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Wastewater Surveillance for Influenza A Virus and H5 Subtype Concurrent with the Highly Pathogenic Avian Influenza A(H5N1) Virus Outbreak in Cattle and Poultry and Associated Human Cases — United States, May 12–July 13, 2024

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Abstract

As part of the response to the highly pathogenic avian influenza A(H5N1) virus outbreak in U.S. cattle and poultry and the associated human cases, CDC and partners are monitoring influenza A virus levels and detection of the H5 subtype in wastewater. Among 48 states and the District of Columbia that performed influenza A testing of wastewater during May 12–July 13, 2024, a weekly average of 309 sites in 38 states had sufficient data for analysis, and 11 sites in four states reported high levels of influenza A virus. H5 subtype testing was conducted at 203 sites in 41 states, with H5 detections at 24 sites in nine states. For each detection or high level, CDC and state and local health departments evaluated data from other influenza surveillance systems and partnered with wastewater utilities and agriculture departments to investigate potential sources. Among the four states with high influenza A virus levels detected in wastewater, three states had corresponding evidence of human influenza activity from other influenza surveillance systems. Among the 24 sites with H5 detections, 15 identified animal sources within the sewershed or adjacent county, including eight milk-processing inputs. Data from these early investigations can help health officials optimize the use of wastewater surveillance during the upcoming respiratory illness season.

Introduction

Wastewater surveillance is used to monitor human shedding of pathogens, including SARS-CoV-2, at a community level and is independent of symptoms, testing access, and care-seeking behavior (*1*). Some sites have conducted wastewater influenza virus surveillance for several years, and findings have correlated with traditional influenza surveillance measures (*2*–*6*). The zoonotic outbreak of highly pathogenic avian influenza (HPAI) A(H5N1) in the United States has resulted

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in 13 confirmed human cases during January–August 2024.* As part of the response to this outbreak, CDC and state and local health departments are using wastewater surveillance to monitor influenza A virus and the H5 subtype; however, current testing techniques cannot distinguish between human and animal sources. This report summarizes data from the first 9 weeks of monitoring influenza A virus and the H5 subtype in wastewater across the United States, including findings from collaborations with state and local health departments to investigate potential sources during the ongoing H5N1 public health response.

Methods

Influenza A Virus Testing

Wastewater samples collected from approximately 750 sites in 48 states and the District of Columbia during May 12–July 13, 2024, were tested for influenza A virus by state and local health departments, a CDC contractor, or an academic partner program (WastewaterSCAN [https://www.wastewaterscan.org/en]); and results were submitted to CDC's Data Collation and Integration for Public Health Event Response (DECIPHER) pipeline.† Although not specific to the H5N1 subtype, the influenza A virus testing performed routinely by partners across the United States frequently detects any influenza A virus, including seasonal and H5 subtypes. For this analysis, concentrations of influenza A virus in wastewater were measured using digital polymerase chain reaction testing with various primer and probe oligonucleotides and assay conditions that were optimized by each laboratory (*7*). For each site, the percentile of the most recent week's normalized concentration was calculated compared with the normalized concentrations reported during October 1, 2023–March 2, 2024, corresponding to the portion of the influenza season before the reported HPAI A(H5N1) outbreak in dairy cattle. Influenza A virus levels at each site were categorized as high, above average, moderate, low, or minimal.§

Influenza A(H5) Virus Subtype Testing

In April 2024, a digital polymerase chain reaction assay for the H5 hemagglutinin gene of the influenza A virus was developed and evaluated by WastewaterSCAN for testing wastewater and detected H5 viral RNA in wastewater samples from multiple locations experiencing cattle outbreaks (*7*). In May 2024, routine H5 testing was implemented at 193 sites (reduced to 152 sites by July 1, 2024) across 41 states, and results were displayed on a public dashboard¶; H5 testing was also implemented at 10 additional sites in one state, for a total of 203 sites with any H5 testing. CDC's wastewater

* https://www.cdc.gov/bird-flu/situation-summary/index.html
† https://www.cdc.gov/nwss/reporting.html#data-submission

§ Influenza A levels were categorized as being at a high (≥80th percentile compared with previous influenza season), above average (60th to <80th percentile), moderate (40th to <60th percentile), low (20th to <40th percentile), or minimal (<20th percentile) level, or as having insufficient data for analysis. https://www.cdc.gov/nwss/about-data.html
¶ https://data.wastewaterscan.org/

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DECIPHER data pipeline was updated to receive influenza A virus subtyping results, and submission of H5 virus data commenced in July 2024.

Collaboration To Evaluate Wastewater Signals

CDC notified jurisdictions of high influenza A virus levels on a weekly basis; notification of new H5 detections were provided daily. CDC provided jurisdictions with a checklist** for follow-up, which included reviewing human influenza surveillance systems and characterizing sewershed inputs (substances that flow into sewer pipes) in partnership with wastewater utilities, departments of agriculture, and others. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.††

Results

Detection of High Influenza A Virus Levels

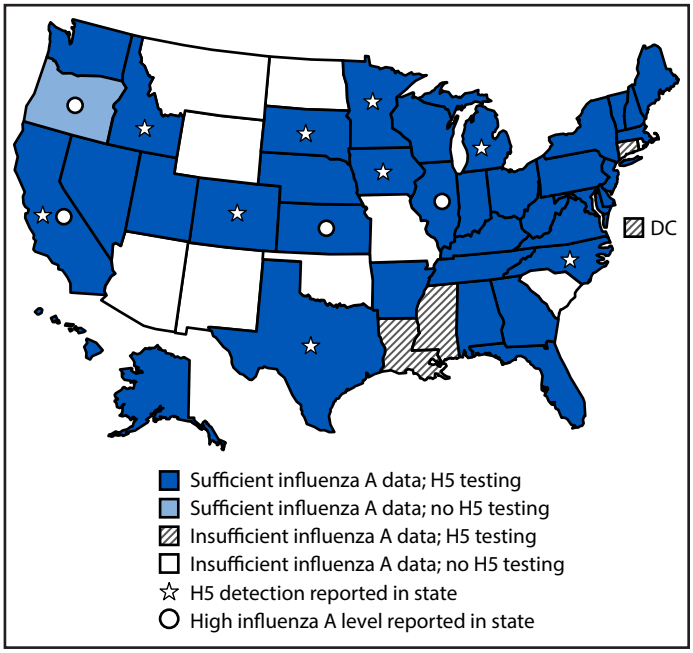
Among an average of 309 wastewater sites with sufficient data for analysis for ≥1 week during May 12–July 13 (Figure), 11 sites in four states (California, Illinois, Kansas, and Oregon) had high influenza A levels detected at least once (Table). In three of these states, six wastewater sites with high influenza A virus levels were in communities with evidence of human influenza activity, based on other surveillance. The influenza A virus wastewater data are not specific to H5, and none of these four states reported H5 human influenza cases, nor did they report any confirmed cases in livestock herds or poultry within their sewersheds or counties during this time.§§ Most of these sites reported open or combined sewersheds, and some sites identified specific potential sources of animal input.¶¶

H5 Subtype Detections

Among 41 states with influenza A H5 testing in wastewater, nine states (California, Colorado, Idaho, Iowa, Michigan, Minnesota, North Carolina, South Dakota, and Texas) reported one or more H5 detections during May 12–July 13, and 32 states did not have H5 detections during this period. The nine states with H5 detections in wastewater included seven states with an HPAI A(H5N1)–infected herd reported during this period and one additional state with an infected herd reported before this period. Two of these nine states (Colorado and Michigan) reported confirmed human cases of HPAI A(H5N1) virus infection during this time.*** Among the 32 states with H5 testing in wastewater and no H5 detections in wastewater during the analysis period, 30 (94%) had no herds with HPAI A(H5N1) virus infections reported during this time, and two had infected herds reported only before this period.

In determining inputs to specific wastewater sites, 15 of 24 sites (63%) with H5 detections identified some animal inputs within the sewershed or county. Eight of 24 sites (33%) identified milk-processing inputs within the sewershed catchment area. Additional inputs noted were meat processing, dairy operations within the sewershed or adjacent county, other sources of livestock waste (e.g., truck wash), wild bird inputs, and domestic poultry farms within the sewershed or county.†††

FIGURE. Influenza A virus and H5 subtype testing in wastewater and sites with high levels* of influenza A virus or H5 detections reported to CDC — United States, May 12–July 13, 2024†



Abbreviation: DC = District of Columbia.

* Influenza A levels were categorized as being at a high (≥80th percentile compared with previous influenza season), above average (60th to <80th percentile), moderate (40th to <60th percentile), low (20th to <40th percentile), or minimal (<20th percentile) level, or as having insufficient data for analysis. https://www.cdc.gov/nwss/about-data.html

† Sites with sufficient data for analysis included those that had influenza A wastewater testing data before October 1, 2023, had 10 or more samples in which influenza A was detected during October 1, 2023–March 2, 2024, had six or more samples tested during October 1, 2023–January 1, 2024, and submitted data in the 2 weeks before analysis.

** Checklist is available at https://stacks.cdc.gov/view/cdc/160378.

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

§§ https://www.cdc.gov/bird-flu/spotlights/h5n1-response-07262024.html; https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/hpai-confirmed-cases-livestock

¶¶ An open system (combined sewer) includes both sewage and stormwater runoff; a closed system (separate sanitary sewer) should only include sewage.

*** Colorado, Idaho, Iowa, Michigan, Minnesota, South Dakota, and Texas had publicly reported influenza A(H5N1) virus infections in dairy cattle herds during this time. Colorado and Michigan had publicly reported human cases during this period.

††† Migratory birds were a possible contributor to inputs at 10 (42%) of 24 sites.

