Pediatric Poisoning Fatalities from 1972 through 2011

August 2014

Angie Qin
Directorate for Epidemiology
Division of Hazard Analysis
U.S. Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

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

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X NO MFRS/PRVTLBLRS OR PRODUCTS IDENTIFIED 10/15/19
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Introduction

Unintentional poisonings from drugs and other household chemical substances pose a hazard to children younger than 5 years of age. Congress passed the Poison Prevention Packaging Act (PPPA) in 1970. Under the PPPA, the U.S. Consumer Product Safety Commission (CPSC) has issued regulations that require child-resistant packaging for about 30 categories of medicines and hazardous household products. Child fatalities have declined substantially since the PPPA became law in 1972: from 216 that year, to an average of about 36 each year from January 1, 2009 through December 31, 2011. This report provides updated information on unintentional pediatric poisonings based on death certificate data from 2011.

Data Sources

Death counts for 1972 through 1996 are from a previous report prepared by CPSC Directorate of Health Sciences staff (see Methodology Appendix). Death counts for 1997 through 2011 are based on data from the National Center for Health Statistics (NCHS) that are coded using the International Classification of Diseases (ICD).[1] Population data for the years 1994 through 2011 were obtained from the U.S. Census Bureau. More information on the data sources is available in the Methodology Appendix.

[1] 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.

Results

Table 1: Pediatric Poisoning Fatalities from 1972 Through 2011

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%

The death counts from Table 1 are illustrated in Figure 1. The horizontal lines in Table 1 and the vertical lines in Figure 1 indicate when the World Health Organization (WHO) switched from using ICD-8 to ICD-9 in 1979, and when it switched from using ICD-9 to ICD-10 in 1999.

For 2011, the NCHS data contain reports of 37 poisoning deaths of children younger than age 5 in the ICD-10 categories included in this report (see Methodology Appendix).

