Pediatric Poisoning Fatalities from 1972 through 2005

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Introduction

Unintentional poisonings from drugs and other household chemical substances pose a hazard to children under five years of age. Congress passed the Poison Prevention Packaging Act (PPPA) in 1970. Under the PPPA, child-resistant packaging for about 30 categories of medicines and hazardous household products is required. Child fatalities have declined substantially since the Poison Prevention Packaging Act became law, from 216 in 1972 to an average of about 33 each year from January 1, 2003, through December 31, 2005. This report updates information on unintentional pediatric poisonings with the most recently available data.

Data Sources

Death counts for 1972 through 1996 are from a previous report prepared by U.S. Consumer Product Safety Commission (CPSC) Directorate of Health Sciences staff. Death counts for 1997 through 2005 are based on data from the National Center for Health Statistics (NCHS). Population data for the years 1994 to 2005 were obtained from the U.S. Census Bureau. More information on the data sources is available in the methodology appendix.

Results

Table 1: Pediatric poisoning fatalities from 1972 through 2005

Year	Deaths	Percent Decrease Since 1972
1972	216	
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

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

dashed vertical lines in Figure 1 indicate when WHO switched from using ICD-8 to ICD-9 in 1979, and when they switched from using ICD-9 to ICD-10 in 1999

For 2005, the NCHS data contains reports of 31 deaths of children under five in the ICD-10 categories included in this report (see Methodology Appendix).

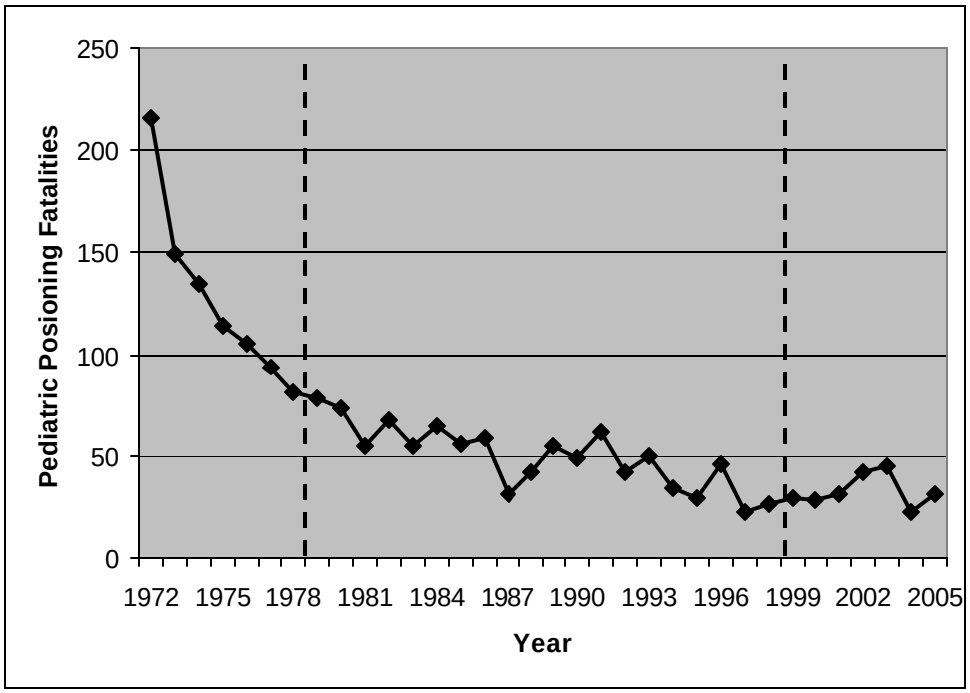

Figure 1: Pediatric poisoning fatalities from 1972 through 2005. This figure shows the number of fatalities for children under five in the United States. The vertical lines indicate the switch from deaths coded under ICD-8 to deaths coded under ICD-9 in 1979 and the switch from deaths coded under ICD-9 to deaths coded under ICD-10 in 1999. Data Source: National Center for Health Statistics.