TABLE. Characteristics of sites with high* influenza A virus activity or H5 detection in wastewater — United States, May 12–July 13, 2024

Characteristic	No. (%)			
	Influenza A virus testing†		H5 subtype testing§	
	States with high level¶ n = 4	Sites with high level n = 11	States with H5 detections** n = 9	Sites with H5 detections n = 24
Human influenza surveillance signals				
Evidence of human influenza activity based on other surveillance systems	3 (75)	6 (54)	1 (11)	3 (13)
Type of sewershed				
Combined (open)	NA	8 (73)	NA	5 (21)
Separate (closed)	NA	3 (27)	NA	17 (71)
Information not provided	NA	0 (—)	NA	2 (8)
Potential signal source (within sewershed or county)††				
Dairy or livestock				
Dairy operations	0 (—)	0 (—)	3 (33)	5 (21)
Livestock truck wash	2 (50)	2 (18)	1 (11)	3 (13)
Milk processing	3 (75)	3 (27)	4 (44)	8 (33)
Meat processing	0 (—)	0 (—)	5 (56)	7 (29)
No dairy or livestock inputs identified	4 (100)	5 (45)	4 (44)	10 (42)
Information not provided	1 (9)	1 (9)	1 (11)	2 (8)
Avian				
Wild bird inputs suspected as possible	2 (50)	6 (55)	4 (44)	10 (42)
Active poultry cases	0 (—)	0 (—)	2 (22)	2 (8)
No avian inputs identified	2 (50)	4 (36)	6 (67)	11 (46)
Information not provided	1 (9)	1 (9)	1 (11)	2 (8)
Any dairy, livestock, or avian input	3 (75)	8 (73)	8 (89)	15 (63)
Information not provided	1 (9)	1 (9)	1 (11)	2 (8)
Other				
Identified human influenza H5 cases during this period	0 (—)	NA	2 (22)§§	NA
H5 confirmed cases in livestock herds during this period	0 (—)	NA	7 (78)¶¶	NA

Abbreviation: NA = not applicable.

* Influenza A levels were categorized as being at a high (≥80th percentile compared with previous influenza season), above average (60th to <80th percentile), moderate (40th to <60th percentile), low (20th to <40th percentile), or minimal (<20th percentile) level, or as having insufficient data for analysis. https://www.cdc.gov/nwss/about-data.html

† At an average of 309 weekly sites in 38 states with sufficient data for analysis.

§ At 203 sites in 41 states.

¶ The following jurisdictions had one or more sites with a high influenza A level during the 9-week period: California, Illinois, Kansas, and Oregon.

** The following jurisdictions had one or more sites with an H5 detection during the 9-week period: California, Colorado, Idaho, Iowa, Michigan, Minnesota, North Carolina, South Dakota, and Texas.

†† Each site had the option to select multiple potential sources; thus, these categories and responses within categories are not mutually exclusive.

§§ Colorado and Michigan had identified human cases of influenza A(H5N1) virus infection during this period.

¶¶ Colorado, Idaho, Iowa, Michigan, Minnesota, South Dakota, and Texas had publicly reported influenza A(H5N1) virus infections in dairy cattle herds during this period.

Discussion

During May 12–July 13, most U.S. wastewater sites tested did not have high influenza A virus levels or any detections of the H5 subtype. Among the sites that did have high influenza A virus levels, the most frequent finding was corresponding evidence of human influenza A virus activity in the community. Among sites that reported H5 detections in wastewater, all but one were in a state with reported infected dairy herds during or before the surveillance period, and animal-related inputs such as effluent from milk-processing plants and suspected contributions from wild birds were frequently reported. These differences highlight the importance of influenza A virus subtyping to provide data specific to HPAI outbreaks.

The findings in this report underscore the importance of using a One Health approach that leverages multisectoral collaboration to understand the complexity of inputs from animal and human sources.§§§ The current zoonotic outbreak of HPAI A(H5N1) virus highlights the importance of coordination across health, agriculture, wildlife, food safety, and other partners. Investigations into wastewater signals also require coordination among public health, academic, municipal water treatment, and community partners. Influenza A(H5N1) virus has been found at very high concentrations in milk from infected cows (*8*); investigations of influenza A and H5 virus signals in wastewater suggest that milk effluent from milk-processing facilities can be a major contributor to H5 viral particles in wastewater (*7*,*9*). Monitoring influenza A viruses and specific influenza A virus subtypes in wastewater might serve as One Health surveillance indicators of the presence of

§§§ https://www.cdc.gov/one-health/about/index.html

influenza viruses in a community. Further, existing human clinical influenza surveillance systems are essential for quickly identifying H5 virus infections in humans and monitoring seasonal influenza virus activity.

Public health agencies that conduct wastewater monitoring to complement influenza surveillance systems should be prepared to add influenza A virus subtype testing when needed to improve understanding of influenza A virus detections in the context of the current HPAI A(H5N1) outbreak. CDC-funded National Wastewater Surveillance System's Centers of Excellence are expanding influenza A virus testing and subtyping, which can contribute to source investigations and be deployed at strategic times and places.¶¶¶ Although this report focused on comparing influenza A virus levels with those from the previous season and identifying H5 detections, subtyping for seasonal influenza A(H1) and A(H3) viruses in wastewater samples and using state and national viral activity levels to monitor influenza A across sites can help with interpretation of wastewater surveillance data during the upcoming influenza season.****

A critical need for clear communication about the meaning of detection of influenza A virus and subtypes exists. Data dashboards can provide regular wastewater surveillance updates to the public, the media, and health care providers; however, these data need to be accompanied by clear public health interpretations focusing on potential human risk and public health actions, which could include alerts to health care providers or increasing availability of testing or vaccines as has been done for SARS-CoV-2 and mpox. Activities to monitor influenza A virus and subtypes using wastewater data are likely to evolve as the methodologies and interpretation are further evaluated and refined.

Limitations

The findings in this report are subject to at least five limitations. First, although influenza viruses can be detected in wastewater, current techniques cannot distinguish between human and animal sources, and the current approach for H5 testing in wastewater is not specific to HPAI A(H5N1) viruses; H5 detections in wastewater might reflect animal rather than human infections and might be detection of low pathogenic avian influenza rather than HPAI A(H5N1) viruses. Second, limited data are available regarding the proportion of persons infected with influenza viruses who shed virus in urine or feces, and how the concentration of viral shedding varies by subtype and across the course of illness (*10*). Third, population wastewater surveillance coverage varies substantially by state; therefore, data are most informative when used in conjunction with clinical human influenza surveillance data. Fourth, states reported information on the investigations of sewershed inputs for sites with high influenza A virus levels or H5 detections, but comparison information for sites without these signals was not collected; therefore, epidemiologic measures for these possible associations could not be generated. Finally, the comprehensiveness of data collection after a signal in wastewater varied widely. Public health investigations into potential sources of H5 viruses in wastewater can be complex (e.g., milk-processing inputs can include milk from other states) and might support or refute likely sources of H5 without providing definitive conclusions.

Summary

What is already known about this topic?

Wastewater surveillance can detect influenza A virus and the H5 subtype, although current testing does not distinguish between human and animal sources.

What is added by this report?

During May 12–July 13, 2024, high influenza A virus levels were detected in wastewater in four states, including three states with seasonal human influenza virus activity noted during this time. The H5 subtype was detected in wastewater in nine states; follow-up investigations in many of these states revealed likely animal-related sources, including those related to milk processing.

What are the implications for public health practice?

Early work to interpret influenza A virus and H5 subtype detections in wastewater can help with public health preparedness and response for the upcoming respiratory illness season.

Implications for Public Health Practice

Lessons learned during early follow-up investigations of wastewater signals can help health officials implement an improved measure of influenza A virus levels in wastewater and optimize the use of wastewater surveillance during the upcoming respiratory illness season. The findings in this report, and data from wastewater surveillance in general, can complement traditional influenza surveillance systems. A One Health approach with multisectoral collaboration and data-informed guidance on when and how to use influenza virus subtyping of wastewater might enhance the public health response to the current outbreak.

¶¶¶ More information about the CDC-funded National Wastewater Surveillance System's Centers of Excellence can be found online. https://www.cdc.gov/nwss/centersofexcellence.html

**** More information about the SARS-CoV-2 and influenza A Wastewater Viral Activity Levels can be found online. https://www.cdc.gov/nwss/about-data.html#data-method

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Vital Signs: Suicide Rates and Selected County-Level Factors — United States, 2022

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On Tuesday, September 10, 2024, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

Abstract

Introduction: Approximately 49,000 persons died by suicide in the United States in 2022, and provisional data indicate that a similar number died by suicide in 2023. A comprehensive approach that addresses upstream community risk and protective factors is an important component of suicide prevention. A better understanding of the role of these factors is needed, particularly among disproportionately affected populations.

Methods: Suicide deaths were identified in the 2022 National Vital Statistics System. County-level factors, identified from federal data sources, included health insurance coverage, household broadband Internet access, and household income. Rates and levels of factors categorized by tertiles were calculated and presented by race and ethnicity, sex, age, and urbanicity.

Results: In 2022, the overall suicide rate was 14.2 per 100,000 population; rates were highest among non-Hispanic American Indian or Alaska Native (AI/AN) persons (27.1), males (23.0), and rural residents (20.0). On average, suicide rates were lowest in counties in the top one third of percentage of persons or households with health insurance coverage (13.0), access to broadband Internet (13.3), and income >100% of the federal poverty level (13.5). These factors were more strongly associated with lower suicide rates in some disproportionately affected populations; among AI/AN persons, suicide rates in counties in the highest tertile of these factors were approximately one half the rates of counties in the lowest tertile.

Conclusions and Implications for Public Health Practice: Higher levels of health insurance coverage, household broadband Internet access, and household income in communities might play a role in reducing suicide rates. Upstream programs, practices, and policies detailed in CDC's Suicide Prevention Resource for Action can be implemented by decision-makers, government agencies, and communities as they work together to address community-specific needs and save lives.

Introduction

In 2022, approximately 49,000 persons died by suicide in the United States (age-adjusted suicide rate = 14.2 per 100,000 population), and provisional data indicate a similar number of persons died by suicide in 2023 (*1*). Suicide was the second leading cause of death among persons aged 10–34 years in 2022 (*1*). Several demographic groups are disproportionately affected by suicide in the United States (*2*). These groups include males, rural residents, and persons from certain racial and ethnic groups, particularly non-Hispanic American Indian or Alaska Native (AI/AN) persons (*1*).

Suicide rates have increased during the last 20 years and remain high (*1*): on average one person dies by suicide every 11 minutes (*1*). However, despite these concerning data, suicide is a preventable public health problem. Suicide prevention requires a comprehensive public health approach that addresses multiple modifiable suicide risk and protective factors at the individual, relationship, community, and societal levels (*3*). Such an approach includes implementation of upstream policies, programs, and practices to prevent persons from reaching a crisis point, and downstream prevention focused on treatment, crisis intervention, and postvention (i.e., activities that reduce risk and promote healing in suicide loss survivors after a suicide has taken place).

A number of nonmedical factors that affect health outcomes, often described as social determinants of health, play an important role in shaping upstream suicide prevention efforts (*4*). These factors are the conditions in which persons are born,

grow, work, live, and age.* For example, insurance coverage, access to broadband Internet, and higher household income might decrease suicide risk by improving health care access, increasing job opportunities, and providing access to sources of support and information (*5*–*7*). However, although evidence of associations between higher levels of these factors and reduced suicide risk exists (*5*–*7*), this evidence is more limited among groups disproportionately affected by suicide. To guide opportunities for prevention, CDC examined differences in suicide rates according to three specific county-level factors, overall and within demographic groups: 1) health insurance coverage, 2) broadband Internet access, and 3) income.

