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Cost of Intentional Drug Overdose and Other Self-Harm Among Youth in the U.S., 2021

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Abstract

Objective—To quantify the annual direct healthcare cost of intentional overdose and other types of self-harm resulting in emergency department (ED) and/or inpatient encounters among youth in the United States (U.S.).

Methods—Using the 2021 Nationwide Emergency Department Sample (NEDS) and National Inpatient Sample (NIS) datasets, produced by the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP), we determined nationally representative cross-sectional frequencies and costs for specific types of self-harm encounters among 8- to 21-year-old pediatric and young adult patients.

Results—The total combined one-year cost of all self-harm encounters was $869 million (95% CI $841M-$897M). The majority of this cost was due to intentional overdose-related encounters, which totaled $530 million (95% CI $512M-$547M). Of this total, $232 million (95% CI $223M-$241M) was paid by public insurers and $296 million (95% CI $281M-$312M) was paid by

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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private insurers. Encounters by females accounted for 79% of the intentional overdose costs ($420 million, 95% CI $404M-$435M).

Conclusion—Based on 2021 data, preventing youth intentional overdose could save the U.S. health system up to $530 million, annually. As we collectively work to prevent suicide deaths among young people, it is important to recognize the needs of the larger group of youth who are engaging in serious self-harm and non-fatal suicidal acts, the majority of whom are young females. Prevention of intentional overdose in this population should be a priority, both in terms of upstream public health efforts and promotion of evidence-based methods of safer storage.

Keywords

Intentional overdose; cost; suicide attempt; self-harm

Introduction

Emergency department (ED) encounters for suicidal ideation and attempts among young people in the United States (U.S.) increased five-fold between 2011 and 2021, and the total societal cost of nonfatal self-harm injuries among young people ages 10 to 24 has been estimated at $19 billion, annually.[1–4] While such studies have drawn important attention to the scale and costs of intentional self-harm and suicidal acts among youth, they have not explicitly evaluated direct healthcare costs of specific types of self-harm in this population, such as intentional overdose and other preventable self-harm methods. A more complete understanding of the costs associated with various types of self-harm could provide an important foundation for examining the long-term economic impact of large scale mental health and suicide prevention programs.[5–8]

In 2019, among youth ages 15-24, drug overdose represented the majority (approximately 55%) of all intentional self-harm.[9] With a case fatality rate of 0.4%, this self-harm mechanism did not result in nearly as many deaths as self-harm using other means.[9] In contrast, firearm-related acts of self-harm, which represented 1.9% of all acts of self-harm in this age group, had a case-fatality rate of 82.8%, and thus were responsible for around half of all suicide deaths.[9] In order to save lives, suicide prevention efforts have been focused on restricting access to firearms for young people, especially young people with elevated risk for suicide.[9,10] It is important to note that, historically, self-harm acts involving firearms have occurred in predominantly White young males, with a more recent increase among Black young males.[9] This is in stark contrast to young females, a group more likely than males to be hospitalized for intentional overdose and other types of self-harm, and who also generally have higher rates of diagnosed depression and anxiety.[4,9,11–13] If research in this field is solely focused on death as the outcome, the unmet needs of young females for mental health outreach may be missed.

Controlling access to medications using specialized safes or other lockable storage devices is often a component of suicide prevention programs focused on lethal means restriction, including national programs such as “Lock to Live” and SAFER Communities, though these programs have prioritized safe firearm storage.[14,15] Medication safety counseling is being conducted in many pediatric clinical practices in the U.S., but little is known about what

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kinds of interventions are effective in practice, meaning there is much work left to be done in this area.[16] In this study, we seek to draw attention to the problem of intentional drug overdose among youth by quantifying the direct healthcare cost of emergency and inpatient encounters for intentional overdose (both lethal and non-lethal) to public and private insurers within the U.S. health system using nationally representative hospital data from 2021.[9]

Methods

Design

A retrospective cross-sectional analysis of U.S. nationally representative ED and inpatient (IP) data was performed for 8–21-year-old patients with an intentional overdose or other self-harm diagnosis during 2021 calendar year.

