel Coronavirus Case Report Form (COVID-19 Case Report Form) developed for the CDC COVID-19 response (https://www.cdc.gov/coronavirus/2019-ncov/php/reporting-pui.html) or the CDC National Notifiable Diseases Surveillance System (NNDSS) (https://wwwn.cdc.gov/nndss/covid-19-response.html). Individual-level case report data were available for approximately 69% of the aggregate number of confirmed cases. Cases reported without sex or age data and in persons repatriated to the United States from Wuhan, China, or the Diamond Princess cruise ship were excluded from this analysis.

§ Underlying conditions were defined based on the categories included in the COVID-19 Case Report Form including diabetes mellitus, hypertension, severe obesity (body mass index [BMI] ≥40 kg/m^2), cardiovascular disease, chronic renal disease, chronic liver disease, chronic lung disease (asthma, emphysema, and chronic obstructive pulmonary disease [COPD]), other (specified) chronic diseases, other (specified) underlying condition or risk behavior, immunosuppressive conditions, autoimmune conditions, being a current or former smoker, substance abuse or misuse, disability (neurologic, neurodevelopmental, intellectual, physical, vision or hearing impairment, and psychological/psychiatric condition). Although obesity in children is not generally defined using BMI, these data are drawn from the NNDSS case report form in which severe obesity is defined as noted.

¶ CDC report date is the date the case was reported to CDC by the state health department. If CDC report date was missing, report date was populated with the earliest date in a series of variables submitted by the jurisdiction, including hospital or ICU admission and discharge date, diagnosis date, symptom onset and resolution dates, and positive specimen dates. As of August 9, 2020, approximately 10% of reported COVID-19 confirmed cases in the 50 states and District of Columbia had no available date information; it cannot be estimated when these were reported to CDC during May–August 2020 (the analytic period for this study).

Columbia) were used.** Data represent test results, not number of persons tested; specimen collection date or test order date was used for analysis.†† The weekly percentage of positive SARS-CoV-2 RT-PCR test results was calculated nationally for each U.S. Department of Health and Human Services (HHS) Region§§ as the number of positive test results divided by the sum of positive and negative test results.

During March 1–September 19, 2020, a total of 277,285 laboratory-confirmed cases of COVID-19 in school-aged children were reported in the United States, including 101,503 (37%) in children aged 5–11 years and 175,782 (63%) in adolescents aged 12–17 years (Table). Overall, 50.8% were in females (aged 5–11 years = 49.4%; aged 12–17 = 51.6%). Among 161,387 (58%) school-aged children with COVID-19 and complete information on race/ethnicity, 42% were Hispanic/Latino (Hispanic), 32% were non-Hispanic White (White), and 17% were non-Hispanic Black (Black). Hispanic children accounted for 46% of cases among younger children and 39% among adolescents; White children accounted for 26% of cases in younger children and 36% in adolescents.¶¶ Weekly incidence among school-aged children increased from March 1, peaking at 37.9 cases per 100,000 the week of July 19 (aged 5–11 years = 25.7; aged 12–17 years = 51.9), plateaued at an average of 34 per 100,000 during July 26–August 23, decreased to 22.6 per 100,000 the week of September 6, and rebounded to 26.3 per 100,000 the last week for which data are available (Figure 1) (Supplementary Figure 1, https://stacks.cdc.gov/view/cdc/94150). Trends in incidence were similar among both age groups. Incidence among adolescents was approximately double that among younger children throughout the reporting period. During May–September, average weekly incidence among adolescents was 37.4 cases per 100,000 compared with 19.0 per 100,000 for younger children.

Weekly SARS-CoV-2 laboratory test volume among school-aged children more than tripled, from 100,081 tests performed during the week beginning May 31 to a peak of 322,227 during the week beginning July 12, then decreased to approximately 260,000 during August and rebounded in September; test volume was higher among adolescents than younger children (Figure 2) (Supplementary Figure 1, https://stacks.cdc.gov/view/cdc/94150) (Supplementary Figure 2, https://stacks.cdc.gov/view/cdc/94151). The percentage of positive SARS-CoV-2 laboratory test results increased for both age groups from May 31 and peaked during the week beginning July 5; percentage of positive test results then decreased among both age groups. Since August 23, the percentage of positive SARS-CoV-2 laboratory test results plateaued at 7% among adolescents and continued to decrease among younger children.

HHS Regions 6, 4, and 9 had the highest weekly percentage of positive test results, peaking during the week of July 5 at 24% (Region 6), 18% (Region 4), and 17% (Region 9), and all declined to approximately 8% the week beginning September 13 (Supplementary Figure 2, https://stacks.cdc.gov/view/cdc/94151). In Region 1, weekly percentage of positive tests decreased from 8% during the week beginning May 31 to <2% during the week beginning September 13. In Region 9, the percentage of positive test results was similar over time in both age groups; in Regions 5 and 7, although the percentage of positive test results were initially similar in both age groups, beginning in early June (Region 7) and mid-June (Region 5), the percentage of positive test results in adolescents exceeded that among younger children.

Among school-aged children with laboratory-confirmed COVID-19, 58% reported at least one symptom, 5% reported no symptoms, and information on symptoms was missing or unknown for 37% (Table). Overall, 3,240 (1.2%) school-aged children with COVID-19 were hospitalized, including 404 (0.1%) who required ICU admission. Fifty-one (<0.01%) school-aged children died of COVID-19. Among school-aged children with complete information on race/ethnicity who were hospitalized (2,473 [76%]) or admitted to an ICU (321 [80%]), Hispanic ethnicity was most commonly reported (45%

** COVID-19 Electronic Laboratory Reporting data submitted by state health departments from all laboratories performing SARS-CoV-2 RT-PCR testing were used for 37 states (Alabama, Alaska, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, North Carolina, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, and Wisconsin). SARS-CoV-2 RT-PCR testing data from a subset of public health, commercial, and reference laboratories were used for the District of Columbia and 14 states/territories (California, Delaware, Maine, Mississippi, Missouri, New Mexico, New York, North Dakota, Ohio, Oklahoma, Puerto Rico, Rhode Island, Washington, and Wyoming). The data from the public health, commercial, and reference laboratories represent approximately 50% of all tests. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority of, but not all, SARS-CoV-2 RT-PCR tests in the United States. The data represent laboratory test totals, not individual persons tested, and exclude antibody and antigen tests.

†† For COVID-19 electronic laboratory reporting data, state was assigned using the state health department reporting the test (available for 100% of tests), and specimen collection date was used to assign date (available for approximately 98% of tests); those with missing specimen collection date were excluded. Within data submitted directly by public health, commercial, and reference laboratories, state was assigned using patient location for 96% of tests; provider location was substituted for 1%, and records with both location fields missing (3%) were excluded; order date was used for 80% of tests, specimen collection date was substituted for 19%, and records with both date fields missing (1%) were excluded.

§§ The HHS Office of Intergovernmental and External Affairs hosts 10 regional offices that directly serve state and local organizations. https://www.hhs.gov/about/agencies/iea/regional-offices/index.html.

¶¶ In 2018, children of Hispanic/Latino ethnicity comprised 26% of children aged 5–11 years and 24% of adolescents aged 12–17 years; children of non-Hispanic Black race comprised 14% of children aged 5–11 years and 14% of adolescents 12–17 years; and children of non-Hispanic White race comprised 50% of children aged 5–11 years and 52% of adolescents aged 12–17 years in the United States. https://datacenter.kidscount.org/data/customreports/1/8446.

TABLE. Demographic characteristics and underlying conditions among school-aged children aged 5–11 years and 12–17 years* with positive test results for SARS-CoV-2 (N = 233,474) — United States, March 1–September 19, 2020

Characteristic	Age group, no. (%)		
	All (N = 277,285)	5–11 yrs (n = 101,503)	12–17 yrs (n = 175,782)
Sex†			
Female	140,755 (50.8)	50,096 (49.4)	90,659 (51.6)
Male	136,530 (49.2)	51,407 (50.6)	85,123 (48.4)
Median age, yrs	13	8	15
Symptom status			
Yes	161,751 (58.3)	56,917 (56.1)	104,834 (59.6)
No	12,806 (4.6)	5,985 (5.9)	6,821 (3.9)
Missing/Unknown	102,728 (37.0)	38,601 (38.0)	64,127 (36.5)
Race/Ethnicity§			
Hispanic/Latino	67,275 (41.7)	27,539 (45.9)	39,736 (39.2)
White, non-Hispanic	52,229 (32.4)	15,503 (25.8)	36,726 (36.2)
Black, non-Hispanic	27,963 (17.3)	11,315 (18.8)	16,648 (16.4)
A/PI, non-Hispanic	4,541 (2.8)	1,932 (3.2)	2,609 (2.6)
AI/AN, non-Hispanic	3,044 (1.9)	1,342 (2.2)	1,702 (1.7)
Multiracial/Other race	6,335 (3.9)	2,421 (4.0)	3,914 (3.9)
Unknown¶	115,898 (N/A)	41,451 (N/A)	74,447 (N/A)
Underlying condition			
Any	7,738 (2.8)	2,396(2.4)	5,342 (3.0)
Chronic lung disease**	4,214 (54.5)	1,441 (60.1)	2,773 (51.9)
Disability††	714 (9.2)	251 (10.5)	463 (8.7)
Immunosuppression	526 (6.8)	193 (8.1)	333 (6.2)
Diabetes mellitus	476 (6.2)	88 (3.7)	388 (7.3)
Psychological/Psychiatric	445 (5.8)	60 (2.5)	385 (7.2)
Cardiovascular disease	363 (4.7)	128(5.3)	235 (4.4)
Current/Former smoker§§	334 (4.3)	11 (0.5)	323 (6.0)
Severe obesity (BMI ≥40 kg/m^2)	315 (4.1)	70 (2.9)	245 (4.6)
Chronic kidney disease	116 (1.5)	47 (2.0)	69 (1.3)
Hypertension	94 (1.2)	13 (0.5)	81 (1.5)
Autoimmune	87 (1.1)	16 (0.7)	71 (1.3)
Chronic liver disease	64 (0.8)	14 (0.6)	50 (0.9)
Substance abuse/use	34 (0.4)	0 (0.0)	34 (0.6)
Other¶¶	1,326 (17.1)	419 (17.5)	907 (17.0)
Outcome			
Hospitalized***	3,240 (1.2)	1,021 (1.0)	2,219 (1.3)
ICU admission†††	404 (0.1)	145 (0.1)	259 (0.1)
Died§§§	51 (<0.1)	20 (<0.1)	31 (<0.1)

Abbreviations: A/PI = Asian/Pacific Islander; AI/AN = American Indian/Alaska Native; BMI = body mass index; COVID-19 = coronavirus disease 2019; ICU = intensive care unit.; N/A = not available.

* Age was missing for 1.9% of all persons with positive test results; the proportion aged 5–17 years cannot be determined.

† Among 281,116 persons aged 5–17 years with COVID-19, sex was missing, unknown, or other for 3,831 (1.4%).

§ Persons for whom ethnicity was missing (i.e., not reported as either "Hispanic" or "non-Hispanic") were categorized has having missing race/ethnicity.

¶ Missing data were excluded from the denominator for calculating percentage of each racial/ethnic group. Missing rates did not differ by age group. Multiracial/other race includes persons reported as American Indian/Alaskan Native, Native Hawaiian or other Pacific Islander, multiracial, and persons of another race without further specification.

** Chronic lung disease includes asthma, emphysema, and chronic obstructive pulmonary disease (COPD).

†† Disability includes neurologic and neurodevelopmental disorders (e.g., seizure disorders, autism spectrum disorders, and developmental delay), intellectual and physical disabilities, vision or hearing impairment, genetic disorders and inherited metabolic disorders, and blood disorders (e.g., sickle cell disease and hemophilia).

§§ Checked the box on the case report form for either "current smoker" or "former smoker."

¶¶ Other includes conditions not listed elsewhere, conditions with no specific autoimmune etiology, endocrine disorders other than diabetes (e.g., polycystic ovarian disease, hypothyroidism, and hyperthyroidism), gastrointestinal disorders (e.g., gastritis or gastroesophageal reflux), obstructive sleep apnea, allergies/atopy, anemia (etiology not specified), history of cancer in remission, and other conditions that did not fall under the specified categories.

*** Hospitalization status. 5–11 years: missing/unknown = 44,300 (43.6%); 12–17 years: missing/unknown = 79,411 (45.2%).

††† ICU admission status. 5–11 years: missing/unknown = 90,405 (89.0%); 12–17 years: missing/unknown = 154,662 (88.0%).