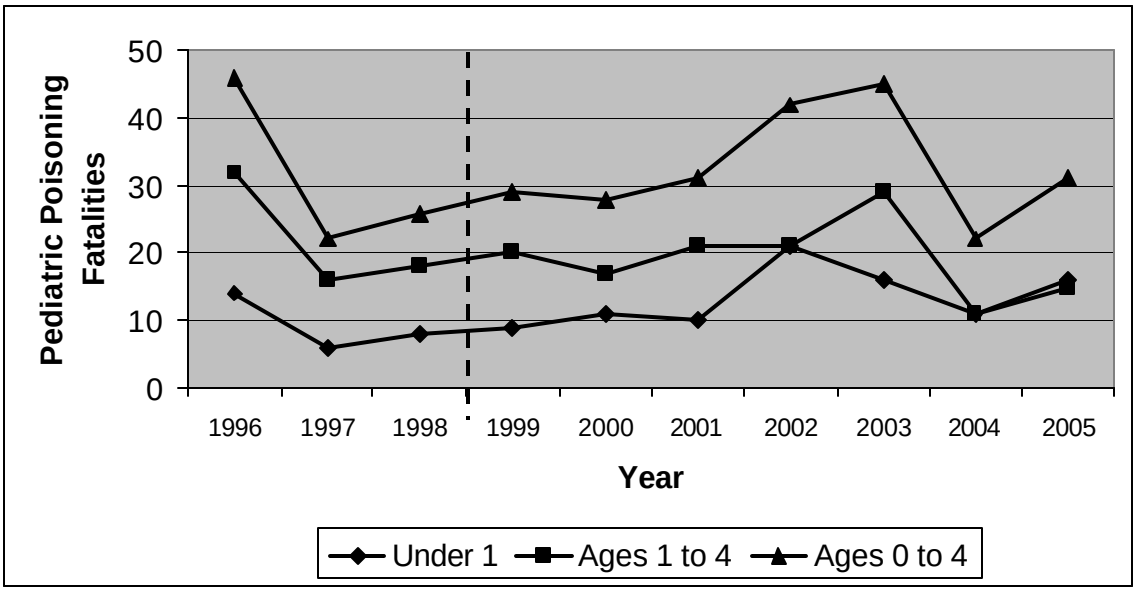

Figure 2: Pediatric poisoning fatalities from 1996 through 2005. This figure shows the number of poisoning deaths for children under five in the United States. The under-one, one-to-four, and less-than-five year age categories are graphed separately. The vertical line indicates the switch from deaths coded under ICD-9 to deaths coded under ICD-10. Data Source: National Center for Health Statistics.

The death counts were categorized by age into deaths to children under one year of age and deaths to children from one to four years of age. The death counts for each age category for the past ten years, along with the total death counts for both age categories, are shown in Figure 2. The dashed vertical line indicates the switch from deaths coded under ICD-9 to deaths coded under ICD-10.

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). The bold line on Table 2 and the dashed line in Figure 3 indicate the switch from deaths coded under ICD-9 to deaths coded under ICD-10.

Table 2: Pediatric poisoning death rates of children under five per million population from 1996 through 2005

Year	Under 1	Ages 1 to 4	Ages < 5
1996	3.71	2.06	2.38
1997	1.59	1.04	1.15
1998	2.11	1.18	1.37
1999	2.36	1.32	1.53
2000	2.88	1.12	1.48
2001	2.48	1.37	1.60
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

The rates in Table 2 are per million population of the specified age. The bold line in Table 2 indicates when the World Health Organization switched from ICD-9 to ICD-10 in 1999.