Methods

Ascertainment of Suicide Deaths

Suicide deaths from the 2022 National Vital Statistics System (NVSS) mortality files were identified using the *International Classification of Diseases, Tenth Revision* underlying cause of death codes X60–X84, Y87.0, and U03.†,§ Demographic factors were extracted, including data on decedent race and ethnicity (i.e., AI/AN, Asian and Native Hawaiian or Pacific Islander [Asian and NH/PI],¶ Black or African American [Black], White, Hispanic or Latino [Hispanic], and multiracial), sex, and age group (10–24,** 25–44, 45–64, and ≥65 years). Hispanic decedents could be of any race; all other racial and ethnic groups were non-Hispanic. Decedent county of residence was linked to the 2023 U.S. Department of Agriculture Rural-Urban Continuum Codes and categorized as urban or rural.††

County-Level Factors

Three county-level factors (health insurance coverage, broadband Internet access, and household income) were measured and linked with decedent county of residence. These three factors were selected based on published literature and their relevance to multiple suicide prevention strategies, including those in CDC's Suicide Prevention Resource for Action (*3*). Health insurance coverage was assessed as the percentage of persons in the county who had health insurance, measured using 2021 Small Area Health Insurance Estimates (SAHIE).§§ Broadband Internet access was defined as the percentage of households in the county that had a broadband Internet subscription, measured using 5-year estimates from the 2018–2022 American Community Survey.¶¶ Income level was derived from the percentage of persons in the county with household incomes >100% of the federal poverty level, measured using 2022 Small Area Income and Poverty Estimates.*** Counties were categorized into tertiles of each individual factor (i.e., counties with the highest, middle, and lowest third for percentage of persons or households with a factor).†††

Data Analysis

Suicide rates (suicide deaths per 100,000 population) were calculated by tertiles of health insurance coverage, household broadband internet access, and household income, overall and by demographic subgroups. Rates were calculated using U.S. postcensal single race estimates of the July 1, 2022, residential population as denominators. Age-adjusted rates were calculated by the direct method,§§§ using the 2000 U.S. standard population. Differences (examined for each factor individually) in suicide rates between the counties in the highest and lowest tertiles for each factor and counties in the intermediate and lowest tertiles for each factor were compared using Z-tests when the number of suicide deaths was ≥100; p-values <0.05 were considered statistically significant. When the number of suicide deaths was <100, differences in rates were considered significant if CIs, based on a gamma distribution, did not overlap. Rate ratios (RRs) were also computed to quantify associations between levels of factors and suicide rates

* https://www.cdc.gov/about/priorities/why-is-addressing-sdoh-important.html
† https://www.cdc.gov/nchs/nvss/deaths.htm
§ To incorporate data from all 50 states, vital records from Connecticut supplemented NVSS files. This strategy was necessary for analyses that incorporated county-level measures because 2022 NVSS county information is classified based on Connecticut's eight counties, but all U.S. Census Bureau products from 2022 forward only contain Connecticut's nine planning regions as county-equivalents. To fill this gap, Connecticut vital statistics provided data for persons who died by suicide in Connecticut, representing 377 of 398 suicide deaths among Connecticut residents.
¶ Asian and NH/PI were combined because the number of deaths for NH/PI alone would have yielded suppressed rates.
** Suicide deaths among persons aged <10 years were suppressed because of low death counts.
†† The U.S. Department of Agriculture urbanicity scheme was used because it is the most current urbanicity scheme. Rural-Urban Continuum Codes 1–3 were coded as urban, and Codes 4–9 were coded as rural. https://www.ers.usda.gov/data-products/rural-urban-continuum-codes
§§ SAHIE measures any type of health insurance coverage. SAHIE estimates reflect county estimates of health insurance coverage among persons aged <65 years because health insurance coverage among persons aged ≥65 years is nearly universal. All ages were included in analyses of overall rates and by race and ethnicity, sex, and urbanicity because subanalyses of the ≥65 years age group demonstrated associations between county-level health insurance coverage and suicide rates. https://www.census.gov/programs-surveys/sahie.html
¶¶ https://www.census.gov/programs-surveys/acs
*** https://www.census.gov/programs-surveys/saipe.html
††† The county tertile cutoffs for the percentage of residents or households with a given factor were as follows: health insurance coverage: 53.7%–87.0%, 87.1%–91.7%, and 91.7%–97.6%; broadband Internet access: 36.0%–80.6%, 80.6%–86.0%, and 86.0%–100%; and income >100% of the federal poverty level: 57.6%–83.9%, 84.0%–88.3%, and 88.4%–96.9%. Percentages were rounded to one decimal place for readability, but groups do not overlap; statistical ranking was used to split counties into tertile groups before rounding.
§§§ https://wonder.cdc.gov/wonder/help/ucd-expanded.html#Age%20Adjustment

(i.e., RRs for counties in the highest versus lowest tertiles of factors and RRs for counties in the intermediate versus lowest tertiles of factors). Analyses were conducted using SAS software (version 9.4; SAS Institute) and R software (version 4.4.0; The R Foundation). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¶¶¶

Results

Suicide Deaths and Rates, Overall and by Demographic Factors

In 2022, a total of 49,476 suicides occurred in the United States (age-adjusted rate = 14.2 per 100,000 population) (Table 1). Among all racial and ethnic groups, the highest rates were among AI/AN persons (27.1), followed by White persons (17.6); approximately 75% of all suicides were among White persons (37,481). The suicide rate among males (23.0) was nearly four times that among females (5.9) and was higher among rural residents (20.0) than among urban residents (13.4). By age group, rates were highest among persons aged 25–44 (18.9) and 45–64 years (19.0).

Suicide Rates by County-Level Factors

Overall, average suicide rates were inversely related to each of the three county-level factor tertiles (Figure 1). Suicide rates were highest in counties in the lowest tertile of health insurance coverage (16.4), broadband Internet access (19.2), and household income (15.2), followed by counties in the intermediate tertiles (14.3, 16.5, and 14.8, respectively). The lowest suicide rates occurred in counties in the highest tertiles (13.0, 13.3, and 13.5, respectively). These findings correspond to 26%, 44%, and 13% lower suicide rates in counties in the highest versus lowest tertiles of health insurance coverage, broadband Internet access, and household income, respectively.****

Suicide Rates and RRs by County-Level Factors and Demographic Groups

Among AI/AN persons, White persons, males, and adults aged 25–44 years, suicide rates were significantly lower among those who lived in counties in the highest and intermediate tertiles for health insurance coverage, broadband Internet access, and income than they were among persons who lived in counties in the lowest tertiles for these factors (Table 2).

TABLE 1. Suicide rates by race and ethnicity, sex, age group, and urbanicity — National Vital Statistics System, United States, 2022

Demographic group	Suicide deaths	Rate*
Overall†	**49,476**	**14.2**
Race and ethnicity†,§		
AI/AN	650	27.1
Asian and NH/PI	1,554	7.1
Black or African American	3,826	8.9
White	37,481	17.6
Hispanic or Latino	5,122	8.1
Multiracial	682	10.5
Sex†		
Female	10,203	5.9
Male	39,273	23.0
Age group, yrs¶,,††**		
10–24	6,533	10.0
25–44	16,848	18.9
45–64	15,645	19.0
≥65	10,438	18.1
Urbanicity§§,¶¶		
Urban	40,096	13.4
Rural	9,359	20.0

Abbreviations: AI/AN = American Indian or Alaska Native; NH/PI = Native Hawaiian or Pacific Islander.

* Suicide deaths per 100,000 population.

† Age-adjusted rates, as described by https://wonder.cdc.gov/wonder/help/ucd-expanded.html#Age-Adjusted%20Rates. Hispanic or Latino (Hispanic) decedents could be of any race; all other racial and ethnic groups were non-Hispanic.

§ Race or ethnicity missing for 161 deaths.

¶ Crude rates.

** Age missing for three deaths.

†† Suppression of persons aged <10 years due to low death counts.

§§ Age-adjusted rates (calculated via direct method, using 2000 U.S. standard population) used 10 age group categories for age-adjustment: 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years. National Vital Statistics System data was used for all states except Connecticut, where state vital records were used (data provided for 377 of 398 suicide deaths among Connecticut residents).

¶¶ Rural-Urban Continuum Codes 1–3 were coded as urban, and Codes 4–9 were coded as rural. https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/

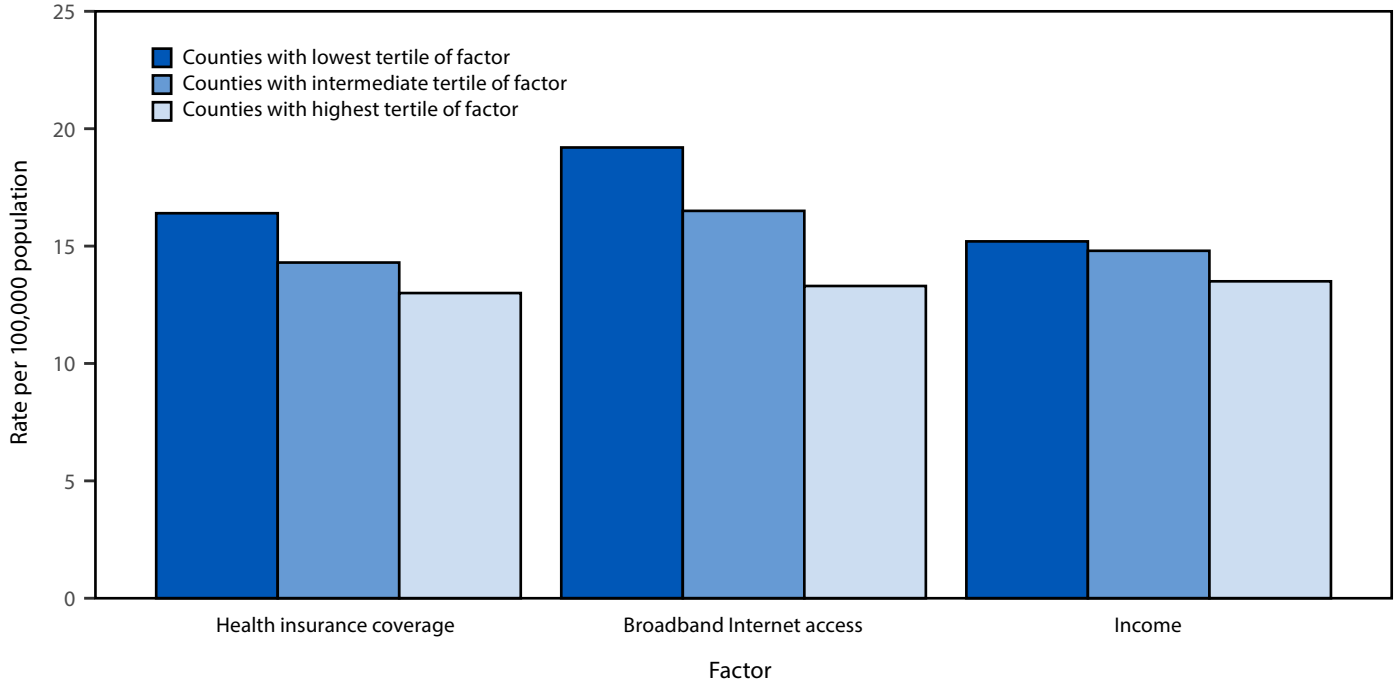
The magnitude of the RRs (i.e., rate in counties in the highest tertile compared with rate in counties in the lowest tertile) tended to be lowest (indicating that presence of the factor was most protective) in these groups and was particularly low for AI/AN persons, for whom the RRs ranged from 0.44 to 0.49 for counties in the highest versus the lowest factor tertiles (Figure 2). In other demographic groups, suicide rates were less consistently associated with these factors. For example, among females living in the lowest-income tertile counties, suicide rates were similar to those among females living in the highest-income tertile counties (RR = 0.98), and a similar pattern was observed among Black persons with respect to health insurance coverage (RR = 1.03).††††