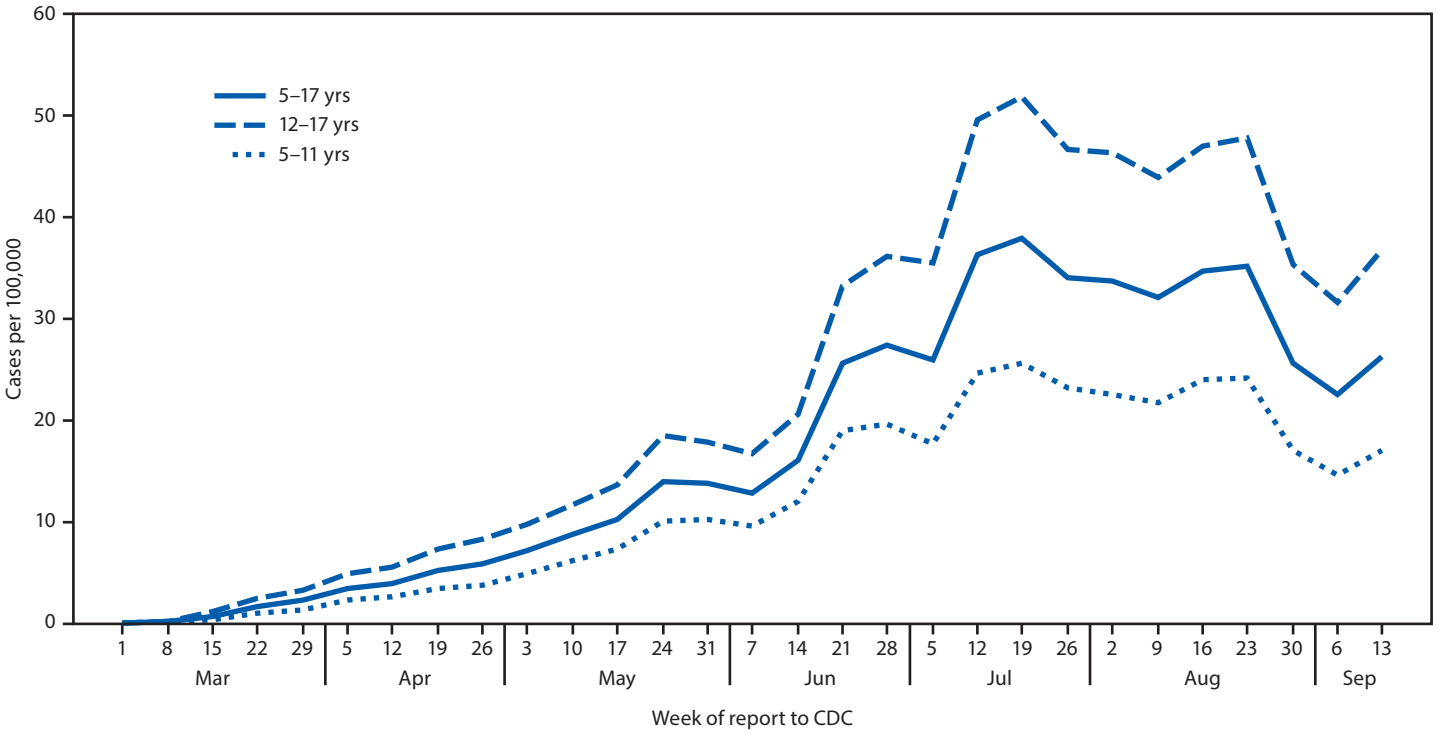
§§§ Mortality status. 5–11 years: missing/unknown = 47,006 (46.3%); 12–17 years: missing/unknown = 83,479 (47.5%).

and 43%, respectively), followed by Black (24% and 28%, respectively) and White (22% and 17%, respectively) races.

Among school-aged children with COVID-19, at least one underlying condition was reported for 7,738 (3%), including approximately 3% of adolescents and 2% of younger children. Among those with an underlying condition, chronic lung disease, including asthma, was most commonly reported (55%), followed by disability*** (9%), immunosuppressive conditions

*** Disability included neurologic or neurodevelopmental disorders, intellectual or physical disability, and vision or hearing impairment.

FIGURE 1. COVID-19 incidence* among school-aged children aged 5–11 years (N = 101,503) and 12–17 years (N = 175,782), by week — United States, March 1–September 19, 2020†



Sources: CDC COVID-19 case report form. https://wwwn.cdc.gov/nndss/covid-19-response.html. CDC National Notifiable Disease Surveillance System. https://wwwn.cdc.gov/nndss.
Abbreviation: COVID-19 = coronavirus disease 2019.
* Incidence = cases per 100,000, calculated using 2018 population from https://datacenter.kidscount.org/.
† Data included through September 19, 2020, so that each week has a full 7 days of data.

(7%), diabetes (6%), psychological conditions (6%), cardiovascular disease (5%), and severe obesity (4%). At least one underlying condition was reported for 16% of school-aged children who were hospitalized for COVID-19, 27% of those admitted to an ICU, and 28% of those who died.

Discussion

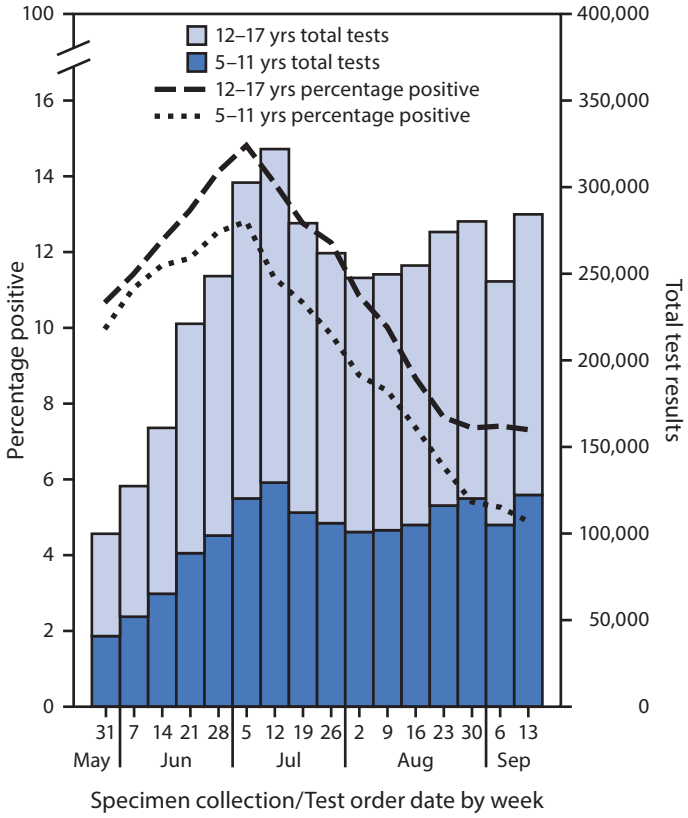
As education resumes and some schools begin in-person learning for the 2020–21 academic year, it is critical to have a baseline for monitoring trends in COVID-19 infection among school-aged children. Since March, a period during which most U.S. schools conducted classes virtually or were closed for the summer, the incidence among adolescents was approximately double that in younger children. Although mortality and hospitalization in school-aged children was low, Hispanic ethnicity, Black race, and underlying conditions were more commonly reported among children who were hospitalized or admitted to an ICU, providing additional evidence that some children might be at increased risk for severe illness associated with COVID-19 (*1*–*4*).††† Acute COVID-19 and multisystem inflammatory syndrome in children (MIS-C) have been reported to disproportionately affect Hispanic and Black children (*3*,*4*). Implementing multiple, concurrent mitigation strategies and tailored communications about the importance of promoting and reinforcing behaviors that reduce spread of COVID-19 (e.g., wearing masks, maintaining a social distance of ≥6 feet, and frequent handwashing) can reduce COVID-19 spread in schools and communities.

Monitoring trends in multiple indicators of COVID-19 could inform mitigation measures to prevent COVID-19 spread.§§§ COVID-19 incidence increased from March to July, and SARS-CoV-2 test volume and weekly percentage of positive test results among school-aged children increased from late May to July. During March through May, widespread shelter-in-place orders were in effect, and most U.S. schools transitioned to online learning. In June and July, when community mitigation measures were relaxed in some areas, incidence increased more rapidly. Recent evidence that monthly COVID-19 incidence increased approximately threefold among persons aged 0–19 years since May and was highest

††† https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/other-at-risk-populations.html.

§§§ https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/indicators.html.

FIGURE 2. Percentage of SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) tests positive and test volume, by week for school-aged children aged 5–11 years and 12–17 years — United States, May 31–September 19, 2020*



Abbreviation: COVID-19 = coronavirus disease 2019.

* From COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and from data submitted directly by public health, commercial, and reference laboratories for 13 states, Puerto Rico, and the District of Columbia, using specimen collection or test order date. The data represent percentage of tests, not of individual persons, with a positive result and include RT-PCR tests but not antigen or point-of-care tests.

among young adults aged 20–29 years during July, suggests that young persons might be playing an increasingly important role in community transmission (*5*,*6*). The percentage of positive test results in school-aged children also varied within and across HHS regions. Variations in percentage of positive tests might indicate differences in community transmission rates. School studies suggest that in-person learning can be safe in communities with low SARS-CoV-2 transmission rates[¶¶¶] (*7*) but might increase transmission risk in communities where transmission is already high.[****]

The findings in this report are subject to at least four limitations. First, these data might underestimate the actual incidence of disease among school-aged children, because testing was frequently prioritized for persons with symptoms, and asymptomatic infection in children is common (*8*). These data

Summary

What is already known about this topic?

Children aged <10 years can transmit SARS-CoV-2 in school settings, but less is known about COVID-19 incidence, characteristics, and health outcomes among school-aged children (aged 5–17 years) with COVID-19.

What is added by this report?

Since March, 277,285 COVID-19 cases in children have been reported. COVID-19 incidence among adolescents aged 12–17 years was approximately twice that in children aged 5–11 years. Underlying conditions were more common among school-aged children with severe outcomes related to COVID-19. Weekly incidence, SARS-CoV-2 test volume, and percentage of tests positive among school-aged children varied over time and by region of the United States.

What are the implications for public health practice?

It is important for schools and communities to monitor multiple indicators of COVID-19 among school-aged children and layer prevention strategies to reduce COVID-19 disease risk for students, teachers, school staff, and families. These results can provide a baseline for monitoring trends and evaluating mitigation strategies.

are also from a single reporting system and therefore might not represent the total number of cases and deaths in school-aged children reported in the United States (*1*). Second, findings on race/ethnicity, symptom status, underlying conditions, and outcomes should be interpreted with caution; these data had high rates of missing or unknown values. Third, because of delays in reporting, trend data might lag behind actual disease transmission dates. Because of missing symptom onset and specimen collection dates, COVID-19 cases are presented by the date each case was reported to CDC, and surveillance artifacts can exist as a result of batch reporting by states.[††††] Finally, laboratory data presented here underrepresent the volume of laboratory tests reported in some states, because state reporting of laboratory data and case surveillance is not uniform.[§§§§]

These findings can provide a baseline for monitoring national trends. Monitoring at the local-level could inform decision-makers about which mitigation strategies are most effective in preventing the spread of COVID-19 in schools and communities (*6*,*9*). CDC's considerations for schools outline important mitigation strategies for safer reopening for in-person learning.[¶¶¶¶] Schools and communities should

[¶¶¶] https://www.cdc.gov/coronavirus/2019-ncov/community/community-mitigation.html.

[****] https://arxiv.org/pdf/2006.14158.pdf.

[††††] https://www.cdc.gov/coronavirus/2019-ncov/covid-data/faq-surveillance.html.

[§§§§] Percentage positive for laboratory data for some states relied on data reported directly to CDC from public health laboratories and a sample of six large commercial laboratories.

[¶¶¶¶] Four cross-cutting strategies to reduce the spread of COVID-19 are outlined in CDC's Community Mitigation Framework: promote behaviors that prevent spread, maintain healthy environments, maintain healthy operations, and prepare for when someone gets ill. https://www.cdc.gov/coronavirus/2019-ncov/community/community-mitigation.html.

implement multiple concurrent preventive strategies and adjust mitigation depending on local levels of transmission to reduce COVID-19 disease risk for students, teachers, school staff members, families and the community.

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Tegan Boehmer, Kathleen Hartnett, Stephanie Dietz, Adi Gundlapalli, CDC.

Corresponding author: Rebecca T. Leeb, RLeeb@CDC.gov.

[1]CDC COVID-19 Response Team; [2]Epidemic Intelligence Service, CDC.

