



United States

**Consumer Product Safety Commission**

# Annual Report on Pediatric Poisoning Fatalities and Injuries

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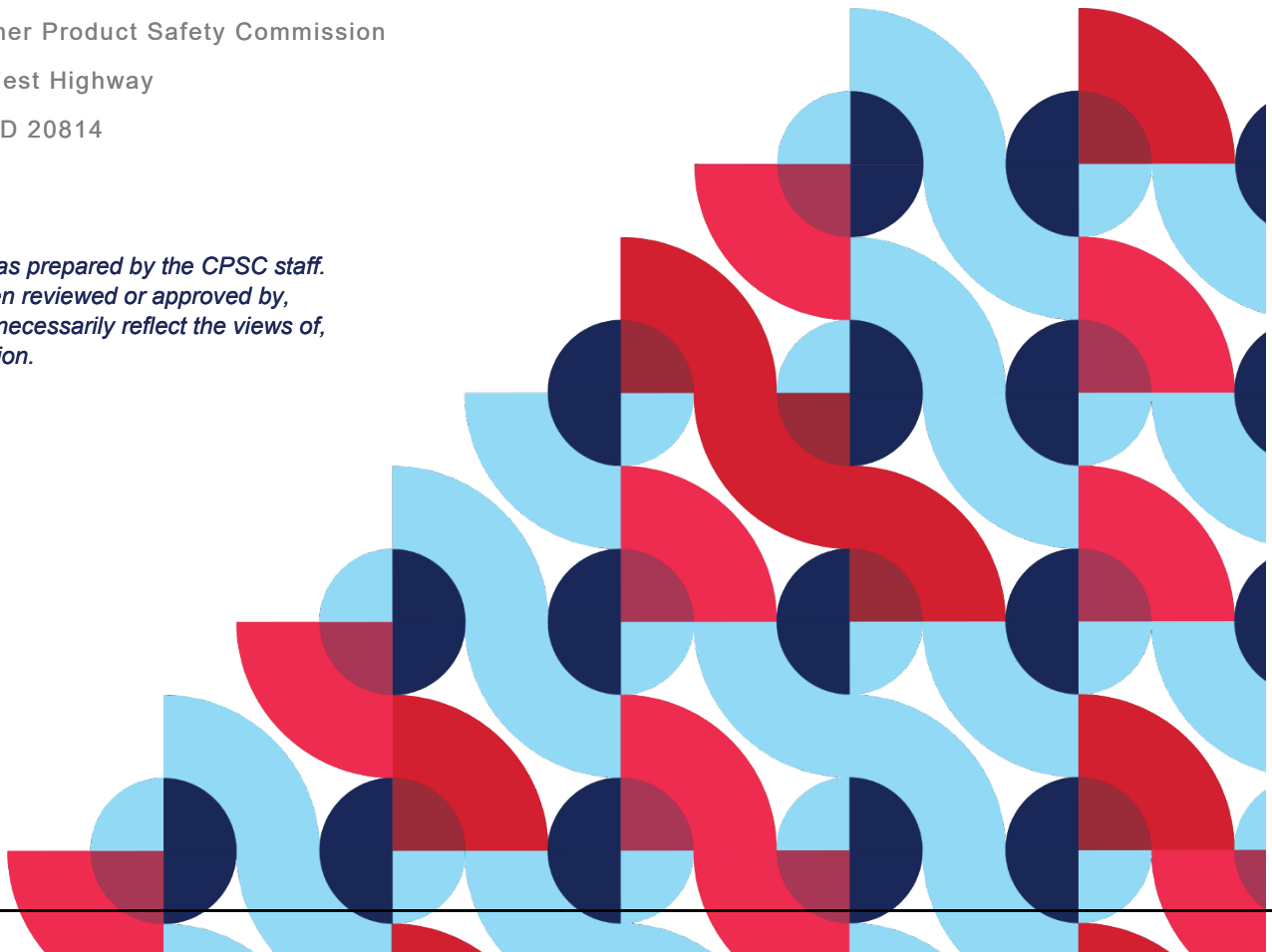
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*This report was prepared by the CPSC staff.  
It has not been reviewed or approved by,  
and may not necessarily reflect the views of,  
the Commission.*



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## Executive Summary

Unintentional poisonings from drugs and other household chemical substances pose a hazard to children younger than 5 years of age. To address this hazard, Congress passed the [Poison Prevention Packaging Act](#) (PPPA) in 1970. Under the PPPA, the U.S. Consumer Product Safety Commission (CPSC) issued regulations that require child-resistant packaging for about 30 categories of medicines and hazardous household products.<sup>1</sup> In this report, CPSC staff presents the latest available statistics on pediatric poisoning fatalities and injuries.

Based on mortality data from the National Center for Health Statistics (NCHS), CPSC staff identified that pediatric poisonings involving children under 5 years of age resulted in:

- Thirty-four fatalities in 2019, a 100 percent increase from the 17 deaths in 2018; and
- Forty-three fatalities in 2020, a 26 percent increase from 2019.

Based on injury data from the National Electronic Injury Surveillance System (NEISS), staff identified that unintentional pediatric poisonings among children under 5 years of age resulted in an estimated 61,500 ED-treated, nonfatal injuries in 2020, a decrease from the estimated 67,500 injuries in 2019. Reports from earlier years ([Pediatric Poisoning Fatalities 1972-2018](#) and [Unintentional Pediatric Poisoning Injury Estimates for 2019](#)) present the fatalities from 1972 through 2018, and the estimated injuries treated in emergency departments through the year 2019, for the under 5 age group.