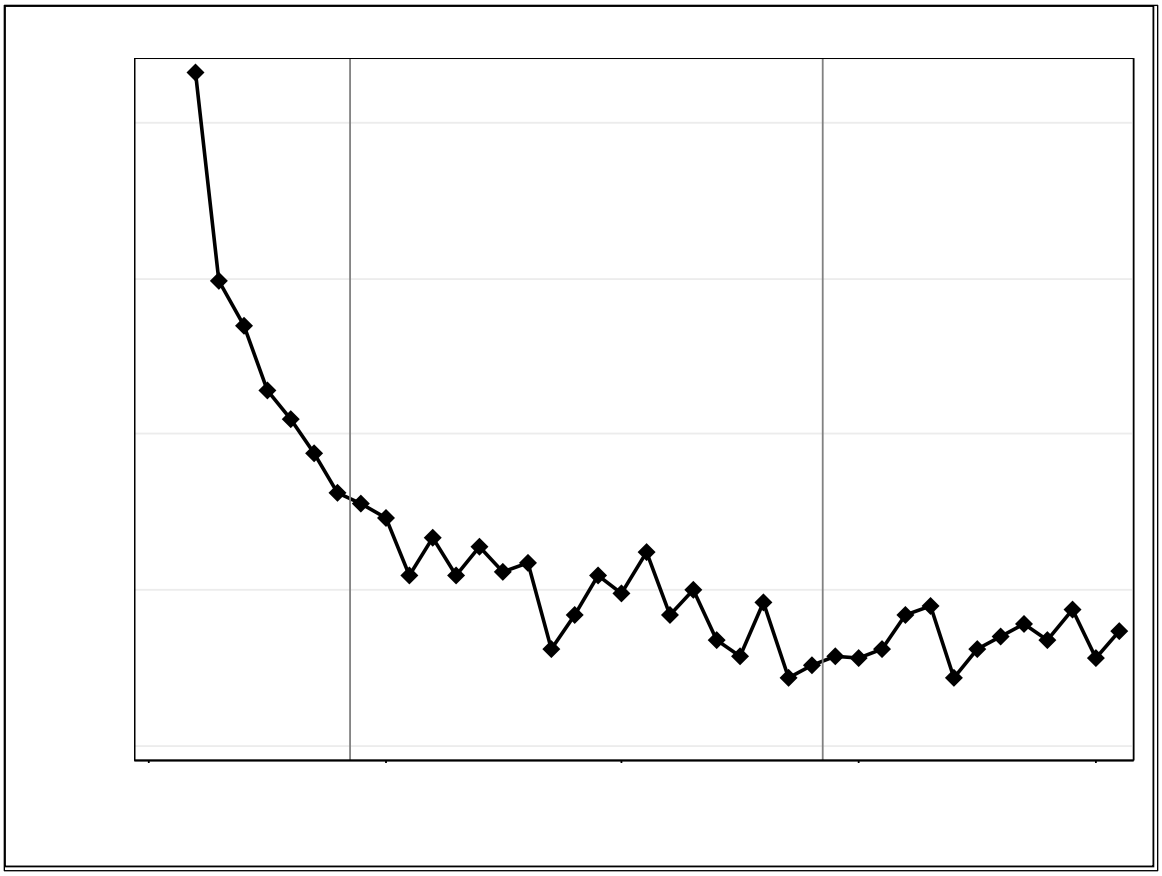

Figure 1: Pediatric Poisoning Fatalities from 1972 through 2011. This figure shows the number of poisoning fatalities in the United States for children younger than age 5. The vertical lines indicate the WHO's switch from deaths coded under ICD-8 to deaths coded under ICD-9 in 1979, and the switch from deaths coded under ICD-9 to deaths coded under ICD-10 in 1999. Data Source: National Center for Health Statistics.

The death counts were categorized by age into two categories: deaths to children younger than 1 year of age, and deaths to children from 1 through 4 years of age. The death counts for each age category for 2002 through 2011, along with the total death counts for both age categories combined, are shown in Figure 2.

