UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: JAN 26 2005

TO : The Commission
Todd Stevenson, Secretary

THROUGH: John G. Mullan, Acting General Counsel
Patricia M. Semple, Executive Director

FROM : Jacqueline Elder, Assistant Executive Director
Hazard Identification and Reduction

Robin Ingle, Mathematical Statistician
Division of Hazard Analysis

SUBJECT : 2003 Annual Report of All-Terrain Vehicle (ATV)-Related Deaths and Injuries

Attached is the annual report of ATV-related deaths and injuries for the year 2003. This report covers death data available as of December 31, 2003 and data on injuries occurring up to December 31, 2003.

Attachment (1)

NOTE: This document has not been reviewed or accepted by the Commission.
Initial _____ Date 1/26/05

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NO MFRS/PRV/TLD DATA OR PRODUCTS IDENTIFIED
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WITH POSSIBLE PROBLEMS ID:

2003 Annual Report of ATV Deaths and Injuries

January 2005

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Washington, DC 20207

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

Table of Contents

Introduction

U.S. Consumer Product Safety Commission (CPSC) staff first began analyzing data on all-terrrain vehicles (ATVs) in the early 1980s as a means to provide statistics on the numbers of deaths and injuries associated with three-wheel ATVs. In April of 1988, CPSC entered into formal agreements with the major ATV manufacturers in which the manufacturers agreed, among other things, to halt production of three-wheelers, offer safety training to all new ATV owners, and recommend adult-sized ATVs only for those aged 16 and older. The agreements expired in April of 1998. Following their expiration, the major manufacturers agreed to continue most of the elements of the agreements through formal action plans. Most of the vehicles on the market today are four-wheel ATVs, though a few of the three-wheelers survive in use by consumers.

This report provides an update of CPSC data on ATV deaths and injuries. This update includes death reports available as of December 31, 2003 and data on injuries occurring up to December 31, 2003.

Deaths Reported to the Commission

On December 31, 2003, the Commission had reports of 5,791 ATV-related deaths that have occurred since 1982 (Table 1). The number of new reports increased by 552 since the December 31, 2002 tabulation reported by Commission staff on September 15, 2003. The new reports include deaths occurring over 2000-2003.

Values above the heavy line in Table 1 reflect a revised classification system from the one used prior to 1999. Specifically, the line marks the switch from data collection under the Ninth Revision of the International Classification of Diseases (ICD-9) to collection under the Tenth Revision (ICD-10), a transition that occurred worldwide in January of 1999. Any comparison of numbers above and below the line should be undertaken with caution. The ICD-10 transition and related methodological issues are discussed more fully in Appendix B.

Table 2 gives the numbers of reported ATV-related deaths for each state, the District of Columbia and Puerto Rico. Deaths occurring in the period 1982 through 1999 are tabulated in the second column and allow for the comparable ranking of states. The years 1982 to 1999 constitute the period for which death report collection is complete. The highest numbers of deaths occurring in the complete period were for California (255), Pennsylvania (219), New York (181), Texas (179) and Michigan (176). Together these five states accounted for 25 percent of all reported deaths in the U.S., as shown in column three.

Counts of deaths reported as of December 31, 2003 in each state for the period 2000-2003 are tabulated in the fourth column of Table 2. This tabulation of deaths reported in these years cannot be used for comparisons among states because data collection in some states is more complete than in other states for those years. Each state's total number of reported deaths is listed in the fifth column.

Table 1
Reported ATV-Related Deaths by Year
ATVs with 3, 4 or Unknown Number of Wheels
January 1, 1982 to December 31, 2003

Year[1]	Number of Deaths	Difference Since Last Update (12/31/2002)
Total	**5,791**	**+552**
2003	*407*	*+407*
2002	*473*	*+116*
2001	*494*	*+27*
2000	*448*	*+2*
1999[2]	399	0
1998	251	0
1997	241	0
1996	248	0
1995	200	0
1994	198	0
1993	183	0
1992	221	0
1991	230	0
1990	234	0
1989	230	0
1988	250	0
1987	264	0
1986	299	0
1985	251	0
1984	156	0
1983	85	0
1982	29	0

Source: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, Division of Hazard Analysis.
Italics denote the period for which reporting is incomplete.