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

**** Percent reduction as calculated by the formula: ([rate for highest tertile of factor – rate for tertile level of factor] / rate for highest tertile of factor) × 100. Percent reduction was calculated using exact, unrounded rates.

†††† RRs were calculated using exact, unrounded rates.

FIGURE 1. Suicide rates,* by tertiles of selected county-level factors†,§,¶, — National Vital Statistics System,†† United States, 2022**



Abbreviation: FIPS = Federal Information Processing Standard.

* Age-adjusted rates (calculated via direct method, using 2000 U.S. standard population) used 10 categories for age adjustment: 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years.

† Percentage of persons with health insurance coverage. Connecticut and Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded. Data was not available for Kalawao County, Hawaii. Data for 2021 are available at https://www.census.gov/programs-surveys/sahie.html.

§ Percentage of households with a broadband Internet subscription. Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded. Five-year estimates (2018–2022) are available at https://www.census.gov/programs-surveys/acs.

¶ Percentage of persons living in a household with income >100% of the federal poverty level. Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded. Data was not available for Kalawao County, Hawaii. Data for 2022 are available at https://www.census.gov/programs-surveys/saipe.html.

** The county tertile cutoffs for the percentage of residents or households with a given factor were as follows: health insurance coverage: 53.7%–87.0%, 87.1%–91.7%, and 91.7%–97.6%; broadband Internet access: 36.0%–80.6%, 80.6%–86.0%, and 86.0%–100%; and income >100% of the federal poverty level: 57.6%–83.9%, 84.0%–88.3%, and 88.4%–96.9%. Percentages were rounded to one decimal place for readability, but groups do not overlap; statistical ranking was used to split counties into tertile groups before rounding.

†† Data from state vital records were used for 377 of 398 suicide deaths among Connecticut residents.

Discussion

These findings highlight the importance of three county-level factors (health insurance coverage, household broadband Internet access, and household income) in relation to suicide rates. Overall, suicide rates in counties with higher levels of health insurance coverage, household broadband Internet access, and household income were lower than rates in counties with lower levels of these factors. There are several potential explanations for how these factors might protect against suicide. Health insurance might facilitate access to mental health services, as well as primary care and crisis intervention (*8*,*9*). Broadband Internet, recently referred to as a superdeterminant of health (*10*), can connect persons to job prospects, opportunities for social connectedness and support, and expanded access to medical services via telehealth (*7*,*10*). Living in higher-income communities is associated with ability to meet basic needs, such as food security and housing stability (*11*,*12*).

In addition, this analysis found that overall, higher suicide rates continue to affect certain sociodemographic groups, including rural residents, males, and AI/AN and White populations. For some sociodemographic groups included in the analyses, especially AI/AN persons, the three county-level factors examined might be particularly important. These findings are especially meaningful considering that some of these groups, such as AI/AN persons, are more likely to live in communities with lower levels of these factors, including broadband Internet access (*13*). The finding that higher levels of the three assessed factors are more strongly related to lower suicide rates among AI/AN persons and males aligns with previous studies examining economic factors (*14*,*15*). In contrast, the factors considered in this analysis were less clearly linked with suicide

TABLE 2. Suicide rates by tertiles of selected county-level factors by demographic characteristics — National Vital Statistics System,* United States, 2022

Characteristic	Tertile†					
	Lowest		Intermediate		Highest	
	Deaths	Rate§	Deaths	Rate§	Deaths	Rate§
Health insurance coverage¶,,††,§§**						
Race and ethnicity¶¶						
AI/AN	377	35.0	188	24.5***	85	15.4***
Asian and NH/PI	243	8.0	444	6.8***	851	7.0
Black or African American	1,151	9.0	1,393	8.7	1,246	9.2
White	9,855	22.2	11,809	18.6***	15,513	15.1***
Hispanic or Latino	1,979	9.0	1,777	7.7***	1,325	7.5***
Multiracial	139	10.2	191	9.8	348	11.2
Sex¶¶						
Female	2,782	6.7	3,189	5.8***	4,135	5.6***
Male	10,984	26.5	12,667	23.3***	15,316	20.9***
Age group, yrs†††,§§§						
10–24	1,874	11.6	2,172	10.2***	2,446	9.1***
25–44	4,768	22.1	5,537	19.0***	6,409	17.1***
45–64	4,211	21.2	4,883	18.8***	6,408	17.9***
≥65	2,911	20.6	3,260	18.5***	4,185	16.5***
Urbanicity¶¶,¶¶¶						
Urban	10,396	15.3	12,947	13.5***	16,403	12.4***
Rural	3,370	21.1	2,909	20.1	3,048	18.8***
Broadband Internet access,******						
Race and ethnicity¶¶						
AI/AN	261	41.0	138	29.7***	251	19.3***
Asian and NH/PI	17	8.2	100	7.3	1,435	7.0
Black or African American	267	8.3	843	9.7***	2,711	8.8
White	3,371	22.7	8,009	19.8***	26,086	16.5***
Hispanic or Latino	296	9.5	824	8.9	3,999	7.9***
Multiracial	40	13.5	84	9.9	558	10.6
Sex¶¶						
Female	758	7.2	1,905	6.3***	7,536	5.7***
Male	3,503	31.4	8,125	27.0***	27,623	21.3***
Age group, yrs†††,§§§						
10–24	582	13.5	1,219	10.6***	4,725	9.6***
25–44	1,482	28.4	3,510	23.5***	11,846	17.2***
45–64	1,259	22.8	3,107	21.2***	11,273	18.1***
≥65	937	21.5	2,191	19.8***	7,310	17.3***
Urbanicity¶¶,¶¶¶						
Urban	1,080	16.7	6,012	14.8***	33,001	13.0***
Rural	3,181	20.3	4,018	19.9	2,158	19.7

See table footnotes on the next page.

rates for some groups, such as Black persons. Other risk factors or protective factors not examined in this report might be more relevant among these populations. Additional community or societal factors, such as indicators of structural racism and stigma and norms around help-seeking, might influence the relationship between county-level factors and decreased suicide risk in certain populations (*16*,*17*). These findings highlight the need to examine risk and protective factors within populations and incorporate the findings of such research into suicide prevention practices.

A comprehensive approach to suicide prevention that targets both upstream and downstream prevention can promote these factors. This approach is laid out in the new 2024 National Strategy for Suicide Prevention (https://www.hhs.gov/nssp), which specifically highlights the importance of upstream prevention strategies. CDC's Suicide Prevention Resource for Action (https://www.cdc.gov/suicide/resources/prevention.html) aligns with the National Strategy and describes policies, programs, and practices with the best available evidence that states and territories, tribes, and communities can implement to address suicide risk and protective factors at the individual, relationship, community, and societal levels (*3*). Relevant upstream strategies include strengthening economic supports (e.g., strengthening household financial security, such as through the Supplemental Nutrition Assistance Program and stabilizing housing), improving access and delivery of suicide

TABLE 2. (*Continued*) Suicide rates by tertiles of selected county-level factors by demographic characteristics — National Vital Statistics System,* United States, 2022

Characteristic	Tertile†					
	Lowest		Intermediate		Highest	
	Deaths	Rate§	Deaths	Rate§	Deaths	Rate§
Income[**,§§,††††]						
Race and ethnicity[¶¶]						
AI/AN	343	37.9	159	22.6***	148	18.5***
Asian and NH/PI	174	6.9	499	7.3	879	7.0
Black or African American	1,216	9.1	1,359	9.1	1,246	8.7
White	7,036	20.0	13,196	19.1***	17,234	15.8***
Hispanic or Latino	1,082	8.2	2,085	8.1	1,952	8.1
Multiracial	95	9.4	212	9.6	375	11.4
Sex[¶¶]						
Female	1,949	5.9	3,544	6.0	4,706	5.8
Male	8,026	25.1	14,027	23.9***	17,198	21.4***
Age group, yrs[†††,§§§]						
10–24	1,398	10.4	2,227	10.0	2,901	9.8
25–44	3,648	21.3	6,092	19.8***	7,098	17.2***
45–64	2,905	19.2	5,533	19.7	7,201	18.3***
≥65	2,020	18.6	3,716	18.7	4,702	17.4***
Urbanicity[¶¶,¶¶¶]						
Urban	6,271	13.3	14,020	13.8***	19,802	13.1
Rural	3,704	20.5	3,551	20.1	2,102	18.9***

Abbreviations: AI/AN = American Indian or Alaska Native; FIPS = Federal Information Processing Standard; NH/PI = Native Hawaiian or Pacific Islander.

* Data from state vital records were used for 377 of 398 suicide deaths among Connecticut residents.

† The county tertile cutoffs for the percentage of residents or households with a given factor were as follows: health insurance coverage: 53.7%–87.0%, 87.1%–91.7%, and 91.7%–97.6%; broadband Internet access: 36.0%–80.6%, 80.6%–86.0%, and 86.0%–100%; and income >100% of the federal poverty level: 57.6%–83.9%, 84.0%–88.3%, and 88.4%–96.9%. Percentages were rounded to one decimal place for readability, but groups do not overlap; statistical ranking was used to split counties into tertile groups before rounding.

§ Suicide deaths per 100,000 population.