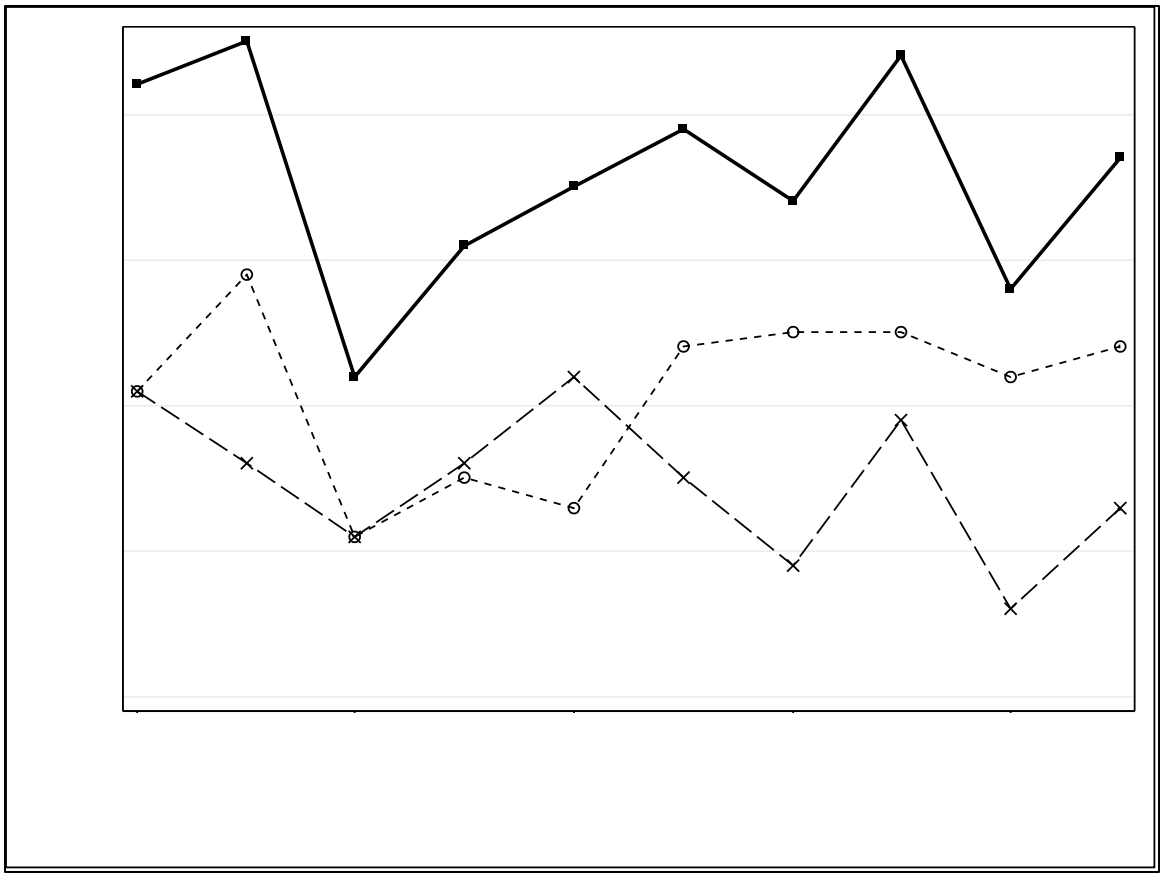

Figure 2: Pediatric Poisoning Fatalities from 2002 through 2011. This figure shows the number of poisoning deaths for children younger than age 5 in the United States. The under 1, 1 to 4, and 0 to 4-year-old age categories[2] are graphed separately. Data Source: National Center for Health Statistics.

Death rates were calculated using population estimates from the U.S. Census Bureau. These rates are shown in Table 2 and Figure 3 (next page).

2 The "Ages 1 to 4" category includes ages from 1 year through 4 years. The "Ages 0 to 4" category includes ages from birth through 4 years.

Table 2: Pediatric Poisoning Death Rates of Children Under Age 5 per Million Population from 2002 Through 2011*

Year	*Under 1*	*Ages 1 to 4*	*Ages 0 to 4*
2002	5.25	1.35	2.15
2003	4.00	1.84	2.28
2004	2.70	0.69	1.10
2005	3.97	0.94	1.55
2006	5.33	0.80	1.71
2007	3.60	1.46	1.89
2008	2.09	1.50	1.62
2009	4.36	1.48	2.07
2010	1.52	1.35	1.39
2011	3.29	1.48	1.83