Data Sources and Sample

Nationwide Emergency Department Sample (NEDS)—Encounter data on ED utilization collected by the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) were extracted from the 2021 Nationwide Emergency Department Sample (NEDS). The 2021 NEDS included over 30 million discharge records from 40 states and represented approximately a 20% stratified sample of U.S. EDs, including children's hospitals and trauma centers.[17] The NEDS includes discharge-level healthcare encounter data that do not result in admission, such as basic demographic characteristics, discharge disposition, length of stay, diagnosis codes and procedure codes associated with each encounter. NEDS stratification methods are based on five hospital characteristics: the U.S. Census region, urban or rural location, hospital ownership, trauma center designation, and status as a teaching hospital. The NEDS includes discharge-level weights to generate nationally representative estimates.[17] NEDS encounters that resulted in hospitalization were excluded, in order to avoid double-counting.

National Inpatient Sample (NIS)—The NIS was also developed by the AHRQ/HCUP and is comprised of a nationally representative sample of inpatient hospital admission data, containing data on over 8 million discharges each year. In 2021, the NIS included a 20% stratified sample of discharge-level data from community hospitals, excluding rehabilitation and long-term acute care facilities in 48 states.[18] Similar to NEDS, sample stratification for the NIS is also based on hospital characteristics (Census division, urban or rural location, ownership, teaching status, and number of beds). NIS data elements are coded consistently with the NEDS, including patient demographic characteristics, disposition, diagnosis codes and procedure codes. Discharge-level weights allow for the calculation of nationally representative estimates.[18] This study was determined to be exempt from full Institutional Review Board review by the Johns Hopkins University School of Medicine IRB.

Case Definitions

Encounters were classified using groupings for the International Classification of Diseases, Tenth Revision (ICD-10) diagnosis/billing codes including self-harm involving only prescription medications, only recreational drugs, only over the counter (OTC) drugs,

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a combination of two or more categories of drugs, toxic effects of non-medicinal substances (for example, ingestion of household chemicals or intentional exposure to carbon monoxide), asphyxiation, drowning, or other violent means, including firearms (see Supplemental Table 1 for details). It is possible that some patients within the intentional overdose unique subgroups may have ingested multiple types of drugs, and such encounters were not explored separately. "Intentional overdose" was defined as one or more of three types of self-harm: overdose of prescription drugs, recreational drugs, or OTC drugs. In instances where more than one category of self-harm was present, encounters were classified according to the more lethal means, see Supplemental Table 1 for details.

Ages 8 to 21 years were included to capture self-harm events in pre-adolescents, adolescents and young adults.[19,20] Age groups were classified using the subgroups: 8–12 years, 13–17 years and 18-21 years. Race and ethnicity were classified according to the groupings within the HCUP databases, which include: "White," "Black," "Hispanic," "Asian or Pacific Islander" (identified here using the acronym AAPI), "Native American" (identified here using the acronym AI/AN) and "Other/Unknown". The HCUP classified sex only as "Male" or "Female," so accordingly these groupings were used in this analysis and the term "sex" is used throughout, noting that we do not have information about biological sex or gender identity. Two proxies for socioeconomic status were included, 1) primary insurance, classified as "Private," "Public" or "None/Other"; and 2) median income per patient's zip code. For the NEDS data, a dichotomous admission variable was classified as positive for those discharges with a disposition of "Admitted to this hospital" or a disposition involving transfer to another hospital.

Cost Calculations

Hospital charges information was derived from the HCUP "Total Charges" variable and represents the total amount a hospital charged for a given encounter in 2021. Given that charges represent the dollar amount a hospital sets for services before negotiating any discounts, the amount actually billed to payers is generally a much lower amount than hospital "charges".[21] Previously established algorithms were employed to convert HCUP reported charges into costs; first multiplying by HCUP-provided hospital or ED-level cost-to-charge ratios (CCR).[22–24] We then multiplied by average professional fee ratios (PFR) for both ED and IP encounters, stratified by Medicaid or Commercial payers, as calculated in Peterson et al.[25] To produce nationally representative estimates, we used discharge weights from the NIS and NEDS datasets to compute total estimates, both overall and by insurance type (public or private).[26] For purposes of this analysis, hospital transport, follow-up care (medical or psychiatric) and indirect costs were not included.