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Multiple COVID-19 Clusters on a University Campus — North Carolina, August 2020

Erica Wilson, MD[1,*]; Catherine V. Donovan, PhD[1,2,*]; Margaret Campbell, MSN[3]; Thevy Chai, MD[4]; Kenneth Pittman, MHA[4]; Arlene C. Seña, MD[5]; Audrey Pettifor, PhD[5]; David J. Weber, MD[5]; Aditi Mallick, MD[6]; Anna Cope, PhD[1,7]; Deborah S. Porterfield, MD[1]; Erica Pettigrew, MD, JD[3,8]; Zack Moore, MD[1]

On September 29, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

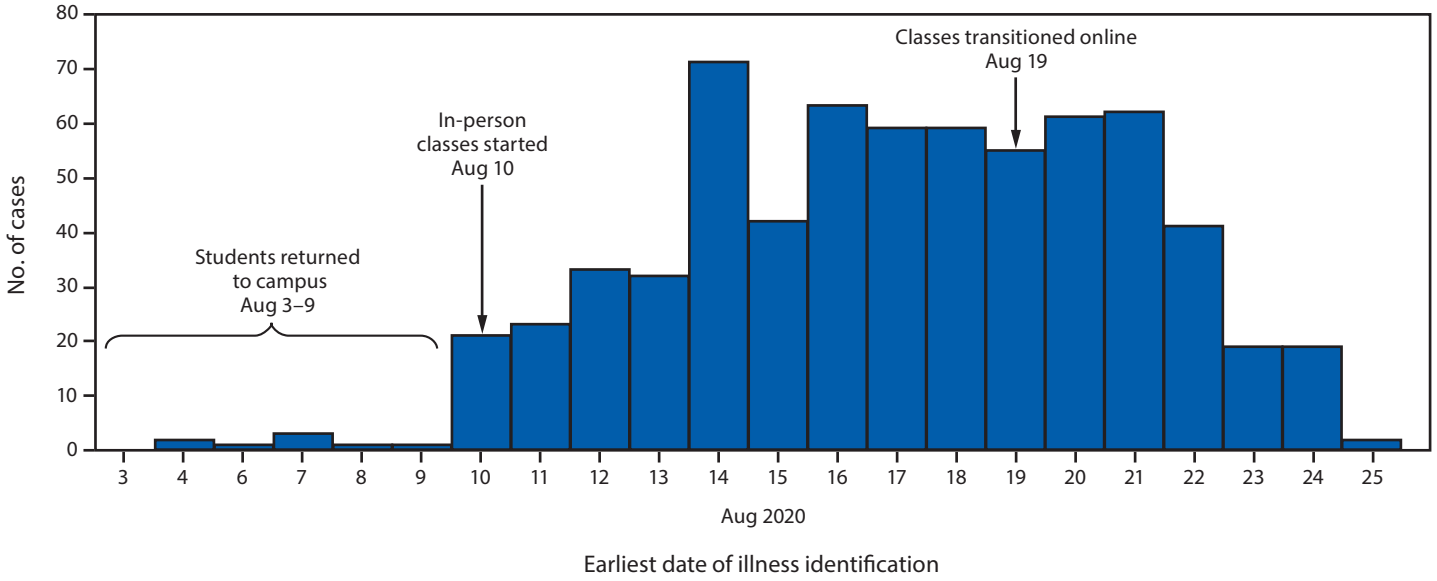
Preventing transmission of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), in institutes of higher education presents a unique set of challenges because of the presence of congregate living settings and difficulty limiting socialization and group gatherings. Before August 2020, minimal data were available regarding COVID-19 outbreaks in these settings. On August 3, 2020, university A in North Carolina broadly opened campus for the first time since transitioning to primarily remote learning in March. Consistent with CDC guidance at that time (*1*,*2*), steps were taken to prevent the spread of SARS-CoV-2 on campus. During August 3–25, 670 laboratory-confirmed cases of COVID-19 were identified; 96% were among patients aged <22 years. Eighteen clusters of five or more epidemiologically linked cases within 14 days of one another were reported; 30% of cases were linked to a cluster. Student gatherings and congregate living settings, both on and off campus, likely contributed to the rapid spread of COVID-19 within the university community. On August 19, all university A classes transitioned to online, and additional mitigation efforts were implemented. At this point, 334 university A–associated COVID-19 cases had been reported to the local health department. The rapid increase in cases within 2 weeks of opening campus suggests that robust measures are needed to reduce transmission at institutes of higher education, including efforts to increase consistent use of masks, reduce the density of on-campus housing, increase testing for SARS-CoV-2, and discourage student gatherings.

University A students returned to residence halls during August 3–9, 2020, and in-person classes began on August 10. Mitigation steps taken to prevent the spread of SARS-CoV-2 on campus included scheduling move-in appointments across a 1-week period, decreasing classroom density to facilitate physical distancing, and reducing maximum dining hall capacity and increasing takeout options. Students were required to sign an acknowledgment of community standards and university guidelines recommending daily symptom checks, use of masks in all indoor common spaces and classrooms, physical distancing of ≥6 feet in indoor and outdoor settings, and limitations on group gatherings consistent with local guidelines (groups of no more than 10 persons indoors and 25 outdoors). Approximately 95% of students signed the acknowledgment; however, data on adherence to these important mitigation strategies were not available. Reentry testing for COVID-19 and quarantine before or after arrival on campus were not used (*1*). Except for two dormitories reserved for isolation and quarantine, residence halls opened at 60%–85% capacity, with most students in double rooms. Those at increased risk for severe illness from COVID-19, according to CDC guidance (*3*), had the option to request a single room. Undergraduate enrollment in university A for the fall semester was 19,690 students. Approximately 5,800 (29%) of these undergraduate students resided on campus as of August 10. In 2019, 83% of undergraduate students were North Carolina residents.

By August 25, 670 laboratory-confirmed cases of COVID-19 with a specimen collection date for SARS-CoV-2 testing of August 3 or later had been identified among students, faculty, and staff members at university A (Figure). Cases were identified by the student health clinic (by self-report or through testing at the student health clinic or the university hospital testing center) or linked to a university cluster by the local health department. Initial information was collected by the university at the time of testing; the university also implemented contact tracing, isolation, and quarantine. Additional investigation of cases was conducted by the local health department for students who were tested off campus. Cases were classified according to the Council of State and Territorial Epidemiologists COVID-19 2020 Interim Case Definition (*4*). An additional 120 potential cases identified by the student health clinic had insufficient information to meet criteria for confirmed or probable COVID-19 and were not included in the analysis. Information on cases reported only to the university employee occupational health clinic, which is separate from the student health clinic, was not available for review at the time of analysis.

* These authors contributed equally.

FIGURE. Confirmed COVID-19 cases among university A students, faculty, and staff members (N = 670), by earliest illness identification date — North Carolina, August 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

Among 670 confirmed cases with specimen collection dates during August 3–25 for SARS-CoV-2 testing, median patient age was 19 years (range = 17–50 years), and 293 (47%) cases occurred in males (information on gender was missing for 47 [7%] patients). Information on school affiliation (e.g., undergraduate versus graduate/professional student, faculty, or staff member) was not consistently recorded; however, considering patient age <22 years as an indicator of undergraduate status, 643 (96%) cases were estimated to have occurred in undergraduate students; among these students, 230 (36%) resided on campus, and at least 51 (8%) were members of a fraternity or sorority and 51 (8%) were student athletes. For the remainder, place of residence, including if living at home or in shared apartments, was not readily available. As of August 25, no COVID-19 patients were hospitalized or had died, and no cases of multisystem inflammatory syndrome in children or adults were reported. One student was kept for extended observation in a hospital emergency department. Information on other clinical manifestations, such as myocarditis, was not available.

Clusters were defined as the occurrence of five or more epidemiologically linked cases (e.g., common residence, sports team, or fraternal organization membership) within 14 days of one another (by earliest date of illness identification). During August 3–25, 18 clusters at university A were identified, eight in residence halls, five among students with membership in a fraternity or sorority, one in off-campus apartments, and four among athletic teams. Overall, 201 (30%) cases were linked to a cluster. Clusters ranged in size from five to 106 patients (median = five), with the largest cluster associated with a university-affiliated apartment complex.

On August 19, when 334 (50%) university A–associated cases had been reported to the local health department, all university A classes transitioned to online, and efforts to reduce the density of on-campus housing commenced. Testing for SARS-CoV-2 was recommended for all persons living in residence halls with case clusters and was offered to all students at the student health clinic and the university hospital testing center. Students living in on-campus residence halls were required to return home unless they applied for and received a hardship waiver indicating they could remain on campus. All students returning home were instructed to self-quarantine for 14 days following departure from campus. Off-campus testing sites were set up both to meet community needs and target off-campus student housing complexes with multiple cases.

Discussion

Rapid increases in COVID-19 cases occurred within 2 weeks of opening university A to students. Based on preliminary case investigations, student gatherings and congregate living settings, both on and off campus, likely contributed to the rapid spread of COVID-19 on campus. This suggests the need for robust and enhanced implementation of mitigation efforts and the need for additional mitigation measures specific to this setting.

Summary

What is already known about this topic?

Before August 2020, minimal data were available about outbreaks and disease transmission in institutes of higher education within the United States.

What is added by this report?

A North Carolina university experienced a rapid increase in COVID-19 cases and clusters within 2 weeks of opening the campus to students. Student gatherings and congregate living settings, both on and off campus, likely contributed to the rapid spread of COVID-19 in this setting.

What are the implications for public health practice?

Enhanced measures are needed to reduce transmission at institutes of higher education and could include reducing on-campus housing density, ensuring adherence to masking and other mitigation strategies, increasing testing for SARS-CoV-2, and discouraging student gatherings.

The findings in this report are subject at least five limitations. First, the number of reported cases at university A is likely an underestimate. For example, some cases were reported to students' home jurisdictions, some students did not identify themselves as students to the county health department, some students did not report to the student health clinic, and not all students were tested. Second, the number of students possibly infected through affiliation with a fraternity or sorority is likely underestimated. Some students might not have disclosed their fraternity or sorority membership, and other students (who were not members of fraternities or sororities) might have participated in unofficial rush events and parties. Third, limited information was available on housing arrangements for students not identified to live on campus, as well as information about the extent of social gatherings and adherence to masking and other important mitigation efforts. Fourth, cases had limited clinical follow-up; thus, the extent of longer-term clinical complications is not known. Finally, because information available on cases in faculty and staff members was limited, the contribution of faculty or staff members to COVID-19 spread on campus cannot be estimated.

The rapid increase in COVID-19 cases among college-aged persons at university A underscores the urgent need to implement comprehensive mitigation strategies (*5*,*6*). In addition to enforcement of mask requirements, measures needed to reduce transmission in college and university settings might include efforts to reduce the density of on-campus housing, increase testing for SARS-CoV-2, and discourage student gatherings. Emerging findings from ongoing monitoring and evaluation efforts at universities and colleges in North Carolina and nationwide are helping to update best practices, including optimal testing strategies, for preventing SARS-CoV-2 transmission on campus and in the adjacent communities.

Corresponding author: Catherine V. Donovan, catherine.donovan@dhhs.nc.gov.

[1]North Carolina Division of Public Health; [2]Epidemic Intelligence Service, CDC; [3]Orange County Health Department, Hillsborough, North Carolina; [4]Campus Health, University of North Carolina at Chapel Hill; [5]Gillings School of Public Health, University of North Carolina at Chapel Hill; [6]North Carolina Department of Health and Human Services; [7]CDC COVID-19 Response Team; [8]University of North Carolina School of Medicine, Chapel Hill.

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Recent Increase in COVID-19 Cases Reported Among Adults Aged 18–22 Years — United States, May 31–September 5, 2020

Phillip P. Salvatore, PhD[1,2]; Erisa Sula, MS[2,3]; Jayme P. Coyle, PhD[2]; Elise Caruso, MPH[2]; Amanda R. Smith, PhD[1,2]; Rebecca S. Levine, PhD[2]; Brittney N. Baack, MPH[2]; Roger Mir, MPH, MSCEng[2]; Edward R. Lockhart, PhD[2]; Tejpratap S.P. Tiwari, MD[2]; Deborah L. Dee, PhD[2]; Tegan K. Boehmer, PhD[2]; Brendan R. Jackson, MD[2]; Achuyt Bhattarai, MD[2]

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Although children and young adults are reportedly at lower risk for severe disease and death from infection with SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), than are persons in other age groups (*1*), younger persons can experience infection and subsequently transmit infection to those at higher risk for severe illness (*2–4*). Although at lower risk for severe disease, some young adults experience serious illness and asymptomatic or mild cases can result in sequelae such as myocardial inflammation (*5*). In the United States, approximately 45% of persons aged 18–22 years were enrolled in colleges and universities in 2019 (*6*). As these institutions reopen, opportunities for infection increase; therefore, mitigation efforts and monitoring reports of COVID-19 cases among young adults are important. During August 2–September 5, weekly incidence of COVID-19 among persons aged 18–22 years rose by 55.1% nationally; across U.S. Census regions,* increases were greatest in the Northeast, where incidence increased 144.0%, and Midwest, where incidence increased 123.4%. During the same period, changes in testing volume for SARS-CoV-2 in this age group ranged from a 6.2% decline in the West to a 170.6% increase in the Northeast. In addition, the proportion of cases in this age group among non-Hispanic White (White) persons increased from 33.8% to 77.3% during May 31–September 5. Mitigation and preventive measures targeted to young adults can likely reduce SARS-CoV-2 transmission among their contacts and communities. As colleges and universities resume operations, taking steps to prevent the spread of COVID-19 among young adults is critical (*7*).

CDC receives patient-level COVID-19 data from jurisdictional health departments through a standardized CDC COVID-19 case report form.† Data on probable and confirmed cases from 50 states, the District of Columbia (DC), and four territories (Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands) were analyzed to determine national trends among demographic groups during May 31–September 5, 2020.§ When available, date of symptom onset was used in calculations of weekly trends of case data; if symptom onset date was unavailable, an alternative date was used in the following descending order: specimen collection date, date reported to CDC, or episode date (California only).¶ Trends were analyzed nationally and by U.S. Census region.