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

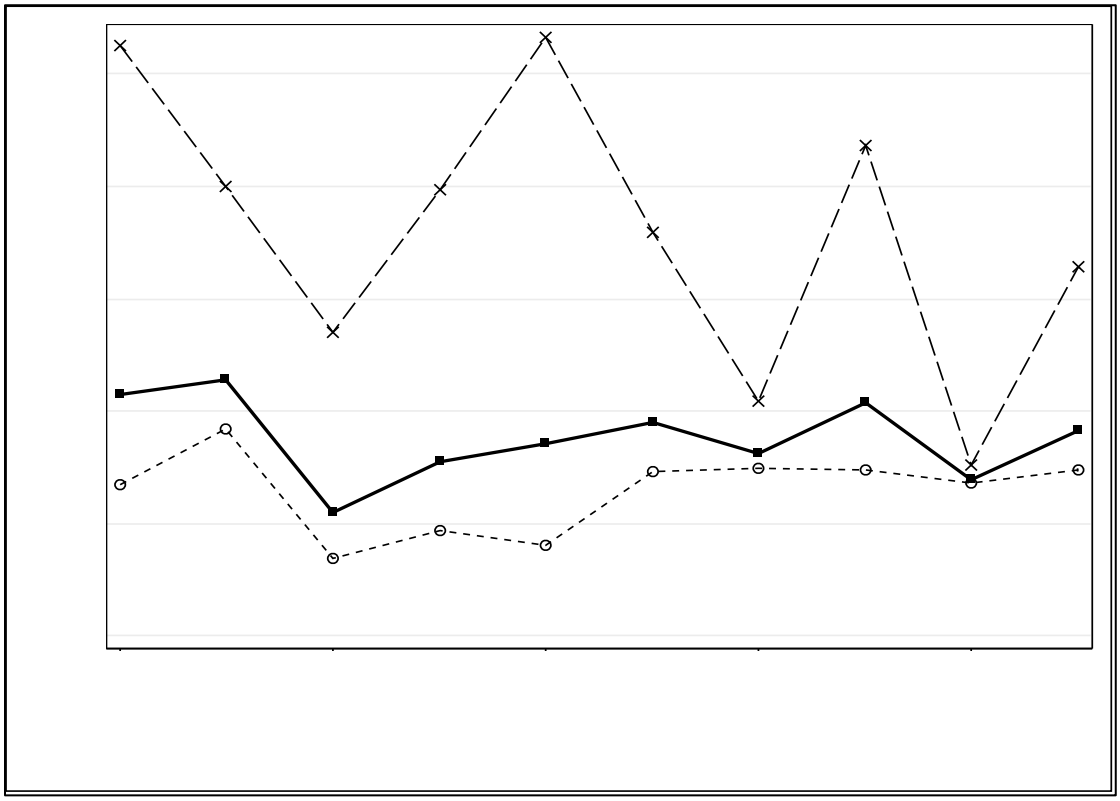

Figure 3: Pediatric Poisoning Death Rates from 2002 Through 2011. This graph shows the death rates in the United States from poisoning per million children in the particular age category, as noted in the chart above. The under 1, 1 to 4, and 0 to 4-year-old age categories are graphed separately. Data Source: National Center for Health Statistics and U.S. Census Bureau.

Poisoning death rates and death counts increased from 2010 to 2011, both overall and for the two age categories. The ICD-10 death codes with decreases from 2010 to 2011were X44 (unspecified drugs, medicaments, and biological substances), which decreased from nine to eight deaths; and X46 (organic solvents and halogenated hydrocarbons), which decreased from two deaths to one death. Death codes with increases from 2010 to 2011were X40 (nonopioidanalgesics, antipyretics, and antirheumatics), which increased from one death to two deaths; X41 (antiepileptic, sedative-hypnotic, antiparkinsonism, and psychotropic drugs), which increased from two deaths to three deaths; X42 (narcotics and psychodysleptics[3]), which increased from 13 to 19 deaths; X45 (alcohol), which increased from zero to one death; and X49 (other and unspecified chemicals), which increased from one death to three deaths.

Table 3: Pediatric Poisoning Death Counts of Children Under 5 by Age Category and ICD-10 Code, 2011

ICD-10 Code[4]	*Under 1*	*Ages 1 to 4*	*Ages 0 to 4*
X40 (nonopioid analgesics, antipyretics, and antirheumatics)	1	1	2
X41 (antiepileptic, sedative- hypnotic, . . . and psychotropic)	2	1	3
X42 (narcotics and psychodysleptics, not elsewhere classified)	5	14	19
X43 (drugs acting on the autonomic nervous system)	0	0	0
X44 (other and unspecified drugs . . . and biological substances)	4	4	8
X45 (alcohol)	0	1	1
X46 (organic solvents and halogenated hydrocarbons)	0	1	1
X48 (pesticides)	0	0	0
X49 (other and unspecified chemicals and noxious substances)	1	2	3
Total	13	24	37

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 11.

METHODOLOGY APPENDIX

Data Sources

Data for 1972 through 1996 are from a previous report prepared by U.S. Consumer Product Safety Commission (CPSC) 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-old age group and the 1-year to 4-year-old age group. Counts of deaths for 2003 through 2006 for children under the age of 5 years were determined from data obtained by CD-ROM from NCHS. Counts of deaths for 2007 through 2011 for children under the age of 5 years were determined from data downloaded from the NCHS website.

The downloads for the NCHS data for 1997 through 2002 were:

- Total Deaths for Each Cause by 5-Year Age Groups, United States, 1994–1998. Downloaded from www.cdc.gov/nchs/datawh/statab/unpubd/mortabs/gmwki.htm on 5 Jan 2001.
- Total Deaths for Each Cause by 5-Year Age Groups, United States, 1999. Downloaded from www.cdc.gov/nchs/datawh/statab/unpubd/mortabs/gmwki10.htm on 10 Jan 2002.
- Deaths for Each Cause, by 5-Year Age Groups, Race, and Sex, United States, 2000. Downloaded from www.cdc.gov/nchs/dvs/wktbli.pdf on 4 Feb 2003.
- Deaths for Each Cause, by 5-Year Age Groups, Race, and Sex: United States, 2001. Downloaded from www.cdc.gov/nchs/datawh/statab/unpubd/mortabs/gmwki10.htm on 29 Apr 2004.
- Deaths for Each Cause, by 5-Year Age Groups, Race, and Sex: United States, 2002. Murphy, Sherry. "Worktable I for 2002 - part 4," E-mail to Craig O'Brien. 12 Apr 2005.

