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Malignant Mesothelioma Mortality in Women — United States, 1999–2020

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Inhalation of asbestos fibers can cause malignant mesothelioma, a rapidly progressing and lethal cancer of the mesothelium, the thin layer of tissues surrounding internal organs in the chest and abdomen. Patients with malignant mesothelioma have a poor prognosis, with a median survival of 1 year from diagnosis. The estimated median interval from initial occupational asbestos exposure to death is 32 years (range = 13–70 years) (*1*). Occupational asbestos exposure is most often reported in men working in industries such as construction and manufacturing; however, women are also at risk for exposure to asbestos fibers, and limited data exist on longer-term trends in mesothelioma deaths among women. To characterize deaths associated with mesothelioma and temporal trends in mesothelioma mortality among women in the United States, CDC analyzed annual Multiple Cause of Death records from the National Vital Statistics System for 1999–2020, the most recent years for which complete data are available. The annual number of mesothelioma deaths among women increased significantly, from 489 in 1999 to 614 in 2020; however, the age-adjusted death rate per 1 million women declined significantly, from 4.83 in 1999 to 4.15 in 2020. The largest number of deaths was associated with the health care and social assistance industry (89; 15.7%) and homemaker occupation (129; 22.8%). Efforts to limit exposure to asbestos fibers, including among women, need to be maintained.

Malignant mesothelioma deaths were identified for 1999–2020 and included any death certificates for which an *International Classification of Diseases, Tenth Revision* (ICD-10) code for malignant mesothelioma was listed in the CDC WONDER Multiple Cause of Death mortality data.* Given the predominantly occupational etiology and long latency of mesothelioma, analysis was limited to deaths of women aged ≥25 years. The annual death rate (per 1 million women) was age-adjusted to the 2000 U.S. standard population. Age-adjusted death rates were mapped by state using geographic information system software (MapInfo Pro v2019.3; Precisely). Joinpoint Regression Program[†] software (version 4.9.0.0.; National Cancer Institute) was used to evaluate time trends in deaths and log-transformed age-adjusted rates. Standard information about the usual industry and occupation[§] was identified in the 2020 NCHS Mortality Multiple

* ICD-10 codes C45.0 (mesothelioma of pleura), C45.1 (mesothelioma of peritoneum), C45.2 (mesothelioma of pericardium), C45.7 (mesothelioma of other sites), and C45.9 (mesothelioma, unspecified). https://wonder.cdc.gov/mcd.html

† https://surveillance.cancer.gov/joinpoint/

§ Starting with the 2020 data year, CDC's National Center for Health Statistics (NCHS) and the National Institute for Occupational Safety and Health (NIOSH) began a collaboration to translate industry and occupation information (submitted by 46 states and New York City [Arizona, North Carolina, Rhode Island, and District of Columbia did not participate in this program for 2020] to NCHS as part of their death certificate data) to U.S. Census Bureau Industry and Occupation codes. As part of this program, Census codes and industry and occupation groupings for 2020 usual occupation information was available and coded for 3,077,127 (91.7% of 3,354,879 records eligible for coding) decedents aged ≥15 years from 46 states and New York City (data collected from Iowa were inconsistent with other states' data and were excluded). Usual occupation is the occupation the person did for "most of his or her working life." https://www.cdc.gov/nchs/data/dvs/Industry-and-Occupation-data-mortality-2020.pdf

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Cause of Death file for decedents in 46 states and New York City.¶ Occupations classified according to the four-digit 2012 U.S. Census Bureau coding system and the two-digit simple industry recode based on the 2012 North American Industry Classification System** were examined using SAS software (version 9.4; SAS Institute).

During 1999–2020, 12,227 (age-adjusted death rate: 4.59 per 1 million women) malignant mesothelioma deaths occurred among women aged ≥25 years in the United States; 11,093 (90.7%) occurred among women aged ≥55 years, 11,447 (93.6%) occurred among White women, and 11,561 (94.6%) among non-Hispanic women (Table 1); 11,499 (94.0%) had malignant mesothelioma listed as the underlying cause of death. Mesothelioma deaths were classified as mesothelioma of pleura (968; 7.9%), peritoneum (1,119; 9.2%), pericardium (35; 0.3%), other sites (1,385; 11.3%), and unspecified location (8,842; 72.3%). The annual number of malignant mesothelioma deaths increased 25%, from 489 in 1999 to 614 in 2020 (p<0.001), and the annual age-adjusted death rate declined from 4.83 per 1 million women in 1999 to 4.15 in 2020 (p = 0.038). During 1999–2020, the annualized state mesothelioma age-adjusted death rate exceeded 6.0 per 1 million women in seven states: Louisiana, Maine, Minnesota, Montana, Oregon, Washington, and Wisconsin (Figure).

Industry and occupation information was available for 567 (92.3%) of 614 malignant mesothelioma deaths among residents of 47 jurisdictions that occurred in women aged ≥25 years during 2020 (Table 2). Among 21 industry groups, the three with the most deaths were health care and social assistance (89; 15.7%); education services (64; 11.3%); and manufacturing (50; 8.8%). One hundred thirty-two occupations were reported on death certificates for malignant mesothelioma decedents among women during 2020. The three occupations with the highest numbers of mesothelioma deaths were homemakers (129; 22.8%); elementary and middle school teachers (32; 5.6%); and registered nurses (28; 4.9%).

Discussion

Asbestos has been used in a variety of construction and manufacturing applications beginning in the 1930s. The annual use of asbestos in the United States peaked at 803,000 metric tons in 1973 and declined to approximately 320 metric tons in 2021 (*2*). Asbestos-related respiratory diseases and cancers are well recognized, and asbestos use is regulated by the Occupational

¶ https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm#Mortality_Multiple

** The 2012 U.S. Census Bureau coding scheme was used to code industry and occupation narratives to individual four-digit census occupation and industry codes (https://www.census.gov/topics/employment/industry-occupation/guidance/code-lists.html) (referred to as 2010 Census Occupation Codes and 2012 Census Industry Codes). NCHS and NIOSH supplement the 2012 Census coding scheme with additional industry and occupation codes for decedents who were not in the civilian workforce, including "housewife/homemaker" which were also used in this report. The industry grouping is the two-digit simple industry recode based on the 2012 North American Industry Classification System–informed codes obtained from the U.S. Census Bureau.

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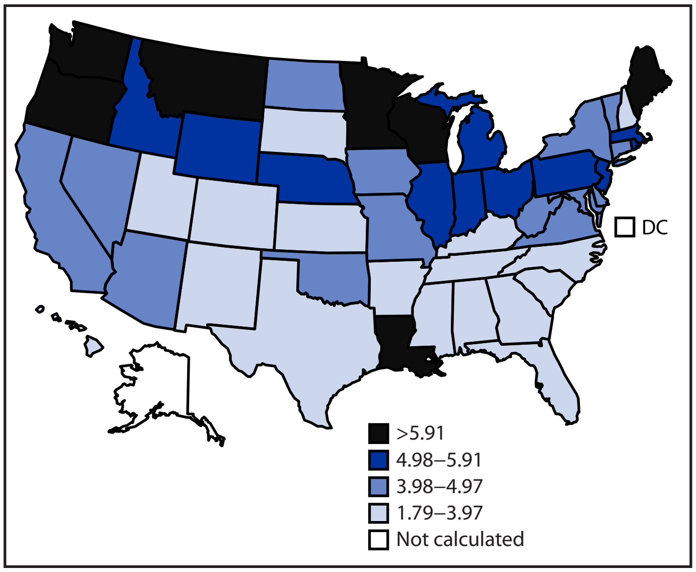
TABLE 1. Number and rate of malignant mesothelioma deaths among women aged ≥25 years,* by selected characteristics and year — United States, 1999–2020

Characteristic	No. of deaths (%)	Death rate† (95% CI)§
Total	**12,227 (100)**	**4.59 (4.50–4.67)**
Age group, yrs¶		
25–34	71 (0.6)	0.16 (0.12–0.20)
35–44	282 (2.3)	0.60 (0.53–0.67)
45–54	781 (6.4)	1.66 (1.54–1.77)
55–64	1,857 (15.2)	4.68 (4.47–4.89)
65–74	3,203 (26.2)	11.69 (11.29–12.10)
75–84	4,018 (32.9)	23.17 (22.45–23.88)
≥85	2,015 (16.5)	25.10 (24.00–26.20)
Race		
White	11,447 (93.6)	5.03 (4.93–4.93)
Black	550 (4.5)	2.02 (1.85–2.19)
Asian or Pacific Islander	179 (1.5)	1.58 (1.34–1.82)
American Indian or Alaska Native	51 (0.4)	2.82 (2.07–3.75)
Ethnicity		
Hispanic or Latino	643 (5.3)	2.98 (2.75–3.22)
Non-Hispanic or Latino	11,561 (94.6)	4.69 (4.60–4.77)
Unknown	23 (0.2)	NA
Anatomic site**		
Pleura	968 (7.9)	0.35 (0.33–0.37)
Peritoneum	1,119 (9.2)	0.42 (0.39–0.44)
Pericardium	35 (0.3)	0 (—)
Other	1,385 (11.3)	0.52 (0.49–0.55)
Unspecified	8,842 (72.3)	3.29 (3.22–3.36)
Year		
1999	489 (4.0)	4.83 (4.40–5.26)
2000	487 (4.0)	4.77 (4.34–5.19)
2001	486 (4.0)	4.66 (4.24–5.07)
2002	444 (3.6)	4.17 (3.78–4.56)
2003	499 (4.1)	4.64 (4.23–5.05)
2004	516 (4.2)	4.77 (4.35–5.18)
2005	556 (4.5)	4.99 (4.58–5.41)
2006	503 (4.1)	4.49 (4.10–4.89)
2007	531 (4.3)	4.67 (4.27–5.07)
2008	557 (4.6)	4.79 (4.39–5.19)
2009	559 (4.6)	4.66 (4.27–5.05)
2010	562 (4.6)	4.72 (4.33–5.12)
2011	543 (4.4)	4.40 (4.03–4.78)
2012	615 (5.0)	4.92 (4.52–5.31)
2013	621 (5.1)	4.89 (4.50–5.27)
2014	610 (5.0)	4.67 (4.29–5.05)
2015	550 (4.5)	4.12 (3.77–4.47)
2016	569 (4.7)	4.16 (3.81–4.50)
2017	672 (5.5)	4.85 (4.47–5.22)
2018	603 (4.9)	4.20 (3.86–4.54)
2019	641 (5.2)	4.36 (4.02–4.70)
2020	614 (5.0)	4.15 (3.81–4.48)
p-value for trend	<0.001	0.038

Source: CDC WONDER Multiple Cause of Death data. https://wonder.cdc.gov/mcd.html
Abbreviation: NA = not applicable.
* *International Classification of Diseases, Tenth Revision* codes C45.0 (mesothelioma of pleura), C45.1 (mesothelioma of peritoneum), C45.2 (mesothelioma of pericardium), C45.7 (mesothelioma of other sites), or C45.9 (mesothelioma, unspecified).
† Age-adjusted deaths per 1 million women using 2000 U.S. standard population.
§ https://wonder.cdc.gov/wonder/help/mcd.html#Confidence-Intervals
¶ Age-specific deaths per 1 million women using 2000 U.S. standard population.
** The sum of individual site death totals exceeds the total number of deaths for any site because some decedents have more than one site of mesothelioma listed on their death certificates.

FIGURE. Malignant mesothelioma* annualized age-adjusted death rate† per 1 million women aged ≥25 years — United States, 1999–2020.



Source: CDC WONDER Multiple Cause of Death data. https://wonder.cdc.gov/mcd.html
Abbreviation: DC = District of Columbia.
* *International Classification of Diseases, Tenth Revision* codes C45.0 (mesothelioma of pleura), C45.1 (mesothelioma of peritoneum), C45.2 (mesothelioma of pericardium), C45.7 (mesothelioma of other sites), and C45.9 (mesothelioma, unspecified).
† Adjusted using 2000 U.S. standard population. Age-adjusted death rates were not calculated for states with ≤20 malignant mesothelioma deaths (Alaska and DC).