¶ Percentage of persons with health insurance coverage. Data for 2021 are available at https://www.census.gov/programs-surveys/sahie.html.

** Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded.

†† Connecticut was excluded.

§§ Data not available for Kalawao County, Hawaii.

¶¶ Age-adjusted rates (calculated via direct method, using 2000 U.S. standard population) used 10 categories for age adjustment: 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years. Hispanic or Latino decedents could be of any race; all other racial and ethnic groups were non-Hispanic.

*** p<0.05 for difference with counties in the lowest tertile of factor based on Z-test for >100 deaths. When deaths were <100, differences in rates were considered significant if CIs based on a gamma distribution did not overlap.

††† Crude rates.

§§§ Suppression of persons aged <10 years due to low death counts.

¶¶¶ Rural-Urban Continuum Codes 1–3 were coded as urban, and Codes 4–9 were coded as rural. https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/

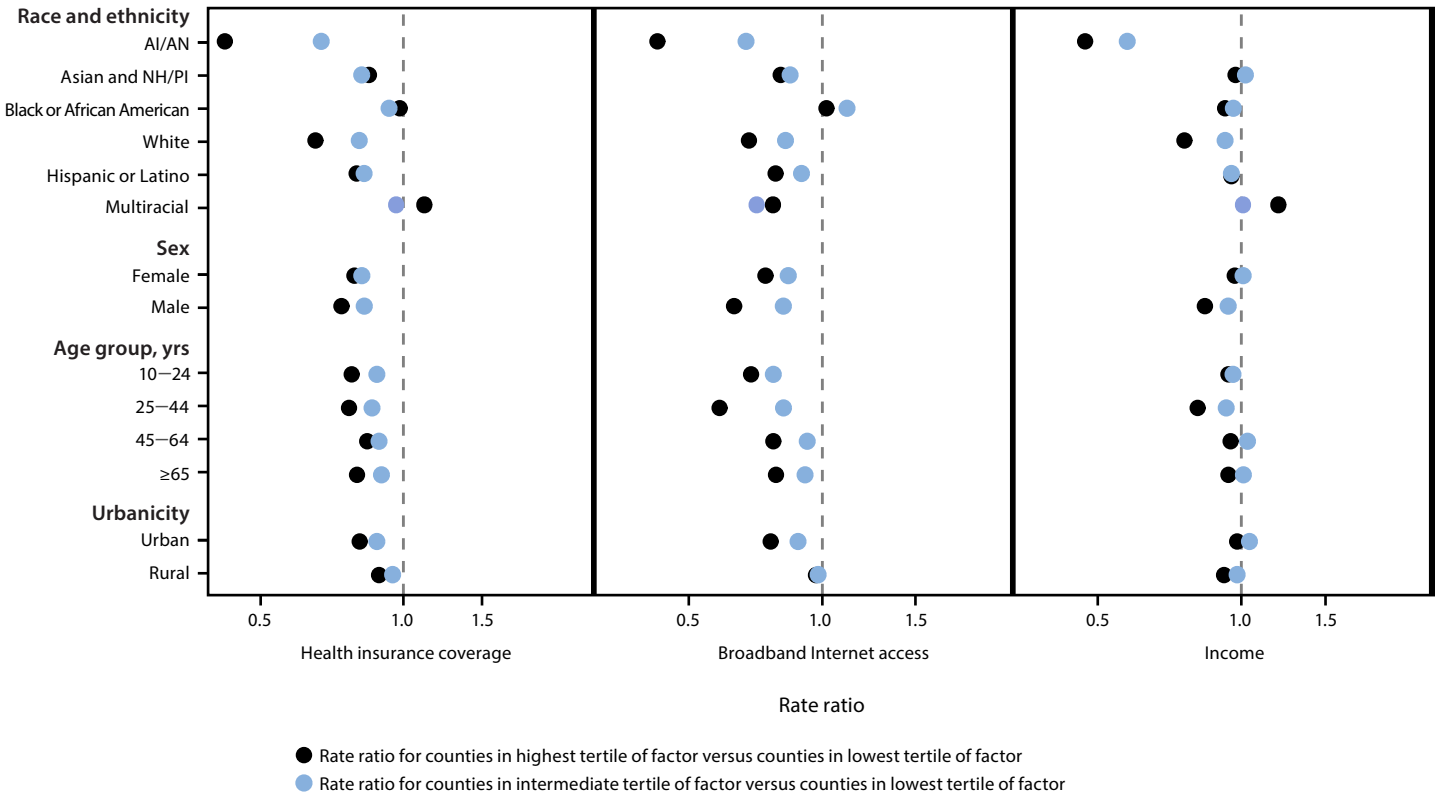
**** Percentage of households with a broadband Internet subscription. Five-year estimates (2018–2022) are available at https://www.census.gov/programs-surveys/acs.

†††† Percentage of persons living in a household with income >100% of the federal poverty level. Data for 2022 are available at https://www.census.gov/programs-surveys/saipe.html.

care (e.g., Zero Suicide[§§§§]), promoting healthy connections (e.g., community engagement), teaching coping and problem-solving skills, and creating protective environments (e.g., creating healthy organizational policies and culture). These strategies are being implemented in populations disproportionately affected by suicide through CDC's Comprehensive Suicide Prevention Program (CSP) (https://www.cdc.gov/suicide/programs/csp.html). For example, in addition to conducting a public health campaign to reduce stigma and training providers in hospital and emergency departments on suicide prevention approaches, the CSP recipient in Vermont is specifically supporting rural populations, including farmers, through peer support networks and increasing providers' abilities to reach and deliver tele-mental health to these populations using telehealth. The CSP recipient in Colorado is not only working with counties and local organizations to promote connectedness for populations at high risk for suicide and providing gatekeeper trainings to help identify and connect persons at risk for suicide with the support services they need but is also working to strengthen community factors that protect against suicide by developing partnerships to support economic stability initiatives, such as food security, affordable housing, and transportation (https://www.cdc.gov/suicide/csp-profiles/index.html).

§§§§ https://zerosuicide.edc.org

FIGURE 2. Associations between selected county-level factors[*,†,§,¶] and suicide rates,[**] by demographic group[††,§§,¶¶] — National Vital Statistics System,[***] United States, 2022[†††]



Abbreviations: AI/AN = American Indian or Alaska Native; FIPS = Federal Information Processing Standard; NH/PI = Native Hawaiian or Pacific Islander.

* Percentage of persons with health insurance coverage. Connecticut and the Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded. Data not available for Kalawao County, Hawaii. Data for 2021 are available at https://www.census.gov/programs-surveys/sahie.html.

† Percentage of households with a broadband Internet subscription. Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded. Five-year estimates (2018–2022) are available at https://www.census.gov/programs-surveys/acs.

§ Percentage of persons living in a household with income >100% of the federal poverty level. Valdez-Cordova Census Area, Alaska, and its updated split FIPS codes (Chugach and Copper River Census Areas, Alaska) were excluded. Data for 2022 are available at https://www.census.gov/programs-surveys/saipe.html.

¶ The county tertile cutoffs for the percentage of residents or households with a given factor were as follows: health insurance coverage: 53.7%–87.0%, 87.1%–91.7%, and 91.7%–97.6%; broadband Internet access: 36.0%–80.6%, 80.6%–86.0%, and 86.0%–100%; and income >100% of the federal poverty level: 57.6%–83.9%, 84.0%–88.3%, and 88.4%–96.9%. Percentages were rounded to one decimal place for readability, but groups do not overlap; statistical ranking was used to split counties into tertile groups before rounding.

** Rates were age-adjusted (calculated via direct method, using 2000 U.S. standard population) for race and ethnicity, sex, and urbanicity; used 10 categories for age adjustment: 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years. Crude rates were used for age-stratified groups.

†† Hispanic or Latino (Hispanic) decedents could be of any race; all other racial and ethnic groups were non-Hispanic.

§§ Persons aged <10 years were not included in age-stratified rate ratios because of low death counts.

¶¶ Rural-Urban Continuum Codes 1–3 were coded as urban, and Codes 4–9 were coded as rural. https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/

*** Data from state vital records were used for 377 of 398 suicide deaths among Connecticut residents.

††† The x-axis is plotted on the log scale.

Limitations

The findings in this report are subject to at least five limitations. First, although these findings highlight associations between health insurance coverage, household broadband Internet access, household income, and decreased suicide rates, this study had an ecologic design and thus did not make causal inferences. The possibility of confounding other than by demographic factors was not addressed. Second, it was not possible to examine some disproportionately affected populations, including veterans, persons with disabilities, and sexual and gender minorities (*2*). Third, factors were measured at the county level; smaller geographic units (e.g., official U.S. census tracts) might better represent communities and be more closely associated with reduced suicide risk (*18*). Fourth, rates by race and ethnicity could reflect underreporting of deaths in the vital statistics data, particularly for AI/AN and Hispanic persons, thereby underestimating rates in these populations (*19*,*20*).

Summary

What is already known about this topic?

In 2022, approximately 49,000 persons died by suicide in the United States. A comprehensive approach that addresses health-related community factors, such as health care access, social and community context, and economic stability, could help prevent suicide.

What is added by this report?

Suicide rates were lowest in counties with the highest health insurance coverage, broadband Internet access, and income. These factors were more strongly associated with lower suicide rates in some groups that are disproportionately affected by suicide.

What are the implications for public health practice?

Implementing programs, practices, and policies that improve the conditions in which persons are born, grow, live, work, and age might be an important component of suicide prevention efforts. Decision-makers, government agencies, and communities can work together to address community-specific needs and save lives.

Finally, other county-level factors that might be relevant to suicide prevention were not examined in this analysis.

Implications for Public Health Practice

Improving the conditions where persons are born, grow, work, live, and age might reduce suicide deaths (*4*). Decision-makers, government agencies, and communities can work together to implement programs, practices, and policies that increase access to health insurance and broadband Internet and promote economic supports; this approach is especially important for populations disproportionately affected by suicide. Combined with downstream actions that support persons at increased or immediate risk for suicide (e.g., crisis care or the 988 Suicide & Crisis Lifeline; https://www.988lifeline.org), an upstream approach that promotes these factors might be an important component of suicide prevention. More attention to such upstream strategies that prevent suicide crises before they start has the potential to accelerate public health's ability to save lives.