Data Analysis

Nationally weighted demographic and clinical characteristics of patients with encounters involving intentional overdose were compared by sex using Pearson's Chi-squared tests or linear regression, separately for the ED and IP datasets. Weighted demographic and clinical characteristics for both datasets combined were estimated by specific subtype of self-harm code, using the categories described above. To evaluate cost, weighted mean and total estimated costs of each type of self-harm encounter were calculated for the NEDS and

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NIS, as well as the NEDS and NIS combined, and intentional overdose cost was stratified by public versus private insurance and sex. Finally, a sub-analysis explored the specific medication or drug types most commonly associated with intentional overdose encounters in the combined NEDS and NIS. Discharge-level and stratum-level weights were used as per the HCUP-recommended methods to generate national-level frequencies and estimated cost totals. Statistical analyses were conducted using Stata software, version 18.0 (StataCorp LLC, College Station, TX).

Results

Of the over 3.7 million records for 8- to 21-year-olds in the NIS and the NEDS in 2021, 27,844 records (19,367-ED, 8,477-IP) were identified with an ICD-10 code indicating intentional overdose which represented a weighted national sample of 124,381 encounters (Table 1). Among the ED intentional overdose group, the mean age at encounter was 15.7 (SD 2.5), 81.1% were female, the majority were White (56.3%); and Medicaid (46.8%) and Private Insurance (43.8%) were the most common insurance types. Among the inpatient group, the mean age at discharge was 16.2 (SD 2.6), 79.5% were female, the majority were White (55.5%), and Medicaid (45.4%) and Private Insurance (45.4%) were the most common insurance types. For both types of encounters, median income quartile was relatively evenly distributed, ranging between 22.1% and 27.3%. Females were more likely than males to be admitted to an inpatient setting (62.5% vs 58.4%, p<.001). The death rate for patients in the ED and inpatient settings was less than 1% for all groups (Table 1).

Table 2 provides nationally weighted frequencies of encounter characteristics with self-harm by category of ICD-10 code, using combined 2021 NEDS and NIS datasets (ages 8–21). Intentional overdose represented 60.5% of self-harm events in this population, and most of the intentional overdose encounters involved one or more prescription drugs (48.8% of all self-harm events, Table 2). OTC drugs and multiple drug types represented smaller proportions of self- harm events, 7.8% and 3.1%, respectively. The second most common category of self-harm was “Other violent means, including firearms” with 36.6% of encounters. Across all self-harm categories except for asphyxiation, females were represented in greater proportions than males, and White youth were the largest group across all self-harm types. Admission rates ranged from 79.1% for drowning to 41.2% for firearms and other violent means, and the admission rate for intentional overdose was 61.7%. The highest death rates occurred among patients with asphyxiation (10.8%); among those with intentional overdose, the death rate was less than .001%.

Nationally weighted mean and total hospital estimated costs by inpatient and ED encounters are detailed in Table 3. The total combined inpatient and ED direct healthcare cost of all self-harm events in this population in 2021 was $869 million (95% CI $841M-$897M). The majority of this cost was accounted for by intentional overdose costs, which totaled $530 million (95% CI $512M-$547M) in direct costs. Public payers paid 43.8% of these costs ($232 million, 95% CI $223M-$241M), and 55.8% ($296 million, 95% CI $281M-$312M) was paid by private insurers. Encounters by females accounted for 79% of the intentional overdose charges ($420 million, 95% CI $404M-$435M). The highest direct cost

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for ED encounters involved drowning ($2,311, 95% CI $1,205-$3,418), while asphyxiation accounted for the highest inpatient cost ($27,589, 95% CI $20,650-$34,527, Table 3).