Safety and Health Administration (*3*) and the Environmental Protection Agency (*4*). Despite the sharp decline in asbestos use, the findings in this report indicate that mesothelioma deaths among women continue to increase. Increases in total number, but not age-adjusted death rates, suggest that changes in underlying annual age distributions of the population over time are contributing to the observed increases in total mesothelioma deaths in women (*5*). Also, the observed increasing trend in the number of mesothelioma cases among women is consistent with a projection based on 1973–2005 Surveillance, Epidemiology, and End Results data (representing 10% of the U.S. population) that the number of mesothelioma cases among women would increase over time (*5*).

Among men, an estimated 85% of mesotheliomas were attributable to work-related asbestos exposure. Among women, the overall attributable risk was estimated at approximately 23% (*6*). Although occupational asbestos exposure is most often recognized among men working in shipbuilding, construction, manufacturing, and other industrial settings where women are less likely to be employed, exposure can also occur in other work settings as a consequence of disturbance of previously installed friable asbestos-containing materials during maintenance or renovation, or the resuspension of settled fibers in the air caused by dusting, sweeping, or cleaning (*7*).

TABLE 2. Usual industry and occupations* within industries associated with ≥5 malignant mesothelioma† deaths among women aged ≥25 years — United States,§ 2020

Industry/Occupation	No. of deaths (%)
Health care and social assistance	89 (15.7)
Registered nurses	28 (4.9)
Nursing, psychiatric, and home health aides	11 (1.9)
Personal care aides	6 (1.1)
Education service	64 (11.3)
Elementary and middle school teachers	32 (5.6)
Teacher assistants	5 (0.9)
Manufacturing	50 (8.8)
Secretaries and administrative assistants	7 (1.2)
Production workers, all other	6 (1.1)
Retail trade	37 (6.5)
Retail salespersons	10 (1.8)
First-line supervisors of retail sales workers	9 (1.6)
Cashiers	5 (0.9)
Public administration	27 (4.8)
Secretaries and administrative assistants	6 (1.1)
Finance and insurance	24 (4.2)
Professional, scientific, and technical services	24 (4.2)
Accommodation and food services	23 (4.1)
Food service managers	5 (0.9)
Waiters and waitresses	5 (0.9)
Other services (except public administration)	23 (4.1)
Hairdressers, hairstylists, and cosmetologists	7 (1.2)
Transportation and warehousing	13 (2.3)
Real estate and rental and leasing	8 (1.4)
Real estate brokers and sales agents	6 (1.1)
Administrative, support, and waste services	8 (1.4)
Information	7 (1.2)
Agriculture, forestry, fishing, and hunting	6 (1.1)
Construction	6 (1.1)
Arts, entertainment, and recreation	5 (0.9)
Other¶/Missing	153 (27.0)
Homemaker	129 (22.8)

Source: NCHS Mortality Multiple Cause Files 2020. https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm#Mortality_Multiple

Abbreviation: NCHS = National Center for Health Statistics.

* U.S. Census Bureau Industry and Occupation 2012 coding scheme. The industry grouping is the two-digit simple industry recode based on the 2012 North American Industry Classification System–informed codes obtained from the U.S. Census Bureau. Usual occupation is the occupation the person did for "most of his or her working life." https://www.cdc.gov/nchs/data/dvs/Industry-and-Occupation-data-mortality-2020.pdf

† *International Classification of Diseases, Tenth Revision* codes C45.0 (mesothelioma of pleura), C45.1 (mesothelioma of peritoneum), C45.2 (mesothelioma of pericardium), C45.7 (mesothelioma of other sites), or C45.9 (mesothelioma, unspecified). https://wonder.cdc.gov

§ Starting with the 2020 data year, NCHS and the National Institute for Occupational Safety and Health began a collaboration to translate industry and occupation information, submitted by 46 states and New York City (Arizona, North Carolina, Rhode Island, and District of Columbia did not participate in this program for 2020) to NCHS as part of their death certificate data, to U.S. Census Bureau Industry and Occupation codes (data collected from Iowa were inconsistent with other states' data and were excluded). https://www.cdc.gov/nchs/data/dvs/Industry-and-Occupation-data-mortality-2020.pdf

¶ Includes mining, utilities, wholesale trade, and management of companies and enterprises.

Summary

What is already known about this topic?

Inhalation of asbestos fibers causes malignant mesothelioma. Although occupational asbestos exposure is most often recognized in men working in industries such as construction and manufacturing, women are also at risk for exposure.

What is added by this report?

The annual number of deaths with mesothelioma among women significantly increased, from 489 (age-adjusted death rate = 4.8 per 1 million women) in 1999 to 614 (4.2) in 2020. The largest number of deaths in 2020 was associated with the health care and social assistance industry (89; 15.7%) and homemaker occupation (129; 22.8%).

What are the implications for public health practice?

Efforts to limit exposure to asbestos fibers, including among women, need to be maintained.

Exposures can also occur in work and nonwork settings through pathways, including potential environmental exposure to naturally occurring asbestos (*8*), indoors when older building materials containing asbestos are present, or from take-home exposures by indirect contact via family members who were exposed to asbestos fibers at workplaces outside of the home. In one study, the relative risk for mesothelioma among women with a husband or father working in an asbestos-related industry increased 10-fold (*9*). The geographic distribution of the highest mesothelioma death rates among women in states with a shipyard industry (e.g., Louisiana, Maine, Minnesota, Oregon, Washington, and Wisconsin) or past asbestos exposure associated with mining and processing vermiculite contaminated with asbestos (e.g., Montana) suggests that take-home asbestos exposure might affect disease development. Higher mesothelioma death rates in northern states might reflect greater use of asbestos in older building stock in that region.

The findings in this report are subject to at least six limitations. First, no information on exposure to asbestos or specific tasks performed at work are available on death certificates. Second, industry and occupation codes for deaths in 2020 were not compatible with coded information for previous years and resulted in a small number of observations in certain industries and occupations. Third, complete lists of all industries and occupations worked during life and information about family members' work were not available. Fourth, the state issuing the death certificate might not always be the state in which decedent's exposures occurred. Fifth, incomplete information on mesothelioma anatomic location on death certificates resulted in approximately 75% of all mesothelioma deaths classified as unspecified for anatomic location (i.e., ICD-10 code C45.9). Data from tumor registries indicate that approximately 74% of mesotheliomas among women arise from pleura (*10*). Using this proportion, approximately 9,050 mesothelioma of pleura deaths (411 per year) for 1999–2020 could be expected. Finally, mesothelioma cases with no histopathological evaluation might have been reported on death certificates as unspecified cancer and assigned less specific codes (e.g., ICD-10 code C76, malignant neoplasm of other and ill-defined sites) and therefore not captured in this analysis.

Efforts to limit exposure to asbestos fibers, including among women, need to be maintained. Although asbestos is no longer mined in the United States, as of early 2022 it is still imported and used (*2,4*). Moreover, in addition to contemporary cases arising from past exposures, cases associated with future occupational and environmental exposures might occur if activities such as remediation and demolition of older buildings and equipment are done with inadequate asbestos controls to protect workers and the surrounding community (*3*). Ensuring future decreases in mortality because of malignant mesothelioma will require meticulous control of exposures in activities such as ship and building renovation and demolition, and in asbestos remediation and disposal. Limiting exposure in workplaces outside of the home will help decrease take-home exposures and reduce family exposure. Clinicians should maintain a high index of suspicion for diseases caused by exposure to asbestos fibers when evaluating workers at risk for occupational exposure or their family members. The continuing risk for potential exposure to asbestos fibers underscores the need for ongoing surveillance to monitor temporal trends in malignant mesothelioma mortality; capturing information on industry and occupation for mortality data can help to provide meaningful interpretation of these trends.

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Progress Toward Polio Eradication — Worldwide, January 2020–April 2022

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In 1988, the World Health Assembly established the Global Polio Eradication Initiative (GPEI). Since then, wild poliovirus (WPV) cases have decreased approximately 99.99%, and WPV types 2 and 3 have been declared eradicated. Only Afghanistan and Pakistan have never interrupted WPV type 1 (WPV1) transmission. This report describes global progress toward polio eradication during January 1, 2020–April 30, 2022, and updates previous reports (*1*,*2*). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.* Five WPV1 cases were reported from Afghanistan and Pakistan in 2021, compared with 140 in 2020. In 2022 (as of May 5), three WPV1 cases had been reported: one from Afghanistan and two from Pakistan. WPV1 genetically linked to virus circulating in Pakistan was identified in Malawi in a child with paralysis onset in November 2021. Circulating vaccine-derived polioviruses (cVDPVs), with neurovirulence and transmissibility similar to that of WPV, emerge in populations with low immunity following prolonged circulation of Sabin strain oral poliovirus vaccine (OPV) (*3*). During January 2020–April 30, 2022, a total of 1,856 paralytic cVDPV cases were reported globally: 1,113 in 2020 and 688 in 2021, including cases in Afghanistan and Pakistan. In 2022 (as of May 5), 55 cVDPV cases had been reported. Intensified programmatic actions leading to more effective outbreak responses are needed to stop cVDPV transmission. The 2022–2026 GPEI Strategic Plan objective of ending WPV1 transmission by the end of 2023 is attainable (*4*). However, the risk for children being paralyzed by polio remains until all polioviruses, including WPV and cVDPV, are eradicated.

Poliovirus Vaccination

Since the 2016 withdrawal of Sabin polio vaccine virus type 2 and the globally synchronized switch from trivalent OPV (tOPV, including Sabin types 1, 2, and 3) to bivalent OPV (bOPV, including Sabin types 1 and 3) in all OPV-using countries, bOPV and injectable inactivated poliovirus vaccine (IPV) (including all three serotypes) have been used in routine immunization programs worldwide. cVDPV type 2 (cVDPV2) has been the predominant cause of cVDPV outbreaks since 2006 and informed the rationale for the switch to bOPV. Monovalent OPV Sabin type 2 (mOPV2) is reserved for cVDPV2 outbreak response campaigns (*3*).

In 2020,† the estimated global coverage with ≥3 doses of oral or inactivated poliovirus vaccine (Pol3) in infants aged ≤1 year received during routine childhood immunization (essential health services) was 83%, with 80% of children receiving ≥1 full dose or 2 fractional doses§ of IPV (IPV1). In Afghanistan, the national estimates of coverage with Pol3 and IPV1 were 75% and 65%, respectively, and in Pakistan, were 83% and 85%, respectively (*5*); however, coverage estimates at many subnational levels were considerably lower.

In 2020, GPEI supported the administration of approximately 665 million bOPV, 6 million IPV, 4 million monovalent OPV type 1 (mOPV1), 201 million mOPV2, and 51 million tOPV doses through 145 supplementary immunization activities (SIAs)¶ in 30 countries. For Afghanistan and Pakistan, both of which have simultaneous circulation of WPV1 and cVDPV2, GPEI approved the release of tOPV stocks to interrupt the transmission of both virus types. In 2021, approximately 726 million bOPV, 17 million IPV, 628 million mOPV2, and 51 million tOPV doses were distributed to 30 countries for use during 94 SIAs.

In November 2020, the World Health Organization (WHO) granted Emergency Use Listing** for novel OPV2 (nOPV2), designed to be more genetically stable than the Sabin strain and less likely to revert to neurovirulence (*6*). nOPV2 was first used during outbreak response SIAs in March 2021. Since that time, approximately 525 million nOPV2 doses have been released for use in 21 countries (as of May 5, 2022).

Poliovirus Surveillance

The primary system for detecting poliovirus is case-based syndromic surveillance for acute flaccid paralysis (AFP), with confirmation by stool specimen testing done at one of 146 WHO-accredited laboratories across 92 countries, comprising

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

† 2020 is the most recent year for which data are available.

§ https://cdn.who.int/media/docs/default-source/immunization/tables/fipv-considerations-for-decision-making-april2017.pdf?sfvrsn=cff574f9_4

¶ SIAs are mass immunization campaigns intended to interrupt poliovirus circulation by vaccinating every child aged <5 years with 2 OPV doses, irrespective of previous immunization status.