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Use of COVID-19 Vaccines for Persons Aged ≥6 Months: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–2025

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Abstract

COVID-19 vaccination provides additional protection against severe COVID-19–associated illness and death. Since September 2023, 2023–2024 Formula monovalent XBB.1-strain COVID-19 vaccines have been recommended for use in the United States for all persons aged ≥6 months. However, SARS-CoV-2 continues to evolve, and since winter 2023–2024, Omicron JN.1 lineage strains of SARS-CoV-2, including the JN.1 strain and the KP.2 strain, have been widely circulating in the United States. Further, COVID-19 vaccine effectiveness is known to wane. On June 27, 2024, the Advisory Committee on Immunization Practices (ACIP) recommended 2024–2025 COVID-19 vaccination with a Food and Drug Administration (FDA)–approved or authorized vaccine for all persons aged ≥6 months. On August 22, 2024, FDA approved the 2024–2025 COVID-19 vaccines by Moderna and Pfizer-BioNTech (based on the KP.2 strain) for use in persons aged ≥12 years and authorized these vaccines for use in children aged 6 months–11 years under Emergency Use Authorization (EUA). On August 30, 2024, FDA authorized 2024–2025 COVID-19 vaccine by Novavax (based on the JN.1 strain) for use in persons aged ≥12 years under EUA. ACIP will continue to evaluate new evidence as it becomes available and will update recommendations as needed.

Introduction

COVID-19 continues to account for thousands of hospitalizations and hundreds of deaths in the United States each week* (*1*). During October 2023–May 2024, U.S. COVID-19–associated hospitalization rates were highest among adults aged ≥75 years, followed by infants aged <6 months and adults aged 65–74 years (*2*). During July 2023–March 2024, among children and adolescents aged ≤17 years admitted to a hospital with COVID-19, 50% had no underlying medical conditions, with underlying conditions less common among infants aged <6 months (25%) and more common among adolescents (78%). Among hospitalized children and adolescents aged ≤17 years with COVID-19 and no underlying medical conditions, 18% were admitted to an intensive care unit. Age-adjusted COVID-19–associated hospitalization rates during October 2023–May 2024 were highest among non-Hispanic American Indian or Alaska Native persons, and non-Hispanic Black or African American persons (*1*). During May 2023–April 2024, monthly rates of COVID-19–associated death were highest among adults aged ≥75 years, followed by adults aged 65–74 years.† In 2023, a total of 44,059 COVID-19–associated deaths were reported in persons aged ≥65 years, 5,634 among persons aged 20–64 years, 125 among persons aged 1–19 years, and 58 among infants aged <1 year.§

The 2023–2024 Formula COVID-19 monovalent vaccines were based on the XBB.1 strain; however, since winter 2023–2024, Omicron JN.1 lineage SARS-CoV-2 strains, including the JN.1 and KP.2 strains, have been widely circulating in the United States. On June 27, 2024, the Advisory Committee on Immunization Practices (ACIP) recommended 2024–2025 COVID-19 vaccination with a Food and Drug Administration (FDA)–approved or authorized vaccine for all persons aged ≥6 months. On August 22, 2024, FDA approved the 2024–2025 COVID-19 vaccines by Moderna and Pfizer-BioNTech (KP.2 strain) for use in persons aged ≥12 years and authorized these vaccines for use in children aged 6 months–11 years under Emergency Use Authorization (EUA) (*3*). On August 30, 2024, FDA authorized 2024–2025 COVID-19 vaccines by Novavax (JN.1 strain) for use in persons aged ≥12 years under EUA (*3*). ACIP's recommendation was based on ongoing vaccine-preventable morbidity and mortality from COVID-19 in all age groups, vaccine effectiveness (VE) and safety data, cost-effectiveness, and equitable access to COVID-19 vaccine, including in disproportionately affected populations (*1*). ACIP will continue to evaluate new evidence as it becomes available and will update recommendations as necessary.

* https://covid.cdc.gov/covid-data-tracker/#datatracker-home (Accessed June 17, 2024).

† https://covid.cdc.gov/covid-data-tracker/#demographicsovertime (Accessed June 17, 2024).

§ https://wonder.cdc.gov/mcd-icd10-provisional.html (Accessed June 5, 2024).

Methods

Since June 2020, ACIP has convened 40 public meetings to review data and consider recommendations for COVID-19 vaccines.[¶] During March–June 2024, the ACIP COVID-19 Vaccines Work Group (Work Group) met nine times to discuss the current policy question (i.e., whether 2024–2025 COVID-19 vaccination should be recommended for all persons aged ≥6 months). The Work Group used the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach[**] to assess the certainty of the evidence regarding benefits and harms associated with an updated (bivalent or 2023–2024) COVID-19 vaccine administered in the United States during September 2022–May 2024. The Work Group selected this population, intervention, and period to identify evidence most applicable to what can be anticipated from the 2024–2025 COVID-19 vaccine in the United States. The Work Group used the Evidence to Recommendations framework[††] to guide their considerations and reviewed data on the importance of COVID-19 as a public health problem and issues of resource use, benefits and harms, patients' values, acceptability, feasibility, and equity related to COVID-19 vaccines (https://www.cdc.gov/vaccines/acip/recs/grade/covid-19-2024-2025-6-months-and-older-etr.html).

Vaccine Effectiveness and Safety

Published assessments of VE and safety of previous COVID-19 vaccine formulations were evaluated using GRADE to assess the confidence (high, moderate, low, or very low) that the actual effect lies close to that of the estimated effect (*1*). A body of evidence that includes only randomized controlled trials begins at high certainty, whereas a body of evidence that includes observational data begins at low certainty.

The benefits of the updated (bivalent or 2023–2024) COVID-19 vaccines compared to no updated vaccination among adolescents and adults were assessed by reviewing pooled VE data for three outcomes: 1) medically attended COVID-19,[§§] 2) COVID-19–associated hospitalization, and 3) COVID-19–associated death. Pooled VE against medically attended COVID-19 was 43% (95% CI = 30%–54%), against COVID-19–associated hospitalization was 44% (95% CI = 34%–52%), and against COVID-19–associated death was 23% (95% CI = 8%–36%) (*1*). The certainty assessment for all three outcomes was low. For infants and children, one study examining medically attended COVID-19 was available, with a VE of 80% (95% CI = 42%–96%), with a low certainty assessment. No published studies were available to assess updated VE against COVID-19–associated hospitalization and death among infants and children; therefore, benefits were inferred from adolescent and adult data. These outcomes had a certainty assessment of very low resulting from serious concern for indirectness due to the inference from data collected among a different population. The certainty assessment for prespecified adverse events (i.e., myocarditis or pericarditis and anaphylaxis) remained low for adults and adolescents and very low for infants and children. The GRADE evidence profile is available at https://www.cdc.gov/vaccines/acip/recs/grade/covid-19-2024-2025-6-months-and-older.html.

ACIP also reviewed additional, updated CDC data on VE of a 2023–2024 COVID-19 vaccine dose compared with no 2023–2024 vaccination[¶¶] (*4*). During October 2023–April 2024, VE among adults aged ≥18 years against symptomatic SARS-CoV-2 infection 60–119 days after vaccination was 58% (95% CI = 33%–73%) for likely XBB-sublineage infection and 37% (95% CI = 13%–51%) for likely JN.1-sublineage infection. During September 2023–May 2024, VE against COVID-19–associated hospitalization among adults aged ≥18 years without immunocompromising conditions was 49% (95% CI = 43%–55%) 7–59 days after 2023–2024 vaccination, declining to 14% (95% CI = 0%–27%) 120–179 days after vaccination. As with previous COVID-19 vaccine formulations (*5*), VE against critical illness appeared somewhat

Summary

What is already known about this topic?

The 2023–2024 COVID-19 vaccines provided protection against SARS-CoV-2 XBB-sublineage strains; however, these strains are no longer predominant in the United States.

What is added by this report?

On June 27, 2024, the Advisory Committee on Immunization Practices recommended 2024–2025 COVID-19 vaccination with a Food and Drug Administration (FDA)–authorized or approved vaccine for all persons aged ≥6 months. In August 2024, the FDA approved and authorized the Omicron JN.1 lineage (JN.1 and KP.2), 2024–2025 COVID-19 vaccines by Moderna and Pfizer-BioNTech (KP.2 strain) and Novavax (JN.1 strain).

What are the implications for public health practice?

The 2024–2025 COVID-19 vaccines are recommended for all persons aged ≥6 months to target currently circulating SARS-CoV-2 strains and provide additional protection against severe COVID-19–associated illness and death.

[¶] https://www.cdc.gov/acip-recs/hcp/vaccine-specific/covid-19.html
[**] https://www.cdc.gov/vaccines/acip/recs/grade/about-grade.html
[††] https://www.cdc.gov/vaccines/acip/recs/grade/downloads/acip-evidence-recs-framework.pdf
[§§] Medically attended COVID-19 was defined as an emergency department or urgent care visit.
[¶¶] Persons who received no 2023–2024 COVID-19 vaccine regardless of COVID-19 vaccination history (i.e., includes both previously unvaccinated and vaccinated with earlier formulations of COVID-19 vaccines).

more durable, at 69% (95% CI = 57%–78%) 7–59 days after 2023–2024 vaccination and 32% (95% CI = 0%–53%) 120–179 days after vaccination. Data for children and adolescents were limited, although VE was similar against medically attended COVID-19 in children and adults.

ACIP also reviewed additional CDC data on 2023–2024 COVID-19 vaccine safety. Vaccine Safety Datalink (VSD) surveillance for prespecified outcomes of special interest identified two statistical signals for mRNA COVID-19 vaccines during the 2023–2024 season (*6*). The first was for Guillain-Barré syndrome (GBS) among persons aged ≥65 years. An association between GBS and mRNA COVID-19 vaccines had not been identified before 2023–2024, and evidence as to whether this 2023–2024 signal represents an actual risk is inconclusive. In addition, VSD identified a statistical signal for ischemic stroke among adults aged ≥50 years. A similar signal had previously been observed for the bivalent COVID-19 vaccine formulation and was reviewed by ACIP in October 2023 (*7*). The cumulative data to date have not provided clear and consistent evidence of a safety problem for ischemic stroke, and a follow-up VSD study is in progress to further assess the risk for ischemic stroke after mRNA vaccination. Any real or theoretical risk of vaccine adverse events needs to be placed in the context of benefits of COVID-19 vaccines in preventing COVID-19 and its potentially serious complications, including stroke.

Economic Analyses

Economic modeling demonstrated that COVID-19 vaccines are most cost-effective in adults aged ≥65 years, who experience the highest rates of severe COVID-19 (*8*). The base case incremental cost-effectiveness ratio (ICER) in this age group was $23,308 per quality adjusted life year (QALY) and was robust to parameter input assumptions. ICERs were $113,248 per QALY for adults aged 50–64 years and $212,225 per QALY for adults aged 18–49 years and were sensitive to input assumptions. ICERs were $202,621 in adolescents aged 12–17 years and $200,445 in children aged 5–11 years, and were highly sensitive to input assumptions (i.e., more uncertain). ICERs in persons aged <65 years were more favorable when input assumptions were varied to consider higher vaccine impact, higher risk for COVID-19–associated hospitalization, higher quality of life impact for symptomatic illness, and lower vaccine cost.