Measures of weekly SARS-CoV-2 real-time reverse transcription–polymerase chain reaction (RT-PCR) testing volumes by age were obtained from COVID-19 electronic laboratory reporting data submitted by state health departments (37 states) and from data submitted directly by public health,

* *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. https://www.census.gov/geographies/reference-maps/2010/geo/2010-census-regions-and-divisions-of-the-united-states.html. Territories are not included in U.S. Census regions; therefore, cases from territories (<1% of national cases) were excluded from analysis of regional trends.

† COVID-19 case report form: https://www.cdc.gov/coronavirus/2019-ncov/php/reporting-pui.html.

§ Case report surveillance data record only 76% of national cases reported through aggregate count based on a daily, robust, multistep process to collect the data and confirm the numbers of cases and deaths within jurisdictions, ranging from 0%–100% in different states. Completeness calculations comparing case report surveillance data with aggregated nationally reported case counts were determined from cases reported during March 15–August 15 (extracted on September 4). In some cases, states report only confirmed cases in aggregate case counts to CDC, while providing case report data on probable and confirmed cases, resulting in >100% completeness. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/faq-surveillance.html.

¶ The California Department of Public Health reports the date associated with COVID-19 as "episode date," using the earliest date available from the following list: illness onset date, specimen collection date, date of death, or date reported. For all other states, date was classified using dates in the descending order of preference from the following list: symptom onset date; if illness onset date is not available, then specimen collection date; if specimen collection date is not available, then the date the case was reported to CDC.

Summary

What is already known about this topic?

Young adults with COVID-19 can spread infection to their contacts and communities.

What is added by this report?

During August 2–September 5, 2020, weekly COVID-19 cases among persons aged 18–22 years increased 55% nationally. Increases were greatest in the Northeast (144%) and Midwest (123%). Increases in cases were not solely attributable to increased testing.

What are the implications for public health practice?

Young adults, including those enrolled in colleges and universities, should take precautions, including mask wearing, social distancing, and hand hygiene, and follow local, state, and federal guidance for minimizing the spread of COVID-19. Institutions of higher education should take action to promote healthy environments.

commercial, and reference laboratories (13 states and DC)** when age was unavailable in state-submitted data. Testing data from U.S. territories were not included. Total number of tests was calculated as the sum of negative and positive test results. Testing volume represents individual tests, not the number of persons tested. Date of specimen collection or test order date was used in calculations of weekly trends in testing volume.††

Data on COVID-19 cases and RT-PCR tests were aggregated by calendar week. Subgroup analyses of case reports and tests were analyzed using two measures: 1) number of reported cases (or tests) per 100,000 population per week (termed incidence for cases), which accounts for differences in underlying population size but is affected by reporting lags and underreporting; and 2) percentage of all cases (or all tests) each week, which does not account for differences in population size but is less affected by reporting lags or underreporting (assuming that reported data do not differ in important ways from lagged data).§§ All analyses were conducted using R software (version 4.0.2; The R Foundation).

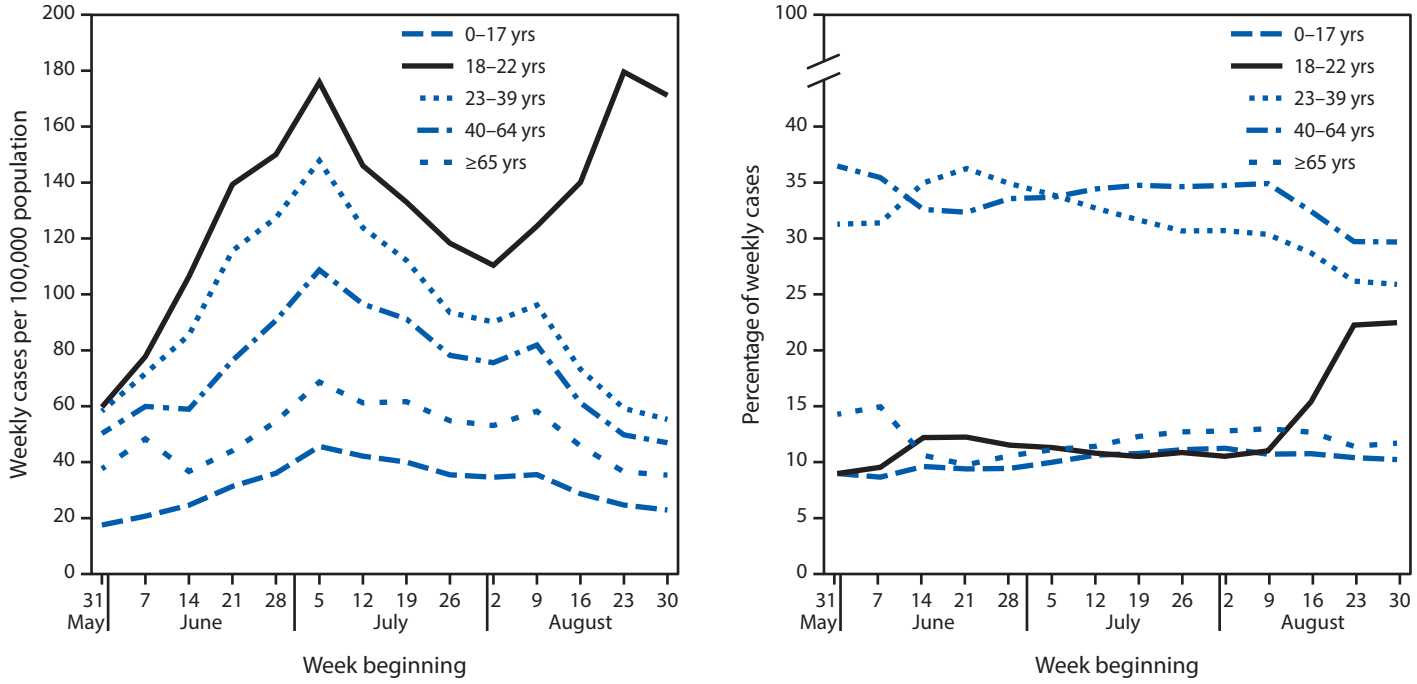
During August 2–September 5, 2020, a total 999,579 persons with COVID-19 with case report data were reported to CDC, 15.6% of whom were aged 18–22 years. National weekly COVID-19 incidence among persons aged 18–22 years increased 62.7% (95% confidence interval [CI] = 60.0%–65.3%) during the 4-week period August 2–August 29 from 110 to 180 cases per 100,000 before declining to 171 during August 30–September 5 (Figure 1). During August 2–September 5, weekly incidence increased most in the Northeast (144.0%; 95% CI = 131.5%–157.3%) from 53 to 130 per 100,000, and in the Midwest (123.4%; 95% CI = 116.1%–131.0%), from 111 to 247 (Supplementary Figure 1, https://stacks.cdc.gov/view/cdc/94198). Notably, in the Northeast, weekly incidence has remained below 53 cases per 100,000 in all other age groups since July 4. In the South, weekly incidence among persons aged 18–22 years increased 43.8% (95% CI = 40.0%–47.6%) from 115 to 166 cases per 100,000. Weekly increases were smallest in the West, where incidence declined initially until August 22 and then increased through September 5, but, overall, declined 1.7% during August. During August 2–September 5, the proportion of all cases per week that occurred among persons aged 18–22 years approximately doubled (2.1-fold; 95% CI = 2.1–2.2), from 10.5% to 22.5%.

** COVID-19 electronic laboratory reporting data submitted by state health departments from all laboratories performing SARS-CoV-2 RT-PCR testing were used for 37 states (Alabama, Alaska, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, North Carolina, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, and Wisconsin). SARS-CoV-2 RT-PCR testing data from a subset of public health, commercial, and reference laboratories were used for the District of Columbia and 13 states (California, Delaware, Maine, Mississippi, Missouri, North Dakota, New Mexico, New York, Ohio, Oklahoma, Rhode Island, Washington, and Wyoming). The data from the public health, commercial, and reference laboratories represent approximately 50% of all tests. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority of, but not all, SARS-CoV-2 RT-PCR tests in the United States. The data represent laboratory test totals, not individual persons, and exclude antibody and antigen tests.

†† Within COVID-19 electronic laboratory reporting data: state was assigned using location of the state health department that reported the test (available for 100% of tests), specimen collection date was used to assign date (available for approximately 98% of tests), and records with missing specimen collection data were excluded. Within data submitted directly by public health, commercial, and reference laboratories: state was assigned using patient location for 96% of tests, provider location was substituted for 1%, and records with both location fields missing (3%) were excluded; order date was used for 80% of tests, specimen collection date was substituted for 19%, and records with both date fields missing (1%) were excluded.

§§ Weekly incidence was calculated as the number of cases that occurred within a subgroup (age group or race/ethnicity) during each week, divided by the size of the U.S. population for that subgroup (in the same geographic region) using 2019 U.S. Census estimates, multiplied by 100,000. Similar methods were used to calculate weekly testing volumes per 100,000. Weekly percentage of total cases within a subgroup was calculated as the number of cases within that subgroup during each week divided by the total number of cases within all subgroups (and the same geographic region) during the same week. Similar methods were used to calculate weekly testing percentages (total positive and negative tests within a subgroup divided by total positive and negative tests across all subgroups and the same geographic region). For proportional increase in incidence (and proportional increase in testing volume), 95% CIs (reported as percentage increase for measures of number per 100,000 and as x-fold differences for measures of percentages) were calculated using the log-transformed delta method for ratios. Cases with missing values for reporting state/territory and symptom onset date (<1% and 1% of all case reports, respectively) were excluded. Race/ethnicity was categorized as "Hispanic/Latino" (all races) and separate non-Hispanic racial groups. Cases with missing values for age or race/ethnicity (<1% and 49% of all case reports, respectively) were excluded from analyses of those subgroups.

FIGURE 1. Weekly COVID-19 incidence in case surveillance data,* by age group — United States,† May 31–September 5, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* From CDC COVID-19 case report surveillance systems. Case report surveillance systems record 76% of national aggregate case counts reported to CDC, based on an analysis of data reported during March 15–August 15.

† Includes cases in 50 states, District of Columbia, and four territories: Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

The number of weekly tests performed among persons aged 18–22 years increased 49.3% (95% CI = 48.7%–49.9%) from 1,877 tests per 100,000 during the week of August 2–August 8 to 2,802 during the week of August 30–September 5 (Figure 2). The largest increase in testing relative to population size was in the Northeast, where weekly tests increased 170.6% (95% CI = 168.3%–172.9%) from 1,975 per 100,000 to 5,345, and in the Midwest, where weekly tests increased 65.2% (95% CI = 63.9%–66.5%) from 2,264 per 100,000 to 3,740 (Supplementary Figure 2, https://stacks.cdc.gov/view/cdc/94197). In contrast, more modest increases were observed in the South (7.0% [95% CI = 6.3%–7.7%], from 2,041 to 2,183 per 100,000); and in the West, testing volume declined 6.2% (95% CI = 5.1%–7.2%), from 1,191 per 100,000 to 1,118. At the end of this period, the proportion of all tests performed nationally among persons aged 18–22 years had increased from 9.4% to 14.4% (1.5-fold [95% CI = 1.53–1.54] higher than at the beginning).