[1] Reporting is incomplete for 2000-2003.
[2] Beginning in 1999, deaths were coded under the Tenth Revision of the International Classification of Diseases (ICD-10). See Appendix B for an explanation of the effect of this change.

Table 2
Deaths Associated With ATVs by State
ATVs with 3, 4 or Unknown Number of Wheels
Reported for the Period January 1, 1982 Through December 31, 2003

State	Reported Deaths 1982-1999	Cumulative Percent of U.S. 1982-1999	*Reported Deaths 2000-2003**	*Total Reported Deaths**
CALIFORNIA	255	6%	*69*	*324*
PENNSYLVANIA	219	12	*98*	*317*
NEW YORK	181	17	*52*	*233*
TEXAS	179	21	*75*	*254*
MICHIGAN	176	25	*70*	*246*
WEST VIRGINIA	158	29	*100*	*258*
TENNESSEE	148	33	*65*	*213*
FLORIDA	144	37	*86*	*230*
NORTH CAROLINA	131	40	*88*	*219*
ARKANSAS	130	43	*38*	*168*
KENTUCKY	123	46	*134*	*257*
WISCONSIN	119	49	*36*	*155*
MISSISSIPPI	115	52	*63*	*178*
GEORGIA	113	55	*64*	*177*
MINNESOTA	111	58	*45*	*156*
OHIO	106	61	*49*	*155*
MISSOURI	105	63	*62*	*167*
ARIZONA	96	66	*26*	*122*
LOUISIANA	94	68	*40*	*134*
ALABAMA	92	70	*31*	*123*
ILLINOIS	87	73	*39*	*126*
ALASKA	82	75	*11*	*93*
UTAH	78	77	*24*	*102*
INDIANA	69	78	*38*	*107*
VIRGINIA	66	80	*41*	*107*
OREGON	62	82	*32*	*94*
MAINE	61	83	*15*	*76*
OKLAHOMA	55	85	*25*	*80*
IOWA	53	86	*27*	*80*
KANSAS	53	87	*24*	*77*
IDAHO	46	88	*21*	*67*
WASHINGTON	41	89	*17*	*58*
NEW MEXICO	40	90	*17*	*57*
COLORADO	39	91	*27*	*66*
NEBRASKA	36	92	*14*	*50*
MASSACHUSETTS	35	93	*11*	*46*
NEW HAMPSHIRE	32	94	*15*	*47*
NEVADA	30	95	*9*	*39*
VERMONT	30	95	*10*	*40*
SOUTH CAROLINA	27	96	*35*	*62*
NEW JERSEY	25	97	*17*	*42*
NORTH DAKOTA	24	97	*5*	*29*
MONTANA	23	98	*7*	*30*
SOUTH DAKOTA	21	99	*11*	*32*
MARYLAND	18	99	*21*	*39*
CONNECTICUT	16	99	*3*	*19*
WYOMING	11	100	*8*	*19*
DELAWARE	5	100	*1*	*6*
RHODE ISLAND	3	100	*1*	*4*
DISTRICT OF COLUMBIA	2	100	*1*	*3*
HAWAII	2	100	*4*	*6*
PUERTO RICO	2	100	*0*	*2*

Source: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, Division of Hazard Analysis.
Italics denote the period for which reporting is incomplete.
*Data collection for 2000-2003 is incomplete. Columns 4 and 5 should not be used for comparison among states.

Characteristics of ATVs and Fatalities

A review of the reported fatalities indicated that 1,846 victims (32 percent of the 5,791 total) were under 16 years of age and 778 (13 percent of the total) were under 12 years of age. Table 3 gives the numbers and percentages of reported fatalities by year for the 0- to 15-year-old age group. Appendix A contains a further breakdown of numbers of reported deaths in the under-16 age group.

Table 3
Reported ATV-Related Deaths of Children Under 16 Years Old
ATVs with 3, 4 or Unknown Number of Wheels
January 1, 1982 to December 31, 2003

Year[3]	0-15 Years Old	0- 15 Years Old Percent of Total
Total	**1,846**	**32%**
2003	*111*	*27*
2002	*121*	*26*
2001	*128*	*26*
2000	*124*	*28*
1999[4]	90	23
1998	82	33
1997	79	33
1996	87	35
1995	64	32
1994	54	27
1993	59	32
1992	71	32
1991	68	30
1990	81	35
1982-1989	627	40

Source: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, Division of Hazard Analysis.
Italics denote the period for which reporting is incomplete.