** Emergency Use Listing Procedure is a risk-based procedure for assessing and listing unlicensed vaccines, therapeutics, and in vitro diagnostics with the ultimate aim of expediting the availability of these products to persons affected by a public health emergency. https://www.who.int/teams/regulation-prequalification/eul the Global Polio Laboratory Network. The two primary indicators used to assess surveillance performance include the nonpolio AFP (NPAFP) rate†† and adequacy of collected stool specimens.§§ AFP surveillance indicators for 43 priority countries¶¶ experiencing or at high risk for poliovirus transmission were reported for 2020–2021 (*7*). Among the 43 priority countries, 32 (74%) met both surveillance indicator targets nationally in 2021. Subnational performance was highly variable (*7*).

Whether or not AFP surveillance performance indicator targets are met, gaps often exist in poliovirus detection subnationally. These gaps can be addressed through environmental surveillance (ES), the systematic collection and testing of sewage samples for poliovirus (*7*). In 2021, the total number of ES samples collected in countries with reported poliovirus circulation was 8,878 samples in 35 countries compared with 5,756 samples in 28 countries in 2020 (Table 1).

Reported Poliovirus Cases and Isolations

Countries reporting WPV cases and isolations. In 2021, five WPV1 cases were reported from the two remaining countries with endemic polio: four from Afghanistan and one from Pakistan (Figure) (Table 2). The four WPV1 cases from two provinces in Afghanistan represent an 82% decrease from the 56 cases in 14 provinces reported in 2020. The single case reported from Balochistan province in Pakistan in 2021 represents a 99% decrease from 84 WPV1 cases in five provinces during 2020 (*8*). In 2022 to date, one WPV1 case has been reported in Afghanistan, from Paktika province on the eastern border near Pakistan, with paralysis onset on January 14. In Pakistan, two WPV1 cases have been reported in 2022, both from North Waziristan in Khyber Pakhtunkhwa province, with paralysis onset on April 9 and April 14.*** ES surveillance in Afghanistan detected one WPV1-positive sample from 474 (0.2%) in 2021, a 97% decrease from the 35 (8%) of 418 samples collected during 2020 (Table 1). The most recent positive sample was collected on February 23, 2021. In Pakistan in 2021, 65 WPV1 isolates were detected from 851 (8%) sewage samples, a 44% decrease from the same period in 2020 when 52% (434 of 830) of samples were WPV1-positive. A recently reported WPV1-positive ES sample was collected on April 5, 2022, in Khyber Pakhtunkhwa province.

WPV1 was detected in specimens from a girl aged 3.5 years living in Lilongwe, Malawi, who had paralysis onset in November 2021. WPV1 was confirmed in February 2022. Genomic sequencing analysis showed the strain detected in Malawi was genetically linked to poliovirus circulating in Sindh province, Pakistan during 2019–2020. On the basis of the number of nucleotide changes from the closest type 1 virus from Pakistan, the Malawi strain was assumed to have circulated in unknown locations for approximately 18 months before its detection.

Countries reporting cVDPV cases and isolations. During January 2020–April 2022, a total of 1,856 cVDPV cases were identified in 33 countries. Three countries reported 51 cVDPV1 cases, and 30 countries reported 1,804 cVDPV2 cases. Israel reported one cVDPV3 case and one country, Yemen, reported cases of both cVDPV1 and cVDPV2. The number of global cVDPV2 cases fell by 37.7% in 2021 (672 cases in 21 countries) compared with 2020 (1,079 cases in 24 countries) (Table 2). Thirty-four different active poliovirus emergence groups (lineages) were reported through AFP surveillance or ES in 2021: four cVDPV1, 27 cVDPV2, and three cVDPV3. Of the 27 cVDPV2 emergence groups reported in 2021, eight were newly detected emergences. In 2022, to date, isolations of 14 cVDPV emergence groups have been reported from all three serotypes.

Discussion

After the last identified indigenous WPV1 case in Nigeria in 2016, the WHO African Region was certified WPV-free in August 2020. In 2021, the region reported its first case of WPV1 in approximately 5 years. In the absence of sustained transmission, this single case does not change the Africa Region's WPV-free status. Afghanistan and Pakistan continue to have endemic WPV1 circulation; thus, only one WHO region (the Eastern Mediterranean Region) is not certified WPV-free. Although substantial improvements in eradication activities have been made in both countries, insecurity, instability, mass population movements, and vaccine refusal continue to pose challenges. COVID-19 pandemic prevention efforts have affected AFP surveillance sensitivity and the administration of routine childhood immunizations globally (*4*,*7*–*9*). Despite these setbacks, a marked reduction in WPV1

†† NPAFP rate is the number of NPAFP cases per 100,000 children aged <15 years per year. An NPAFP rate ≥2 is considered sufficiently sensitive to detect circulating poliovirus.

§§ Stool adequacy is defined as having two stool specimens collected ≥24 hours apart and within 14 days of paralysis onset, and arrival at a WHO-accredited laboratory by reverse cold chain (storing and transporting samples at recommended temperatures from the point of collection to the laboratory) and in good condition (i.e., without leakage or desiccation). Stool specimens are tested using cell culture methods, and any polioviruses isolated have serotype and intratype determined. https://polioeradication.org/wp-content/uploads/2017/05/Polio_Lab_Manual04.pdf

¶¶ 2021 priority countries (2022–2024 Global Polio Surveillance Action Plan priority countries are indicated by [G]). African Region: Angola (G), Benin (G), Burkina Faso (G), Cameroon (G), Central African Republic (G), Chad (G), Côte d'Ivoire (G), Democratic Republic of the Congo (G), Equatorial Guinea (G), Ethiopia (G), Gambia, Guinea (G), Guinea-Bissau (G), Kenya (G), Liberia, Madagascar (G), Malawi, Mali (G), Mauritania, Mozambique (G), Niger (G), Nigeria (G), Republic of the Congo, Senegal, Sierra Leone, South Sudan (G), Togo (G), and Uganda; Eastern Mediterranean Region: Afghanistan (G), Djibouti, Egypt, Iran, Iraq (G), Pakistan (G), Somalia (G), Sudan (G), Syria (G), and Yemen (G); European Region: Tajikistan and Ukraine; South-East Asia Region: Burma (Myanmar) (G); Western Pacific Region: Papua New Guinea (G) and Philippines (G).

*** https://polioeradication.org/where-we-work/pakistan/

transmission occurred in 2021, possibly linked to improvements in SIA quality, decreased population movement at the start of the COVID-19 pandemic, and renewed national commitments to the program (*8*). While recovery of sensitive AFP surveillance has been limited in 2021 and 2022, the observed reduction in the proportion of WPV1-positive ES samples reported during this period is consistent with a genuine decline in poliovirus transmission.

In Afghanistan, restrictions on house-to-house vaccination campaigns that have been in place in many areas since 2018 have further limited eradication progress. After the shift in political power in Afghanistan in August 2021, mosque-to-mosque polio vaccination campaigns resumed in certain regions of the country, reaching approximately 2 million children who had not been accessible for nearly 3 years, and a coordinated campaign with Pakistan took place in December 2021 (*9*). If these vaccination efforts continue and are extended to include house-to-house campaigns, additional progress toward interrupting WPV1 transmission is feasible during 2022–2023.

To end cVDPV2 transmission by the end of 2023, the 2022–2026 GPEI Strategic Plan (*4*) aims to improve the timeliness of case detection, streamline emergency response structures, and improve cross-border coordination to facilitate prompt outbreak response mobilization. The plan also aims to support the scale-up of nOPV2 availability (*6*). However, given currently limited nOPV2 supply replenishment, higher than expected demand has depleted nOPV2 stock (*3*,*4*). The risk for international spread of polioviruses

TABLE 1. Number and proportion of sewage samples with circulating wild polioviruses and circulating vaccine-derived polioviruses in environmental surveillance — worldwide, January 1, 2020–April 30, 2022*

	Jan 1–Dec 31, 2020		Jan 1–Dec 31, 2021		Jan 1–Apr 30, 2021		Jan 1–Apr 30, 2022	
Country	**No. of samples**	**No. (%) with isolates**	**No. of samples**	**No. (%) with isolates**	**No. of samples**	**No. (%) with isolates**	**No. of samples**	**No. (%) with isolates**
Countries with reported WPV1-positive samples (no. and % of isolates refer to WPV1)								
Afghanistan	418	35 (8)	474	1 (0)	153	1 (1)	151	0 (—)
Pakistan	830	434 (52)	851	65 (8)	284	55 (19)	253	1 (0)
Countries with reported cVDPV-positive samples (cVDPV type) (no. and % of isolates refer to cVDPVs)								
Afghanistan (2)	418	175 (42)	474	40 (9)	153	39 (26)	151	0 (—)
Benin (2)	70	5 (7)	143	1 (1)	31	1 (3)	20	0 (—)
Cameroon (2)	273	9 (3)	368	1 (0)	116	0 (—)	81	0 (—)
Central African Republic (2)	88	2 (2)	138	1 (1)	28	0 (—)	29	0 (—)
Chad (2)	77	3 (4)	64	1 (2)	17	0 (—)	13	0 (—)
China (3)	0	0 (—)	2	1 (50)	1	1 (100)	0	0 (—)
Côte d'Ivoire (2)	130	95 (77)	85	0 (—)	28	0 (—)	31	2 (6)
Democratic Republic of the Congo (2)	170	1 (1)	447	3 (1)	92	0 (—)	78	0 (—)
Djibouti (2)	0	0 (—)	71	5 (7)	0	0 (—)	10	0 (—)
Egypt (2)	557	1 (0)	916	12 (1)	228	9 (4)	205	2 (1)
Ethiopia (2)	51	4 (8)	32	0 (—)	9	0 (—)	9	0 (—)
Gambia (2)	0	0 (—)	39	9 (23)	0	0 (—)	11	0 (—)
Ghana (2)	184	20 (11)	189	0 (—)	68	0 (—)	40	0 (—)
Guinea (2)	67	1 (1)	143	2 (1)	42	0 (—)	2	0 (—)
Iran (2)	43	3 (7)	71	1 (1)	15	1 (10)	15	0 (—)
Israel (3)	2	1 (50)	9	5 (55)	0	0 (—)	25	25 (100)
Kenya (2)	170	1 (1)	176	1 (1)	59	1 (2)	39	0 (—)
Liberia (2)	34	7 (21)	86	14 (16)	27	12 (44)	14	0 (—)
Madagascar (1)	351	0 (—)	390	31 (8)	81	6 (7)	136	2 (1)
Malaysia (1,2)	201	14 (5)	122	0 (—)	49	0 (—)	11	0 (—)
Mali (2)	44	4 (9)	51	0 (—)	19	0 (—)	7	0 (—)
Mauritania (2)	0	0 (—)	72	7 (10)	0	0 (—)	22	0 (—)
Niger (2)	157	9 (6)	208	0 (—)	42	0 (—)	36	0 (—)
Nigeria (2)	1,294	5 (0)	2,427	300 (12)	541	6 (1)	755	29 (4)
Pakistan (2)	830	135 (16)	851	35 (4)	284	31 (11)	253	0 (—)
Palestinian Territory (3)	0	0 (—)	7	7 (100)	1	1 (100)	9	9 (100)
Philippines (2)	227	4 (2)	211	0 (—)	80	0 (—)	19	0 (—)
Republic of the Congo (2)	12	1 (8)	437	3 (1)	99	1 (1)	50	0 (—)
Senegal (2)	27	1 (4)	23	14 (61)	7	2 (29)	28	0 (—)
Sierra Leone (2)	0	0 (—)	208	9 (4)	60	8 (13)	44	0 (—)
Somalia (2)	87	26 (30)	134	1 (1)	37	0 (—)	41	0 (—)
South Sudan (2)	84	6 (7)	83	0 (—)	32	0 (—)	1	0 (—)
Sudan (2)	50	14 (28)	90	0 (—)	20	0 (—)	25	0 (—)
Tajikistan (2)	0	0 (—)	18	17 (94)	12	11 (92)	0	0 (—)
Uganda (2)	58	0 (—)	93	2 (2)	24	0 (—)	28	0 (—)
Total	**5,756**	**1,016 (14.5)**	**8,878**	**589 (6.6)**	**2,302**	**197 (8.6)**	**2,238**	**68 (3)**

Abbreviations: cVDPV = circulating vaccine-derived poliovirus; WPV1 = wild poliovirus type 1.
* Data as of May 5, 2022.

was declared a Public Health Emergency of International Concern in 2014; in 2021, the Strategic Advisory Group of Experts on Immunization and other advisory bodies[†††,§§§] recommended that any country experiencing a cVDPV2 outbreak should begin prompt outbreak response with available OPV2 vaccine, whether it be a Sabin strain mOPV2 or nOPV2 (*10*).