The NCHS CD-ROMs for 2003 through 2006 were:

- U.S. Department of Health and Human Services. National Center for Health Statistics. *Multiple Cause-of-Death Public-Use File* CD-ROM. Hyattsville, MD: NCHS, 2006.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Multiple Cause-of-Death Public-Use File* CD-ROM. Hyattsville, MD: NCHS, 2007.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Multiple Cause-of-Death Public-Use File* CD-ROM. Hyattsville, MD: NCHS, 2008.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Multiple Cause-of-Death Public-Use File* CD-ROM. Hyattsville, MD: NCHS, 2009.

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[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.

The downloads for the NCHS data for 2007 through 2011 were:

- U.S. Department of Health and Human Services. National Center for Health Statistics. *Mortality Multiple Cause File*. Downloaded from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/DVS/mortality/mort2007us.zip on 1 Jun 2010.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Mortality Multiple Cause File*. Downloaded from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/DVS/mortality/mort2008us.zip on 10 Sep 2011.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Mortality Multiple Cause File*. Downloaded from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/DVS/mortality/mort2009us.zip on 17 Apr 2012.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Mortality Multiple Cause File*. Downloaded from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/DVS/mortality/mort2010us.zip on 7 May 2013.
- U.S. Department of Health and Human Services. National Center for Health Statistics. *Mortality Multiple Cause File*. Downloaded from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/DVS/mortality/mort2011us.zip on 1 August 2014.

Population data for the years 1994 to 2011 were obtained from the website of the U.S. Census Bureau. The downloads of the population data were:

- Monthly postcensal resident population estimates for April 1, 1994, to September 1, 1999. Six files, downloaded from www.census.gov/population/estimates/nation/e90s on 11 Feb 2002.
- Monthly postcensal resident population estimates, titled "April 1, 2000 to September 1, 2000," downloaded from www.census.gov/population/estimates/nation/e90s/e0000rmp.txt on 7 Feb 2003.
- Monthly postcensal resident population, by single year of age, sex, race, and Hispanic origin, 7/1/01 to 12/1/01, downloaded from www.census.gov/popest/data/national/asro_detail_1.php on 29 Apr 2004.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/02 to 12/1/02, downloaded from www.census.gov/popest/national/asrh/2003_nat_res.html on 22 Apr 2005.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/03, downloaded from www.census.gov/popest/national/asrh/2003_nat_res.html on 13 Feb 2006.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/04, downloaded from www.census.gov/popest/national/asrh/2004_nat_res.html on 23 Jan 2007.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/05, downloaded from www.census.gov/popest/national/asrh/2005_nat_res.html on 5 Feb 2008.

- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/06, downloaded from www.census.gov/popest/national/asrh/2006_nat_res.html on 28 Apr 2009.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/07, downloaded from www.census.gov/popest/national/asrh/2007_nat_res.html on 12 May 2008.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/08, downloaded from www.census.gov/popest/national/asrh/2008_nat_res.html on 20 Oct 2009.
- Monthly postcensal resident population, by single year of age, sex, race and Hispanic origin, 7/1/09, downloaded from www.census.gov/popest/national/asrh/2009_nat_res.html on 3 Feb 2010.
- Intercensal Estimates of the Resident Population by Sex and Age for the United States: July 1, 2010, downloaded from http://www.census.gov/popest/data/intercensal/national/nat2010.html on 12 Jul 2012.
- Intercensal Estimates of the Resident Population by Sex and Age for the United States: July 1, 2011, downloaded from http://www.census.gov/popest/data/intercensal/national/nat2011.html on 1 Aug 2014.

Data Subsetting

For 2011, the NCHS mortality data file, as downloaded from the Internet, was used. The data are provided in a column-format text file, with documentation on the table layout. CPSC staff wrote SAS v9.3® code to subset the data provided by the ICD-10 cause of death code, age, and resident status.

ICD-10 codes X40 through X49, excluding X47, were used in the report. Traditionally, the X47 code is collected for analysis, but excluded from the report because it covers carbon monoxide poisonings not relevant to the PPPA. Incidents were included 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. The data also include all
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 subset by resident status to exclude foreign nationals from the report.

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 2011 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-

[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.

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.[6]

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. However, the true number of deaths associated with household products or the drug packaging within the CPSC's jurisdiction is likely a subset of the number presented in this report in any given year.

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7 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.