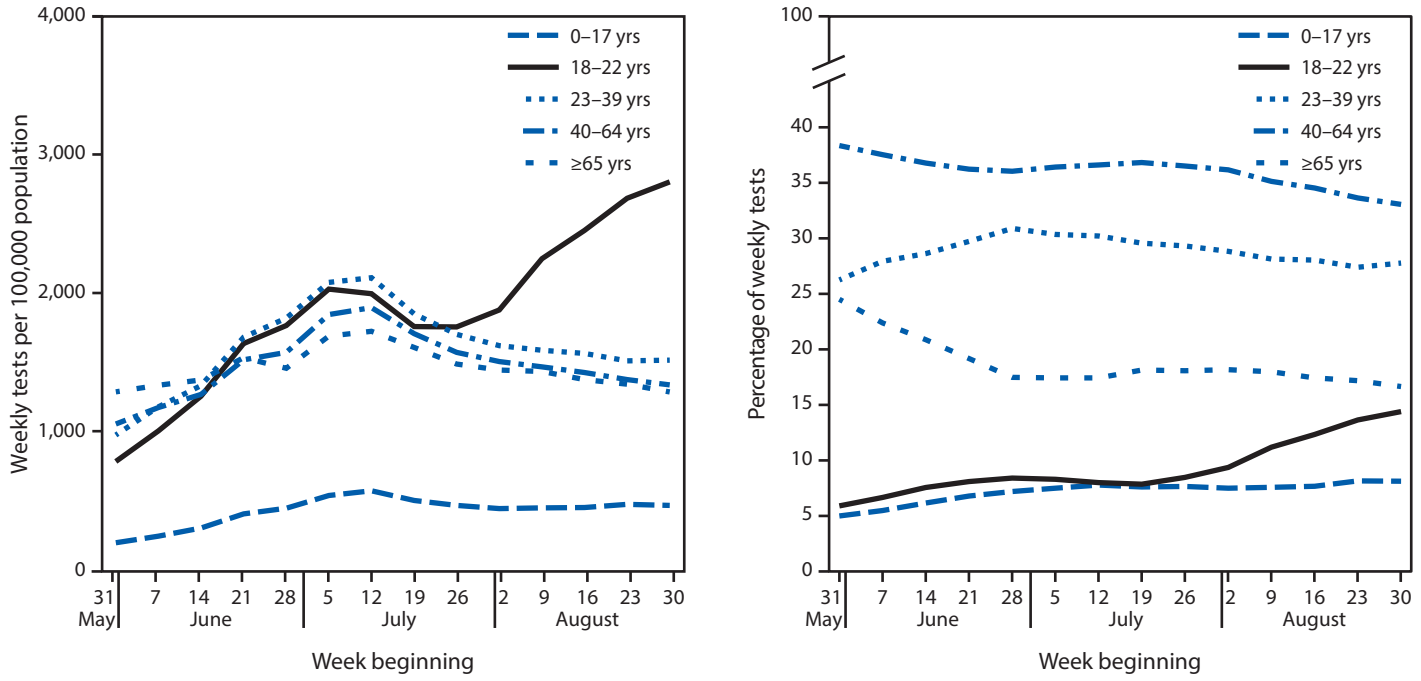
When examined by race and ethnicity nationally, during August 2–September 5, the weekly incidence among White persons aged 18–22 years increased 149.7% (95% CI = 78.8%–248.7%), from 48 per 100,000 to 120 (Figure 3). During May 31–June 20, the proportion of weekly cases that occurred among White persons aged 18–22 years increased from 33.8%% to 50.8%. Then, during August 2–September 5, the proportion was 1.5-fold that during May 31–June 20 (95% CI = 0.2–12.9), having increased from 52.1% to 77.3%. At the same time, incidence among persons of other racial and ethnic minority groups remained stable or declined. The largest increases in incidence among White persons were in the Midwest (198.2%; from 65 to 195 per 100,000) and the Northeast (168.4%; from 14 to 37 per 100,000) (Supplementary Figure 3, https://stacks.cdc.gov/view/cdc/94196).

Discussion

In August 2020, CDC and case-reporting jurisdictions identified an increase in the percentage of COVID-19 cases among persons aged 18–22 years. Incidence in this age group changed 2.1-fold during this time, compared with a 1.5-fold change in testing (possibly related to new screening practices as colleges and universities reopened). Although increased incidence was likely driven in part by an increase in COVID-19 diagnostic testing, this is unlikely to be the sole reason for the observed increases in incidence.

The observed increases in COVID-19 cases among persons aged 18–22 years could be driven by many factors, including changes in behavior or risk profiles resulting from multiple social, economic, and public policy changes during this period. Because approximately 45% of persons aged 18–22 years attend

FIGURE 2. Total weekly SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) test volume and percentage of weekly tests,* by age group — United States,† May 31–September 5, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* Percentage of weekly tests was calculated as number of tests within each age group divided by number of tests in all age groups. Specimen collection date or test order date was used for analysis. Tests volume data were obtained from COVID-19 electronic laboratory reporting data submitted by state health departments for 37 states and, when age was not available in state-submitted data, from data submitted directly by public health, commercial, and reference laboratories for 13 states and the District of Columbia. The data might not include results from all testing sites within a jurisdiction (e.g., point-of-care test sites) and therefore reflect the majority of, but not all, SARS-CoV-2 RT-PCR tests in the United States.

† Includes tests conducted in 50 states and District of Columbia.

colleges and universities and 55% of those attending identified as White persons (*6*), it is likely that some of this increase is linked to resumption of in-person attendance at some colleges and universities. Detailed exposure information from patients in this age group (e.g., through targeted epidemiologic studies) can help identify the specific drivers of the observed trends.

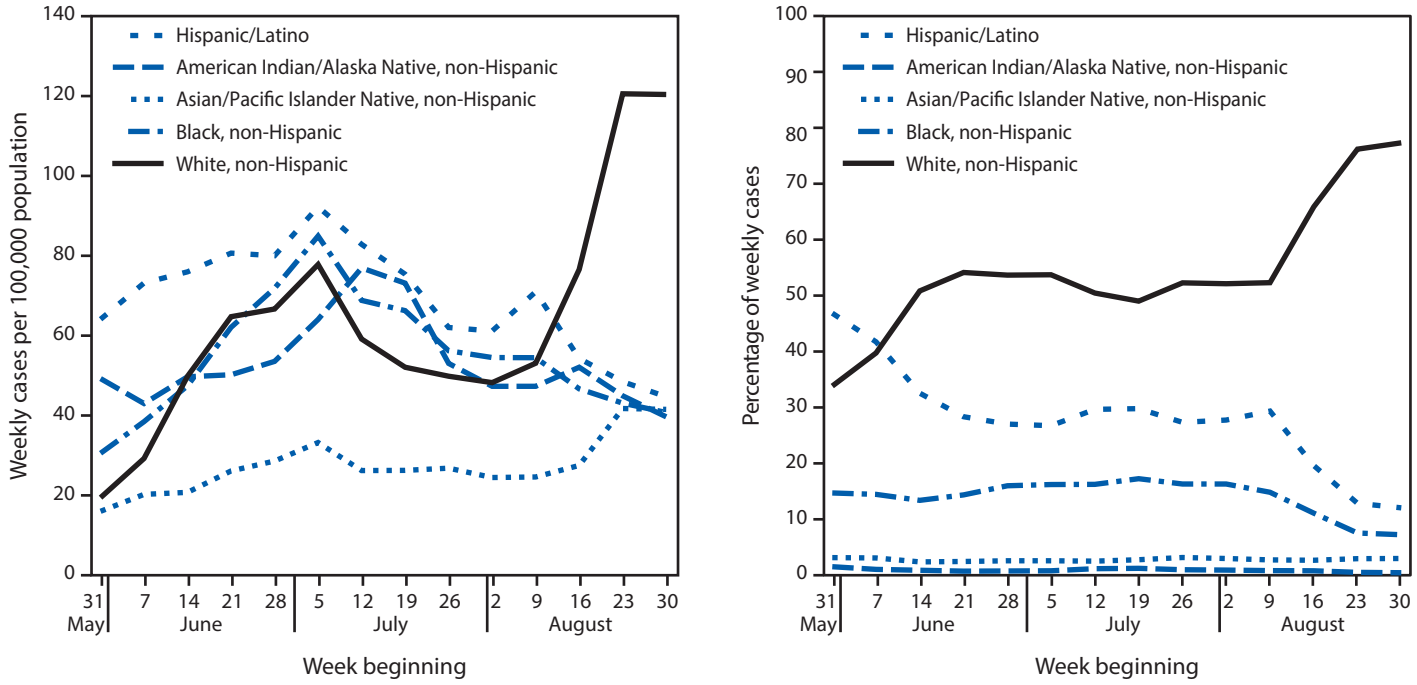
The findings in this report are subject to at least four limitations. First, race/ethnicity data were complete for only one half of cases reported to CDC; changes in completeness of race/ethnicity data over time call for caution in interpretation of the observed trends in race/ethnicity. Second, data-reporting lags can delay recognition and reporting of trends in case surveillance data; for this reason, this report examines COVID-19 cases occurring through September 5, which might be more completely reported than are cases in more recent weeks. Third, a revised COVID-19 case definition introduced by the Council of State and Territorial Epidemiologists on August 5,¶¶ which updated definitions of probable cases, was gradually adopted by approximately one half of reporting jurisdictions during the period of this analysis and might have introduced additional variability in case reporting. Finally, trends in case surveillance data need to be interpreted in the context of laboratory testing patterns (e.g., repeat testing of all students in some university settings)*** and trends in other age groups and with evidence from other data sources; however, linking testing data with case surveillance remains a challenge because person-level data are deidentified before aggregation or analysis.

Previous reports identified young adults as being less likely than are other age groups to adhere to some COVID-19 prevention measures (*8*), which places them and their close contacts at higher risk for COVID-19. Approximately 71% of persons aged 18–22 years reside with a parent, nearly one half attend colleges and universities, and 33% live with a parent while enrolled (*6*,*9*). To prevent cases on campuses and broader spread within communities, it is critically important for students, faculty, and staff members at colleges and universities to remain vigilant and take steps to reduce the risk for SARS-CoV-2 transmission in these settings. Transmission by young adults is not limited to those who attend colleges and universities but can occur throughout communities where young adults live, work, or socialize and to other members

¶¶ https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/08/05/.

*** https://www.washingtonpost.com/local/education/welcome-to-college-now-get-tested-for-the-coronavirus--again-and-again/2020/09/04/2d087722-ed2f-11ea-b4bc-3a2098fc73d4_story.html.

FIGURE 3. Weekly COVID-19 incidence in case surveillance data* among persons aged 18–22 years, by race/ethnicity†,§ group — United States,¶ May 31–September 5, 2020



Abbreviation: COVID-19 = coronavirus disease 2019.

* From CDC COVID-19 case report surveillance systems. Case report surveillance systems record 76% of national aggregate case counts reported to CDC, based on an analysis of data reported during March 15–August 15.

† Race/ethnicity data were not reported for 2,476,317 (48.5%) case reports; these cases were excluded from this subgroup analysis.

§ Race categories include persons of non-Hispanic ethnicity.

¶ Includes cases in 50 states, District of Columbia, and four territories: Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

of their households (*3–4*), some of whom might be at high risk for severe COVID-19–associated illness because of age or underlying medical conditions. Mitigation and preventive measures targeted to young adults (e.g., social media toolkits discussing the importance of mask wearing, social distancing, and hand hygiene) (*10*), including those attending colleges and universities, can likely reduce SARS-CoV-2 transmission among their contacts and communities. Institutions of higher education should support students and communities by taking action to promote healthy environments (*7*).

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Corresponding author: Phillip P. Salvatore, PSalvatore@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]CDC COVID-19 Response Team; [3]Oak Ridge Institute for Science and Engineering, Oak, Ridge, Tennessee.

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Notes from the Field

Botulism Type B After Intravenous Methamphetamine Use — New Jersey, 2020

Michelle A. Waltenburg, DVM[1,2]; Valerie A. Larson, MD[3]; Elinor H. Naor, DO[3]; Timothy G. Webster, MD[3]; Janet Dykes, MS[2]; Victoria Foltz[2,4]; Seth Edmunds, MPH[2,4]; Deepam Thomas, MPH[5]; Joseph Kim, MD[3,6]; Leslie Edwards, MHS[2]

On May 15, 2020, a White man aged 41 years arrived at an emergency department in New Jersey with a 2-day history of new onset blurred vision, double vision, ptosis, and difficulty swallowing. He was evaluated for cerebrovascular accident (CVA [stroke]), was found to have unremarkable computed tomography and magnetic resonance imaging brain scans, and was discharged with a diagnosis of diplopia (double vision). The following day, his symptoms worsened, and he visited a second emergency department with slurred speech, oral thrush, and facial weakness. Thorough skin and scalp examinations revealed peripheral phlebitis and sites of induration, but no abscesses or open wounds. He was admitted to the hospital with a diagnosis of CVA and treated with antifungal medications for oral and laryngeal candidiasis.

Past medical history was notable for methamphetamine use for approximately 20 years; the patient did not report any other illicit drug use. The patient reported he had only inhaled methamphetamine in the past; however, after a 2-week abstinence, he reported that he injected methamphetamine mixed with water intravenously approximately 24–48 hours before his symptoms began. The water came from a bottle that had been open in his home for an unknown duration. This history of recent intravenous drug use raised suspicion for botulism, a paralytic illness caused by botulinum neurotoxin (BoNT). To the patient's knowledge, no one else who had injected the same batch of methamphetamine had had an adverse reaction.

Per New Jersey Reporting Regulations (NJAC 8:57),* the suspected illness was immediately reported to the New Jersey Department of Health. After consultation with CDC, heptavalent botulinum antitoxin was released by the CDC quarantine station in New York and administered to the patient within 24 hours of admission to the hospital. He did not require ventilatory support, and his symptoms of double vision, ptosis, difficulty swallowing, and facial weakness gradually improved until hospital discharge 5 days after antitoxin administration. The patient's mild blurred vision persisted, and he was referred for vision rehabilitation, speech and language pathology, psychiatry, and infectious disease follow-up. Serum obtained before antitoxin administration tested positive for BoNT type B by the BoNT Endopep-MS assay, a mass spectrometry–based method that rapidly detects and differentiates active BoNTs, toxic substances that inhibit normal neuromuscular function (*1*).

Injection drug use is the leading cause of wound botulism in the United States; most cases occur in the western and southwestern United States,† potentially associated with the supply and distribution of black tar heroin§ (*2*). Botulinum toxin type A is the most common toxin type among cases of wound botulism; in 2018, 47 of the 51 laboratory-confirmed cases of wound botulism were botulinum toxin type A, and injection drug use was reported by all wound botulism patients (Figure) (CDC, unpublished data, 2018). This case is notable for three reasons: 1) the rarity of botulinum toxin type B in wound botulism cases, 2) the occurrence in the northeastern United States, and 3) association with injection of methamphetamine rather than heroin.