Tables 4a. and 4b. list the top 20 diagnosis codes for ED and inpatient encounters among encounters with prescription-related intentional-overdose ICD-10 codes. The lists are ranked in order of codes with the highest proportion of all intentional overdose encounters and display similar patterns between inpatient and ED encounters. Most coding involved analgesic (specifically, aminophenol derivatives, propionic acid derivatives), antidepressant (specifically, selective serotonin reuptake inhibitor), antipsychotic, antiallergy or antiemetic medications. “Unspecified” or “other drugs” constituted an estimated 12.6% of the ED intentional overdose coding (Table 4).

Discussion

The most recent exhaustive analysis of the cost of youth suicide in the U.S. was published over 35 years ago, in 1989, and it is time to refocus on this problem.[6] Given the U.S. calls for action, reflected in the April 2024 National Strategy for Suicide Prevention Federal Action Plan and the 2022 White House National Drug Control Strategy,[2,27] it is important to understand the direct healthcare costs of intentional self-harm for public and private insurers. This work demonstrates that, per 2021 data, preventing youth self-harm resulting in ED and IP hospital encounters could save the U.S. health system up to $530 million, annually, representing a substantive economic impact to the health system.

This work focuses specifically preventable self-harm among youth, with the underlying idea that most youth live in an environment where parents and caregivers *can* limit access to lethal means, whereas this circumstance is generally different for adults. Indisputably, safe gun storage is vital to reducing youth suicide death rates, but youth self-harm by intentional overdose of prescription, OTC and recreational drugs is also potentially avoidable through safer storage of drugs by adult household members.[10] The total cost to public payers due to intentional overdose was $232 million, which supports a fiscal argument for increasing federally supported programs promoting evidence-based methods of safer storage, such as medication lock boxes.[28] This work would also support calls for improved systems for real-time tracking of nonfatal drug overdoses, both to better understand the epidemiology of overdose and to detect drugs that may represent emerging threats.[29]

An important strength of this study is the focus on self-harm among young females. Though admittedly a lofty goal, preventing intentional overdose could save up to $530 million dollars per year in total, and 79.5% ($420 million) of that is comprised of encounters by females. This finding argues for the development of tailored prevention efforts, taking into account the unique experiences of young people of all genders, ethnicities and races, providing culturally sensitive, multilevel programming to prevent intentional self-harm and address mental health problems. Another strength of this work is the use of nationally representative datasets to estimate the economic impact of both fatal and non-fatal self-harm resulting in hospitalization, allowing us to draw conclusions about the potential healthcare cost impact of interventions to reduce lethal means access and/or to address unmet mental

health needs that may result in suicidal thoughts or actions, both of which are important components of the National Strategy for Suicide Prevention.[2]

There are limitations to this work. First, we are only capturing intentional self-harm events that result in an ED encounter and/or hospital admission; we are unable to account for self-harm resulting in an urgent care or other healthcare encounter or attempts that were not disclosed and/or did not result in any medical visit, all of which would indicate that we are underestimating the health system cost of youth self-harm. We are also only examining the very specific population of patients who attempt suicide, have a medical evaluation and live long enough to get admitted to a hospital, which is a very different population than that captured by suicide death data. For example, the population in this study who had self-harm encounters for “Other violent means, including firearms” was 72% female, very different from the population who die by firearms, estimated to 78% males (for all ages).[9] Finally, due to the nature of clinical record data, we have limited demographic data, such as detailed race and gender identity information, and we hope that future data collection efforts will allow for more granular categories of both.

We acknowledge that the direct health system economic cost of youth self-harm is a small part of the larger resource puzzle, and it is not within the scope of this work to analyze other important and substantial cost measures related to self-harm or suicide, such as follow up mental and physical health care or Years of Productive Life Lost (YPLL).[1] Quantifying the current full scope of the economic impact of youth self-harm and suicide is an important direction for future research. We are also unable to quantify the immeasurable pain and suffering that accompany self-harm and youth suicide attempts, but it is important to honor the very personal and difficult experiences of families and young people represented in these data.