The percentage of victims under age 16 has declined in recent years, for which data collection is still incomplete. These lower percentages of young victims may also be affected by the change in the death classification system from ICD-9 to ICD-10.

Production of three-wheel ATVs ceased in the mid- to late-1980s, and most ATVs currently distributed in the U.S. are four-wheel ATVs. The percent of reported fatalities that involved four-wheel ATVs has increased from seven percent or less prior to 1985 to about 90 percent for 2003, based on those fatalities reported as of December 31, 2003. (Data collection for 2000-2003 was not complete.)

[3] Reporting is incomplete for 2000-2003. Percentages for years for which reporting is incomplete should be interpreted with caution because the rate at which deaths are reported may not be consistent across all age groups.
[4] Beginning in 1999, deaths were coded under the Tenth Revision of the International Classification of Diseases (ICD-10). See Appendix B for a discussion of the effect of this change.

Estimated Deaths and Risk of Death, 1985 to 2002

The deaths reported to the Commission represent a minimum count of ATV-related deaths. To account for deaths not reported to the Commission, estimates of the annual deaths were calculated for 1985 through 2002 using a statistical approximation method. Table 4 shows the annual reported and estimated numbers of ATV-related deaths for ATVs with three, four or unknown number of wheels, in addition to the annual estimates and risk of death (per 10,000 in use) for four-wheel ATVs from 1985 to 2002.

Table 4
Annual Estimates of ATV-Related Deaths
And Risk of Death for Four-Wheel ATVs
As of December 31, 2003

Year[5]	Reported Deaths	Estimated Deaths Associated With ATVs with 3, 4 or Unknown Wheels	Estimated Deaths Involving 4-Wheel ATVs	Estimated 4-Wheel ATVs in Use (millions)[6]	Estimated Risk of Death per 10,000 4-Wheel ATVs In Use
2002	*473*	*621*	*580*	*5.5*	*1.1*
2001	*494*	*609*	*561*	*4.9*	*1.1*
2000	*448*	*556*	*505*	*4.2*	*1.2*
1999[7]	399	535	487	3.6	1.4
1998	251	287	245	3.1	0.8
1997	241	291	243	2.7	0.9
1996	248	267	208	2.4	0.9
1995	200	276	212	2.2	1.0
1994	198	244	168	2.0	0.8
1993	183	211	144	1.9	0.7
1992	221	241	158	1.9	0.8
1991	230	255	152	1.8	0.8
1990	234	250	151	1.8	0.9
1989	230	258	153	1.6	0.9
1988	250	286	152	1.4	1.1
1987	264	282	126	1.1	1.1
1986	299	347	95	0.7	1.3
1985	251	295	55	0.4	1.5

Source: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, Division of Hazard Analysis.
Italics denote the period for which reporting is incomplete.

The heavy line between 1998 and 1999 in Table 4 demarcates the previously discussed switch from data collection under the Ninth Revision of the International Classification of Diseases (ICD-9) and the

[5] Reporting is incomplete for 2000-2002.
[6] Rounded.
[7] Beginning in 1999, deaths were coded under the Tenth Revision of the International Classification of Diseases (ICD-10). See Appendix B for an explanation of the effect of this change.

Tenth Revision (ICD-10). The ICD-10 transition and the resulting necessary changes in methodology are explained more fully in Appendix B. Because ICD-10 allows CPSC to gather data on more ATV-related deaths on public roads than had been possible under ICD-9, some of the increase in deaths from 1998 to 1999 is probably due to changes in data collection, although the magnitude of the effect of this change is unclear. Such a conclusion would indicate that the death and risk estimates calculated by the pre-1999 methodology were underestimates, though they were the best estimates possible using available data.