Current progress toward polio eradication needs to be sustained in countries experiencing endemic transmission and outbreaks, and multiple efforts to immunize all children must be enhanced. Ongoing circulation of WPV1 in Afghanistan and Pakistan in 2022 continues to pose a risk for poliovirus exportation globally, further highlighted by detection of WPV1 from Malawi genetically linked to the region. Until

††† WHO Director-General's Emergency Committee for the International Health Regulations. http://apps.who.int/iris/bitstream/handle/10665/341623/WER9622-eng-fre.pdf

§§§ GPEI Independent Monitoring Board. https://polioeradication.org/wp-content/uploads/2021/07/20th-IMB-report-20210631.pdf

Summary

What is already known about this topic?

Wild poliovirus type 1 (WPV1) transmission remains endemic in Afghanistan and Pakistan. Outbreaks of paralysis due to circulating vaccine-derived polioviruses (cVDPVs) occur in populations with low immunity following prolonged circulation of Sabin strain oral poliovirus vaccine.

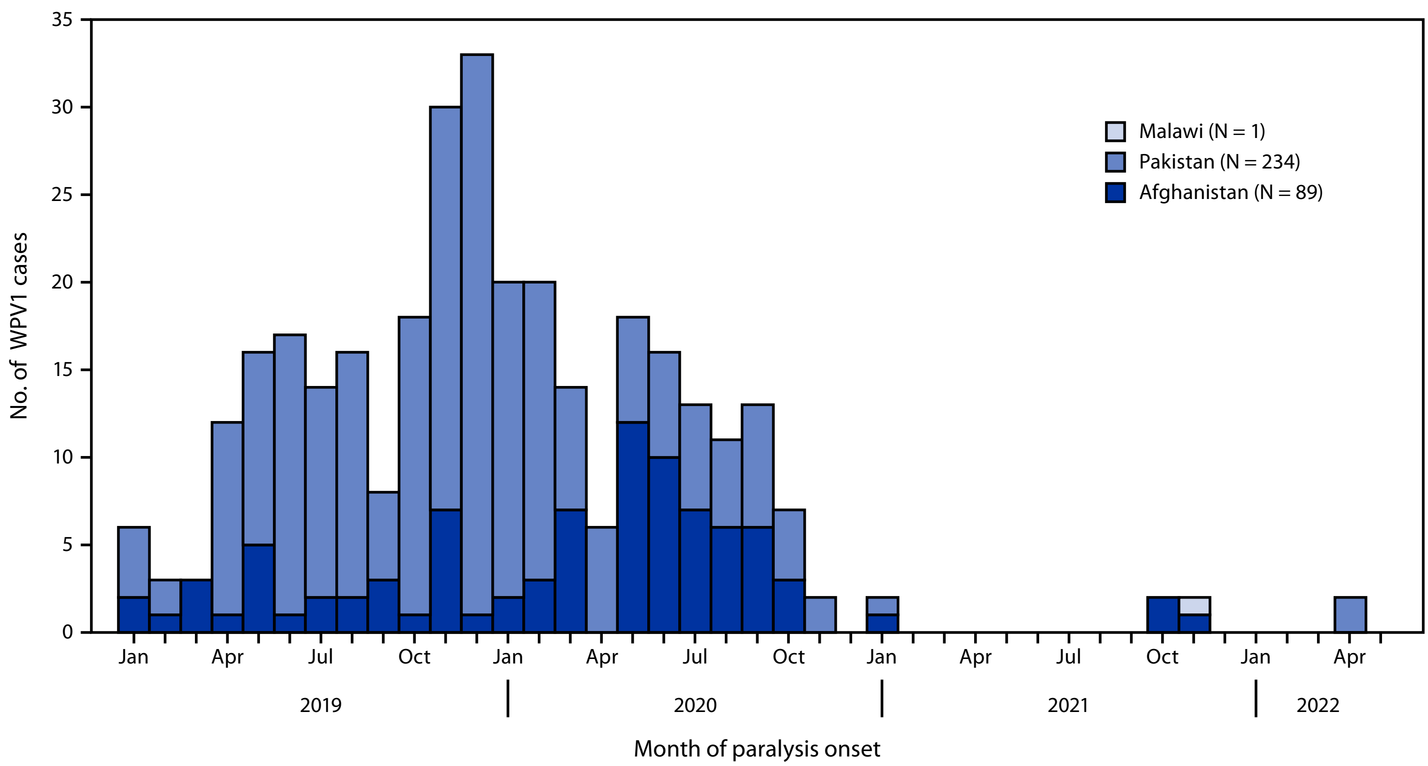
What is added by this report?

In 2021, Afghanistan and Pakistan reported a sharp decline in WPV1 cases from previous years. A WPV1 case genetically linked to these countries occurred in Malawi in November 2021.

What are the implications for public health practice?

Current progress toward polio eradication must be sustained in countries experiencing endemic transmission and outbreaks. Intensified programmatic actions leading to more effective outbreak responses and enhanced efforts to immunize all children are essential. Until WPV1 is eradicated and cVDPV transmission is interrupted, the risk for children being paralyzed by polio remains.

FIGURE. Number of wild poliovirus type 1 cases, by country and month of paralysis onset — worldwide, January 2020–April 2022*



Abbreviation: WPV1 = wild poliovirus type 1.
* Data as of May 5, 2022.

TABLE 2. Number of poliovirus cases, by country — worldwide, January 1, 2020–April 30, 2022*

	Reporting period							
	2020		2021		Jan–Apr 2021		Jan–Apr 2022	
Country	**WPV1**	**cVDPV**	**WPV1**	**cVDPV**	**WPV1**	**cVDPV**	**WPV1**	**cVDPV**
With reported WPV1 cases (cVDPV type)								
Afghanistan (2)	56	308	4	43	1	40	1	0
Malawi	0	0	1	0	0	0	0	0
Pakistan (2)	84	135	1	8	1	8	2	0
With reported cVDPV cases (cVDPV type)								
Angola (2)	0	3	0	0	0	0	0	0
Benin (2)	0	3	0	3	0	2	0	0
Burkina Faso (2)	0	65	0	2	0	1	0	0
Cameroon (2)	0	7	0	3	0	0	0	0
Central African Republic (2)	0	4	0	0	0	0	0	0
Chad (2)	0	101	0	0	0	0	0	0
Côte d'Ivoire (2)	0	64	0	0	0	0	0	0
Democratic Republic of the Congo (2)	0	81	0	28	0	10	0	26
Ethiopia (2)	0	36	0	10	0	6	0	0
Ghana (2)	0	12	0	0	0	0	0	0
Guinea (2)	0	44	0	6	0	6	0	0
Guinea-Bissau (2)	0	0	0	3	0	0	0	0
Israel (3)	0	0	0	0	0	0	0	1
Liberia (2)	0	0	0	3	0	2	0	0
Madagascar (1)	0	2	0	13	0	5	0	1
Malaysia (1)	0	1	0	0	0	0	0	0
Mali (2)	0	52	0	0	0	0	0	0
Mozambique (2)	0	0	0	2	0	1	0	0
Niger (2)	0	10	0	17	0	0	0	0
Nigeria (2)	0	8	0	415	0	14	0	20
Philippines (2)	0	1	0	0	0	0	0	0
Republic of the Congo (2)	0	2	0	2	0	2	0	0
Senegal (2)	0	0	0	17	0	7	0	0
Sierra Leone (2)	0	10	0	5	0	5	0	0
Somalia (2)	0	14	0	1	0	0	0	2
South Sudan (2)	0	50	0	9	0	9	0	0
Sudan (2)	0	59	0	0	0	0	0	0
Tajikistan (2)	0	1	0	32	0	14	0	0
Togo (2)	0	9	0	0	0	0	0	0
Ukraine (2)	0	0	0	2	0	0	0	0
Yemen (1,2)	0	31	0	64	0	3	0	5
Total	**140**	**1,113**	**6**	**688**	**2**	**135**	**3**	**55**

Abbreviations: cVDPV = circulating vaccine-derived poliovirus; WPV1 = wild poliovirus type 1.
* Data as of May 5, 2022

WPV1 is eradicated and cVDPV transmission is interrupted, the risk for poliovirus exportation to polio-free areas of the world remains. Strong global efforts are needed to sustain and increase routine immunization coverage and maintain sensitive poliovirus surveillance.

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Vital Signs: Changes in Firearm Homicide and Suicide Rates — United States, 2019–2020

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Abstract

Introduction: The majority of homicides (79%) and suicides (53%) in the United States involved a firearm in 2020. High firearm homicide and suicide rates and corresponding inequities by race and ethnicity and poverty level represent important public health concerns. This study examined changes in firearm homicide and firearm suicide rates coinciding with the emergence of the COVID-19 pandemic in 2020.

Methods: National vital statistics and population data were integrated with urbanization and poverty measures at the county level. Population-based firearm homicide and suicide rates were examined by age, sex, race and ethnicity, geographic area, level of urbanization, and level of poverty.

Results: From 2019 to 2020, the overall firearm homicide rate increased 34.6%, from 4.6 to 6.1 per 100,000 persons. The largest increases occurred among non-Hispanic Black or African American males aged 10–44 years and non-Hispanic American Indian or Alaska Native (AI/AN) males aged 25–44 years. Rates of firearm homicide were lowest and increased least at the lowest poverty level and were higher and showed larger increases at higher poverty levels. The overall firearm suicide rate remained relatively unchanged from 2019 to 2020 (7.9 to 8.1); however, in some populations, including AI/AN males aged 10–44 years, rates did increase.

Conclusions and Implications for Public Health Practice: During the COVID-19 pandemic, the firearm homicide rate in the United States reached its highest level since 1994, with substantial increases among several population subgroups. These increases have widened disparities in rates by race and ethnicity and poverty level. Several increases in firearm suicide rates were also observed. Implementation of comprehensive strategies employing proven approaches that address underlying economic, physical, and social conditions contributing to the risks for violence and suicide is urgently needed to reduce these rates and disparities.

Introduction

Firearm homicides and suicides represent persistent and significant U.S. public health concerns. In 2020, 79% of all homicides and 53% of all suicides involved firearms (somewhat higher than during the preceding 5 years, when 73%–75% of all homicides and 50%–51% of all suicides involved firearms each year) (*1*). Although all population groups experience firearm homicides and suicides, some are disproportionately affected. Firearm homicide rates are consistently highest among males, adolescents and young adults, and non-Hispanic Black or African American (Black) and non-Hispanic American Indian or Alaska Native (AI/AN) persons; firearm suicide rates are highest among males, older adults, and non-Hispanic White (White) and AI/AN persons (*1*).

Economic conditions in communities contribute to risk for violence, including firearm-related violence, and related racial and ethnic inequities (*2*). For example, multiple indicators (e.g., income inequality, unemployment, and housing and economic instability) are associated with risk for homicide and suicide (*3*–*5*). Youth firearm homicide and suicide rates have been associated with poverty at the county level (*6*), and the percentage of youths living in conditions of household poverty is higher among racial and ethnic minority populations (*6*). The economic and social challenges associated with the COVID-19 pandemic could have exacerbated such risks (*2*,*7*).

This study examined changes in firearm homicide and firearm suicide rates coinciding with the COVID-19 pandemic in 2020, in conjunction with existing and potentially widening inequities by race and ethnicity and poverty level. The findings in this report can help identify disproportionately affected populations and guide the development and implementation of evidence-based strategies for communities experiencing social and structural conditions contributing to violence and disparities in violence.