Conclusion

In conclusion, a deeper understanding of the epidemiology of youth self-harm and suicide is an important component of developing appropriate and targeted support for young patients with need. While it is essential to continue to work to prevent suicide deaths, it is also important to recognize the needs of the larger group of young people who are engaging in serious self-harm and non-fatal suicidal acts, the majority of whom are young females. The field of emergency medicine has made remarkable progress in saving the lives of the vast majority of patients who present with drug overdose,[30] but this still comes at a great economic impact, and it is critical to remember the many reasons why prevention should be prioritized.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

U.S.	United States
ED	Emergency Department
NEDS	Nationwide Emergency Department Sample
NIS	National Inpatient Sample
AHRQ	Agency for Healthcare Research and Quality
HCUP	Healthcare Cost and Utilization Project
IP	Inpatient
OTC	Over the counter
AAPI	Asian or Pacific Islander
AI/AN	American Indian/Alaska Native
PFR	Professional fee ratios
YPLL	Years of Productive Life Lost

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What's New

The direct healthcare cost of intentional overdose and self-harm in the U.S. is substantial. This work supports prevention efforts focused intentionally on all genders, including upstream public health efforts as well as promotion of evidence-based methods of safer medication storage.

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Table 1a.

Weighted patient characteristics for patients with intentional overdose ICD-10 codes by gender, 2021 NEDS and 2021 NIS, Ages 8–21

	National Emergency Department Sample (NEDS)***				National Inpatient Sample (NIS)			
	All intentional overdose*, n(%)	Males, n(%)	Females, n(%)	p value**	All intentional overdose*, n(%)	Males, n(%)	Females, n(%)	p value**
Characteristics								
N	81,996	15,460 (18.9%)	66,536 (81.1%)		42,385	8,695 (20.5%)	33,690 (79.5 %)	
Age category				<0.001				<0.001
8–12	11. 7%	6.0%	13.0%		7.9%	3.3%	9.1%	
13–17	64.6%	58.2%	66.1%		59.4%	51.1%	61.6	
18–21	23.7%	35.8%	20.8%		32.7%	45.6%	29.4%	
Race/ethnicity				0.84				0.092
Asian American Pacific Islander	2.7%	2.6%	2.7%		2.9%	2.4%	3.0%	
American Indian and Alaska Native	1.2%	1.2%	1.2%		1.5%	1.4%	1.5%	
Black	12.3%	11.7%	12.4%		13.9%	13.9%	13.9%	
Hispanic	17.5%	17.1%	17.6%		15.3%	13.3%	15.8%	
White	56.3%	57.1%	56.2%		55.5%	57.6%	54.9%	
Other/Unknown	10.1%	10.3%	10.0%		11.0%	11.4%	10.9%	
Insurance				<0.001				0.119
Medicare	0.4%	0.5%	0.4%		0.4%	0.3%	0.4%	
Medicaid	46.8%	45.1%	47.2%		45.4%	43.0%	46.0%	
Private	43.8%	43.5%	43.9%		45.4%	47.5%	44.9%	
Self-pay/No charge	5.2%	6.6%	4.9%		4.2%	4.8%	4.1%	
None/Unknown/ Other	3.7%	4.3%	3.6%		4.6%	4.4%	4.7%	
Median Household Income Quartile				0.093				0.048
Q1	26.1%	27.4%	25.9%		26.9%	26.4%	26.9%	
Q2	27.3%	26.0%	27.6%		25.3%	24.7%	25.3%	
Q3	24.5%	23.8%	24.6%		25.6%	25.9%	25.6%	
Q4	22.1%	22.8%	22.0%		22.2%	22.3%	22.2%	
Admitted/ Transferred (NEDS only)	61.7%	58.4%	62.4%	<0.001				
Died	<0.01%	<0.01%	<0.01%	0.144	0.2%	0.5%	0.2%	0.012

* See Supplemental Table 1 for list of ICD-10 groupings; intentional overdose includes prescription, recreational drugs and OTC drugs

** Pearson's Chi-squared test was used for categorical variables, and linear regression was used for continuous variables.