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<sup>1</sup> The Child Nicotine Poisoning Prevention Act of 2015 (CNPPA), Public Law No. 114-116, requires any nicotine provided in a liquid nicotine container, sold, offered for sale, manufactured for sale, distributed in commerce, or imported into the United States shall be packaged in accordance with the standards of the PPPA.

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## Fatality Data

Death counts for 1972 through 1996 are from a previous report prepared by CPSC's Directorate for Health Sciences staff. Death counts for 1997 through 2020 are based on data from the NCHS that are coded using the International Classification of Diseases (ICD).<sup>2</sup> Population data for the years 1994 through 2020 were obtained from the U.S. Census Bureau. More information on the data sources is available in Appendix A: Methodology.

In 2019, there were 34 fatalities, and in 2020, there were 43 fatalities involving unintentional pediatric poisonings. Although 2019 and 2020 show sizeable increases, the fatalities for children younger than age 5 have declined substantially since Congress founded the CPSC in 1972, from an annual average of about 167 deaths in the 1972 to 1974 timeframe, to an annual average of about 31 deaths in the 2018 to 2020 timeframe. Table 1 and Figure 1 show the detailed death counts by year from 1972 to 2020.

**Table 1: Pediatric Poisoning Fatalities Among Children Under 5: 1972 to 2020**

Note: The horizontal lines indicate when the World Health Organization switched from using ICD-8 to ICD-9 in 1979, and when it switched from using ICD-9 to ICD-10 in 1999.

Year	Deaths	Percent Decrease
		Since 1972
1972	216	0%
1973	149	31%
1974	135	38%
1975	114	47%
1976	105	51%
1977	94	56%
1978	81	63%
1979	78	64%
1980	73	66%
1981	55	75%
1982	67	69%
1983	55	75%
1984	64	70%
1985	56	74%
1986	59	73%
1987	31	86%
1988	42	81%
1989	55	75%
1990	49	77%
1991	62	71%
1992	42	81%
1993	50	77%

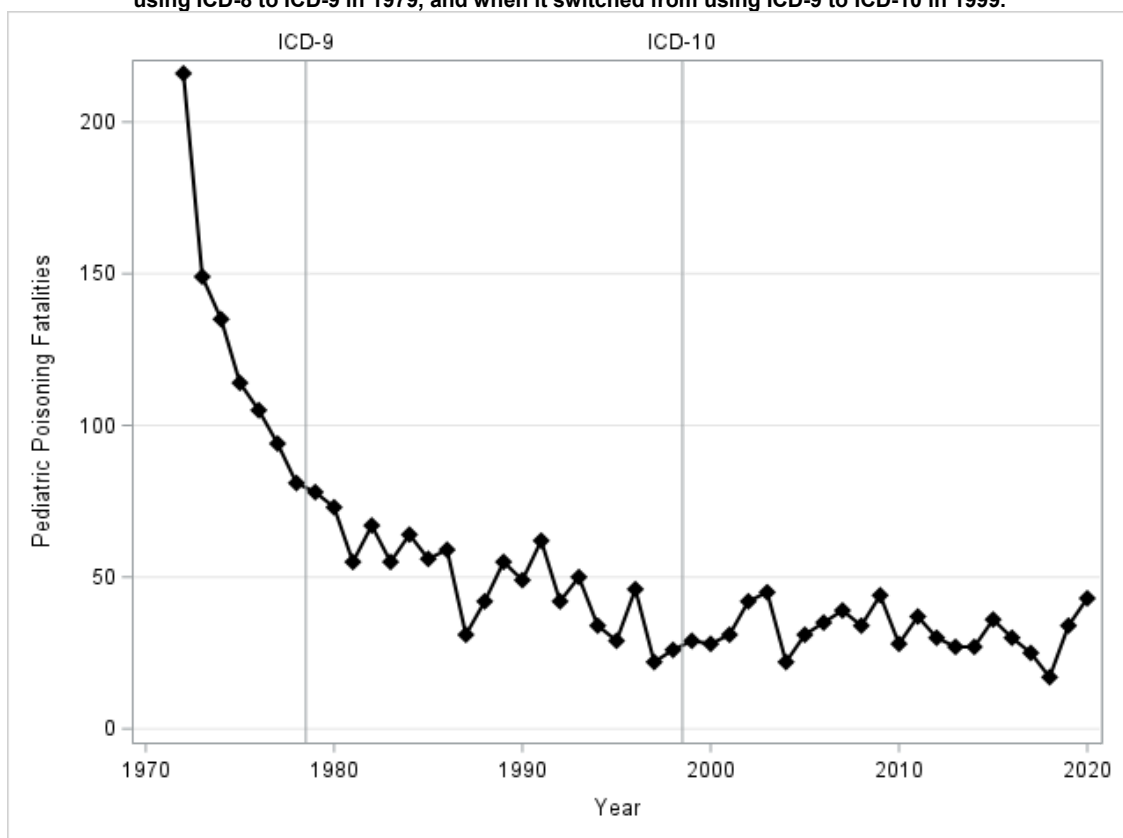
<sup>2</sup> Not all these incidents are addressable by an action the CPSC could take. It was not the purpose of this report to evaluate whether the incidents could be addressed, but rather, to update the death counts associated with pediatric poisonings.

Year	Deaths	Percent Decrease Since 1972
1994	34	84%
1995	29	87%
1996	46	79%
1997	22	90%
1998	26	88%
1999	29	87%
2000	28	87%
2001	31	86%
2002	42	81%
2003	45	79%
2004	22	90%
2005	31	86%
2006	35	84%
2007	39	82%
2008	34	84%
2009	44	80%
2010	28	87%
2011	37	83%
2012	30	86%
2013	27	88%
2014	27	88%
2015	36	83%
2016	30	86%
2017	25	88%
2018	17	92%
2019	34	84%
2020	43	80%

Source: National Center for Health Statistics.