Recommendations for 2024–2025 COVID-19 Vaccination

On June 27, 2024, ACIP recommended 2024–2025 COVID-19 vaccination with an FDA-approved or authorized vaccine for all persons aged ≥6 months.*** This recommendation includes FDA-licensed or authorized Omicron JN.1 lineage (JN.1 and KP.2) monovalent COVID-19 vaccines (i.e., Moderna and Pfizer-BioNTech [KP.2 strain] or Novavax [JN.1 strain] 2024–2025 COVID-19 vaccines), consistent with FDA-licensed indications or EUA. Because the 2024–2025 Novavax COVID-19 vaccines for persons aged ≥12 years and all 2024–2025 COVID-19 vaccines for children aged 6 months–11 years are authorized under EUA, recommendations for 2024–2025 Novavax vaccine and all 2024–2025 COVID-19 vaccines in children aged 6 months–11 years are interim recommendations.

Recommendations for Persons Without Moderate or Severe Immunocompromise

Persons aged 5–11 years without moderate to severe immunocompromise need 1 dose of 2024–2025 COVID-19 vaccine (Moderna or Pfizer-BioNTech) to be up to date. Persons aged ≥12 years without moderate to severe immunocompromise need 1 dose of 2024–2025 COVID-19 vaccine (Moderna, Novavax, or Pfizer-BioNTech) to be up to date (Table 1). Persons aged ≥12 years who have not previously received any COVID-19 vaccines and choose to get Novavax should receive 2 doses of the 2024–2025 Novavax vaccine. Children aged 6 months–4 years are recommended to receive an initial multidose vaccination series when they first receive COVID-19 vaccination and thus need more than 1 COVID-19 vaccine dose, including at least 1 dose of the 2024–2025 COVID-19 vaccine, to be up to date (Table 2).

Recommendations for Persons Who Are Moderately or Severely Immunocompromised

Persons aged ≥6 months who are moderately or severely immunocompromised should receive at least 1 dose of 2024–2025 COVID-19 vaccine. Depending on vaccination history, additional doses may be recommended. Unvaccinated persons aged 6 months–11 years who are moderately or severely immunocompromised are recommended to receive an initial 3-dose vaccination series of a 2024–2025 mRNA COVID-19 vaccine, with all doses from the same manufacturer. Unvaccinated persons aged ≥12 years who are moderately or severely immunocompromised should complete an initial vaccination series with either 3 doses of a 2024–2025 mRNA COVID-19 vaccine from the same manufacturer or 2 doses of 2024–2025 Novavax COVID-19 vaccine.

*** ACIP voted (11 to zero with one abstention) to recommend vaccination with 2024–2025 COVID-19 vaccines as authorized or approved for persons aged ≥6 months.

TABLE 1. Recommended 2024–2025 COVID-19 vaccination schedule for persons aged ≥5 years who are not moderately or severely immunocompromised,* by previous COVID-19 vaccination history — United States, September 2024

Previous COVID-19 vaccination history†,§	2024–2025 COVID-19 vaccine	No. of 2024–2025 doses indicated	Interval between doses
Unvaccinated	Moderna	1	NA
	or Pfizer-BioNTech	1	NA
	or Novavax (aged ≥12 yrs only)	2	3–8 wks between dose 1 and dose 2
Previously received ≥1 COVID-19 vaccine dose¶	Moderna	1	≥8 wks after last dose
	or Pfizer-BioNTech	1	≥8 wks after last dose
	or Novavax (aged ≥12 yrs only)	1	≥8 wks after last dose

Abbreviation: NA = not applicable.
* Additional clinical considerations, including detailed schedules and tables by age and vaccination history for those who are and are not moderately or severely immunocompromised, are available at https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html.
† Before 2024–2025 vaccine.
§ https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#not-immunocompromised
¶ Including at least 1 dose Moderna, Pfizer-BioNTech, Janssen (Johnson & Johnson) (aged ≥18 years only) COVID-19 vaccines, or at least 2 doses of Novavax COVID-19 vaccine (aged ≥12 years). Persons who received only 1 dose of Novavax (aged ≥12 years) COVID-19 vaccine should receive dose 2 of Novavax 3–8 weeks after dose 1, or if more than 8 weeks have elapsed since receipt of dose 1 of Novavax, any 2024–2025 COVID-19 vaccine (i.e., Moderna, Novavax, or Pfizer-BioNTech) may be administered.

TABLE 2. Recommended COVID-19 vaccination schedule for children aged 6 months–4 years who are not moderately or severely immunocompromised,* by previous COVID-19 vaccination history — United States, September 2024

Previous COVID-19 vaccination history†,§	2024–2025 COVID-19 vaccine	No. of 2024–2025 doses indicated	Interval between doses
Unvaccinated	Moderna	2	4–8 wks between dose 1 and dose 2
	or Pfizer-BioNTech	3	3–8 wks between dose 1 and dose 2 ≥8 wks between dose 2 and dose 3
Previously received Moderna vaccine			
1 dose any Moderna	Moderna	1	4–8 wks after dose 1
≥2 doses any Moderna	Moderna	1	≥8 wks after last dose
Previously received Pfizer-BioNTech vaccine			
1 dose any Pfizer-BioNTech	Pfizer-BioNTech	2	3–8 wks between dose 1 and dose 2 ≥8 wks between dose 2 and dose 3
2 doses any Pfizer-BioNTech	Pfizer-BioNTech	1	≥8 wks after dose 2
≥3 doses any Pfizer-BioNTech	Pfizer-BioNTech	1	≥8 wks after last dose

* Additional clinical considerations, including detailed schedules and tables by age and vaccination history for those who are and are not moderately or severely immunocompromised, are available at https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html.
† Before 2024–2025 mRNA vaccine.
§ https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#not-immunocompromised

Persons who are moderately or severely immunocompromised, have completed an initial series, and have received at least 1 dose of a 2024–2025 COVID-19 vaccine, may receive 1 additional age-appropriate dose of 2024–2025 COVID-19 vaccine at least 2 months after the last recommended 2024–2025 vaccine dose. Further additional doses may be administered, guided by the clinical judgment of a health care provider and personal preference and circumstances. Any further additional doses should be administered at least 2 months after the last 2024–2025 COVID-19 vaccine dose. Additional clinical considerations, including detailed schedules and tables by age and vaccination history for persons who are and are not moderately or severely immunocompromised, are available at https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html.

Implementation Considerations

Since 2023, COVID-19 vaccines have been distributed in the commercial marketplace. The Affordable Care Act requires insurers to cover all ACIP routinely recommended vaccines without cost-sharing by the next coverage year after recommendations are made.††† Section 3203 of the Coronavirus Aid, Relief, and Economic Security Act expedites coverage of COVID-19 vaccines beyond that which is required for most preventive services. COVID-19 vaccines are also covered under Medicare part B and for nearly all Medicaid beneficiaries without cost-sharing. COVID-19 vaccines are included in the Vaccines for Children Program,§§§ which provides vaccines to approximately one half of U.S. persons aged <19 years at no cost. CDC's Bridge Access Program¶¶¶ provided free

††† https://www.law.cornell.edu/uscode/text/42/300gg-13
§§§ https://www.cdc.gov/vaccines-for-children/about/index.html
¶¶¶ https://archive.cdc.gov/#/details?url=https://www.cdc.gov/vaccines/programs/bridge/index.html

2023–2024 COVID-19 vaccines to adults without health insurance and adults whose insurance did not cover all COVID-19 vaccine costs. However, the Bridge Access Program ended in August 2024 and will not be available to cover the 2024–2025 COVID-19 vaccine. Before vaccination, providers should provide the EUA Fact Sheet (*3*), manufacturer's package insert, or Vaccine Information Statement regarding the vaccine being administered and counsel vaccine recipients about expected systemic and local adverse reactions (reactogenicity).

Reporting of Adverse Events

Adverse events after vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS). For licensed COVID-19 vaccines administered to persons aged ≥12 years, reporting is encouraged for any clinically significant adverse event, even when a causal association between the vaccine and the event is uncertain, as well as for vaccination errors. For COVID-19 vaccines given under Emergency Use Authorization,**** vaccination providers are required to report certain adverse events to VAERS. Additional information is available at https://vaers.hhs.gov or by telephone at 1-800-822-7967.

**** 2024–2025 COVID-19 vaccines that are under FDA EUA are Moderna and Pfizer-BioNTech for use among children aged 6 months–11 years, and Novavax for use among persons aged ≥12 years.

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Notes from the Field

Support for Wastewater Monitoring and Influence on Protective Behavioral Intentions Among Adults — United States, July 2024

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In 2020, during the COVID-19 pandemic, CDC established the National Wastewater Surveillance System and later expanded it to include mpox and influenza A data dashboards.† Wastewater utility partners have cited community health benefits as a motivating factor for participating in wastewater surveillance; a lack of public support for wastewater surveillance activities might lead utility partners to cease participation (*1*,*2*). However, little is known about public support for wastewater monitoring and its influence on protective health behaviors. As innovative surveillance strategies such as wastewater surveillance evolve, ethical considerations, including understanding public perceptions regarding support for these activities and potential risks to communities, are essential (*3*).

Investigation and Outcomes

During July 24–26, 2024, Porter Novelli Public Services§ conducted a nationwide nine-question survey in English, developed with input from CDC, among U.S. adults regarding support for wastewater monitoring of infectious diseases and protective health behavior intentions, to guide public messaging about wastewater surveillance. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¶ Nonprobability quota sampling was used to select 1,016 respondents. The sample was weighted by gender, age, region, race and ethnicity, and education to match the U.S. population composition using Current Population Survey proportions.**

Data from this survey were analyzed for 1) overall support for wastewater monitoring of infectious diseases, 2) support for access to wastewater data regardless of known interpretation of risk to the public, 3) protective health behaviors respondents would take if wastewater data indicated that a virus such as influenza were spreading in their area, and 4) differences in support and protective behavioral intentions by sociodemographic factors. Responses were analyzed by respondent characteristics. Statistical significance was determined at $\alpha = 0.05$ using Pearson chi-square tests corrected for survey design. Analyses were conducted using Stata (version 17.0, StataCorp).

Overall Support for Wastewater Surveillance for Infectious Diseases

Four survey items on support for wastewater monitoring of specific types of pathogens with a Cronbach's α of 0.91 were averaged into a single measure of overall support. Almost three quarters of respondents (74.6%) strongly or somewhat supported public health department monitoring of wastewater for infectious diseases (Table). Support for wastewater monitoring was similar among persons of different races and ethnicities ($p>0.9$) but differed significantly by age, education, and marital status.