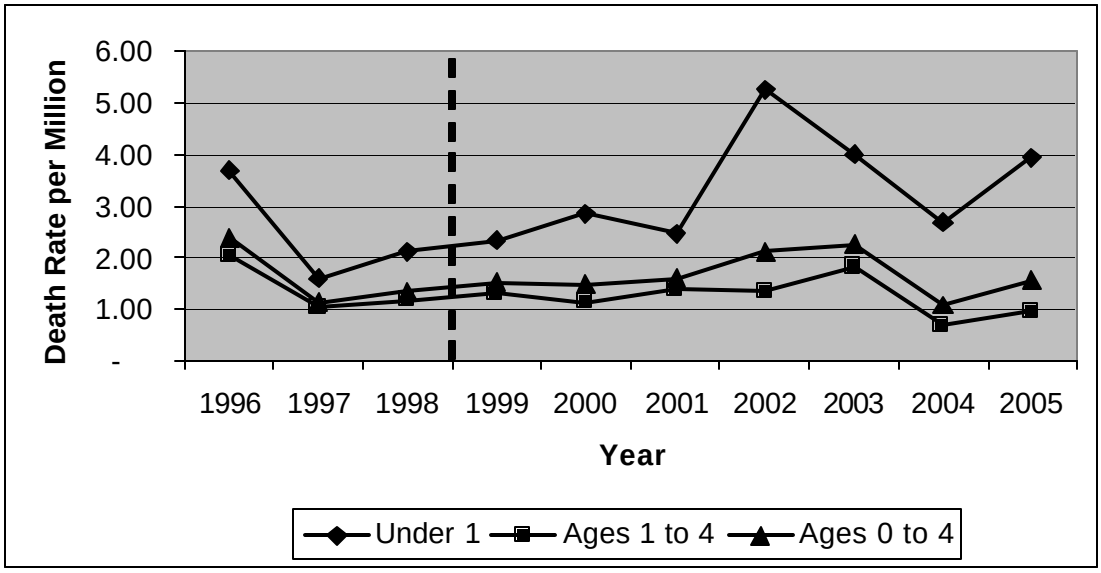

Figure 3: Pediatric poisoning death rates from 1996 through 2005: This graph shows the death rates from poisoning per million children under the age of five in the United States. The under-one, one-to-four, and less-than-five year age categories are graphed separately. The vertical line indicates the switch from deaths coded under ICD-9 to deaths coded under ICD-10. Data Source: National Center for Health Statistics and U.S. Census Bureau.

Death rates and death counts increased for all age groups from 2004 to 2005. Analysis of the death codes shows the largest increase is in code X44 (unspecified drugs, medicaments, and biological substances), which had 10 deaths out of 22 in 2004 (45%) and 15 deaths out of 31 in 2005 (48%). However, X44 is historically the largest category examined in this report. The remaining 12 deaths in 2004 were spread across four categories, while the remaining 16 deaths in 2005 were spread across five categories. The

only categories with deaths in both 2004 and 2005 and no change in counts were X40 (nonopioid analgesics, antipyretics, and antirheumatics) and X41 (anitepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified), each of which had one death in each year. The categories with no deaths in either 2004 or 2005 were X45 (alcohol) and X48 (pesticides). The variability apparent in the death counts since 1999 may be normal random variability, and not due to any particular product or trend. However, the data available are not sufficient to determine the sources of variability in the death counts.

METHODOLOGY APPENDIX

Data Sources

Data for 1972 through 1996 are from a previous report prepared by U.S. Consumer Product Safety Commission (CPSC) Directorate of Health Sciences staff.[1] Counts of deaths for 1997 through 2002 were obtained from the National Center for Health Statistics (NCHS) website, utilizing data in the under-one year age group and the one-to-four-year-old age group. Counts of deaths for 2003 through 2005 were determined from data obtained by CD-ROM from NCHS for children under the age of five.

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 2005 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.

Population data for the years 1994 to 2005 were obtained from the website of the U.S. Census Bureau. The downloads of the population data were:

[1] 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.

- 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.

Data Subsetting

For 2005 the NCHS mortality data file as provided on CD-ROM was used. The data is provided in a column-format text file, with documentation on the table layout. CPSC staff wrote SAS v9.1® code to subset the data provided by ICD-10 cause of death code, age, and resident status.

ICD-10 codes X40 through X49, excluding X47, were used in the report. The X47 code is traditionally collected for analysis but excluded from the report, as it covers carbon monoxide poisonings not relevant to the PPPA. Incidents were only included in the subset if a relevant ICD-10 code was listed as the underlying cause of death.

The NCHS data uses 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 than a year, which are used for children less than a 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 2005 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 which 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.[2] Because ICD-10 codes are not directly comparable to ICD-9 codes, discontinuities can appear in trend analyses that utilize 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

[2] 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.

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.[2] For most cause-of-death groupings, the 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.[2]

In the absence of a ratio for poisoning, the ratio for non-transport accidents was considered for use in this analysis. Non-transport accidents include all accidental deaths that do not involve a vehicle. Because of the possibility that the comparability ratio for the poisoning group could be significantly different from that for all non-transport 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 poisoning, 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 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. Both X40 and X41 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 in CPSC's jurisdiction is likely a subset of the number presented in this report in any given year.