*** Excluding n=154,438 NEDS observations from inpatient data sources in order to avoid duplicate counts

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Table 2.

Nationally weighted characteristics of encounters with self-harm Dx by type of intentional overdose ICD-10 code, 2021 NEDS and NIS combined, Ages 8–21

	Intentional overdose, N=124,381					Other intentional self-harm, N=81,195			
	Any Intentional Overdose (combo of all 4 groupings	**Prescription drugs(only)**	**Recreational Drugs (only)**	**OTC drugs(only)**	**Multiple drugs**	**Toxic effects of non-medicinal substances**	**Asphyxiation**	**Drowning**	**Other violent means, incl firearms**
Nationally weighted N	124,381	100,211	1,912	15,942	6,316	4,219	1,578	155	75,243
Nationally weighted % (of total with any self-harm	60.5%	48.8%	0.9%	7.8%	3.1%	2.1%	0.8%	<.01%	36.6%
Age category									
8–12	10.4%	10.4%	5.1%	11.5%	8.6%	8.9%	16.9%	6.6%	11.0%
13–17	62.9%	63.0%	50.6%	63.2%	64.2%	56.7%	52.4%	52.5%	59.2%
18–21	26.7%	26.6%	44.2%	25.3%	27.2%	34.4%	30.7%	40.9%	29.9%
Sex									
Female	80.6%	81.7%	60.2%	77.0%	77.9%	68.8%	47.4%	74.1%	72.3%
Male	19.4%	18.3%	39.8%	23.0%	22.1%	31.2%	52.6%	25.9%	27.7%
Race/ ethnicity									
AAPI	2.7%	2.8%	2.7%	2.6%	2.0%	2.7%	1.7%	0.0%	2.0%
AI/AN	1.3%	1.3%	0.7%	1.1%	1.9%	1.5%	1.6%	0.0%	1.4%
Black	12.8%	12.2%	10.6%	16.8%	13.2%	15.5%	11.9%	35.7%	10.5%
Hispanic	16.8%	16.7%	18.7%	17.5%	15.7%	14.4%	19.2%	21.4%	16.0%
White	56.0%	56.9%	53.7%	51.8%	54.5%	52.1%	48.6%	36.5%	61.5%
Other/ Unknown	10.4%	10.2%	13.6%	10.2%	12.6%	13.8%	17.0%	6.4%	8.6%
Insurance									
Medicare	0.4%	0.4%	1.5%	0.5%	0.2%	0.4%	1.4%	3.5%	0.8%
Medicaid	46.3%	45.9%	41.5%	49.6%	46.1%	47.4%	46.6%	47.0%	49.8%
Private	44.4%	45.0%	44.4%	40.0%	45.0%	43.3%	39.1%	27.2%	39.8%
Self-pay/No charge	4.9%	4.7%	8.8%	5.8%	4.6%	4.9%	1.5%	16.1%	5.0%
Unknown/ Other	4.1%	4.0%	3.9%	4.1%	4.2%	4.0%	8.8%	6.3%	4.7%
Median Household									

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	Intentional overdose, N=124,381					**Other intentional self-harm, N=81,195**			
	Any Intentional Overdose (combo of all 4 groupings	**Prescription drugs(only)**	**Recreational Drugs (only)**	**OTC drugs(only)**	**Multiple drugs**	**Toxic effects of non-medicinal substances**	**Asphyxiation**	**Drowning**	**Other violent means, incl firearms**
Income Quartile									
Q1	26.4%	26.0%	23.5%	29.2%	27.4%	26.1%	26.5%	32.6%	25.8%
Q2	26.6%	26.4%	31.0%	27.4%	26.9%	25.7%	27.0%	18.7%	26.7%
Q3	24.8%	25.3%	23.2%	22.1%	24.7%	24.7%	24.1%	28.0%	24.3%
Q4	22.1%	22.3%	22.3%	21.3%	21.0%	23.5%	22.4%	20.7%	23.2%
Admitted (NEDS only)	61.7%	62.7%	50.1%	56.4%	66.5%	62.6%	65.1%	79.1%	41.2%
Died	<.001%	<.0001%	<.0001%	0.002%	<.0001%	0.1%	10.8%	0.0%	0.5%

[*] See Supplemental Table 1 for list of specific ICD-10 codes used for groupings

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Table 3a.