Methods

This study integrated four data sources: National Vital Statistics System mortality data*; National Center for Health Statistics (NCHS)/U.S. Census Bureau bridged-race population estimates†; NCHS county urbanization designations§; and U.S. Census Bureau county poverty data.¶ Firearm homicides were identified by *International Classification of Diseases, Tenth Revision* underlying cause-of-death codes X93–X95 and U01.4 and firearm suicides by codes X72–X74. A small number of records (approximately 0.25%) that were missing decedent race and ethnicity or age were excluded from the study data. Suicide statistics further excluded data for persons aged <10 years, as intent for self-harm can be difficult to ascertain in young children. Rates for specific age groups are reported as crude rates; other rates were age-adjusted to the year 2000 U.S. standard population. Rates involving firearm homicide or suicide counts <20 are not presented because of concerns about statistical instability; this criterion ensures that relative SEs usually do not exceed 23% under the assumption that counts are Poisson-distributed. Rate comparisons between years refer to absolute differences unless relative (percentage) changes are indicated. For simplicity in this report, comparisons are nominal and do not involve formal statistical testing; however, such comparisons are restricted to statistically stable rates. The county urbanization data provide a single static designation (representing the year 2013) for each individual county. The six original designations were collapsed into three broader designations (large metropolitan, small/medium metropolitan, and nonmetropolitan). The poverty data provide a yearly measure for each individual county (percentage of all persons living in poverty). Counties were grouped according to four fixed poverty ranges, each covering approximately one quarter of the overall 2019 U.S. population. Data analysis was conducted using SAS software (version 9.4; SAS Institute).

Results

From 2019 to 2020, the overall age-adjusted firearm homicide rate increased substantially, from 4.6 to 6.1 per 100,000 persons (relative change = 34.6%) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/116519) (Table 1). Rates increased across all age groups, with the highest rates and increases observed among those aged 10–24 (from 7.0 to 9.8 per 100,000) and 25–44 years (8.2 to 11.0). Rates also increased for both sexes, with a greater increase observed among males (7.6 to 10.4). By race and ethnicity, the highest rates and increases occurred among Black (19.0 to 26.6) and AI/AN populations (6.4 to 8.1). Rates increased across all U.S. Census divisions (relative changes ranged from 24.6% [South Atlantic] to 51.0% [Middle Atlantic]) and across all levels of urbanization (28.5% [nonmetropolitan] to 36.9% [large metropolitan]). Rate differentials are amplified when considering age, sex, and race and ethnicity simultaneously (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/116520). The largest increases in firearm homicide rates were among Black males aged 10–24 (54.9 to 77.3) and 25–44 years (66.5 to 90.6) and among AI/AN males aged 25–44 years (18.9 to 28.7). Among females, the highest rates and largest increases were among those who were Black, aged 10–24 (6.4 to 9.1) and 25–44 years (6.9 to 10.2).

The overall age-adjusted firearm suicide rate among persons aged ≥10 years remained nearly level between 2019 and 2020 (7.9 and 8.1 per 100,000 persons, respectively [relative change = 1.5%]) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/116519) (Table 2). More notable age-specific rate increases among persons aged 10–24 (from 4.7 to 5.4) and 25–44 years (7.6 to 8.1) were partially offset by a decrease among those aged 45–64 years (9.4 to 8.8). Firearm suicide rates by sex remained nearly level. By race and ethnicity, the firearm suicide rate among AI/AN persons showed the largest increase (7.7 to 10.9). Considering age, sex, and race and ethnicity simultaneously, rates of firearm suicide increased most notably among AI/AN males aged 10–24 (14.0 to 23.4) and 25–44 years (16.0 to 23.8) (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/116521).

County-wide poverty conditions varied by race and ethnicity (Table 3). As of 2020, approximately 24% of the U.S. population overall resided in counties classified as the most impoverished, however, approximately 29% of the Hispanic population, 39% of the Black population, and 44% of the AI/AN population resided in these counties. Firearm homicide rates were lowest and increased least at the lowest poverty level (from 2.0 to 2.4 per 100,000 persons) and were higher and showed larger increases at higher poverty levels (e.g., from 7.7 to 10.8 at the highest level). By race and ethnicity, rates were highest and increased most among Black persons at the two highest poverty levels. Associations between poverty and firearm suicide are also evident (Table 4). Yearly rates were lowest at the lowest poverty level and highest at the highest poverty level for the U.S. population overall and among Hispanic, Black, and White persons. The largest rate increases occurred among AI/AN persons at the two highest poverty levels.

* https://www.cdc.gov/nchs/products/index.htm
† https://www.cdc.gov/nchs/nvss/bridged_race.htm
§ https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf
¶ https://www.census.gov/content/dam/Census/library/publications/2020/demo/p30-08.pdf

TABLE 1. Changes in firearm homicide incidence, by selected sociodemographic factors — United States, 2019–2020

Characteristic	No. (rate*) 2019	No. (rate*) 2020	Rate change	% Rate change
U.S. population overall†,§	**14,392 (4.6)**	**19,350 (6.1)**	**1.6**	**34.6**
Age group, yrs¶				
<10	125 (0.3)	175 (0.4)	0.1	40.9
10–24	4,474 (7.0)	6,176 (9.8)	2.7	38.5
25–44	7,154 (8.2)	9,685 (11.0)	2.8	34.6
45–64	2,176 (2.6)	2,767 (3.3)	0.7	28.0
≥65	463 (0.9)	547 (1.0)	0.1	14.7
Sex†,§				
Female	2,284 (1.4)	2,954 (1.9)	0.4	29.4
Male	12,108 (7.6)	16,396 (10.4)	2.7	35.5
Race and ethnicity,§**				
A/PI, non-Hispanic	228 (1.1)	227 (1.0)	−0.0††	−4.2
AI/AN, non-Hispanic	172 (6.4)	221 (8.1)	1.7	27.0
Black, non-Hispanic	8,499 (19.0)	11,904 (26.6)	7.5	39.5
Hispanic (any race)	2,301 (3.6)	2,946 (4.5)	0.9	25.8
White, non-Hispanic	3,192 (1.7)	4,052 (2.2)	0.5	28.4
U.S. Census Bureau division†,§,§§				
New England	209 (1.5)	280 (2.0)	0.5	32.2
Middle Atlantic	1,064 (2.7)	1,594 (4.1)	1.4	51.0
East North Central	2,319 (5.2)	3,410 (7.7)	2.5	47.8
West North Central	845 (4.2)	1,149 (5.7)	1.5	36.6
South Atlantic	3,754 (6.0)	4,681 (7.5)	1.5	24.6
East South Central	1,527 (8.5)	2,056 (11.3)	2.9	33.7
West South Central	2,293 (5.7)	3,030 (7.5)	1.8	31.2
Mountain	829 (3.4)	1,057 (4.4)	0.9	27.3
Pacific	1,552 (3.0)	2,093 (4.0)	1.0	35.2
Urbanization level†,§				
Large metropolitan	8,688 (4.8)	11,880 (6.6)	1.8	36.9
Small/Medium metropolitan	4,066 (4.3)	5,380 (5.7)	1.4	32.1
Nonmetropolitan	1,638 (4.0)	2,090 (5.1)	1.1	28.5

Abbreviations: A/PI = Asian or Pacific Islander; AI/AN = American Indian or Alaska Native.
* Firearm homicides per 100,000 persons.
† Excludes decedent records with missing race and ethnicity or age.
§ Rates are age-adjusted to the year 2000 U.S. standard population.
¶ Excludes decedent records with missing race and ethnicity.
** Excludes decedent records with missing age.
†† A value of "–0.0" denotes a negative change rounded to the nearest tenth.
§§ https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

Discussion

The firearm homicide rate in 2020 was the highest recorded since 1994 (*1*). However, the increase in firearm homicides was not equally distributed. Young persons, males, and Black persons consistently have the highest firearm homicide rates, and these groups experienced the largest increases in 2020. These increases represent the widening of long-standing disparities in firearm homicide rates. For example, the firearm homicide rate among Black males aged 10–24 years was 20.6 times as high as the rate among White males of the same age in 2019, and this ratio increased to 21.6 in 2020. Although the overall firearm suicide rate remained relatively unchanged between 2019 and 2020, young persons and some racial/ethnic minority groups experienced increases in firearm suicide. Notably, the largest increase occurred among AI/AN persons, resulting in this group having the highest firearm suicide rate as of 2020. Racial and ethnic minority groups are more likely to live in communities with high surrounding poverty, and firearm homicide and suicide were also associated with poverty. Counties with the smallest proportion of the population living below the poverty line experienced a 22% increase in firearm homicides, whereas all other counties experienced an increase of ≥40%. In 2020, counties with the highest poverty level had firearm homicide and firearm suicide rates that were 4.5 and 1.3 times as high, respectively, as counties with the lowest poverty level.

The findings of this study do not support causal inferences, and reasons for increasing rates and widening inequities are unclear and potentially complex. Several explanations have been proposed, including increased stressors (e.g., economic, social, and psychological) and disruptions in health, social, and emergency services during the COVID-19 pandemic; strains in law enforcement-community relations reflected in protests over law enforcement use of lethal force; increases

TABLE 2. Changes in firearm suicide incidence, by selected sociodemographic factors — United States, 2019–2020

Characteristic	No.* (rate*,†) 2019	No.* (rate*,†) 2020	Rate change	% Rate change
U.S. population overall§,¶	**23,888 (7.9)**	**24,245 (8.1)**	**0.1**	**1.5**
Age group, yrs**				
10–24	2,969 (4.7)	3,393 (5.4)	0.7	14.7
25–44	6,683 (7.6)	7,105 (8.1)	0.4	5.7
45–64	7,863 (9.4)	7,284 (8.8)	−0.6	−6.8
≥65	6,373 (11.8)	6,463 (11.6)	−0.2	−1.5
Sex§,¶				
Female	3,214 (2.2)	3,108 (2.1)	−0.1	−3.2
Male	20,674 (14.2)	21,137 (14.5)	0.3	2.0
Race and ethnicity††,¶				
A/PI, non-Hispanic	381 (2.0)	374 (2.0)	−0.0§§	−1.9
AI/AN, non-Hispanic	183 (7.7)	267 (10.9)	3.2	41.8
Black, non-Hispanic	1,588 (4.2)	1,852 (4.9)	0.6	14.3
Hispanic (any race)	1,534 (3.0)	1,790 (3.4)	0.4	13.8
White, non-Hispanic	20,202 (10.4)	19,962 (10.4)	−0.0§§	−0.3
U.S. Census Bureau division§,¶,¶¶				
New England	625 (4.4)	587 (4.2)	−0.3	−6.1
Middle Atlantic	1,587 (4.0)	1,561 (4.0)	−0.0§§	−1.0
East North Central	3,257 (7.6)	3,252 (7.6)	0.0§§	0.5
West North Central	1,882 (9.9)	1,932 (10.2)	0.3	3.2
South Atlantic	5,254 (8.5)	5,359 (8.7)	0.2	2.1
East South Central	2,041 (11.7)	2,103 (12.1)	0.5	3.9
West South Central	3,487 (9.8)	3,593 (10.1)	0.2	2.5
Mountain	2,911 (13.1)	3,078 (13.6)	0.5	3.8
Pacific	2,844 (5.8)	2,780 (5.6)	−0.2	−3.3
Urbanization level§,¶				
Large metropolitan	10,085 (6.0)	10,136 (6.1)	0.0§§	0.3
Small/Medium metropolitan	8,546 (9.5)	8,727 (9.7)	0.2	2.4
Nonmetropolitan	5,257 (12.4)	5,382 (12.8)	0.3	2.6

Abbreviations: A/PI = Asian or Pacific Islander; AI/AN = American Indian or Alaska Native.
* Numbers and rates overall and by sex, race and ethnicity, U.S. Census Bureau division, and urbanization level exclude persons aged <10 years.
† Firearm suicides per 100,000 persons.
§ Excludes decedent records with missing race and ethnicity or age.
¶ Rates are age-adjusted to the year 2000 U.S. standard population.
** Excludes decedent records with missing race and ethnicity.
†† Excludes decedent records with missing age.
§§ A value of "−0.0" denotes a negative change rounded to the nearest tenth; a value of "0.0" denotes a positive change rounded to the nearest tenth.
¶¶ https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

in firearm purchases; and intimate partner violence (*7–10*). The COVID-19 pandemic might have exacerbated existing social and economic stressors that increase risk for homicide and suicide, particularly among certain racial and ethnic communities (*2*). Longstanding systemic inequities and structural racism (*11*) have resulted in limited economic, housing, and educational opportunities associated with inequities in risk for violence and other health conditions among various racial and ethnic groups.