**Figure 1: Pediatric Poisoning Fatalities Among Children Under 5: 1972 to 2020**

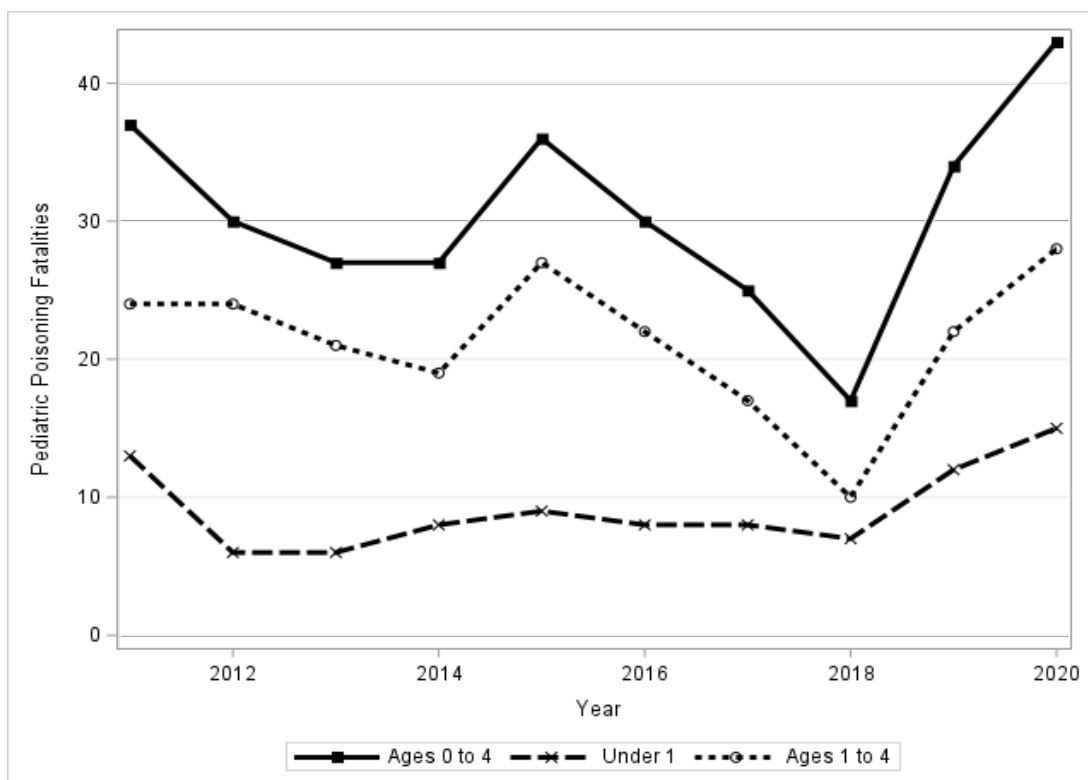
Note: The vertical lines indicate when the World Health Organization switched from using ICD-8 to ICD-9 in 1979, and when it switched from using ICD-9 to ICD-10 in 1999.



Source: National Center for Health Statistics

Poisoning death counts for children younger than age 5 were categorized into two age subcategories: children younger than 1 year of age, and children from 1 year through 4 years of age. The death counts for each age category from 2011 through 2020, along with the total death counts, are shown in Figure 2.

**Figure 2: Pediatric Poisoning Fatalities Among Children Under 5: 2011 to 2020  
By Age Categories**



Source: National Center for Health Statistics.

The death rates were calculated using population estimates from the U.S. Census Bureau. The death rates for each age subcategory from 2011 through 2020, along with the total death rates, are shown in Table 2 and Figure 3. It should be noted that the death rates may change slightly, depending on the release year of the population data used in the calculation.

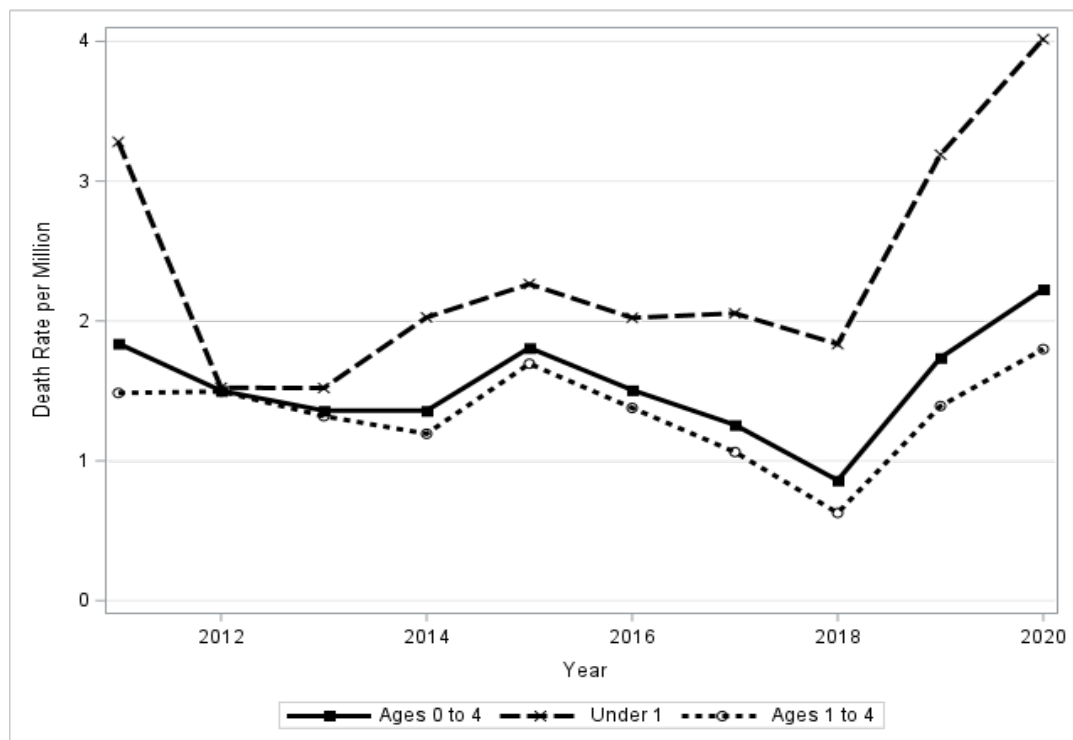
**Table 2: Pediatric Poisoning Death Rates Among Children Under 5: 2011 to 2020  
By Age Categories\***