Although most wound botulism cases are caused by black tar heroin injection (*2–4*), this case highlights the need for awareness of the risks for and signs and symptoms of wound botulism¶ among all persons who inject drugs, as well as among clinicians caring for persons who inject drugs. Early recognition and treatment of botulism is critical to reducing morbidity and mortality, and broader awareness of risks and symptoms of wound botulism might prompt persons who have symptoms to seek medical care early and potentially facilitate an earlier diagnosis (*5*). Some signs of wound botulism (e.g., ptosis and altered phonation) might be interpreted as mental status changes associated with methamphetamine abuse, highlighting the importance of conducting a thorough neurologic examination to differentiate botulism from other diagnoses (*5*). This case further illustrates that mild wounds can harbor *Clostridia* bacteria that produce botulinum toxin (*5*); therefore, it is important for health care providers to consider wound botulism among patients with a history of injection drug use, even in the absence of a visible abscess or severe wound.

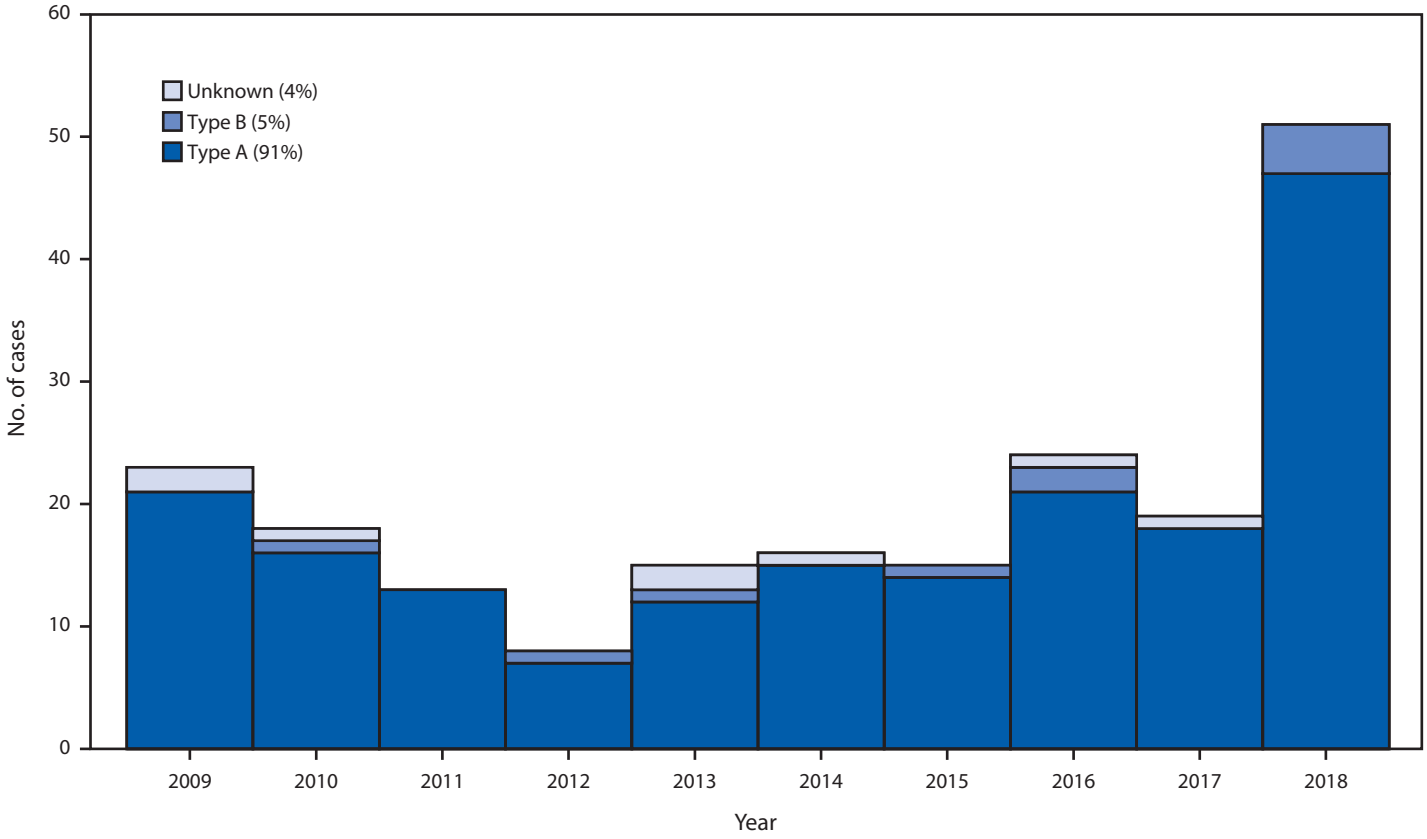
* https://www.state.nj.us/health/cd/reporting/acode/index.shtml.

† https://www.cdc.gov/botulism/surv/2017/index.html.

§ https://www.dea.gov/sites/default/files/2018-07/DIR-001-17_2016_NDTA_Summary.pdf.

¶ https://www.cdc.gov/botulism/wound-botulism.html.

FIGURE. Laboratory-confirmed wound botulism cases, by year and botulinum toxin type — United States, 2009–2018*



* 2018 data are provisional.

Acknowledgments

New Jersey Department of Health; CDC Quarantine Stations; Carolina Luquez.

Corresponding author: Michelle A. Waltenburg, mwaltenburg@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [3]Morristown Medical Center, Morristown, New Jersey; [4]Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee; [5]New Jersey Department of Health; [6]ID CARE, Randolph, New Jersey.

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Correction and Republication: Deaths and Years of Potential Life Lost From Excessive Alcohol Use — United States, 2011–2015

On July 31, 2020, *MMWR* published "Deaths and Years of Potential Life Lost From Excessive Alcohol Use — United States, 2011–2015" (*1*). On August 19, 2020, the authors informed *MMWR* that some results were inaccurate because of a data input error that occurred during an update to the Alcohol-Related Disease Impact application (*2*) used in the study. This error resulted in an overall underestimate of average annual alcohol-attributable deaths by 1,862 (from 93,296 to 95,158) and years of potential life lost by 79,844 (from 2,683,211 to 2,763,055) for the United States during 2011–2015. On September 3, 2020, corrections were made in the online Alcohol-Related Disease Impact application to the alcohol-attributable fractions for five acute causes of death: drownings, fall injuries, fire injuries, firearm injuries, and homicide. The authors have corrected the *MMWR* report accordingly and confirmed that the interpretation and the conclusions of the original report were not affected by these corrections. In accordance with December 2017 guidance from the International Committee of Medical Journal Editors (*3*), *MMWR* is republishing the report (*4*). The republished report includes the original report with clearly marked corrections in supplementary materials.

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Morbidity and Mortality Weekly Report

Deaths and Years of Potential Life Lost From Excessive Alcohol Use — United States, 2011–2015

Marissa B. Esser, PhD[1]; Adam Sherk, PhD[2]; Yong Liu, MD[1]; Timothy S. Naimi, MD[3,4]; Timothy Stockwell, PhD[2]; Mandy Stahre, PhD[5]; Dafna Kanny, PhD[1]; Michael Landen, MD[6]; Richard Saitz, MD[3,4]; Robert D. Brewer, MD[1]

Excessive alcohol use is a leading cause of preventable death in the United States (*1*) and costs associated with it, such as those from losses in workplace productivity, health care expenditures, and criminal justice, were $249 billion in 2010 (*2*). CDC used the Alcohol-Related Disease Impact (ARDI) application* to estimate national and state average annual alcohol-attributable deaths and years of potential life lost (YPLL) during 2011–2015, including deaths from one's own excessive drinking (e.g., liver disease) and from others' drinking (e.g., passengers killed in alcohol-related motor vehicle crashes). This study found an average of 95,158 alcohol-attributable deaths (261 deaths per day) and 2.8 million YPLL (29 years of life lost per death, on average) in the United States each year. Of all alcohol-attributable deaths, 51,078 (53.7%) were caused by chronic conditions, and 52,921 (55.6%) involved adults aged 35–64 years. Age-adjusted alcohol-attributable deaths per 100,000 population ranged from 20.8 in New York to 53.1 in New Mexico. YPLL per 100,000 population ranged from 631.9 in New York to 1,683.5 in New Mexico. Implementation of effective strategies for preventing excessive drinking, including those recommended by the Community Preventive Services Task Force (e.g., increasing alcohol taxes and regulating the number and concentration of alcohol outlets), could reduce alcohol-attributable deaths and YPLL.†

CDC has updated the ARDI application, including the causes of alcohol-attributable death, *International Classification of Diseases, Tenth Revision* codes,§ and alcohol-attributable fractions.¶ CDC used ARDI to estimate the average number of annual national and state alcohol-attributable deaths and YPLL caused by excessive drinking (i.e., deaths from conditions that are 100% alcohol-attributable, acute conditions that involved binge drinking, and chronic conditions that involved medium or high average daily alcohol consumption). ARDI estimates alcohol-attributable deaths by multiplying the total number of deaths (based on vital statistics) with an underlying cause corresponding to any of the 58 alcohol-related conditions in the ARDI application by its alcohol-attributable fraction. Some conditions (e.g., alcoholic liver cirrhosis) are wholly (100%) attributable to alcohol (alcohol-attributable fraction = 1.0), whereas others are partially attributable (alcohol-attributable fraction <1.0) to alcohol (e.g., breast cancer and hypertension). Deaths are assessed by age group and sex and averaged over a 5-year period. The alcohol-attributable fractions for chronic conditions are generally calculated using relative risks from published meta-analyses and the prevalence of low, medium, and high average daily alcohol consumption among U.S. adults, based on data from the Behavioral Risk Factor Surveillance System.** The prevalence estimates are adjusted to account for underreporting of alcohol use during binge drinking episodes (*3*). Alcohol-attributable fractions for acute causes (e.g., injuries) are generally based on studies that measured the proportion of decedents who had a blood alcohol concentration ≥0.10 g/dL (*4*). Alcohol-attributable fractions for motor vehicle crash deaths are based on the proportion of crash deaths that involved a blood alcohol concentration ≥0.08 g/dL.†† For 100% alcohol-attributable conditions, deaths are summed without adjustment.§§ YPLL, a commonly used measure of premature death, are calculated by multiplying the age-specific and sex-specific alcohol-attributable deaths by the corresponding reduction in years of life potentially remaining for decedents relative to average life expectancies.¶¶ Chronic causes of death are calculated for decedents aged ≥20 years, and acute causes are generally calculated for decedents aged ≥15 years. Deaths involving children that were caused by someone else's drinking (e.g., deaths caused by a pregnant mother's drinking and passengers killed in alcohol-related motor vehicle crashes) are also included.

CDC used the data available in ARDI to estimate the average annual national and state alcohol-attributable deaths and YPLL associated with excessive drinking and national estimates of alcohol-attributable deaths and YPLL by cause of death, sex,

* https://www.cdc.gov/ARDI.
† https://www.thecommunityguide.org/topic/excessive-alcohol-consumption.
§ https://www.cdc.gov/alcohol/ardi/alcohol-related-icd-codes.html.
¶ https://www.cdc.gov/alcohol/ardi/methods.html.

** https://www.cdc.gov/brfss/.
†† https://www-fars.nhtsa.dot.gov/Crashes/CrashesAlcohol.aspx.
§§ Conditions that that are 100% alcohol-attributable include 13 chronic conditions (alcoholic psychosis, alcohol abuse, alcohol dependence syndrome, alcohol polyneuropathy, degeneration of the nervous system caused by alcohol use, alcoholic myopathy, alcohol cardiomyopathy, alcoholic gastritis, alcoholic liver disease, alcohol-induced acute pancreatitis, alcohol-induced chronic pancreatitis, fetal alcohol syndrome, and fetus and newborn affected by maternal use of alcohol) and two acute conditions (suicide by and exposure to alcohol and alcohol poisoning).
¶¶ https://www.cdc.gov/mmwr/preview/mmwrhtml/00001773.htm.

and age group. National and state alcohol-attributable deaths and YPLL per 100,000 population were calculated by dividing the average annual alcohol-attributable death and YPLL estimates, respectively, by average annual population estimates from the U.S. Census for 2011–2015, and then multiplying by 100,000. The alcohol-attributable death rates were then age-adjusted to the 2000 U.S. population.*** The number of YPLL per alcohol-attributable death was calculated by dividing total YPLL by total alcohol-attributable deaths in the United States and in states.

During 2011–2015 in the United States, an average of 95,158 alcohol-attributable deaths occurred, and 2.8 million years of potential life were lost annually (29.0 YPLL per alcohol-attributable death) (Table 1) (Table 2). Among the 95,158 deaths, 51,078 (53.7%) were caused by chronic conditions and 44,080 (46.3%) by acute conditions. Of the 2.8 million YPLL, 1.1 million (40.0%) were because of chronic conditions, and 1.7 million (60.0%) were because of acute conditions. Overall, 67,943 (71.4%) alcohol-attributable deaths and 2.0 million (71.0%) YPLL involved males. Among all alcohol-attributable deaths, 52,921 (55.6%) involved adults aged 35–64 years, 24,972 (26.2%) involved adults aged ≥65, and 14,819 (15.6%) involved young adults aged 20–34 years (Figure).