The findings of this study underscore the importance of comprehensive strategies that can stop violence now and in the future by addressing factors that contribute to homicide and suicide, including the underlying economic, physical, and social inequities that drive racial and ethnic disparities in multiple health outcomes. For example, policies that enhance economic and household stability (e.g., temporary assistance to families, child care subsidies, tax credits, housing assistance, and livable wages) can reduce family poverty and other risk factors for homicide and suicide (e.g., family stress and substance use) (*3,4,12–14*). Communities can also implement locally driven approaches that address physical and social environments that contribute to violence and other inequities, with the potential for immediate benefits. Approaches such as enhancing and maintaining green spaces and the remediation of vacant buildings can reduce opportunities for violence and promote positive social interactions. These approaches have been associated with significant reductions in risk for firearm violence (*13,15*). For example, a study in a major U.S. city found that restoration of vacant lots (e.g., cleaning up debris or adding vegetation) was associated with significant reductions in firearm assaults, with the largest reduction (29%) in areas with the highest poverty (*15*).

In addition to addressing known drivers of inequities and disparities, it is important for prevention strategies to focus

TABLE 3. Changes in firearm homicide incidence, by race and ethnicity and surrounding poverty level — United States,* 2019–2020

Race and ethnicity group/ Poverty range (%)†	2019		2020			
	% of population in poverty range§	No. (rate¶)	% of population in poverty range§	No. (rate¶)	Rate change	% Rate change
U.S. population overall**						
<9.1	**24.7**	**1,494 (2.0)**	**26.7**	**1,972 (2.4)**	**0.4**	**21.9**
9.1–12.1	**24.7**	**2,428 (3.2)**	**28.0**	**4,002 (4.6)**	**1.4**	**45.6**
12.2–14.6	**25.7**	**4,340 (5.3)**	**21.3**	**5,058 (7.5)**	**2.2**	**41.0**
>14.6	**24.9**	**6,130 (7.7)**	**24.0**	**8,318 (10.8)**	**3.1**	**40.0**
Total	**100**	**14,392 (4.6)**	**100**	**19,350 (6.1)**	**1.6**	**34.6**
A/PI, non-Hispanic††						
<9.1	37.6	49 (0.6)	41.4	64 (0.7)	0.1	14.8
9.1–12.1	23.7	53 (1.0)	23.1	50 (1.0)	−0.1	−5.0
12.2–14.6	26.0	71 (1.3)	21.8	68 (1.4)	0.1	5.6
>14.6	12.6	55 (2.0)	13.6	45 (1.4)	−0.6	−28.1
Total	**100**	**228 (1.1)**	**100**	**227 (1.0)**	**−0.0§§**	**−4.2**
AI/AN, non-Hispanic††						
<9.1	12.9	8 (—¶¶)	16.0	21 (4.7)	—¶¶	—¶¶
9.1–12.1	20.6	43 (7.6)	23.5	68 (10.8)	3.2	41.6
12.2–14.6	20.9	34 (5.8)	16.8	27 (5.8)	0.0§§	0.6
>14.6	45.6	87 (7.3)	43.7	105 (8.8)	1.6	21.5
Total	**100**	**172 (6.4)**	**100**	**221 (8.1)**	**1.7**	**27.0**
Black, non-Hispanic††						
<9.1	16.9	728 (9.6)	15.9	907 (12.7)	3.1	32.0
9.1–12.1	17.8	1,168 (14.5)	23.1	2,163 (20.6)	6.1	41.7
12.2–14.6	27.3	2,559 (20.9)	22.4	3,098 (30.8)	9.8	47.0
>14.6	38.0	4,044 (24.2)	38.6	5,736 (33.6)	9.5	39.1
Total	**100**	**8,499 (19.0)**	**100**	**11,904 (26.6)**	**7.5**	**39.5**
Hispanic (any race)††						
<9.1	17.5	229 (2.0)	19.0	333 (2.6)	0.6	29.0
9.1–12.1	21.6	385 (2.7)	26.1	650 (3.8)	1.1	38.8
12.2–14.6	32.4	850 (4.1)	25.6	921 (5.5)	1.4	34.3
>14.6	28.5	837 (4.7)	29.3	1,042 (5.6)	0.9	19.6
Total	**100**	**2,301 (3.6)**	**100**	**2,946 (4.5)**	**0.9**	**25.8**
White, non-Hispanic††						
<9.1	27.3	480 (0.9)	30.0	647 (1.2)	0.2	22.9
9.1–12.1	27.3	779 (1.5)	30.2	1,071 (1.9)	0.4	24.8
12.2–14.6	23.4	826 (1.8)	19.8	944 (2.6)	0.7	38.5
>14.6	22.0	1,107 (2.7)	20.1	1,390 (3.7)	1.0	39.0
Total	**100**	**3,192 (1.7)**	**100**	**4,052 (2.2)**	**0.5**	**28.4**

Abbreviations: A/PI = Asian or Pacific Islander; AI/AN = American Indian or Alaska Native.
* Excludes Kalawao County, Hawaii because of missing poverty data.
† For comparability, the county poverty ranges are constant across race and ethnicity groups and years.
§ Percentage of indicated group residing in counties within the specified poverty range.
¶ Firearm homicides per 100,000 persons; age-adjusted to the year 2000 U.S. standard population.
** Excludes decedent records with missing race and ethnicity or age.
†† Excludes decedent records with missing age.
§§ A value of "–0.0" denotes a negative change rounded to the nearest tenth; a value of "0.0" denotes a positive change rounded to the nearest tenth.
¶¶ Rate or rate change considered statistically unstable because of homicide count <20.

on populations experiencing the highest risks for and rates of violence (*4*,*13*). For example, the comprehensive White Mountain Apache Suicide Surveillance and Prevention System was associated with reduced Apache suicides and attempts (*16*). Community and street outreach programs, like Cure Violence, have shown promising results for multiple outcomes, including firearm violence, by connecting populations at highest risk for violence with community services while reducing tensions and retaliatory actions (*4*,*13*). Hospital-based programs that intervene with victims of violence can have lasting effects on risk for revictimization and perpetration (*17*), and those that intervene with patients at risk for suicide can prevent reattempts (*3*,*18*). Other individual and family therapeutic approaches can lessen harm from exposure to violence and prevent continuation of violence (e.g., Trauma Focused Cognitive Behavior Therapy and Multisystemic Therapy) (*4*). Moreover, many violence prevention programs, such as those that teach coping and problem-solving skills, enhance norms

TABLE 4. Changes in firearm suicide incidence, by race and ethnicity and surrounding poverty level — United States,* 2019–2020

Race and ethnicity group/ Poverty range (%)†	2019 % of population in poverty range§	2019 No.¶ (rate¶,**)	2020 % of population in poverty range§	2020 No.¶ (rate¶,**)	Rate change	% Rate change
U.S. population overall††						
<9.1	**24.7**	**4,782 (6.5)**	**26.7**	**5,439 (6.8)**	**0.3**	**4.7**
9.1–12.1	**24.7**	**6,353 (8.5)**	**28.0**	**7,191 (8.4)**	**−0.0§§**	**−0.0§§**
12.2–14.6	**25.7**	**5,903 (7.6)**	**21.3**	**5,248 (8.2)**	**0.6**	**7.5**
>14.6	**24.9**	**6,850 (9.3)**	**24.0**	**6,367 (8.9)**	**−0.3**	**−3.6**
Total	**100**	**23,888 (7.9)**	**100**	**24,245 (8.1)**	**0.1**	**1.5**
A/PI, non-Hispanic¶¶						
<9.1	37.6	107 (1.5)	41.4	136 (1.8)	0.3	16.7
9.1–12.1	23.7	98 (2.2)	23.1	91 (2.1)	−0.1	−6.5
12.2–14.6	26.0	111 (2.2)	21.8	95 (2.3)	0.0§§	1.3
>14.6	12.6	65 (2.7)	13.6	52 (2.0)	−0.7	−27.4
Total	**100**	**381 (2.0)**	**100**	**374 (2.0)**	**−0.0§§**	**−1.9**
AI/AN, non-Hispanic¶¶						
<9.1	12.9	20 (6.9)	16.0	35 (9.2)	2.3	33.0
9.1–12.1	20.6	48 (9.6)	23.5	64 (10.8)	1.2	12.9
12.2–14.6	20.9	25 (4.9)	16.8	47 (11.3)	6.4	128.8
>14.6	45.6	90 (8.4)	43.7	121 (11.5)	3.1	36.6
Total	**100**	**183 (7.7)**	**100**	**267 (10.9)**	**3.2**	**41.8**
Black, non-Hispanic¶¶						
<9.1	16.9	219 (3.4)	15.9	224 (3.7)	0.2	6.6
9.1–12.1	17.8	285 (4.3)	23.1	427 (4.8)	0.5	12.0
12.2–14.6	27.3	425 (4.1)	22.4	427 (5.0)	0.9	22.1
>14.6	38.0	659 (4.7)	38.6	774 (5.3)	0.6	12.8
Total	**100**	**1,588 (4.2)**	**100**	**1,852 (4.9)**	**0.6**	**14.3**
Hispanic (any race)¶¶						
<9.1	17.5	221 (2.4)	19.0	280 (2.8)	0.4	17.9
9.1–12.1	21.6	304 (2.8)	26.1	483 (3.5)	0.7	26.0
12.2–14.6	32.4	483 (2.9)	25.6	444 (3.3)	0.4	14.2
>14.6	28.5	526 (3.7)	29.3	583 (3.8)	0.2	4.3
Total	**100**	**1,534 (3.0)**	**100**	**1,790 (3.4)**	**0.4**	**13.8**
White, non-Hispanic¶¶						
<9.1	27.3	4,215 (8.2)	30.0	4,764 (8.4)	0.2	3.0
9.1–12.1	27.3	5,618 (10.6)	30.2	6,126 (10.5)	−0.1	−0.9
12.2–14.6	23.4	4,859 (10.6)	19.8	4,235 (11.1)	0.5	4.8
>14.6	22.0	5,510 (13.0)	20.1	4,837 (12.6)	−0.3	−2.6
Total	**100**	**20,202 (10.4)**	**100**	**19,962 (10.4)**	**−0.0§§**	**−0.3**

Abbreviations: A/PI = Asian or Pacific Islander; AI/AN = American Indian or Alaska Native.
* Excludes Kalawao County, Hawaii because of missing poverty data.
† For comparability, the county poverty ranges are constant across race and ethnicity groups and years.
§ Percentage of indicated group residing in counties within the specified poverty range.
¶ Numbers and rates exclude persons aged <10 years.
** Firearm suicides per 100,000 persons; age-adjusted to the year 2000 U.S. standard population.
†† Excludes decedent records with missing race and ethnicity or age.
§§ A value of "−0.0" denotes a negative change rounded to the nearest tenth; a value of "0.0" denotes a positive change rounded to the nearest tenth.
¶¶ Excludes decedent records with missing age.

against intimate partner and other violence, prevent substance use and suicide attempts, encourage help-seeking, or provide mentoring and employment opportunities can be implemented more broadly, irrespective of risk (*3*,*4*,*13*).

