

Letters

RESEARCH LETTER

National Trends in Pediatric Deaths From Fentanyl, 1999-2021

In 2021, almost 70 000 US adults fatally overdosed on fentanyl.^{1,2} Little is known about the extent to which the fentanyl crisis has affected the pediatric population since the opioid epidemic began nearly 25 years ago, and to our knowledge, no study has reported on national trends in fentanyl poisonings among children younger than 10 years.³⁻⁵

Methods | In this cross-sectional study, county-level vital statistic data from the US Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research (CDC WONDER) database were used to identify opioid deaths between January 1, 1999, and December 31, 2021, among individuals younger than 20 years. Consistent with earlier research,^{5,6} deaths were examined by age category (<1, 1-4, 5-9, 10-14, and 15-19 years). Mortality rates were calculated per 100 000. *International Statistical Classification of Diseases and Related Health Problems, 10th Revision*, codes were used to identify cause and manner of death (eTable in Supplement 1).

Descriptive statistics were used to characterize deaths (per CDC WONDER policy, rates and counts of 9 or fewer deaths cannot be reported). Temporal trends were examined with Poisson regression. Analyses were conducted in SAS, version 9.4 (SAS Institute Inc) with a 2-sided significance level of $P < .05$. This study was exempt from approval by the Yale School of Medicine's Institutional Review Board owing to the use of deidentified, publicly available data. This study followed the **STROBE** reporting guideline.

Results | Fentanyl was implicated in 5194 of 13 861 (37.5%) fatal pediatric opioid poisonings between 1999 and 2021. Most deaths were among adolescents aged 15 to 19 years (89.6%) and children aged 0 to 4 years (6.6%). For all ages, 43.8% of deaths occurred at home, and 87.5% were unintentional. Coingestion of benzodiazepines was implicated in 17.1% of deaths (Table).

In 1999, approximately 5% of the 175 deaths from opioids were from fentanyl. By 2021, 1557 (94.0%) of 1657 opioid deaths were attributed to fentanyl. Between 2013 and 2021, the mortality rate per 100 000 increased 3740.0%, from 0.05 (95% CI, 0.04-0.07) to 1.92 (95% CI, 1.82-2.01) ($P < .001$ for trend) (Figure). For adolescents aged 15 to 19 years, the mortality rate between 2018 and 2021 increased 289.8%, from 1.67 (95% CI, 1.49-1.84) to 6.51 (95% CI, 6.16-6.85) ($P < .001$ for trend); among children aged 0 to 4 years, it increased 590.0%, from 0.10 (95% CI, 0.06-0.15) to 0.69 (95% CI, 0.57-0.81) ($P < .001$ for trend). In 2021, fentanyl was responsible for the deaths of 40 infants and 93 children aged 1 to 4 years.

Discussion | Fentanyl is now the primary agent noted in the pediatric opioid crisis. Mirroring trends seen among adults, pediatric deaths from fentanyl began to increase substantially in 2013, resulting in a more than 30-fold increase in mortality between 2013 and 2021. A surge that began in 2018 has led to a nearly 3-fold increase in deaths among older adolescents and a nearly 6-fold increase among children younger than 5 years. Across age groups, annual deaths peaked in 2020 and 2021,

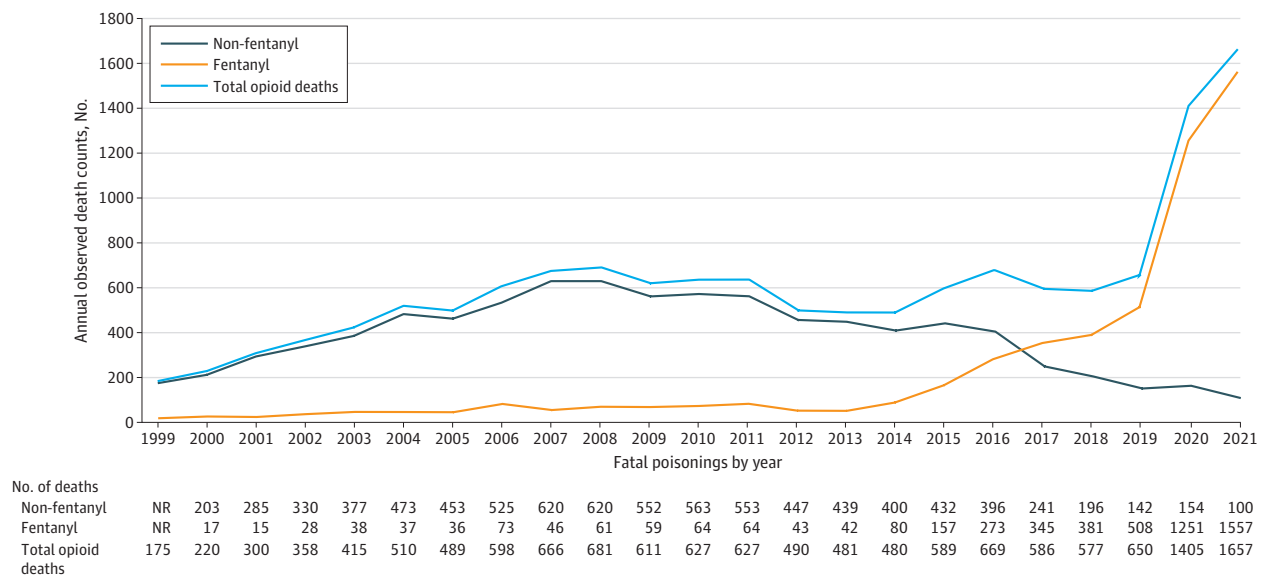
Table. Fatal Pediatric Opioid Poisonings, 1999-2021