Alcoholic liver disease was the leading chronic cause of alcohol-attributable deaths overall (18,164) and among males (12,887) and females (5,277) (Table 1). Poisonings that involved another substance in addition to alcohol (e.g., drug overdoses) were the leading acute cause of alcohol-attributable deaths overall (11,839) and among females (4,315); suicide associated with excessive alcohol use was the leading acute cause of alcohol-attributable deaths among males (7,711). Conditions wholly attributable to alcohol accounted for 29,068 (30.5%) of all alcohol-attributable deaths and 762,241 (27.6%) of all YPLL.

The national average annual age-adjusted alcohol-attributable death rate was 28.0 per 100,000, and the YPLL per 100,000 was 873.0 (Table 2). The average annual number of alcohol-attributable deaths and YPLL varied across states, ranging from 203 alcohol-attributable deaths in Vermont to 11,026 in California, and from 5,085 YPLL in Vermont to 308,831 in California. Age-adjusted alcohol-attributable death rates among the 40 states with reliable estimates (excluding those with suppressed data where estimates might not account for all the alcohol-attributable deaths in the state) ranged from 20.8 per 100,000 in New York to 53.1 in New Mexico. YPLL per 100,000 ranged from 631.9 in New York to 1,683.5 in New Mexico.

*** https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

Summary

What is already known about this topic?

Excessive drinking is a leading cause of preventable death in the United States and is associated with numerous health and social problems.

What is added by this report?

During 2011–2015, excessive drinking was responsible for an average of 95,158 deaths (261 per day) and 2.8 million years of potential life lost (29 years lost per death, on average) in the United States each year.

What are the implications for public health practice?

Widespread implementation of prevention strategies, including those recommended by the Community Preventive Services Task Force (e.g., increasing alcohol taxes and regulating the number and concentration of places that sell alcohol) could help reduce deaths and years of potential life lost from excessive drinking.

Discussion

Excessive alcohol use was responsible for approximately 95,000 deaths and 2.8 million YPLL annually in the United States during 2011–2015. This means that an average of 261 Americans die from excessive drinking every day, shortening their lives by an average of 29 years. The majority of these alcohol-attributable deaths involved males, and approximately four in five deaths involved adults aged ≥35 years. The number of alcohol-attributable deaths among adults aged ≥65 years was nearly double that among adults aged 20–34 years. Approximately one half of alcohol-attributable deaths were caused by chronic conditions, but acute alcohol-attributable deaths, all of which were caused by binge drinking, accounted for the majority of the YPLL from excessive drinking.

Little progress has been made in preventing deaths caused by excessive drinking; the average annual estimates of alcohol-attributable deaths and YPLL in this report are slightly higher than estimates for 2006–2010, and the age-adjusted alcohol-attributable death rates are similar (*5*), suggesting that excessive drinking remains a leading preventable cause of death and disability (*1*). From 2006–2010 (*5*) to 2011–2015, average annual deaths caused by alcohol dependence increased 14.2%, from 3,728 to 4,258, and deaths caused by alcoholic liver disease increased 23.6%, from 14,695 to 18,164. These findings are consistent with reported increasing trends in alcohol-induced deaths (e.g., deaths from conditions wholly attributable to

TABLE 1. Average annual number of deaths and years of potential life lost attributable to excessive alcohol use,* by condition and sex — United States, 2011–2015

Cause	Alcohol-attributable deaths			Years of potential life lost		
	Total†	Males no. (%)	Females no. (%)	Total†	Males no. (%)	Females no. (%)
Total†	**95,158**	**67,943 (71.4)**	**27,215 (28.6)**	**2,763,055**	**1,962,436 (71.0)**	**800,619 (29.0)**
Chronic causes	**51,078**	35,583 (69.7)	15,495 (30.3)	**1,105,190**	752,936 (68.1)	352,253 (31.9)
Alcohol abuse	**2,591**	1,986 (76.6)	605 (23.4)	**66,839**	49,129 (73.5)	17,710 (26.5)
Alcohol cardiomyopathy	**510**	432 (84.7)	78 (15.3)	**12,235**	10,136 (82.8)	2,099 (17.2)
Alcohol dependence syndrome	**4,258**	3,269 (76.8)	989 (23.2)	**109,911**	81,192 (73.9)	28,719 (26.1)
Alcohol polyneuropathy	**3**	3 (100.0)	0 (—)	**54**	54 (100.0)	0 (—)
Alcoholic gastritis	**33**	26 (78.8)	7 (21.2)	**890**	696 (78.2)	194 (21.8)
Alcoholic liver disease	**18,164**	12,887 (70.9)	5,277 (29.1)	**467,996**	313,897 (67.1)	154,099 (32.9)
Alcoholic myopathy	**0**	0 (—)	0 (—)	**0**	0 (—)	0 (—)
Alcoholic psychosis	**703**	549 (78.1)	154 (21.9)	**14,129**	10,799 (76.4)	3,330 (23.6)
Alcohol-induced acute pancreatitis	**278**	214 (77.0)	64 (23.0)	**8,284**	6,247 (75.4)	2,037 (24.6)
Alcohol-induced chronic pancreatitis	**52**	38 (73.1)	14 (26.9)	**1,507**	1,046 (69.4)	461 (30.6)
Atrial fibrillation	**329**	228 (69.3)	100 (30.4)	**2,943**	2,084 (70.8)	860 (29.2)
Cancer, breast (females only)	**584**	NA	584 (NA)	**11,203**	NA	11,203 (NA)
Cancer, colorectal	**996**	898 (90.2)	98 (9.8)	**15,540**	14,016 (90.2)	1,524 (9.8)
Cancer, esophageal§	**494**	430 (87.0)	64 (13.0)	**8,038**	7,007 (87.2)	1,031 (12.8)
Cancer, laryngeal	**248**	233 (94.0)	15 (6.0)	**4,002**	3,737 (93.4)	265 (6.6)
Cancer, liver	**1,609**	1,545 (96.0)	64 (4.0)	**28,191**	27,129 (96.2)	1,061 (3.8)
Cancer, oral cavity and pharyngeal	**909**	830 (91.3)	79 (8.7)	**16,034**	14,715 (91.8)	1,319 (8.2)
Cancer, pancreatic¶	**186**	151 (81.2)	35 (18.8)	**2,827**	2,301 (81.4)	526 (18.6)
Cancer, prostate (males only)	**188**	188 (NA)	NA	**1,952**	1,952 (NA)	NA
Cancer, stomach¶	**58**	56 (96.6)	3 (5.2)	**943**	897 (95.1)	46 (4.9)
Chronic hepatitis	**2**	2 (100.0)	0 (0.0)	**42**	36 (85.7)	6 (14.3)
Coronary heart disease	**3,537**	2,971 (84.0)	567 (16.0)	**46,698**	40,183 (86.0)	6,515 (14.0)
Degeneration of nervous system attributable to alcohol	**145**	118 (81.4)	27 (18.6)	**2,617**	2,030 (77.6)	587 (22.4)
Esophageal varices	**112**	77 (68.8)	34 (30.4)	**2,414**	1,711 (70.9)	703 (29.1)
Fetal alcohol syndrome	**4**	2 (50.0)	2 (50.0)	**212**	122 (57.5)	90 (42.5)
Fetus and newborn affected by maternal use of alcohol	**1**	1 (100.0)	0 (0.0)	**76**	76 (100.0)	0 (—)
Gallbladder disease	**0**	0 (—)	0 (—)	**0**	0 (—)	0 (—)
Gastroesophageal hemorrhage	**31**	20 (64.5)	10 (32.3)	**517**	359 (69.4)	157 (30.4)
Hypertension	**3,584**	1,638 (45.7)	1,946 (54.3)	**50,016**	26,021 (52.0)	23,994 (48.0)
Infant death, low birthweight**	**2**	1 (50.0)	1 (50.0)	**133**	69 (51.9)	65 (48.9)
Infant death, preterm birth**	**44**	24 (54.5)	19 (43.2)	**3,410**	1,845 (54.1)	1,565 (45.9)
Infant death, small for gestational age**	**0**	0 (—)	0 (—)	**13**	5 (38.5)	7 (53.8)
Liver cirrhosis, unspecified	**9,801**	5,696 (58.1)	4,105 (41.9)	**197,875**	114,580 (57.9)	83,295 (42.1)
Pancreatitis, acute	**0**	0 (—)	0 (—)	**0**	0 (—)	0 (—)
Pancreatitis, chronic	**15**	12 (80.0)	3 (20.0)	**317**	252 (79.5)	65 (20.5)

See table footnotes on the next page.

alcohol) among adults aged ≥25 years,††† including alcoholic liver disease,§§§ as well as with increases in per capita alcohol consumption during the past 2 decades.¶¶¶

Age-adjusted alcohol-attributable death rates varied approximately twofold across states, but deaths caused by excessive drinking were common across the country. The differences in alcohol-attributable death and YPLL rates in states might be partially explained by varying patterns of excessive alcohol use, particularly binge drinking, which is affected by state-level alcohol pricing and availability strategies (*6*) and differential access to medical care.

The findings in this report are subject to at least five limitations. First, the prevalence of alcohol consumption ascertained through the Behavioral Risk Factor Surveillance System is based on self-reported data, which substantially underestimates alcohol consumption (*7*). Second, these estimates are conservative, because former drinkers, some of whom might have died from alcohol-related conditions, are not included in the estimates of alcohol-attributable deaths and YPLL for partially alcohol-attributable causes of death. Third, direct alcohol-attributable fraction estimates for some chronic and acute conditions rely on data older than that of 2011–2015 (*4*)

††† https://www.cdc.gov/mmwr/volumes/68/wr/mm6833a5.htm.
§§§ https://pubs.niaaa.nih.gov/publications/surveillance111/Cirr15.htm.
¶¶¶ https://pubs.niaaa.nih.gov/publications/surveillance110/CONS16.htm.

TABLE 1. (*Continued*) Average annual number of deaths and years of potential life lost attributable to excessive alcohol use,* by condition and sex — United States, 2011–2015

Cause	Alcohol-attributable deaths			Years of potential life lost		
	Total†	Males no. (%)	Females no. (%)	Total†	Males no. (%)	Females no. (%)
Pneumonia††	**133**	105 (78.9)	29 (21.8)	**3,714**	2,839 (76.4)	875 (23.6)
Portal hypertension	**61**	34 (55.7)	26 (42.6)	**1,267**	729 (57.5)	538 (42.5)
Stroke, hemorrhagic	**938**	565 (60.2)	374 (39.9)	**14,497**	8,856 (61.1)	5,641 (38.9)
Stroke, ischemic	**342**	243 (71.1)	100 (29.2)	**3,867**	2,837 (73.4)	1,030 (26.6)
Unprovoked seizures, epilepsy, or seizure disorder	**134**	112 (83.6)	22 (16.4)	**3,987**	3,352 (84.1	635 (15.9)
Acute causes	**44,080**	32,360 (73.4)	11,720 (26.6)	**1,657,865**	1,209,500 (73.0)	448,365 (27.0)
Air-space transport	**75**	64 (85.3)	11 (14.7)	**2,268**	1,867 (82.3)	401 (17.7)
Alcohol poisoning	**2,288**	1,735 (75.8)	553 (24.2)	**76,224**	56,511 (74.1)	19,713 (25.9)
Aspiration	**255**	141 (55.3)	114 (44.7)	**4,765**	2,695 (56.6)	2,070 (43.4)
Child maltreatment§§	**148**	87 (58.8)	61 (41.2)	**11,000**	6,294 (57.2)	4,706 (42.8)
Drowning	**1,043**	820 (78.6)	223 (21.4)	**35,969**	28,803 (80.1)	7,167 (19.9)
Fall injuries¶¶	**2,015**	1,427 (70.8)	588 (29.2)	**53,954**	38,009 (70.4)	15,945 (29.6)
Fire injuries	**1,066**	640 (60.0)	426 (40.0)	**25,550**	15,145 (59.3)	10,405 (40.7)
Firearm injuries	**129**	109 (84.5)	20 (15.5)	**4,947**	4,124 (83.4)	823 (16.6)
Homicide	**7,334**	5,899 (80.4)	1,436 (19.6)	**318,006**	258,572 (81.3)	59,434 (18.7)
Hypothermia	**296**	194 (65.5)	102 (34.5)	**6,199**	4,354 (70.2)	1,845 (29.8)
Motor-vehicle nontraffic crashes	**190**	144 (75.8)	47 (24.7)	**5,588**	4,249 (76.0)	1,339 (24.0)
Motor-vehicle traffic crashes***	**7,092**	5,522 (77.9)	1,570 (22.1)	**323,610**	245,447 (75.8)	78,163 (24.2)
Occupational and machine injuries	**126**	117 (92.9)	9 (7.1)	**3,294**	3,060 (92.9)	234 (7.1)
Other road vehicle crashes	**170**	137 (80.6)	33 (19.4)	**5,632**	4,473 (79.4)	1,159 (20.6)
Poisoning (not alcohol)	**11,839**	7,524 (63.6)	4,315 (36.4)	**444,235**	280,270 (63.1)	163,965 (36.9)
Suicide	**9,899**	7,711 (77.9)	2,189 (22.1)	**332,791**	252,674 (75.9)	80,117 (24.1)
Suicide by and exposure to alcohol	**38**	24 (63.2)	14 (36.8)	**1,267**	764 (60.3)	503 (39.7)
Water transport	**75**	65 (86.7)	9 (12.0)	**2,566**	2,189 (85.3)	377 (14.7)

Abbreviation: NA = not applicable.