Support for Data Availability Regardless of Known Public Health Risk or Protective Behaviors

Respondents strongly or somewhat agreed (57.8%) that they wanted access to rapid wastewater data, even if information to determine public health risk or specific protective actions is insufficient (Table). The percentages of persons who indicated that they would like to see rapid wastewater data were higher among non-Hispanic Black or African American persons (67.5%), Hispanic or Latino (Hispanic) persons (64.2%), and non-Hispanic persons from other racial groups (65.5%) than among non-Hispanic White persons (52.9%) (overall $p<0.01$). Those most supportive of rapid access to wastewater data included men ($p<0.05$), persons who were employed ($p<0.001$), and residents of urban or suburban communities ($p<0.05$).

Intention for Data-Informed Protective Behaviors

Almost all respondents (95.3%) would consider at least one protective health behavior if wastewater data indicated a virus such as influenza in their area. Behaviors most likely to be considered included more frequent handwashing (76.1%), avoiding large gatherings (61.1%), and avoiding visiting persons at higher risk for infection-related complications (59.1%) (Supplementary Table, https://stacks.cdc.gov/view/cdc/162074).

Preliminary Conclusions and Actions

The findings in this report are subject to at least five limitations. First, because this survey used an Internet panel, persons with limited Internet access or technological proficiency might

* These authors contributed equally to this report.
† www.cdc.gov/wastewater/
§ https://www.porternovelli.com/
¶ 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.
** https://www.census.gov/programs-surveys/cps.html

TABLE. Levels of support for wastewater monitoring and behavioral intentions among adults — Porter Novelli View survey, United States, July 2024*

Characteristic	No. (%)§	Weighted row %									
		Level of support for public health departments monitoring wastewater for infectious diseases†				Would like access to wastewater data even when there is not enough information to determine public health risk or protective behaviors				Would use one or more protective behavior if wastewater data showed that a virus such as influenza were spreading in area	
		Strongly or somewhat support	Neutral	Strongly or somewhat oppose	p-value¶	Strongly or somewhat agree	Neutral	Strongly or somewhat disagree	p-value¶	Yes	p-value¶
Total	**1,016 (100.0)**	**74.6**	**17.9**	**7.5**	—	**57.8**	**26.4**	**15.8**	—	**95.3**	—
Gender identity											
Female	506 (50.9)	76.0	16.8	7.2	0.18	53.5	28.8	17.8	0.04	96.0	0.40
Male	500 (48.6)	73.5	18.7	7.8		62.3	23.9	13.8		94.6	
Other	10 (0.5)	47.7	52.3	0.0		58.4	33.6	8.1		100.0	
Race and ethnicity**											
Black or African American	118 (12.1)	71.4	19.0	9.6	0.93	67.5	21.4	11.1	0.01	96.8	0.07
White	640 (61.3)	75.7	17.5	6.8		52.9	28.0	19.1		93.9	
Hispanic or Latino	143 (17.5)	72.5	19.2	8.3		64.2	26.1	9.7		97.9	
Other race††	115 (9.1)	75.4	16.8	7.8		65.5	23.0	11.6		98.2	
Age group, yrs											
18–29	220 (19.8)	62.0	24.8	13.2	<0.001	61.9	25.0	13.2	0.32	96.2	0.75
30–39	197 (18.4)	70.6	20.5	9.0		61.2	27.4	11.4		95.9	
40–49	154 (15.0)	78.8	15.4	5.8		61.2	23.1	15.7		96.5	
50–64	246 (24.4)	77.9	16.5	5.6		55.0	26.4	18.7		94.4	
≥65	199 (22.4)	82.8	12.9	4.3		52.2	29.2	18.7		94.3	
Employment status											
Employed	586 (54.1)	73.8	18.6	7.5	0.80	65.1	21.9	13.0	<0.001	97.5	<0.001
Not employed	430 (45.9)	75.5	17.0	7.4		49.2	31.7	19.1		92.8	
Education											
High school or less	327 (38.9)	71.3	19.3	9.4	0.05	59.7	25.9	14.4	0.67	94.5	0.30
Some college	264 (24.7)	71.0	21.2	7.7		55.9	28.5	15.6		94.5	
Bachelor's degree	251 (22.1)	80.9	14.5	4.6		57.2	27.3	15.5		97.5	
Any postgraduate education	174 (14.3)	80.3	13.6	6.2		56.8	22.8	20.4		95.7	
Marital status											
Currently married or in a union	529 (50.1)	78.1	16.1	5.8	0.03	55.7	27.3	17.0	0.53	95.9	0.66
Divorced, widowed, or separated	182 (19.9)	71.7	22.0	6.3		56.7	28.2	15.1		94.5	
Never married	305 (30.0)	70.7	18.2	11.1		62.0	23.7	14.3		94.9	
Community type											
Rural	218 (22.3)	71.5	23.1	5.4	0.08	51.0	27.4	21.6	0.04	94.5	0.71
Suburban	508 (48.9)	76.6	16.5	6.9		58.0	26.2	15.7		95.3	
Urban	290 (28.8)	73.6	16.3	10.0		62.6	25.9	11.5		96.1	

* Survey was administered in English online during July 24–26, 2024.
† Levels of support for wastewater monitoring were similar across four separate pathogen categories (Cronbach's α = 0.91); therefore, categories were averaged into a single measure of overall support.
§ Unweighted counts and weighted column percentages.
¶ Statistical significance of differences in responses was determined at α = 0.05 using Pearson chi-square tests corrected for survey design.
** Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial group tabulation is limited to those persons reporting being non-Hispanic.
†† Includes American Indian or Alaska Native, Asian or Asian-American, Middle Eastern or North African, and Native Hawaiian or Pacific Islander persons, and persons identifying as more than one race.

not have been able to participate. Second, public awareness of wastewater surveillance might vary geographically, and participation might have been higher among persons with higher levels of awareness than the average U.S. resident. Third, responses might be subject to social desirability bias, or the tendency of respondents to report what they believe is desirable, rather than their true opinions or behaviors (*4*). Fourth, this survey was intended to gauge public support for wastewater monitoring of infectious diseases; public support for other uses of wastewater monitoring might differ from what is reported here. Finally, because the survey was administered in English only, these data do not include the perceptions of persons with limited English proficiency.

These findings indicate strong support for wastewater monitoring for infectious diseases among U.S. adults across various sociodemographic groups and intention to use reported wastewater data to guide certain health-related behaviors. In addition, most respondents indicated that they wanted access to rapid wastewater data even if information available to determine public health risk or which actions should be taken is insufficient. Wastewater data can help keep the public informed and should be accompanied by clear public health interpretations.

Summary

What is already known about this topic?

Wastewater monitoring has expanded since 2020, providing data for several infectious diseases.

What is added by this report?

In a survey of public support, U.S. adult residents (74.6%) strongly or somewhat support wastewater monitoring, with nearly all (95.3%) stating they would take steps to protect themselves if wastewater monitoring data indicated disease transmission in their area.

What are the implications for public health practice?

Making infectious disease wastewater data readily available helps keep the public informed and can facilitate early adoption of protective health behaviors. Presentation of these data should be accompanied by clear public health interpretations.

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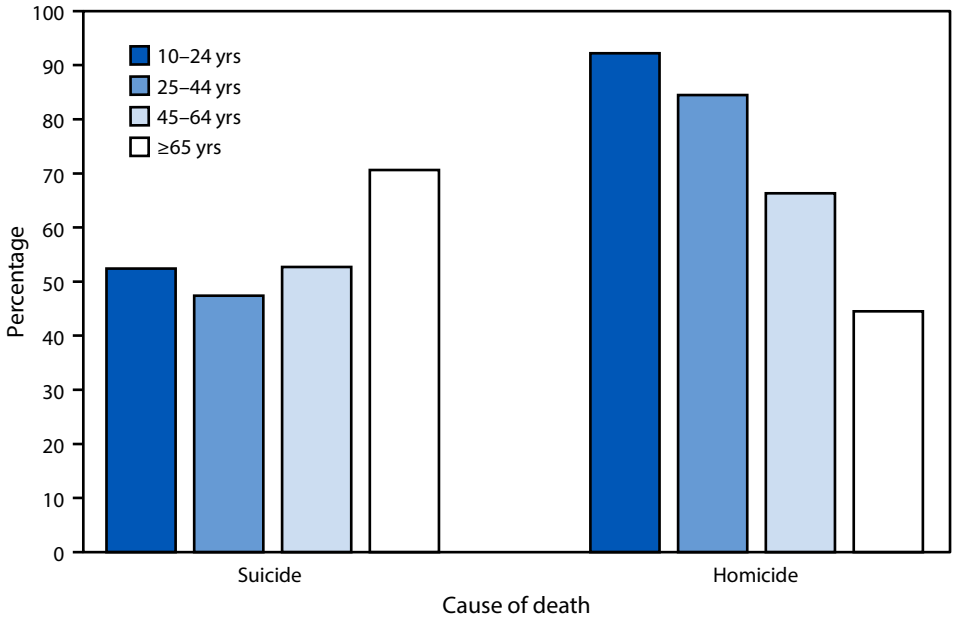
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Suicides* and Homicides† Involving a Firearm Among Persons Aged ≥10 Years, by Age Group — United States, 2022



Abbreviation: ICD-10 = *International Classification of Diseases, Tenth Revision*.

* Suicide was identified using ICD-10 underlying cause-of-death codes U03, X60–X84, and Y87.0. Firearm-involved suicide was identified using ICD-10 underlying cause-of-death codes X72–X74.

† Homicide was identified using ICD-10 underlying cause-of-death codes U01–U02, X85–Y09, and Y87.1. Firearm-involved homicide was identified using ICD-10 underlying cause-of-death codes U01.4 and X93–X95.

In 2022, among persons aged ≥10 years, the percentage of suicide deaths involving a firearm was lowest among persons aged 25–44 years (47.4%) and highest among persons aged ≥65 years (70.6%). The percentage of homicide deaths that involved a firearm was highest among persons aged 10–24 years and then decreased with age, from 92.2% among those aged 10–24 years to 44.5% among those aged ≥65 years.

Supplementary Table: https://stacks.cdc.gov/view/cdc/160513

Source: National Center for Health Statistics, National Vital Statistics System, Mortality Data, 2022. https://www.cdc.gov/nchs/nvss/deaths.htm

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For more information on this topic, CDC recommends the following links: https://www.cdc.gov/suicide and https://www.cdc.gov/firearm-violence/about/index.html.

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