Approaches that focus on enhancing firearm safety and storage, particularly to protect persons at risk from harming themselves or others, are part of a comprehensive prevention strategy. For example, research suggests that physician counseling paired with provision of a safety device is associated with safer firearm storage practices in the home (*19*). A recent review also concluded that child access prevention laws have been associated with lower rates of youth firearm self-injury, including suicide, and laws preventing firearm ownership by those under domestic violence restraining orders are associated with reductions in intimate partner homicides (*20*). It is important to examine the circumstances and mechanisms (e.g., implementation processes and changes in knowledge or norms) that facilitate the most effective firearm safety approaches (*20*).

There is substantial need for additional research to expand the evidence base for programs, policies, and practices that effectively reduce firearm injuries and deaths, and that address inequities in risk for violence and suicide.

The findings in this report are subject to at least four limitations. First, the urbanization and poverty measures are countywide indicators and thus not specific to any demographic subpopulations. Second, statistically stable rate estimates for certain demographic cross-classifications could not be reported because of small counts. Third, rate estimates by race and ethnicity could reflect underreporting of deaths in the vital statistics data, particularly for AI/AN persons. Finally, the study could not determine why observed increases occurred or whether they are attributable to the COVID-19 pandemic or other causes. Preliminary data for 2021 indicate that firearm homicide incidence during the first half of 2021 was higher than that during the same period in 2020, suggesting that the elevated rate might have persisted; however, further analysis is required (*1*).

The increases in firearm homicide rates and persistently high firearm suicide rates in 2020, with increases among populations that were already at high risk, have widened disparities and heightened the urgency of actions that can have immediate and lasting benefits. State and local governments, community partners, and health care and other service providers can use the best available evidence to implement comprehensive approaches to prevent homicide and suicide, including addressing physical, social, and structural conditions that contribute to violence and disparities.

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Summary

What is already known about this topic?

Firearm homicides and suicides represent important public health concerns in the United States, with substantial inequities by race and ethnicity and poverty level.

What is added by this report?

In 2020, coincident with the COVID-19 pandemic, the firearm homicide rate increased nearly 35%, reaching its highest level since 1994, with disparities by race and ethnicity and poverty level widening. The firearm suicide rate, although higher than that for firearm homicide, remained nearly level overall but increased among some populations.

What are the implications for public health practice?

Communities can implement comprehensive violence prevention strategies to address physical, social, and structural conditions that contribute to violence and disparities.

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Notes from the Field

Trends in Gabapentin Detection and Involvement in Drug Overdose Deaths — 23 States and the District of Columbia, 2019–2020

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Gabapentin is an anticonvulsant medication, which is also approved by the Food and Drug Administration to treat postherpetic neuralgia, a painful complication of shingles, which results from reactivation of the varicella zoster virus.*,† Gabapentin is commonly used off-label to treat neuropathic pain (*1*). Gabapentin prescribing has steadily increased in recent years, and in 2019, 69 million gabapentin prescriptions were dispensed in the United States, making it the seventh most commonly prescribed medication nationally.§ Although gabapentin is generally considered safe and is infrequently associated with overdose on its own, when used with other central nervous system depressants such as opioids, there is risk for respiratory depression, potentially resulting in death (*2*).¶

Gabapentin can be used to potentiate illicit opioids; data indicate gabapentin exposures associated with intentional abuse, misuse, or unknown exposures reported to U.S. poison centers increased by 104% from 2013 to 2017 (*3*). However, less is known about the drug's role in fatal overdoses (*4*). To assess quarterly trends in gabapentin-involved overdose deaths of unintentional or undetermined intent during 2019–2020, CDC analyzed data from the State Unintentional Drug Overdose Reporting System (SUDORS) in 23 states and the District of Columbia.** SUDORS requires jurisdictions to abstract data from death certificates and medical examiner or coroner reports, including postmortem toxicology results, which identify detected drugs and those determined to cause death (referred to as involved††).

Data on 62,652 overdose deaths that occurred during 2019–2020 in the 24 jurisdictions were entered in SUDORS; among 58,362 deaths with documented toxicology results, a total of 5,687 (9.7%) had gabapentin detected on postmortem toxicology. Gabapentin-involved deaths occurred in 2,975 of 5,687 decedents (52.3%) with a positive gabapentin test result. Across the study period, the demographic characteristics of decedents remained largely similar. Most gabapentin-involved overdose deaths occurred among non-Hispanic White persons (83.2%) and persons aged 35–54 years (52.2%); gabapentin-involved overdose deaths occurred with approximately equal frequency among men (49.7%) and women (50.3%).

During the second quarter of 2020, the number of deaths reported with gabapentin detected (959) approximately doubled compared with the first quarter of 2019 (449) (Figure); in the fourth quarter of 2020, 801 deaths with gabapentin detected occurred. Among deaths where gabapentin was detected, 49.4% were gabapentin-involved during the first quarter of 2019; this percentage increased to 55.1% during the fourth quarter of 2020.

The percentage of deaths with gabapentin detected that were opioid-involved remained consistently high, ranging from 85% to 90%. Illicit opioid-involved deaths accounted for 56.8% of overdose deaths with gabapentin detected in the first quarter of 2019 and 69.2% in the last quarter of 2020; this increase was largely driven by illicitly manufactured fentanyl and fentanyl analogs. The percentage of deaths that involved a prescription opioid declined from 41.9% of deaths with gabapentin detected in the first quarter of 2019 to 33.0% during the last quarter of 2020. The percentage of deaths with gabapentin detected that involved a stimulant (in the absence of opioid coinvolvement) was low and largely stable, ranging from 6% to 9%.

During 2019–2020, gabapentin detection and involvement in fatal drug overdoses increased, appearing to follow the rising trend in overall overdose deaths during the COVID-19 pandemic. Overall increases were largely driven by increases in synthetic opioids such as illicitly manufactured fentanyls and likely exacerbated by the social and economic consequences of the pandemic. Nearly 90% of drug overdose deaths in which

* https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/020235s064_020882s047_021129s046lbl.pdf

† https://effectivehealthcare.ahrq.gov/products/nonopioid-chronic-pain/research

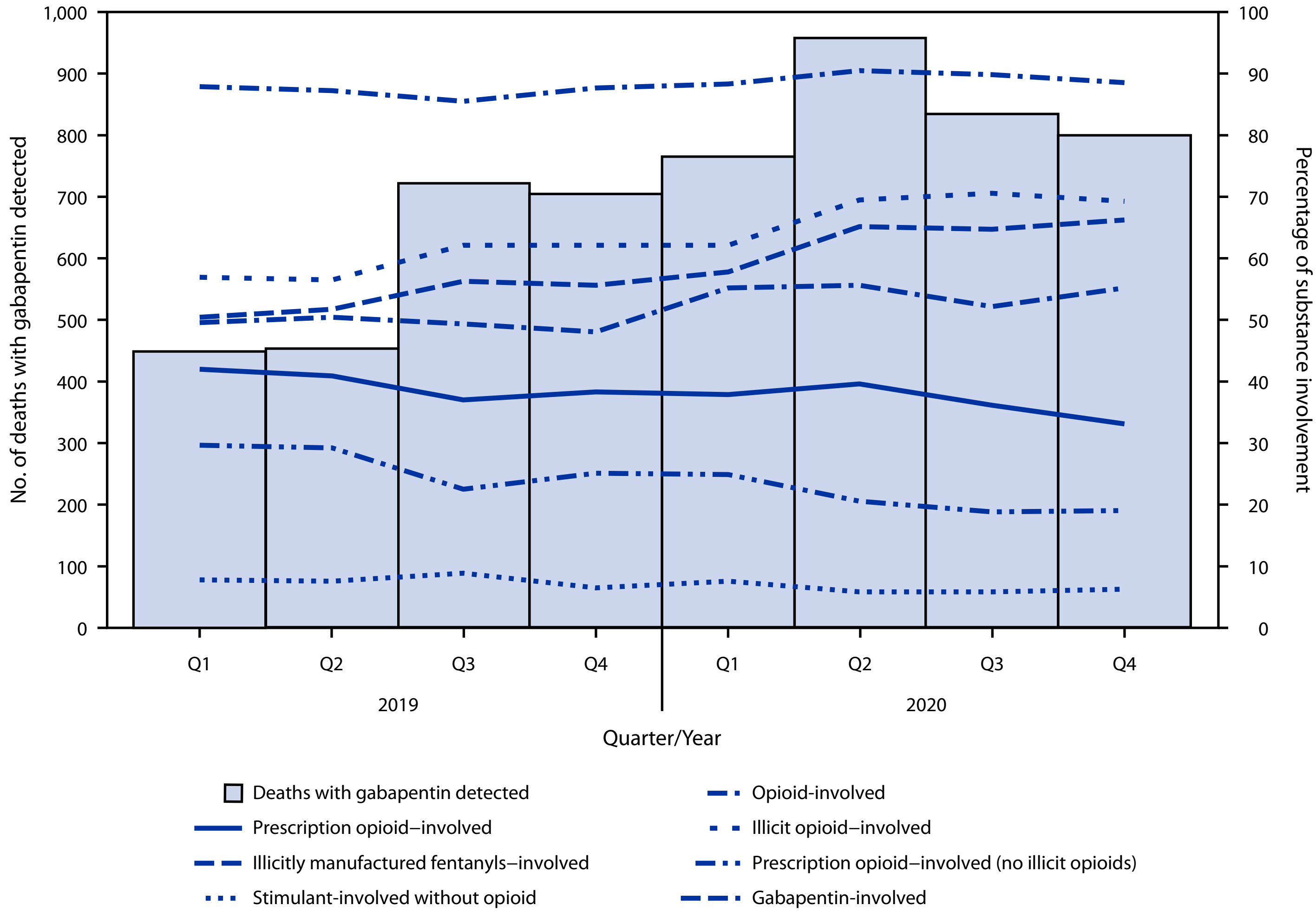
§ https://www.iqvia.com/insights/the-iqvia-institute/reports/medicine-spending-and-affordability-in-the-us

¶ https://www.fda.gov/drugs/drug-safety-and-availability/fda-warns-about-serious-breathing-problems-seizure-and-nerve-pain-medicines-gabapentin-neurontin

** Data are reported to SUDORS in half-year increments (January–June and July–December) based on when deaths occur. Twenty-three states (Alaska, Connecticut, Delaware, Georgia, Illinois, Maine, Massachusetts, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia, Washington, and West Virginia) and the District of Columbia submitted complete data at the time of analysis and were included in this report. Data for this report were downloaded on October 25, 2021, and might differ from other reports because death data might be updated over time, and SUDORS supplements death certificate data with medical examiner and coroner reports.

†† When nonspecific terminology was used in an overdose cause of death statement (e.g., "multidrug overdose"), all drugs detected in postmortem toxicology were included as involved in the death. For example, if the cause of death was "multidrug overdose" and toxicology results were positive for five drugs, all five were classified as involved.

FIGURE. Quarterly trends in gabapentin detection and involvement of gabapentin and other substances in drug overdose deaths among decedents in whom gabapentin was detected, by substance involvement* — 23 states and the District of Columbia,† 2019–2020



Abbreviation: Q = quarter.

* Substances determined to have caused death. When nonspecific terminology was used in an overdose cause of death statement (e.g. multidrug overdose), all drugs detected in postmortem toxicology were included as involved in the death. For example, if the cause of death was "multidrug overdose," and toxicology results were positive for five drugs, all five were classified as involved.

† Twenty-three states (Alaska, Connecticut, Delaware, Georgia, Illinois, Maine, Massachusetts, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia, Washington, and West Virginia) and the District of Columbia.

gabapentin was detected also involved an opioid, particularly (and increasingly) illicitly manufactured fentanyls. Although gabapentin testing is recommended as part of comprehensive postmortem toxicology testing protocols for drug overdose death investigations in the United States, gabapentin is not included in the list of substances recommended in an adequate analyte panel (*5*) and is not uniformly included on death certificates by some certifiers; therefore, overdose deaths involving gabapentin or with gabapentin detected are likely underestimated. Routine gabapentin testing, as part of comprehensive postmortem toxicology testing protocols for drug overdose death investigations, could further elucidate its role in drug overdose deaths. Despite the lack of uniform testing, gabapentin detection and involvement in overdose deaths increased during 2019–2020. These findings highlight the dangers of polysubstance use, particularly co-use of gabapentin and illicit opioids. Persons who use illicit opioids with gabapentin should be educated about the increased risk for respiratory depression and death.