Nationally weighted mean and total costs* of encounters with self-harm Dx by type of intentional overdose ICD-10 code, 2021 NEDS/NIS, Ages 8–21

	Emergency Department	Inpatient	Emergency and Inpatient Combined
Type of self-harm code	**mean cost (95%CI)**	**mean cost (95% CI)**	**total cost (95% CI)**
All intentional overdose	$1,596 ($1,574, $1,617)	$9,536 ($9,170, $9,904)	$530 M ($512 M, $547 M)
Prescription drugs	$1,625 ($1,601, $1,650)	$9,563 ($9,145, $9,981)	$444 M ($427 M, $461 M)
Recreational Drugs	$1,426 ($1,326, $1,609)	$10,974 ($8,583, $13,364)	$7.38 M ($5.78 M, $8.98 M)
OTC drug/household items	$1,372 ($1,335, $1,410)	$8,102 ($7,402, $8,801)	$44.1 M ($40.9 M, $47.3 M)
Multiple types of drugs	$1,888 ($1,755, $2,021)	$10,774 ($9,595, $11,952)	$34.5 M ($30.6 M, $38.4 M)
Toxic effects of non-medicinal substances	$1,769 ($1,601, $1,938)	$11,030 ($9,424, $12,637)	$22.5 M ($19.2 M, $25.8 M)
Asphyxiation	$1,948 ($1,752, $2,145)	$27,589 ($20,650, $34,527)	$16.0 M ($11.5 M, $20.4 M)
Drowning	$2,311 ($1,205, $3,418)	$5,334 ($2,694, $7,974)	$0.52 M ($0.26 M, $0.79 M)
Other violent means, incl firearms	$1,103 ($1,081, $1,124)	$14,313 ($13,143, $15,483)	$300 M ($279 M, $321 M)
Total of all self-harm combined	$1,402 ($1,386, $1,417)	$11,024 ($10,608, $11,440)	$869 M ($841 M, $897 M)

*Costs are calculated by multiplying total hospital charges by cost to charges ratio, then by the appropriate provider charges ratio

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Table 3b.

Nationally weighted total costs* of encounters with intentional overdose ICD-10 code by gender and insurace type, 2021 NEDS/NIS, Ages 8–21

	Emergency and Inpatient Combined	Combined Total Medicaid/ Medicare Costs	Combined Total Private/Self-pay/ Other Insurance Costs
Type of self-harm code	**total cost (95% CI)**	**total cost (95% CI)**	**total cost (95% CI)**
Total of all self-harm combined	$869 M ($841 M, $897 M)	$397 M ($379 M, $416 M)	$470 M ($449 M, $491 M)
All intentional overdose (IO)	$530 M ($512 M, $547 M)	$232 M ($223 M, $241 M)	$296 M ($281 M, $312 M)
IO - males	$110 M ($102 M, $119 M)	$46.8 M ($42.1 M, $51.6 M)	$62.9 M ($56.0 M, $69.9 M)
IO - females	$420 M ($404 M, $435 M)	$185 M ($178 M, $193 M)	$233 M ($220 M, $247 M)

*Costs are calculated by multiplying total hospital charges by cost to charges ratio, then by the appropriate provider charges ratio

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Table 4a.

