Pediatric Poisoning Fatalities From 1972 Through 2018

[redacted]

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

Introduction

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.[1] Fatalities for children younger than age 5 associated with these products have declined substantially since Congress founded the CPSC in 1972, from 216 that year, to an annual average of about 24 for the time frame 2016 through 2018. This report provides updated information on pediatric poisonings associated with these products based on death certificate data from 2 years, 2017 and 2018.

Data Sources

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 2018 are based on data from the National Center for Health Statistics (NCHS) that are coded using the International Classification of Diseases (ICD).[2] Population data for the years 1994 through 2018 were obtained from the U.S. Census Bureau. More information on the data sources is available in Appendix A: Methodology.

[1] 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 to be packaged in accordance with the standards of the Poison Prevention Packaging Act (PPPA).

[2] Not all of 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.

Table 1: Pediatric Poisoning Fatalities Among Children Under 5: 1972–2018

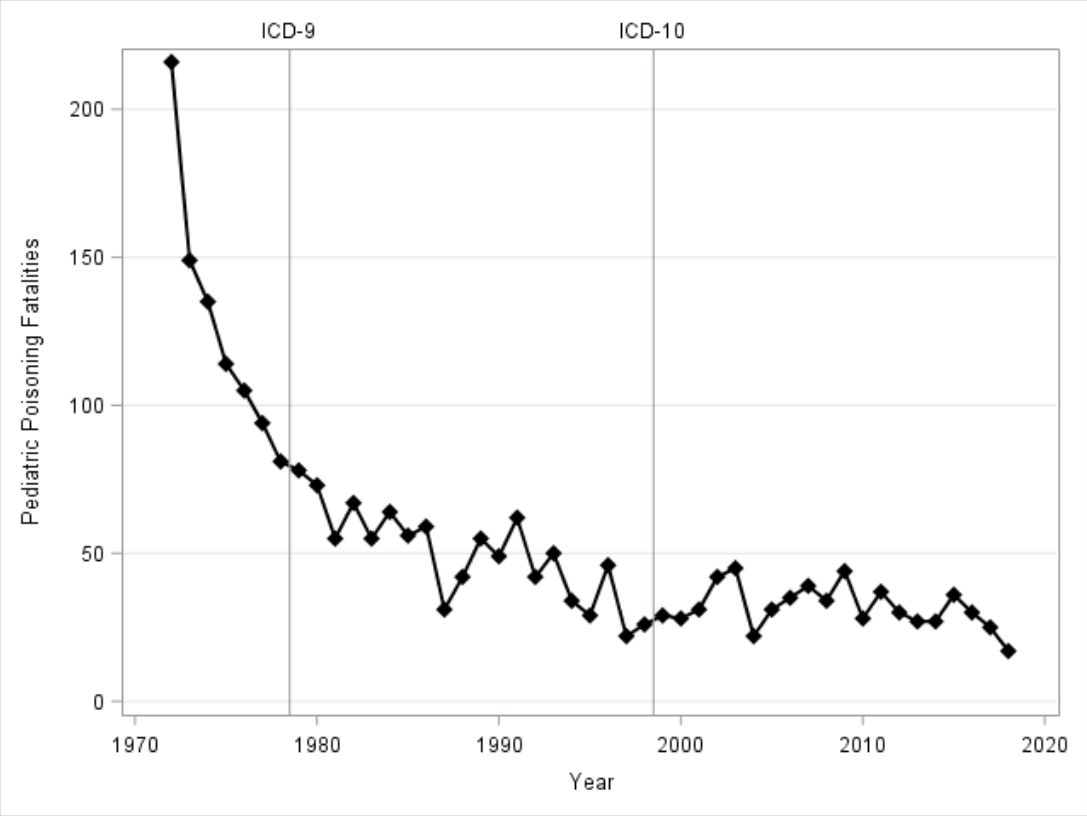
Note: The horizontal lines in Table 1 indicate when the World Health Organization switched from using ICD-8 to ICD-9 in 1979, and when it switched from using ICD-9 to ICD-10 in 1999.

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%
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%

Data Source: National Center for Health Statistics.