\*The rates in Table 2 are per million population of the specified age group.

Year	Under 1	Ages 1 to 4	Ages 0 to 4
2011	3.28	1.49	1.84
2012	1.52	1.50	1.50
2013	1.52	1.32	1.36
2014	2.03	1.19	1.36
2015	2.26	1.69	1.81
2016	2.02	1.38	1.51
2017	2.05	1.06	1.26
2018	1.83	0.63	0.86
2019	3.19	1.39	1.74
2020	4.02	1.80	2.23

Source: National Center for Health Statistics and U.S. Census Bureau.

**Figure 3: Pediatric Poisoning Death Rates Among Children Under 5: 2011 to 2020  
By Age Categories**



Source: National Center for Health Statistics and U.S. Census Bureau.



Overall, the total poisoning death counts and rates for children under age 5 increased from 2018 to 2020. The death rate for under-1-year age category was higher than the rate for ages 0 to 4 and age 1 to 4 categories throughout the years.

By specific ICD10 codes, changes in poisoning death counts of children under age 5 from 2018 to 2020, by ICD-10 codes, are shown in Table 3.

**Table 3: Pediatric Poisoning Death Counts Among Children Under 5: 2018 to 2020 by ICD-10 Code<sup>3</sup>**

ICD-10 Code	2018	2019	2020
X40 (non-opioid analgesics, antipyretics, and antirheumatics)	0	0	1
X41 (antiepileptic, sedative- hypnotic, . . . and psychotropic)	2	8	8
X42 (narcotics and psychodysleptics, not elsewhere	10	17	21
X43 (drugs acting on the autonomic nervous system)	0	0	0
X44 (other and unspecified drugs . . . and biological	5	7	11
X45 (alcohol)	0	0	0
X46 (organic solvents and halogenated hydrocarbons)	0	0	0
X48 (pesticides)	0	1	2
X49 (other and unspecified chemicals and noxious	0	1	0
<b>Total</b>	<b>17</b>	<b>34</b>	<b>43</b>

Source: National Center for Health Statistics.

<sup>3</sup> The code definitions were abbreviated due to space considerations. Please see the full list of codes and definitions on page 14.

## Estimated Injury Data

In 2020, staff found 2,613 cases involving unintentional pediatric poisonings in the NEISS.<sup>4</sup> Based on these cases, staff computed a national estimate of 61,500 ED-treated injuries, with a coefficient of variance (C.V.) of 15.43 percent. The 95 percent confidence interval (C.I.) for this estimate was 42,500 to 80,500. A breakdown of the estimated injuries by diagnosis is shown in Table 4.

**Table 4: 2020 ED-Treated Unintentional Pediatric Poisoning Estimates by Diagnosis\***

Diagnosis (Code)	Estimate	Cases	C.V.	95% C.I.
Poisoning (68)	58,200	2,505	14.09%	41,800-74,600
Chemical Burn (49)	N/A**	117	44.91%	N/A**
Total <sup>5</sup>	61,500	2,613	15.43%	42,500-80,500

Source: National Electronic Injury Surveillance System, June 2021

\* Adjusted to exclude adverse reactions, therapeutic errors, and exposures beyond the victim's control.<sup>6</sup>

\*\*Estimates are unstable as c.v. is above the threshold of 33%.

From 2018 to 2020, there was an annual average of estimated 66,600 emergency department (ED)-treated injuries involving unintentional pediatric poisonings for children younger than age 5. The estimated injuries decreased from 2018 to 2020, but the trend was not statistically significant (the lowest p-value for all trends was 0.31). Table 5 gives a breakdown of the estimated injuries by year and diagnosis code.

**Table 5: 2018–2020 ED-Treated Unintentional Pediatric Poisoning Estimates by Year\***

Diagnosis (Code)	2018	2019	2020	Average
Poisoning (68)	66,800	64,500	58,200	63,200
Chemical Burn (49)	4,200	N/A**	N/A**	N/A**
Total	70,900	67,500	61,500	66,600

Source: National Electronic Injury Surveillance System, June 2021

\* Adjusted to exclude adverse reactions, therapeutic errors, and exposures beyond the victim's control.

\*\*Estimates are unstable as c.v. is above the threshold of 33%.

An estimated 48,800 (79 percent of the total 61,500) poisonings occurred at home. An estimated 11,900 (19 percent) poisonings occurred at an unknown location. The remaining injuries occurred at other locations, such as streets, schools, playgrounds, and other public property.

<sup>4</sup> In October 2018, NEISS was upgraded. An ED visit is allowed to contain up to two codes for the diagnoses. Data were extracted if either of the two codes listed poisoning or chemical burn. Note it is possible for some incidents to have both poisoning and chemical burn diagnoses.

<sup>5</sup> Columns may not sum to totals due to rounding and the diagnosis categories are not mutually exclusive

<sup>6</sup> See examples of the out-of-scope cases in Methodology section on page 16.