Column 5 of Table 4 gives annual estimates for the numbers of four-wheel ATVs in use. According to CPSC's *All Terrain Vehicle 2001 Injury and Exposure Studies*, in 2001, about 5.6 million three- and four-wheel ATVs were in use, and about 86 percent of these were four-wheelers.[8]

A discussion of the methodology used for the calculation of the estimates of the numbers of deaths and the risk of death associated with ATVs is given in Appendix B.

Estimated Hospital Emergency Room Treated Injuries

Table 5 shows estimates of ATV-related injuries treated in hospital emergency rooms nationwide between January 1, 1982 and December 31, 2003. These estimates are generated from CPSC's National Electronic Injury Surveillance System, a probability sample of U.S. hospitals with 24-hour emergency rooms and more than six beds.

The injury estimate for all ages for 2003 reflects an increase of about ten percent over the 2002 estimate. This increase was statistically significant.

Children under 16 years of age accounted for about 37 percent of the total estimated injuries from 1985 through 2003 inclusive, and about 31 percent of the estimated injuries for 2003. The 2003 estimate for children under 16 represents a four percent increase over the 2002 estimate. This increase was not statistically significant.

[8] Levenson, M. *All-Terrain Vehicle 2001 Injury and Exposure Studies.* U.S. Consumer Product Safety Commission. January 2003.

Table 5
Annual Estimates[9] of ATV-related Hospital Emergency Room Treated Injuries
ATVs with 3, 4 or Unknown Number of Wheels
January 1, 1982 through December 31, 2003

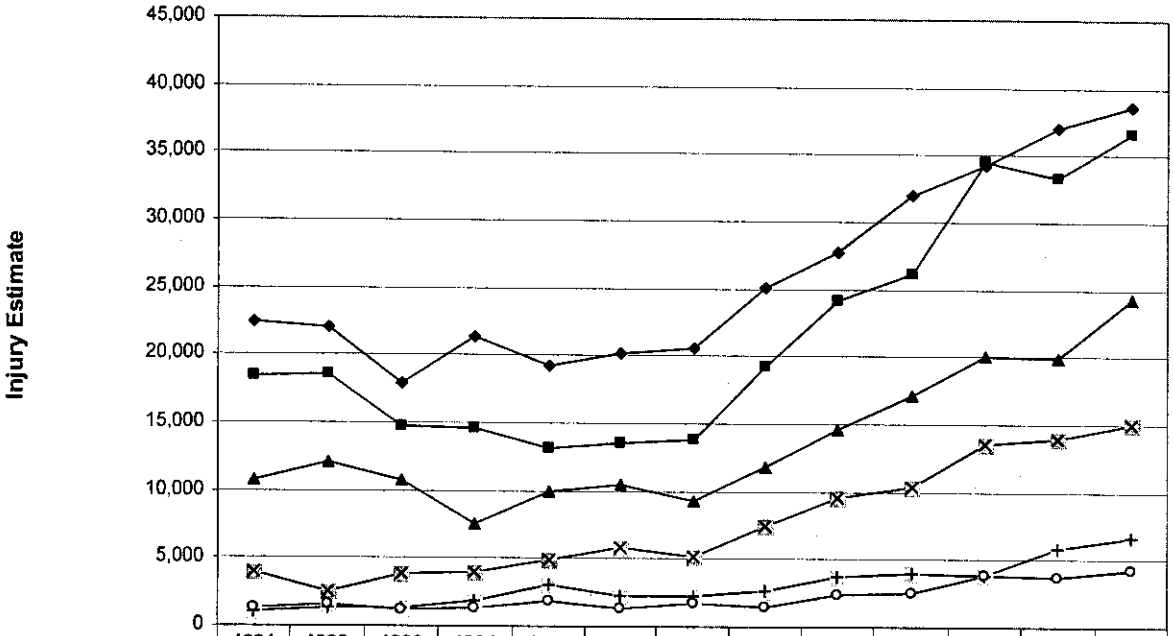
Year	Estimated Number of Injuries All Ages	Estimated Number of Injuries Ages Less Than 16 Years	Percent of Total Ages Less Than 16 Years
2003	125,500	38,600	31%
2002	113,900	37,100	33
2001	110,100	34,300	31
2000	92,200	32,000	35
1999	82,000	27,700	34
1998	67,800	25,100	37
1997	52,800	20,600	39
1996	53,600	20,200	38
1995	52,200	19,300	37
1994	50,800	21,400	42
1993	49,800	17,900	36
1992	58,200	22,000	38
1991	58,100	22,500	39
1990	59,500	22,400	38
1989	70,300	25,700	37
1988	74,600	28,500	38
1987	93,600	38,600	41
1986	106,000	47,600	45
1985	105,700	42,700	40
1984	77,900	[10]	
1983	32,100	[10]	
1982	10,100	[10]	

Source: National Electronic Injury Surveillance System, U.S. Consumer Product Safety Commission.