* In the Alcohol-Related Disease Impact application (https://www.cdc.gov/ARDI), deaths attributable to excessive alcohol use include deaths from 1) conditions that are 100% alcohol-attributable, 2) deaths caused by acute conditions that involved binge drinking, and 3) deaths caused by chronic conditions that involved medium (>1 to ≤2 drinks of alcohol [women] or >2 to ≤4 drinks [men]) or high (>2 drinks of alcohol [women] or >4 drinks [men]) levels of average daily alcohol consumption.

† Numbers might not sum to totals, and row percentages might not sum to 100% because of rounding.

§ Deaths calculated for the proportion of esophageal cancer deaths caused by squamous cell carcinoma only, based on the Surveillance, Epidemiology, and End Results data in 18 states (SEER18). https://seer.cancer.gov/.

¶ Deaths among those consuming high average daily levels of alcohol only.

** Alcohol consumption prevalence estimates calculated among women aged 18–44 years only.

†† Deaths among persons aged 20–64 years only because of the high number of deaths from pneumonia among persons aged ≥65 years that are not alcohol-related and the lack of relative risks that differ by age.

§§ Deaths among persons aged 0–14 years.

¶¶ Deaths among persons aged 15–69 years only because of the high number of deaths from falls among persons aged ≥70 years that are not alcohol-attributable and the lack of alcohol-attributable fractions that differ by age.

*** Deaths among persons of all ages. A blood alcohol concentration level of ≥0.08 g/dL is used for defining alcohol attribution for this condition.

and might not accurately represent the proportion of excessive drinkers among persons who died of some conditions (e.g., drug overdoses) during that period. This emphasizes the importance of more timely information on alcohol involvement and various health conditions. Fourth, several conditions partially related to alcohol (e.g., tuberculosis, human immunodeficiency virus, and acquired immunodeficiency syndrome)**** are not included because published risk estimates were not available. Finally, the alcohol-attributable deaths and YPLL are based on alcohol-related conditions that were listed as the underlying (i.e., primary) cause of death, and not as a multiple cause of death, yielding conservative estimates.

The implementation of effective population-based strategies for preventing excessive drinking, such as those recommended by the Community Preventive Services Task Force (e.g., increasing alcohol taxes and regulating the number and concentration of alcohol outlets), could reduce alcohol-attributable deaths and YPLL. These strategies can complement other population-based prevention strategies that focus on health risk behaviors associated with excessive alcohol use, such as safer prescribing practices to reduce opioid misuse and overdoses (*8*,*9*) and alcohol-impaired driving interventions (*10*).

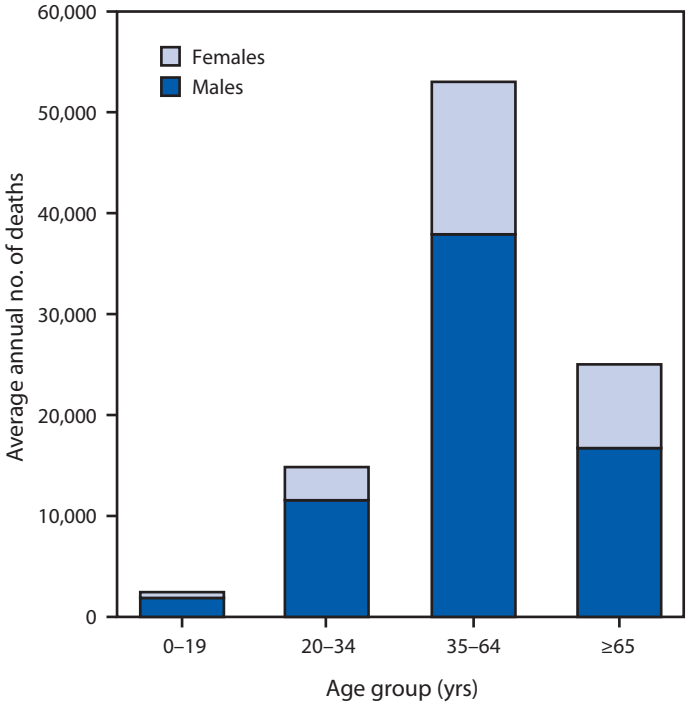
**** https://apps.who.int/iris/bitstream/handle/10665/274603/9789241565639-eng.pdf?ua.

TABLE 2. Annual average number of deaths and years of potential life lost from excessive alcohol use,* by state — United States, 2011–2015

Location	Alcohol-attributable deaths	Age-adjusted alcohol-attributable deaths per 100,000-population	Years of potential life lost	Years of potential life lost per 100,000-population	Years of potential life lost per alcohol-attributable death
U.S. total	**95,158**	**28.0**	**2,763,055**	**873.0**	**29.0**
Alabama	1,504	29.2	46,347	959.4	30.8
Alaska	297	40.0†	9,794	1,335.5	33.0
Arizona	2,629	37.5	76,039	1,144.8	28.9
Arkansas	923	29.4	27,699	936.3	30.0
California	11,026	27.5	308,831	803.8	28.0
Colorado	1,821	32.7	54,564	1,033.6	30.0
Connecticut	913	23.2	26,366	733.8	28.9
Delaware	278	27.6†	8,445	911.5	30.4
District of Columbia	219	33.0†	6,440	994.6	29.4
Florida	6,903	30.4	188,713	960.6	27.3
Georgia	2,637	25.6	79,017	789.6	30.0
Hawaii	349	22.3†	9,482	674.3	27.2
Idaho	493	29.5	14,099	872.2	28.6
Illinois	3,391	24.8	100,018	776.9	29.5
Indiana	1,946	28.1	58,407	889.2	30.0
Iowa	841	24.8	22,266	719.8	26.5
Kansas	764	25.2	22,725	785.5	29.7
Kentucky	1,552	33.0	46,452	1,056.4	29.9
Louisiana	1,591	33.0	50,180	1,084.9	31.5
Maine	427	27.2†	11,375	855.8	26.6
Maryland	1,505	23.8	46,185	778.8	30.7
Massachusetts	1,744	23.6	49,020	731.0	28.1
Michigan	3,205	29.7	92,753	936.8	28.9
Minnesota	1,343	22.9	37,011	683.0	27.6
Mississippi	954	30.7	29,516	987.8	30.9
Missouri	1,913	29.7	58,107	961.2	30.4
Montana	416	37.6	12,289	1,211.1	29.5
Nebraska	460	23.3	12,899	690.0	28.0
Nevada	1,051	35.1	30,229	1,080.1	28.8
New Hampshire	421	27.5†	11,389	860.1	27.1
New Jersey	2,016	20.9	59,604	669.4	29.6
New Mexico	1,145	53.1	35,087	1,683.5	30.6
New York	4,473	20.8	124,315	631.9	27.8
North Carolina	2,876	27.2	85,199	865.4	29.6
North Dakota	216	28.7†	6,402	887.1	29.6
Ohio	3,674	29.2	106,752	922.2	29.1
Oklahoma	1,497	37.2	44,920	1,166.8	30.0
Oregon	1,508	33.8	39,705	1,007.9	26.3
Pennsylvania	3,843	27.2	111,516	872.6	29.0
Rhode Island	339	28.8†	9,346	887.0	27.6
South Carolina	1,679	32.4	50,141	1,049.5	29.9
South Dakota	283	32.9†	8,681	1,029.5	30.7
Tennessee	2,151	30.8	64,392	990.7	29.9
Texas	7,245	27.4	219,901	828.6	30.4
Utah	686	26.2	21,937	755.6	32.0
Vermont	203	27.2†	5,085	811.5	25.0
Virginia	2,011	22.7	58,540	709.0	29.1
Washington	2,214	29.1	60,508	866.2	27.3
West Virginia	738	36.1	22,087	1,193.0	29.9
Wisconsin	1,737	27.5	48,122	838.1	27.7
Wyoming	237	38.8†	7,329	1,264.3	30.9

* In the Alcohol-Related Disease Impact application (https://www.cdc.gov/ARDI), deaths attributable to excessive alcohol use include deaths from 1) conditions that are 100% alcohol-attributable, 2) deaths caused by acute conditions that involved binge drinking, and 3) deaths caused by chronic conditions that involved medium (>1 to ≤2 drinks of alcohol [women] or >2 to ≤4 drinks [men]) or high (>2 drinks of alcohol [women] or >4 drinks [men]) levels of average daily alcohol consumption.
† The estimate might be unreliable because of suppressed estimates of the number of alcohol-attributable deaths in two or more age groups, and estimates might not account for the total number of alcohol-attributable deaths in the state.

FIGURE. Average annual number of deaths attributable to excessive alcohol use,* by sex and age group — United States, 2011–2015



* In the Alcohol-Related Disease Impact application (https://www.cdc.gov/ARDI), deaths attributable to excessive alcohol use include deaths from 1) conditions that are 100% alcohol-attributable, 2) deaths caused by acute conditions that involved binge drinking, and 3) deaths caused by chronic conditions that involved medium (>1 to ≤2 drinks of alcohol [women] or >2 to ≤4 drinks [men]) or high (>2 drinks of alcohol [women] or >4 drinks [men]) levels of average daily alcohol consumption.

Corresponding author: Marissa B. Esser, messer@cdc.gov, 770-488-5463.

[1]Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]Canadian Institute for Substance Use Research, University of Victoria, British Columbia, Canada; [3]Boston Medical Center, Boston, Massachusetts; [4]Boston University Schools of Medicine and Public Health, Boston, Massachusetts; [5]Forecasting and Research, State of Washington Office of Financial Management; [6]New Mexico Department of Health.

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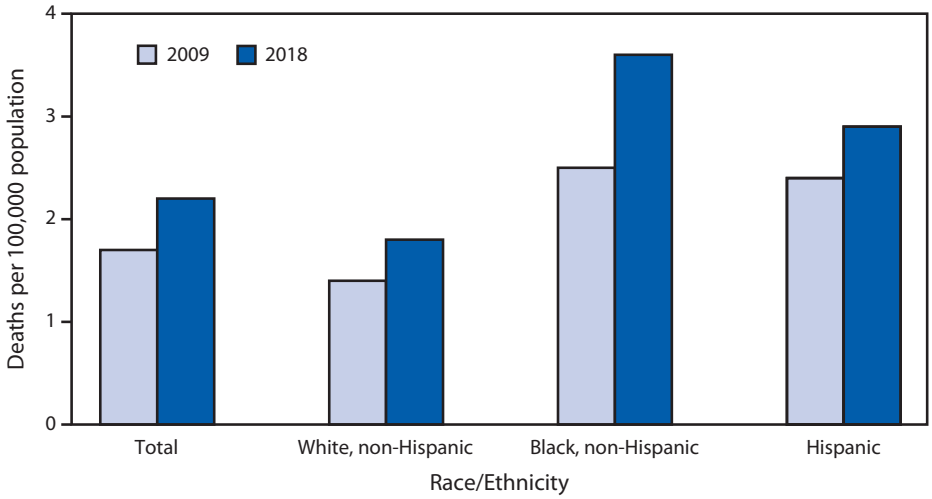
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Pedestrian* Death Rates,† by Race/Ethnicity — National Vital Statistics System, United States, 2009 and 2018



* As underlying cause of death, pedestrian deaths are identified with *International Classification of Diseases, Tenth Revision* codes V01–V09. Decedents include pedestrians struck by motor vehicles, bicycles, trains, and other transport vehicles on all types of public and nonpublic roadways and nonroad sites, such as driveways and parking lots.

† Deaths per 100,000 population are age-adjusted to the 2000 U.S. standard population.

The age-adjusted pedestrian death rate increased from 1.7 per 100,000 in 2009 to 2.2 in 2018. This increase was seen in each racial/ethnic group: from 1.4 to 1.8 per 100,000 for non-Hispanic White persons, from 2.5 to 3.6 for non-Hispanic Black persons, and from 2.4 to 2.9 for persons of Hispanic origin. In both 2009 and 2018, non-Hispanic White persons had the lowest death rate; in 2018, the rate was highest for non-Hispanic Black persons.

Sources: National Center for Health Statistics, National Vital Statistics System, mortality data, 2009 and 2018; CDC WONDER online database. https://wonder.cdc.gov/ucd-icd10.html.

Reported by: Sibeso Joyner, MPH, uvi1@cdc.gov, 301-458-4254; Deepthi Kandi, MS.

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