Table 6 gives a breakdown, by the product involved, for the estimated ED-treated unintentional pediatric poisonings. Note that the product categories are not mutually exclusive because it is possible for two different products to be associated with the same poisoning incident.

**Table 6: 2020 ED-Treated Unintentional Pediatric Poisoning Estimates  
by Top 10 Products<sup>7\*</sup>**

Product	Estimate <sup>8</sup>	C.V.	95% C.I.
Blood Pressure Medications	5,000	19.82%	3,100-6,900
Acetaminophen	4,300	16.41%	2,900-5,700
Antidepressants	3,100	21.77%	1,800-4,400
Dietary Supplements	3,000	18.98%	1,900-4,100
Bleach	2,700	19.94%	1,700-3,700
Diphenhydramine	2,200	21.35%	1,300-3,100
Laundry Packets	2,200	22.66%	1,200-3,200
Attention Deficit Disorder Medications	1,800	25.47%	900-2,700
Ibuprofen	1,700	18.26%	1,100-2,300
Unknown	2,100	22.76%	1,200-3,000

Source: National Electronic Injury Surveillance System, June 2021

\* Adjusted to exclude adverse reactions, therapeutic errors, and exposures beyond the victim's control.

Tables 7 and 8 provide breakdowns by race and ethnicity for the estimated ED-treated unintentional pediatric poisonings for the injured and U.S. population under the age of 5.

**Table 7: 2020 ED-Treated Unintentional Pediatric Poisoning Estimates  
by Victims' Race<sup>\*</sup>**

Race	Injured Population	U.S. Population
White	72.8%	76.3%
Black/African American	19.8%	13.4%
Asian	1.1%	5.9%
American Indian/Alaska Native	0.9%	1.3%
Native Hawaiian/Pacific Islander	0.2%	0.2%
Other <sup>9</sup>	5.2%	2.9%

Source: National Electronic Injury Surveillance System and U.S. Census Bureau.

\* Excludes Race "Not Stated" which comprises 35 percent of the estimated injuries.

<sup>7</sup> Liquid nicotine poisoning injury did not appear in the top 10 products in 2020, or any prior years. The CNPPA, requires any nicotine provided in a liquid nicotine container, sold, offered for sale, manufactured for sale, distributed in commerce, or imported into the United States shall be packaged in accordance with the standards of the PPPA.

<sup>8</sup> Please refer to appendix on page 19 for estimates for prior years.

<sup>9</sup> This category includes two or more races.

**Table 8: 2020 ED-Treated Unintentional Pediatric Poisoning Estimates  
by Victims' Ethnicity\***

<b>Ethnicity</b>	<b>Injured Population</b>	<b>U.S. Population</b>
Non-Hispanic Origin	80.9%	81.5%
Hispanic Origin	19.1%	18.5%

Source: National Electronic Injury Surveillance System and U.S. Census Bureau.

\* Excludes Ethnicity "Not Stated" which comprises 37 percent of the estimated injuries.

## **Appendix A**

### **Methodology**

#### **Fatalities Data**

The data for 1972 through 1996 are from a previous report prepared by CPSC’s Directorate for Health Sciences staff.<sup>10</sup> Counts of deaths for 1997 through 2002 were obtained from the NCHS website, using data in the under-1-year age group and the 1- to 4-year age group. Counts of deaths for 2003 through 2006 for children under the age of 5 years were determined from data obtained in CD-ROMs from NCHS. Counts of deaths for 2007 through 2019 for children under the age of 5 years were determined from data downloaded from the NCHS website. Population data for the years 1994 to 2019 were obtained from the website of the U.S. Census Bureau.

The download of the NCHS data for 2019 and 2020 were from:

- U.S. Department of Health and Human Services. National Center for Health Statistics. *Mortality Multiple Cause File*. Downloaded from:  
[https://ftp.cdc.gov/pub/health\\_statistics/nchs/datasets/dvs/mortality/mort2019us.zip](https://ftp.cdc.gov/pub/health_statistics/nchs/datasets/dvs/mortality/mort2019us.zip)  
on December 10, 2021.

The download of the population data for 2019 and 2020 were from:

- Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States: April 1, 2010, to July 1, 2020, downloaded on December 10, 2021 from:  
[National Population by Characteristics: 2010-2020 \(census.gov\)](https://www.census.gov/data/tables/time-series/demo/states/population/2010-2020.html)

We used the NCHS mortality data file, as downloaded from the Internet. The data are provided in a column-format text file, with documentation on the table layout. CPSC staff wrote SAS Studio v3.6 code to subset the data provided by the ICD-10 cause of death code, age, and resident status.

Staff used ICD-10 codes X40 through X49, excluding X47. Traditionally, we collected the X47 code for analysis, but we excluded it from the report because it covers carbon monoxide poisonings not relevant to the PPPA. We included incidents in the subset only if a relevant ICD-10 code was listed as the underlying cause of death.

The NCHS data use two-variable age encoding with a unit and a value. Included in the subset are all incidents with a unit of years and a value less than five. It also includes all incidents with a unit shorter

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<sup>10</sup> Memorandum from Susan Aitken, Ph.D., to Kenneth P. Giles, dated 29 Jan 1999: “National Center for Health Statistics (NCHS) Data on Pediatric Fatalities for 1996.” U.S. Consumer Product Safety Commission, Washington, D.C.

than 1 year, which is used for children younger than 1 year old. There is an “unknown” age unit that is not included in the subset.

The data are arranged in the subset by resident status to exclude foreign nationals.