Demographic and clinical characteristics	No. (%)		
	All opioids (N = 13 861)	Fentanyl (n = 5194)	Non-fentanyl (n = 8667)
Age category, y			
<1	285 (2.1)	105 (2.0)	180 (2.1)
1-4	694 (5.0)	237 (4.6)	457 (5.3)
5-9	137 (1.0)	26 (0.5)	111 (1.3)
10-14	544 (3.9)	174 (3.4)	370 (4.3)
15-19	12 201 (88.0)	4652 (89.6)	7549 (87.1)
Sex			
Female	3980 (28.7)	1594 (30.7)	2386 (27.5)
Male	9881 (71.3)	3600 (69.3)	6281 (72.5)
Race and ethnicity ^a			
American Indian or Alaskan Native	244 (1.8)	101 (1.9)	143 (1.6)
Black or African American	1409 (10.2)	705 (13.6)	704 (8.1)
Hispanic	2064 (14.9)	1095 (21.1)	969 (11.2)
White	11 959 (86.3)	4221 (81.3)	7738 (89.3)
Other ^b	249 (1.8)	167 (3.2)	82 (0.9)
Coingestion of other substances			
Benzodiazepines	2510 (18.1)	889 (17.1)	1862 (21.5)
Cocaine	1543 (11.1)	636 (12.2)	1025 (11.8)
Psychostimulants	889 (6.4)	494 (9.5)	468 (5.4)
Cannabis	217 (1.6)	91 (1.8)	139 (1.6)
Alcohol	844 (6.1)	328 (6.3)	564 (6.5)
Place of death			
Home	5569 (40.2)	2273 (43.8)	3296 (38.0)
Inpatient	1427 (10.3)	466 (9.0)	961 (11.1)
Emergency department or outpatient	3070 (22.1)	1022 (19.7)	2048 (23.6)
Dead on arrival	404 (2.9)	93 (1.8)	311 (3.6)
Other or unknown	3391 (24.5)	1340 (25.8)	2051 (23.7)
Manner of death			
Unintentional	11 493 (82.9)	4547 (87.5)	6946 (80.1)
Suicide	620 (4.5)	169 (3.3)	451 (5.2)
Homicide	357 (2.6)	120 (2.3)	237 (2.7)
Undetermined	1391 (10.0)	358 (6.9)	1033 (11.9)

^a Race and ethnicity categories are reported according to statistic data from the US Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research database.

^b The race and ethnicity reporting varies from 1999-2020 and 2021, so the other classification reflects the lack of specificity.

Figure. Fatal Pediatric Opioid Poisonings Stratified by Fentanyl vs Non-Fentanyl, 1999-2021



In accordance with the reporting policies followed by the US Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research, values that would allow for the back calculation of 9 or fewer deaths are not reported (NR).

suggesting that the COVID-19 pandemic exacerbated this public health crisis.

The primary limitation of this research is that it relied on population-based death certificate data, including provisional 2021 data. The quality of this information depends on the accuracy and completeness of the investigations conducted at the time of death.

Findings from this study suggest that the pediatric opioid crisis is changing in ways that will make it harder to combat. Commonsense solutions (eg, safe storage and disposal) are still needed to prevent pediatric exposures to opioids, but a greater emphasis on harm reduction strategies is necessary, including parental and adolescent treatment for opioid use disorder and improving access to naloxone in homes, which is where most pediatric deaths from fentanyl occur.

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Disclaimer: The findings and conclusions in this article are those of the author and do not necessarily represent the official position of the Yale School of Medicine.

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