Figure 1: Pediatric Poisoning Fatalities Among Children Under 5: 1972–2018

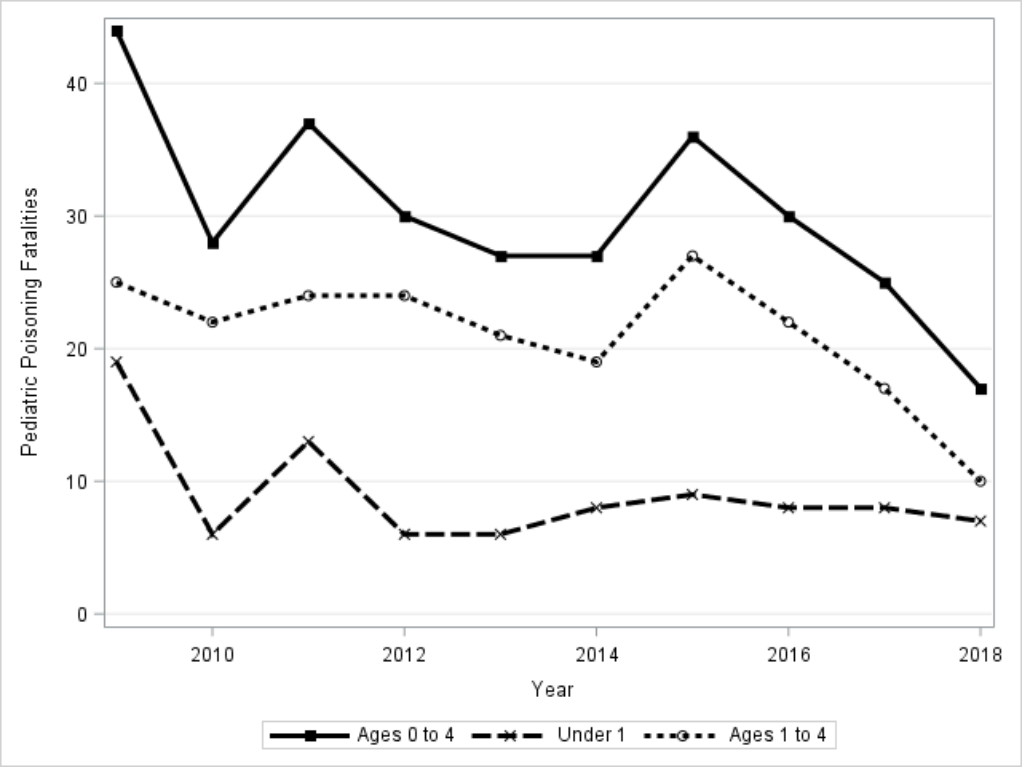
Note: The vertical lines indicate when the World Health Organization switched from using ICD-8 to ICD-9 in 1979, and when it switched from using ICD-9 to ICD-10 in 1999.



Data Source: National Center for Health Statistics.

Poisoning death counts for children younger than age 5 were categorized into two age sub-categories: 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 2009 through 2018, along with the total death counts, are shown in Figure 2.

Figure 2: Pediatric Poisoning Fatalities Among Children Under 5: 2009–2018
By Age Categories



Data Source: National Center for Health Statistics.

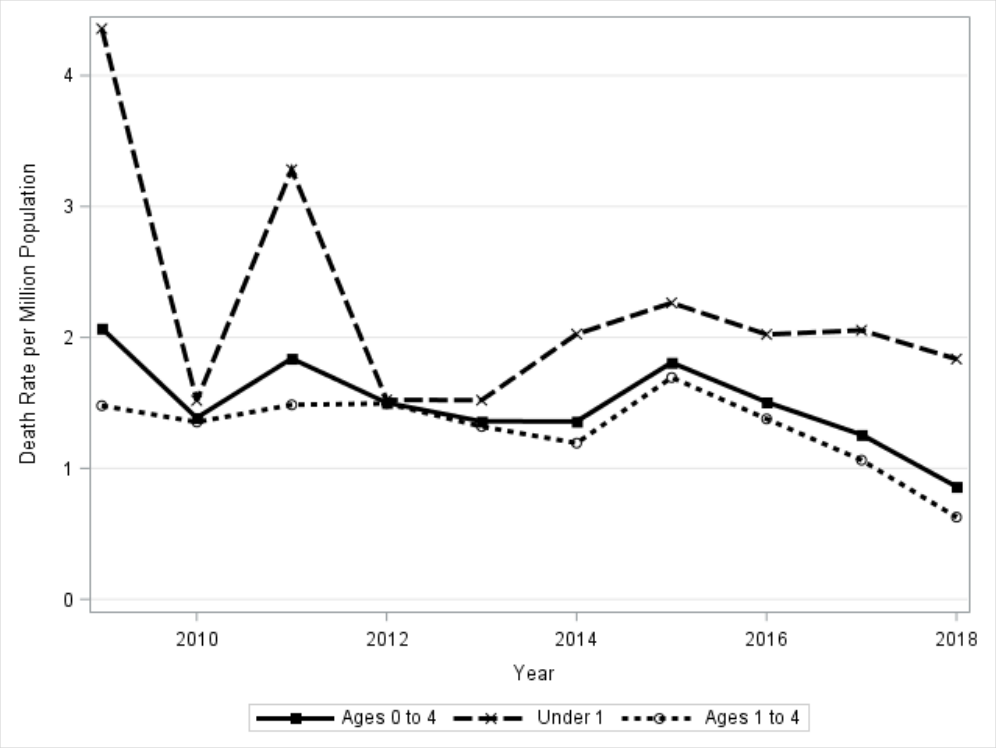
The death rates were calculated using population estimates from the U.S. Census Bureau. The death rates for each age sub-category from 2009 through 2018, along with the total death rates, are shown in Table 2 and Figure 3 (next page). It should be noted that the death rates may change slightly, depending on the release year of the population data used in the calculation.