Figure 1 on the next page presents annual estimates by age group for ATV-related injuries treated in hospital emergency rooms since 1989.

[9] Estimates have been adjusted according to the methodology in Appendix B.
[10] Adjusted estimates for children under 16 years old were not computed prior to 1985.

Figure 1
Annual ATV-Related Injury Estimates[11]
ATVs with 3, 4 or Unknown Number of Wheels
1991-2003



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
under 16	22,500	22,000	17,900	21,400	19,300	20,200	20,600	25,100	27,700	32,000	34,300	37,100	38,600
16-24	18,400	18,600	14,700	14,600	13,100	13,500	13,800	19,300	24,200	26,200	34,500	33,300	36,600
25-34	10,800	12,100	10,700	7,600	10,000	10,500	9,300	11,800	14,600	17,100	20,100	19,900	24,300
35-44	4,000	2,500	3,900	4,000	4,900	5,800	5,200	7,400	9,500	10,400	13,500	13,900	15,000
45-54	1,100	1,300	1,300	1,900	3,000	2,300	2,200	2,700	3,700	4,000	3,900	5,900	6,700
55 and over	1,300	1,600	1,200	1,300	1,800	1,300	1,700	1,400	2,400	2,500	3,800	3,700	4,300

Source: National Electronic Injury Surveillance System, U.S. Consumer Product Safety Commission.

The estimated number of injuries increased in every age group in 2003, though not all increases were statistically significant. The greatest percentage change in number of injuries occurred in the 25- to 34-year-old age group, where injuries increased by 22 percent between 2002 and 2003. This increase in the estimate for the 25- to 34-year-old group was significant. The 55-and-older group increased by 16 percent, the 45-54 group increased by 14 percent and the 16-24 group increased by ten percent. Slight percentage increases were also seen in the 35-44 group and the under-16 group.

Table 6 shows estimates of four-wheel ATV-related injuries and risk of injury for January 1, 1985 through December 31, 2003, where risk is defined as the estimated number of injuries divided by the number of vehicles in use, multiplied by 10,000. The injury estimate for 2003 represents an increase of 11 percent over the estimate for 2002 and is statistically significant. Four-wheel injuries constitute 93 percent of the total estimate for ATVs with three, four or an unknown number of wheels in 2003.

[11] Estimates have been adjusted according to the methodology in Appendix B.

Table 6
Estimated Number of Injuries And Risk of Injury
Associated with Four-Wheel ATVs
January 1, 1985 – December 31, 2003

Year	Injury Estimate[12]	Estimated 4-Wheel ATVs in Use (millions)[13]	Risk Estimate per 10,000 4-Wheel ATVs
2003	116,600	6.2	188.4
2002	104,800	5.5	190.0
2001	98,200	4.9	200.9
2000	82,300	4.2	197.2
1999	68,900	3.6	193.0
1998	57,100	3.1	184.7
1997	39,700	2.7	146.1
1996	40,700	2.4	168.1
1995	36,200	2.2	165.7
1994	33,300	2.0	165.4
1993	32,000	1.9	164.9
1992	33,000	1.9	175.1
1991	34,400	1.8	188.1
1990	30,800	1.8	175.1
1989	35,700	1.6	217.8
1988	39,400	1.4	276.1
1987	33,900	1.1	305.9
1986	23,400	0.7	319.2
1985	14,700	0.4	391.1

Source: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, Division of Hazard Analysis; National Electronic Injury Surveillance System; and the Directorate for Economic Analysis.