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Notes from the Field

Increase in Drug Overdose Deaths Among Hispanic or Latino Persons — Nevada, 2019–2020

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Reports have documented national and state-level increases in drug overdose–related emergency department visits, emergency medical services incidents, and deaths among racial and ethnic minority groups in the United States during 2020 amid the COVID-19 pandemic (*1*–*3*). In June 2021, the Nevada Department of Health and Human Services reported an increase in drug overdose deaths during 2020 among Hispanic or Latino (Hispanic) persons, who make up approximately one third of Nevada's population (*4*). To better understand this increase, investigators analyzed 2019–2020 State Unintentional Drug Overdose Reporting System (SUDORS) data.*

SUDORS is a CDC surveillance system containing detailed information on death scene investigations, toxicology, and other risk factors associated with fatal drug overdoses of unintentional or undetermined intent. Hispanic persons were identified through the SUDORS ethnicity variable, which considers persons with Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin as Hispanic, regardless of race. Chi-square pairwise comparisons with Bonferroni adjustment were used to assess differences between 2019 and 2020 in characteristics and circumstances for all overdose deaths and for those among Hispanic persons (*5*).

From 2019 to 2020, drug overdose deaths among all races and ethnicities in Nevada increased 54.5% (from 510 to 788), compared with 119.7% (from 66 to 145) among Hispanic persons (Table). By sex and age group, the highest percentage increases occurred among males (overall = 6.9%; Hispanic persons = 6.2%) and those aged <25 years (overall = 77.6%; Hispanic persons = 86.2%). During 2020, the proportions of Hispanic decedents who were male (77.2%) and those aged <25 years (28.3%) were higher than overall proportions (68.3% male; 13.5% aged <25 years). From 2019 to 2020, the proportion of deaths involving illicitly manufactured fentanyls† increased significantly overall (115.6%) and among Hispanic persons (134.5%). By route of drug administration, oral ingestion was highest for deaths in both 2019 (overall = 38.0%; Hispanic persons = 40.9%) and 2020 (overall = 40.7%; Hispanic persons = 31.0%), and the proportion of smoking among Hispanic persons increased 31.6%. During 2020, among those with opioids contributing to death (opioid-involved deaths), only 28.1% of all decedents and 35.7% of Hispanic decedents were known to have received naloxone (Table). Data in SUDORS are dependent on information documented at time of death, and some might be missing, which could underestimate some of the percentages reported. In addition, Hispanic deaths are included in the "all deaths" group.

To improve evidence-based drug overdose prevention and response efforts among persons who use opioids in Nevada, particularly among young male Hispanic persons who have experienced overdoses involving illicitly manufactured fentanyls, a better understanding of the underlying risks for the recent increase in overdose deaths is needed. Naloxone can reverse the effects of overdose from opioids, such as illicitly manufactured fentanyls. Although evidence of naloxone administration for opioid-involved deaths was higher among Hispanic persons in 2020, only approximately one in three of those Hispanic decedents had evidence§ of naloxone administration. Test strips for detecting fentanyl might be useful, especially in substances that might be ingested or smoked. Increasing awareness of the life-saving potential of naloxone and fentanyl test strips and ensuring that persons who use drugs and their friends and family have access to both and carry them could prevent some overdose deaths. With CDC assistance, part of the Nevada Overdose Data to Action (NV OD2A)¶ program's role is to provide partner organizations with data to alert corresponding communities about drug overdose death increases. For example, NV OD2A convenes community leaders to expand harm reduction strategies among younger Hispanic persons and increase naloxone access to help prevent future overdose deaths. NV OD2A also evaluates existing overdose prevention messaging in the Hispanic community to make improvements, and future actions will include continued monitoring of drug overdose deaths and working toward implementing enhanced prevention efforts.

* SUDORS is a CDC surveillance system funded through Overdose Data to Action (OD2A) that supports 48 jurisdictions to collect and abstract data on unintentional and undetermined intent drug overdose deaths from death certificates and medical examiner or coroner reports (e.g., scene findings, autopsy reports, and full postmortem toxicology findings) for entry into a web-based CDC platform that is shared with the National Violent Death Reporting System (NVDRS). https://www.cdc.gov/drugoverdose/foa/state-opioid-mm.html

† Illicitly manufactured fentanyls include both illicitly manufactured fentanyl and illicit fentanyl analogs; they were identified using both toxicology and scene evidence because toxicology alone cannot distinguish between them.

§ Evidence of naloxone administration includes documentation that the decedent was administered naloxone in response to their fatal overdose.

¶ https://nvopioidresponse.org/od2a/

TABLE. Characteristics, circumstances, and substances contributing to drug overdose deaths among all decedents and Hispanic or Latino decedents — Nevada, 2019–2020

Characteristic, circumstance, or substance	All deaths			Hispanic or Latino deaths		
	2019 (n = 510) No. (%)	2020 (n = 788) No. (%)	% Change in proportion from 2019 to 2020	2019 (n = 66) No. (%)	2020 (n = 145) No. (%)	% Change in proportion from 2019 to 2020
Proportion of overdose deaths among Hispanic or Latino persons, %	NA	NA	NA	12.9	18.4	42.6
Sex						
Male	326 (63.9)	538 (68.3)	6.9	48 (72.7)	112 (77.2)	6.2
Female	184 (36.1)	250 (31.7)	−12.2	18 (27.3)	33 (22.8)	−16.5
Age group, yrs						
<25	39 (7.6)	106 (13.5)	77.6*	10 (15.2)	41 (28.3)	86.2
25–34	83 (16.3)	149 (18.9)	16.0	15 (22.7)	42 (29.0)	27.8
35–44	99 (19.4)	144 (18.3)	−5.7	12 (18.2)	27 (18.6)	2.2
45–54	120 (23.5)	158 (20.1)	−14.5	18 (27.3)	16 (11.0)	−59.7
≥55	169 (33.1)	231 (29.3)	−11.5	11 (16.7)	19 (13.1)	−21.6
Location of overdose†						
Home	391 (76.7)	604 (76.6)	−0.1	55 (83.3)	108 (74.5)	−10.6
Other location or unknown	119 (23.3)	184 (23.4)	0.4	11 (16.7)	37 (25.5)	52.7
Evidence of unresolved substance use or misuse problem reported¶						
Yes	350 (68.6)	536 (68.0)	−0.9	46 (69.7)	91 (62.8)	−9.9
No or unknown	160 (31.4)	252 (32.0)	1.9	20 (30.3)	54 (37.2)	22.8
Route of administration**						
Oral ingestion	194 (38.0)	321 (40.7)	7.1	27 (40.9)	45 (31.0)	−24.2*
Injection	109 (21.4)	126 (16.0)	−25.2*	11 (16.7)	16 (11.0)	−34.1
Smoking	92 (18.0)	147 (18.7)	3.9	10 (15.2)	29 (20.0)	31.6
Snorting	26 (5.1)	82 (10.4)	103.9*	—§	19 (13.1)	—§
Unknown	107 (21.0)	51 (6.5)	−69.0*	17 (25.8)	19 (13.1)	−49.2*
Opioids contributing to death††						
Any opioid	293 (57.5)	516 (65.5)	13.9*	37 (56.1)	98 (67.6)	20.5
Prescription opioids	128 (25.1)	180 (22.8)	−9.2	18 (27.3)	23 (15.9)	−41.8
Heroin	103 (20.2)	124 (15.7)	−22.3	—§	18 (12.4)	—§
Illicitly manufactured fentanyls§§	75 (14.7)	250 (31.7)	115.6*	13 (19.7)	67 (46.2)	134.5*
Naloxone administration among decedents for whom opioids was listed as a cause of death						
Yes	73 (24.9)	145 (28.1)	12.9	12 (32.4)	35 (35.7)	10.2
No or unknown	220 (75.1)	371 (71.9)	−4.3	25 (67.6)	63 (64.3)	−4.9
Nonopioids contributing to death††						
Methamphetamine	264 (51.8)	376 (47.7)	−7.9	35 (53.0)	67 (46.2)	−12.8
Benzodiazepines	89 (17.5)	168 (21.3)	21.7	—§	35 (24.1)	—§
Cocaine	53 (10.4)	87 (11.0)	5.8	—§	19 (13.1)	—§

Source: Nevada State Unintentional Drug Overdose Reporting System 2019–2020.
Abbreviation: NA = not applicable.
* Indicates statistically significant change from previous year ($p<0.01$).
† House, home, or apartment setting might not be the decedent's residence. Other locations include motor vehicle, park, or other outdoor area that is not in a home.
§ Indicates count or percentage change suppressed because of sample size <10
¶ Evidence of unresolved substance use or misuse problem reported does not include alcohol.
** Based on information from death investigations indicating drug paraphernalia that was found on scene; categories are not mutually exclusive.
†† Includes substances listed as a cause of death. Multiple substances could be listed as a cause of death; therefore, substances are not mutually exclusive.
§§ Illicitly manufactured fentanyls include both illicitly manufactured fentanyl and illicit fentanyl analogs; they were identified using both toxicology and scene evidence because toxicology alone cannot distinguish between them.

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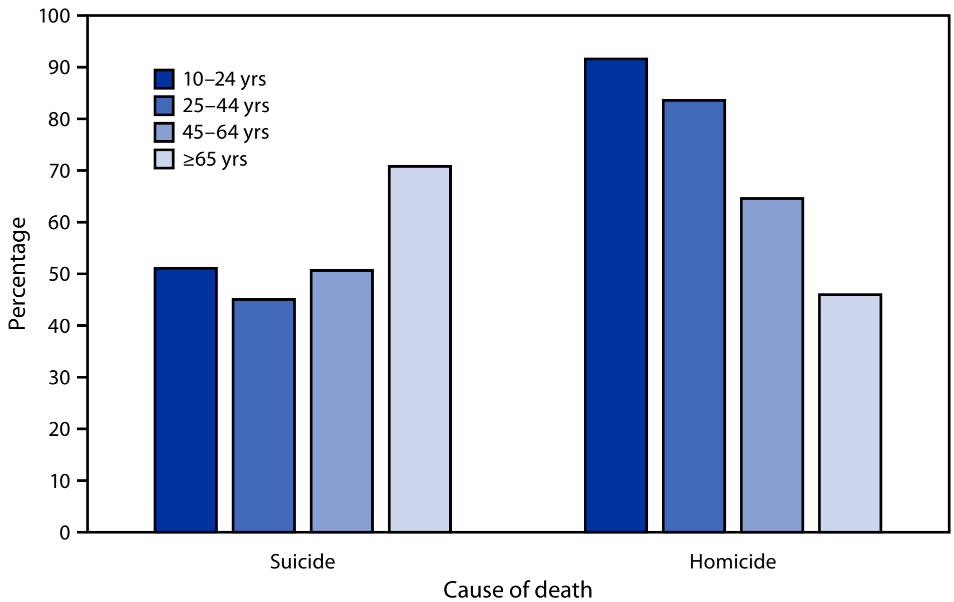
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Suicides* and Homicides† Involving a Firearm Among Persons Aged ≥10 Years, by Age Group — National Vital Statistics System, United States, 2020§



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 2020, approximately 8 in 10 homicides and 5 in 10 suicides in the United States involved firearms. Additional information on firearm homicide and firearm suicide rates during 2019–2020 is available at https://www.cdc.gov/mmwr/volumes/71/wr/mm7119e1.htm

In 2020, among persons aged ≥10 years, the percentage of suicide deaths that involved a firearm was lowest among those aged 25–44 years (45.1%) and highest among those aged ≥65 years (70.8%). The percentage of homicide deaths that involved a firearm decreased with age, from 91.6% among those aged 10–24 years to 46.0% among those aged ≥65 years. Persons aged ≥65 years had the highest percentage of suicide deaths that involved a firearm but the lowest percentage of homicide deaths that involved a firearm.

Source: National Vital Statistics System, Mortality Data, 2020. 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/violenceprevention

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