Fatalities from 1994 through 1998 were coded in 17 E-codes (850 through 866) from the ninth revision of the International Classification of Diseases (ICD-9). Fatalities for 1999 through 2018 are identified under the nine codes from X40 through X49, excluding X47, from the tenth revision of the International Classification of Diseases (ICD-10). These codes are:

- X40 Accidental poisoning by and exposure to nonopioid analgesics, antipyretics, and antirheumatics.
- X41 Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism, and psychotropic drugs, not elsewhere classified.
- X42 Accidental poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified.
- X43 Accidental poisoning by and exposure to other drugs acting on the autonomic nervous system.
- X44 Accidental poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances.
- X45 Accidental poisoning by and exposure to alcohol.
- X46 Accidental poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapors.
- X48 Accidental poisoning by and exposure to pesticides.
- X49 Accidental poisoning by and exposure to other and unspecified chemicals and noxious substances.

The excluded code, X47, is for accidental poisoning by and exposure to other gases and vapors, a code that includes carbon monoxide poisoning.

The United States began using ICD-10 codes for deaths occurring in 1999, replacing ICD-9, which had been adopted in 1979. The revision of ICD-9 into ICD-10 involved increasing the number of categories from about 5,000 to about 8,000, changing from numeric to alphanumeric codes, and changing some rules

for selecting the underlying cause of death.<sup>11</sup> Because ICD-10 codes are not directly comparable to ICD-9 codes, discontinuities can appear in trend analyses that use data on deaths occurring before 1999. Year-to-year variability is also evident in the data.

Comparability ratios can be used to adjust past NCHS counts to reflect how many deaths would have been coded in certain groupings had ICD-10 been in effect during a given year. However, NCHS has not released a comparability ratio for poisonings as of this writing. NCHS released *preliminary* estimates of comparability ratios for the transition from ICD-9 to ICD-10 in May 2001. The estimates were based on a sample of double-coded death certificates from 1996.<sup>12</sup> For most cause-of-death groupings, the NCHS researchers provided ratios. For the poisoning group, however, the preliminary ratio estimate was deemed unreliable. This may have been for several possible reasons, including a paucity of deaths in the poisoning codes; a lack of inclusion of deaths from the poisoning grouping in the preliminary study; or an increase or decrease in deaths due to poisoning, which was determined by the researchers to be both large-scale and erroneous.

In the absence of a ratio for poisoning, the ratio for nontransport accidents was considered for use by CPSC staff in this analysis. Nontransport accidents include all accidental deaths that do not involve a vehicle. Because of the possibility that the comparability ratio for the poisoning group could differ significantly from that for all nontransport accidents for any one of the reasons above, CPSC staff ultimately chose to postpone the use of an NCHS comparability ratio. Comparisons between pre-1999 and post-1999 data should be made with caution.

The ICD-10 categories included in this report were chosen to present comprehensive statistics on childhood poisonings, with a particular interest in including any death that may have been prevented using child-resistant packaging. Some of the deaths included may involve situations or products that fall outside of the CPSC's jurisdiction. For example, the category X44 may include deaths due to food poisoning (*e.g.*, salmonella, botulism toxin) or due to exposure to wild mushrooms; and category X42 may include deaths due to exposure to illegal drugs.

In the absence of a detailed analysis of the full complement of death certificates in the given categories, it is not possible to determine what percentage of the deaths included in these codes may have been preventable using child-resistant packaging. A detailed analysis might be helpful. It is noted that the true number of deaths due to household products or the drug packaging within the CPSC's jurisdiction is likely close to and is a subset of the number presented in this report in any given year.

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<sup>11</sup> Anderson, RN, Minino, AM, Hoyert, DL, Rosenberg, HM. Comparability of Cause of Death Between ICD-9 and ICD-10: Preliminary Estimates. National Vital Statistics Report; vol 49 no 2. Hyattsville, Maryland: National Center for Health Statistics. 2001.

<sup>12</sup> Memorandum from Susan Aitken, Ph.D. to Kenneth P. Giles dated 29 Jan 1999: "National Center for Health Statistics (NCHS) Data on Pediatric Fatalities for 1996." CPSC, Washington, D.C.

## Estimated Injury Data

NEISS is a probability sample of approximately 100 U.S. hospitals, each operating 24-hour EDs and providing more than six beds. Staff in each hospital input and code consumer product-related data from the ED record, and then the data are transmitted electronically to the CPSC. Because NEISS is a probability sample, each case collected represents several cases (the case's *weight*) in the total estimate of injuries in the United States. Different hospitals carry different weights, based on stratification by their annual number of ED visits (Kessler and Schroeder, 1999).

Hazard Analysis staff searched NEISS databases for all incidents with poisoning diagnosis (code 68) or chemical burn diagnosis (code 49) involving children under the age of 5. Health Sciences staff examined all incidents to identify cases that were not unintentional exposures, but were deemed generally associated with a prescribed therapeutic regimen, or an unforeseen incidental exposure from a situation beyond the victim's control. These types of cases, delineated below, are out-of-scope cases because they do not directly involve a child independently accessing a poison.

1. *Adverse Reactions*: This includes undesirable effects that occur with the proper use of a substance (*e.g.*, drowsiness after administration of an antihistamine). Allergic, hypersensitivity, or idiosyncratic reactions to recommended doses of vaccines, antibiotics, or other medications are also included in this category.

2. *Therapeutic Errors*: Unintentional mistakes made during a prescribed or recommended course of treatment, such as: (1) a caregiver administering the wrong substance or an overdose (*e.g.*, two tablespoons instead of two teaspoons) to the patient; (2) a pharmacist mislabeling the dosage instructions on a prescription; or (3) a caregiver giving medication to the wrong child.