Discussion

The use of three-wheel ATVs has declined; therefore, ATVs in use are primarily four-wheel vehicles. Estimated numbers of deaths for four-wheel ATVs (Table 4) were generally constant from the late 1980s through the early 1990s; thereafter, estimated numbers of deaths increased. In 1999, a revision of the system for coding deaths was implemented. Because of those changes, some of the increase seen between 1998 and 1999 is probably due to CPSC's increased ability to obtain more accurate counts of deaths occurring on public roads, although the magnitude of this effect is unclear. Any conclusion indicating that at least some of the increase in estimated deaths is due to data collection also implies that the estimates for years prior to 1999 are underestimates, though they were the best estimates possible using available data. CPSC staff believes this to be the case; while the 1999-2002 estimates indicate there is an actual increase in deaths, the trend may not be rising as sharply as it appears when

[12] Annual estimates have been adjusted according to the methodology in Appendix B.
[13] Rounded.

the estimate for 1998 is compared to the estimate for 1999, because the numbers of deaths in the period coded under ICD-9 were underestimates. Such is also the case for risk of death.

The estimated number of injuries for four-wheel vehicles (Table 6) was also relatively constant for the late 1980s through the early- to mid-1990s; thereafter the numbers of injuries also increased, and statistically significant increases have occurred most years since 1997. The increase in the estimated injuries suggests that the increase in deaths may not be entirely due to better data collection.

While the absolute number of injuries is clearly increasing, the overall picture for risk of injury is less clear. The estimated risk of injury for four-wheel ATVs for 2003 was 188.4 injuries per 10,000 ATVs in use. A recent high in the estimated risk of injury occurred at 200.9 in 2001.

The estimated risk of death for four-wheel ATVs in 2002 was 1.1 deaths per 10,000 four-wheel ATVs in use. In 1999, the earliest comparable year due to changes in data collection, the estimated risk of death was 1.4 deaths per 10,000 four-wheel ATVs in use. Data collection for deaths for 2000-2003 is incomplete, so these values are likely to change in future reports.

Appendix A

Table 7
Reported ATV-Related Deaths by Year and Age Group
ATVs with 3, 4 or Unknown Number of Wheels
January 1, 1982 to December 31, 2003

Year[14]	0-11 Years Old	0-11 Years Old Percent of Total	0-15 Years Old	0- 15 Years Old Percent of Total
Total	**778**	**13%**	**1,846**	**32%**
2003	*50*	*12*	*111*	*27*
2002	*41*	*9*	*121*	*26*
2001	*56*	*11*	*128*	*26*
2000	*50*	*11*	*124*	*28*
1999[15]	34	9	90	23
1998	30	12	82	33
1997	38	16	79	33
1996	40	16	87	35
1995	26	13	64	32
1994	20	10	54	27
1993	18	10	59	32
1992	32	14	71	32
1991	40	17	68	30
1990	27	12	81	35
1982-1989	276	18	627	40

Source: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, Division of Hazard Analysis.
Italics denote the period for which reporting is incomplete.

[14] Reporting is incomplete for 2000-2003. Percentages for years for which reporting is incomplete should be interpreted with caution because the rate at which deaths are reported may not be consistent across all age groups.
[15] Beginning in 1999, deaths were coded under the Tenth Revision of the International Classification of Diseases (ICD-10). See Appendix B for a discussion of the effect of this change.

Appendix B

Methodology

Deaths

CPSC staff estimates the number of deaths associated with ATVs by use of a capture-recapture approach. This approach involves examining the numbers of reports of fatalities gathered by two different methods. The first method is the collection of death certificates purchased from the states, where the death was deemed ATV-related by the medical examiner. These incidents are entered into CPSC's death certificate database (DTHS). The second method is the collection of various types of reports of fatal ATV-related incidents by any other means available to the agency: news clips, reports from the Medical Examiners' and Coroners' Alert Project (MECAP), reports from consumers via phone or Internet, hospital reports from the National Electronic Injury Surveillance System (NEISS), as well as other types of reports.

Table 1 presents counts of deaths reported to CPSC that have not been reported in previous years. Additional reports that are duplicates of ones counted in previous versions of this annual report may have been received (e.g., CPSC may have received a news clip about a death that originally was reported via a MECAP report in a prior year). Counts of these duplicate reports are not included in Table 1.