20 Most common medication/drug-related ICD-10 Codes in the Emergency Department Sample

HCUP coding	diagnosis	Weighted proportion of all intentional overdose
T391X2A	Poisoning by 4-Aminophenol derivatives, intentional self-harm	22.0%
T43222A	Poisoning by selective serotonin reuptake inhibitors, intentional self-harm	16.4%
T39312A	Poisoning by propionic acid derivatives, intentional self-harm	16.0%
T43592A	Poisoning by other antipsychotics and neuroleptics, intentional self-harm	8.7%
T450X2A	Poisoning by antiallergic and antiemetic drugs, intentional self-harm	8.0%
T50902A	Poisoning by unspecified drugs, medicaments and biological substances, intentional self-harm	7.3%
T43212A	Poisoning by selective serotonin and norepinephrine reuptake inhibitors, intentional self-harm	4.1%
T50992A	Poisoning by other drugs, medicaments and biological substances, intentional self-harm	4.1%
T424X2A	Poisoning by benzodiazepines, intentional self-harm	3.7%
T426X2A	Poisoning by other antiepileptic and sedative-hypnotic drugs, intentional self-harm	3.2%
T43292A	Poisoning by other antidepressants, intentional self-harm	2.0%
T465X2A	Poisoning by other antihypertensive drugs, intentional self-harm	1.8%
T402X2A	Poisoning by other opioids, intentional self-harm	1.6%
T39392A	Poisoning by other nonsteroidal anti-inflammatory drugs [NSAID], intentional self-harm	1.5%
T43622A	Poisoning by amphetamines, intentional self-harm	1.4%
T43632A	Poisoning by methylphenidate, intentional self-harm	1.1%
T6592XA	Toxic effect of unspecified substance, intentional self-harm	1.0%
T65892A	Toxic effect of other specified substances, intentional self-harm	0.9%
T447X2A	Poisoning by beta-adrenoreceptor antagonists, intentional self-harm	0.8%
T383X2A	Poisoning by insulin and oral hypoglycemic [antidiabetic] drugs, intentional self-harm	0.8%

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Table 4b.

20 Most common medication/drug-related ICD-10 Codes in the Inpatient Sample

HCUP coding	diagnosis	Weighted proportion of all Overdose
T391X2A	Poisoning by 4-Aminophenol derivatives, intentional self-harm	32.7%
T43222A	Poisoning by selective serotonin reuptake inhibitors, intentional self-harm	16.1%
T39312A	Poisoning by propionic acid derivatives, intentional self-harm	12.4%
T450X2A	Poisoning by antiallergic and antiemetic drugs, intentional self-harm	11.2%
T43592A	Poisoning by other antipsychotics and neuroleptics, intentional self-harm	10.1%
T50902A	Poisoning by unspecified drugs, medicaments and biological substances, intentional self-harm	5.0%
T43212A	Poisoning by selective serotonin and norepinephrine reuptake inhibitors, intentional self-harm	4.9%
T43292A	Poisoning by other antidepressants, intentional self-harm	4.8%
T426X2A	Poisoning by other antiepileptic and sedative-hypnotic drugs, intentional self-harm	4.5%
T424X2A	Poisoning by benzodiazepines, intentional self-harm	4.1%
T465X2A	Poisoning by other antihypertensive drugs, intentional self-harm	3.4%
T50992A	Poisoning by other drugs, medicaments and biological substances, intentional self-harm	2.2%
T402X2A	Poisoning by other opioids, intentional self-harm	1.9%
T43622A	Poisoning by amphetamines, intentional self-harm	1.8%
T43632A	Poisoning by methylphenidate, intentional self-harm	1.2%
T443X2A	Poisoning by other parasympatholytics [anticholinergics and antimuscarinics] and spasmolytics, intentional self-harm	1.2%
T383X2A	Poisoning by insulin and oral hypoglycemic [antidiabetic] drugs, intentional self-harm	1.2%
T447X2A	Poisoning by beta-adrenoreceptor antagonists, intentional self-harm	1.1%
T5492XA	Toxic effect of unspecified corrosive substance, intentional self-harm	1.0%
T428X2A	Poisoning by antiparkinsonism drugs and other central muscle-tone depressants, intentional self-harm	1.0%