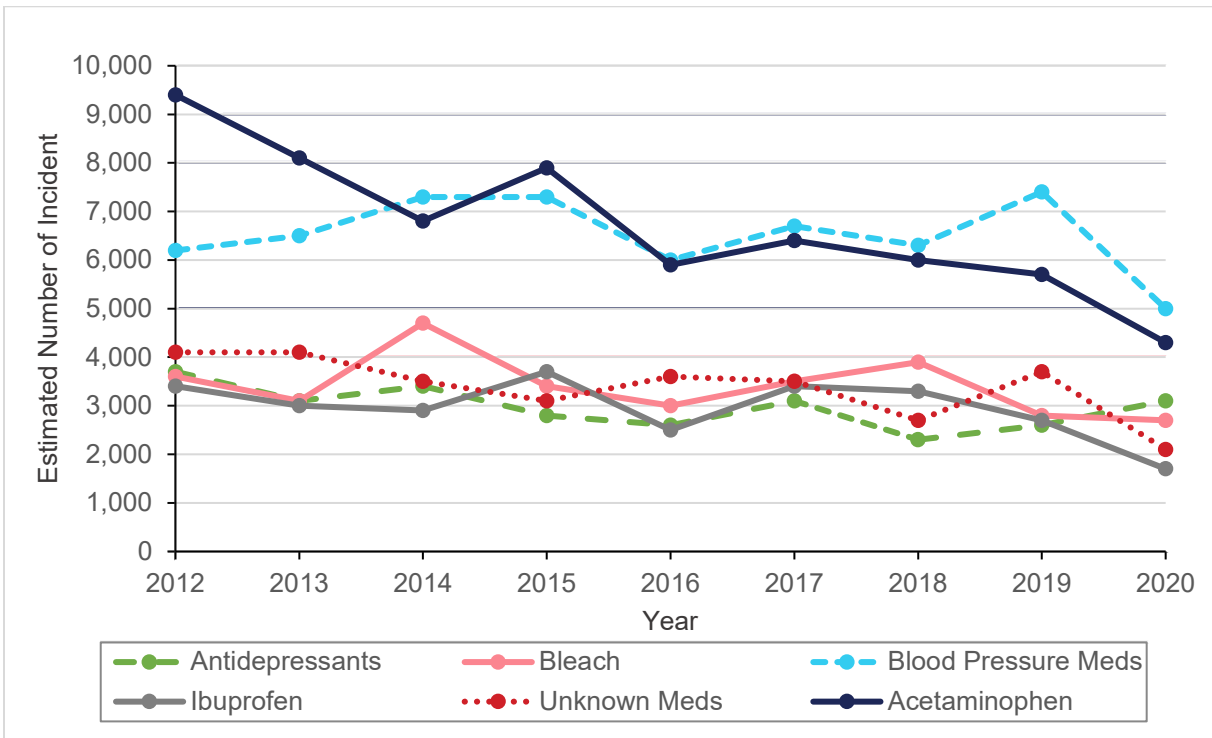
3. *Incidental Exposures*: This category refers to exposures resulting from a situation beyond the control of the victim. Examples include exposures to: (1) chlorine fumes from a pool; (2) gas fumes while in a dwelling or an automobile; (3) gasoline while it is being pumped into an automobile; or (4) illicit drugs (*e.g.*, cocaine, methamphetamine, marijuana) while the caregiver is using or producing them.

Hazard Analysis staff used SAS<sup>®</sup> software program version 9.4 to manage and retrieve data and to compute estimates and the associated C.V. for the number of unintentional pediatric poisoning injuries. A C.V. is the ratio of the standard error of the estimate (*i.e.*, variability) to the estimate itself. This is generally expressed as a percent. A C.V. of 10 percent means the standard error of the estimate equals 0.1 times the estimate.

NEISS data do not typically identify all the contributing factors to unintentional pediatric poisoning injuries. CPSC continues public outreach efforts to help manufacturers comply with the PPPA and to remind consumers about the need to keep products in their original child-resistant packaging and out of the reach of children.