The calculation of the capture-recapture estimate entails examining the number of incidents included in DTHS or from non-DTHS sources as well as the number included on both lists of incidents. The estimate is given by

$$estimate = \frac{(M+1)(N+1)}{n+1} - 1 \qquad \textit{Formula 1}$$

where

M is the number of incidents captured by purchase of death certificates from the states,
N is the number of incidents collected by other means, and
n is the number of incidents captured by both death certificate purchase and by at least one other source.

Estimates of fatalities occurring after January 1, 1999 that were associated with ATVs with three, four or an unknown number of wheels were calculated using formula 1.

In 1999, CPSC began collecting death certificates of all fatalities involving an ATV, as coded under the Tenth Revision of the International Classification of Diseases (ICD-10). ICD-10 marks the first revision for which all ATV-related fatalities are grouped under a single code, thus facilitating more complete collection of these incidents by CPSC than was accomplished prior to 1999.

Prior to 1999, CPSC received death certificates only of fatalities occurring in places other than public roads and of fatalities occurring in public road locations that were erroneously reported as non-public-road locations. Because of this, the procedure for estimating ATV-related deaths had two parts. Because death certificates generally were not collected for public road fatalities, the count for these fatalities was the number of reports received, mostly in the Injury or Potential Injury Incident file (IPII). For incidents occurring in other places, the capture-recapture approach was applied. The two parts (incidents occurring on public roads and incidents occurring in other places) were then combined for the annual estimate of deaths, as in the following formula:

$$estimate = \frac{(M_{NP}+1)(N_{NP}+1)}{n_{NP}+1} - 1 + C_P \qquad \textit{Formula 2}$$

where

M_{NP} is the number of reports of non-public-road fatalities captured by purchase of death certificates from the states,

N_{NP} is the number of reports of non-public-road fatalities collected by other means,

n_{NP} is the number of reports of non-public-road fatalities captured by both death certificate purchase and by at least one other source,

and

C_P is the count of reports of ATV-related fatalities occurring on public roads from any source.

We believe estimates for years prior to 1999 to be under-estimates because those estimates used only the available count of public road fatalities, and did not account for missing reports. Since CPSC now receives death certificates for ATV incidents occurring anywhere, the capture-recapture approach has been utilized for the entire estimate of ATV-related deaths from 1999 forward. The resulting estimates of deaths after January 1, 1999 represent a better approximation of the number of deaths associated with ATVs.

A number of incidents reported to CPSC involve ATVs for which the number of wheels is unknown. Because some of these actually involve four-wheel ATVs, the unknowns are apportioned in the calculation of the estimated number of deaths associated with four-wheelers. This estimate was calculated by first dividing the reported number of deaths for four-wheel ATVs by the combined reported number of deaths for three- and four-wheel ATVs, then multiplying this quotient by the estimated number of deaths for all ATVs (three, four or unknown number of wheels). Thus, the estimate of deaths associated with four-wheel ATVs is given by

$$Estimate_{4W} = \frac{rep_{4W}}{rep_{3W+4W}} Est_{3W+4W+UW} \qquad \textit{Formula 3}$$

where

$Estimate_{4W}$ is the estimated number of fatalities associated with four-wheel ATVs,

rep_{4W} is the reported number of fatalities associated with four-wheel ATVs,

rep_{3W+4W} is the reported number of fatalities associated with three- and four-wheel ATVs, and

$Est_{3W+4W+UW}$ is the estimated number of fatalities associated with ATVs with three, four or an unknown number of wheels.

Risk of death associated with four-wheel ATVs was calculated by dividing the annual estimate by the number of ATVs in use in a given year. Annual ATV population estimates are based on ATV sales and operability rates provided by industry, as well as on injury and exposure studies conducted by CPSC.[16] Annual population estimates for 1994 and prior years were computed from a survival model derived from 1994 data. Annual population estimates for years 2001 and after were computed from a survival model derived from 2001 data. Population estimates for the intervening years come from a model that provides a smooth transition between the 1994 and the 2001 models. The estimated number of four-wheel ATVs in use in Tables 4 and 5 are rounded figures. Risk estimates calculated using these rounded figures may not match those in the tables because of this.