Table 2: Pediatric Poisoning Death Rates Among Children Under 5: 2009–2018
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*
2009	4.36	1.48	2.07
2010	1.52	1.35	1.39
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

Figure 3: Pediatric Poisoning Death Rates Among Children Under 5: 2009–2018
By Age Categories



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

Overall, the total poisoning death counts and rates for children under age 5 decreased from 2016 to 2018. The death rate for the under-1 age category was higher than the rate for ages 0 to 4 and ages 1 to 4 categories throughout the years.

By specific ICD-10 codes, changes in poisoning death counts of children under age 5 from 2016 to 2018 are shown in Table 3.

Table 3: Pediatric Poisoning Death Counts Among Children Under 5: 2016–2018 by ICD-10 Code[4]

ICD-10 Code	*2016*	*2017*	*2018*
X40 (non-opioid analgesics, antipyretics, and antirheumatics)	2	1	0
X41 (antiepileptic, sedative-hypnotic . . . and psychotropic)	4	3	2
X42 (narcotics and psychodysleptics, not elsewhere classified)	20	9	10
X43 (drugs acting on the autonomic nervous system)	0	0	0
X44 (other and unspecified drugs . . . and biological substances)	2	9	5
X45 (alcohol)	2	1	0
X46 (organic solvents and halogenated hydrocarbons)	0	0	0
X48 (pesticides)	0	0	0
X49 (other and unspecified chemicals and noxious substances)	0	2	0
Total	**30**	**25**	**17**

Data Source: National Center for Health Statistics.

For three of the ICD-10 codes, the poisoning death counts of children under age 5 decreased from 2016 to 2018. The categories were X40 (non-opioid analgesics, antipyretics, and antirheumatics), X41 (antiepileptic, sedative-hypnotic, and psychotropic), and X45 (alcohol). For three of the ICD-10 categories, the death counts decreased then increased or increased then decreased from 2016 to 2018. They were X42 (narcotics and psychodysleptics[3]), X44 (unspecified drugs, medicaments, and biological substances), and X49 (other and unspecified chemicals). The ICD-10 categories with no changes in death counts from 2016 to 2018, were X43 (drugs acting on the autonomic nervous system), X46 (organic solvents and halogenated hydrocarbons), and X48 (pesticides).

[3] Psychodysleptics are hallucinogens.
[4] The code definitions were abbreviated due to space considerations. Please see the full list of codes and definitions on page 9.

APPENDIX A: METHODOLOGY

Data Sources

Data for 1972 through 1996 are from a previous report prepared by CPSC's Directorate for Health Sciences staff.[5] Counts of deaths for 1997 through 2002 were obtained from the National Center for Health Statistics (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 2018, for children under the age of 5 years, were determined from data downloaded from the NCHS website. Population data for the years 1994 to 2018 were obtained from the website of the U.S. Census Bureau.

The download of the NCHS data for 2017 and 2018 was 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/mort2017us.zip
  https://ftp.cdc.gov/pub/health_statistics/nchs/datasets/dvs/mortality/mort2018us.zip
  on 29 June 2020.

The download of the population data for 2017 and 2018 was from:

- Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States: April 1, 2010 to July 1, 2019, downloaded on 29 June 2020 from:
  https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html

Please refer to previous annual reports here for the download sites for earlier data.

Data Subsetting

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.

In this report, 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

[5] 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.

incidents with a unit shorter 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.

International Classification of Diseases Revisions

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.[6] 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.[7] 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.[7]

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 in an attempt to present comprehensive statistics on childhood poisonings, with a particular interest in including any death that may have been prevented through the use of 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 through the use of child-resistant packaging. A detailed analysis might be helpful. It is noted that the true number of deaths associated with 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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[6] Anderson, RN, Minino, AM, Hoyert, DL, Rosenburg, 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.

[7] See note 5 on page 8 of 10.