**Figure A.1: Estimated ED-treated Injuries for Products in the Top 10 Every Year from 2012 to 2020\***

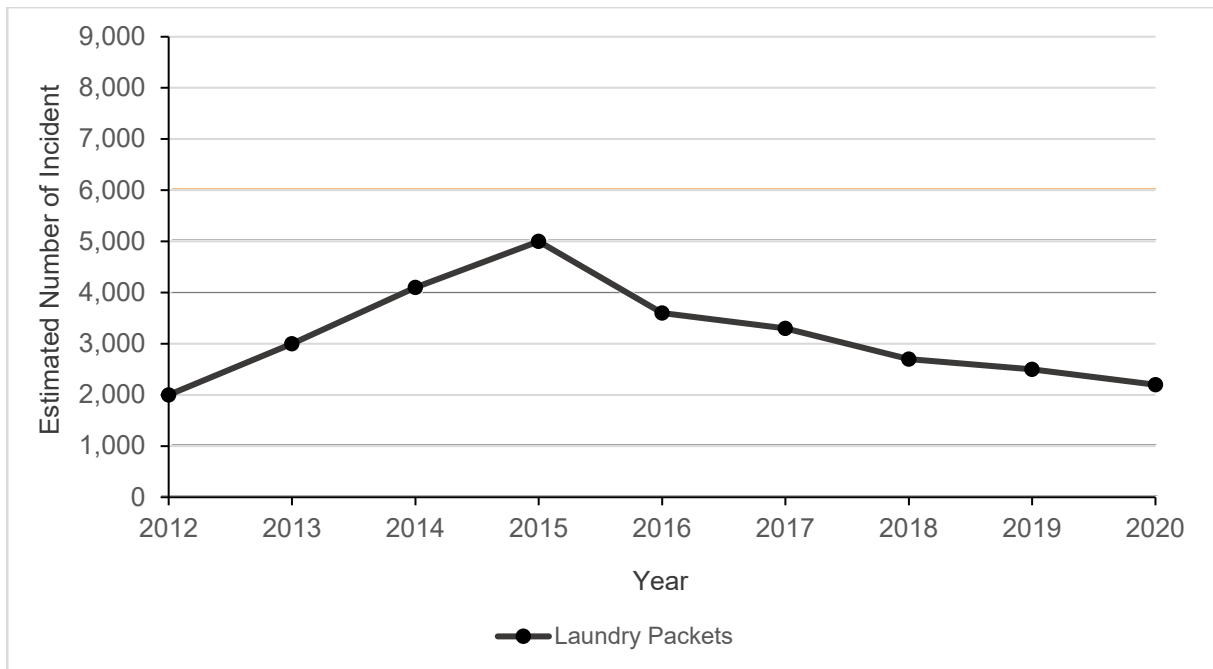


\*Due to limited variance in the population of children under 5, the pattern remains the same when normalized per 100,000 children.

\*There is a reduction in Acetaminophen since 2012, which may be due to several Acetaminophen child safety cap recalls.

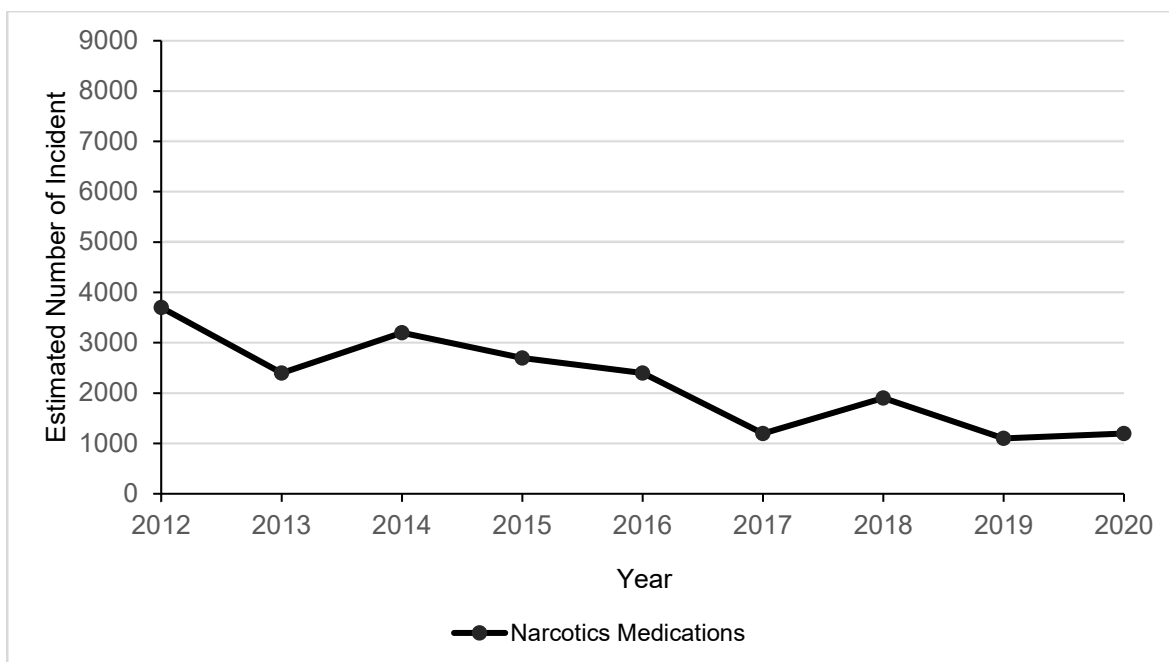
Source: National Electronic Injury Surveillance System.

**Figure A.2: Estimated ED-treated Injuries for Laundry Packets  
from 2012 to 2020\***



\* Laundry Packet was introduced in 2012 and moved into top 10. It has decreased since 2015 and is no longer in top 10.  
Source: National Electronic Injury Surveillance System.

**Figure A.3: Estimated ED-treated Injuries for Narcotics Medications from 2012 to 2020\***



\* Although Narcotics medications deaths increased 70% from 2018 to 2019 and increased 24% from 2019 to 2020, Narcotics medications injuries decreased 42% from 2018 to 2019 and increased 9% from 2019 to 2020.  
Source: National Electronic Injury Surveillance System.

Estimated ED-treated injuries for the top 10 products for each year from 2012 through 2018 are provided in <https://www.cpsc.gov/content/Unintentional-Pediatric-Poisoning-Injury-Estimates-for-2019>, pp 7-9. Shown below is the tabulation for the 2019 top 10 products involved in unintentional pediatric poisoning injuries.

**Table A.1: 2019 ED-Treated Unintentional Pediatric Poisoning Estimates  
by Top 10 Products\***

Product	Estimate	C.V.	95% C.I.
Blood Pressure Medications	7,400	17.08%	4,900-9,900
Acetaminophen	5,700	13.56%	4,200-7,200
Bleach	2,800	28.33%	1,300-4,400
Ibuprofen	2,700	21.50%	1,600-3,900
Antidepressants	2,600	17.28%	1,700-3,500
Attention Deficit Disorder Medications	2,600	23.40%	1,400-3,800
Laundry Packets	2,500	20.88%	1,500-3,600
Dietary Supplements	2,400	20.51%	1,500-3,400
Diphenhydramine	2,300	21.42%	1,400-3,300
Unknown	3,700	18.74%	2,300-5,000

Source: National Electronic Injury Surveillance System

\* Adjusted to exclude adverse reactions, therapeutic errors, and exposures beyond the victim's control