Because reliable operability rate data are not available for three-wheel ATVs, the risk of death is given in this report only for four-wheel ATVs.

Fatal incidents considered in-scope in this report include any unintentional incident involving an ATV, whether or not the ATV was in operation at the time of the incident. Because of the difficulties inherent in distinguishing between occupational and non-occupational use, occupational fatalities are included when reported to CPSC. For instance, a fatality that occurs when a victim is riding alongside a fence on a ranch for the purpose of checking it and then overturns his ATV while deviating from his usual work routine to take a "joy ride" up a nearby hill may be difficult to classify. In addition, ATVs are primarily recreational products, and the relative proportion of occupational fatalities in this report is small.

Injuries

All injury estimates in this report were derived from data collected through CPSC's National Electronic Injury Surveillance System, a probability sample of U.S. hospitals with 24-hour emergency rooms and more than six beds.[17] Estimates have been adjusted due to revisions in the NEISS Coding Manual in 1985, as well as to account for NEISS sampling frame updates.[18] Estimates for 1982 through 1985 were adjusted based on a review of NEISS comments to exclude dune buggies and identify ATVs classified as mini or trail bikes.

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[16] See Levenson, M., 2001 ATV Operability Rate Analysis, memorandum. May 6, 2003. U.S. Consumer Product Safety Commission. Also see Levenson, M. *All-Terrain Vehicle 2001 Injury and Exposure Studies.* U.S. Consumer Product Safety Commission. January 2003.

[17] Schroeder, T. and Ault, K. *The NEISS Sample (Design and Implementation) From 1979 to 1996.* U.S. Consumer Product Safety Commission. June 2001.
Schroeder, T. and Ault, K. *The NEISS Sample (Design and Implementation) From 1997 to the Present.* U.S. Consumer Product Safety Commission. June 2001.

[18] Marker, D.; Waksberg, J.; and Braden, J. *NEISS Sample Update.* Westat, Inc. June 3, 1988.
Marker, D., and Lo, A. *Update of the NEISS Sampling Frame and Sample.* Westat, Inc. October 11, 1996.

Injury estimates for 1985 and 1989 are based on injury surveys using NEISS cases. Injury estimates for other years have been adjusted by factors to account for out-of-scope (non-ATV) cases based on injury studies in 1985, 1989, 1997 and 2001.[19] An in-scope case was defined to be any non-occupational, unintentional case involving an ATV, whether or not the victim was operating the ATV at the time of the incident. (NEISS does not collect occupational injuries.) The adjustment factors were 0.93 for 1986 through 1988, 0.95 for 1990 through 1996, 0.903 for 1997 through 2000 (amended from 0.935) and 0.922 for 2001 and after.

NEISS includes incidents associated with ATVs for which the number of wheels is unknown. Because of this, the unknowns are apportioned in the calculation of the estimated injuries associated with four-wheelers. The four-wheel calculation was accomplished by the following formula:

$$Total\ Estimate_{4W} = \frac{Estimate_{4W}}{Estimate_{3W+4W}}\left(Estimate_{3W+4W+UW}\right) \qquad \textit{Formula 4}$$

where

$Total\ Estimate_{4W}$ is the total estimated injuries associated with four-wheel ATVs with unknowns apportioned,

$Estimate_{4W}$ is the estimated injuries associated with four-wheel ATVs not including unknowns,

$Estimate_{3W+4W}$ is the combined estimated injuries associated with three- and four-wheel ATVs (not including unknowns),

$Estimate_{3W+4W+UW}$ is the combined estimated injuries associated with ATVs with three, four or an unknown number of wheels.

Risk of injury in this report is defined as the estimated number of injuries divided by the number of vehicles in use, multiplied by 10,000. Annual ATV population estimates were the same as those used in the calculation of risk of death and are discussed elsewhere in this appendix.

[19] Levenson, M., ATV Injury Adjustment Factors for 1997 and 2001, memorandum. September 12, 2003. U.S. Consumer Product Safety Commission.
Rodgers, G. and Zamula, W. Results of the ATV Exposure Study, memorandum. September 12, 1986. U.S. Consumer Product Safety Commission.
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